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EXPANDING CITIES DIMINISHING SPACE

ARE "SMART CITIES" THE SOLUTION OR PART OF THE PROBLEM OF CONTINUOUS URBANISATION AROUND THE GLOBE?

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or part of the problem of continuous urbanisation around the globe?

Proceedings of

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Beiträge zur

23. internationalen Konferenz zu Stadtplanung, Regionalentwicklung und Informationsgesellschaft

Edited by

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REAL CORP 2018

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PREFACE

Manfred SCHRENK,

Conference Director,
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WELCOME to REAL CORP 2018, the 23rd International Conference on Urban & Regional Development and Spatial Planning in the Information Society!

The proceedings of this year's conference contain 78 scientific papers; most of them were selected after a double-blind, double-stage (for both abstracts and full papers) peer-review process for publication and presentation at the 23rd International Conference on Urban Planning and Regional Development in the Information Society, REAL CORP 2018. The non-reviewed papers were accepted by the programme committee after a double-blind abstract review. The conference is held from 4 to 6 April 2018 in Vienna, Austria, in co-operation with TU Wien, Department of Geodesy and Geoinformation, Research Group Geoinformation.

REAL CORP 2018 "Expanding Cities – Diminishing Space" tries to answer the question: Are "Smart Cities" the solution or part of the problem of continuous urbanisation around the globe?

The world's total population is expected to hit the 10 billion point in the 2060s, more than 70 % living in urban areas. Cities are not only growing in population, but are expanding in area. Even with constant number of inhabitants there is a demand for more space. As a consequence cities also grow into 3rd dimension: "up into the sky" and "going underground". Many cities kind of expand in time, become "cities that never sleep", extending their urban activities to 24 hours per day all the year round – 24/365. Even in countries and regions with constant or declining population numbers, it is still the cities that attract people. While the "hunger" in the literal sense for food and resources is growing, the "spaces in between", especially agricultural land, but also natural retreats and buffer zones are diminishing.

These aspects of city expansion do not only lead to massive changes all over the world, they also arise multiple challenges, chances and risks which have to be dealt with in planning processes. Current projections indicate that during the next decades the space occupied by cities will be more than three times the amount of today's urban areas. The majority of the world's population is already living in urban settlements. Not only megacities like in China, India, parts of Africa and Latin America are growing fast, but also small- and medium-sized cities are gaining population rapidly.

So on the one hand there is the threat that the permanent demand for more space leads to a number of consequences such as scarcity of resources, infrastructural bottlenecks, pollution and devastation of land or social conflicts. Questions arise on how to deal with these problems at short notice, and what has to be done to find solutions to these challenges thinking in long-term strategies – the challenges and problems seem huge. On the other hand more and more unprecedented (urban) technologies are available to monitor and manage cities. Monitoring is as well done by remote sensing in stunning

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precision, and by extensive sensor networks in (almost) real time. Smart urban technologies promise a contribution to the solution of multiple challenges we are facing in cities. However, these technologies are a precondition for the management and also for the growth of bigger and bigger urban agglomerations. Is this development sustainable? How resilient are huge urban systems based on highly complex technology? Smart urban technologies can be applied in wide fields, an essential aspect is to overcome “disciplinary approaches” and having a holistic view of the city – an approach that urban planners claim to have been using forever. With all the technology in focus of course the goals of sustainability and resilience remain as important as they have always been. Cities are mainly about people and not about technology, so it is still “quality of life” that should be in focus. REAL CORP 2018 shows the current state of the art as well as presents projects and approaches for the use of future technology.

Vienna, the host city of REAL CORP 2018, is still the most liveable city in the world according to the well-known Mercer study on quality of living. The results of this study show, for the 8th time now, that Vienna’s approach to quality of living is acknowledged internationally – an ideal location for REAL CORP which has always been a conference with a strong focus on international presenters and audience – this year we brought together some 250 participants from more than 40 countries worldwide. The main goal of the REAL CORP conference series isto bring together leading experts in the field of spatial planning, geoinformation and related disciplines to exchange their knowledge, share their ideas, discuss current developments and get together for face to face networking leading to the development of new thoughts, partnerships and projects.

The success of the REAL CORP conferences is – clearly without doubt – the result of the efforts of participants, reviewers, and the conference organising team consisting of CORP association, ISOCARP – International Society of City and Regional Planners, Karlsruhe Institute of Technology and TU Wien.
We would like to acknowledge the Reviewer Team and Programme Committee members for their valueable voluntary help with the review process. Our thanks go to all participants and authors of the submitted papers as well.

Welcome to Vienna! Have a great conference!

Manfred SCHRENK, Clemens BEYER & the REAL CORP Team

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A Concept of Geo-Facts for Online Discourse in "Postfactual" Times in the Context of Spatial Planning

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1 ABSTRACT

The paper discusses geo-facts and their importance in discussions. The context of the examples is spatial planning. It is assumed that geo-facts should be the basis for modern (trustworthy and reliable) e-participation in spatial planning processes. This is discussed in comparison with "alternative facts" and some ideas about necessary data on facts are presented.

Starting from an intuitive definition of facts we develop the concept of geo-facts, show their usefulness for discourse in a spatial planning environment, and points out some technical details. The paper discusses ideas and aims at presenting a vision rather than present a detailed evaluation and solution that is ready to be implemented. The goal of this paper is starting a discussion how expertise can be stored and used.

Keywords: linked data, creation, validation, spatial planning, geo-facts

2 INTRODUCTION

The current political and social situation increasingly relies on opinions. An example was provided by the Trump-administration in response to pictures from the inauguration ceremony and a comparison between the inauguration of Donald Trump and Barack Obama four years before. Trump's press secretary said that more people visited the inauguration of Donald Trump although pictures suggested otherwise and this was later defended as "alternative facts" by a senior White House aide (The Guardian, 2017). This causes a huge problem for any reasonable discussion including those on spatial planning. If there are concepts like alternative facts, how can it been decided which to use as a basis for planning? Starting from this problem the paper discusses the concept of facts, how facts are generated, and how they can be used.

Facts are statements that are created and can be validated. In this paper we discuss the concept of geo-facts. A geo-fact is a fact connected to a specific location, which may be a point, a line, or an area. In order to store these facts, they also need to have a reference, e.g., a Uniform Resource Locator (URL). This was already suggested for cadastral objects for Switzerland. After introducing and discussing these fundamental concepts, further questions on the use of geo-facts arise. How could a smart visualisation help to distinct important from less relevant facts?

In order to illustrate the ideas, throughout the paper reference to a spatial planning project in a small Austrian village will be made (see Fig. 1). It could have arbitrary topic, for instance planning a new cycle path for children, collecting ideas for a new arrangement of service stations, involving citizens in planning a public transportation line for the city, involving citizens in locating a new area for dog-walking, etc.

The remainder of the paper is structured as follows: Section 2 introduces the notion of a fact as used in this paper. Section 3 outlines the specialities of geo-facts and section 4 discusses the risk of "alternative facts" in discourse. Section 5 then provides a brief introduction to the importance of geo-facts in spatial planning and section 6 provides some ideas on making geo-facts accessible. Section 7 shows the technical requirements for geo-facts, which are necessary due to the changing (social and physical) reality. In the end we present some conclusions.

3 FACTS

The core purpose of a fact in the context of this paper is that the fact can be used as an argument in discourse. Looking up a general definition of "fact" produces something like the following:

- "something that actually exists; reality; truth
- something known to exist or to have happened
- a truth known by actual experience or observation; something known to be true
- something said to be true or supposed to have happened" (dictionary.com)

or

- "a thing that is known or proved to be true" (Oxford Living Dictionary).

However, these definitions require a concept of "truth" that is difficult to apply to complex situations. The idea that experience or observation is used to identify truth is similarly limited. It can be assumed that reality is (almost?) infinitely complex and human observations are rather limited. Thus determining truth from observation is difficult. Thus any discussion of facts and their use should avoid "truth". The concept of "something said to be true or supposed to have happened" is much weaker than the other concepts. It might sound somehow strange but this makes it a promising starting point for a discussion in this paper.

Based on this definition, what is a fact? Something, e.g., information can turn into a fact when it becomes referable and unchangeable within a defined period of time. Something is referable if it is possible to use a reference to it in a discourse. Translated into terms of scientific literature it is citable or in the domain of the Internet it is linkable. Nowadays information is primarily shared via the Internet. Therefore, a fact in the Internet needs to have a unique address (URI/URL). Examples for practical implementations of such identifier systems are the Persistent Uniform Resource Locator (PURL) or the Digital Object Identifier (DOI).

3.1 What is a fact and what is not a fact

In the context of this paper a pragmatic approach is used for the definition of what a fact is. Assuming there is no such thing as an absolute truth, it is postulated that a fact is a piece of information that can be used to argue for or against something. This applies to any information.

Understanding the fact concept might lead to conclusion, that it must be understandable for the target audience. This sometimes provides a problem, e.g., when discussing complex structures. How many, for example were capable to understand the concept of black holes in the discussion about risks connected to experiments in the Large Hadron Collider (LHC) at CERN? The physical existence of the LHC is a fact and the fear of the people as well. However, how far are the details of physics relevant facts in the discussion of the fear of the people? Is it really correct that facts only understood by experts are irrelevant?

According to WikiPedia, "information is that which informs" (WikiPedia, 2018a), in the context of this paper, information is potentially an argument in a discourse and it becomes a fact if it can be referable (compare section 7). However, even apparently useless pieces of information can become relevant even if not the whole audience can fully understand the reasoning behind the geo-fact. This means, that a subjective assumption about the quality (in the sense of plausibility) of an information is not sufficient to decide if the information is relevant or not. This also applies to the type of information discussed here, the facts. What makes the facts more useful, is the constraint that it fulfils formal criteria so it can be (but does not need to be) linked to and used in an online-discourse.

3.2 Validation of facts – telling facts from fiction

A fact can be validated if it is compared to other facts. The death of a public figure, for example, can be witnessed by persons who then can spread the information as a fact. Discussions on the death of the public figure can then be linked to this fact. If the original fact is correct, then there will be other, independent facts that agree with the original fact. Otherwise, contradicting facts will occur, e.g., press releases by the public figure that the original obituary was premature. A list of premature obituaries can be found on the web (WikiPedia, 2018b).

A standard method to validate facts could be statistics. Statistics is used successfully when dealing with observations and observation errors. Gross errors, which represent incorrect facts, can be eliminated by robust statistical methods like Least Trimmed Squares or Ransac. However, these methods can need to be applied carefully because a measurement is always affected by statistical variation whereas a fact is either true or false. A fact is more likely to be true if numerous people create multiple instances of the same fact independent of each other. Thus errors in the people's observation would be corrected because it is not plausible several people have the same incorrect observation independent of each other. When different people, for example assess the number of participants at a conference and publish this as facts, a larger number of facts will provide a better assessment of the conference size. However, the Loch Ness Monster would be a validated fact because there are multiple, independent observations documented. Therefore, reliable validation of facts could require thorough analysis of each fact.

4 GEO-FACTS

What makes a fact a geo-fact? A geo-fact is a fact that refers to a specific location at a specific time. The location may be identified by any hierarchical concept (e.g., from country to municipality to private property), a fuzzy concept (e.g., downtown Vienna) or a discrete geometry (constructed from point, lines, polygons, etc.). A geo-fact describes any kind of information on this location, e.g., links to an event that happened on this location, refers to an object in this location, or indicates a relation between a person and a location.

It is also possible, that a social, political or geographical description is a fact by itself. An example is the definition of the boundary of the municipality Bad Gleichenberg, which was defined as a text in the 19th century (Navratil, 2011). Of course this fact makes no sense if it is not used in the correct context and linked by other facts (to the historical development in this case). This can be used, for example, to document changes in geographical names over time (e.g., Carnuntum in the 1st century AD vs. Petronell-Carnuntum today).

A difference between non geo-related facts and geo-facts is that rules of geography, i.e., the first law of geography “Everything is related to everything else, but near things are more related than distant things” (Tobler, 1970) can be used to validate geo-facts. This enables the use of statistical analysis to trustworthiness of a geo-fact. However, Goodchild and Li (2012) documented the limits of this concept in the context of Volunteered Geographic Information (VGI).

Another problem may be provided by the spatial variation of a geo-fact. The global sea-level rise is a geo-fact. However, test calculations in the 1990ies by Bretterbauer already showed that additional water will not be evenly distribute over the oceans In addition, some parts of continents are rising or falling independent of the seal-level rise. Scandinavia, for example, is still affected by post-glacial rise. If this rise exceeds the annual seal-level rise, then local gauges will report drop of sea-level and thus local geo-facts will contradict the global geo-fact of sea-level rise.

This problem is connected to granularity. Phenomena can be constructed from small pieces and these pieces may behave differently that the total phenomenon. The granularity of the phenomenon determines a maximum level of detail that is suitable for a description of the phenomenon. A dune, for example, consists of small grains and the behaviour of the dune (movement, shape change, etc.) depends on the grains and the atmospheric conditions. Looking at the phenomenon dune at a level of detail that considers parts of the grains does not improve understanding of the behaviour of dunes.

While the granularity of the phenomenon determines a maximum level of detail, the scope of discussion determines a suitable level of abstraction. Humans can deal with a limited number of aspects at any given time. Miller discussed this topic in his famous paper (Miller, 1956) for distinguishing different stimuli (e.g., shades of a colour) and memory span connected with lists of objects. This is the experimental proof that humans cannot argue about arbitrarily complex problems because detail will not stay in short term memory. Thus the amount of detail needs to be reduced for any discussion. The simplest way to do this is to make abstractions by ignoring details. A discussion of travelling in sand deserts will need to include the shape of dunes because travelling in some directions is much easier than in other directions. The shape is a direct result of grains move by wind but on a coarse level of abstraction this is ignored. If somebody needs proof that dunes have this form, either pictures of dunes (geo-facts) or theoretical models of grain movement (facts of physics) may be used.

These issues are relevant for non-spatial facts as well but they are even more relevant for geo-facts. The first law of geography suggests, that spatial autocorrelation (close things are more related) is an important assumption for geographical features. Highly correlated facts, however, can be grouped together and the information that a phenomenon has multiple instances (there are numerous dunes in a desert) can be ignored and the geo-fact “there are dunes in this area” is an abstraction of the geo-facts documenting every single dune. The selection of a suitable abstraction level (eliminating irrelevant detail and nothing more) is crucial for a fruitful discourse.

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5 CONSIDERATIONS CONCERNING “ALTERNATIVE FACTS” IN ONLINE-DISCOURSE ENVIRONMENTS

Why are we referring to the concept of alternative facts? Citizens perceive the world through their sensors. Thus each citizen has a subjective view of the world. These views may vary between the citizens. Some of these differences in views may only have limited significance for the individuals, e.g., if someone likes the colour of a facade. In other cases, the view of the individual is in opposition to what the majority assumes. This is no problem for a discourse if it is treated as an opinion (the fact, that a citizen has this specific believe). However, if this opinion is translated into a geo-fact by (i) making a wrong statement (e.g., falsifying an image, reporting wrong observations) or (ii) drawing illogical conclusions (e.g., derive a general rule from one single observation like “I have once seen a red lake so lakes are red”).

Like in politics and all fields of society, also in citizen participation wrong, incomplete or misinterpreted information is often used as basis for an argument. If this (wrong) argument is published online it can be named an “alternative fact”. In the context of this paper, it would be an “alternative geo-fact”.

It would be easy to ignore this aspect of problematic handling of information. However, the recent intense discussion in media about “alternative facts” showed that scientists should point out their position for handling this kind of geo-fact in discourse oriented communication environments. The existence of “alternative views on how things are” is a reality and a trustworthy information environment should not make the mistake to treat plausible and unreliable information in a different manner, because both are a reality in discourse. It should be repeated in this place that a fact is in the definition of this paper a referable information object that fulfils “formal” criteria (see formal criteria in section 7).

An approach for the identification of purposefully wrong facts is necessary. Such an approach can start from the currently observed pattern that correct facts are typically reported independently by different people whereas purposefully wrong facts are stated once and then repeated. A differentiation based on statistical analysis seems plausible if facts can be traced to their origin, i.e., if sets of geo-facts can be reduced to the originally published geo-facts.

6 GEO-FACTS IN SPATIAL PLANNING

The concept of geo-facts is essential for high quality discourse in public participation processes. The evolution of Web 2.0 technologies, mobile communication, and beyond enabled public participation projects using an online representation. The most common occurrence in this context is the so called blended participation where online and offline media are mixed. Assuming the following phases of participation:

(1) Pre-participation phase (information of the Stakeholder)

(2) Discussion and decision

(3) Documentation for comprehensibility of the process

The quality of the discussion in phase 2 is very much depending on the quality of information provided to the different stakeholder of the participatory project. Nowadays, phase 2 is often offline. But it can be very much assumed that much more of the communication in the future will be online. Especially if phase 2 is online (for instance for a period of some days citizen are in discussion in a web environment a special planning issue) it is essential to have geo-facts to enable an efficient discourse. Figure 1 shows a possible approach for a user interface. The participatory example in a small Austrian village refers to a made-up trail that shall be created and an online-discussion is initiated to allow the citizens to participate in the decision-making process. Different types of geo-facts like a trail-plan, a study, or a photo are represented by different symbols. In order to reduce the complexity of the presentation, a limitation of the number of shown geo-facts is possible (here 11 of 50). A discussion of the timeline can be found in the next section.

What is the vision of the paper? We aim to apply the geo-fact concept to modern participatory planning processes. We are convinced that the quality of the process and results as well as the acceptance by the involved can be very much increased. We invite the community to start a in depth discussions, how geo-facts should be specified. It seems obvious that geo-facts can be either bottom-up collections where citizens can contribute their thoughts and their local knowledge or top-down where the administration provides facts on legal restrictions or administrative settings. An example for bottom-up is the possibility to add photos as shown in Fig. 1. Photos can be used to document aspects that the local population wants addressed. A study will typically be top-down since is it ordered and financed by the administration. The concept of geo-facts can thus incorporate both views and the planning process must later make a distinction if necessary.

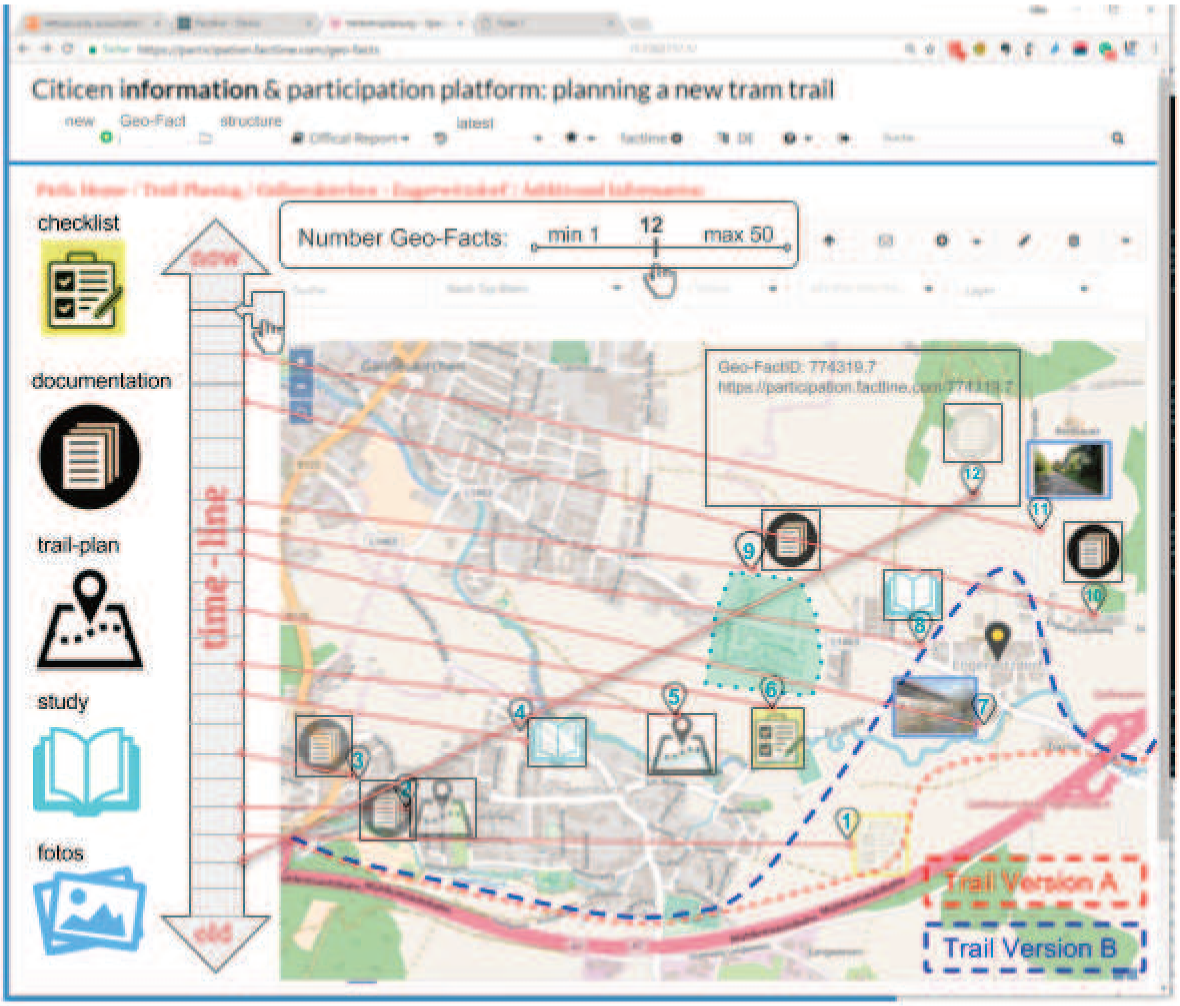

Fig. 1: A possible user interface to access geo-facts for an online-discourse in spatial planning: An example in a small Austrian village.

7 WORKING WITH GEO-FACTS

It is fair to assume future planning projects will require that better tools than providing some information on a Website, a Dropbox-Folder or some Wiki. Modern (Internet-based) society is suffering in many ways from information overload. One of the key problems might be that too much information is accessible and no reasonable filtering tools are available. Everybody with Internet access is a potential “fact-creator” and the created geo-facts are accessible for everybody else. This explains why there is so much more Information compared to former times. However, the challenge is now, how to cope with this reality.

It can also be said that that humans (participants of an online participation, spatial planning project) have a limited attention span to process Information. The attention span is thus a valuable resource. Now when suggesting a concept of information, the geo-fact, it is essential to consider how the information can be presented efficiently. Efficiency in in this context means, that a participants of a discussion process finds the relevant Information within his or her attention span. This requires the ability to separate noise (large number of geo-facts) from signal (relevant geo-facts).

Twitter is proof of the fact, that less data sometimes create more information. The concept, that the publisher of a tweet is restricted to 160 characters makes Twitter a widely used information and communication channel. The reduction of quantity is the key aspect for the consumers. The concept of geo-facts tries to apply this idea to information rich discussions in the domain of spatial planning.

Why are access permissions and fingerprints needed for geo-facts? As already mentioned, the core idea of the fact is, that it can be used as an argument in discourse. In the context of participation it is often assumed

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that all information should be publicly available. But reality shows this can lead to problems. Figure 1 provides an example for a planned track in a village. Before starting the participation process, the village council will commission a consultant to analyse the area where the new trail is planned. The resulting report may contain descriptions of the private properties of the area and their condition. This Information could be used to draw conclusions on the financial status of the property owner and some property related information might even contain security relevant details.

The goal of the village council will be that all potentially affected citizens should participate. This might be persons living in the village but also people from a neighbouring village or people owning the property without living in the village. As a result it may be difficult to create a complete list of all persons who should be included in the discussion. However, all potential participants must be informed about the available relevant local facts (geo-facts) to ensure a high level of participation. The facts would provide the basis for the participants. But it cannot be published for universe (for everybody in the Internet) if it contains sensitive information.

In addition, it can be imagined that several planners are developing different variations for trails. Of course, the implementation of each trail would have a big impact on the owner of the affected property (e.g., by decreasing or increasing the property value). In the beginning of the planning process they might suggest many trails that are rejected for various reasons. But it would create irritation if the public would see all of these trails because they would naturally assume that this is a realistic track. However, later, when it becomes clear where the trail will be, the "old arguments" used to exclude these tracks might still be of value to prove that a neutral process was going on or to counter proposals for one of these fracks from the audience. So all the argument that have been invisible must later have the ability to become visible. In order to perform such changes automatically, concepts like a fingerprint of each fact (fact-hash) would be necessary.

From the above described scenarios the following additional requirements for geo-facts can be drawn. Each (version of a) geo-fact must have permission rules. It must be possible to grant access for persons in a certain group, e.g., for the neighbours of a property. As an effect of this, individuals might get different views if they belong to different groups. Persons with access to specific geo-facts may understand limitations for the planning that are more difficult to understand for outsiders, who do not have access to these geo-facts. Reasons to hide facts from the general public may be privacy or planned activities that are not yet developed for enough for a discussion in a wider audience.

7.1 A Possible Representation of Geo-Facts

A two dimensional map can present a limited number of geo-facts. The geo-facts are marked by Symbols. For instance a study is represented by the symbol of an open book. The zoom-level of the map and the total number of geo-facts determine how many geo-facts are displayed. Selection of geo-facts requires an order of relevance. This order can be represented using graphical variables. Relevant geo-facts are clearly visible; less relevant geo-facts seem to fade out. In Figure 1, the fact with the number 11 is the latest fact and the one with the number 1 is the oldest. Whereas the symbol of fact 1 is barely visible, the symbol for 11 is printed with a high saturation and the symbol is clearly visible. In addition, the facts are also connected to the timeline on the left side to make the temporal order of the facts visible. This idea was introduced in the concept of the geoTalk communication platform (Navratil and Harnoncourt, 2004).

What makes a geo-fact more relevant? This question cannot be solved completely in a short paper, but a first suggestion is possible. A new fact may be more relevant than a fact that was not explicitly known but already published earlier. In this case the relevance criterion is the actuality. So the most recently published geo-fact is "in the front" and older facts are faded out. However, only a limited number of geo-facts, e.g., the last 50 geo-facts, get displayed to make the information able to be processed. An alternative or complementary approach would be that the most important facts should be presented. The question here is to quantify importance. It can be assumed, that multiple factors make information important. For Instance, more relevant fact may be more often linked to other facts. Other possible parameters could be if the geo-fact is often commented or rated, often edited by different persons, often tagged, etc. If importance is considered as the relevance criterion, a formula to calculate importance is necessary. In contrast to systems like Google PageRank, such a formula needs to be published in order to be acceptable for public participation processes.

There have been even considerations to make the weighting of the parameters applied in the algorithm a process the community has to agree on.

7.2 Augmented Reality and GeoTalk

When assuming that mobile information sharing, communication, and participation is a growing in the information sector, especially in the field of special planning, it is essential that geo-facts can be displayed in a useful (value adding way) with smartphones. Modern participation tools could apply the concept of augmented reality (AR) to present the geo-facts but also to follow the “discourse elements” shown in Figure 1 about the specific project. Whereas Allbach et al. (2011), Broschart, et al. (2013) and Höhl and Broschart (2015), for example, focus on the inclusion of 3D models in real scenes, the concept proposed here would visualize the availability of geo-facts. Fundamentally the above mentioned concept from the GeoTalk-concept of fading of less relevant facts can be applied in an augmented reality viewer. Discussion on spatial phenomena is not simple because simplified representation of geography in the mental map leads to incorrect assessments. Typical examples are the rectangular arrangement of elements that humans intuitively perform and that frequently contradicts reality. Thus, discussion about real world phenomena is easier in the real world. Focal points in this situation are objects that the participants of the process can discuss about. However, digital fragments like facts are not visible in reality. AR-technology like special glasses can merge the real world and the digital view by depicting geo-facts in the correct location while navigating the area of interest. This can help to structure and guide a discussion process.

8 LIFECYCLES AND RELATED CRITERIA FOR GEO-FACTS

Geo-facts are created when something starts to exist or becomes relevant enough to be documented. The geo-fact changes with time. This could be a change of content, e.g., if the opening hours for a local attraction are changed. However, it could also be a change of location or extent, e.g., if a children’s playground is extended or the public library moved to a different location. Finally the geo-fact is terminated when the phenomenon is eliminated. The geo-fact is still known but the phenomenon it represents does not exist anymore. This happens, e.g., when a building is demolished. This situation is similar to objects in a database: Such objects are created, destroyed suspended, and resumed. Their compositions can involve single objects, and then it is called evolving, or a group of objects. In this case it can be constructive and weak fusion, aggregation, separation, fission, or segregation. An algebraic description of such a model can be found in the work of Medak (1999) and a similar model based on identity-based change operations in the work of Hornsby and Egenhofer (2002).

Geo-facts contain more complexity than objects in databases since objects in databases are typically created by experts whereas geo-facts can be published by laypersons as well. The likelihood of mistakes is probably higher with laypersons and this may require corrections or more detailed definitions. This phenomenon is also known in other areas. Modern software, for example, frequently requires updates when new patches are available. Geo-facts equally need a possibility to be updated. However, unlike with software, it is important that the original version of the fact remains accessible Otherwise references made to the original fact could point to facts that do no longer support the claim made in the derived fact and thus nobody would be able to refer to an information and construct his argument based on other facts without freeze the referenced fact.

There are several additional aspects a “fact” has to comply with. The following list contains some aspects (formal criteria) and provides some concrete examples:

- Author or publisher (Who created the fact; who published the fact)
  Pictures of the car accident were made by A.
- Timestamp (Date of relevance for the information / When was it published)
  The car accident happened at 2:30 AM, the pictures were taken at 6:45.
- Permission (Who is permitted to view the fact)
  Police, prosecution, involved persons, and experts of the insurance company are permitted to access the pictures
- Guarantee of existence (Until what time will the fact be available)
- Metadata for correct interpretation of the fact (Language, Mime Code…..)

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9 CONCLUSIONS

In the near future, major public discourse will take place in Internet and specifically in social media. Therefore, any information and communication environment that claims relevance must provide connectivity to social media. Most of the considerations for the suggested concept of geo-facts are derived from lessons learned in scientific communication. In scientific communication, the creation of information that can be cited is one of the most important aspects. The concept of geo-facts tries to transfer the concept that proved successful in science into social media. It should help to increase the quality of discussion the social media and (when used in this context) also in public spatial planning processes. A second benefit would be that the geo-scientific community would be able to publish their findings in a way that it can be the basis for a fact based online discourse.

The following core elements of the geo-fact concept are relevant

- Traceability of a fact development (version control),
- Referability and linkability,
- Guarantee of existence (How long will the information be available for sure), and
- Access permission on facts.

Geo-Facts can be the basis for a number of applications. The visualization presented in this paper is merely an incentive to imagine future applications based on geo-facts. However, it can be assumed that geo-facts could become a core asset for the developed world where augmented reality meets decision making in public space.

The above presented draft for a concept of geo-facts is a status report on an ongoing discourse building a robust framework for valuable arguments in spatial planning processes. The authors are convinced that the formal definition of a geo-fact can and should only be developed having in mind the applications and scenarios using geo-facts. There is a long list of open questions: The fading of facts requires a sorting mechanism. More discussion and the application of the idea in different scenarios will be necessary to understand, which aspects could be used to sort geo-facts. A complete set of formal criteria for facts is necessary as well as software solutions to make the tests in different scenarios.

10 REFERENCES

ALLBACH, B., MEMMEL, M., ZEILE, P.,STREICH, B. (2011): Mobile Augmented City – New Methods for Urban Analysis and Urban Design Processes by using Mobile Augmented Reality Services. In: SCHRENK, POPOVICH, ZEILE (Eds.) Proceedings REAL CORP 2011 Tagungsband, corp.at, pp. 633-641.

BROSCHART, D., ZEILE, P., SCHREICH, B. (2013): Augmented Reality as a Communication Tool in Urban Design Processes. In: SCHRENK, POPOVICH, ZEILE, ELISEI (Eds.) Proceedings REAL CORP 2013 Tagungsband, corp.at, pp. 119-126.

GOODCHILD, M.F. & LI, L. (2012): Assuring the quality of volunteered geographic information. Spatial Statistics, 1: 110-120.

HÖHL, W. & BROSCHART, D. (2015): Augmented Reality im öffentlichen Raum. In: SCHRENK, POPOVICH, ZEILE, ELISEI, BEYER (Eds.) Proceedings REAL CORP 2015 Tagungsband, corp.at, pp. 73-82.

HORNSBY, K. & EGENHOFER, M.J. (2000): Identity-based Change: A Foundation for Spatio-temporal Knowledge Representation. International Journal of Geographical Information Science, 14:3, 207-224, DOI: 10.1080/136588100240813.

MEDAK, D. (1999): Lifestyles - An Algebraic Approach to Change in Identity. In: BÖHLEN, JENSEN, SCHOLL (eds.) Spatio-Temporal Database Management. Lecture Notes in Computer Science, vol 1678. Springer, Berlin, Heidelberg.

NAVRATIL, G. (2011): Cadastral Boundaries: Benefits of Complexity. URISA Journal, 23(1): 19-27.

NAVRATIL, G. & HARNONCOURT, M. (2004): geoTalk: eine Raum-Zeit-Kommunikationsplattform. In: SCHRENK (Ed.) Proceedings & Multimedia 2004, corp.at, pp. 657-663.

THE GUARDIAN (2017): Donald Trump's team defends 'alternative facts' after widespread protests. Monday, 23 Jan. 2017. https://www.theguardian.com/us-news/2017/jan/22/donald-trump-kellyanne-conway-inauguration-alternative-facts. Accessed: 5. Dec. 2017.

TOBLER, W. (1970): A computer movie simulating urban growth in the Detroit region. Economic Geography, 46(Supplement): 234-240.

WIKIPEDIA (2018a): Information. https://en.wikipedia.org/wiki/Information. Accessed Jan. 12 2018.

WIKIPEDIA (2018b): List of premature obituaries. https://en.wikipedia.org/wiki/List_of_premature_obituaries. Accessed: Jan. 4 2018.

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reviewed paper

A Socio-ecological Approach to Assessing Physical Sctivities in Public Open Spaces of Alexandria City, Egypt

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1 ABSTRACT

Public open spaces are the main attractive areas for people, to practice physical activities, and interact with their surrounding social as well as physical (natural and man-made) environment. Socio-ecological approach is found to be the most applicable approach to examine and measure the various aspects affecting physical activities within public open spaces. The research focused on Alexandria, Egypt, and the study area selected was Pharoas area near old city centre of Alexandria. A field research has been conducted using on-site and online Questionnaire. Statistical analysis was produced to analyse the findings using SPSS statistics software. The results showed that the main factors influencing public open spaces location selection choices were the social environment factors, followed by physical environment factors, then the time taken to reach selected public open space. Physical activities were found to be affected the most by the time spent in the public open space.

Keywords: socio-ecological, physical activities, Alexandria, physical environment, public open spaces

2 INTRODUCTION

The socio-ecological approach is a new concept, area of Study, in Physical Education. (Katzmarzyk ,2008). Physical activity is an issential constituent of health and eudaemonia (Wilk, Piotr, et al,2018). The word ecology evolved from biological sciences and refers to the interrelationships between organisms and their environments. Ecological and socio-ecological models of human behaviour have evolved over a number of decades in the fields of sociology, psychology, education and health and focus on the nature of people’s interactions with their environments. (Victorian Curriculum and Assessment Authority ,2014)

“Public open spaces”, appear to be key built environment frame work that provide opportunities for a multiple physical activity behaviour, such as refreshment walking and playing sports. A lot of research has examined how different characteristics of public open space, such as access to, size and design features, are related to physical activity collaboration. Are views of 50 quantitative studies (Katzmarzyk, 2008). Recently, growing stress, on the implications between the physical environment and physical activity has existed (Elder et al., 2007).

This paper aims at exploring the “Open Spaces” examining relations between public open space and physical activity using Socio-ecological approach to further understand determinants of physical activity. (Van Hecke et al. ,2016). The concept of socio-Ecological approach state that physical activity has various levels of effectiveness, including demographic, psychosocial, physical environmental, and policy factors. To modify people's behaviour, it is important to interfere with these levels, researchers have progressively used socio-ecological models to promote understanding determinants of physical activity (Elder et al., 2007, Glanz et al., 2008). This concept proposes built environment as the most influential level which ease collaboration in physical activity (Rosenbaum et al, 2011).

Social and Physical characteristics of low-socio-ecological impact/high-walk able areas differ from those of high-socio-ecological impact /high walkable areas, and these interactions should be investigated. Thus, it is crucial to specify if walkability to health attitude. Examining these interactions is related to health and urban environment policy, for the future increasing physical activity initiation, former researches have proved that neighbourhood have significant direct relation with physical activity (Shumaker et al. ,2009). Redevelopment of public open spaces is the act of increasing the value within its neighbourhood. Old city centre extension (Bahary and Pharoas area) contained the most attractive historic building which is Citadel of Qaitbay and the public walking area accessing the citadel. Downtowns present the architectural image and character of the city and its history. Thus, it is important to redevelop it to maintain its heritage. It is mandatory to revive the retail activities for people instead of the enclosed shopping malls. It is also important to decrease the congestion of traffic at peak hours to revive the downtown open public spaces as a focal point that attracts tourists and enhances the sense of belonging to the residents of the city. (Shafik.S et al. ,2015). Urban population has rapidly increased thus the city of Alexandria has been enlarged and gradually human relations with nature have been damaged. (Nady.R ,2016). For these reasons, people in Alexandria have lost the opportunity to come in contact with nature. Urban open spaces, parks and its effects on people's health have significant need to be improved to develop the city. To achieve sustainability of urban open spaces and their design strategies have an important rule. Its transformation will provide a high quality of living environment presenting the socio-ecological approach to create sustainable open spaces as an integrated part of a sustainable city. Finally, the non-focus on developing Bahary's open spaces in Alexandria has bad impact of losing successful historic public open spaces. (Shafik. S et al. ,2015).

The objectives of this research could be listed in the following:

- Evaluate which factors of socio-ecology will be more useful to increase the public open spaces attractiveness.
- Suggest a number of steps that may lead Alexandria's public open spaces to be sustainable.
- Measure the weights of aspects of socio-ecological open spaces and its relevant indicators using on-site and on-line survey to both Egyptian and foreign visitors of the area as well as using statistical analysis using SPSS application which is used to measure and state relations between socio-ecological domains and determine the significant factors on physical activities in public open spaces. As shown in Fig.1

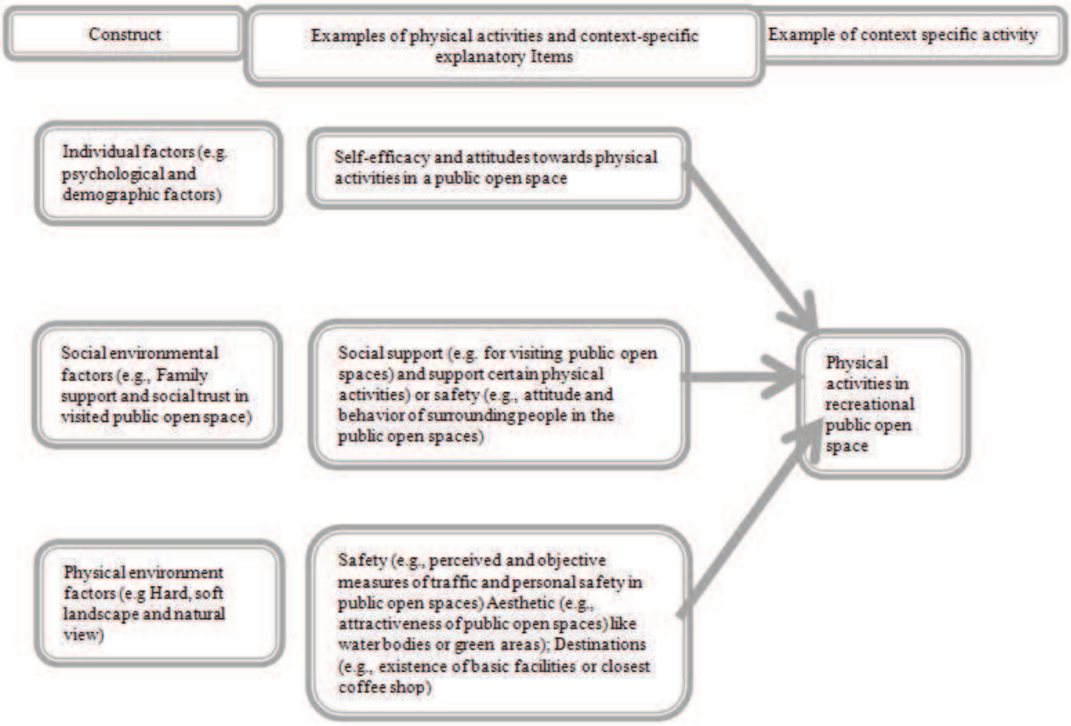

Fig. 1: Structure of socio-ecological theory four domains and how it will effect physical activities in consequence. Source: Researcher, 2017.

3 METHODOLOGY

This study focuses on a number of questions. What are the factors influencing physical activities in public open spaces? How do people choose their free time visiting locations, and what are the factors playing rules in this process? The research relies on a pragmatic approach. It includes both qualitative and quantitative methods. Which are onsite and online survey, observation and statistical analysis. The principle of selecting mixed methods is, on one hand, to respond to the different natures of the research questions. Furthermore, it attempts to introduce a theoretical ground for the assessment of a public open space and to how far it encourages or discourages physical activities bounded by them.

3.1 Theoretical approach

The socio-ecological approach is based on multi-step method. It attempts to assess public open spaces and self-selection factors in a holistic framework, aiming to pinpoint the determinants of physical activity (Van Hecke 2016, Bronfenbrenner ,1994). This concept suggests built environment as the most effective level, as it affluence support to physical activity (Wilk et al., 2018). Fig 2 conceptualizes the four factors of socio-ecological theory that effect individuals' physical activities.

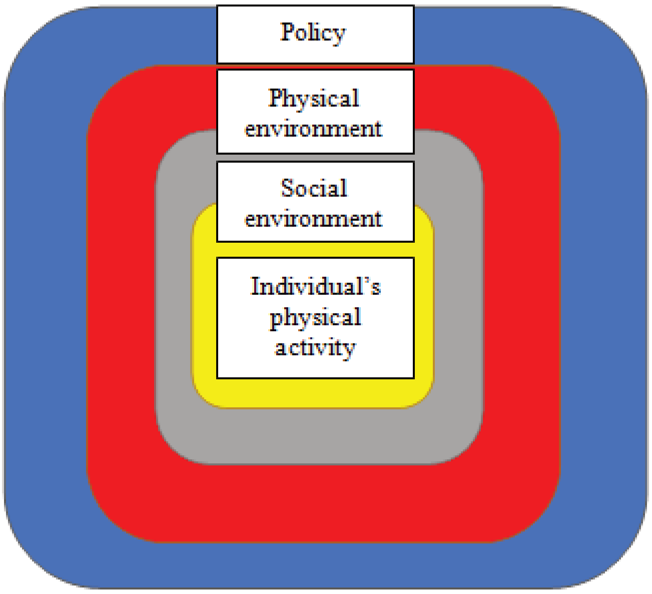

Fig. 2. Relation between the socio-ecological theory four domains. Source: Researcher, 2017.

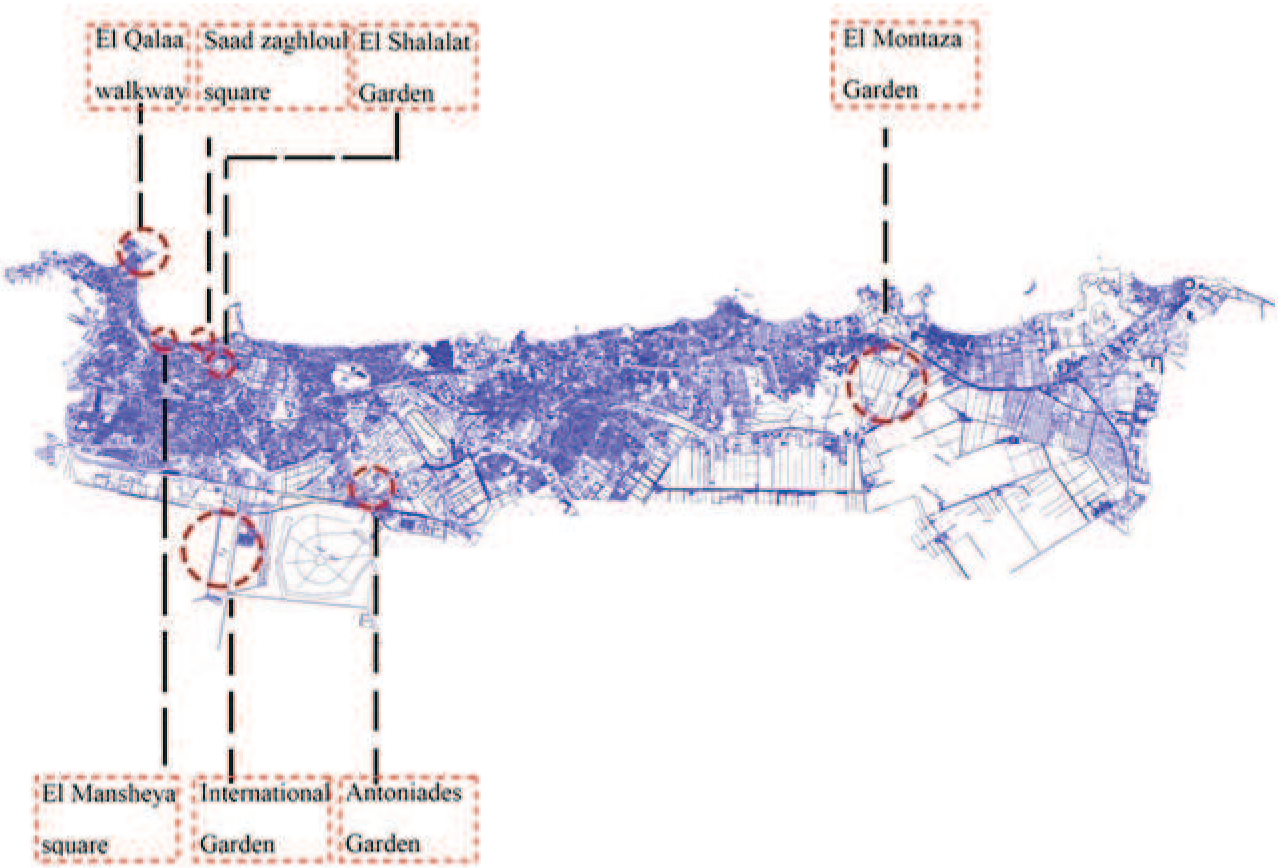

Fig. 3 highlighting locations of public open spaces in Alexandria illustrated by author.

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3.2 Empirical work

After illustrating the different factors related to effect of public open spaces, a knowledge gap appears. First, the factors of more significance Second, the proportion between the four factors domains remains ambiguous, especially in the case of public open spaces in Alexandria. Therefore, an empirical method is needed to identify these two aspects.

The city of Alexandria, Egypt, with 5,217,833 inhabitants in 2018. (CAPMAS, 2018) has been selected as a case study for the research. There are two reasons for selecting Alexandria. First, it represents the second largest urban mass in Egypt. Second, represented by Fig 3; limited recreational public open spaces located within its boundary.

Since the aim of research is studying physical activities in public open spaces as types mentioned in World Health Organization (2015); Table 1 represents why el Qalaa Area is selected highlighting the various physical activities occurring in it regardless its relatively small area comparing to other public open spaces illustrated in Fig 3.

Activities	El Qalaa walkway	El Mansheya square	Saad zaghloul square	El Shalalat Garden	El Montaza Garden	International Garden	Antoniades Garden
Walking	●	●	●	●	●	●	●
Joging	●		●	●	●	●	●
Runing	●		●	●	●	●	●
Horse riding	●						
Cycling	●			●	●		
Crusing	●						
Fishing	●				●		
Ball playing	●		●	●	●	●	●
Relaxing	●	●	●	●	●	●	●

Table 1 compares the various physical activities between P.O.S in Alexandria. Source: Researcher, 2017.

3.2.1 Data collection

Due to the absence of official register or previous studies that tackle measurement of physical activities in public open spaces in Alexandria, primary data became the only way to conduct this research. The data are collected based on a questionnaire in 2017 based on literature review (Veitch, Jenny, et al.,2014, Van Hecke, Linde, et al ,2016, Chan, Pui-shan, et al.,2014) The survey is designed to cover different related factors for public open spaces visiting choices and how it impacts physical activities within it) Qualitative data were described using number and percent. Quantitative data was described using range mean and standard deviation. Significance of the obtained results was judged at the 5% level (Kirkpatrick LA et al. ,2013). Socio-ecological four domains have been studied and categorized into three different sections: individual, social environment and physical environment factors. Individual factors comprised (15 questions); Social environment factors (10 questions), physical environment (6 questions). The first part, individual factors, covers the basic information about the respondent, such as: age, gender, marital status, employment. While the second part, social environment factors, divided into four parts: social context which depends on people’s behaviour in public open spaces, Modelling part which addresses the individuals own social network and how active they are; social network part shade the extent of social interaction could be done between visitors. And last part in social factors is social trust and cohesion addressing the mutual trust and willing of plateful between visitors. Part three, physical environment factors which includes man-made and natural environment factors and their importance to visitors in public open spaces. In Fig.4 map illustrates the locations where the author took samples from the Area. The sample taken for the survey varied in the places where people have been asked. But mainly samples were taken from the lower walkway because it is the most crowded and various in its physical activities. People have been asked in front of the aquarium, the castle, the private cafeterias where people gather and along the lower walkway and the promontory. The total area of Pharoas is 18,500 m2. It could be analysed according to design, services and physical activities that take place in the area. Statistical analysis of the data was fed to the computer and analysed using IBM SPSS software (Kotz S et al. ,2006). The physical activities attract people to visit the whole pharoas area are shown in Fig.3

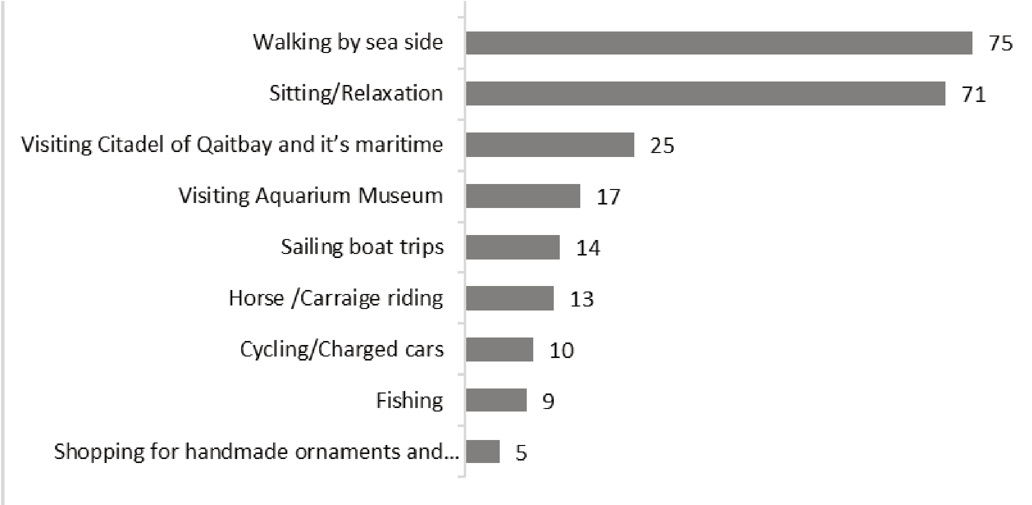

Fig.3 shows the most attractive activities in the area selected by visitors. Source: Researcher , 2017

Design: the design of Soft scape showing a lack in the green elements while the existing green elements in the steps separating the building side walkway from the upper walkway need maintenance and cleaning.

Hard scape like lighting elements, only 44 columns placed on the upper walk while 15 on the building side walkway where 2 columns need fixing and lamps replacing. No lighting in the lower walkway or in the non-designed part except for the 3 columns lighting the façade of the castle and the 4 floor lamps in the same area. Benches were mostly broken or in a bad condition and there were 11 in the whole area. Retail kiosks existed in a hidden location by cars parking in front of it, block its accessibility hide the exhibits inside. The pattern on the sidewalks is interlock which is suitable for walking, but there were some uncovered holes. On the street side basalt pattern is used in some areas forcing drivers to slowdown for pedestrians. The pattern used properly too in the upper walk way where circular patterns used to emphasize the nodes where people gather and rectilinear where people just move or sit. However, patterns need to be cleaned.

Existing buildings like the castle attracted people to the area, the castle is affiliate the Ministry of Tourism. The second place attracting visitors to the place is the aquarium located in the middle of the walkway which is affiliate the ministry of scientific research. the place is less maintained and not attractive to visit more than one or times with family. The last public visit place is the private cafeterias located at the beginning of the walkway where shelters, shadings and proper seating and safe area for kids to play while parents could enjoy the view without any disturbance of other activities or street venders and it is separated by coiled fence and barrels from the public area of walk-way these cafeterias mainly is not entered by public who cannot pay to enjoy that service. Services: There were lack in the basic facilities like bins and water fountains also the parking area is not enough. There were two toilets in a good condition located at the beginning and at the end of the area. Safety: Two small kiosks for police station were located in the middle of the area.

Physical activities: In Fig.5 section A-A also shows that natural environment affected people physical activities in which people gathered in front of the sea in the lower walkway(most crowded by physical activities) to sit and relax, take family cruses, walk, take photos, fish, while their children play around, cycle or motorcycle, ride horses or balloons or flying their kites. Some of the visitors complained their children may fall on the hard pattern while playing or they got hit by one of the motorcycles or horses. The physical environment in the lower walkway gives some privacy and separation from the other parts of the walkway. On the same level there is promontory with area 600m2 shown in Fig.4, it combines relaxing and entering boat cruises and mostly fishing activities as it is surrounded by sea from 3 sides. The upper walkway helped people to walk and enjoy the scene from a higher level. It is mis-used by street venders where they spread their goods with no order. The node in the beginning of upper walkway is full by small bicycles and charged cars to be rented to children. The position of the building side walk way where car parkings and small area of sidewalks prevented people from walking easily.It is mainly used by the clubs' visitors. People tend to walk in the middle of the street instead of walking on the sidewalks. The undersigned part of the walkway stretches along 1,172 m2 area. Considered the most unsafe part because of the absence of lighting elements

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at night. And the broken benches and unsafe floor patterns. This part lacks any shadings to shelters. People use the castle openings to be sheltered. Bad smell existed because people through rubbish and it is not collected.

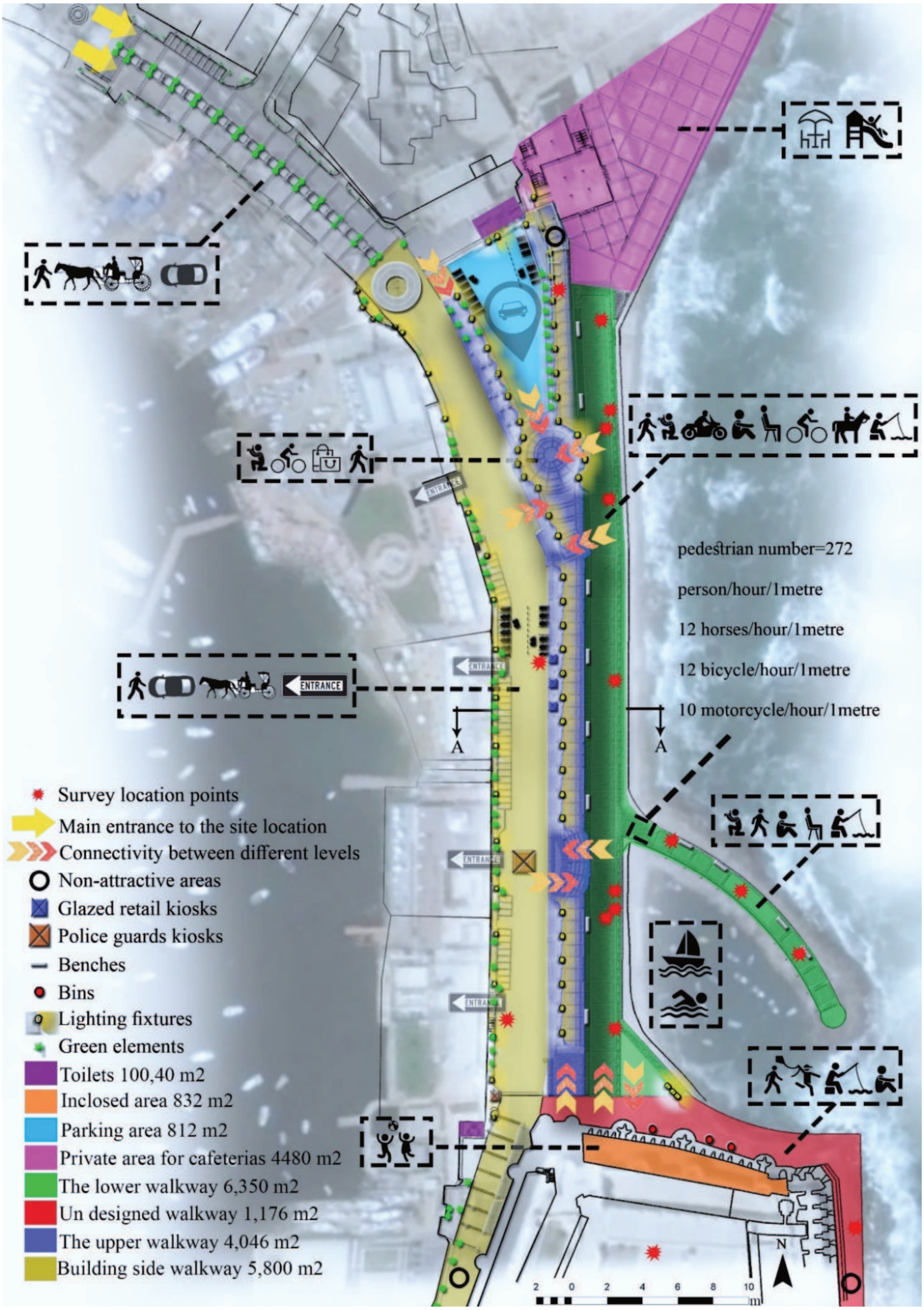

Fig.4 A map shows the layout of Pharoas area of study. Source: Reasercher 2017.

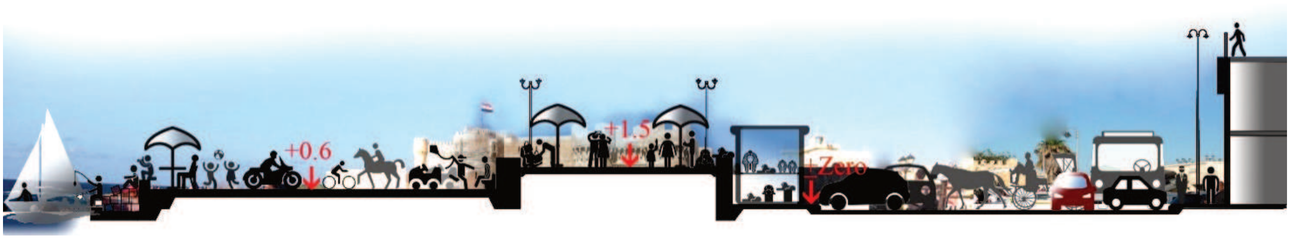

Fig.5 is Section A-A shows physical activities by visitors illustrating the interaction between visitors and physical environment. Source: Reasercher 2017.

In Fig.4 the enclosed area highlighted in orange is 832m2 where children gather to play ball games in front of the castle because it is the safest place and also well illuminated at night. In Fig.5 a section in the area shows that it is divided into three different levels on the left the lower walk way which is 0.6m above zero level. And in the middle the upper walkway wich is 1.5m above street level . on the right side the building side walkway.

4 FINDINGS

4.1 Individual factors

The survey is a representative of a random sample of 100 person 50 onsite and 50 online survey where 37% of the surveyed inhabitants are males, with females of 63% of the sample. A ratio of 56% the age cohort of 21–30, 14% are under 20 years old, while 10% are 41-50, 9% 31-40 ,5% are 51-60 and 7% are 60 and above. A fraction of 45% are living with family members, 33% with spouse, 18% with family members, 3% spouse and parents, and 2% are living alone. A percentage of 42% occupy a full-time job and a part time job, and 13% are retired, 4% are searching for a job while 39% are students. A range of 51% reach the area by their private cars. while 34% get on mini bus. A ratio of 21% by bus, while 8% come by walking 2% cycling.

The Gender of the visitors as shown in Table 2 and Health condition shown in Table 3 presented significance to the physical activities occurred in Pharoas area. While other individual factors showed no significant relation on physical activities in the studied area of Pharoas.

Physical activities	Male		Female	
	No.	%	No.	%
Sitting/ resting/reading/listening to radio or music (n = 47)	18	38.3	29	61.7
Chatting (n = 12)	3	25	9	75
Playing chess/ watching other play chess (n = 2)	1	50	1	50
Walking (n = 22)	5	22.7	17	77.3
jogging (n = 1)	1	100	0	0.0
Using elderly exercise facilities (n = 3)	1	33	2	66.7
Play ballgames (n = 5)	2	40	3	60
Cycling (n = 1)	0	0	1	100
Photograph-ing (n = 5)	5	100	0	0.0
Watching playing kids (n = 3)	0	0	3	100
χ^2(^{MC}p)	14.741*(0.042*)			

Table 2 shows the significance of Gender on Physical activities in Pharoas public open space. Source: Researcher, 2017.

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Physical activities	Health Conditions					
	Good		Normal/Fair		Poor	
What do you usually do in parks	No.	%	No.	%	No.	%
Sitting/ resting/reading/listening to radio or music (n = 47)	36	76.6	10	21.3	1	2.1
Chatting (n = 12)	10	83.3	2	16.7	0	0
Playing chess/ watching other play chess (n = 2)	1	50.0	0	0	1	50.0
Walking (n = 22)	14	63.6	8	36.4	0	0.0
jogging (n = 1)	0	0.0	1	100.0	0	0.0
Using elderly exercise facilities (n = 3)	3	100.0	0	0.0	0	0.0
Play ballgames (n = 5)	1	20.0	4	80.0	0	0.0
Cycling (n = 1)	0	0.0	0	0.0	1	100.0
Photograph-ing (n = 5)	5	100.0	0	0.0	0	0.0
Watching playing kids (n = 3)	1	33.3	2	66.7	3	3.0
$\chi^2(^{MC}p)$			$33.889^*(0.003^*)$			

Table 3 shows the significance of Health condition on Physical activities in Pharoas public open space. Source: Researcher , 2017.

4.2 Social environment factors

There were 60% of surveyed people approved there are drug use in the area. And 50% also approved that their families are active. A ratio of 82% agreed their friends often ask them to hang out. A percentage of 85% approved on existence of lots of other active people in the area. A potion of 75% disapproved to know lots of people in Pharos area. A proportion of 80% disapproved of existence of other people who they could share them in doing activities. while help 64% agreed on existence of people who are willing to help. A percentage of 50% positively responded that people in the area can be trusted. The social environment factor has no significance on physical activities takes place in Pharoas area, while physical environment has significant relation with the physical activities of the visitors. However, in Table 4 there is a very strong significant between the social environment factors and rate of visiting the area or declining visiting it. Followed by the physical environment factors of the place which also impact the decision of the visitors to visit the area or not, as shown in Table 5.

4.3 Physical environment factors

The respondents chose Fig.6 the physical environment factors to be sufficient in Pharos area.

The main physical environment factors were found to be enough in the area was the air quality and ventilation where 92 people out of 100 choosed to be enough. The least suffcient factors were the quantity and quality of basic facilities where only 12 out of 100 agreed to be enough in the area.

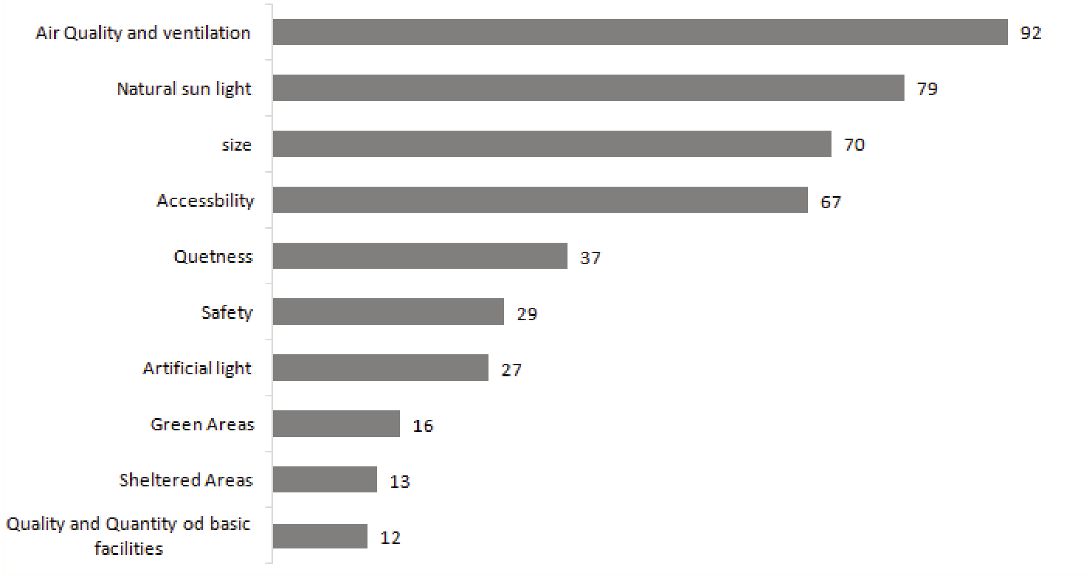

Fig.6 shows the existing physical environment were enough. Source: Researcher 2017.

What activities visitors do in Pharao's area	N	Total social environment factors	Total physical environment factors
		Mean ± SD.	Mean ± SD.
Walking by sea side	75	47.85 ± 21.53	65.60 ± 14.15
Visiting Citadel of Qaitbay and it's maritime museum	25	48.44 ± 22.65	66.13 ± 11.49
Visiting Aquarium Museum	17	43.79 ± 22.73	64.71 ± 12.42
Fishing	9	66.67 ± 27.78	70.0 ± 18.41
Sailing boat trips	14	55.56 ± 24.65	72.86 ± 15.84
Shopping for handmade ornaments and accessories	5	53.33 ± 26.53	65.33 ± 10.70
Horse /Carraige riding	13	57.26 ± 21.20	76.15 ± 14.39
Cycling/Charged cars	10	63.33 ± 22.86	79.67 ± 18.62
Sitting/Relaxation	71	52.58 ± 21.90	65.02 ± 15.09
F(p)		1.612(0.122)	2.253*(0.02*)

Table 4 shows the significance relation of Physical activities with physical environment factors and the insignificant relation between social environment factors and physical activities in Pharoas public open space. Source: Researcher, 2017.

	Total social environment factors	Total opinions to parks physical environment
Visiting Pharoas area	Mean ± SD.	Mean ± SD.
Yes	63.43 ± 22.81	64.86 ± 16.97
Seldom	44.78 ± 18.04	65.12 ± 13.07
No	43.33 ± 19.91	65.33 ± 7.24
F(p)	8.619*(<0.001*)	0.005(0.995)

Table 5 shows the significant relation of physical environment factors and social environment factors with visiting Pharoas public open space. Source: Researcher, 2017.

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5 DISCUSSION

From author's observation the main attractive man-made physical environment factor is the castle located in the area which is a historic building attracts people specially who live out of Alexandria.while the sea was the main attractive natural environment attracting people. The social environment factors affected the walkway visitors' physical activities in a significant way were most of the visitors were accompanying their families and also affected positively from residents of the area from their activeness of selling or fishing or swimming in the small bay. But also affected negatively from being annoyed by the street venders or the harassments they experience. The polices affected the walkway as in the weekends or vacations when the parking areas are fully occupied, officers from the police station prevent cars from entering the area and ask people to search for another area to park thier cars.

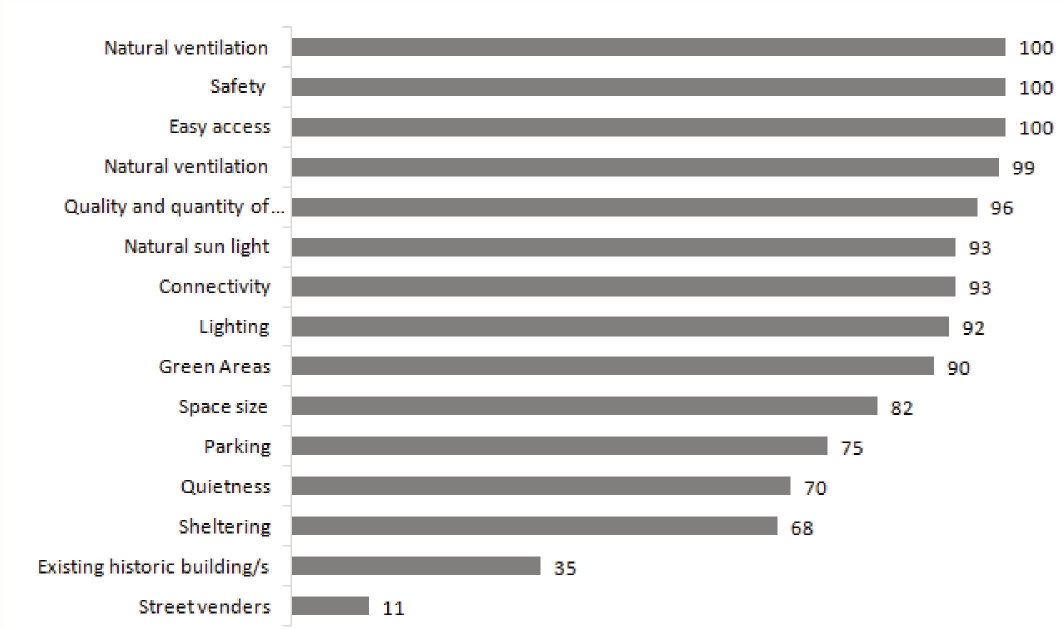

Fig. 8: Physical environment factors visitors see very important or important to exist in the selected public open space they choose to visit. Source: Researcher 2017.

	The time taken by visitors to reach the public open space they usually visit							
	<15 min (n = 14)		15-30 min (n = 31)		30-60 min (n = 43)		>60 min (n = 13)	
	No.	%	No.	%	No.	%	No.	%
Physical activities								
Sitting/resting/reading/listening to radio or music	5	35.7	10	32.3	27	62.8	5	38.5
Chatting	2	14.3	7	22.6	3	7.0	0	0.0
Playing chess/watching other play chess	0	0.0	2	6.5	0	0.0	0	0.0
Walking	5	35.7	9	29.0	6	14.0	2	15.4
Jogging	0	0.0	1	3.2	0	0.0	0	0.0
Using elderly exercise facilities	1	7.1	0	0.0	2	4.7	0	0.0
Play ballgames	1	7.1	1	3.2	1	2.3	2	15.4
Cycling	0	0.0	1	3.2	0	0.0	0	0.0
Photographing	0	0.0	0	0.0	4	9.3	1	7.7
Watching playing kids	0	0.0	0	0.0	0	0.0	3	23.1
$\chi^2(^{MC}p)$	$40.230^*(0.004^*)$							

Table 6 shows the significanct relation of the time taken by visitors to reach the area of public open space they usually visit with the physical activities they practice in the same area. Source: Researcher , 2017

From the visitors demands for pharoas area:

- Design: hard scape and lanscape features should be mantained and more areas of shelter be implemented.
- Services: Inhance basic facilities' quantity and quality.
- Safety: Increase security provision.

In Fig. 8 it is shown the number of people who choosed the shown factors either to be very important or important physical environment factors in any open public space they would like to visit. And the most significant factor to physical activities in a selected public open space is the time taken to reach as shown in table 6.

6 CONCLUSION

This research highlights the importance of understanding the process of assesment of a succesful public open space towards physical activities within it.In the context of Alexandria , it highlights the unprecedented conditions of the public open space designs need for rethinking critically concerning the future scenarios designing or redesigning them. It aims to provide a complementary theoretical approach to include the nature of the different settings of public open spaces development based on different factors and users conditions involved in the whole process of public open spaces allocation. It encourages other scholars to further elaborate on the factors that affect public open spaces choices which has the most postive impact on physical activities, in different cities of Egypt. After tackling the socio-ecological factors influencing public open space location choice in Alexandria, Egypt, it was found that the frequency of the visitors visit the public open space, the time visitors spend in it , followed by the time taken to reach the public open space then the physical environment factors followed by the health condition and gender from indvidual factors. While the social factors appeared to be the strongest factors to encourage or discourage visitors from visiting a specific public open space.The main expressed factor influencing respondents' decision in selecting their usually frequent public open spaces locations or the studied walking area of Bahary.Thus, it rejects the hypothesis that people tend to choose where to spend their leasure time based only on the nearest public open space to thier area hence they are already few.

Also, it explains why the majority of Egyptians would rather visit rehabiltation public open space with a natural view and basic facilities in an inadequate closed cafeteria or restuarant within the reach of public transports. Moreover, it can explain that even if social factors play an important role for Egyptians,

most inhabitants have significant support from their family and friends affecting their selectio of public open space . In fact, most of the survayed have mentioned that they accompany either their family or friend with a neglected percent of alone response.

Finally, the research predicts interrelation between the current socio- ecological domains of a certain public open space and the future expectation of it in the future. It opens the field to scholars concerned with human environment interaction development to tackle the unexpressed factors like policy factor to be studied more in depth which indeed influence the self-selection process of public open space as well as the physical activity done by visitors and their interaction with surrounding environment.

7 REFERENCES

Bronfenbrenner, U: Ecological Models of Human Development, International Encyclopaedia of Education, Vol 3, London,1994.

CAPMAS: Central Agency for Public Mobilization and Statistics, Statistical year book, Cairo, 2018.

Chan, Pui-shan. "Review on planning and design of public open space for aging population in Hong Kong: a case study in Wan Chai District." HKU Theses Online, HKUTO, Hong Kong, 2014.

Elder, J P, Lytle, L, Sallis, J F, Young, D R, Steckler, A, Simons-Morton, D, Stone, E, Jobe, J E, Stevens, J, Lohman, T, Webber, L, Pate, R, Saksvig, B I and Ribisl K: A Description of the Social-Ecological Framework used in the Trial of Activity for Adolescent Girls, Health Education Research, vol. 22, no. 2, pp. 155–165, 2007.

Glanz, K, Rimer B K & Viswanath, K (eds): Health Behaviour and Health Education – Theory, Research and Practice, 4th edn, John Wiley and Sons, San Francisco, USA, 2008.

Katzmarzyk, P T, Baur, L A, Blair, S N, Lambert E V, Oppert, J M & Riddoch, C: International conference on physical activity and obesity in children: Summary statement and recommendations, Applied Physiology Nutrition and Metabolism, vol. 33, pp. 371–387, 2008.

Kirkpatrick LA, Feeney BC.: A simple guide to IBM SPSS statistics for version 20.0. Student ed. Belmont, Calif. Wadsworth, Cengage Learning; USA, 2013

Nady, Riham: Towards Effective and Sustainable Urban Parks in Alexandria, Volume 34, Pp 474-489, USA, 2016

Rosenbaum, Mark, Canan Corus, Amy Ostrom, Laurel Anderson, Raymond Fisk, Andrew Gallan, Mario Giraldo et al.: Conceptualisation and aspirations of transformative service research, Issue: 19, 2011, USA ,2011.

Sherine Shafik Ahmed, Aly: Downtown Redevelopment by Applying New Urbanism Principles (Case Study: Alexandria Downtown, Egypt). American Journal of Sustainable Cities and Society Issue 4, Vol. 1, USA, 2015

Shumaker, SA, Ockene, J K and Riekert, K A: The Handbook of Health Behaviour Change, Springer Publishing Company, vol.4, New York, 2009.

Van Hecke, Linde, et al.: Social and physical environmental factors influencing adolescents' physical activity in urban public open spaces: A qualitative study using walk-along interviews, PloS one 11.5, e0155686.London, 2016.

Veitch, Jenny, et al.: A natural experiment to examine the impact of park renewal on park-use and park-based physical activity in a disadvantaged neighbourhood: the REVAMP study methods, BMC Public health 14.1, pp.1-9. London, 2014.

Victorian Curriculum and Assessment Authority: Social-Ecological Model. Health and promotion, London, 2014

Wilk, Piotr, et al.: Examining individual, interpersonal, and environmental influences on children's physical activity levels, SSM-Population Health vol. 4, pp 76-85, USA, 2018.

World Health Organisation: The Ottawa Charter for Health Promotion, 2015.

Alte Idee, neu gedacht: Grünraumspange Bisamberg – Gerasdorf – Norbert-Scheed-Wald

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1 ABSTRACT

„Die Natur mit ihren herrlichen Wunderwerken aus Gottes Hand, mit ihrer Sprache zum Herzen, diese naturgemäß so bedeutungsvolle Stätte für die ‚Feierstunde' des Volkes, soll nicht nur die Höheren begünstigen, sie soll auch die arbeitenden Classen, und zwar in allen Categorien und auf allen Altersstufen, nach Maßgabe der dargebotenen Möglichkeiten empfangen. Für Männer und Frauen im Arbeitsalter, für die Kindheit und Jugend, das hinfällige Alter, für Arme und Reiche, Kranke und Gesunde, Familien und Ledige – für jede Categorie muß es erreichbar sein, nach der Arbeit Mühe und Last ‚ohne übermäßigen Zeitaufwand' (mithin in einer Entfernung, die nicht mehr als eine halbe Stunde beansprucht), eine wohltätige Erfrischung während der Sommerhälfte des Jahres im Freien und Grünen genießen zu können. Des Menschen wahrhafte Bedürfnisse sind des Menschen wahrhafte Anrechte!" (DOHNA-PONISKA alias ARMINIUS, 1874, 135ff, zitiert nach FALUDI, 1967, 194).

Die Planungsgeschichte zeigt, dass die strategisch-konzeptionellen Ideen der Grünraumspange auf die Ideen des Grüngürtels zurückgehen, die erstmals bereits vor fast 500 Jahren formuliert und im Laufe der Zeit immer wieder diskutiert, weiterentwickelt, interpretiert und „institutionalisiert" wurden (vgl. FALUDI, 1967, SCHMIDT 1971-1972; SACK, 1993; PETZ, 1995 u.a.). Der Artikel leistet einen Beitrag zur nachhaltigen, integrierten Stadtentwicklung aus dem Blickwinkel der Grün- und Freiraumplanung, indem am Beispiel des Landschaftsplans „Grünraumspange Bisamberg ¬– Gerasdorf – Norbert-Scheed-Wald" die historisch-theoretischen Ansätze mit der aktuellen Praxis der interkommunalen Grün- und Freiraumentwicklung in Bezug gesetzt werden.

Keywords: process-orientated, Lower Austria, metropolitan region Vienna, landscape plan, green space

2 AUSGANGSLAGE

2.1 Anlass und Planungsprozess zur Grünraumspange

Der allgemein steigende Nutzungsdruck auf Grünräume, bedingt durch ein Anwachsen der Bevölkerung infolge der Re- und Suburbanisierung, stellt Städte und Stadtregionen vor neue Herausforderungen. Wie können die Grünräume der Stadtregion langfristig gesichert und für die Erholungsnutzung der wachsenden Bevölkerung attraktiver und nachhaltig gestaltet werden? Dieser Frage geht das von der EU geförderte Projekt „LOS_DAMA!"[1] nach, in dessen Rahmen in sieben Städten und Stadtregionen Lösungen und neue Ansätze der stadtregionalen Zusammenarbeit verfolgt werden. Gemeinsam mit der Stadtgemeinde Gerasdorf wirft die Stadt Wien, als Partnerin im Projekt, einen Blick auf die nördliche Stadtregion von Wien. In einem breiten Stakeholderprozess werden dazu von November 2016 bis Oktober 2019 planerische Vorgaben für die Entwicklung einer Grünraumspange vom Bisamberg über Gerasdorf bis zum zukünftigen Norbert-Scheed-Wald ausgearbeitet. Die zwei ineinandergreifenden Instrumente dieses Prozesses sind der Landschaftsplan und der Lokale Aktionsplan (siehe Abb. 1). Der Landschaftsplan zur Grünraumspange liegt nun vor und enthält räumliche verortbare Maßnahmen, die in weiterer Folge im Lokalen Aktionsplan für die Umsetzung vorbereitet werden und um Maßnahmen u.a. aus dem Bereich der Bewusstseinsbildung ergänzt werden.

[1] http://www.alpine-space.eu/projects/los_dama/en/home

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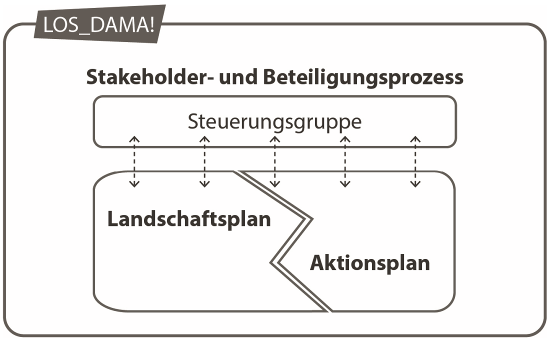

Abb. 1: Einbettung des Landschaftsplans in den Gesamtprozess © Jauschneg

2.2 Grün- und Freiräume der Stadtregion – Herausforderungen der Zukunft

Die ökologischen, sozialen und ökonomischen Herausforderungen der Zukunft brauchen insbesondere von Städten und Stadtregionen richtungsweisende Antworten. Grün- und freiraumorientierter Handlungsbedarf leitet sich vor allem aus folgenden, sich gegenseitig beeinflussenden Entwicklungen ab: Klimawandel, Bevölkerungswachstum und zunehmende Pluralisierung der Lebensstile, demografischer Wandel, agrarstruktureller Wandel sowie die Energie- und Mobilitätswende und Digitalisierung. Drei Aspekte seien hier exemplarisch herausgegriffen:

- Die Folgen des Klimawandels sind bereits jetzt bspw. durch vermehrte Hitzeinseln in urbanen Gebieten sowie durch Dürreschäden in der Landwirtschaft spürbar. Von einem unbebauten Umland profitiert die Stadt, da sich Kaltluftseen bilden, die zur Kühlung der Stadt erforderlich sind. Zudem speichern horizontmächtige Böden und eine vielgestaltige Vegetation CO2. Die Feldlandschaften sowie die Ruderalfluren und Grünstrukturen bieten Lebensräume für Pflanzen und Tiere.
- Der steigende agrarökonomische Druck des „Wachsens oder Weichens“ führt zu weniger Betrieben, die mehr Fläche bewirtschaften. Gleichzeitig gibt es in Stadtregionen für die Landwirtschaft auch andere Entwicklungsoptionen: Bedingt durch die stadtnahe Lage, eröffnet sich ein Markt zur Versorgung der Stadt mit gesunden Lebensmitteln, wodurch Transportwege und CO2-Emissionen gespart und alternative landwirtschaftliche Vertriebsformen wie Community Supported Agriculture, Food Coops, Selbsterntefelder etc. etabliert werden können.
- Parallel dazu erfordert die wachsende Bevölkerung neben neuem Wohnraum auch qualitativ hochwertige Grün- und Freiräume im Wohnumfeld und Naherholungsräume in der Stadtregion als Ausgleich zu dichter werdenden innerstädtischen Räumen. Dabei werden die Menschen und ihre Nutzungsanforderungen an Grün- und Freiräume immer „bunter“. Ein weiterer Aspekt liegt auch in der zunehmenden Ernährungsarmut der Menschen, der durch die Förderung von Stadtlandwirtschaft – diese braucht wiederum stadtnahe gut erreichbare Flächen – begegnet werden kann (vgl. HAMEDINGER 2017). Auch soll die aktive Mobilität aus Umwelt- und Gesundheitssicht gefördert werden; die zunehmende Nahmobilität in Form des Zufußgehens und Radfahrens benötigt attraktive Wegenetze, die das Fortbewegen sowohl im Alltag als auch in der Freizeit unterstützen.

3 THEORETISCHER HINTERGRUND

3.1 Vom Gröngürtel zur Grünraumspange – ein kurzer historischer Abriss

Ideengeschichtlich geht die Grünraumspange auf den Grüngürtel zurück, der am Anfang des 16. Jh. von Thomas MORUS[2] erstmals formuliert wurde und im Laufe der Zeit unterschiedliche Interpretationen etwa

[2] Thomas Morus, zu seiner Zeit Lordkanzler in England, beschreibt 1516 den „Gürtel“ der Äcker in Utopia: Jede Stadt ist rundherum von Ackerflächen mit mind. 12 m Breite umgeben. Dieser Ackergürtel dient der Versorgung der Stadt aus dem direkten Umland. Die Bewirtschaftungsidee zu diesem Ackerring ist die Idee vom Tausch der Höfe alle 10 Jahre mit Los, es gibt kein Privateigentum. Der Stadtrand ist hier Ort der Produktion von Lebensmitteln für die Stadt (vgl. MORUS, 1516/1992).

durch die Frühsozialisten[3] oder Adelheid DOHNA-PONINSKA alias ARMINIUS (1874)[4] erfuhr. Diese fordert 1874 einen grünen Ring um die Großstädte und plädiert für wohnumfeldnahes Grün:

„Es ist dringend an der Zeit, weshalb wiederholt darauf aufmerksam gemacht werden darf, daß die bauliche Construction der Großstädte in einem weiteren Sinne wie bisher als ein Ganzes betrachtet werde, und die Idee zur Geltung komme: „daß zur Wohnstätte der Menschen nicht nur Häuser, sondern auch ein grüner Zubehör in freier Natur gerechnet werden muß, Stätten der Erholung, die theils in unmittelbarer Nähe der Stadt zu Fuß zu erreichen, theils weiter gelegen, mittelst der verschiedenen Fahrgelegenheiten zu benutzen sind". (…)" (DOHNA-PONINSKA, 1874, 144)

Einen weiteren planungshistorisch wichtigen Beitrag, der nach wie vor rezipiert wird, lieferte Ebenezer HOWARD mit seiner „Garden-Cities of To-Morrow". Er formuliert den „Rural Belt" rund um die Gartenstadt, in dem Pachtgärten und Landwirtschaft angesiedelt sind.

Die Beiträge gehen aber allesamt weit über den grünen Gürtel oder Ring an sich hinaus; so thematisiert Dohna-Poninska umfassend die Frage der Finanzierung und wendet sich argumentativ gegen die „bemoosten Vorurtheile", die notwendigen Reformen im Bereich der grün- und freiraumorientierten Stadtentwicklung entgegenstehen. Auch Howard denkt Stadtentwicklung gesamthaft und völlig neu. Er formuliert die Gartenstadt als Modell der nachhaltigen Stadtentwicklung, die weniger in architektonischer Hinsicht innovativ ist als in den darin enthaltenen sozio-ökonomischen Ideen und den finanziell-organisatorischen Aspekten, die auf die sozialen und gesellschaftlichen Fragen seiner Zeit richtungsweisende Antworten suchten. Die häufige Reduktion seiner Ideen der Gartenstadt auf die vorstädtische Reihenhaussiedlung wird seinem Konzept nicht gerecht (vgl. DAPPEN et al., 2017; VERNET und COSTE, 2017).

3.2 Anknüpfungspunkte für die heutige Planungspraxis

Viele dieser Ideen wie etwa der Grüngürtel trafen auf breite Zustimmung und fanden Eingang in Bauordnung und Raumordnungsgesetze. Ein Bezug zu heute lässt sich herstellen (1) über die städtebauliche Dichte – ein ausgewogenes Verhältnis von Bebauung und qualitätsvollen, differenzierten Freiräumen –, (2) über die Fragen zur Flächenmobilisierung/-management – Howard und Dohna-Poninska sehen den Umwidmungsgewinn als zentralen Hebel zur Realisierung von gemeinwohlorientierten Grün- und Freiraum-Projekten –, (3) in der Frage der Landwirtschaft – insbesondere Howard plädiert für eine Stärkung der regionalen Kreislaufwirtschaft und (4) nicht zu Letzt in neuen Formen der Beteiligung und Mitwirkung durch verschiedenste Akteurinnen und Akteure – ein starkes Gemeinwesen und die Mitgestaltung durch Bewohnerinnen und Bewohner und Gewerbetreibende zeichnet beispielsweise das Howardsche Konzept im Kern aus. (vgl. ebd.)

Angesichts der Herausforderungen der Zukunft an die Grünräume der Stadtregion soll das LOS_DAMA!-Projekt (1) durch den Landschaftsplan die räumliche Entwicklung steuern und Grün- und Freiräume sichern; (2) gemeinsam mit den wichtigen Akteurinnen und Akteuren, z. Bsp. Vertreterinnen der Landwirtschaft Lösungen für ein gutes Miteinander der Nutzungen im Landschaftsraum finden; (3) neue Wege der interkommunalen Zusammenarbeit, neue Instrumente zur Umsetzung und zum Monitoring entwickeln; (4) dabei auf einen breit angelegten Stakeholder-Prozess und Bürgerbeteiligung setzen.

4 DER LANDSCHAFTSPLAN ALS INSTRUMENT ZUR GRÜNRAUMSPANGE

Der Begriff „Landschaftsplan" wird hier für das Planwerk zur interkommunalen Grünraumspange verwendet, und ist, entgegen klassischer Zuordnungen, zwischen örtlicher und überörtlicher Planungsebene („Landschaftsrahmenplan") angesiedelt. Der Landschaftsplan ist in Österreich nicht rechtlich verankert, er

[3] Als Vorläufer der Gartenstadt gelten die sozialreformerischen Siedlungsexperimente der „utopischen Sozialisten", die im Zuge der Industrialisierung eine Kombination von Landwirtschaft und Industrie für den Stadtrand vorschlagen und sich in der Idealstadt „Victoria" von 1849, die auf Owen (1771-1858) zurückgeht (Owen schlägt die Neugründung von Städten rund um Industrieanlagen auf dem Land vor), räumlich manifestiert, und als Vorbild für die australische Stadt Adelaide mit „Parkland", von Colonel William genommen wurde. Weiters Vorbild dafür war „Happy Colony" von Robert Pemberton. (vgl. SCHMIDT, 1971-1972)

[4] Gräfin Adelheid Dohna-Poninska alias Arminius beschreibt 1874 im „Grünen Ring der Großstädte" die Nutzung des Rings als Garten, Feld, Wiese und Wald durch Eigentümer und Pächter und auch als Erholungsstätte in freier Natur; hier fungiert der Stadtrand neben der Produktion bereits als Reproduktionsort und der Gedanke des Ausgleichs aus sanitären Gründen wird formuliert. (vgl. DOHNA, 1971)

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wird als Teil der Raumordnung gesehen, die in integrativen Verfahren versucht, die unterschiedlichen Raumansprüche zu koordinieren. Knoll stellt fest, dass einheitliche Festlegungen oder fix zu bearbeitende Inhalte fehlen; als gemeinsame Themen kristallisieren sich jedoch Naturschutz und Landschaftspflege heraus. Damit einhergehen Schwerpunktsetzungen bei der Aufwertung der Erholungsfunktion, dem Erhalt der Kulturlandschaften und der Sicherung wertvoller Lebensräume. (vgl. KNOLL und AICHHORN, 2012, 7)

Der vorliegende Landschaftsplan soll als fachliches Gutachten eine strategisch-konzeptionelle Zielsetzung für die Entwicklung des Landschaftsraumes formulieren; besonders innovativ ist dabei der interkommunale Anspruch und die Berücksichtigung von „zwei Planungssystemen/Raumplanungsmaterien" – Wien-NÖ.

4.1 Der Projekthintergrund

In Tradition der Grüngürtel-Ideen stehend, beschloss die Stadt Wien 1905 den Wiener Wald- und Wiesengürtel; als „geistiger Vater" gilt Eugen Faßbender mit seinem Konzept des Volksrings (vgl. FALUDI, 1967). Man beabsichtigte den Waldschutz und die Sicherung der Frischluft. Die Stadt Wien sicherte damit zuerst vor allem den Naherholungsraum des Wiener Waldes für steigende Bevölkerungszahlen im Westen Wiens mit ambitioniert-visionärer Haltung, schuf ein Instrument der Widmung, das bis heute besteht und diente damit auch als Vorbild für andere Städte wie etwa Berlin. Das Gebiet in Transdanubien, der Norden und Nordosten der Stadt, wurde erst nach dem 2. WK stärker in die Planungen einbezogen. Im Jahr 1995 wurde vom Wiener Gemeinderat beschlossen, den Grüngürtel rund um Wien im Bereich der nordöstlichen Stadtregion zu schließen. Dazu findet sich eine Vielzahl an landschaftsplanerischen Beiträgen[5], die sowohl die strategischen Ziele für die Entwicklung dieses Raumes formulierten als auch konkrete Ausgestaltungsideen für die Grün- und Freiräume entwickelten. Die Umsetzung (sog. 1000-ha-Programm, Wiener Wald Nordost) erfolgte aber nicht, bzw. nur in Ansätzen (vgl. MA 18, 2015, 21). In jüngerer Zeit rückt angesichts des steigenden Nutzungsdrucks die Grünraumsicherung und -entwicklung wieder stärker in den Fokus. Aktuell bietet sich ein günstiges Zeitfenster dafür: der Handlungsdruck steigt, Schlüsselpersonen und viele andere Akteurinnen und Akteure nehmen sich des Themas an, Netzwerke bilden sich und ein EU-Projekt fördert den internationalen Austausch. Das Projekt LOS_DAMA! nutzt dieses Zeitfenster für Planungsarbeiten mit den beiden Instrumenten Landschaftsplan und Lokaler Aktionsplan, wobei in den folgenden Ausführungen der Landschaftsplan im Vordergrund steht.

4.2 Konkrete Zielstellung des Landschaftsplans

Ziel des Landschaftsplans ist es, eine Grünraumspange im Nordosten der Stadtregion zu schaffen, die den Bisamberg mit dem Norbert-Scheed-Wald verbindet. Der Landschaftsplan steht für eine gemeindeübergreifende Vision der nördlichen Stadtregion. Der Stadtgemeinde Gerasdorf kommt dabei eine zentrale grünraumverbindende Rolle zu – sie ist gleichsam das „Scharnier" zwischen dem Bisamberg, dessen nordwestlicher Teil als Natura-2000-Gebiet geschützt ist, und dem Norbert-Scheed-Wald, der die Bereiche des Breitenleer Bahnhofs sowie die angrenzende Feldlandschaft des Marchfelds umfasst und wiederum wesentlich für den Grünschluss in Richtung Nationalpark Donau-Auen ist.

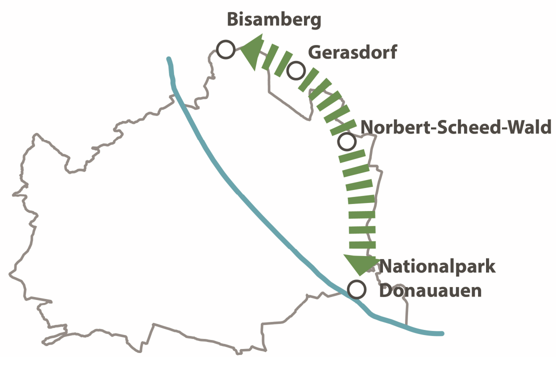

Abb. 2: Überblick zur verbindenden Funktion der Grünraumspange © Jauschneg

[5] vgl. Ivancsics, R., 1989 Landschaftsplan Langes Feld; Ivancsics, R. und Hattinger, H., 1990: Landschaftsrahmenplan Wien-Nordost; Ivancsics, R. und Hattinger, H., 1992: Landschaftsplan Süßenbrunn-Breitenlee-Rautenweg; Proksch, Th. und Stadler, K., 1992: Stadtrandgärten „Breitenlee"; Proksch, Th., 2008: Landschaftsplan Aspern Essling Marchfeld.

4.3 Woraus besteht der Landschaftsplan zur Grünraumspange?

Der Landschaftsplan hat die langfristige nachhaltige Gestaltung des Landschafts- bzw. Grünraums zum Thema. Ausgangspunkt dafür ist ein multifunktionaler, inhomogener und von unterschiedlicher Entwicklungsdynamik charakterisierter Landschaftsraum, der überwiegend landwirtschaftlich geprägt ist, der Schönheiten und Qualitäten hat, die oft erst auf den zweiten Blick wahrgenommen werden (vgl. APPLETON, 1975; KAPLAN und KAPLAN, 1989). In diesem Raum wird eine sanfte Erholungsnutzung (kein Disneyland) als Grundkonzept der Entwicklung angestrebt. Sie soll Ruhe, Entschleunigung und Ausgleich zur dichter werdenden Stadt und ein gutes Miteinander mit der Landwirtschaft ermöglichen.

Da sich der Landschaftsraum durch eine große Stabilität u.a. in Besitzverhältnissen und Nutzungen auszeichnet, ist ein langfristiger Planungshorizont 2065+ adäquat. Eine Dynamik entsteht durch die Baulandentwicklung, die eng verbunden ist mit einem Erholungsbedürfnis der Bevölkerung. Ausgehend von dieser Ambivalenz zwischen Stabilität und Dynamik, liegen den Maßnahmen des Landschaftsplans unterschiedliche Zeithorizonte zur Umsetzung zu Grunde, die von kurz- über mittel- bis hin zu langfristig reichen.

Der Landschaftsplan besteht aus einem Analyse- und einem konzeptionellen Teil. Basierend auf übergeordneten Zielen und Leitgedanken, die sich aus der Analyse des Gebiets ableiten, werden im konzeptionellen Teil des Landschaftsplans Maßnahmen und Empfehlungen für die übergeordneten Themenbereiche Erreichbarkeit & Erschließung, Freizeit & Erholung, Naturschutz sowie Landwirtschaft formuliert und in Themenkarten räumlich verortet. Diese bilden die inhaltliche Grundlage für die Synthesekarten zu Teilbereichen des Bearbeitungsgebiets, in denen die Maßnahmen aus den unterschiedlichen Themenbereichen zusammengeführt und detailliert werden und die eine überleitende Funktion zum Aktionsplan haben.

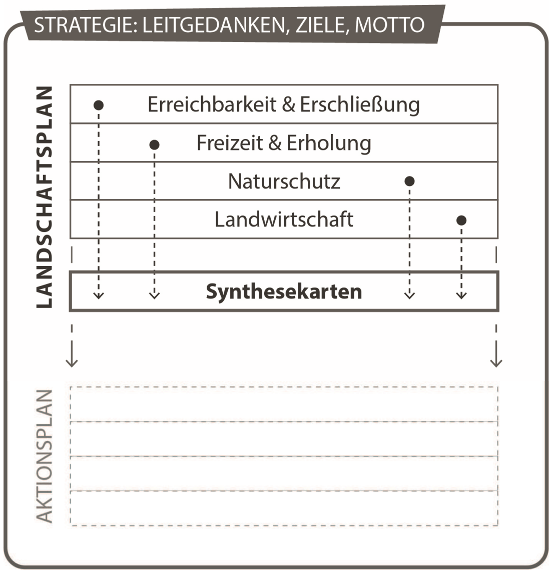

Abb. 3: Aufbau des Landschaftsplans © Jauschneg

4.3.1 Analyseteil

Der Analyseteil beschreibt die ortstypischen Landschaften und die Topografie, zeigt Durchlässigkeit und Barrieren auf, macht Einzugsbereiche von Haltestellen des öffentlichen Verkehrs sichtbar, erfasst Lebensraumtypen und Naturdenkmäler, stellt die agrarische Landnutzung dar und hält Besonderheiten wie Kleindenkmäler, Kunstwerke, Mahnmale fest. Darauf aufbauend wurden für die Themenfelder Erreichbarkeit & Erschließung, Erholung &Freizeit, Naturschutz und Landwirtschaft Leitgedanken als planerische Ziele formuliert.

Beispiel: exemplarisch angeführte Ziele für Erholung & Freizeit

- Bei der Entwicklung attraktiver Orte werden vorhandene Potentiale zur Umnutzung aktiv wahrgenommen.
- Hochpunkte, natürliche wie künstliche, sind für das Erlebnis der Weite besonders spannend und sollen in Szene gesetzt werden.

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- Nutzungsangebote (= attraktive Orte und Wege) richten sich im Sinne der Mehrfachnutzung an mehrere Nutzerinnengruppe und Nutzergruppen; ein rücksichtsvolles Miteinander wird gefördert; Konflikte werden punktuell gelöst (z.B. durch Errichtung von Hundezonen an neuralgischen Punkten).
- Wege zu attraktiven Orten werden unterschiedlich und zielgruppenspezifisch ausgestaltet, es soll eine attraktive kinderwagentaugliche Route im Grünraum möglich sein.
- Die Erholungsnutzung ist v.a. im Randbereich der Siedlung intensiver und funktionaler gestaltet als in siedlungsfernen Bereichen (wildere offenere Bereiche).

4.3.2 Konzeptioneller Teil

Der konzeptionelle Teil des Planwerks formuliert Maßnahmen zu den vier übergeordneten Themenfeldern, die folgende Teilthemen umfassen: Einstiegspunkte, Fußwegenetz, Fahrradinfrastruktur, miV-Infrastruktur, Erholungsinfrastruktur, Themenwege und Beschilderungen, Generationenweg, Naturschutz und Landwirtschaft. Im Folgenden wird exemplarisch auf zwei konzeptionelle Karten – Erholungsinfrastruktur und Landwirtschaft – näher eingegangen, die maßgeblich die flächige Ausdehnung der Grünraumspange bestimmen.

Beispiel: Erholungsinfrastruktur

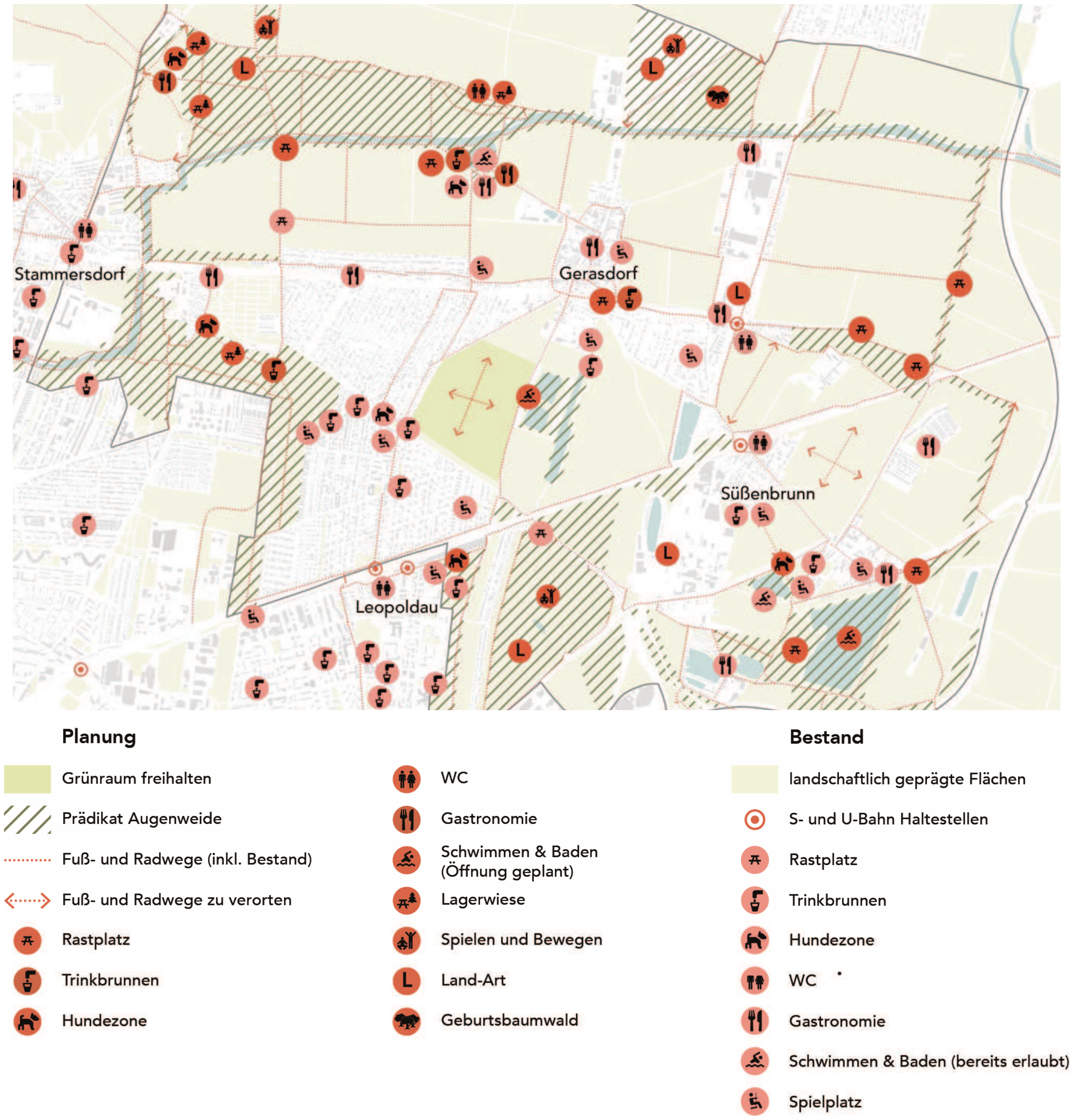

Abb. 4: Ausschnitt aus dem Plan zur Erholungsinfrastruktur © Jauschneg

Entscheidungskriterien für die Erholungsinfrastruktur sind Siedlungsnähe und räumliche Konzentration. Wesentliche Aspekte sind dabei sowohl die Mehrfachnutzung als auch zielgruppenspezifische Angebote. Gemäß der sanften Erholungsnutzung ist es wichtig, attraktive Angebote zu schaffen, aber den Landschaftsraum nicht „über zu programmieren“ und „überauszustatten“.

Die Rastplätze, Lagerwiesen und Spielplätze sowie das Wegenetz sind eingebettet in das „Prädikat Augenweide“. Die Bereiche der Augenweide haben einen naturnahen Charakter und sind von enormer landschaftlicher Vielfalt – landwirtschaftlich genutzte Flächen wie Äcker, Grünland, Wiesen; Wälder; Brachen; Uferbereiche – geprägt. Es handelt sich um einen Naturerfahrungsraum und einen Entdeckungsort mit entwicklungspsychologischem Aspekt insbesondere für Kinder und Jugendliche. Die Gestaltung, wie etwa bei einem Park, steht im Hintergrund, währenddessen die Naturvermittlung einen Teilaspekt bildet („Themenwege“, „Land-Art“). Der Raum wird nicht zielstrebig durchquert, sondern auf Basis des Wegenetzes wird die Landschaft erlebt, lädt zum Verweilen ein und alle Sinnesbereiche werden in erhöhtem Maß angesprochen: Hören, Schmecken, Orientierung, Sehen, Riechen, Bewegung, Fühlen & Tasten.

Die Bereiche der Augenweide stellen stadtregional wichtige Grünverbindungen und -korridore dar, die unbedingt erhalten und entwickelt werden sollen (vgl. ZLENDER und WARD THOMPSON, 2017). Gerade weil in diesem Raum keine physische/natürliche Grenze das Stadtwachstum beschränken könnte, ist es wichtig, zukünftig frei von Bebauung zu haltende Gebiete zu definieren.

Beispiel: Landwirtschaft

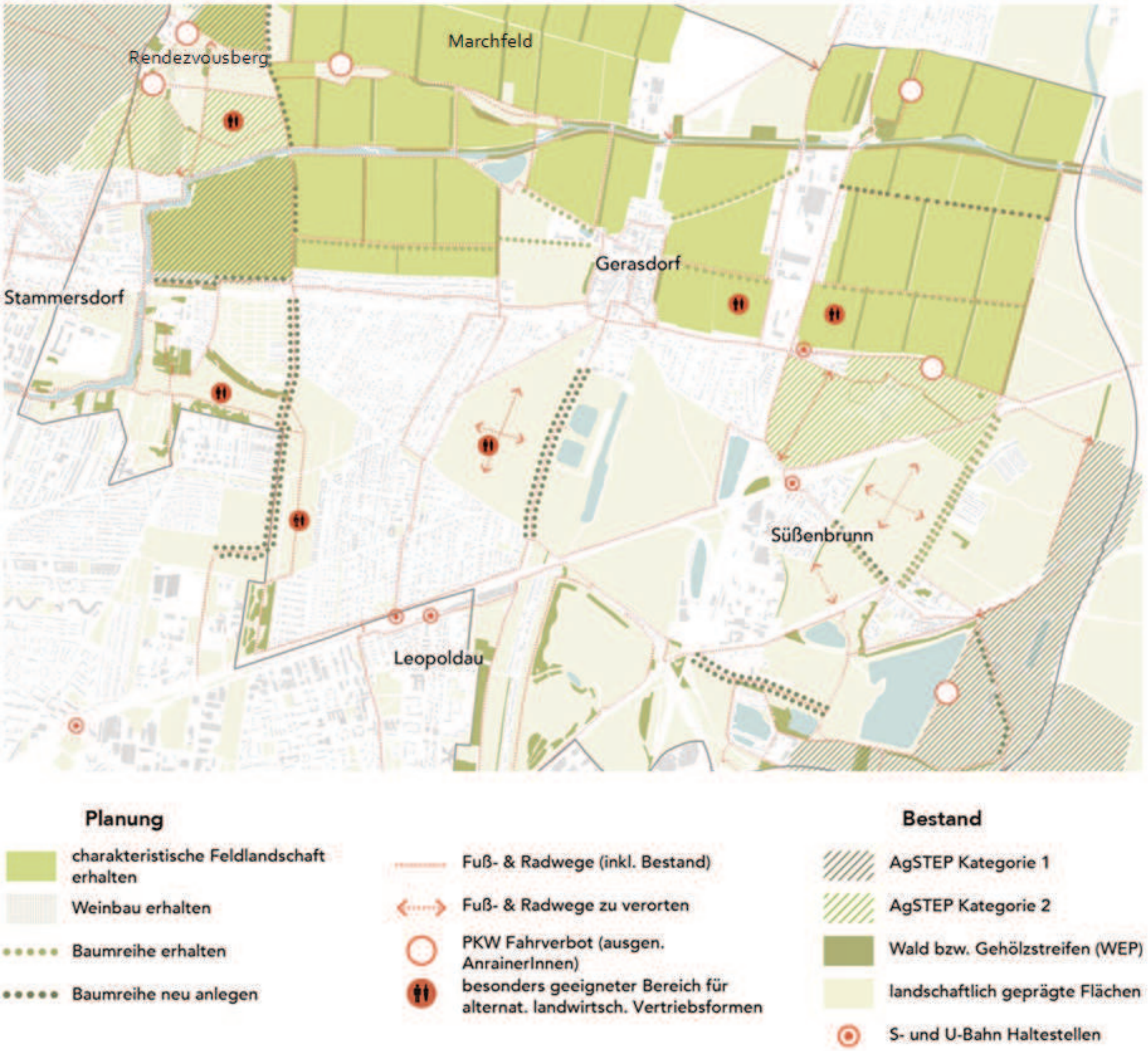

Abb. 5: Ausschnitt aus dem Plan zur Landwirtschaft © Jauschneg

Die Landwirtschaft prägt die Kulturlandschaft der Grünraumspange wesentlich. Ziel ist es, den Weinbau am Rendezvousberg als auch den Ackerbau im Marchfeld zu erhalten, da hier entsprechende naturräumliche Voraussetzungen gegeben sind. Es gilt, Maßnahmen für den Erhalt der Landwirtschaft zu definieren. So wurden etwa Gebiete markiert, die sich aufgrund ihrer guten Erreichbarkeit mit dem Fahrrad oder mit öffentlichen Verkehrsmitteln besonders für alternative landwirtschaftliche Vertriebsformen eignen. Der direkte Bezug zu den Konsumentinnen und Konsumenten (z. .Bsp. Community Supported Agriculture, Selbsterntefelder, Schule am Bauernhof, Green Care…) soll gestärkt werden, insbesondere kleine Höfe und Einsteigerinnen und Einsteiger sollen im Wirtschaften unterstützt werden, um so insgesamt zum Erhalt und zur Förderung der landschaftlichen Vielfalt durch eine nachhaltige Landwirtschaft beizutragen.

Wesentliche Bestandteile der Kulturlandschaft sind die wegbegleitenden Baumreihen, die im Landschaftsraum bereits eine lange Tradition haben. Sie fassen den Raum, geben Orientierung, spenden Schatten und sind Lebensraum für Vögel und Kleintiere. Angedachte Gehölze sind Nuss, Kirsche und verschiedene Wildobstsorten, da sie für den Standort geeignet und deren Früchte durch die Grün- und Freiraumnutzerinnen und Freiraumnutzer gesammelt werden können.

4.3.3 Synthesekarten

Aufgrund ihrer hohen Entwicklungs- und Gestaltungschance wurden für die drei Bereiche der Grünraumspange Rendezvousberg, Mitte und Süßenbrunn Synthesekarten erstellt (Übersicht siehe Abb. 6). Diese stellen Teilausschnitte des Bearbeitungsgebiets dar, in denen die vorangegangenen Gesichtspunkte aus den Themenkarten zusammengeführt, inhaltlich vertieft und maßstäblich detailliert werden.

Abb. 6: Übersicht über die Ausschnitte der drei Synthesekarten „Rendezvousberg“, „Mitte“ und „Süßenbrunn“ © Jauschneg

<u>Beispiel: Mitte</u>

Abb. 7: Ausschnitt aus dem Plan der Synthesekarte Mitte © Jauschneg

Das Leitthema für die Entwicklung und Gestaltung dieses Bereiches ist „Draußen am Kleinen Wagram". Wander- und Themenwege setzen den Landschaftsraum dort in Szene, wo er die stärkste Raumqualität aufweist – am Zusammenfluss der Terrassenkante des Kleinen Wagrams mit dem Marchfeldkanal nördlich des Badeteiches Gerasdorf. Die Straße oben auf der Terrassenkante kommt einem Panoramaweg gleich, welcher die Möglichkeit zum Erleben der Weite, der frischen Luft und zum „im-Freien-Sein" bietet. Direkt daneben befindet sich ein optimaler Platz für eine kleine Lagerwiese, von der aus der Blick über die Felder in Ruhe genossen werden kann. Zentral ist dabei das Offenhalten der Böschungskante, das z. Bsp. durch Beweidungsprojekte unterstützt werden sollte.

5 KONTEXTUALISIERUNG DES LANDSCHAFTSPLANS MIT DEN IDEEN ZUM GRÜNGÜRTEL

In den folgenden Absätzen wird der Landschaftsplan in Bezug auf die vorhin erläuterten historischen Anknüpfungspunkte reflektiert und diskutiert.

5.1 Grün vernetzt

Ring, Gürtel, Kreis, Spange – im Laufe der Zeit wurde die Diskussion zu Ring und Gürtel rund um die Stadt – bedingt aus der historischen konzentrischen Stadtanlage heraus – ergänzt um Keile und Korridore, die als tangentiale Achsen auch die Erreichbarkeit der Flächen verbessern sollten. Die Idee, vom grünen Stadtrand bzw. von den Erholungsgebieten am Stadtrand aus ein Netz aus Grün- und Freiräumen in die inneren Bezirke zu spannen, findet sich heute in der Idee des Freiraumnetzes der Stadt Wien wieder. Dabei sollen Grünräume unterschiedlicher Ausprägung, vom großen Park über den Beserlpark bis hin zu kleineren ökologisch bedeutsamen Flächen verbunden werden. Dieses Verbundsystem hat sowohl ökologischen, stadtklimatischen und stadtgliedernden Nutzen als auch wesentliche Funktion für die Erholungsnutzung der Bevölkerung.

Im Landschaftsplan stellen die Bereiche der „Augenweiden" für Erholungs- und Freizeitnutzung (siehe Abb. 4) zu qualifizierende Bereiche dar und bilden gemeinsam mit den erhaltenswerten Landwirtschaftsflächen (siehe Abb. 5) den Kernraum der Grünraumspange, auch im Sinne eines „grünen Netzes".

Die Grün- und Freiraumausstattung der Erholungsinfrastruktur (siehe Abb. 4) folgt dem Prinzip, dass stärker funktional gestaltete Bereiche eher siedlungsnah vorgesehen sind und „wildere" nutzungsoffenere Bereiche siedlungsfern erhalten bleiben sollen. Flächensicherungen, die derzeit vorrangig der Erholungs- und Freizeitnutzung dienen, schließen auch das Potential für alternative Nutzungsformen etwa von Selbstversorgung ein. Denn: Die Vorsorge für öffentliche Grün- und Freiräume ist mehrdimensional: Steht aktuell vor allem die Erholungs- und Freizeitnutzung im Mittelpunkt, beinhalten diese Flächen auch die Möglichkeit für eine etwaige zukünftig verstärkte Selbstversorgung – als Offenhalten der Möglichkeiten für geänderte ökonomische Verhältnisse und um alternative Ökonomien zu fördern.

5.2 Öffentlich zugängliche Grün- und Freiräume für alle

Allen historischen Ideen zum Grüngürtel liegt ein öffentliches Interesse zugrunde, die Grünräume am Stadtrand sollen der Erholung der Bewohnerinnen und Bewohner dienen und daher öffentlich zugänglich und nutzbar sein, die Grün- und Freiräume sollen durch den individuellen Gebrauch aneigenbar sein (vgl. DAMYANOVIC et al., 2014). Im Landschaftsplan wird der Nutzerinnen-, Nutzer- und Alltagsorientierung sowie der Barrierefreiheit ein großer Stellenwert eingeräumt. Die vorgeschlagenen Maßnahmen adressieren explizit den Alltag der Menschen, die in dem Raum wohnen und arbeiten – nicht nur die sonntäglichen Ganztages-Ausflüglerinnen und Ganztages-Ausflügler. Zentral sind dabei die Forderungen nach attraktiven, barrierefreien Fuß- und Radwegen (vgl. Abb. 3, ohne Karte) und öffentlich zugänglichen Angeboten (keine Eintritte) mit Möglichkeiten des konsumzwangfreien/konsumungebundenen Aufenthalts/Nutzung (Lagerwiese, Wanderwege, Badeseen) (siehe Abb. 4).

Die Nutzungsintensität und die Nutzungskonflikte steigen aktuell auf Kosten der Landwirtschaft. So werden etwa Grünbrachen oder Jungansaaten als für Hundeauslauf oder Ballspiel nutzbare Flächen missinterpretiert. Der Freiraumbedarf ist momentan höher als die tatsächliche Freiraumversorgung, daher auch der akute Handlungsbedarf.

5.3 Grün ist erreichbar

Im Howardschen Modell der Gartenstadt ist durch die Vielfalt und Zuordnung der einzelnen Funktionen eine fußläufige Erreichbarkeit aller Einrichtungen und Angebote möglich und von zentralem Wert, ebenso fordert Dohna-Poninska:

„(…) für jede Categorie muß es (das Grün, Anm.) erreichbar sein, nach der Arbeit Mühe und Last, ohne übermäßigen Zeitaufwand' (mithin in einer Entfernung, die nicht mehr als eine halbe Stunde beansprucht), eine wohltätige Erfrischung während der Sommerhälfte des Jahres im Freien und Grünen genießen zu können (…)" (DOHNA-PONINSKA, 1874, 135f).

Übertragen auf die gegenwärtige Situation bedeutet das, dass die fußläufige Erreichbarkeit von Grün- und Freiräumen der Grünraumspange einen hohen Stellenwert einnehmen soll und die Erreichbarkeit mit dem

ÖPNV zentral ist, aber auch alternative Mobilitätsangebote wie Verleihsysteme von Fahrrädern eine wichtige Rolle spielen sollen (vgl. Abb. 3, ohne Karte).

Wie von Howard und Dohna-Poninska vorgeschlagen, fokussieren wesentliche Inhalte des Landschaftsplans auf die Mobilität und Erreichbarkeit sowie die Erschließung des Landschaftraumes und der Grünraumspange. Wichtig für die Förderung der aktiven Nahmobilität ist zudem, dass neben angedachten radialen Radverbindungen zwischen Wien und Gerasdorf auch tangentiale Verbindungen von der Donaustadt und Floridsdorf nach Gerasdorf geplant und umgesetzt werden.

5.4 Grün- und Freiräume mitgestalten

Das Howardsche Modell der Gartenstadt ist im Kern ein Modell der integrierten Stadtentwicklung, es ist kein endgültiger Plan, sondern baut auf Kooperationen auf, wobei die Mitgestaltung der Bewohnerinnen und Bewohner und der verschiedensten Akteurinnen und Akteure eine zentrale Rolle spielen. Bestehende Organisationen, Eigentümerinnen, Eigentümer, Pächterinnen und Pächter sollen in die Entwicklung der Stadt eingebunden werden; die Arbeits- und Aufgabenteilung gestaltet sich nach Howard flexibel, je nach Fortschreiten des Prozesses nimmt „die Stadt" eine mehr oder weniger aktive Rolle ein (vgl. DAPPEN et al., 2017; VERNET und COSTE, 2017).

Der Planungsprozess zum Landschaftsplan erfolgte über ein dreiviertel Jahr im intensiven Austausch mit sehr vielen verschiedenen Akteurinnen und Akteure, allen voran mit den Mitgliedern der Steuerungsgruppe (vgl. Abb. 1). Um den bislang wenig beachteten Raum in den Fokus der Aufmerksamkeit zu rücken und den Boden für zukünftige Umsetzungen bestmöglich aufzubereiten, wurden gemeinsame Begehungen und Raderkundungen vor Ort durchgeführt. Dabei wurden spannende Geländekanten, beeindruckende Blickbeziehungen aber auch Barrieren unmittelbar er-fahren und erlebt. Darüber hinaus wurden die Inhalte des Landschaftsplans mit Fachleuten anderer Planungsfelder wie Ortsentwicklung, Naturschutz, Landwirtschaft, Mobilität und Wasserschutz/Altlastensanierung diskutiert und abgestimmt. Last but not least, flossen von den Bewohnerinnen und Bewohnern als „Expertinnen und Experten ihres lokalen Alltags" sehr viele Ideen ein, die im Rahmen einer zweitägigen Ideenwerkstatt zum Grünraum erarbeitet wurden, darunter der Generationenweg, ein Abenteuerspielplatz sowie die Verbesserung von Rad- und Fußwegen.

5.5 Landwirtschaft ist zentral

Howard geht von der Idee aus, dass Stadt und Land eng verwoben sind. In der Stadt findet sich der Absatzmarkt für die landwirtschaftlichen Produkte, Abfälle der Stadt werden am Land zu wertvollem Humus. Folglich formuliert er ein Model der Kreislaufwirtschaft, es sollen lokale Märkte gestärkt und Kreislaufwirtschaft gefördert werden.

War der Ackergürtel in Morus' Utopia anno 1516 notwendig zur Versorgung der Stadt, so wird heute das Getreide des Marchfelds auch an der Getreidebörse in Rotterdam gehandelt und ist vielerorts aus agrarökonomischer Logik völlig vom lokalen Markt entkoppelt. Jedoch bedeutet der Erhalt der Landwirtschaft den Erhalt der Kulturlandschaft, welche wiederum die Grundlage der Erholungsnutzung ist. Übersetzt auf heute heißt das, dass die Kooperation mit der Landwirtschaft zentral für das Entwickeln der Grünraumspange ist, und dass die Potentiale der stadtnahen Landwirtschaft gehoben und befördert werden sollten (siehe Abb. 5).

Die Landwirtschaft und darunter insbesondere kleinbäuerlich organisierte und für Einsteigerinnen und Einsteiger offene Wirtschaftsweisen besitzen am Stadtrand großes Potential (vgl. JAUSCHNEG, 2012-2014). Sie brauchen die räumliche Nähe zwischen Produzierenden und Konsumierenden und gelten zunehmend als gesellschaftlicher Trend. Treiber dieser Entwicklungen sind in einem verstärkten Bewusstsein für Gesundheit und regionale Produkte, für Umweltschutz, für sozial faire Produktion und in der gewünschten stärkeren Unabhängigkeit von Konzernen u.a. zu finden.

6 CONCLUSIO

6.1 Ausblick: Flächenmanagement – zwischen privaten und gemeinschaftlichen Konzepten

Der Landschaftsplan als fachliches Gutachten liegt nun vor und soll in Gremien vorgestellt werden, um eine breite Akzeptanz und damit auch eine stärkere Verbindlichkeit für die Umsetzung zu erfahren. Der einfachen bzw. raschen Realisierbarkeit steht jedoch der geringe kommunale Flächenbesitz gegenüber: Die wenigen, in

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kommunalem Besitz befindlichen Flächen wurden daher besonders auf ihre Eignung hinsichtlich der Grünraumspange geprüft und in das Konzept miteinbezogen und es wurden bestehende kommunale Flächen als potentielle Tauschflächen identifiziert.

Den alten Gringürtelkonzeptionen liegt als wesentlicher Bestandteil die Idee von Gemeinschafts- und Genossenschaftseigentum zugrunde. Das Howardsche Modell der Stadtentwicklung bindet verschiedene Organisationen, Institutionen und Eigentümerinnen und Eigentümer in die Entwicklung ein, wobei er die Arbeits- und Aufgabenteilung als flexibel und anpassbar versteht, je nach Fortschreiten des Prozesses nimmt „die Stadt“ eine mehr oder weniger aktive Rolle ein. Er entwickelt, ähnlich wie Thomas Morus für den Ackergürtel in Utopia (vgl. PETZ 1995), die Idee der Gemeinschaft im Sinne von Genossenschaft: gemeinschaftlicher Erwerb und Besitz sollen Bodenspekulation hintan- Pacht und Miete niedrig halten, dennoch sollte trotz Genossenschaft die persönliche Freiheit und Selbständigkeit nicht eingeschränkt werden.

Zentral für den Landschaftsplan ist: Die Stadt Wien mit den Bezirken Floridsdorf und Donaustadt und die Stadtgemeinde Gerasdorf verstehen die Frage der Grünraumentwicklung als ein Thema, das beide gleichermaßen betrifft und für das beide gleichermaßen zuständig sind – die Grünräume einer Stadtregion können langfristig und nachhaltig nur gemeinsam entwickelt werden. Sie haben bereits jetzt eine pro-aktiv steuernde Rolle eingenommen und neue Formen der Kooperation erprobt. Dies sollte in der zukünftigen Umsetzung, vorbereitet durch den Lokalen Aktionsplan (vgl. Abb. 1), weiter gepflogen und weiter entwickelt werden. SCHELLING (2017) sieht eine institutionelle Möglichkeit darin die gemeindeübergreifende Zusammenarbeit in Form eines regionalen Planungs- und Entwicklungsverband zu organisieren. In diesem zu entwickelnden Verband soll trotz oder gerade wegen der in vielerlei Hinsicht völlig unterschiedlichen Ressourcen der verschiedenen Kommunen zum Beispiel in der Frage der finanziellen Mittel oder der notwendigen Planungskompetenz ein produktiv-pragmatischer Umgang mit den unterschiedlichen Rahmenbedingungen gefunden werden.

Denn: Für die Umsetzung von geplanten Maßnahmen gibt es mehrere Möglichkeiten:

- Der „klassische“ kommunale Ansatz ist, dass jede Stadt/Kommune für sich die Flächen, die sie durch Kauf oder Tausch erwirbt, entwickelt. Dabei kann sie sich die reichen Erfahrungen aus dem Bereich der gemeinwohlorientierten genossenschaftlichen Formen wie sie etwa in Wien im Bereich des Wohnens seit langem existieren, für die Grün- und Freiräume zu Nutze machen.
- Für die zukünftige Entwicklung der stadtregionalen Grünraumspange bietet der interkommunale Ansatz ein hohes Potential, in dem zwei oder mehrere Gemeinden die Flächen gemeinsam entwickeln. Hierzu könnten bereits entwickelte Instrumente wie das Landschaftskonto, das seinen Ansatz vorrangig in der Ausgleichslogik für Infrastrukturgroßprojekte hat, auf-, ausgebaut und adaptiert werden und als regionales Instrument mit einem gemeinsamen Flächenpool etabliert werden (vgl. PROKSCH und GRAF, 2011). Ein stadtregionaler Planungs- und Entwicklungsverband könnte diese Aktivitäten unterstützen. Dazu empfiehlt es sich auch auf Erfahrungswerte aus vergleichbaren, bereits bestehenden Projekten wie den Grünen Ring Leipzig zurückzugreifen. Dieser freiwillige Zusmammenschluss ist als Verband von derzeit 13 Kommunen sowie zwei Landkreisen organisiert, die sich auf Grundlage eines gemeinsamen Handlungskonzepts in Arbeitsgruppen mit Themen der regionalen Entwicklung auseinandersetzen (vgl. GRÜNER RING LEIPZIG, 2018).
- Denkbar ist auch, dass Gemeinden oder auch Gemeindeverbände gemeinsam mit Privaten (Public/Private Partnership) einzelne Flächen entwickeln und dazu privatrechtliche Verträge abschließen (vgl. FRIEDMAN, 2016).
- Oder, dass, als relativ neuer Ansatz, private Organisationen und Personen(gruppen) wie Nachbarschaftsgruppen, Firmen, Einzelpersonen aus der Motivation der Förderung des Gemeinwohles selbst Flächen gestalten, die sie der Allgemeinheit dauerhaft oder temporär zur Verfügung stellen – denkbar auch inklusive Erhaltung/Pflege. Die Bandbereite reicht dabei von nachbarschaftlich organisierten „Grünraumgruppen“, angelehnt an Baugruppen, über gemeinnützige Stiftungen hin zu Kooperationen mit Konzernen, die Rahmen ihrer Marketingstrategie vor Ort sichtbar sein wollen (vgl. die gesponserte Sitzbank des lokalen Geldinstituts).

Neben der Flächenmobilisierung stellt sich immer die Frage der Finanzierung: Klassisch finanziert die Stadt/Kommune, da es eine hoheitliche Aufgabe der Stadt ist, Grünraum zu sichern und zu entwickeln, die

Maßnahmen aus Steuergeld. Dies erfordert jedoch angesichts der angespannten Budgetlage ein bewusstes Umdenken und gezieltes Umschichten in den Ausgaben zugunsten des Grün- und Freiraums. Die Idee des interkommunalen Landschaftskontos ist es, dass Investorinnen und Investoren als Ausgleich für Eingriffe in die Umwelt konkrete grünplanerische Maßnahmen finanzieren. Abseits bestehender Finanzierungslogiken könnte sich ein näherer Blick auf innovative Zugänge und Modelle als lohnend erweisen: Wie könnte etwa Crowd-Funding für die Grün- und Freiraumentwicklung eingesetzt werden? Welche alternativen, gemeinschaftlichen Bewirtschaftungsformen außer des bei uns sehr stark prägenden Privateigentums bieten sich an und sollten auf ihre Potentiale für Grün- und Freiräume geprüft werden? Wie könnte Gemeinschaftseigentum bezogen auf Grün- und Freiräume heute aussehen? Welche Anleihen können bei der Allmende/den Commons genommen werden (vgl. HELFRICH, 2012)? Wie könnten beispielsweise gemeinnützige Bundesstiftungen als Werkzeug zur Sicherung von Grundstücken der gemeinschaftlichen nachhaltigen Nutzung von Grün- und Freiräumen einen sicheren Rahmen geben (vgl. RASENNA, 2017)?

6.2 2065+ - Was bleibt über?

Die Sicherstellung von öffentlichem Grün- und Freiraum, speziell auch im Hinblick auf die soziale Verantwortung, ist ein wesentlicher Aspekt einer nachhaltigen Entwicklung der Region. Dies bedeutet, Flächen dort bereitzustellen, wo Menschen sie brauchen. Im Hinblick auf den hohen ökologischen, klimawirksamen und sozialen Stellenwert des Grüns muss Grünraumplanung stets mehr sein als die Nutzung eines „verbleibenden Restes" einer Flächenentwicklung. Der Landschaftsplan versteht sich vor diesem Hintergrund als übergeordnetes Konzept, das eine „große, zusammenhängende" Gesamtidee beschreibt. Der Landschaftsplan soll als Entscheidungsgrundlage für Wien und Niederösterreich dienen und als umsetzungsorientiertes Instrument eine Argumentationsgrundlage darstellen, gezielt Geld für die Grün- und Freiräume in die Hand zu nehmen.

7 LITERATUR

APPLETON, J.: The experiences of Landscapes. Plenum Press, New York, 1975.

DOHNA-PONINSKA, Adelheid alias ARMINIUS: Die Großstädte in ihrer Wohnungsnoth und die Grundlagen der durchgreifenden Abhilfe. Leipzig, 1874.

DAMYANOVIC, Doris; REINWALD, Florian und WEIKMANN, Angela: Handbuch Gender Mainstreaming in der Stadtplanung und Stadtentwicklung: Werkstattbericht Nr. 130, hrsg. Magistratsabteilung 18 – Stadtentwicklung und Stadtplanung. Wien, 2014.

DAPPEN, Claudia; HERBST, Charlotte und SCHLEGELMILCH, Frank: Band 1: Die Entwicklung der Gartenstadt und ihre heutige Relevanz. In: BUNDESINSTITUT FÜR BAU-, STADT- UND RAUMFORSCHUNG (BBSR) (Hrsg.): Gartenstadt 21: Ein neues Leitbild für die Stadtentwicklung in verdichteten Ballungsräumen – Vision oder Utopie? Bonn, 2017.

DAPPEN, Claudia; HERBST, Charlotte und SCHLEGELMILCH, Frank: Band 2: Ein Modell der nachhaltigen und integrierten Stadtentwicklung. Gartenstadt 21 – grün-urban-vernetzt. In: BUNDESINSTITUT FÜR BAU-, STADT- UND RAUMFORSCHUNG (BBSR) (Hrsg.): Gartenstadt 21: Ein neues Leitbild für die Stadtentwicklung in verdichteten Ballungsräumen – Vision oder Utopie? Bonn, 2017.

DOHNA, Ursula: Gegen bemooste Vorurtheile. Städtebauliche Reform-Ideen einer Frau vor 100 Jahren. In: Das Gartenamt 4/71, S. 170-173. Hannover, 1971.

FALUDI, Andreas: Der Wiener Wald- und Wiesengürtel und der Ursprung der „green belt" – Idee. In: Raumforschung und Raumordnung, Heft 5/1967, S. 193-206. Hannover, 1967.

FRIEDMAN, Stephen (Hrsg.): Succsessful Public/Private Partnerships: From Principles to Practices. Urban Land Institute, Washington DC, 2016.

GRÜNER RING LEIPZIG (o.J.): Was wir tun. Verfügbar unter: http://gruenerring-leipzig.de/was-wir-machen/ (letzter Zugriff am 14.2.2018)

HAMEDINGER, Alexander: Ernährungsarmut in Wohlstandsgesellschaften. In: zoll+ österreichische Schriftenreihe für Landschaft und Freiraum, textedition Nr. 31, Dezember 2017, S. 49-53. Wien, 2017.

HELFRICH, Silke und HEINRICH-BÖLL-STIFTUNG: Commons. Für eine neue Politik jenseits von Markt und Staat. Transcript Verlag, Bielefeld, 2012.

HOWARD, Ebenezer: Garden Cities of Tomorrow – Gartenstädte von morgen. Das Buch und seine Geschichte. Ullstein Bauwelt Fundamente 21, München, 1968.

JAUSCHNEG, Martina; GRUBER, Sonja; LUGER, Sabine und ERDMANN, Michael: Primärproduktive Stadt-Landschaft. Ziele, Strategiefelder und Aktionsplan für Wien. Wien, 2015.

JAUSCHNEG, Martina (Hrsg.): Stammersdorf – Lebens- und Wirtschaftsort. Berichte zur gleichnamigen Lehrveranstaltung an der BOKU Wien im WS 2012 und im SS 2014, Übungen mit Feldarbeiten zu Landschaftsplanung. Leitung: Martina Jauschneg. Wien, 2012-2014.

KAPLAN, R. und KAPLAN, St.: The experience of nature. A psychological perspective. Cambridge University Press, Cambridge, 1989.

KNOLL, Thomas und AICHHORN, Ursula: Pilotstudie kommunaler Landschaftsplan. Qualitätskriterien für den Landschaftsplan im Rahmen der örtlichen Raumplanung in Niederösterreich. Auftraggeber: Amt der NÖ Landesregierung Abt. Raumordnung und Regionalpolitik. St. Pölten, 2012.

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Editors: M. SCHRENK, V. V. POPOVICH, P. ZEILE, P. ELISEI, C. BEYER, G. NAVRATIL

MA 18 Magistrat der Stadt Wien für Stadtentwicklung und Stadtplanung (Hrsg.): Fachkonzept Grün- und Freiraum, Autorinnen und Autoren: Wieshofer, I., Prochazka, E., Knoll, Th., Cserny, A. Wien, 2015.
MORUS, Thomas: Utopia (Übersetzung von Hermann Kothe, Leipzig 1890). Erste Auflage. Insel Taschenbuch, 1516/1992.
ÖROK Österreichische Raumordnungskonferenz: ÖREK_Partnerschaft „Kooperationsplattform Stadtregionen“ Expertenpapier im Auftrag der Partnerschaft. Mehrwert stadtregionaler Kooperationen. Bearbeitung: KDZ-Managementberatungs- und WeiterbildungsGmbH und Österreichisches Institut für Raumplanung. Wien, 2013.
PETZ, Karl Christian: Grüngürtel und Grünkeile oder städtische Freiraumplanung? Studien zum Landschaftsprogramm Berlin. Diplomarbeit am Institut für Landschaftsplanung und Ingenieurbiologie, Universität für Bodenkultur, Wien, 1995.
PROKSCH, Thomas und GRAF, Karin: Landschaftskonto Endbericht Etablierung des Landschaftskontos als strategischen Modellansatz am Sektor Landschaftsentwicklung im Ballungsraum Wien – Niederösterreich. Erstellt im Auftrag des Vereins Wien-Niederösterreich gemeinsame Entwicklungsräume. Wien, 2011. Download unter: http://www.stadt-umland.at/themen/gruen-und-freiraum/nuetzliche-tools.html (letzter Zugriff am 21.1.2017)
RASENNA: Homepage des Vereins RASENNA – Boden mit Zukunft. Verfügbar unter: http://rasenna.at/ (letzter Zugriff am 21.1.2017)
SACK, I.: Grüngürtel – Neue Argumente für eine alte Idee? Die Entwicklung der Grüngürtelidee und ihre Relevanz in der heutigen Stadtentwicklung unter besonderer Berücksichtigung Kölns. Diplomarbeit am Fachbereich 14, Landschaftsentwicklung, Institut für Landschafts- und Freiraumplanung, Technische Universität Berlin. Berlin, 1993.
SCHELLING, Nicola: Gastvortrag: Metropolitane Wohnungspolitik in Stuttgart. Regionaldirektorin Verband Region Stuttgart; am 30.11.2017 am Wohnbauforschungstag 2017, an der TU Wien. Download unter http://www.wohnbauforschung.at/index.php?id=476 (letzter Zugriff am 21.1.2017)
SCHMIDT, Erika: Die Green-Belt-Idee vom 16. Jahrhundert bis zur Gegenwart und ihre Zukunftschancen. In: Das Gartenamt 8/1971: S. 371-374, 9/1971: S. 442-451, 4/1972: S. 201-206, 10/1972: S. 559-564. Hannover, 1971-1972.
SUM Stadt-Umland-Management: Landschaftskontomodell. Grundprinzipien, Anwendungsbeispiele. Baden, 2014. Download unter: http://www.stadt-umland.at/themen/gruen-und-freiraum/nuetzliche-tools.html (letzter Zugriff am 21.1.2017)
VERNET, Nicolas und COSTE, Anne: Garden Cities of the 21 st Century: A Sustainable Path to Subuirban Reform. In: Urban Planning (ISSN: 2183-7635) Volume 2, Issue4, S. 45-60. Lissabon, 2017.
WURZER, Rudolf: 60 Jahre „Wald- und Wiesengürtel“ der Stadt Wien. In: Berichte zur Raumforschung und Raumplanung, Heft 4/1965, S. 366-387. Wien, 1965.
ZLENDER, Vita und WARD THOMPSON, Catherine: Accessibility and use of peri-urban green space for inner-city dwellers: A comparative study. In: Landscape und Urban Planning 165, S. 193-205. Amsterdam, 2017.

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An Automated Verification Workflow for Planned Lighting Setups using BIM

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1 ABSTRACT

The use of Building Information Modeling (BIM) methods is becoming more and more established in the planning stage, during the construction, and for the management of buildings. Tailored BIM software packages allow to handle a vast amount of relevant aspects, but have so far not been covering specialized tasks like the evaluation of light distributions in and around a 3D model of a building. To overcome this limitation, we demonstrate the use of the open-source IFC format for preparing and exchanging BIM data to be used in our interactive light simulation system. By exploiting the availability of 3D data and semantic descriptions, it is possible to automatically place measurement surfaces in the 3D scene, and evaluate the suitability and sustainability of a planned lighting design according to given constraints and industry norms. Interactive visualizations for fast analysis of the simulation results, created using state-of-the-art web technologies, are seamlessly integrated in the 3D work environment, helping the lighting designer to quickly improve the initial lighting solution with a few clicks.

Keywords: analysis, visualisation, lighting design, verification, BIM

2 INTRODUCTION

Building Information Modelling (BIM) is becoming more and more of a standard in terms of planning, supervising and managing the complete lifecycle of a building. The base of a BIM project is a single data set, consisting of 3D geometry together with all kinds of semantic information, reaching from material properties over electrical installations up to the designated purpose of rooms. The main advantage and idea (but at the same time one of the biggest challenges) of this holistic approach is the possibility that all involved users work on the same, single data basis, which reduces redundancy, miscommunication issues and exchange problems. For this to work, specific views onto this model have to be defined for the individual experts: The access to only relevant parts of the data avoids reduces the handling complexity, and improves the efficiency by providing domain-specific tools.

In praxis, not all relevant planning and management responsibilities can be performed in a single software environment: Even though available BIM tools (see Section3) cover an enormous amount of workflows for complex planning tasks, specialized parts are still carried out using the established tools tailored towards the needs of the corresponding industry. Hence, the data exchange plays a crucial role in this environment: In order to exploit the availability of the BIM data source with all its meta information, to create specialized views onto it, and to synchronize the externally generated data with the source BIM model, the open-source data exchange format IFC has been proposed: Apart from geometric and material information, it also holds semantic annotations and information that can be used for verification purposes.

In this work, we propose a novel approach for an optimal BIM-based lighting design workflow using multiple components. Lighting design is one of the fields that relies on specialized design tools, but that can benefit immensely from both the 3D geometry as well as from the metadata immanent in the BIM model: For the first time, a digital system includes nearly every necessary information needed to automatically verify all formal requirements of a lighting solution. This would make it possible to find an optimal lighting design solution in a short time period, and apply necessary modifications in cost-effective phases.With the goal to make steps towards this automation, we strive to properly handle the following aspects:

- Data preparation: For an optimal export and use in a lighting design environment, we suggest a way to use the existing annotation possibilities the BIM standard offers. It is crucial that the overhead for this annotation stays low, both in terms of modeling time as well as in data size.
- Data exchange: Using the IFC data format for the exchange from the BIM tool to the lighting design software and vice versa, we are not tied to a certain feature set only a certain software manufacturer

has created. Nevertheless, the needed data conversion requires certain considerations and precautions.

- Data enhancement: A proper, physically accurate light transport relies not only on the exact 3D geometry, but also on a physical description of both the light sources as well as any surface property (i.e. material) in the 3D scene. BIM tools as well as the IFC standard do not take physical material measurements into account, and this has to be considered.
- Verification of lighting-induced constraints and norms: The lighting industry has established toolsets and methods for the verification of a planned lighting solution. In order to evaluate the suitability of the light in the scene, certain criteria and norms have to be fulfilled. In the real-world, these can be measured using special devices; in a simulation environment, these measurement tools have to be artificially simulated as well. The setup of this tools can be automatically derived by using the proper information prevalent in the BIM data.
- Visualization of the lighting result: Emerging light simulation data has so far been visualized in multiple ways, like the direct display of the incoming light on the geometry, false color visualizations, etc. - but together with the available semantic context, it is now feasible to automatically apply information visualization methods to gain more insight on the results.
- Use of state-of-the-art technologies and tools: We try to exploit the availability of various existing tools and libraries such as xBIM(eXtensible Building Information Modelling Toolkit[XBIM]) for parsing end editing the IFC files, or CEF (Chromium Embedded Framework [CEF]) for the creation of information visualization gadgets using web-based technologies. This has not only the benefit of rapid prototyping, but also guarantees a wide range of support.

By taking these aspects into account, we demonstrate our first version of a continuous workflow from the BIM software into a light planning setup, including fully automatic verification steps and visual guidance for further improvements. In this process, we have identified the following scientific contributions:

- Automatic and seamless creation of a light planning view onto a BIM data set (with little preprocessing effort), including a physically-based conversion of material and light data
- Automatic placement of light measurement surfaces based on semantic information prevalent in the BIM meta, including an assignment of light-relevant constraints from norms and industry standards
- A real-time visual guidance system, relying on web-based techniques for information visualization, giving fast insights on the achieved quality of the solution, and where improvements are necessary.
- An outlook on further possible extensions that could be seamlessly integrated in such a system, making it possible to verify time-dependent, perception-based or psychological aspects of a lighting design.

In the next sections, we will first give an overview on the current state of the art in the related fields of lighting design and BIM (Section 3), followed by an overview on our system components and the BIM data exchange in Section 4. In Section 5, we demonstrate the initial visualization results of the light distribution. The use of the additional semantic context is used in a visual guidance system that is explained in Section6, followed by a results Section (7). We conclude this paper and give an outlook on future work in section 8.

3 RELATED WORK

3.1 Lighting Design Tools

In the field of lighting design, various solutions are available [DAVOODI]to solve the challenges that occur during the creation of a lighting concept. Photometric measurements provided by luminaire manufacturers serve as one of the important input factors for a physically accurate lighttransport simulations. Thisphotometric data represents lighting characteristics of luminaires in the form of IES [IES] or EULUMDAT [EULUMDAT]files. All relevant lighting design software tools feature a kind of measurement surfaces that measure illuminance values (see Section 4.1.4), which can be used to evaluate any lighting scenario.

The most common software products combining CAD modeling, measurement tools and possibilities to evaluate lighting scenarios are Relux[RELUX], DIALux[DIALUX] or AGi32 [AGI32].Dialux and AGi32 perform calculations for the light simulation based on the concept of radiosity [GORAL]. Relux uses the Radiance renderer by Ward [WARD] for the light simulation.HILITE, a light planning-software currently developed in an academic environment, calculates and visualizes a physically based light simulation in real-time. It uses a many-light global-illumination solution [LUKSCH, 2013] to calculate light maps, and filtered environment maps to create glossy material effects [LUKSCH, 2014]. A unique feature of this tool is its interactivity, allowing users to change materials, positions of luminaires, or entire luminaire models, while the light simulation is updated at interactive framerates. This makes rapid iterations on a lighting concept possible and therefore provides a very fast workflow.In this work, we opted for HILITE as the used light simulation tool, since the physically-based interactive simulation together with HILITE's capabilities to evaluate lighting scenarios and an easy-to-extend programming interface form the ideal environment for our work.

3.2 BIM and Lighting

In recent years, Building Information Modeling (BIM) has gained more and more importance in architectural design and construction workflows, and first research effort has already been dedicated to using BIM data for energy or light simulations.Yan et al. [YAN] developed system interfaces to connect BIM with Building Energy Models (BEM) to provide the possibility of energy simulations using BIM data. The authors use Revit as BIM tool and Radiance, a high-quality ray-tracing software system, and DAYSIM [REINHART]for daylight simulations. Their prototype Revit2Radiance represents the first direct translator between Revit and Radiance. It generates input geometry for Radiance and DAYSIM by extracting and triangulating surfaces from Revit models.Similarly, Kota et al. [KOTA] focused their research on combining different tools to ease daylight simulations and analysis for BIM models. The authors investigated the benefits and challenges of integrating BIM into daylight simulation tools and developed a prototype that integrates Revit as BIM tool into Radiance and DAYSIM for daylight simulations.

Research on Building Energy Management Systems (BEMS), like conducted by Ock et al. [OCK], also investigates possibilities for using BIM data for daylight simulations. The goal is to generate control patterns for BEMS using weather data together with BIM models and Computational Fluid Dynamic (CFD) simulation. The control systemOck et al. propose does not use real-time light simulation of whole buildings, since the authors deemed it too expensive in terms of processing time to control the lighting embedded in their BEMS. Instead, pre-computed daylighting illuminance levels for each full hour are computed with Autodesk 3D Max Design, DAYSIM or Radiance from a BIM model. The system looks up the respective illuminance levels to evaluate a pre-defined lighting setup, resulting in control instructions for the BEMS to adjust the lighting.

Yan et al. [YAN] and Kota et al. [KOTA] already proved that it possible to convert BIM data into other models, that can be used by thermal or daylight simulation tools, in an accurate and efficient manner.

Building on their research, we also chose Revit as source for our BIM data and took their approach one step further by integrating BIM data in HILITE, a light planning software that is not only capable of daylight simulations, but also provides physically accurate simulations of very complex indoor lighting scenes, while allowing interactive changes and various possibilities to automatically evaluate the illumination in a scene based on physically correct values and norms.

3.3 BIM Data Exchange

In their recent case study of two industrial facilities, Gourlis[GOURLIS] investigated potentials and deficits of converting BIM to BEM data and possible uncertainties that arise in the process. From their literature review of state-of-the-art research on BIM to BEM, the authors conclude that most projects still require custom software or domain specific design guidelines that are formulated by domain experts and are therefore influenced by their personal views and skills.This supports our claim that there is a demand for automatic methods, which enable reliable workflows from BIM data to BEM or light simulation tools.

Davoodi[DAVOODI] compared multiple light simulation tools in her thesis and investigated the use of BIM models for light simulations. The author states that current workflows requires various manual steps to convert data back and forth between different BIM and simulation tools. Since most processes in this

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toolchain are purpose-driven, the respective tools often do not provide all the necessary information for other tools. For example, material parameters (like the reflectiveness of a material), or physically-based specifications of light distributions of luminaires, are rarely provided by material /element vendors and therefore have to be added manually for the light simulation.Lu et al. [LU] recently published an in-depth review of numerous publications about applications of BIM in the context of green buildings and their development. After a critical reflection on currently used BIM software tools, the authors confirm the missing information as one major issue for the integration of green BIM with light simulations tools like Radiance and DAYSIM.

Withour solution, missing light data is automatically inserted from a light database. Our tool also provides means to handle missing material properties similarly by connecting a material database or a lookup table.

4 SYSTEM COMPONENTS FOR AN AUTOMATED VERIFICATION OF LIGHTING DESIGNS

To verify the suitability and sustainability of a planned lighting design for a given BIM model, three major components are necessary: A BIM modeling software to generate a 3D scene together with semantic information, a light simulation application, and the data exchange interface between them. We first describe the main considerations for the suitability of a light simulation system, followed by the aspects of a BIM tool relevant for the verification of lighting designs.

4.1 Light Simulation

A light simulation application usable for this purpose has to at least fulfill the minimal photometric measure accuracy to allow lighting design verification, i.e. the light transport simulation must not deviate from real light transport by more than 10-15%. To create such highly accurate measurements, the light interaction between various complex materials as well as the luminaires themselves have to be described in detail. Moreover, the simulation quality strongly correlates with the complexity of the light transport algorithm. In our approach, we opted for the HILITE application, as its light transport algorithm has been optimized for architectural scenes and is extremely fast due to GPU acceleration.

4.1.1 Luminaries

Every luminaire in the scene must be described by photometric data, which mainly consists of the light distribution information. The light distribution describes how a luminaire emits light into the scene, based on real-world measurements. The light simulation application relies on these measurements to decide in which direction which energy amount has to be distributed. Furthermore, the photometric data contains various manufacturer's details like color temperature (see Figure 1) and a color rendering index.

Fig. 1: Color temperature comparison. Left: warm white (3000K). Right: cool white (5000K)

4.1.2 Daylighting

Lighting design is not only based on placing artificial luminaires, it also includes daylight to achieve a high light quality solution and reduce the overall energy consumption. As sunlight is our natural main light source, the human visual system is optimized for its light spectrum, and the presence of daylight within a building improves the quality of life. During the planning and management stages of a building, considering the influence of daylight can obviously help tremendously to reduce energy costs - but also more complex light-induced aspects, like glare, reflections, and hard shadows are often caused by sunlight. Therefore, the lighting design tool has to be capable of considering daylight within the architectural planning phase to avoid glare prone constellations of highly reflecting areas, like glass coverings or windows. A physically-baseddaylight modelprovides time and location-dependent photometric data for these aspects (Figure 2).

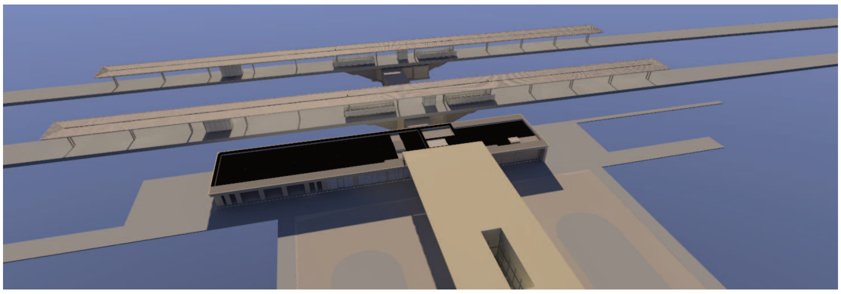

Fig. 2: Daylight simulation for a train station. Both direct sunlight as well as ambient light are simulated, and multiple light bounces are considered. The light transport computation in this scene took approximately 20 seconds

4.1.3 Materials

Materials have to be described in a physically plausible way to correctly simulate the light interaction within a scene. Opaque materials reflect all incident light, while transparent materials refract portions the incoming light. To describe the reflection behavior of an opaque surface a Bidirectional Reflectance Distribution Function (BRDF) is used. Metallic reflections manifest as a highly specular reflection, while non-metallic materials tend to appear diffuse with low specular reflections. The material's microstructure or roughness strongly influences the glossiness of an object. In case of transparent materials, the light propagates through its medium. While light enters another medium, the light direction is bent according to the material's refractive index. By applying real-world observation and physical laws, a huge variation of materials can be simulated.

Fig. 3: Various renderings of the same scene. Left:Abstract material shading. Middle:Illumination values applied to material model. Right: Illuminated scene inclusive view dependent material effects.

4.1.4 Measurement Surfaces

For architectural projects, especially in public space, the light intensity within a certain area is described by industry norms. The light simulation provides a light intensity value for each point in a scene. To form statistical terms for a certain area, the light measurements for all points within this space have to be evaluated. To define the area of interest on an object's surface, measurement surfaces can be described by the user. Measurement surfaces are linked to a certain industry norm to allow automatic evaluation. The most prominent lighting norms regarding a measure area are lighting level ($\bar{E}$m) and uniformity of illuminance (U0). The lighting level represents the average illuminance within a measurement surface and is used as a maintenance factor to ensure a minimum level of light quality. Uniformity of illuminance states how evenly light is spread over the measurement surface.

4.1.5 View-dependent LightingEffects

Lighting design norms provide guidelines to handle view dependent lighting quality. Glare is the most prominent effect as it represents a safety issue. Heavy glare can lead to tiredness, errors and even to injuries. Proper lighting implies to avoid or reduce glare as much as possible. The unified glare index (UGR) states how much glare is present at an actor's position within the scene with a given field of view.By introducing a time component and moving actors, effects like the adaption of the human visual system can be simulated as well. HILITE currently supports this partly in the form of adaptive tone mapping during interactive walkthroughs, but not yet in statistical evaluation scenarios.

4.2 BIM Software

BIM-based modeling software allow to describe a complex life cycle of an object, and is capable of properly handling various aspects, starting with the object's planning and construction right through to its usage, maintenance and even deconstruction. For the usage of BIM data in lighting design, though, we (and others, see Section 3.3) have encountered the problem that several aspects in the data need special considerations:

4.2.1 Luminaire Dummies

To allow the simulation of light within a BIM project, photometric data needs to be linked to luminaire objects. To place the luminaire within the scene, each luminaire must be attached to a placeable geometry. A detailed luminaire geometry is not necessary for the calculation of a light simulation: First, the measured photometric data already describes how the light is affected by the luminaire's casing. Second, we intend to automatically switch luminaires in multiple simulation runs to find the best fit, i.e. in such a case, only position and orientation information is needed.

To simplify the lighting design process, only the luminaire's dimensions are necessary to check geometry intersections within the scene. Basic geometry shapes (box, pyramid, cone, and cylinder) are used as luminaire dummies instead of detailed casings. Real-world projects tend to contain a great number of luminaires, which have an impact on the rendering performance. The simplification of complex models to luminaire dummies reduce the rendering overhead, but also reduces realism of the rendered images displayed in the viewport. To counter rendering performance issues, either instancing or a level-of-detail approach can be used.

4.2.2 Annotations

Every 3D object within a BIM project can have various properties assigned. On the one hand, properties can hold simple numerical, nominal or Boolean values, like manufacturer's details, quantities or geographic information - but on the other hand, they can store more complex information like spatial relationships. The user can add, edit and remove properties of an object type, while each instance of an object holds its individual values. Additional information, like photometric data or semantic area descriptions (e.g. the purpose of a room or area, such as "office area" or "train platform"), need to be provided to the light simulation software. This required information for proper lighting evaluation can easily be attached to existing objects by definingnew properties for a certain object type. By annotating existing objects, the manual creation of additional helper objects (e.g. measurement surfaces) can be avoided, as their location and purpose can be automatically derived.Luminaire annotations hold metadata, like photometric data or orientation. Walls, floors or other building parts can be annotated to later automatically represent measurement surfaces for given lighting design norms.

4.2.3 IFC and Property Sets

As every object may hold many properties of various fields, their organization is important to keep a well-structured view. Properties are grouped to generate a tidy overview, allowing the user to fast identify relevant information. IFC (Industry Foundation Classes), an open data model for BIM, is a useful file format to export 3D data and metadata from a BIM project. To simply export all properties of an object via IFC is possible, but leads to an unnecessary work overload as only a portion of the immense data is of importance. Depending on the used IFC-scheme, several properties are included by default. User defined properties, like the lighting design relevant properties, are grouped together to a property set. To efficiently export the BIM project property sets are filtered.

4.3 Data exchange interface and verification workflow

For our automated verification workflow (Figure 4), the lighting design tool (Section 4.1) is connected to a BIM modelling software (Section 4.2) using a data exchange interface. In our current BIM projects (see Section7), the BIM models were generated using Revit Autodesk - but any other BIM software capable of exporting IFC can be used as well. The architectural model is enriched with photometric data or semantic area annotations, which are grouped together into property sets. To export a clean BIM model via IFC only the light simulation relevant property sets are additionally included.

Note that our workflow proposal is not restricted solely to the IFC file format. Any other semantically enhanced geometry format, such as CityGML, could be used as an exchange format. For example, the used light simulation system is based on libraries that support the handling of COLLADA and CityGML files as well. The handling and interpretation of the corresponding meta data would of course have to be adapted correspondingly to enable GIS applications like street lighting simulation for urban space planning.

To import the IFC file into our .NET-based lighting design application HILITE, we use the free open source toolkit xBIM[XBIM]. xBIM is a middle ware toolbox for IFC-based applications and provides a rich API to interact and modifying the IFC packed BIM model. Next to IFC-file parsing, xBIM provides a geometry engine, which turns IFC geometry data into an accessible mesh representation.We use this functionality to import geometry data as well as metadata into HILITE.

HILITE then accesses the xBIM representation and translates it to its own internal representation. In this translation process, the previously attached annotations are used to trigger creation rules:

- Luminaires: The dummy holds a lookup key to query the local HILITE luminaire database. The HILITE luminaire database contains an optimized geometric representation of the luminaire and its photometric data. The luminaire dummies, previously placed within the BIM model, provide orientations and positions, which are used to place the HILITE luminairesin the scene.
- Measurement Surfaces / Lighting Norms:While adding the geometries to the HILITE scene, every associated IFC-object is checked for annotations that lead to the need for a measurement surface. The annotations act as a key property to query the local lighting norm database. After generating and placing the measurement surface on top of the annotated object, the queried lighting norm is linked to it. For automatic lighting norm verification, each measurement surface is evaluated after the simulation has been calculated, and compared to the linked lighting norm. The result can be immediately displayed (Section 6) or saved(in near future, see Section 8) to an IFC file.
- Materials: The xBIM material description can only hold as many parameters as the IFC-materials offers. Hilite requires additional, non-default parameters due to its more sophisticated material model. The current workflow uses a local material database to complete the missing material parameters.

Lighting design norms, such as statistical terms like lighting level or uniformity of illuminance, can be directly validated by the measurement surfaces. View-dependent lighting effects have to be evaluated for each required position and field of view within the scene. To validate light specific norms, such as color temperature or a color rendering index, all luminaires contributing to the measurement surface have to be analyzed.

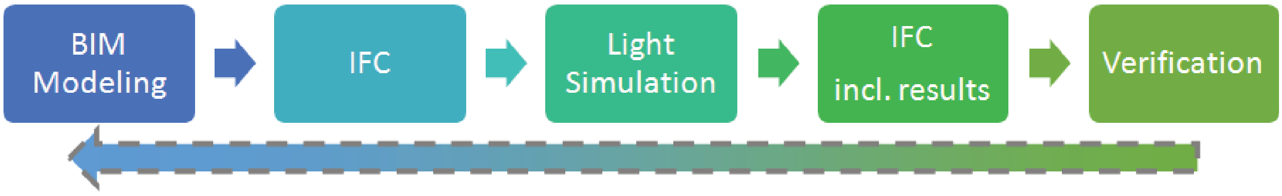

Fig. 4: The workflow concept and its components. Based on the BIM data, an IFC file is generated. The IFC file is analyzed, and the semantic data is used to enrich material properties, place measurement surfaces according to industry norms, and load photometric light profiles. After the physically correct light simulation, the results are stored, and the verification process is performed. In the future, these results will be made accessible to the original BIM again (via IFC).

5 VISUALIZATIONS

The light simulation application calculates the illuminance for all visible surface points within a scene as numerical values. By hovering with the mouse over the scene, the measured illuminance values can be inspected for each point. Nevertheless, distributed light in a scene is perfectly suited for a direct visualization by combining the illuminance values with the objects' underlying material models to produce a photorealisticview of the scene, including lighting and shadows. Such a rendering gives a good preview of how the lighting design affects the final building (Figure 3) visually, but does hardly give any information if the requirements defined by the industry norms are met! For the purpose of quickly visualizing the quality of a lighting solution, false color methods are applied.

5.1 FalseColorVisualization

The simplest false color visualization interprets illuminance values as grayscale values. The mapping of an illuminance value to a grayscale value is described by a so-called transfer function. A linear transfer function simply maps the illuminance values onto the range of renderable gray values. Most approaches rely on a logarithmic transfer function as it better correlates to our human perception.

More complex transfer functions map ranges on color schemes, where certain areas of interest can be better emphasized (Figure 5, left). By using the global minimal / maximal illuminance values, the range can be automatically set. This approach is a good starting point to explore the current lighting design, but comparisons with other scenes are hard to achieve. To reveal weak spots, a manual adjustment of the transfer function is necessary: To optimize the illuminance uniformity, the transfer function range is successively refined to expose even small illuminance differences. Furthermore, fixed ranges allow to compare different simulation runs.

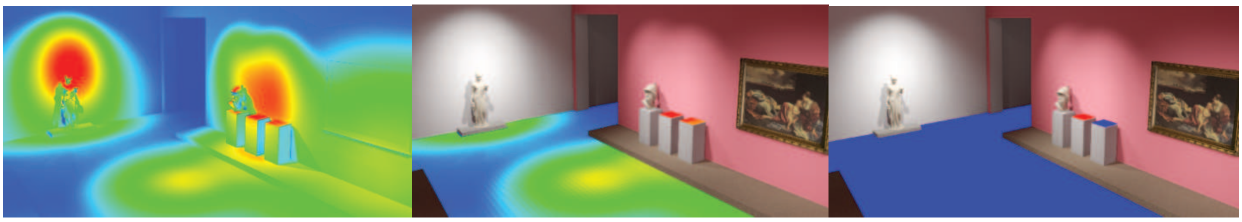

Fig. 5: Left: Global false color visualization. Middle: Measurement surface false color visualization with varying sample size. Right: Local false color view for measurement surfaces with visual verification.

5.2 Local False Color Visualization on Measurement Surfaces based on Norms and Constraints

The default false color visualization approach described above is based on one global transfer function. While evaluating multiple measurement surfaces, linked to individual lighting design norms, a global range is not sufficient to identify irregularities on the fly. Therefore, the range of the transfer function is set separately for each lighting design norm. By restricting false color visualizations only to measurement surfaces, the areas of interest are easy to detect within the scene (Figure 5, middle). A globally fixed color scheme allows to easily identify under- or overexposed measurement surfaces in respect to their linked lighting design norm (Figure 5, right). Theautomatic generation of this visualization is only possible due to the availability of semantic information from the BIM. It directly helps the user to add, move or remove luminaires in proximity to the measurement surface in order to find an optimal lighting design solution more efficiently.

6 INTERACTIVE VISUAL GUIDANCE

The semantic context for each measurement surface allows to verify the results of the current simulation run. Depending on the application area, the industry norms vary, which makes an individual, interactive treatment of the measurement areas necessary. The current validation state is visualized in various ways (Figure 6). We provide an interactive visualization within the 3D planning view to give immediate feedback for each measurement surface within the viewport. We opted for a traffic light symbol, as its concepts is generally well-known, and it is powerful enough to visualize the current verification status. Note that the yellow traffic light could be linked to the maintenance status of the light sources illuminating the measurement surface, which could be derived from the installation date in the BIM system.

To provide a global overview of the current verification status, all measurement surfaces are enlisted in a separate 2D view. The traffic light color scheme is re-used to easily detect unfulfilled lighting norms. By selecting a list element, the user can demand a more detailed visualization of the current verification status. For this purpose, we rely on various (scientific) visualization techniques that have been developed to present data in the most informative way. Especially the web-developing community provides an enormous amount of reusable content, mostly based on interactive JavaScript tools. HILITE provides the possibility to embed web-based content within its user interface, allowing fast prototyping and access to a wide range of visualizations. To demonstrate how easily various complex visualizations can be reused, we sketched the detail verification status view within the 2Dview using the well-known visualization tool Highcharts [HIGHCHARTS].

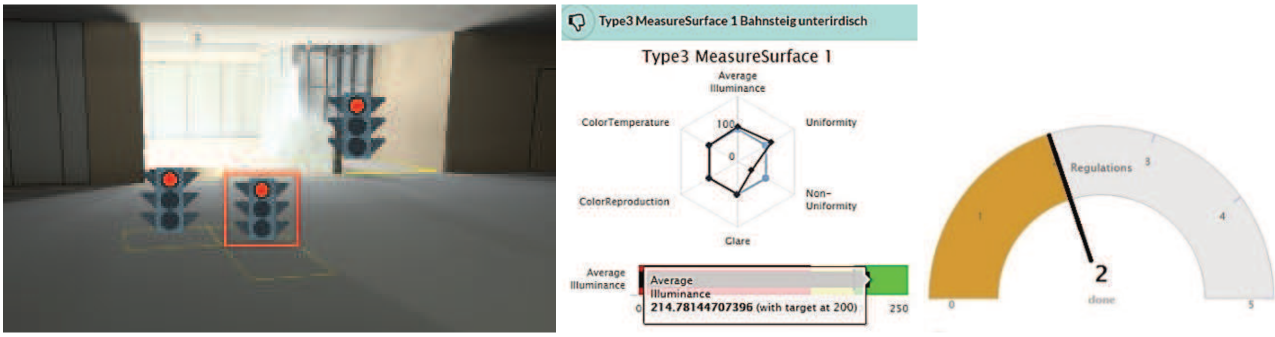

Fig. 6: Interactive visualizations using web-based technologies. Left: Traffic light symbol within 3D scene, quickly indicating whether all required norms are fulfilled for the selected measurement area. Middle and Right: Detail analysis view for the selected measurement area. The selection states of the areas are synced between 2D and 3D views. We integrated multiple plots for example purposes – note that they can be easily exchanged by other web-based visualizations. A polar plot (middle, top) provides a detailed overview on the fulfillment of all requirements. A bullet plot (middle, bottom) is used to visualize how well the current average illuminance requirement is met. The gauge (right) is best suited for a really quick overview on the number of valid constraints.

Our detail visualization uses a polar plot to visually compare the current values to the desired norm values. By normalizing all measured values to a range between 0 and 100, the polar plot contour can be directly compared to the desired norm values. A bullet plot is useful to depict ranges, which is suitable to compare the quality of the current measured value in relation to the accepted norm range. To quickly visualize the progress of all norms of a measurement surface, we use an angular gauge chart. The needlewithin the angular gauge chartindicates how many of the norms are currently satisfied.

As both views (2D / 3D) rely on the same dataset, their content as well as the user interactions on them are synchronized. While hovering over an element in the 2D view, the corresponding symbol in the 3D view is highlighted, and vice versa. This linkage helps the user to access additional information or to locate a specific measurement surface within the scene.

7 RESULTS

Autodesk Revit provides an example BIM project, where a building is modeled in detail. Figure7 shows a side by side comparison of the default building in Revit (left) and the illuminated scene in Hilite (right). The annotated floors were automatically mapped to measurement surfaces (show in false color mode).

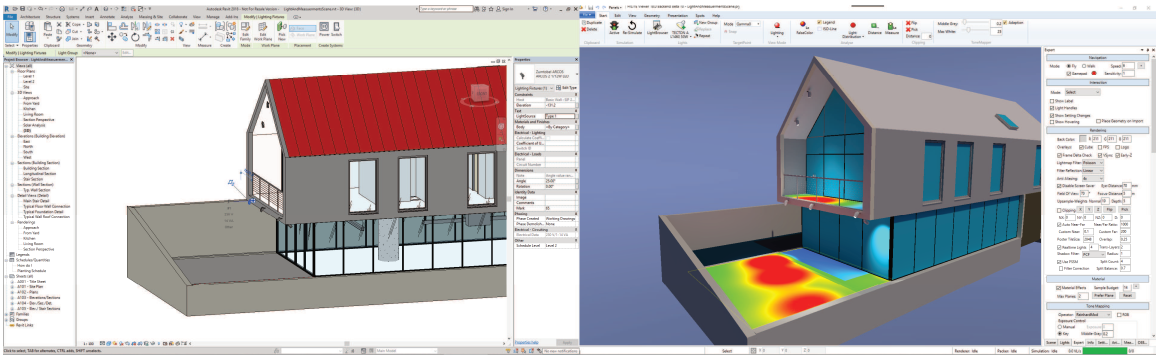

Fig. 7: Side by side comparison of Revit (left) and HILITE (right)

In cooperation with the Austrian Railway Association (ÖBB), we could apply our work flow to a BIM model of a rail station that is currently in the planning phase. Updates to the BIM model are planned on a regular basis, making an automatic, flexible approach a necessity. Figure8 shows the scene with automatically placed measurement surfaces (left), and using a global false color visualization (right).

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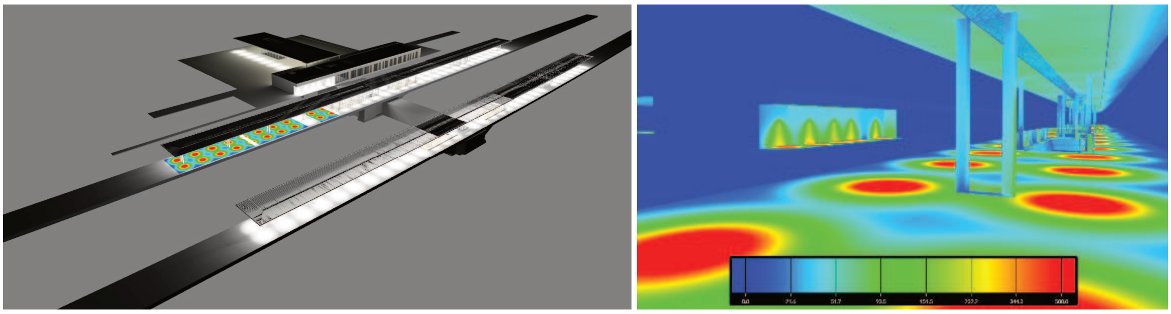

Fig. 8: An early planning stage of a train station: automatically placed measurement areas (left) and false colors (right).

7.1 Limitations

Currently the measurement surface is simply generated on top of an annotated object with a given offset. Intersections with other objects, like a pillar (Figure 9), are currently not excluded from the measurement surface evaluation. Therefore, the current measurement surface generation is limited to open areas.

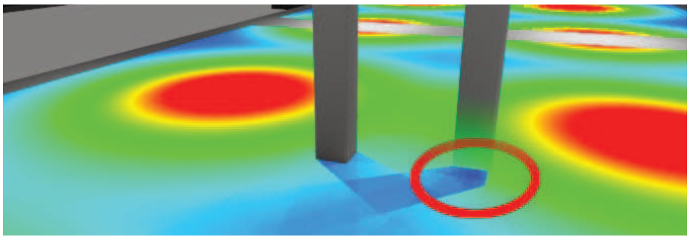

Fig. 9: Visualization of the measurement surface, where the red circle indicates the wrongly includedintersection area (dark blue).

8 CONCLUSION AND FUTURE WORK

We have demonstrated a novel, reproducible and easily extendable approach for the automatic verification of lighting setups planned in BIM environments. We rely on BIM data in the form of IFC files, and enhance them in terms of material description and photometric information in order to generate physically accurate results. Using semantic data, measurement surfaces with constraint set to the sorresponding industry norms are automatically created and evaluated. The approach has proven to be successfully applicable for demo scenes as well as in a large real-world scenario, and acts as a basis for further developments in the direction of a fast validation of light-related aspects in the planning and management phases of buildings.

Apart from properly handling the limitations described in Section 7.1, we plan to further enhance our system in various ways to solve problemsthat are relevant in this domain. For example, even though there has been some research regarding architecture for lighting-control systems[GUILLEMIN, PANDHARIPANDE], or comparisons of lighting setups [SORGER], the optimal placement of luminaires and sensors for such systems has hardly been addressed. We plan to investigate optimization methods for automatic luminaire placement and use BIM data for the verification as presented in this paper. The web-based visual information systems are predestined to develop guidance systems that help a designer with suggestions for further modeling steps.Another important aspect is the thorough verification of further lighting aspects, such as the color rendering index, color temperature, contrast, or to put more focus on view-dependent light effects. In order to find viewing positions and angles that cause problems, we plan to use an agent-based simulation system. This would also allow to investigate issues regarding eye adaption, or other time-related effects.

This brings us closer to Virtual-Reality-based evaluations:Since a human's perception of light is highly dependent on the surrounding lighting conditions, renderings of 3D scenes that are observed on a 2D computer monitor can only give an impression of the effects of a certain lighting setup. By combining our light simulation with a virtual or augmented reality application in future work, we want to provide more immersive possibilities to evaluate lighting conditions in a scene. In comparative studies with real-world situations, we plan collaborative research with psychologists and lighting designers. We also want to investigate the influence of vision impairments on the ability of people to navigate through a building. There, we want to especially focus on the influence of lighting conditions and how they can be adapted to aid people with reduced visual acuity, and will provide means to evaluate current norms, taking visual impairments into account.

In order to follow the BIM philosophy, the availability of the light verification results should not be limited to the lighting tool, but should be accessible via IFC for external verification. We plan to propose methods to integrate the verified aspects in the exported files, and will propose validation methods accordingly.

9 ACKNOWLEDGEMENTS

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10 REFERENCES

XBIM:"eXtensible Building Information Modelling Toolkit",http://docs.xbim.net/. [Accessed 13 01 2018].
CEF: "Chromium Embedded Framework ", https://bitbucket.org/chromiumembedded/cef. [Accessed 13 01 2018].
DAVOODI, A.: Lighting simulation for a more value-driven building design process (PHD Thesis), Lund: Miljöpsykologiska enheten, Institutionen för arkitektur, Lunds tekniska högskola, 2016.
IES: Illuminating Engineering Society, http://www.ies.org. [Accessed 13 02 2017].
EULUMDAT:Light Consult Inc., Berlin, http://www.helios32.com/Eulumdat.htm. [Accessed 13 02 2017].
RELUX: Relux Infromatik AG, http://www.relux.com. [Accessed 13 02 2017].
DIALUX: DIALux GMBH, http://www.dial.de/dialux/. [Accessed 13 02 2017].
AGI32: Lighting Analysts, Inc., http://www.agi32.com. [Accessed 13 02 2017].
GORAL, C. M. et al.: "Modeling the Interaction of Light Between Diffuse Surfaces," SIGGRAPH Comput. Graph., vol. 18, pp. 213-222, 1984.
WARD, G.: "Radiance Renderer", http://radsite.lbl.gov/radiance. [Accessed 13 01 2018].
LUKSCH, C. et. al.: "Fast Light-Map Computation with Virtual Polygon Lights," in I3D 2013, Orlando, Florida, 2013.
LUKSCH, C. et. al.: "Real-Time Rendering of Glossy Materials with Regular Sampling," The Visual Computer, vol. 30, pp. 717-727, 2014.
YAN, W. et al.: "Interfacing BIM with building thermal and daylighting modeling," in BS2013, Chambéry, 2013.
REINHART, C.: "DAYSIM", http://daysim.ning.com/. [Accessed 13 01 2018].
KOTA, S. et al.: "Building Information Modeling (BIM)-based daylighting simulation and analysis," Energy and Buildings, vol. 81, pp. 391-403, 2014.
OCK, J. et al.: "Smart building energy management systems (BEMS) simulation conceptual framework," in Winter Simulation Conference (WSC), Washington, DC, 2016.
GOURLIS, G. et. al.: "Building Information Modelling for analysis of energy efficient industrial buildings–A case study," Renewable and Sustainable Energy Reviews, vol. 68, pp. 953-963, 2017.
LU, Y. et al.: "Building Information Modeling (BIM) for green buildings: A critical review and future directions.," Automation in Construction, vol. 83, pp. 134-148, 2017.
HIGHCHARTS: Highsoft AS, https://www.highcharts.com/. [Accessed 13 01 2018].
GUILLEMIN, A. et. al.: "Innovative lighting controller integrated in a self-adaptive building control system," Energy and Buildings, vol. 33, no. 5, pp. 477-487, 2001.
PANDHARIPANDE, A. et. al.: "Smart indoornlighting systems with luminaire-based sensing: A review of lighting control approaches," Energy and Buildings, vol. 104, pp. 369-377, 2015.
SORGER, J. et. al.: "Litevis: integrated visualization for simulation-based decision support in lighting design," IEEE Vis, vol. 22, pp. 290-299, 2016.

reviewed paper

An Open Multi-user Platform in Support of Urban Development: the DATA WebGIS

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1 ABSTRACT

One of the key features of our times is the availability of a huge amount of digital data regarding any branch of knowledge or human activity, combined with the widespread diffusion of devices connected to the web. Besides, the potential of data mining and processing offered by contemporary ICT is constantly growing.

Turning these capabilities into opportunities and advantages is a challenge involving a lot of research areas.

In the field of urban and territorial studies, free and open access to spatial data is by now a common policy for national and international institutions: an example is the INSPIRE Directive by European Union, which sets a framework for Spatial Data Infrastructures by its member states. As a consequence, georeferenced data and thematic maps concerning cities and their surrounding territory are released for public consultation by administrations and monitoring agencies.

Nevertheless, this proliferation of data is not always accompanied by an improvement of spatial planning quality: in western cities, economic crisis and functional obsolescence can take to decommission or underuse of buildings and compounds, both public and private; at the same time, a circular and environmentally-friendly vision of urban development is still struggling to gain acceptance in practices.

In order to reactivate complex urban or peri-urban areas, traditional planning shall therefore lean on different research fields in a multidisciplinary vision. Proposed scenarios should be sustainable, and take advantage of new ways of thinking and acting bred by the advancement of digital geo-information technologies.

DATA – Developing Abandoned Transurban Areas is a research project financed by European Social Funds, involving Departments of Civil, Environmental and Architectural Engineering and Industrial Engineering of the University of Padova and fitting in the framework described above. It aims to generate pilot transformation scenarios for abandoned areas awaiting regeneration. The chosen sample region is a part of the western periphery of Padova, in the North East of Italy, marked by a mix of rural and built surfaces, infrastructures and partially abandoned building complexes.

One of DATA topics is to collect and process multi-scale data related to the region of interest, for the purpose of releasing them on an open source webGIS platform, thus spreading knowledge outside the academic field and creating interactions with involved urban actors.

Collected data include base city maps, social and environmental information, historical evolution of the studied area, urban development plans. Their processing is developed through an open source workflow, from QGIS software to a GeoNode web platform, and their combination produces integrated information layers and in-depth analysis about the nodes of possible urban transformations.

This paper introduces data and GIS-based analysis feeding the platform, together with its fruition levels: the webGIS in fact addresses to different users' categories, including the research group itself, public and private stakeholders that may be interested in starting new urban projects, active citizens and associations willing to participate in the processes of development. The final goal is to keep the platform working beyond the end of the research project, as a base framework for the futures of the area.

Keywords: urban regeneration, data, WebGIS, INSPIRE, data mining

2 INTRODUCTION

2.1 Spatial data proliferation and GIScience

In XXI century the demand and availability of spatial-based services, initially driven by platforms like Google Earth/Maps, Bing Maps and OpenStreetMap, has become widespread and tens of millions of people access geographic information every day for the most different purposes.

More and more in this context, public administrations, research groups, monitoring agencies and project developers need to communicate, to spread and to share information and results with involved or interested communities. This necessity matches with ubiquity of digital technologies and pervasiveness of the internet as an everyday tool. Already in 2007, the INSPIRE directive by European Union set a framework for Spatial Data Infrastructures (SDI) supporting environmental and territorial policies by its member states, with common implementing rules on metadata, interoperability and network services.[1] A key concept is open data policy, meant to guarantee free availability of data by communities of users.

As a consequence, there is a growing diffusion of web maps, geoportals and webGIS platforms.

While web maps only allow viewing and searching geographic information, geoportals and webGIS offer other services, which may include data analysis, editing and download.

On a back-end level, Geographic Information Systems, or GIS, are a very effective tool for these purposes, because of their capacity to connect multi-scale spatial representations with tabular attributes. It means that the user of a GIS is able to realize maps with different spatial extents and to add any kind of information related to the regions of interest.

GIS-based operations don't only consist in collecting and querying data, but include density mapping of phenomena, surveying conflicts related to the impact of human activities and, detecting most suitable areas to host some functions. GIS are therefore very useful working tools for studies and activities with a remarkable spatial and relational component.

Compared to a desktop GIS software, a webGIS is released on the web and therefore accessible for online users. It has the disadvantage to allow limited processing and editing options, but the advantage to enable viewing, querying and downloading geographic data and other contents to a multiplicity of users.[2]

2.2 GIS and WebGIS in territorial and urban planning

In the field of territorial development and management, in order to provide valid, effective outputs, a solid supporting profile is more and more needed, to combine and process data with the aim to evaluate consequences of planned transformations

In urban planning and design, and especially when dealing with regeneration of peripheral and peri-urban areas, a webGIS can have multiple uses, in relation with users' communities and data categories:

- for the members of the working or research group, it is a platform for data exchange, testing and delivering results obtained;
- for stakeholders and potential investors, it gives the opportunity to access information and indications oriented to design transformation scenarios and to define guidelines and action strategies;
- for engaged or interested citizens, it stands as an open and user-friendly information and analysis repository, fostering critical awareness about the present and future of changing urban areas.

Examples in literature[3] or in practices show two major types of using webGIS: a) to spread and enquire base data, as for example in public administrations' geoportals; and b) for targeted processing and representations, linked to specific city management projects or research programmes. The latter kind is more interesting as a reference model for studying urban themes, but usually in these cases webGIS are online just till the end of the mother project, or they are only accessible by inner users.

[1] The text of the directive is available at http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=OJ:L:2007:108:TOC
[2] Veenendal, 2016; De Iaco et al., 2014.
[3] Manzke et al., 2016; Abdelhalim et al., 2016; Scanu et al., 2013

3 THE DATA PROJECT: LOCATION AND PILOT ACTIONS

3.1 Research framework

DATA – Developing Abandoned Transurban Areas involves Department of Civil, Environmental and Architectural Engineering and Department of Industrial Engineering of University of Padova. It is a research project funded by Veneto Region through European Social Funds, lasting one year.

The project has the goal to design pilot transformation scenarios for transurban areas awaiting regeneration. The last decades in evolution of Western cities, especially in Italy, have been marked by growth, often poorly planned, of urban territories. Along the fringes between settled city and surrounding countryside, that led to sprawling suburbs and proliferation of junk spaces and infrastructures, while relocation or closing of industrial, commercial or public service activities spawned lots of decommissioned or underused sites.

Such phenomena, which are still ongoing, also have environmental costs in terms of soil consumption and sealing: soil is now considered a hardly renewable resource[4], so future urban development should lean on transformations of existing spaces rather than further expansion. This raises issues about reuse of neglected buildings or places and reactivation of functions and social activities in challenging urban environments.

These processes can be regarded as systemic in contemporary dynamics of city borders. In order to understand their inner working it is possible to locate sample areas fitting the described spatial settings. Then, procedures to collect and select and analyse data can be tested, and pilot design scenarios connecting different scales can be developed.

3.2 Location of case study

he case study chosen for DATA is located in West Padova, one of the municipalities with the highest level of soil consumption in Italy. Here, beyond the tracks of Padova-Bologna railway and the neighbouring ring road, a sparse urban fabric stretches, structured along two penetration axes. A canal marks the western physical border and municipality boundary. This city part features a mix of buildings and crops and some big decommissioned and a former mental hospital, now a health complex.

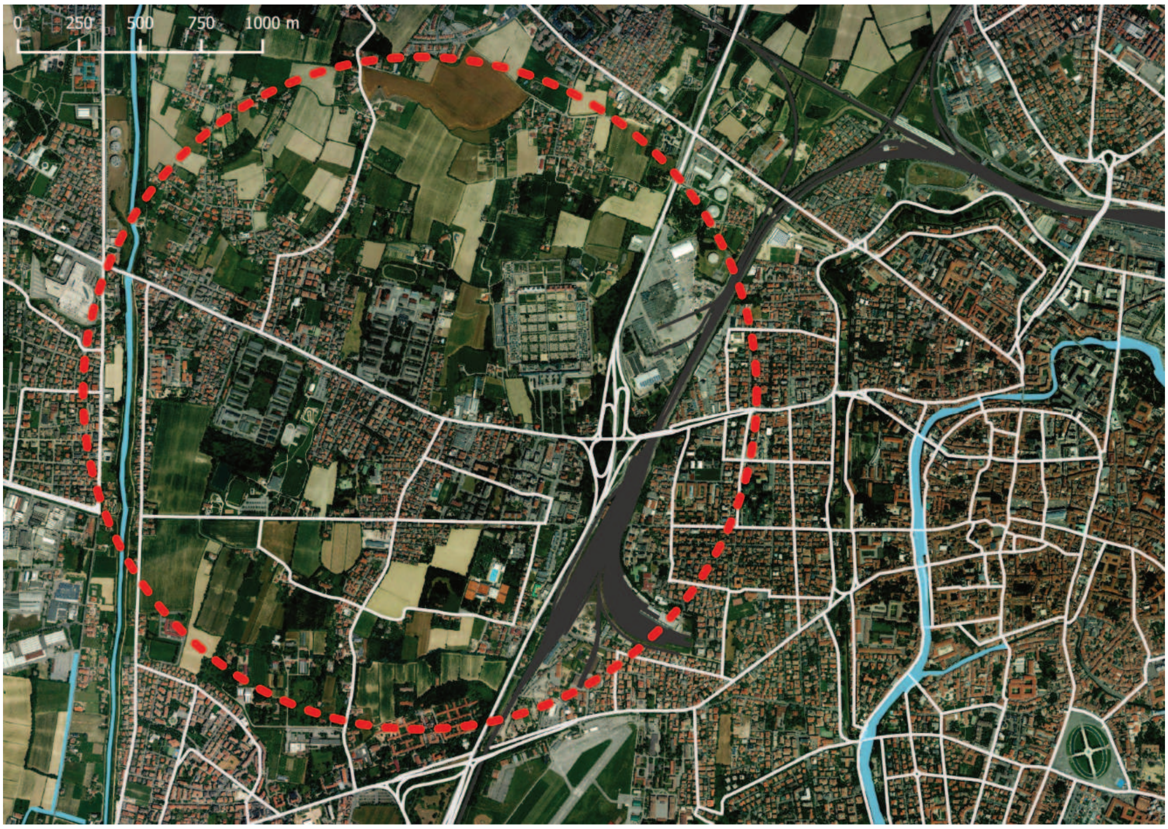

Fig. 1: Location of the area of interest in Padova. Transport infrastructures and streams are shown.

[4] Pileri, 2015.

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This zone serves as a good example for issues and potential of peri-urban environments, because of the presence of transport infrastructures, sites now underused and agricultural softscape which could be the core of sustainable urban regeneration.

3.3 Planned actions

DATA project aims to combine and mash up different skills. It is in fact organized in six topics:

- WebGIS and data mining;
- Building and Land Information Modeling;
- Pilot scenarios Design;
- Urban planning and feasibility studies;
- Urban mining;
- Data management and ICT.

One of the target is mutual exchange and update between academic field and companies on the territory, in a contemporary context where urban and territorial planning experiments the collaboration between environment studies and informatics, while public participation processes or public-private partnerships try to activate worthwhile changes.

The first stage of the project, still ongoing, has been dedicated to define targets in detail, to find and discuss analysis methods and to set interactions between involved research fields.

An early masterplan has been realized, showing transformation concepts for the study area: opening to the city the big architectural systems; connecting areas now fragmented by infrastructures; bringing the green to the foreground.

The concept of pilot scenarios means that analysis developed and actions planned for the chosen peri-urban environment may be replicated in other urban regions, in Padova or elsewhere, which show similar features.

4 BUILDING THE WEBGIS: MATERIALS, METHODS AND RESULTS

4.1 Data mining

As we claimed before, one of the key functions of a GIS is the connection between information and graphical representation. This is even more important when dealing with drawing-based disciplines like urban planning and architectural design. For this reason, an exhaustive collection of data is needed to build a common playground.

Within DATA, collected data are structured into categories to support information exchange between involved people and fields. Such categories are:

- Selected historical maps (starting from 1784) and aerial photos (starting from 1954) depicting Padova and in particular its west side, to show the evolution of the study area;
- Orthophotos representing the city in detail;
- Census data. They give information about population density, age and conservation state buildings and relevant social indexes like youth population and work mobility;
- Environmental data, taken from geoportals of public administrations or monitoring agencies. They include soil permeability, stream network, plant location and help evaluating the impact of planned actions. They also support urban mining practices;
- Land use/land cover map;
- Urban development plans concerning the areas of interest, especially the Territorial Management Plan and the Intervention Plan of Padova Municipality. They stand as a reference framework for the production of regeneration scenarios;
- Maps and data specifically concerning the built environment. They allow the exchange of information between GIS, used for urban and territorial analysis, and BIM, more suitable for architectural 3D models.

Collected data are multi-scale and multidisciplinary, as their extent goes from regional transport networks to local features of the sample area.

4.2 GIS-based analysis

The DATA project aims to generate effective, easily available tools to detect most suitable areas for transformations and to assess the consequences of alternative planned actions. Therefore, base data are combined in GIS environment, in order to build up information tables useful to understand local contexts. According to the principles of developing replicable methods, this operation is made at municipality scale.

For example, intersecting farmland category from land cover map and the Intervention Plan for Padova, a map of farmlands to be transformed was obtained. Some of them should undergo residential or service development, other will be turned into parks and gardens.

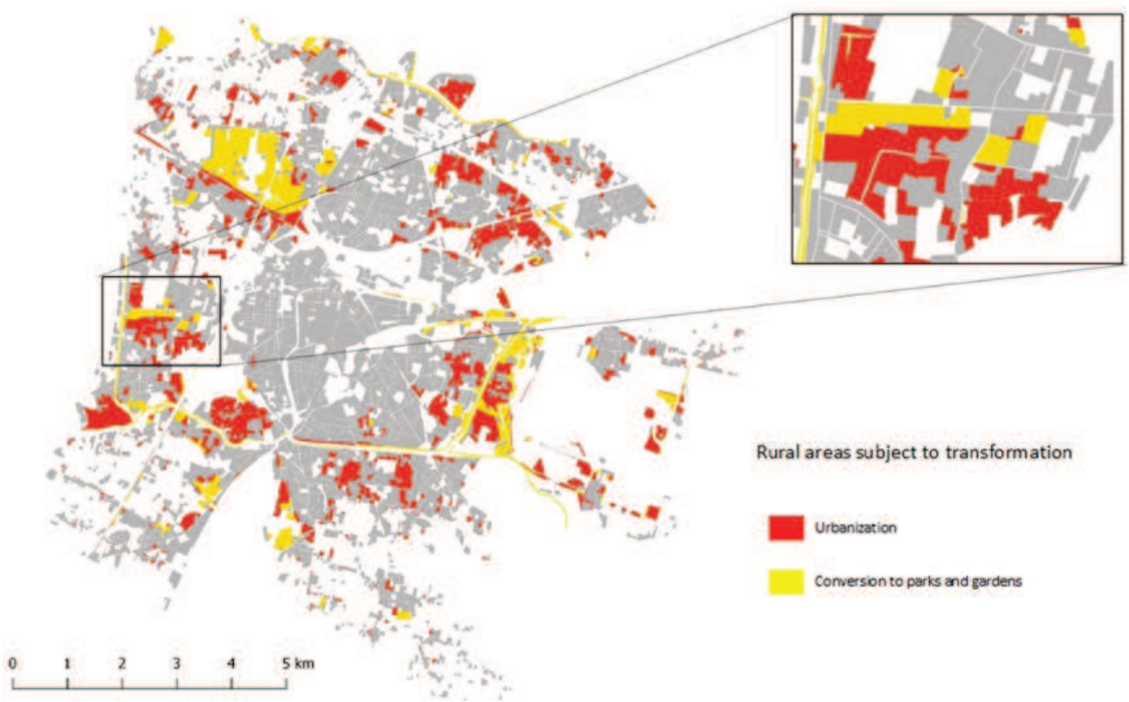

Fig. 2: Map of Padova agricultural areas subject to transformation, with a focus on DATA pilot area.

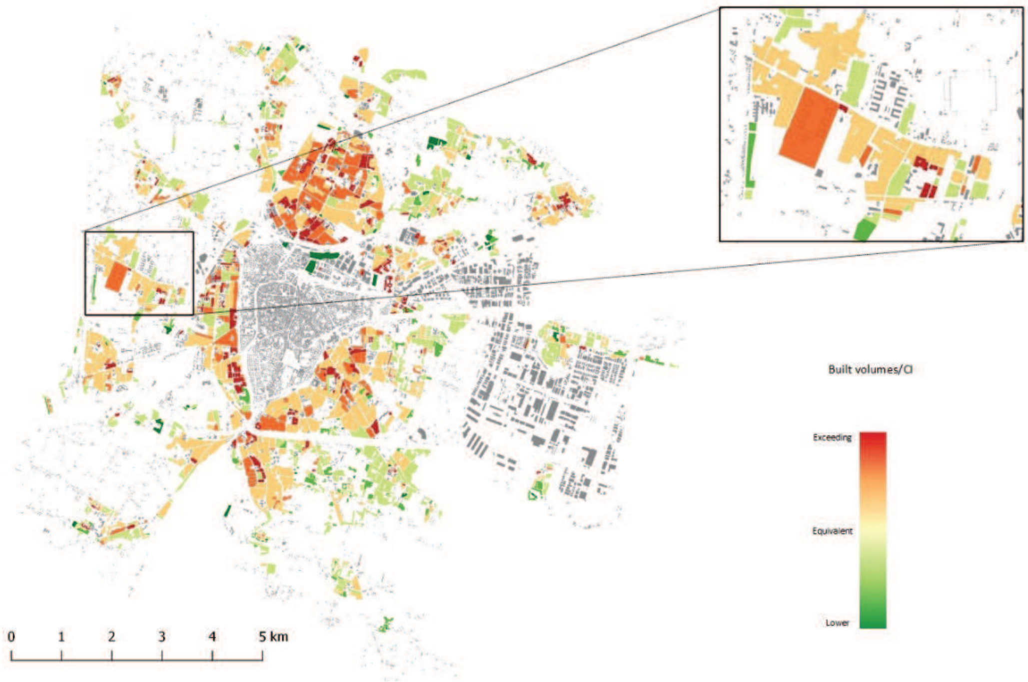

Fig. 3: Density map of Padova built volumes in relation with construction indexes, with a focus on DATA pilot area.

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This map can serve as a monitoring tool for soil consumption or support green design actions.

Another GIS processing performed is adding parameters from the Intervention Plan to the map of Padova buildings. By combining data, the relationship between built volumes and construction indexes was mapped.

The second map shows areas where such volumes are exceeding or lower than allowed thresholds. This could give indications about city evolution and sites where it is still possible to build.

In the upcoming phases of the project, feasibility studies and design scenarios will be developed starting from data collected and analysis performed.

Furthermore, data concerning buildings have been put together to test interoperability between GIS and BIM, thus feeding a 3D city model provided with significant information.

4.3 WebGIS implementation

In the field of urban regeneration studies and operations, moving from research to interaction with territorial entities requires sharing tools and results with involved actors, as a starting point for further actions.

DATA intends to spread information and materials produced within the project, taking into account different modes of reception and use of released data by platform users.

The products of research work and all the other documents that may help understanding addressed subjects and places are published on the open source webGIS platform GeoNode. It is an application for spatial data dissemination based on Django as Python web development framework and PostgreSQL-PostGIS as spatial DBMS. The platform allows to manage documents as texts and images, accompanied by metadata according to ISO standards. On GeoNode, one can publish single layers processed and stylized by GIS software, and overlap them to form thematic maps.[5]

Fruition by users' groups can be organized through different access permissions: from view-only to downloading and even editing options. Released data are gathered into categories, and their attribute table is displayed by clicking on features. To help searches by keywords, tags can be added to published layers.

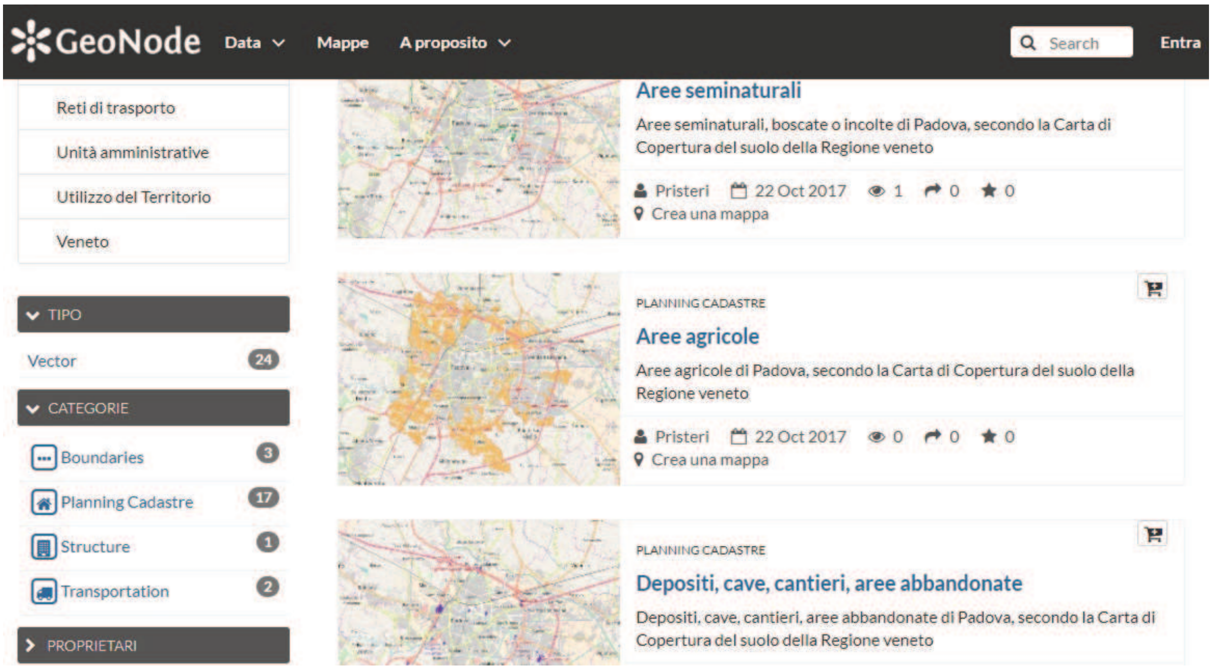

Fig. 4: Visual interface of the DATA GeoNode platform.

For the moment, there are three fruition levels, each one corresponding to an access permission:

- first or inner level gathers data that are not available for external users. Anyway, they can be viewed, downloaded and edited by the research group, whose members uses the platform for exchanging and updating materials during the working process. These data represent intermediate steps of processing;

[5] Regarding the use of GeoNode as an urban data repository, see for example Steiniger et al., 2017.

- second level is made by data that anyone can view, but only the research group can download and edit. It includes the results of operations performed on base data during the project and some public interest data subject to publishing restrictions, like the elements of the Intervention Plan by Padova Municipality;
- third level includes data that anyone can view and download, but only the research group can edit, such as data coming from open access public geoportals. However, they can be edited and stylized to fit the project's themes and purposes.

Besides, the platform addresses to different kinds of users. First of all, the research group itself, as an inner project management system. Then, stakeholders: in this case they are public administrators, with the task to direct urban development, land owners, local associations and companies, investors interested in ground-breaking urban projects. They can have access to thematic information maps at a urban scale, and to test design scenarios at a local scale (West Padova transurban area). Finally, a crowd of scholars and engaged or simply curious citizens, who can freely explore the functions offered.

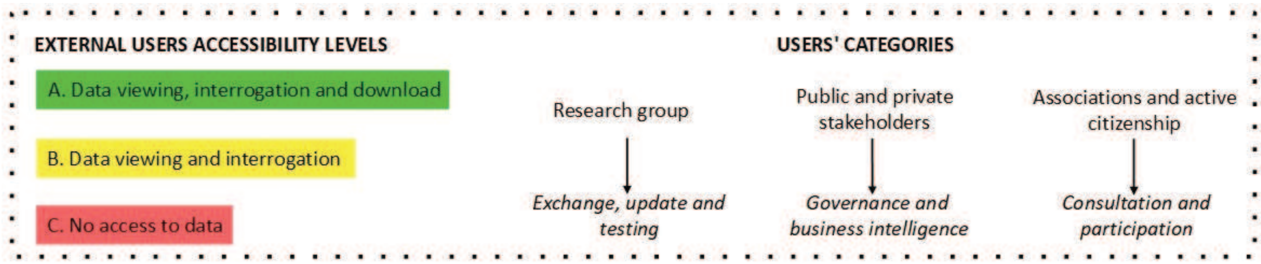

Fig. 5: Layout of the platform's fruition levels.

Of course, the listed categories could actually combine one another, and unexpected ways of fruition could arise during the platform's life cycle.

5 CONCLUSION

At this development stage, the webGIS platform is still in progress and hosts base data listed above and results of the work performed on data related to buildings, land cover and urban development plans. With the advancement of the project, further data and analysis will be added, to support feasibility studies and global impact assessment of planned changes. Design scenarios will be represented as map layers, too.

As soon as an exhaustive dataset is set, the GeoNode platform, which is now used by the research group, will be released to public. Once launched, the platform will be updated when necessary and provided with new layers, maps and documents. At the end of DATA activities, the webGIS and its contents will show the final results of the project. However, since some expected products cannot be displayed as data layers, a more complete online management and communication system should be implemented.

After DATA deadline, the aim is to turn the webGIS into an independent tool supporting future transformations. Then, update and maintenance plans will be set, trying to trigger social energies and institutional processes to keep the platform in operation and to go on developing it.

Apart from possible achievements in terms of urban regeneration, anyway, this process will fulfil its tasks if, by means of digital technologies, it fosters the advancement of shared knowledge about urban dynamics and gives to communities new focuses and points of view on some neglected city areas.

6 REFERENCES

ABDELHALIM, B., DRIDI, H., KALLA, M.: Application of Webgis in the development of interactive interface for urban management in Batna City. In: Journal of Engineering and Technology Research, vol. 8 n. 2, pp. 16-20. 2016.

BORRUSO, G.:Cartografia e informazionegeografica “2.0 e oltre”, webmapping, webgis. Un'introduzione. In:Bollettino AIC n. 147/2013, pp. 7-15. 2013.

BROVELLI, M.A., FAHL, F.C., MINGHINI, M., MOLINARI, M.E.: Land use and land cover maps of Europe: a webGIS platform. In: The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences, vol. XLI-B4 – XXIII ISPRS Congress, Prague, pp. 913-917. 2016.

CARTA, M.: Reimagining Urbanism, List Lab, Trento. 2014.

CASTI, E., (ed.):Areedismesse e obsolete in Lombardia, Rapporto I fase di ricerca del progettoRifo/It. Rigenerazioneurbana e restituzione del suolo, DiathesisLab, UniversitàdegliStudi di Bergamo. 2014.

CETRARO, F.: GIS e WebGIS a confronto. Cartografiaapplicataaisistemiinformativiterritoriali, EPC, Roma. 2011.

COLUCCI, A.: The potential of periurban areas for the resilience of metropolitan region. In:TeMA. Journal of Land Use Mobility and Environment, ECCA Conference, Copenhagen special issue, pp. 103-122. 2015.
DE IACO, S., DISTEFANO, V., PALMA, M., POSA, D.: GIS e WebGIS: elementi e applicazioni, Giappichelli, Torino. 2014.
DI GIACOMO, T. V.: Interactivity of WebGIS for the simulation of land development. In:TemA. Journal of Land Use Mobility and Environment vol. 8 n.1, pp. 69-81. 2015.
GARAU, C.:Processi di piano e partecipazione, Gangemi, Roma. 2013.
GRECEA, C., HERBAN, S., VILCEANU, C.:WebGIS solution for urban planning strategies. In: Procedia Engineering, vol. 161, pp. 1625-1630. 2016.
LEGGIERI, E., LORET, E.:Telerilevamento e GIS per la riqualificazionedegliinsediamentiindustrialidismessi. In: Attidella XVIII Conferenza Nazionale ASITA, Firenze, pp. 727-734. 2014.
MANZKE, N., KADA, M., KASTLER, T., SHAOJUAN, X., DE LANGE, N., EHLERS, M.: The URBIS project: identification and characterization of potential urban development areas as a web-based service. In: The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences, vol. XLI-B4 – XXIII ISPRS Congress, Praga, pp. 227-233. 2016.
PILERI, P.: Che cosac'è sotto. Il suolo, isuoisegreti, le ragioni per difenderlo, Altreconomia, Milano. 2015.
PRESCIA, R., TRAPANI, F.: eds., Rigenerazioneurbana, innovazionesociale e cultura del progetto, FrancoAngeli, Milano. 2016.
PRISTERI, G., PAPPALARDO, S., CODATO, D., GIANOLI, F., DE MARCHI, M.: Un webGIS per la conoscenza di areetransurbane a Padova. In:UrbanisticaInformazioni vol. 272 Special Issue: 10° INU Study Day, pp. 595-600. 2017.
STEINIGER, S., DE LA FUENTE, H., FUENTES, C., BARTON, J., MUÑOZ, J-C.: Building a geographic data repository for urban research with free software – learning from Observatorio.CEDEUS.cl. In: The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences, Volume XLII-4/W2 – FOSS4G-Europe 2017, Marne La Vallée, pp. 147-153. 2017.
VANDENSCHRINK, G., MICHA, L.:BruGIS, a webGIS for Brussels urban planning: past, present and future. In: Geomatic Workbooks n. 12 – FOSS4G Europe, Como, pp. 527-528. 2015.
VEENENDAL, B.: Eras of web mapping development: past, present and future. In: The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences, vol. XLI-B4 – XXIII ISPRS Congress, Praga, pp. 247-252. 2016.

7 REFERENCE SITES

http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=OJ:L:2007:108:TOC
http://secondarycities.geonode.state.gov/
http://www.mybrugis.irisnet.be/MyBruGIS/brugis
http://www.turas-cities.org/
http://www.ict-urbis.eu/
http://datos.cedeus.cl/
http://www.isprambiente.gov.it/it

🏆 *reviewed paper*

Angsträume und Stressempfinden im urbanen Kontext

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1 ABSTRACT

Die vorliegende Veröffentlichung befasst sich mit der Fragestellung, wie Angsträume im urbanen Raum wahrgenommen werden können und ob diese quantifizierbar bzw. raumzeitlich lokalisierbar sind.

Diese subjektiven Eindrücke sind in Bezug auf die Gestaltung von Städten sehr bedeutend, werden allerdings aufgrund fehlender Aufnahmemethodik in der Planung vielfach noch nicht berücksichtigt, da ein quantifizierbares Instrument fehlt. Bislang wurde sich diesem Thema primär mit Hilfe von Fragebogenerhebungen genähert, welche ausschließlich die individuelle subjektive Wahrnehmung der Teilnehmerin bzw. des Teilnehmers wiedergibt. Ein wesentlicher Baustein dieses Papers ist somit die Frage, ob Angsträume quantifizierbar, raumzeitlich lokalisierbar und die damit zusammenhängenden Emotionen messbar sind.

Was zeichnet einen Angstraum aus? Nach Schmidt „beschleunigen [Angsträume] unseren Puls und Schritt“ (Schmidt 2015) und lösen negative Gefühle aus. Eine der wenigen existierenden Definitionen, die auch im raumplanerischen Kontext verwendet werden kann, ist von Hiller. Dieser beschreibt den Angstraum als „einen öffentlichen (oder halböffentlichen) Ort, an dem Menschen Angst haben, Opfer von Kriminalität zu werden“ (Hiller 2010: 2).

Am Beispiel von Dortmund-Dorstfeld wird der Frage nachgegangen, ob raumbezogener Stress messbar und somit objektivierbar ist. Gibt es Unterschiede zwischen subjektivem Stressempfinden und durch Sensorik gemessenen Stress? Sind mithilfe dieser Methoden Angsträume zu lokalisieren? Und schlussendlich auch die Frage, ob es Wahrnehmungsunterschiede zwischen den Geschlechtern gibt.

Grundlage für diesen Beitrag ist die Forschungsarbeit „Sind Emotionen messbar? – Angsträume und Stressempfinden im urbanen Raum am Beispiel der Stadt Dortmund“ (Schlosser 2017).

Keywords: Urban Emotions, Sicherheit, Infrastrukturplanung, Stadtgestaltung, Angstraum

2 EINLEITUNG

Die Frage Sind Emotionen messbar? ist der wesentliche Stein des Anstoßes für die nachfolgende Auseinandersetzung mit Emotionen in Bezug auf die Raum- sowie Stadtplanung. Obwohl „Emotionen […] ein grundlegender Bestandteil unseres menschlichen Wesens“ (Wengel 2017) sind, spielten sie für die Raum- und Stadtplanung bislang nur eine „indirekte Rolle“ (Wilhelm et al. 2015: 261). Dabei sind Emotionen gerade in Bezug auf die Gestaltung von Städten von entscheidender Bedeutung, da der Mensch sein räumliches Umfeld fortwährend wahrnimmt, welches wiederum einen grundsätzlichen Einfluss auf seinen Gemütszustand und damit auch auf seinen gesundheitlichen Zustand nimmt (vgl. ebd.). Ein wesentlicher Baustein der vorliegenden Arbeit beschäftigt sich demnach mit der Frage, ob diese Wirkung quantifizierbar und raumzeitlich lokalisierbar ist und Emotionen schlussendlich auch messbar sind. Das Anwendungsgebiet hierfür bietet das Thema der Angsträume.

„Angsträume in Städten beschleunigen unseren Puls und Schritt“ (Schmidt 2015) und können dabei negative Gefühle wie Angst oder Stress auslösen. Die Schwierigkeit, sich diesem Thema zu nähern, liegt vor allem darin, dass es sich hierbei um höchst subjektive Gefühle handelt, denn ein Angstraum meint „einen öffentlichen (oder halböffentlichen) Ort, an dem Menschen Angst haben, Opfer von Kriminalität zu werden“ (Hiller 2010: 2). Somit ist dies kein leicht zu quantifizierender Wert wie beispielsweise die Kriminalitätsrate in einer Stadt oder einem Stadtteil. Um dennoch eine Quantifizierung sowie Lokalisierung zu ermöglichen, wurde in der vorliegenden Forschungsarbeit ein sogenanntes EmoMapping durchgeführt (vgl. Zeile et al. 2013). Im Mittelpunkt der Studie standen die Fragestellungen nach der Methodik der Stressmessung sowie der planerische Umgang mit den identifizierten Angsträumen:

- Lässt sich raumbezogener Stress vermessen und so objektivierbar machen?
- Gibt es Unterschiede zwischen subjektivem Stressempfinden und objektiver Stressmessung?

- Lassen sich städtische Orte ausmachen, die ein Großteil aller Probandinnen und Probanden als Angsträume wahrnimmt?
- Gibt es Wahrnehmungsunterschiede hinsichtlich der Angsträume zwischen den Geschlechtern?

In diesem Zusammenhang werden mögliche Unterschiede innerhalb der Gruppe der Probandinnen und Probanden herausgefiltert, welche im positiven Fall weitere Erkenntnisse über die ausgewählten Angsträume liefern und auch den Umgang mit den Ergebnissen beeinflussen, so beispielsweise mithilfe geschlechtsspezifischer Maßnahmen. Bei der Durchführung der Studie wurde also eine Methode entwickelt, die sich dem Thema der Angsträume nähert und im Rahmen dieser Untersuchung auf ihren Nutzen sowie ihre Sinnhaftigkeit hin kritisch betrachtet wurde.

3 STAND DER FORSCHUNG

3.1 Angsträume

Angsträume sind der zentrale inhaltliche Untersuchungsgegenstand der vorliegenden Forschungsarbeit. Da dieser Begriff unterschiedlichste Assoziationen weckt und Definitionen beherbergen kann, bedarf er einer klaren Abgrenzung. Grundsätzlich handelt es sich hierbei um eine Thematik, bei der das „subjektive Sicherheitsempfinden, die ‚gefühlte' Sicherheit" (Hiller 2010: 1) von großer Bedeutung ist und nicht nur der tatsächliche Zustand der Kriminalitätsbelastung, allgemeiner auch der öffentlichen Sicherheit einer Stadt (vgl. ebd.). Der Auslöser für die Wahrnehmung von Bereichen als Angsträume kann hierbei allerdings variieren. So ist es unter anderem möglich, dass extremistische Gruppierungen das persönliche Sicherheitsempfinden beeinträchtigen (vgl. Pahle-Franzen 2011: 4). Angsträume können also beispielsweise durch „objektiv oder subjektiv wahrgenommene Rechts- oder Ausländerextremisten" (ebd.: 5) entstehen. Es reicht zum Teil schon die schiere „Präsenz einer provokativ auftretenden, als extremistisch wahrgenommenen Gruppe" (ebd.: 181), um sich unwohl und einem Risiko ausgesetzt zu fühlen. In Folge dessen werden diese Orte sukzessive gemieden (vgl. ebd.). Neben dem Begriff der Angsträume gibt es noch den der No-Go-Areas, wobei die Abgrenzung zwischen den Begrifflichkeiten schwierig ist und je nach Verständnis auch unterschiedlich ausgelegt wird. Teilweise werden die Begriffe auch (fälschlicherweise) synonym verwendet (vgl. dazu Sträter 2016, Pahle-Franzen 2011: 76, Korfmann 2017 und Reisener & Schwerdtfeger 2017).

Angsträume, wie sie für die vorliegende Studie verwendet und definiert werden, sind nicht auf spezielle extremistische Gruppierungen oder territorial geprägte No-Go-Areas zurückzuführen, sondern bezeichnen „einen öffentlichen (oder halböffentlichen) Ort, an dem Menschen Angst haben, Opfer von Kriminalität zu werden" (Hiller 2010: 2). Es geht also nicht um die tatsächliche Kriminalität vor Ort, sondern um die Angst, potenziell ein Opfer von Kriminalität werden zu können. Diese persönliche Wahrnehmung manifestiert sich zu einem Angstraum, „wenn sich die Menschen in diesem Raum nicht mehr wohl und sicher fühlen. Das subjektive Sicherheitsgefühl ist dann so stark beeinträchtigt, dass die Menschen ihre Lebensgewohnheiten ändern und diesen Raum meiden" (ebd.). Hierbei kann es sich beispielsweise um kleine Bereiche wie Unterführungen oder Grünanlagen handeln (vgl. Bartholomä 1990: 40f.). Die Ausprägung von Angsträumen – genauer gesagt das subjektive Sicherheitsempfinden und die Angst vor Kriminalität – ist also abhängig von der Gestaltung sowie der „Qualität des öffentlichen Raums" (Hiller 2010: 3).

3.2 Beteiligungsverfahren

Heute wird die „Beteiligung der Betroffenen an Planungs- und Entscheidungsprozessen […] als Notwendigkeit weitgehend anerkannt" (Fürst und Scholles 2008: 171). Beteiligungsprozesse können in unterschiedlichsten Bereichen, aber auch auf den verschiedensten Entscheidungsebenen angewandt werden (vgl. Partizipation & nachhaltige Entwicklung in Europa 2017a). Unterschieden wird dabei in die formelle und informelle Beteiligung (vgl. ebd.). Aber auch die Methodenwahl selbst ist von Bedeutung, da sie beeinflusst, in welchem Maße die im Zuge eines Beteiligungsverfahrens geäußerten Interessen einfließen können (vgl. ebd.). Darüber hinaus ist die „Bereitschaft der EntscheidungsträgerInnen aus Politik, Verwaltung und Wirtschaft" (ebd.) ein großer Einflussfaktor, der bestimmt, „inwieweit sie die Ideen anderer AkteurInnengruppen in Planung und Entscheidung berücksichtigen wollen" (ebd.).

Informelle Beteiligungsverfahren, wie z. B. die Anwendung eines EmoMapping, sind dagegen anders organisiert und können anlassbezogen eine unterschiedliche Gestaltung aufweisen (vgl. Partizipation &

nachhaltige Entwicklung in Europa 2017b). Diese Verfahren „basieren auf Freiwilligkeit und dem Prinzip der gemeinsamen Aufgabenbearbeitung“ (ebd.). Wie genau dies stattfindet, „wird im Vorfeld festgelegt oder von den Mitwirkenden selbst bestimmt“ (ebd.). So werden unter anderem die Fragen, „[w]er sich beteiligt, wie gearbeitet wird, welche Methoden zum Einsatz kommen und welche Spielregeln dabei gelten“ (ebd.) selbstständig geklärt. Die erarbeiteten Ergebnisse sind dabei meist weniger verbindlich, als vielmehr eine Empfehlung (vgl. ebd.). Dabei „dienen [sie] der Entscheidungsvorbereitung für Gremien wie den Gemeinderat, können aber – z. B. durch einen Gemeinderatsbeschluss – Verbindlichkeit erlangen“ (ebd.).

Solche Formate erhöhen „Vertrauen durch umfassende Transparenz“ (ebd.). Die eigene Teilnahme an dem Planungsprozess kann zudem dazu führen, dass die Bürgerin bzw. der Bürger eher mit dem Ergebnis zufrieden ist (vgl. Partizipation & nachhaltige Entwicklung in Europa 2017c). Darüber hinaus sind die erarbeiteten Ergebnisse aus einem Beteiligungsverfahren häufig länger konsistent und werden stärker akzeptiert (vgl. ebd.).

Besonders schwierig wird die Umsetzung partizipativer Ansätze, wenn „[d]as früher vorherrschende und auch heute noch anzutreffende [Planerinnen- und] Planerselbstverständnis“ (Fürst und Scholles 2008: 163) eine sehr antiquierte Haltung gegenüber Partizipation hat. So ist ein Hauptargument dieser Haltung, dass andauernde Diskussionen über nebensächliche Aspekte geführt werden, aber auch der Mangel von Betroffenen an Verfahrenskenntnissen wird moniert (vgl. ebd.: 164). Erfolgreiche Teilhabe muss dementsprechend niederschwellig organisiert sein, wobei zu beachten ist, „dass Partizipation nicht Selbstzweck ist und auch nicht das verwaltungsrechtliche Entscheidungsverfahren ersetzen, sondern Mittel und Bestandteil eines Verfahrens sein soll“ (ebd.). Unabhängig von der freiwilligen Integration informeller Planungs- und Beteiligungsprozesse ist immer wieder darauf hinzuweisen, dass die Verantwortung für eine Planung trotzdem bei den Legitimierten, sprich Politikerinnen und Politikern, bleibt. Abwägung und Entscheidung sind Verwaltungsakte. So steht nicht primär die allgemeine Zufriedenheit oder ein „‚Wohlfühleffekt‘ von Prozessen“ (ebd.) im Mittelpunkt des Beteiligungsprozesses, sondern das stetige Bemühen, „allseits zufriedenstellende Lösungen“ (ebd.) zu finden. Partizipation kann generell nur funktionieren, wenn sie von Ehrlichkeit und Offenheit geprägt ist und die primären Vorentscheidungen nicht bereits vor der Beteiligung getroffen wurden (vgl. ebd.).

3.3 Emotionen in der Raumplanung

Emotionen sind ein allgegenwärtiger und „grundlegender Bestandteil unseres menschlichen Wesens“ (Wengel 2017). Unser Alltag ist durch Emotionen geprägt, „denn wir bewerten meist unbewusst jede Situation mithilfe unserer Gefühle“ (ebd.). Daher sind Emotionen auch für die Raum- und Stadtplanung relevant, für die sie zwar „eine wichtige, aber bisher noch indirekte Rolle“ (Wilhelm et al. 2015: 261) spielen. Aus Sicht der Wissenschaft ist es immer noch schwer, Emotionen zu definieren. Bis heute sind es lediglich „Arbeitsdefinitionen – eher vergleichbar mit einer Phänomenbeschreibung“ (Wengel 2017) und keine Definitionen im klassischen Sinne (vgl. ebd.).

Die für die vorliegende Thematik wesentliche Emotion Angst ist nicht nur ein zentraler und völlig normaler Bestandteil des Lebens, es handelt sich hierbei um „eine primäre Emotion […] wie Freude, Trauer, Furcht, Wut, Überraschung und Ekel“ (Morschitzky 2009: 1). Auch wenn sie einen zentralen und normalen Aspekt im mensch¬lichen Leben darstellt, ist es unangenehm, Angst zu empfinden. Doch Angst ist sinnvoll und lebensnotwendig, besonders als Reaktion auf reale oder imaginäre Gefahrensituationen und Bedrohungen, denn sie ermöglicht es, „sich so zu verhalten, dass Gefahren überwunden oder vermieden werden können“ (ebd.). Handelt es sich nicht um eher intellektuelle Sorgen ohne körperliche Symptome, so wird die reale Angst – oder Angststörung – von biologischen Reaktionen begleitet: „Herzklopfen, Atemnot, feuchte Hände, blasses Gesicht, Muskelzittern oder weiche Knie“ (ebd.) sind hier mögliche Ausprägungen. Angst stellt somit eine zwar unangenehme, aber auch sinnvolle und sichtbare bzw. spürbare Emotion des menschlichen Körpers dar (vgl. ebd.).

Angst wird nicht nur von körperlich erlebbaren Symptomen begleitet, die Angst selbst kann ein Symptom sein, besonders für Stress. Hierbei ist es nicht der Stress für sich genommen, der Menschen zu schaffen und sogar krank macht, es ist die Befürchtung, den Stress nicht kontrollieren zu können. Wichtig hierbei ist, dass Stress zwar etwas allgemein Bekanntes ist – jeder kennt Stress und hat schon einmal Stress erlebt –, jedoch ist die Reak¬tion darauf eine ganz individuelle. In der Folge kann es unter anderem zu „Herz-Kreislauf-Probleme[n], Atembeschwerden, Magen-Darm-Beschwerden, Kopf- und Rückenschmerzen,

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Schlafstörungen, Alkoholmissbrauch“ (Morschitzky 2009: 13) kommen. Kulminiert, kann Stress zu Panik¬attacken führen, die als Ventil für die angestauten Ängste und Probleme fungieren (vgl. ebd.).

Emotionen sind auch für die Raumplanung von großer Bedeutung, besonders in den Bereichen der Raum- und Humansensorik. Durch Entwicklungen im Bereich der Raumsensorik „oder auch People Centric Urban Sensing“ (Campbell et al. 2006) in Kombination mit biostatistischen Methoden (Nold 2008, Zeile et al. 2009) ist es möglich, „neue Erkenntnisse und Perspektiven für die Raumplanung – oder im Speziellen auch für die Stadtplanung – zu gewinnen“ (Wilhelm et al. 2015: 262) und neue Ansätze zur Informationsgewinnung zu schaffen. Wesentlicher Vorteil des heutigen technologischen Standards ist die Möglichkeit, urbane Daten und Informationen sammeln und diese beinahe in Echtzeit verarbeiten zu können (vgl. Zeile et al. 2013: 1f.). Neben der Nutzung spezifischer technischer Sensoren steht im Bereich der Raumsensorik vor allem auch der Mensch im Vordergrund (vgl. ebd.: 2). Dieser ist ein „aktiver Sensor“ (ebd.), der zusammen „mit den Sensoren des Smartphones […] ein neues System aus intelligenten und smarten Sensoren“ (ebd.) bildet. Menschliche Sensoren haben den Vorteil, dass zusätzlich zu den „klassischen Messparametern wie der Temperatur“ (ebd.) auch „indirekte Messgrößen wie das persönliche Wohlempfinden“ (ebd.) ermittelt werden können. Letzteres lässt sich mithilfe „der Hautleitfähigkeit und der Hauttemperatur“ (ebd.) herausfinden. Die so ermittelten Informationen und Daten werden also „vor Ort gesammelt [...] und durch die Sende- und Empfangsmöglichkeit mobiler Kommunikationsgeräte einem größeren Netzwerk oder [einer] Community zu Verfügung gestellt“ (ebd.). Netzwerke sind entscheidend, da sie Elemente der Raumsensorik miteinander vernetzen: Über Netzwerke erfolgt die ganze „Kommunikation und Verknüpfung von diesen Sensordaten“ (Wilhelm et al. 2015: 262). Dabei können wie bereits erwähnt Bürgerinnen und Bürger als Sensoren fungieren und Daten sammeln. Wie bereits angedeutet sind nicht nur Menschen selbst geeignete Sensoren zur Datengenerierung; das Smartphone bildet nicht nur „die ideale Basis für Sensoren“ (ebd.), sondern fungiert gleichzeitig selbst als solcher (vgl. ebd.). So führt ein Großteil der Menschen einen tragbaren Sensor tagtäglich präsent mit sich (vgl. ebd.).

Menschen können also als Sensoren zur Datengewinnung fungieren, doch es bleibt die Frage, wie genau „menschliche Emotionen in einem objektivierbaren Ansatz aufgenommen und analysiert werden“ (Zeile et al. 2013: 2) können. Klassischerweise fokussiert sich die Raumpla¬nung auf menschliche Belange aus den Bereichen Ökonomie, Ökologie sowie Soziales (vgl. Wilhelm et al. 2015: 263). Besonders im Vorfeld einer Planung ist dies der Fall, bei der Aufnahme und Auswertung des Bestands (vgl. ebd.). Hier können Fortschritte in der Raumsensorik dazu führen, dass diese Untersuchungen vereinfacht und ver¬bessert werden (vgl. ebd.). Auch wenn „der Mensch mit seinen subjektiven Eindrücken bei dieser Analyse im Fokus steht, [so] wird er oft nicht hinreichend in die Untersuchung miteinbezogen“ (ebd.). Dies soll sich durch die Entwicklungen in der Raum- sowie Humansensorik ändern. Wie bereits beschrieben können Bürgerinnen und Bürger hierbei sowohl Sensoren tragen, als „auch selbst als subjektiver Sensor“ (ebd.) fungieren (vgl. ebd.). Dieser Ansatz wird auch „People as Sensors“ (Resch et al. 2015: 515), also Menschen als Sensoren, genannt. Der wesentliche Unterschied zur Raumsensorik ist hierbei die anthropozentrische Ausrichtung der Humansensorik (vgl. Wilhelm et al. 2015: 263). Aktuelle Sensoren zur Messung von Emotionen sind in der Lage, Ausschläge unterschiedlicher biometrischer Parameter wahrzunehmen, wie beispiels¬weise einen erhöhten Puls, die Hautleitfähigkeit oder die Hauttemperatur – allerdings kön¬nen diese nicht die emotionale Qualität dieses Ausschlags bzw. den oder die ge¬nauen Auslöser erfassen (vgl. Zeile et al. 2015: 216).

Mit einer von mehreren Methoden im Bereich der Humansensorik wurde sich innerhalb der vorliegenden Studie auseinandergesetzt: dem psychophysiologischen Map¬ping bzw. Monitoring (psychophysiologische Kartierung bzw. Beobachtung). Hierbei werden die Emotionen einer Probandin oder eines Probanden extrahiert (vgl. Zeile et al. 2013: 3). Dies geschieht, indem „die Leitfähigkeit und Temperatur der Haut (Vitaldaten) ei¬ner Person, unter Berücksichtigung von Ort und Zeit, aufgenommen“ (Beyel et al. 2016: 691) werden. Probandinnen und „Probanden werden dazu mit einem Sensorarmband […] [und] einem GPS-Logger […] ausgestattet“ (ebd.). Mithilfe dieser „zeitlich synchrone[n] GPS-Messung sind diese physiologischen Daten lokalisierbar“ (ebd.). Bei diesen Daten, welche „in Echtzeit“ (Zeile et al. 2013: 3) gemessen werden, handelt es sich um „Daten der sich verän-dernden Körperreaktionen (Körperphysiologie) [einer Probandin bzw.] eines Probanden“ (ebd.). Klar und eindeutig zu identifizieren sind hierbei negative Emotionen, welche in aggregierter Form auch als Stress bezeichnet werden können (vgl. ebd.). Das Ziel des psychophysio¬logischen Mappings ist es daher, „mit diesen Daten Stressmomente zu identifizieren“ (Beyel et al. 2016: 691), indem Muster herausgefiltert werden, welche „sich an den Stellen herausbil¬den, bei denen

[Probandinnen und] Probanden negative Emotionen (z. B. Angst oder Ärger) verspüren“ (ebd.). In diesen Situationen „entsteht der sogenannte ‚kalte Angst¬schweiß‘, durch den die Hautleitfähigkeit ansteigt und kurz darauf die Hauttemperatur ab¬fällt“ (ebd.) – hierbei handelt es sich um die gesuchten „Stressmomente“ (ebd.). Karten, die als Ergebnis solcher Untersuchungen im Bereich der Humansensorik entstehen, bei der „‚Menschen als Messfühler‘“ (Zeile et al. 2013: 8) agieren, nennt man „umgangssprach¬lich ‚emomaps‘“ (ebd.: 7), also emotionale Karten. Der „Ansatz des ‚emo¬tional mappings‘“ (ebd.: 8), der emotionalen Kartierung, verbindet demnach Themen der Humansensorik mit der räumlichen Planung als Anwendungsfeld (vgl. ebd.: 7). EmoMapping stellt somit eine Methode „aus dem Bereich der Humansensorik [dar], die den Menschen als Sensor nutzt und Vitaldaten über ihn liefert“ (Beyel et al. 2016: 690). Es werden also allge¬mein „biostatistische Signale gemessen und als Emotionen interpretiert“ (ebd.). Aufgrund der „relativ einfache[n] Identifikation von ‚Stresspunkten‘“ (ebd.) bietet es sich an, das Emo¬Mapping mithilfe des psychophysiologischen Mappings bzw. Monitorings durchzuführen (vgl. ebd.).

4 EMOMAPPING DORTMUND DORSTFELD

Die theoretische Auseinandersetzung mit Methoden der Humansensorik wurde im Folgenden mithilfe der Durchführung eines EmoMapping in Dortmund-Dorstfeld verknüpft. Das EmoMapping in Dortmund-Dorstfeld wurde am Mittwoch, den 10. Mai 2017 durchgeführt, von ungefähr 10:20 Uhr bis 17:45 Uhr. Dabei war es den ganzen Tag über sonnig und wolkenlos, bei ca. 15 °C bis 20 °C. Zu den weiteren Rahmenbedingungen ist zu sagen, dass es keine besonderen Vorkommnisse wie beispielsweise Veranstaltungen auf der Route für das EmoMapping gab. Die Durchführung fand allerdings in der Zeit des Wahlkampfes statt, sodass es viele Plakate mit politischen Parolen gab – in Dortmund-Dorstfeld fielen vor allem die vielen Plakate rechter sowie rechtsradikaler Parteien auf, welche die Ausrichtung sowie Gesinnung ihrer Partei eindeutig widerspiegelten.

4.1 Der Untersuchungsraum

Ein wichtiger Punkt in der Vorbereitung ist die Auswahl des Untersuchungsraumes, welcher im Rahmen der vorliegenden Forschungsarbeit thematisiert wird. Dazu wurden Gespräche mit der Stadt Dortmund geführt, genauer mit Ansprechpartnerinnen und -partnern des Projekts Nordwärts. Bei diesem Projekt handelt es sich um ein „‚Zehn-Jahres-Projekt‘, das die Stärken der nördlichen Stadtbezirke Dortmunds in den Fokus der Öffentlichkeit rückt“ (Stadt Dortmund 2017a), mit dem Ziel der „Harmonisierung der Lebensqualität in der Gesamtstadt“ (ebd.). Das im Jahre 2015 gestartete Projekt setzt strukturell vor allem auf ein „breit angelegtes Dialog- und Beteiligungsverfahren“ (ebd.). Der wesentliche Stein des Anstoßes, den Kontakt zur Stadt Dortmund herzustellen, lag in dem Nordwärts-Projekt Nummer 852 (vgl. Stadt Dortmund 2017b). Dieses beinhaltet die „Vision: Angsträume (ÖPNV, Plätze, Orte) sind beseitigt, Beleuchtungskonzepte erhöhen das Sicherheitsgefühl“ (ebd.). Aus Gesprächen mit Projektverantwortlichen ergaben sich einige Vorschläge und schlussendlich fiel die Entscheidung zugunsten des Dortmunder Stadtteils Dortmund-Dorstfeld, genauer gesagt zugunsten des Umfelds des S-Bahnhofs Dortmund-Dorstfeld. Der wesentliche Ansatzpunkt für die Auseinandersetzung mit der S-Bahn-Station in Dortmund-Dorstfeld ist ein Tunnel innerhalb der Station, der von den Beteiligten assoziativ als Angstraum bezeichnet und nach diversen Ortsbegehungen der verschiedenen Vorschläge innerhalb Dortmunds ausgesucht wurde.

In einem nächsten Schritt wurde den Hinweisen nachgegangen und eine Route um die Station entwickelt, welche möglichst unterschiedliche Angsträume beinhalten sollte – hier war neben der fachlichen Überprüfung auch das eigene Gefühl von Unwohlsein ein treibender Faktor, eine Route in Dortmund-Dorstfeld zu nutzen.

4.2 Durchführung und Methodik

Um die in Kapitel 3.3 erläuterten messbaren Reaktionen zu nutzen, erlauben „[n]eue technologische Entwicklungen, wie z. B. ein Sensorband, […] das Aufzeichnen dieser Parameter auch außerhalb des Forschungslabors, ohne [die Betroffene bzw.] den Betroffenen in [ihrer bzw.] seiner Bewegung einzuschränken“ (Bergner et al. 2011: 433). Ein solches Sensorarmband bzw. Smartband misst sowohl die „elektrodermale Aktivität“ (ebd.: 434), als auch die Temperatur der Haut (vgl. ebd.). Hinzu kommt die Messung der geografischen Position mithilfe eines GPS-Loggers, um die mit dem Sensorarmband gemessenen emotionalen Ausschläge zu verorten (vgl. ebd.). Dies geschieht „[d]urch einen Zeitstempel, der manuell im Moment des Einschaltens (sowie Ausschaltens) des Smartbands gesetzt wird“ (Groß et al. 2015:

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251), der „eine spätere Synchronisation beider Geräte ermöglicht“ (ebd.). Zu beachten ist hierbei, dass „[n]ur durch eine exakte Synchronisation [..] die Datenvalidierung erfolgreich sein“ (ebd.) kann. Des Weiteren wird für das EmoMapping der vorliegenden Forschungsarbeit eine GoPro-Kamera genutzt, welche mögliche äußere Einflüsse, die über die Gestalt des Stadtraums hinausgehen, einfangen soll und es so ermöglicht, die gemessenen Daten des Sensorarmbands sowie des GPS-Loggers zu bereinigen. So ist es denkbar, dass das Sensorarmband eine Stressreaktion misst, welche durch „eine heikle Situation“ (ebd.: 250) wie einen nah vorbeifahrenden Lastkraftwagen oder durch einen pöbelnden Passanten ausgelöst wird, um nur zwei Beispiele zu nennen. Des Weiteren handelt es sich bei den Anfangs- sowie Endpunkten eines solchen Tests um potenzielle Stressauslöser, da die Probandinnen und Probanden sich in einer unnatürlichen Situation befinden. Sollte sich zudem eine Testperson verlaufen, werden die Stresspunkte auf dieser falschen Route ebenfalls bereinigt. Für die genannten Eventualitäten kann also Stress gemessen werden; da sie im Zuge der vorliegenden Forschungsarbeit jedoch irrelevant sind, werden diese mithilfe der GoPro-Videoaufnahmen und der GPS-Daten sowie Zeitstempel herausgelöscht bzw. bereinigt. Bei der für das EmoMapping genutzten Hardware handelt es sich um:

- ein Smartband von Bodymonitor,
- eine GoPro Hero4 Silver Edition,
- einen i-Blue 747A+ Bluetooth GPS Trip Recorder (Datenlogger mit Bluetooth und USB Receiver Funktion) und
- einen GoPro Omni Rig.

Bei dem GoPro Omni Rig handelt es sich um eine 360°-Kamera, welche für einen einmaligen Digitalisierungslauf genutzt wird. Die Idee hierbei ist, die Route des EmoMapping zu digitalisieren, um so die Möglichkeit zu haben, „Situationen nochmals ‚zu begehen‘“ (Folz et al. 2016: 547); in diesem Fall Situationen wie die Läufe im Zuge des EmoMapping. 360°-Filmaufnahmen bieten „[e]ine interessante Zwischenlösung […], die anhand eines Weges die Betrachtung verschiedener Sichtwinkel zulässt“ (ebd.). Es handelt sich hierbei um eine Zwischenlösung, die zwischen Foto- sowie Filmaufnahmen anzusiedeln, aber auch als virtuelles Modell in der Familie von VR-Lösungen zu verorten ist (vgl. ebd.). Der wesentliche „Vorteil von dreidimensionalen Aufnahmen liegt in einem besseren Raumgefühl für Planungen“ (ebd.). Aufgrund eines begrenzten Zeitrahmens sowie Arbeitsumfangs konnte diesem Aspekt leider nicht nachgegangen werden. Die Weiterführung dieser Methodik ist im Rahmen einer neuen Untersuchung denkbar, eine Veröffentlichung der erhobenen Videodaten oder eine weitere Verwendung dieser ist derzeit nicht geplant.

Eine wichtige vorbereitende Maßnahme ist die Erstellung eines Fragebogens, welchen die Probandinnen und Probanden im Anschluss an die Durchführung des EmoMapping ausfüllen. Im Zuge der Erstellung des Fragebogens für die Befragung gilt es, „auf die qualitative und quantitative Übereinstimmung des Instrumentariums mit dem Forschungsziel zu achten“ (Porst 2014: 17). Letzteres ist in diesem Fall sehr eindeutig definiert und dient der Dokumentation von Eindrücken sowie von Feedback bezüglich des zuvor durchgeführten EmoMapping der Probandinnen und Probanden. Somit steht hierbei vor allem die Beschaffung von Informationen im Mittelpunkt, die nicht durch das EmoMapping generiert werden, um dieses einerseits inhaltlich zu unterfüttern und andererseits Vergleiche zwischen subjektivem Stressempfinden und objektiver Stressmessung zu ermöglichen.

Insgesamt haben zehn Probandinnen und Probanden an der Durchführung des EmoMapping teilgenommen. Dabei handelte es sich um je fünf Frauen und Männer, zwischen 21 und 55 Jahren. Alle Probandinnen und Probanden wurden hinsichtlich der jeweiligen Aufgaben vor Ort sowie der Rahmenbedingungen und der Hardware-Ausstattung instruiert. Eine genaue Einweisung und Erklärung erfolgte am Tag der Durchführung des EmoMapping selbst, bevor die jeweilige Probandin bzw. der jeweilige Proband losgeschickt wurden. Neben der Hardware – einem Smartband von Bodymonitor, einer GoPro Hero4 Silver Edition sowie einem Datenlogger mit der genauen Bezeichnung i-Blue 747A+ Bluetooth GPS Trip Recorder – wurde jeder Probandin und jedem Probanden eine Luftbildkarte mit der eingezeichneten Route, eine Version als Stadtplan mit den jeweiligen Straßennamen und zusätzlich noch eine textliche Wegbeschreibung ausgehändigt. Der Datenlogger bzw. GPS-Tracker konnte bequem in der Hosen- oder Jackentasche verstaut werden und auch das Sensorarmband war sehr unauffällig, da es wie ein normales Arm- oder Schweißband um das Handgelenk gebunden wird. Einzig die GoPro war sehr auffällig und veränderte die

Versuchsbedingungen dahingehend, dass die Probandinnen und Probanden nicht wie alltäglich die verabredete Route abliefen, sondern den meisten Passantinnen und Passanten auffielen. Besonders weil diese dabei gefilmt wurden, hat dies teilweise zu leichtem Unwohlsein bei einigen Probandinnen und Probanden geführt.

Alle erhobenen Daten, ob GoPro-Aufnahme oder ausgefüllter Fragebogen, sind selbstverständlich anonymisiert worden, sodass keinerlei Rückschlüsse auf die einzelnen teilnehmenden Personen gezogen werden können. Somit wird den Ansprüchen eines angemessenen Datenschutzes entsprochen.

4.3 Vorgehensweise in der Auswertung

Das EmoMapping wird mithilfe des Sensorarmbands, des GPS-Loggers sowie der GoPro-Kamera ausgewertet. Zuerst werden die Ergebnisse „[b]asierend auf den aufgenommenen Daten und Biosignalen des GPS-Loggers und des Smartbandes“ (Bergner et al. 2011: 434f.) betrachtet. Wie bereits erwähnt „liegt eine negative Erfahrung dann vor, wenn die elektrodermale Aktivität zunimmt und kurz danach die Hauttemperatur abnimmt“ (ebd.: 435). Zur Auswertung werden nun die GPS-Daten des Loggers mit den Vitaldaten des Sensorarmbands zusammengeführt, sodass „jedes Ereignis sekunden- und ortsgenau festgehalten werden“ (Groß et al. 2015: 251) kann (vgl. ebd.). Ein Ereignis, genauer gesagt ein Stressereignis, ist identifizierbar, „[s]obald drei Sekunden nach einer Reihe direkt aufeinanderfolgender merklicher Veränderungen der Hautleitfähigkeit eine Reihe direkt aufeinanderfolgender Veränderungen der Hauttemperatur erscheint“ (ebd.). So kann „bereits die Aussage getroffen werden, in welcher Sekunde seit Beginn der Aufzeichnung eine negative Beeinträchtigung stattgefunden hat“ (ebd.). Zusammen mit der räumlichen Verortung der durch den GPS-Tracker gemessenen Vitaldaten wird es ermöglicht, die erhobenen Daten und die daraus entstehenden Ergebnisse zu visualisieren, beispielsweise durch die Übertragung in ein Geoinformationssystem (GIS) als Shape-Dateien (genauer Punkt-Shapes), in dem die Ergebnisse häufig in Form von sogenannten Hotspots einer Heatmap dargestellt werden (vgl. ebd.). Für die Auswertung dieser Arbeit wurde das Programm QGIS genutzt.

An diesem Punkt der Auswertung können bereits erste Aussagen getroffen werden, beispielsweise „ob, wann und wo ein negativer Einfluss stattgefunden hat“ (Groß et al. 2015: 252). Da die Ursachen hierbei noch unklar sind, aber bei der Untersuchung von Angsträumen ohnehin nicht eindeutig zuordenbar ist, was genau den Stress auslöst, dient die Auswertung der Fragebögen der inhaltlichen Unterfütterung der erhobenen Daten. Um allerdings gänzlich irrelevante Daten herauszufiltern, wird die Durchführung des psychophysiologischen Monitorings von einer GoPro Hero4 Silver Edition begleitet. Diese ist durch ihre „Kompaktheit […] dafür geeignet, durch einen Brustgurt am Oberkörper befestigt zu werden“ (ebd.). Die mit Hilfe der GoPro aufgezeichneten Videos geben „Aufschluss über die möglichen Ursachen für die Reaktion“ (ebd.). „Auslöser, Trigger genannt“ (ebd.), welche im Sinne der Untersuchung zum Thema Angsträume und durch die GoPro-Aufnahmen nicht ersichtlich sind, werden aus den Daten gelöscht bzw. bereinigt. So sollen äußere Einflüsse, die Stress oder Angst triggern können, herausgefiltert werden. Hierbei könnte es sich beispielsweise um Passantinnen und Passanten, welche die jeweilige Probandin bzw. den jeweiligen Probanden ansprechen oder um auffällig lange, mit Stress verbundene Orientierungsphasen handeln. Auch die Start- und Endpunkte des Versuchs sind anfällig für Stresspunkte, weshalb diese ebenfalls – da sie keine natürlichen Trigger im Sinne des EmoMapping darstellen – bereinigt werden. Zudem können Messungenauigkeiten mithilfe der Zeitstempel korrigiert werden.

Nach diesen Arbeitsschritten werden die Karten mit den genannten Heatmaps analysiert und interpretiert. Dabei werden auch Informationen aggregiert betrachtet, zum Beispiel mithilfe der Analysetechnik der „Kartenüberlagerung (Overlay Mapping)“ (Fürst und Scholles 2008: 324). Selbstverständlich ist eine solche „Überlagerung [..] kein Selbstzweck, sondern dient der Beantwortung einer bestimmten Frage“ (ebd.). So werden die Informationen der einzelnen EmoMaps für sich betrachtet, also Probandin für Probandin bzw. Proband für Proband. Die Beantwortung der ersten Forschungsfrage wird nach der Auswertung der EmoMapping-Ergebnisse möglich, wenn auch der Informationsgehalt sowie die Aussagekraft dieser Ergebnisse erörtert sind. Wichtig ist für die methodische Vorgehensweise, dass zunächst die erhobenen Daten des EmoMapping sowie die Daten aus der Auswertung der Fragebögen getrennt voneinander betrachtet, analysiert und auf ihre Aussagekraft hin untersucht werden. Anschließend werden diese Ergebnisse aggregiert und zusammenhängend betrachtet, sodass diese zusammen einen möglichen Mehrwert an Informationen generieren können und gleichzeitig eine Vergleichbarkeit beider Methoden und ihrer

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jeweiligen Informationsgehalte schaffen. Im Zuge dieses Arbeitsschrittes wird die zweite Forschungsfrage beantwortet. Für die Beantwortung der dritten Forschungsfrage bedarf es der Aggregation aller EmoMapping-Ergebnisse, daher ist es wichtig, diese Daten zu überlagern. Für die Beantwortung der vierten Forschungsfrage ist eine Aggregation der Heatmaps der Probandinnen sowie der Probanden (s. Abbildung 1) essenziell wichtig.

Bei der Auswertung des Fragebogens ist vor allem die beschreibende Statistik zu nennen, da sie „Methoden [bietet], um eine Menge von Daten zusammenzufassen" (Lohninger 2012). Daraufhin werden die in den Fragebögen erhobenen Daten ausgewertet und anschließend werden die Ergebnisse mithilfe der jeweiligen Methode und Darstellungsform interpretiert. Aufgrund der Einfachheit des Fragebogens und der überschaubaren Menge der Probandinnen und Probanden sind einfache Methoden deskriptiver Statistik ausreichend, um genügend verwertbare Erkenntnisse aus den ausgefüllten Fragebögen zu ziehen.

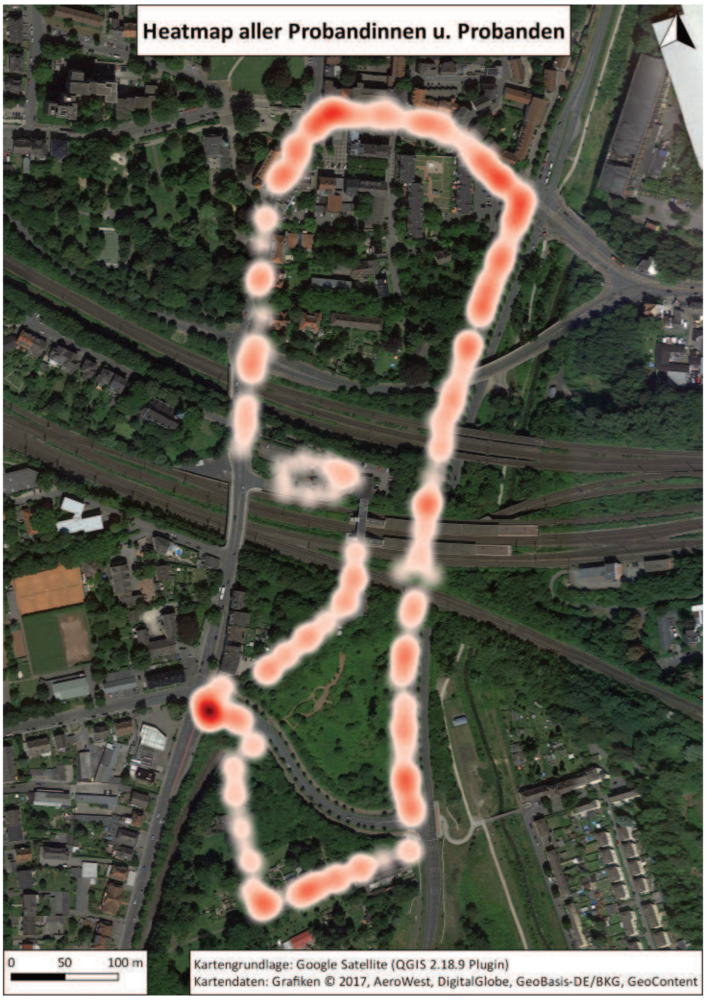

Abbildung 1: Heatmap aller Probandinnen u. Probanden; Quelle: eigene Darstellung

4.4 Beantwortung der Forschungsfragen

Im Folgenden werden die aufgestellten Forschungsfragen beantwortet. Die erste Forschungsfrage lautete:

(1) Lässt sich raumbezogener Stress vermessen und so objektivierbar machen?

Das EmoMapping hat gezeigt, dass es möglich ist, raumbezogenen Stress bzw. die Reaktion darauf auf räumlicher Ebene zu messen und lokalisieren. Allerdings ist es auch wichtig, festzuhalten, dass dies nur so gut gelingt, wie es die Hardware und Software zulässt. So können derzeit Stressmomente georeferenziert zur Analyse nutzbar gemacht werden, jedoch ist es noch nicht möglich, die Intensität dieses Stresses zu messen. Die genutzte Methodik des psychophysiologischen Monitorings ermöglicht es, zu identifizieren, ob an einem bestimmten Ort Stress durch einen Trigger ausgelöst wurde oder nicht. Darüber hinaus wurden in den theoretischen Grundlagen weitere Ansätze aufgezeigt, wie Emotionen zur Forschung im Bereich der Raum- und Stadtplanung genutzt werden können. Insgesamt kann die erste Forschungsfrage daher bejaht werden. Die zweite Forschungsfrage lautete:

(2) Gibt es Unterschiede zwischen subjektivem Stressempfinden und objektiver Stressmessung?

Zu diesem Zweck wurde dem EmoMapping ein Fragebogen hinzugefügt, welcher den Probandinnen und Probanden die Möglichkeit geben sollte, ihre reinen subjektiven Eindrücke festzuhalten. Somit wurde die Stressmessung objektiv durch das Sensorarmband im Rahmen des EmoMapping und die Erhebung des subjektiven Stressempfindens durch den Fragebogen ermöglicht. Es gab bei beiden Ansätzen unterschiedliche Ergebnisse; es haben sich vor allem verschiedene Angstraumverdachtspunkte herauskristallisiert. Beispielsweise wurde im Fragebogen auf eine Unterführung verwiesen, welche in den Heatmaps des EmoMapping eine eher untergeordnete Rolle spielte. Daher gibt es Unterschiede zwischen subjektivem Stressempfinden und objektiver Stressmessung; somit kann die zweite Forschungsfrage ebenfalls bejaht werden. Die dritte Forschungsfrage lautete:

(3) Lassen sich städtische Orte ausmachen, die ein Großteil aller Probandinnen und Probanden als Angsträume wahrnimmt?

Es konnten sowohl im Rahmen des EmoMapping als auch im Rahmen der Fragebogenergebnisse Orte identifiziert werden, welche die meisten Probandinnen sowie Probanden als unangenehm empfunden haben. Diese Räume sind daher Angstraumverdachtspunkte und können stressige Situationen hervorrufen. Allerdings kristallisierten sich im Rahmen des EmoMapping andere Stellen heraus als bei der Fragebogenerhebung. Des Weiteren ist der Zusatz notwendig, dass die Ergebnisse nicht unisono bestimmte Räume als Angsträume offenbarten. Es ist wichtig zu betonen, dass im Rahmen dieser Untersuchung lediglich Angstraumverdachtspunkte herausgearbeitet werden konnten und keine eindeutige Zuordnung zu Angsträumen möglich war. Diese Verdachtspunkte bedürfen einer weiteren Betrachtung. Daher kann die dritte Forschungsfrage in Bezug auf die Herausarbeitung und Lokalisierung von Angstraumverdachtspunkten bejaht werden, allerdings bedeutet dies nicht, dass es sich hierbei auch notwendigerweise um Angsträume handelt. Bei der vierten Forschungsfrage stand vor allem die Erfassung möglicher geschlechtsspezifischer Unterschiede im Vordergrund. Diese lautete:

4. Gibt es Wahrnehmungsunterschiede hinsichtlich der Angsträume zwischen den Geschlechtern?

Die Heatmaps aus dem EmoMapping zeigen, dass es Wahrnehmungsunterschiede zwischen den Geschlechtern gab. Bei den Probandinnen zeigte sich ein herausstechender Hotspot, wobei die Probanden vergleichsweise viele deutliche Hotspots offenbarten. Zudem hatten die Probanden mehr Stressmomente als die Probandinnen, wobei dieser Wert durch das Verlaufen einer Probandin verzerrt sein könnte. Jedoch ist es tendenziell möglich festzuhalten, dass die Messungen im Rahmen des EmoMapping weniger einen wahrnehmbaren Unterschied in der Anzahl der Stressmomente zwischen Frauen und Männern zeigte,

sondern eher in der Verteilung dieser Stressmomente zur Herausbildung von deutlichen Hotspots. Die Ergebnisse des Fragebogens zeigten hingegen, dass die Probandinnen sich selbst ängstlicher einschätzten, als dies die Probanden taten. Dies legt nahe, dass hierbei vor allem Geschlechter-, Rollen- sowie Raumzuschreibungen eine Rolle spielen, welche nach wie vor die Wahrnehmung von Orten bzw. in diesem Fall Angsträumen beeinflussen. Jedoch bedarf dies einer weiteren Untersuchung. Insgesamt kann die vierte Forschungsfrage ebenso bejaht werden, allerdings weichen die Ergebnisse des EmoMapping von denen der Fragebögen ab.

5 FAZIT UND AUSBLICK

Eine wesentliche Erkenntnis aus der Durchführung des EmoMapping ist, dass objektive Stressmessungen nicht deckungsgleich mit den subjektiven Empfindungen bei der räumlichen Wahrnehmung sind. Somit kann der bisher gängigen Annäherung an das Thema der Angsträume, welche sich auf die Erfragung subjektiver Eindrücke stützt, eine konstruktive Kritik entgegnet werden: Ein psychophysiologisches Monitoring bzw. ein EmoMapping ist eine sinnvolle Ergänzung zur Lokalisierung von Angstraumverdachtspunkten und wird für weitere, zukünftige Forschungsbedarfe in dieser Richtung ausdrücklich empfohlen. Diese Methode kann einen neuen Anreiz für zukünftige Beteiligungen geben und die Art, wie Bürgerinnen und Bürger im Planungskontext beteiligt werden, sogar prägen. Allerdings hängen die Funktionalität, die Ökonomie der Methode sowie die reine Durchführbarkeit derzeit noch von technischem Know-how sowie von hohen Anschaffungskosten der Hardware ab. Des Weiteren hängt der Erfolg der Methode im Wesentlichen an der technischen Entwicklung, sodass Messungenauigkeiten verringert werden oder weitere Innovationen es perspektivisch eventuell ermöglichen, auch die Intensität der Stressmomente messen zu können. Nach dem

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heutigen Stand handelt es sich aber ebenfalls um eine sinnvolle und funktionierende Methode, welche sicher noch weiter optimiert wird, allerdings heute schon für die Planungspraxis und Forschung genutzt werden könnte. Aufgrund des begrenzten Umfangs der vorliegenden Forschungsarbeit konnten nicht alle geplanten Aspekte umfassend beleuchtet werden. So gibt es über diese Arbeit hinaus noch weiteren Forschungsbedarf. Zum einen kann das Thema der Angsträume mit einer noch umfangreicheren theoretischen Aufarbeitung bedacht werden, zumal lediglich Angstraumverdachtspunkte und keine eindeutigen Angsträume identifiziert werden konnten. Zum anderen wäre aus diesem Grund eine weitere Auseinandersetzung mit den identifizierten Verdachtspunkten sinnvoll. Auch die Ergebnisse des Fragebogens mit den Einschätzungen der Probandinnen und Probanden in Bezug auf die Indikatoren für sowie die möglichen Maßnahmen gegen Angsträume bedürfen einer noch gründlicheren Untersuchung. Interessant war im Speziellen, dass eine Unterführung unter einer Brücke im Vorhinein als Angstraumverdachtspunkt erwartet wurde und auch durch den Fragebogen bestätigt wurde (9 von 10 Nennungen), allerdings nur ein Proband in diesem Bereich eine wirklich auffällige Häufung an Stressmomenten aufwies. Darüber hinaus wurde der Gedanke formuliert, dass Geschlechter-, Rollen- sowie Raumzuschreibungen eine große Rolle bei der Wahrnehmung von Angsträumen spielen. Diese Aspekte wären ebenfalls eine gänzlich neue Forschungsarbeit wert. Des Weiteren wurde die Nutzung des 360°-Videos erwogen, welche nur aus zeitlichen Gründen sowie aufgrund des begrenzten Umfangs dieser Arbeit nicht umgesetzt wurde. Inwiefern eine solche Untersuchung virtuell funktioniert und ob ein Stresstest – sozusagen ein virtuelles EmoMapping im Labor mit Hilfe von Virtual sowie Augmented Reality – ähnliche bzw. überhaupt brauchbare Ergebnisse liefert, wäre interessant herauszufinden.

Selbstverständlich sind die erhobenen Daten aufgrund der wenigen Teilnehmenden nicht repräsentativ, allerdings lassen sie erste Rückschlüsse auf die Funktionalität der Methodik zu. Eine Untersuchung mit deutlich mehr Probandinnen und Probanden wäre vom heutigen Stand ausgesehen aber sehr aufwendig, sowohl bezüglich der Zeit als auch der Organisation. Darüber hinaus hängt die Belastbarkeit der Daten stark von der Entwicklung der Hardware und der Bereinigung der Daten im Zuge der Auswertung ab. Daher wird davon ausgegangen, dass sich die dargestellte Methodik zukünftig deutlich verbessern wird. Wie von Probandin Nr. 4 innerhalb des Fragebogens ergänzt wurde, ist es zudem für den weiteren Forschungsbedarf in Bezug auf das EmoMapping sinnvoll, sowohl Menschen unterschiedlicher Alters- sowie Bevölkerungsgruppen zu beteiligen, als auch eine Unterscheidung zwischen Lokalen bzw. Einheimischen und Fremden vorzunehmen. So kann der Einfluss der Vertrautheit eines Raumes erörtert werden und ob dieser überhaupt eine Rolle in Bezug auf Angsträume spielt. Denkbar ist auch, dass lokal bekannte Angsträume eine Mystifizierung erleben, welche Fremde nicht kennen und somit auch nicht damit assoziieren. Es bleibt festzuhalten, dass es viel Forschungsbedarf gibt und dass das Thema der Angsträume noch am Anfang der wissenschaftlichen Auseinandersetzung steht.

6 DANKSAGUNG

Der vorliegende Beitrag und die Studie zum Mappen von Angsträumen entstand im Rahmen des von der DFG und des FWF geförderten Projektes „Urban Emotions“ mit dem Förderkennzeichen ZE1018/1-2 und RE3612/1-2. Besondere Dank geht an die Probanden, die an der Studie teilgenommen haben.

7 REFERENCES

BARTHOLOMÄ, G. (1990). Angsträume in Dortmund. Ein Beitrag zur Verbesserung von Mobilitätschancen für Frauen in öffentlichen Räumen. Dortmund. Stadt Dortmund, Frauenbüro

BERGNER, B. S., ZEILE, P., PAPASTEFANOU, G., RECH, W. (2011). Emotionales Barriere-GIS als neues Instrument zu Identifikation und Optimierung stadträumlicher Barrieren. In: Strobl, Josef (Hg.): Angewandte Geoinformatik 2011. Beiträge zum 23. AGIT-Symposium Salzburg. Berlin. Wichmann, 430–439.

BEYEL, S., WILHELM, J., MUELLER, C., ZEILE, P., KLEIN, U. (2016). Stresstest städtischer Infrastrukturen - ein Experiment zur Wahrnehmung des Alters im öffentlichen Raum. In: Schrenk, M. et al. (Hg.): REAL CORP 2016. Wien. S. 689–698.

CAMPBELL, A. T., EISENMAN, S. B., LANE, N. D., MILUZZO, E. & PETERSON, R. A. (2006), People-centric urban sensing. In: Proceedings of the 2nd annual international workshop on Wireless internet. ACM, Boston, Massachusetts, 18.

FOLZ, S., BROSCHART, D., ZEILE, P. (2016). Raumerfassung und Raumwahrnehmung - aktuelle Techniken und potenzielle Einsatzgebiete in der Raumplanung. In: Schrenk, M. et al. (Hg.): REAL CORP 2016. Wien. S. 541–550.

FÜRST, D., SCHOLLES, F. (2008). Handbuch Theorien und Methoden der Raum- und Umweltplanung. 3., vollst. überarb. Aufl. Dortmund. Rohn.

GROß, D. J., HOLDERLE, C., WILHELM, J. (2015). EmoCycling - Analyse von Radwegen mittels Humansensorik für Kommunen. In: Schrenk, M. et al. (Hg.): REAL CORP 2015. Wien. S. 249–259.

GROTEFELS, S., SCHOEN, H. (2005). Beteiligungsverfahren. In: Ritter, Ernst-Hasso (Hg.): Handwörterbuch der Raumordnung. 4., neu bearb. Aufl. Hannover. Akademie für Raumforschung und Landesplanung, 86–89.
HILLER, K. (2019). Sicherheit im Stadtquartier: Angsträume und Präventionsmaßnahmen, Stadtmarketing-Tag des Einzelhandelsverbades BW. CIMA, 2010.
KORFMANN, M. (2017). Sicherheit. NRW-Landtage streitet über "Angsträume" und "No-Go-Areas". Westfalenpost. https://www.wp.de/politik/nrw-landtag-streitet-ueber-angstraeume-und-no-go-areas-id209415527.html. Aufgerufen 30. März 2017.
LOHNINGER, H. (2012). Grundlagen der Statistik: Beschreibende Statistik. http://www.statistics4u.com/fundstat_germ/cc_descriptive_stat.html. Aufgerufen 10. Juli 2017.
MORSCHITZKY, H. (2009). Angststörungen. Diagnostik, Konzepte, Therapie, Selbsthilfe. 4. Aufl. s.l. Springer Verlag Wien.
NOLD, C. (2009), Emotional cartography. Technologies of the self. http://emotionalcartography.net. Aufgerufen 15.01.2015.
PAHLE-FRANZEN, U. (2011). Stadt als Angstraum. Untersuchungen zu rechtsextremen Szenen am Beispiel einer Großstadt. Dissertation. Karlsruhe.
PARTIZIPATION & NACHHALTIGE ENTWICKLUNG IN EUROPA (2017a). Anwendungsmöglichkeiten. http://www.partizipation.at/anwendung.html. Aufgerufen 28. Juni 2017.
PARTIZIPATION & NACHHALTIGE ENTWICKLUNG IN EUROPA (2017b). Rechtlicher Rahmen. http://www.partizipation.at/rechtlicherrahmen.html. Aufgerufen 29. Juni 2017.
PARTIZIPATION & NACHHALTIGE ENTWICKLUNG IN EUROPA (2017c). Nutzen und Grenzen. http://www.partizipation.at/nutzen-und-grenzen.html. Aufgerufen 28. Juni 2017.
PORST, R. (2014). Fragebogen: Ein Arbeitsbuch. Lehrbuch. 4., erweiterte Auflage. Wiesbaden. Springer VS.
RESCH, B., SUDMANNS, M., SAGL, G., SUMMA, A., ZEILE, P., EXNER, J.-P. (2015). Crowdsourcing Physiological Conditions and Subjective Emotions by Coupling Technical and Human Mobile Sensors. In: GI_Forum, Jg. 1, 514–524.
SCHLOSSER, F. (2017). Sind Emotionen messbar? – Angsträume und Stressempfinden im urbanen Raum am Beispiel der Stadt Dortmund. Masterarbeit.
SCHMIDT, W. (2015). Augen auf und durch. Tagesspiegel. http://www.tagesspiegel.de/wirtschaft/immobilien/unwirtliche-staedte-augen-auf-und-durch/12069326-all.html. Aufgerufen 30. November 2017.
STADT DORTMUND (2017a). Projekt 'Nordwärts': Was ist "Nordwärts"? https://www.dortmund.de/de/leben_in_dortmund/nordwaerts/nordwaerts_im_ueberblick/index.html. Aufgerufen 5. Juli 2017.
STADT DORTMUND (2017b). Nordwärts: "Nordwärts"-Online-Karte. http://rathaus.dortmund.de/nordwaerts. Aufgerufen 19. Februar2018.
STRÄTER, A. (2016). No-Go-Areas. Wo sind die "rechtsfreien Räume" in NRW? WDR. http://www1.wdr.de/nachrichten/landespolitik/no-go-areas-ueberblick-faq-100.html. Aufgerufen 14. Juni 2017.
WENGEL, A. (2017). Psychologie. Emotionen. Planet-Wissen. Aufgerufen 21. Juni.
WILHELM, J., BROSCHART, D., ZEILE, P. (2015). EmoVision - Potenziale von EmoMapping in der räumlichen Planung. In: Schrenk, M. et al. (Hg.): REAL CORP 2016. Wien. S. 261–270.
ZEILE, P., HÖFFKEN, S. & PAPASTEFANOU, G. (2009), Mapping people? - The measurement of physiological data in city areas and the potential benefit for urban planning. In: Schrenk, M., Popovich, V., Engelke, D. & Elisei, P. (Hrsg.), REAL CORP 2009, Sitges.
ZEILE, P., EXNER, J.- P., BERGNER, B. S. & STREICH, B. (2013), Humansensorik und Kartierung von Emotionen in der räumlichen Planung. In: BUHMANN, E., ERVIN, S. M. & PIETSCH, M. (Hrsg.), DLA Conference 2013. Wichmann Verlag, Berlin, 129–141.
ZEILE, P., RESCH, B., EXNER, J.-P., SAGL, G. (2015). Urban Emotions. Benefits and Risks in Using Human Sensory Assessment for the Extraction of Contextual Emotion Information in Urban Planning. In: Geertman, Stan; Ferreira, Joseph; Goodspeed, Robert; Stillwell, John (Hg.): Planning Support Systems and Smart Cities. Lecture Notes in Geoinformation and Cartography. Cham. Springer International Publishing, 209–225.

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🏆 *reviewed paper*

Assessing Expanding Space Use versus Infill for Economic Activities

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1 ABSTRACT

In order to limit additional (net) land take for economic activities, the reality of space use needs to be properly understood since the location of economic activities and the patterns of space use vary in different environments. This was assessed by comparing the spatial patterns obtained from a field inventory with those from existing data for 5 case areas in Flanders (Belgium). Each case area is a transect from a high density urban area to a suburban neighbourhood or even a semi-rural zone, in different (types of) regions: inland-coastline transect, transects in the metropolitan areas of the major cities Antwerp and Ghent (exluding the city centres), in the medium sized city of Hasselt (and its suburbs) and th smaller city of Aalst (and the zone along an important access road), and transects incorporating small towns such as Deinze and Veurne . The observations in the field were made from what is visible from the street, thus representing what is normally perceived as economic activity. The statistics are based on official data, mostly derived from tax returns and social security contributions, and on commercial retail data.

The location of economic activities and the patterns of space use vary in different settlement environments. The analysis then compared similar settlement environments in different regions, and identified typical characteristics for 8 location environments (with some further subcategories). These were presented to experts in workshops and (group) interviews. This revealed that, in some environments, (the combination of) data and statistics give a good understanding of the space use while, in other environments, gaps with realities in the field are obvious. Therefore, suggestions are made for targeted new data collection methods, such as remote sensing, crowd sourcing, and web data extraction.

Keywords: statistics, inventory, urban expansion, land use, spatial economics

2 INTRODUCTION

Land recycling allowing inner city development or the re-naturalisation of abandoned artificial areas is a key part of sustainable land management. It is intricately linked with the issue of land take, as in the absence of brownfield redevelopment, areas dedicated to economic use are artificially created at the fringe of cities thus increasing the annual consumption of new land. Simultaneously, new attractive developments at the outskirts of urban areas may attract new residents and firms, leading to the gradual dereliction of the core city areas, and eventually creation of new brownfield sites. In 2014 a comparative study on available data and indicators of available areas for (re)development within the urban fabric concluded that the knowledge base needed to be improved in order to foster analysis of potential future EU land take trends, to set EU-level targets (including control indicators) and to determine appropriate monitoring mechanisms (BIO, 2014).

The European Commission's Roadmap to a Resource Efficient Europe proposed as milestone: "By 2020, EU policies take into account their direct and indirect impact on land use in the EU and globally, and the rate of land take is on track with an aim to achieve no net land take by 2050" (COM(2011) 571 final). In Flanders the concept of 'no net land take' was approved as part of the Spatial Policy Plan Flanders by the regional government in November 2016. This implies an optimisation of space use in developed areas, and

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consequently, an understanding of this use within the urban fabric. Considered by international standards, most of Flanders is urban fabric: 11 of the 308 municipalities have more than 50.000 inhabitants, according to the Eurostat degree of urbanisation 7 are considered cities, 228 are towns and suburbs, and 74 are rural areas Eurostat, 2016).

Sarzynski et.al. (2014) identify spatial patterns in metropolitan areas using a combination dimensions, i.e. intensity, compactness, mix and monocentricity, yet ascertain that these areas are still internally complex. They conclude that “anti-sprawl” programs must be carefully constructed based on the particular land use dimensions while generic “anti-sprawl” policies and planning activities are likely to produce disparate metropolitan impacts.

The Flemish departments of Environment and of Innovation and Business set up a series of studies called ‘Segmentation’ to explore the economic land use in this densely populated region. Our paper presents the outcomes of the Segmentation III project, introduced in section 3. Section 4 presents the assessment of actual land-use in 5 case areas in Flanders by comparing the spatial patterns obtained from a field inventory with those from statistics based on existing data. In addition, interviews and workshops were conducted to understand the local context reflected in the spatial organization of parcels, buildings and infrastructure. A comparison of similar sub-zones in the case areas, was used to determine location environments for economic activities. The discrepancy between the field inventory and spatial patterns derived from traditional databases based on e.g. employment and tax returns, show that strengths, weaknesses, gaps and synergies also differ by location. We suggest targeted new data collection methods in different settlement environments. In the final section, we zoom out, and conclude that assessing expanding space use versus infill for economic activities is scale dependent.

3 THE ‘SEGMENTATION III’ PROJECT

The study (called Segmentation III) was conducted in a collaborative learning setting involving two departments (Environment and Innovation and business) of the Flemish Region, Buck Consultants International, and researchers from the University of Leuven. The study had two main goals:

(1) increase the knowledge of the factual land use for economic activities as an input for a future observatory on economic space;

(2) analyse the relevant concepts in the Spatial Policy Plan Flanders (BRV) by applying them in an economic context.

It succeed two previous studies (Segmentation I and II) that gradually try to unravel the complexities behind the mix and interweaving of economic activities with other functions using space such as housing. While segmentation I (van Dinteren, Muskens, Geudens, & Haskoning DHV, 2015; van Dinteren, Muskens, Geudens, Zaman, & Pennincx, 2015) focused on a segmentation and classification of economic locations (environments or milieus), Segmentation II (Pennincx, De Mulder, & Zaman, 2016) analysed the transformation of economic estates, while Segmentation III aims at gaining insights in the ways and reasons why economic space embedded in settlements tends to degrade or to be underused.

The search for detailed factual land use explains why a series of applied methods (GIS layering, hot spot analysis etc.) and statistical analysis techniques serve a highly empirical approach with a focus on the degrees of and opportunities for interweaving of residential and economic functions. Field survey and in-depth interviews complement the approach in creating a new database of field observations and enrich the interpretation of the resulting spatial patterns. The current paper addresses the understanding of space use for economic activities within the urban fabric. The consultations with economic stakeholders and with civil servants to translate these in potential starting points for spatial economic policy are beyond the scope of this paper since this is still work in progress (A new Segmentation IV project was launched to further elaborate these issues.

In the previous section we mentioned the issue of underused space and degraded land. One of the key concepts the Segmentation Projects are focussing on, in search for an effective answer, is ‘interweaving’.

Interweaving implies that several activities share the same space. The nature of these activities is flexible: work with work, work with housing, work with nature and leisure etc. under the condition that the activities are not hindering each other while the main function or activity is always guaranteed. Shared use of space, rooms or infrastructure is a particular format of interweaving (VR - Witboek BRV, 2016). Therefore, each spatial environment has a particular interweaving profile. The possibilities for interweaving of a firm with its surrounding milieu depend on the interaction between the different actors: firm and stakeholders living or working in the vicinity. In other words the interweaving profile of the firm and the interweaving profile of the area surrounding the firm, have to be in balance (Leinfelder & Pisman, 2008). .

This concept is related to what is called 'spatial productivity'. This concept indicates the degree to which an economic location is efficient and effective in creating employment, in producing goods and/or in delivering services, and thus in delivering economic output. A high spatial productivity is aimed for but not at the expense of the good functioning of the firm. Therefore, the challenge is to determine a minimal use of space that benefits society and firms in a particular context. Therefore researchers and policy makers look for economic locations that optimise the space productivity which implies an efficiency (productivity per space unit) of the firm and fuel the efficiency of the production factor 'land' (e.g. reflected by the creation of added value) without hampering the functioning of firm. Such a vision allows e.g. for buffers between activities if this is appropriate in view of the nature of activities.

4 ASSESSMENT OF ACTUAL LAND-USE FOR ECONOMIC ACTIVITIES

4.1 Overall approach

We mentioned in the introduction that the inventory in the field was one of the specific aims of the project. This meticulous work delivered data on the economic reality in terms of use of land and spatial patterns for economic purposes in order to make a comparsion with existing majar statistical databases. This confrontation was aimed for since the hypothesis formulated, questioned the ability of the statistical data to grasp all the (important) characteristics of the (f)actual economic land use. In fact, the hypothesis supposed important gaps that can hinder efficient policy making and planning

Researchers started with an inventory of all visual economic activities, walking or cycling through the streets in particular case study areas, indicated by the project awarding authorities. The method used for inventarisation is an extended version of the one developed for and used in the Brussels Northern Area (Giaretta & Zaman, 2017). For each parcel (based on the digital reference map of Flanders –GRB- indicating buildings, parcels, routes and other geographical and infrastructural features) showing economic use, a number of features were recorded, according to a strict protocol, which was developed in cooperation with policy and planning officials Elements taken into account, were structured into two categories: the firm/activity (dominant activity, activities on the ground floor, activities on the other floors, for rent/sale, physical condition or state of the used space) and characteristics of the parcel or plot (green/blue infrastructure, temporary constructions, temporary use, ramps, number of parking lots, fence, quality of the surfacing, multiple buildings), enriched with pictures in complicated or special situations. This inventory was thematically mapped in different ways, using GIS, respecting the parcel as a unit.

The identification of the different location environments was developed through action research. Therefore a number of stakeholders from practice and policy officials collaborated with the researchers to delimit and label sub-zones within the case study areas. These sub-zones were identified based on particular characteristics in terms of patterns and relationship between different kinds of economic land use and housing.No prior categorisation from literature or former research was taken into account during this phase. The identification of the environments was based on a process of 'out-of-the box' thinking and interpretation based on the patterns emerging through the mapping out of the field inventarisations. Although the aim was to think out of the box, spatial practitionars involved divided the space in more or less ‚known' master-cathegories we recognise from the previous labelling (citycentre, main access road, economic estate, residential area, scattered build up area) and made a subdivision starting from that point.

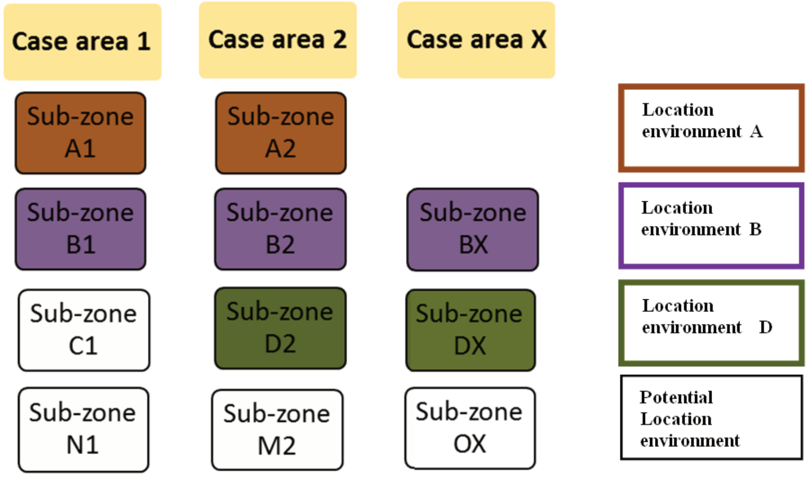

Figure 1: The identification of location environments

4.2 Selection and demarcation of case study areas

Five case areas in Flanders (Belgium) were selected by the project awarding authorities (Figure 2). Each case area is a transect from a high density urban area to a suburban neighbourhood or even a semi-rural zone, in different (types of) regions: coastline (Koksijde)-inland (Veurne) transect, transects in the metropolitan area of the major cities of Antwerp and Ghent, in the medium sized city of Hasselt (and its suburbs), and the smaller city of Aalst (including the area along one arterial or access road) and small towns such as Deinze or Veurne. These choices emerge from experience with a very diverse urban and semi-urban to semi-rural fabric with a very complicated, partly historically built-up tissue in which mixed land use and interweaving is a general phenomenon. The selection is broad enough to cover a diverse range of particular environments that contribute to the differentiated landscape of economic land use and physical as well as functional relationships. Table 1 gives an overview of the particular cases and numbers related to the in-field inventory. From the numbers, one can see that the inventory is very detailed and the information very substantial. Therefore, one can detect several layers of environments with differences between the case study areas but particularly also within case study areas. For sure the cases studies, ‘Wijnegem-Malle’ (transect through the metropolitan area of Antwerp) is partly comparable, partly different from the ‘Deinze-Gent’ case (transect through the metropolitan area of Ghent or the Hasselt case which focusses on the densely populated and economically used city centre with a transect through its suburbs. This again is different from the ‘Aalst-Herzele’ case, studying on old industrial tissue and city centre up to developments along access roads through an urbanized country side while the Koksijde-Veurne case focusses on specific economic uses in areas with a high impact of agriculture (inland) or tourism and services (coastline). By examining the detailed patterns (on a plot level) it becomes clear that differences within the cases are not only prominent but that the previous labelling (centre, main access road, economic estate, residential area) is too vague and general in terms of location milieus for economic activities.

To illustrate this point, we present two exemplary maps. The first one (Figure 4) shows the first identification of rough sub-zones, based on the resulting pattern showing all parcels with an economic use (without distinguish any sub category). The second one (Figure 5) illustrates that clusters of economic activities in one and the same suburban milieu might be very different in terms of economic nature and dedication.

Case	Number of activities	Number of firms	Number of parcels with
Koksijde- Veurne	1235	1054	945
Aalst- Herzele	2194	1714	1519
Hasselt	2680	2187	1686
Deinze- Gent	1118	889	788
Wijnegem- Malle	1263	1149	983
Total for all cases	8490	6993	5921

Table 1: Number of activities, firms and parcels per case area from the inventory

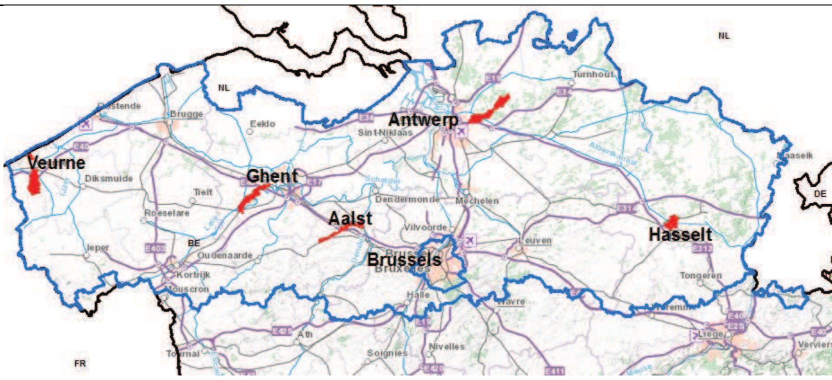

Figure 2: Situation of the five case study areas within Flanders

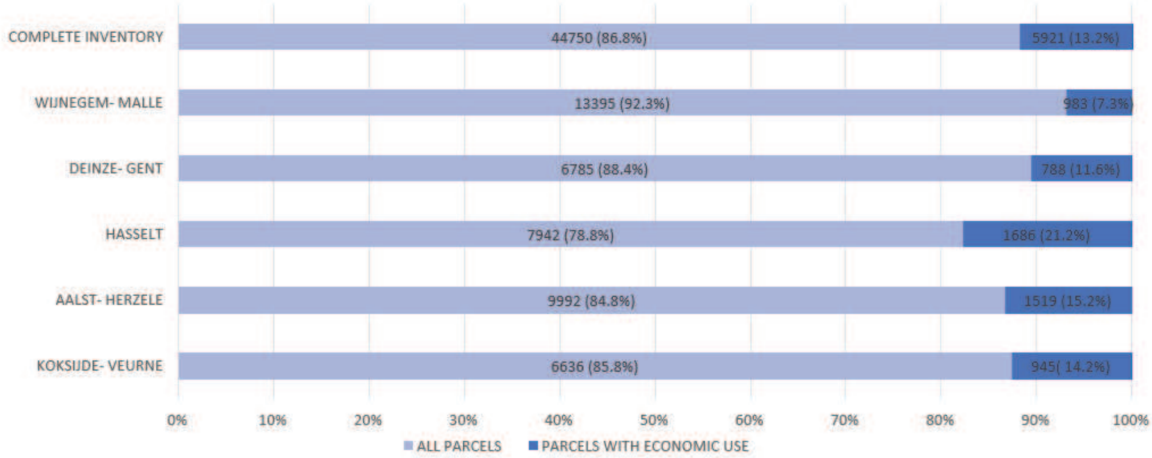

Figure 3: Share of parcels giving proof of economic land use during the inventory

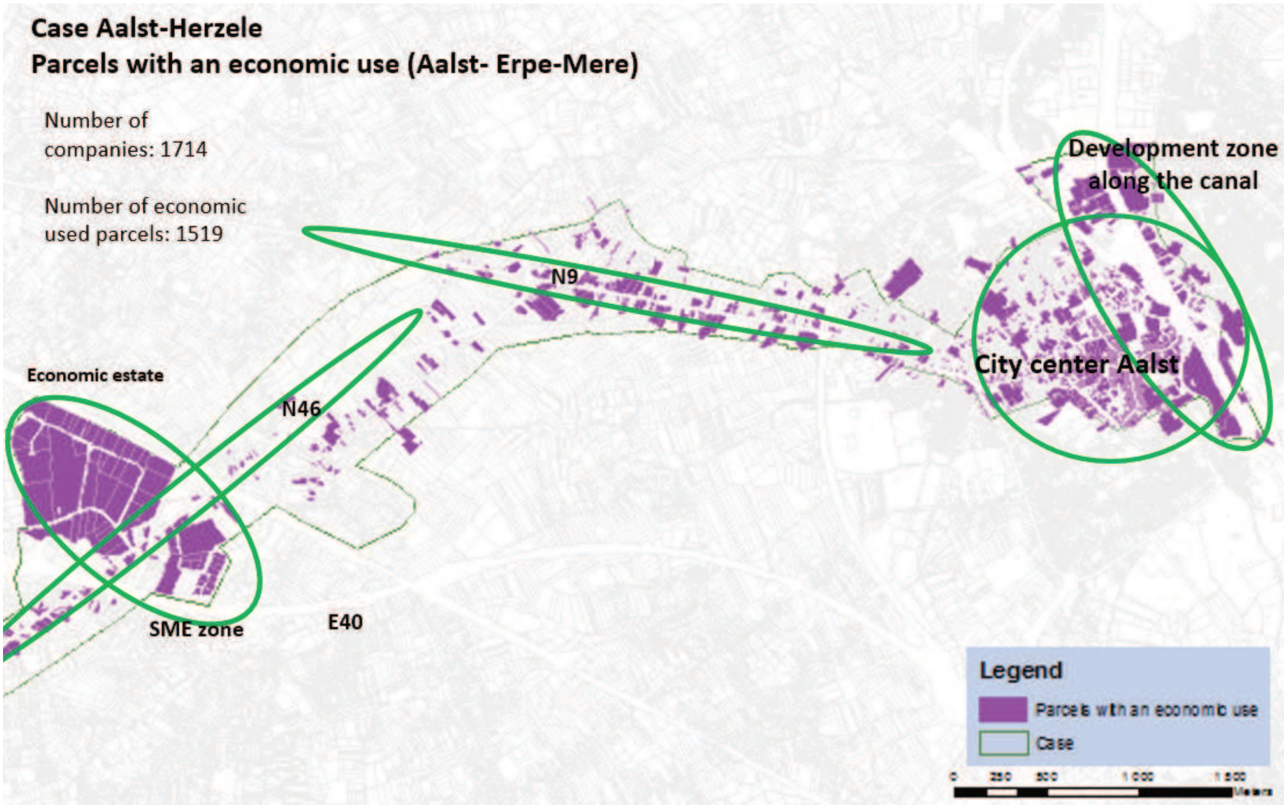

Figure 4: Factual economic use of plots in the Aalst-Herzele case study area

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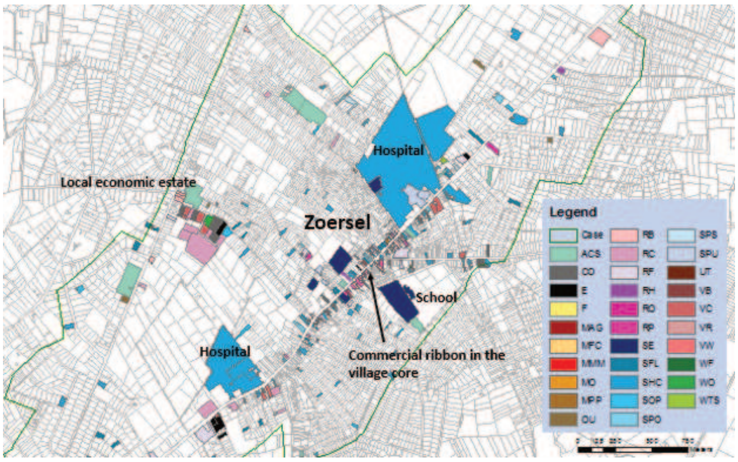

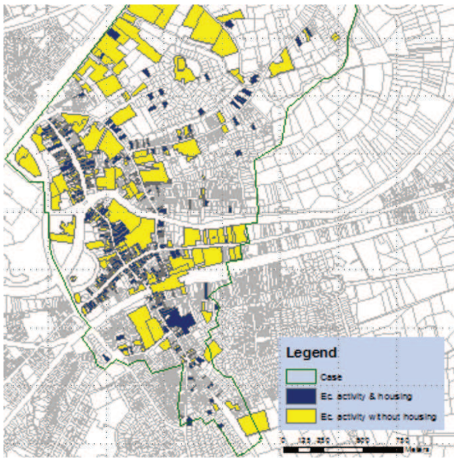

Figure 5: Factual economic use of plots in Zoersel, Figure 6: Economic use combined with housing (Deinze)

The activity codes in the legend are: ACS - Arts, culture and sports; CO - Construction; E - Vacant; F - Faith; MAG - Manufacture/agriculture; MFC - Manufacture/food, drinks and catering; MMM - Manufacture/metals and machinery; MO - Other manufacturing; MPP - Printing and publishing; OU - Unknown; RB - Restaurants and bars; PC - Retail/construction; RF - Retail/food; RH - Hotels and lodging; RO- Other retail; RP - Retail/personal; SE - Services/education; SFL - Services/financial, insurance, legal and consultancy; SHC - Services/healthcare; SOP - Other personal services; SPO - Other professional services; SPS - Public services; UT - Utilities; VB - Vehicle/bicycle; VC - Vehicle/car and trick; VR - Vehicle/rail; VW - Vehicle/water; WF - Wholesale/food; WO - Other wholesale; WTS - Transport and storage.

Of course, other, more sophisticated analyses and combinations with other indicators help the researcher to describe the characteristics of these environments even more indepth. One of those indicators is the combination with housing since it makes a huge difference in terms of density of land use. Figure 5 illustrates such a pattern. This allows, among others, to distinguish more traditional and/or historical and organically grown economic tissues such as shopping streets in cities centres from more artificial and dedicated zoning for economic use in which, housing might be forbidden or tied by strict regulations. The same goes for a combination with the presence of vacant buildings for economic use (production, offices, shops). Another interesting GIS procedure is dissolving adjacent parcels with a similar economic use into 1 feature. This allows for insights in the degree of fragmentation versus concentration.

4.3 Identification of location environments

In line with the analytical logic presented in the previous section and following an action research method with the concepts of interweaving and spatial productivity in mind, eight location milieus could be identified of which two were subdivided. The delineation of the location milieus had to be determined in order to analyse the milieus, but the research team considers this as an open delineation. We tried to summarize the results in the following table (table 2).

We try to illustrate how the summary above is elaborated in detail for the different case by taking some location environments from the Aalst-Herzele case (see also figure 4). In this case, we take Aalst as an exemplary case.

A first location environment is the city or urban centre which, in line with the expectations, is characterized by a high concentration of mixed retail, (ho)reca and services. Aalst responds to that profile with 57% of the economic plots used by retail and horeca and 26% by services. Vacant buildings in the centre are quite common as well (13%). A combination of economic activities and a residential function was recorded in 53% of the economically used plots in this location environment. Even then, detailed patterns can be found, among others that a residential function combined with an economic function, tends to be limited in the real core and characteristic for the 'edges'.

Location environments	Most common econ. activities – broad categorisation	Combined with housing	Vacancy rate	Agglomeration effects[1]	Size of parcels
Urban centres	Approx. 50% of all main economic activities in retail and catering	Approx. 50% of all parcels with an economic function. Big differences between cities	+/- 10%	Concentration of similar economic activities	Small parcels but a large range. Median of approx. 200 m²
High street retail area (urban commercial centres)	Approx. 50-80% of all main economic activities of activities in retail and catering	Approx. 50% of all parcels with an economic use	+/- 10%	Large concentr. of similar economic activities, more specifically retail and catering	Smaller parcels. Median of approx. 180m²
Services along the city belt	>50% of all main economic activities in services	Approx. two third of all parcels with an economic use is combined with housing. Exceptions: bigger parcels with schools, hospitals…	+/- 10%	Mainly adjacent activities in services	In general larger compared to the urban centres. Median of ca. 250 m². Large range and big differences across areas
Residential areas characterized by scattered services	Approx. 2/3 of all main economic activities in services	Approx. 75% of all parcels with an economic function	Close to zero	No concentration; adjacent functions	Large parcels and range. Median of approx. 680 m².
Arterial roads					
Arterial roads characterized by retail and car related business	Economic activities mainly in retail & catering and car related businesses	Approx. one third of all parcels with an economic function	Limited	Limited	Large parcels and range. Median of approx. 1315m²
Arterial roads characterized by services, retail & cat.	Economic activities mainly in retail & catering and services	Approx. 50 percent of all parcels with an economic function.	< 10 %.	Limited	Smaller compared to 'main access roads in general. . Median of approx. 380m²
Smaller centres					
(Village) centre characterized by retail and services	Economic activities mainly in retail & catering and services	Approx. 80% of all parcels with an economic function.	Approx. 6%.	Concentration of similar economic activities	Medium sized parcels. Median of approx. 430 m²
(Village) centre characterized by scattered services	Approx. 50 % of economic activities in services and 25% in retail & catering	Approx. two thirds of all parcels with an economic function	Limited.	Limited	Larger parcels and a large range. Median of approx. 830 m²
Open areas[2]	Mainly agriculture	Approx. 75% of all parcels with an economic function	Limited.	n.a.	Very large parcels and a large range. Median of ca.4600 m²
Business parks	Wholesale and logistics (ca. 25%), services, production, retail & construction	Approx. 100% of all parcels with an economic function	Approx. 8 %.	Large, especially for activities in production/manufacturing.	Very large parcels. Median of approx. 3260 m².

Table 2 Eight location environments delimited (based on field inventory in 5 case study areas)

As can be expected, comparable activities are often situated on adjacent plots, especially retail and reca; therefore if one merge plots from the same 'economic use' category, less than half (49%) of the parcels are left which indicates a low(er) fragmentation/ high(er) concentration of similar economic activities. It is not surprising that this figure drops to 29% if one take the core shopping area only (see Table 2). Nevertheless, it is interesting to notice that this fragmentation is quite different from city to city with, in our research, a range from 41% of parcels left for Hasselt (30% for the core shopping area) and 65% of plots left for Deinze (60% for the core shopping area). The median plot size in Aalst is nearly 170 m² which is fairly small compared to other cities in our research. What is clear from our results is, that a city centre, as a location milieu, has many

[1] Measured in terms of adjacent parcels with the same economic use
[2] Only built-up parcels are inventoried

different appearances. Of course, the urban centre of Aalst shows similarities with other cities such as Hasselt, but important differences can be detected when comparing with Veurne or Deinze. In smaller cities, the mix in the city or town centre seems to be larger. This reveals, at least, that size of the city or town is important, not only in terms of quantity of economic activities but also in qualitative terms, being differences in their locational patterns inside the centre and dominance or weakness of subcategories within the major activity categories such as 'personal services'. But even within the same city size category, the centres may differ quite extensively as was the case between Veurne and Deinze. This can be influenced by the population densities and other characteristics of the catchment area around the city or its functional role on a regional level.

Around a number of inner ring roads, railway stations or particular squares (called a milieu of services along the city belt or in the urban fringe), one can detect a concentration of services, while retail and reca are less dominant (compared to the city centres) or even relatively absent. While, for Aalst, retail and reca drop to 32%, services gain in share, up to 52%. The fragmentation is quite high since merging plots characterised by similar activities, leaves us with 64% of the former number of plots after the procedure was carried out, although the interweaving with other functions and activities is low and just in case we detect interweaving, it might be with vacant economic buildings. On a plot level we notice interweaving among services and between services and vacant economic buildings. Slightly more than 65% of all plots with economic use (in this milieu) are combined with housing, which is in line with the other cities. The median plot size of all economic used plots is 214 m². One can conclude that this milieu is fairly consistent across the different cities and towns in our inventory but differences can be detected between cities of approximately the same size and between bigger and smaller cities. For example, the share of professional services is considerably higher in Hasselt than in Aalst while vacant buildings are more common in Aalst. Further, the diversity of economic activities in this milieu is higher in bigger cities and less in smaller cities while, for the city centre the contrary could be found.

The study revealed a type of location environment labelled 'residential areas with scattered services'. This type of 'milieu' which could be detected in all case study areas, is particularly interesting because of the discrepancy between what could be observed in the field and figures from databases such as VKBO (Flemish database of registered economic activities and firms). This kind of environment can be found near city centres, in residential neighbourhoods along access roads as well as near the centre of urbanised and densely populated villages. From the parcels with economic use, 20% host a medical service function and 16%, a personal service function; all kinds of services constitute a share of 62% while retail and horeca constitute a share of only 19%. The distribution of economic activities is scattered, indicated by a figure of 88% of the plots remaining after merging adjacent parcels that belong to the same activity category. Further, it is not surprising that 73% of the economically used plots are combined with housing, while on very few plots, a combination of several activities could be detected. The median plot size goes up again and attains 677 m².

Main access roads revealed to be a very specific location environment although many differences can be found within this category from a density, activity and plot size perspective. Some particular characteristics in terms of activities can be summarized as follows: i) large mix (no dominant activity), ii) relative absence of personal services; iii) remarkable presence of car related companies (10% of the economically used plots). A percentage of 80% remaining plots after a join of adjacent 'same-activity' plots, indicates rather diversity than fragmentation while only about half (52%) of the plots combine economic activities with a residential function. The importance of this kind of location environment in Flanders on the one hand and its diversity on the other hand, urged the researchers to distinguish two sub-categories: access roads with retail (e.g. furniture and sanitary equipment and other products related to homebuilding, 18%) and car related businesses (16%) on the one hand and access roads with a more mixed profile in which services are more important on the other hand. The former combines economic activities far less (34%) with housing compared to (62%) while the median plot size is much bigger (1315 m² versus 380 m²).

Finally, we would like to give some details about village centres. This type of location environment is abundant in all case study areas and occur repeatedly in different shapes and formats. Not one activity is very dominant but, of course, services (43% of the economically used plots) and retail/horeca (38%) are very important. Within the category of services, personal services are the most important (13%) while within retail, groceries are on top of the list (9%). With personal products' retail (8%) almost as important, one should realize that this location environment is going beyond the provision for every day needs. The percentage of plots kept over a join is 75% which does not indicate a high concentration but not a high fragmentation either. Diversification of activities might explain this figure. Again the researchers opted for a sub-categorisation into village centres with a prominent presence and concentration of retail and reca (often in combination with the location along an important road) and others with spread services.

In this overview, we presented only 5 location milieus in detail. It seems that the remaining (core shopping centres, open area with ca. 50% of the economically used plots being dedicated to agriculture and finally economic estates) milieus are more straightforward and in general less surprising. They have a more specific dedication and focus on certain economic activities. Nevertheless, in next stages, it can be interesting to analyse exactly those activities in these areas that are deviating from the (clear) pattern.

It is worth mentioning that a comparable inventory was done in the fringe of Brussels (commissioned by the same Department of the Flemish government) which explores the actual use of space in a metropolitan area (Giaretta, Pennincx, De Mulder, & Zaman, 2018 (forthcoming). Although comparable location environments can be found, Brussels constitutes another reality in terms of degree of urbanisation and functionalities of the urban tissue.

4.4 The combination of field observations with different data and statistics: gaps and synergies

All too often, one supposes that the existing data(bases) will reveal the complexity (in terms of type) and the location (in terms of milieu) of economic activities and that these data will be able to underpinn policies related to space for economy and the needs of economic actors in space. On a daily basis, policy makers and officials experience that the reality is far more complex than data from databases reveal. Detecting and especially understanding the processes that foster or hinder the interweaving of economic and other activities and understanding location strategies and decisions by economic actors in relation to attitudes and opinions of other stakeholders sharing the same space, is a concern. Nevertheless it is very difficult to ‚proof‘ that there is a gap between the data and the reality in the field. This project allowed for the first time to confront a very detailed field inventory (and resulting spatial pattern) with the pattern emerging from data, and subsequently, answering three questions: i) to what extend are both patterns confirming each other or not, ii) how can existing data enrich the field inventory (e.g. in order to calculate the space productivity) and iii) do policy makers need targeted new data and data collection methods?

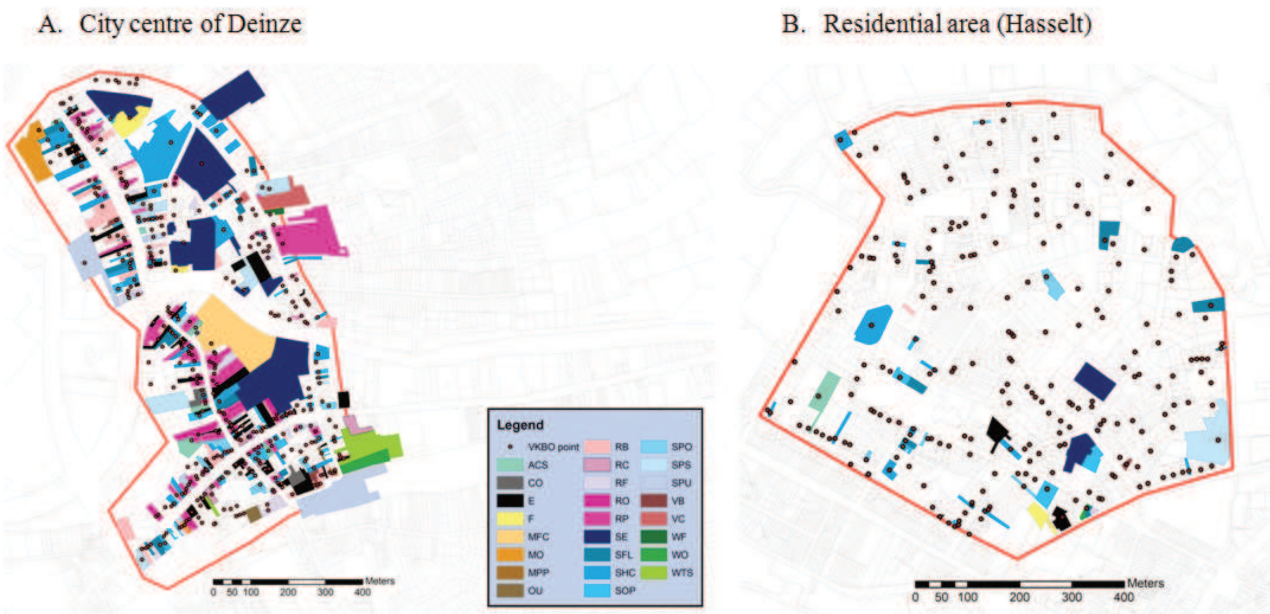

Figure 7: Database address points versus Inventory mapping of visual economic activities

The first question was researched by creating a GIS overlay between registered companies (address points – XY coordinates) in the enriched database of registered economic activities and firms (from VKBO) and the cartographic representation of the inventory of economic activities that could be detected in the field (parcels). The outcome can be threefold: address from the database and plot with economic activity are in line (4206 plots on 8957 address point of firms), we registered a kind of economic activity during the fieldwork but it does not show from the database (1702 plot on 8957) or we have a mapped firm from the

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database without visual appearance in the field (4751 plots on 8957). These differences between case study areas and location environments are considerable but the bottom line is that only 47% of the registered firms matches with the inventory from the field. The main question therefore is: why?

Before reflecting a explanations, we present two illustrative maps, one from a city centre and one from a residential area, illustrating the discrepancy described above (Figure 6).

Some explanations are simple and straight forward. It is possible that an economic activity takes place without leaving a visual indication in the field. This could be the case for small, independent businesses and activities of self-employed. Especially people with the double status of employee and self-employed as a secondary occupation might be registered without a material witness of their (limited) activity. This explains why we have a large amount of mismatches in residential areas (Figure 7). There is also the frequent situation that the registered office is not corresponding with the place where the activity actually takes place. It is common practice that owners of a company register their company at their home address while the activity takes place somewhere else. In the latter –well known- case, the mapping of the database becomes a doubtful source for the real spread of economic activities.

When looking into the situation for the location environment ‚city centres‘ one can conclude that the inventory identified more plots with an economic, compared to the amount of plots one could identify from the database (almost 103% vs. 66% in the inventory as a whole). Consequently, there is a greater convergence between the VKBO and inventory in terms of plots (76,7%) and companies (61,4%), while the discrepancy between these two numbers indicated that the presence of multiple companies on a parcel (e.g. high rise building) are not visible. For ‚core shopping centres‘, the convergence is even stronger, both in terms of plots (93%) and companies (71%). On the other hand (in both environments), around 25% of the activities, seen in the field, could not be found on a corresponding plot in the database. Spatial productivity in city centres is therefore higher than can be detected from the database and one can state that a combination of both is useful to quantify the space productivity in city centres. This is also in line with the situation in the location environment ‚service area at the urban fringe/ along the urban belt‘.

The situation is totally different in the location environment ‚residential areas‘. Only 17% of the parcels identified in the database could be detected during the inventory (and 21% in terms of the amount of companies). But it is surprisingly, that we identified more companies (in numbers) on all detected plots in the inventory than could be expected from the database (102% vs. 76% for the inventory as a whole). Nevertheless, the important mismatch in which it is not even clear if it is about registered offices (with a use of space elsewhere or even nowhere, e.g. in the case of transporation) or a ‚hidden‘ activity, makes the VKBO database less suitable to calculate the space productivity without additional analysis (field research aiming at detecting if an activity is takingplace as well as characteristics of the company).

As for the location environment ‚access roads‘, the convergence between the VKBO and inventory in terms of plots (55%) and companies (50.3%) is only slightly higher compared to the inventory as a whole. At the same time it should be stressed that the share of identified plots which were not found in the database is relatively high (29%), while on parcels where the researchers registered economic activities, there is still a discrepancy in the amount of companies. The usefulness of the VKBO database combined with the inventory is therefore rather limited and not clear-cut. One could suppose that the situation might be less complex in ‚village centres‘ where activities can be seen due to minor densities. However, the convergence between the VKBO and field inventory in only slightly higher, both in terms of plots (58%) and in terms of companies (56%). Besides, it is striking that in a sub-type with spread services, the mismatch in terms of plots with economic activities without a corresponding firm in the database is much higher than in the sub-type with a high concentration of retail and horeca (resp. 34% and 18%).

Ultimately, in the ‚open area‘, we notice an average convergence between the VKBO and inventory, both in terms of plots (47.9%) and in terms of companies (in numbers) (55%). If we just consider the amount of parcels which should indicate a economic activity (according to the VKBO), we detected 82 percent of the plots. This is indicating a high number of plots which were detected on the field but are not identified in the database (41.8%), while at the same time there are plots showing an economic activity which we did not notice on the field. The former is partly a consequence of farms using more than one plot, while this is logically not identified from the VKBO (XY coordinates based on adress). The same is true for the ‚economic estates‘. Merely looking at the numbers, more than 120% of the number of plots (based on the

VKBO) were identified. At the same time, the convergence between the VKBO and the inventory in terms of plots is 77% and 65% in terms of companies. Almost 37% of all plots detected in the inventory could be identified from the VKBO. In practice many of the larger companies use several plots, especially if they carry out more than 1 activity (e.g. production, office & warehouse).

In short, especially a high match between a parcel in economic use being on the inventory and being reflected in the VKBO data, makes the database an instrument to reflect economic space productivity. We summarize this match in table 3.

Location environment/milieu	% parcels in the inventory + in VKBO
City centres	77%
Core shopping centres	93%
Service areas urban fringe	68%
Residential areas	17%
Access roads	55%
Village centres	58%
Open areas	48%
Economic estates	77%

Table 3. Share of the ‚Inventory in the field‘ firms with VKBO match in the total number of firms in VKBO

From Table 3, it is clear that the VKBO database, although very important and one of the main sources on the Flemish companies, its significance for mapping the location patterns of the companies and to detect location environments as well as its value to calculate space productivity is very variable according to the location environment at stake.

5 SOME REFLECTIONS

Let’s start with the contribution of the research outcome to the following policy objective: better and more intensive design of the existing land use which contribute to lowering the pressure on open space. At present in Flanders, an additional 6 hectares a day are taken for the development of housing, economic activities and employment, facilities and infrastructure. The aim is to lower this additional consumption of open space to 3 hectares in 2025 and to stop additional net land take by 2040. Since, in reality, 80% of the Flemish firms is already located outside economic estates but rather in interwoven conditions, the broad policy lines opt for a concentration of functions in urban areas and a general interweaving of functions and activities steered by a coherent vision on space. This implies that the policy makers need instruments to put such a policy in place that go beyond policy for economic development or space for economy. The new instruments should foster the growing tendency to channel new developments towards transformed and revitalized brown fields.

For sure, the outcome of our research presents an multitude of location environments. One of the dividing characteristics is the presence of a residential function. In some areas, the residential function is very important or even dominant, in other environments, housing is relatively rare or absent. The traditional (rigid) instruments cope with the monofunctional situations but proofs not to be sufficient in cases of intensive interweaving and fragmentation, the latter urging for more flexible instruments. This goes in pair with the need for a more context related reflection since not only the instruments are lacking to stimulate interweaving but also insights in the contexts where interweaving can (not) be stimulated. Further one should take into account that interweaving is not limited to a particular scale. One can distinguish at least five levels from a multifunctional use on the regional level, cities and their catchment area, specific location environments, parcels with several activities or a combination of living and working and the individual firm (building).

The study reveals patterns linked to 2D parcel information. Including the third dimension could add additional insights, especially in urban environments where the interweaving of activities may reflect interactions between activities at different floors, or in different parts of the buildings. The field inventory did not allow observations inside buildings. The potential of innovative apporaches, such as crowd sourcing and particpative mapping could be further explored, to fill up this gap.

Our results present the existence of location environments that, in many cases, are dominated by particular economic activities. The hypothesis therefore is, that these particular location environments are suitable for these activities. In other words, location milieus seem to provide the necessary or prefered location factors of specific economic activities. When narrowing the number of location environments to four (city centre, access road, residential area and economic estate), qualitative research added to understanding the location behavior and preference of the firms as prime stakeholders for that matter. From literature and a research on location factors (e.g. Vanneste et al., 2003a, 2003b), we know that accessibility, an affordable plot and/or building, no hinderence by other functions, a pleasant environment (for work and living) accessibilty of permits and welcoming authorities are important but also depending on the nature of the economic activity. In most cases, this information is obtained via a survey; in our case interviews with the firms in the case study areas and workshops with field experts allowed to go much more in detail and understand the economic logic behind the location, the relationship between adjacent firms and the relation (bond) of the firm with the stakeholders in the surrounding area (such as the residents) (Table 4).

As we mentioned in the introduction, the translation of our results into potential starting points for spatial economic policy is beyond the scope of this paper. They do contribute to the understanding of space use for economic activities and the tremendous complexities policy makers are confronted with. It certainly underlines the need to develop new or adapted instruments to measure fragmentation and interweaving in relation to dominant versus mixed economic land use and combinations of economic versus residential use. This research proof very clearly that one of the main statistical resourse, the VKBO database, is only useful in particular situations (location environments) while in other, remote sensing, crowd sourcing, and web data extraction might be appropriate levers to create additional policy-supporting data.

	City centre	Main access road	Economic estate	Residential area
Production	• Mostly small scale activities • Larger activities:historically grown situation	• Suitable, especially for smaller scale companies • Frequently noticed	• Preferred location for most production activities (larger parcels, specific regulation, accessibility	• Historically grown • Not a preferred location for production and vice versa
Wholesale activities	• Suitable, although not too large • Frequently noticed	• Preferred location for most companies due to accessibility and visibility	• Attractive location for wholesale companies if combined with a good accessibility)	• Not a preferred location • Historically grown or small-scale activites
Logistics	• In general not a preferred location due to limited accessibility	• Suitable, especially for smaller scale companies • Frequently noticed	• Preferred location for companies in logistics(size of parcels, accessibility)	• Not a preferred location and vice versa (traffic generation)
Retail/ horeca	• Preferred location for many activities in retail and horeca	• Attractive environment for larger activities (accessibility and visibility)	• Potentially attractive • Reversed: quality of economic estate can be enhanced by adding retail/horeca facilities	• Potentially attractive (small scale activities) • Can improve liveability in certain residential areas
Services (offices)	• Preferred location for offices with a public function	• Preferred location environment for offices (accessibility and visibility)	• In some cases a preferred location for offices (near highways)	• Offices at home (small-scale & self-employed) and other small-scale activities
Services (health, education et cetera.)	• Small scale services (often combined with other services or retail)	• Medium and larged sized services	• Not a preferred location • Large functions (e.g. hospitals) as separate economic estate?	• Small-scale services as medical practices.

Table 4: Relationship location environment – locations factors for six activity categories (KU Leuven, BCI, 2017, based on interviews and expert workshops)

6 REFERENCES

BIO by Deloitte, Institute for Environmental Studies, Amec, Vienna University of Economics and Business (2014). Study supporting potential land targets under the 2014 land communication. Report prepared for the European Commission, Directorate-General for Environment. Luxembourg.

European Commission (2011). Roadmap to a Resource Efficient Europe. COM(2011) 571 final. 2011.

Eurostat (2016). Degree of urbanisation for local administrative units level 2. Urban Audit.

Giaretta, F., Pennincx, I., De Mulder, S., Zaman, J. (2018). Defining economic typologies based on an economic activities database. In Real Corp 2018. (forthcoming)

Giaretta, F., Zaman, J. (2017). Can an economic activities inventory fill the knowledge gap about the economic sector in a policy making process? In: Real Corp 2017. Wien

Gruijthuijsen, W., Vanneste, D., Steenberghen, T., Van Liere, S., Roelofs, B., Verweij, K., Hubers, J. (2017). Segmentatie III: ruimteproductiviteit, verweving en ruimtelijk rendement van economische locaties. Studie uitgevoerd. Report commissioned by the Flemish Department Omgeving en the Agency Innoveren en Ondernemen.

Leinfelder, H., & Pisman, A. (2008). A methodological framework for a political approach of mixed land use, tested in the urbanised region of Flanders, Belgium. Paper presented at the Bridging the divide: celebrating the city.

Pennincx, I., De Mulder, S., & Zaman, J. (2016). Segmentatie van werklocaties toegepast op verschillende uitgangssituaties. In R. Van der Lecq & E. Vanempten (Eds.), Plandag 2016. Verruimen. Ruimte maken met maatschappelijk talent. (pp. 464). Tilburg: Stichting Planologische Discussiedagen.

Sarzynski A., Galster G., Stack L. (2014). Typologies of sprawl: investigating United States metropolitan land use patterns. Urban Geography. Vol. 35, Iss. 1, 48-70.

van Dinteren, J., Muskens, B., Geudens, G., & HaskoningDHV, R. (2015). Segmentatie van werklocaties Vlaanderen, onderzoek uitgevoerd in opdracht van Ruimte Vlaanderen. Retrieved from http://www2.vlaanderen.be/ruimtelijk/onderzoek/studies/AOM1414segmentatie_nov2015.pdf

van Dinteren, J., Muskens, B., Geudens, G., Zaman, J., & Pennincx, I. (2015). Segmentatie van werklocaties. Gezond voor ruimte en economie. Ruimte, 28 dec 2015 - jan feb 2016 (economie), 6.

Vanneste, D., Abraham, F., Cabus, P., Sleuwaegen L. (2003a), Belgische werkgelegenheid. In Een mondialiserende economie. Impact op de micro-economische en de geografisch-territoriale structuur, Federaal Wetenschapsbeleid – Academia Press Gent.

Vanneste, D. m.m.v. De Rijck, T., Laureyssen, I. (2003b), Bedrijvennetwerken, Report commissioned by the Min. Vlaamse Gemeenschap, Departement Economie, SPRE

Vlaamse Regering (2016), Witboek BRV. Samen aan de slag om Vlaanderen te transformeren – een opstap naar een volwaardig omgevingsbeleid, VR 2016 3011 DOC.0852/2QUINQUIES https://www.ruimtelijkeordening.be/Portals/108/BRV/VR20163011WitboekBRV.pdf (2016)

ATTRACTIVE DANUBE Project – Territorial Attractiveness Analysis of the Danube Region

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1 ABSTRACT

Following integrative approach of the European Spatial Development Perspective (ESDP) for achieving balanced and sustainable territorial development in Europe, European Union (EU) has launched the European Observation Network for Territorial Development and Cohesion (ESPON) programme to research and identify integrative territorial evidence models for the different EU development policies monitoring and evaluation. Among the others, territorial evidence model for a territorial attractiveness (TA) monitoring was developed as result of the ESPON's ATTREG project, since TA has been recognized by the different EU policies as one of those complex territorial qualities important for the European competitiveness and territorial cohesion.

Defined as a set of territorial capitals and assets with capacities to retain existing and attract new resources, policy-supported TA is able to create or improve territorial identity –i.e. competitive advantage- needed for reaching inclusive, smart and sustainable development goals on different levels within EU and its cross-border regions.

Thus, targeting the EU Strategy for the Danube Region (EUSDR) goals, and relying on the INTERREG Danube Transnational Programme (DTP) instrument, the Improving Capacities for Enhancing Territorial Attractiveness of the Danube Region (Attractive Danube) project has been launched in 2017 with the aim to build a TA monitoring system in the Danube Region. This system should support both national TA policy priorities identification and monitoring, as well as transnational TA policies coordination among the 11 partner-countries (including Austria) in the Danube macroregion.

The purpose of this paper is to present the initial findings of TA analysis for the Danube Region, using the results achieved during the first year of the Attractive Danube project implementation. The project objectives and activities in 2017 included: 1) data collection for the selected TA indicators, and 2) building national and transnational TA monitoring platforms, namely 11 national TAMPs and transnational CO TAMP. The focus of this paper is on the 22 common TA indicators analysis based on their values collected by the project partners for period 2008-2016. In order for the TA disparities and trends to be identified and, thus, needed TA policy improvements to be defined, methodology applied for this TA indicator analysis was compiled using the approaches elaborated and modelled by the other ESPON projects, namely INTERCO and KITCASP projects. As an initial result, it is found that positive TA cohesion trend was prevailing one and that there was no common TA indicator with strong territorial disparity trend in period 2008-2016.

Therefore, in this paper, after the Attractive Danube project's aim and objectives description, the TA as development concept is presented. Then, methodological approaches to the TA indicators data collection and analysis are defined. Finally, the main results and initial findings of the TA indicators analysis for the Danube Region are presented and interpreted, and general conclusions on possible TA policy improvements towards territorial cohesion and sustainability in future in this macroregion are made.
Keywords: Attractive Danube project, territorial attractiveness analysis and policy management, territorial attractiveness monitoring system, territorial attractiveness, EU policy

2 BACKGROUND

After the introduction of a territorial dimension as an integrative factor of the development vision in Europe by the ESDP (Faludi, 2006), and the later recognition of the territorial cohesion by the Lisbon Treaty, Europe 2020 strategy (URL2) and Territorial Agenda (TA) 2020 (EU, 2011) as the synergistic element for achieving the high competitiveness following the smart, sustainable and inclusive growth goals, the territorial development policies and spatial planning in general got much greater roles in EU, both in science and politics (Servillo et al., 2011).

This focus of the EU, as one of the leading global markets, on the improvement of competitiveness could be connected to the consequences of the last financial crisis in 2008, while territorial cohesion as one of the main goals could be directly linked to the emerging regional disparities following the EU enlargement process. (Servillo et al., 2011; Hanell, 2014) Moreover, advancement in technologies have introduced new – namely, smart- development paradigm, giving thus a new meaning to the sustainable and inclusive growth, as well as different and specific thinking about 'quality of life' or 'quality of place', that is, what is consider to be territorially attractive or competitive for capital, people and resources in general (Servillo et al., 2011).

Therefore, the planners of the EU policies have to take into account these changes in thinking and preferences on different levels in Europe, and to direct the Cohesion Policy instrument (URL7) towards supporting these variations when achieving common EU goals of smart, sustainable and inclusive development in all INTERREG macroregions, while preserving and/or improving EU diversities in general.

Finally, these new expectations from the spatial structures and dynamics in Europe have to be reflected into the ESPON Programme's projects and policy monitoring systems in general (URL1), while making and keeping them standardised, visual, reliable, interactive, on-line and, in general, open to the needs of all territorial development policy focus groups, like decision-makers, planners and public in general. (OECD, 2004; Lindberg and Dubois, 2014; Soria Lara et al., 2015; Walsh et al., 2014; Živković, 2017)

2.1 Attractive Danube project

In the 1st Call of DTP (URL6), under the priority for 'Well-governed Danube Region' and targeting the specific objective 'Improve institutional capacities to tackle major societal challenges', 12 financing project partners from 11 Danube countries[1], and with the total budget of 1,860,000 euros, are implementing the Attractive Danube project to strengthen their policy and democratic capacities for the TA quality management (URL3).

Thus, the aim of the Attractive Danube project is to strengthen multilevel, cross-sectoral and transnational governance and institutional capacities of the policy planners involved in territorial development within the DTP geographic scope, that is, within 11 partner-countries of the Danube Region. Additional aim of the project relates to the improvement of collection, diversity, availability, accessibility and analysis of TA-relevant data by the project partners.

Therefore, recognising lack of a good quality data and data on TA in general as one of the common challenges of the partner-countries for efficient and effective territorial development policy management, both within national boundaries and in the Danube Region in general, next project objectives are specified:

(1) To make TA data available to policy planning stakeholders;

(2) To improve and strengthen multilevel and cross-sector territorial development planning; and

(3) To increase the skills, knowledge and capacities of policy planning stakeholders.

Therefore, the aim of this paper is to present results of the project activities relevant for the achievement of the first of the three specific project objectives, namely building of the TA monitoring platforms on transnational and national levels for collection and management of standardised, reliable and updated TA-relevant data, i.e. indicators, which would be available to all territorial development policy planning stakeholders and public in general. It is expected that national monitoring platforms will inform TA policy process in each partner-country, on one side, while transnational platform would support coordination of national TA policies within the Danube Region, on the other. On this way established TA monitoring network is expected to secure in the short-run efficient and effective evidence-based TA decision-making tool for the general territorial cohesion goal achievement in the Danube Region; in the long-run, this monitoring network should improve TA policy management process in the Danube macroregion by providing the more detailed and specific TA indicators data and benchmarking TA values with those on European and global levels.

In next lines, TA concept adopted within the Attractive Danube project is presented, while later the first insights into TA disparities and trends in the Danube Region, analysing the common TA indicators values for period 2008-2016, are described.

[1] Slovenia (Geodetic Institute of Slovenia - Lead partner), Hungary (Lechner Ltd., EMFIE), Czech Republic (CENIA), Slovakia (TUKE), Germany (aifora GmbH), Bulgaria (BIFORUM), Romania (URBASOFIA), Serbia (IAUS), Croatia (KCKZZ), Montenegro (ISSP), and Bosnia and Herzegovina (FMPU)

3 TERRITORIAL ATTRACTIVENESS

The definition of TA for the Attractive Danube project relies on the ESPON's ATTREG (URL5) and SEE Programme's Attract-SEE projects' results (URL4), which targeting Europe 2020 and TA 2020 goals as well, and it describes it as

"capacity of certain Territorial Capitals and Assets to attract and retain target groups (tourists, residents, migrants and companies/investments) by already existing or developed advantages (environmental, economic and human, anthropic, socio-cultural, and institutional), imposed by relevant policies and their goals." (Živković et al., 2015)

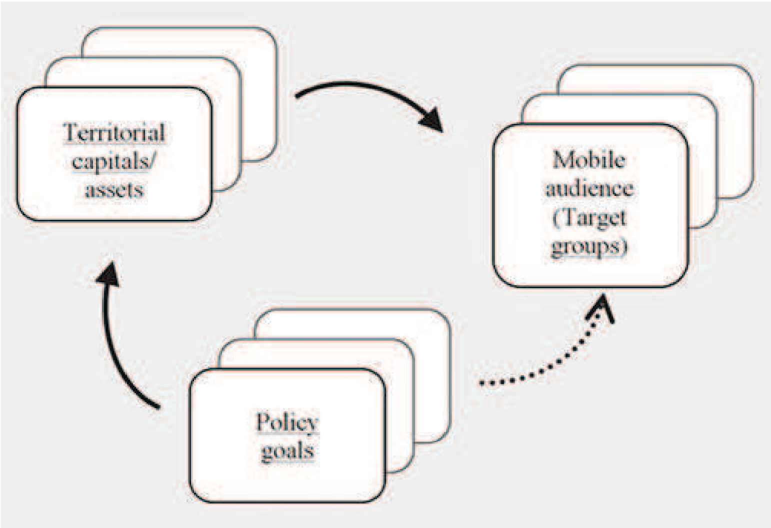

Fig. 1: Territorial attractiveness concept (URL4)

In order for the above identified TA concept (Fig.1) to be measurable and manageable, each territorial capital and asset is described with the several indicators (Table 1.) needed for the regular TA monitoring, both on the national and transnational levels. (Živković et al., 2015; Živković and Barborič, 2017)

During the Attractive Danube project implementation, here identified 22 TA indicators would be applied for standardized and consistent monitoring and coordination of the common, transnational territorial development advantages in the Danube Region, through the selective social, economic, cultural and environmental TA development goals identification and relevant policies integration.

Besides above listed 22 common TA indicators, project partners have selected, defined, collected and processed according to the commonly agreed standard and recommendations from the ESPON's KITCASP project (ESPON, 2013a) also data needed for the country-specific TA indicators, which would support preservation and enhancement of the locally important TA assets and existing EU diversities in general.

In order for the Attractive Danube project results to be sustained and support the next EU programming cycle for period 2020-2027, and to potentially leverage TA concept on the European level, data for selected TA indicators would be collected by the project partners up to 2021, i.e. 3 years after the project ends.

In the next Chapter 4 methodological approach to the TA indicators data collection and their analysis for the evidence-based TA policy measures identification is described. Afterwards, in the Chapters 5 and 6 TA indicators analysis results interpretation and conclusions are presented.

4 METHODOLOGY

Methodology applied for getting the initial insights into the TA disparities between the partner-countries and for the TA trends identification within the Danube Region, included next two steps:

(1) TA indicators data collection; and

(2) TA indicators analysis.

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4.1 Data collection

During the Attractive Danube project 11 national TAMPs and transnational CO-TAMP would be established for the TA monitoring, evidence-based decision-making and relevant territorial development policy process management in the Danube Region.

No.	TERRITORIAL ASSET	TA INDICATOR	TARGET GROUP
		ENVIRONMETAL CAPITAL	
1	Environmental quality	Air pollution: Ozone concentration	tourists, residents, migrants
2		Population connected to urban waste water treatment with at least secondary treatment	
3	Natural resources and energy	Electricity generated from renewable sources	companies/investments, residents
4		Consumption of water per capita	
		ANTHROPIC CAPITAL	
5	Landscape quality	% of terrestrial area protected (total and by ecological region)	tourists, residents
6	Infrastructures	Population (or households) with accessibility to high-speed broadband (1 Mbit/second up and down)	companies/investments, tourists, residents, migrants
		SOCIO-CULTURAL CAPITAL	
7	Culture	European cultural sites on the Unesco World Heritage List, 2010	tourists, residents, migrants
8	Quality of life	Life expectancy at birth by sex (Europe 2020 indicator)	companies/investments, tourists, residents, migrants
9		Gross disposable household income	
10		People at risk of poverty or social exclusion (Europe 2020 indicator) or % in risk of poverty	
		ECONOMIC/HUMAN CAPITAL	
11	Knowledge & Innovation	Population aged 25-64 with tertiary education	companies/investments, residents, migrants
12		Research & Experimental Development expenditure as % of GDP (Europe 2020 indicator)	
13	Employment	Employment rate 20-64 years by sex [%] (regional) (Europe 2020 indicator)	companies/investments, residents, migrants
14		Youth unemployment rate	
15	Specializations / Key sectors	Share of employment by sector	companies/investments
16	Tourism	Number of overnight stays of tourists per capita per year	companies/investments, tourists
17		Share of tourism related employment in total employment	
18	Investment promotion	% of GDP of foreign direct investment	companies/investments, migrants
19	Population	Population growth rate	residents, migrants
20		% of population in age 20-64 years	
21		Ageing index	
		INSTITUTIONAL CAPITAL	
22	International relations	Number of foreign students and/or professors	companies/investments, migrants

Table 1: List of common territorial attractiveness indicators compiled by Attract-SEE project partner-countries from different sources/databases, like Eurostat, OECD, European Commission, European Environmental Agency, United Nations, UNESCO, World Bank, ESPON projects (URL4)

Comparing to the precedent Attract-SEE project, data collected during the Attractive Danube project both for country-specific and 22 common TA indicators would be stored, analysed, managed, visualised and disseminated using the upgraded interactive, online and user-friendly Web GIS application STAGE II (http://cotamp.gis.si/attractive_danube/).

From the technical point of view, STAGE II application (Fig.2) is integrated platform for dissemination of the geospatial statistics.[2] For purpose of the Attractive Danube project, upgraded STAGE II GIS database registry with just aggregating spatial units for Slovenia was extended with the project partners‘ spatial units (Fig.3), which data are stored within the Eurogeographics database.

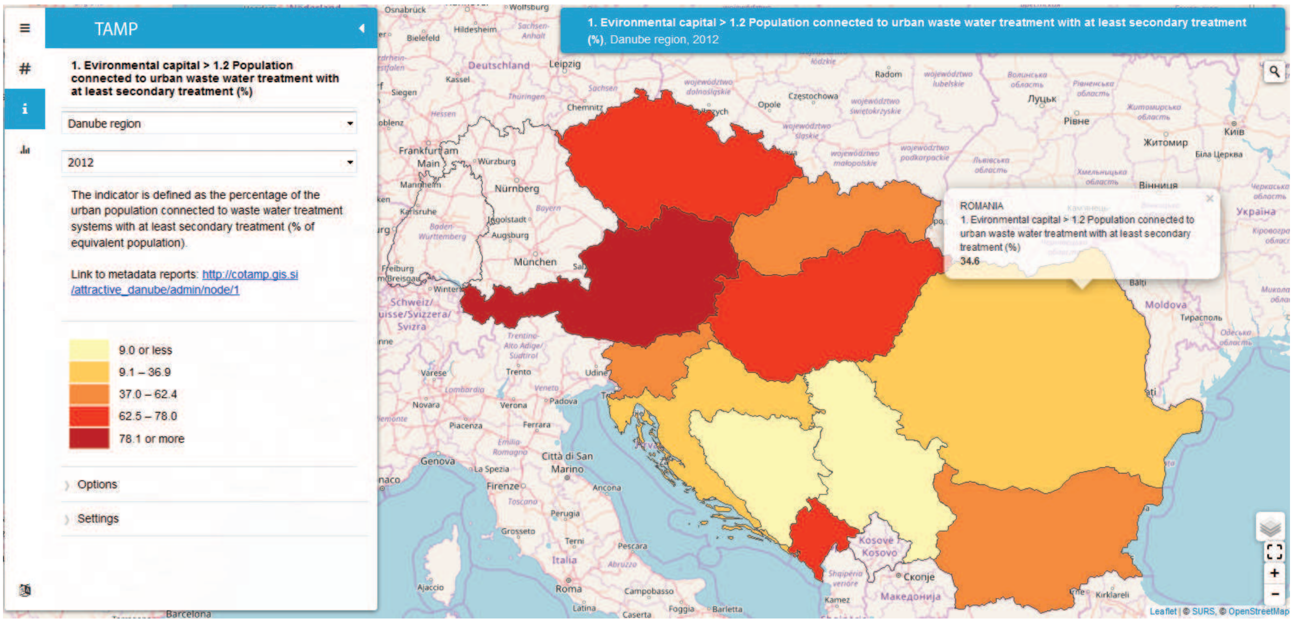

Fig. 2: STAGE II Web-based GIS tool for inserting, monitoring and visualization of TA in Danube Region

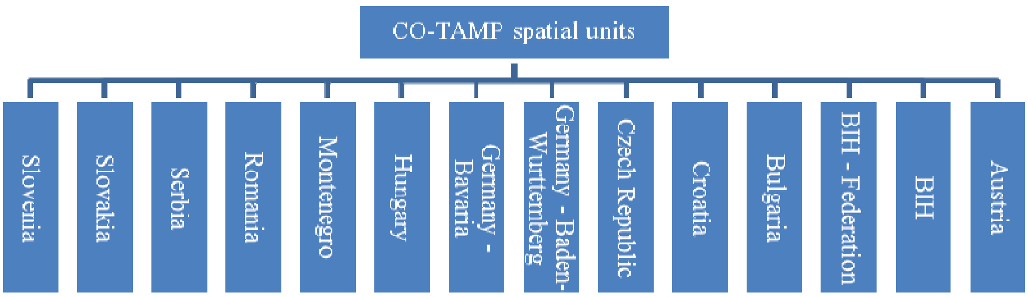

Fig. 3: Spatial units for TA indicators data aggregation within transnational CO-TAMP monitoring platform for Danube Region

Therefore, after the data for national and common TA indicators were collected and processed according to the commonly agreed definition and methods, TA indicators values have been input by the project partners using one of the two methods: 1) by keying-in indicators values directly to the Web GIS application as attribues of the spatial units (NUTS regions) (Fig.2), and 2) by filling indicators values into the Excel table and their later migration to the STAGE II database.

For the purpose of this paper, only common TA indicators values were used in the TA analysis of the Danube Region.

4.2 Indicator analysis

In order for TA analysis for the Danube Region to be performed and multi-year trends to be determined, common TA indicators values for all project partners have been processed and initial findings identified using the selected statistical methods and analysis. These statistical methods and analysis are combined results from the relevant ESPON projects, namely INTERCO (ESPON, 2013b) and KITCASP. According to the recommendations from these two projects, appropriate analysis and presentation of the findings and

[2] This application is developed and maintained by the Geodetic Institute of Slovenia, in association with the Statistical Office of the Republic of Slovenia, and its development was funded by the EUROSTAT

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indicators themselves, which could respond to the territorial development policy planners, decision-makers and public needs, should include several indicator values, trends and their visualisation, i.e. maps with graphs.

Therefore, for getting the initial insight and understanding of TA status in the Danube Region in period 2008-2016, territorial disparities and trends for each of the 22 common TA indicators are calculated using the annual values for all partners' spatial units (Fig.3), and presented here by:

- Linear regression of minimal annual values (Min);
- Linear regression of maximal annual values (Max);
- Linear regression of average annual values (Avg);
- Linear regression of standard deviation of average annual values (StDev); and
- Linear regression of sigma convergence or coefficient of variation of annual values (CV).

After the above values calculation, using the adapted ranges recommended by the INTERCO project (Table 2.), cohesion trends (Cohesion) are defined for each of the 22 common TA indicators.

Territorial cohesion evaluation			
	Territorial disparities/convergence trend		Territorial cohesion trend
$-0.5 < R^2 < 0.5$	weak disparities trend/no clear convergence	▶	stable territorial cohesion
$R^2 = 0.5$ - 0.75	moderate increase in disparities	▼	moderate decrease of territorial cohesion
$R^2 = -0.5$ - -0.75	moderate decrease in disparities	▲	moderate increase of territorial cohesion
$R^2 > 0.75$	strong disparities increase	▼	strong decrease of territorial cohesion
$R^2 < -0.75$	strong disparities decrease	▲	strong increase of territorial cohesion

Table 2: Possible territorial disparities and cohesion trend statuses (adapted from INTERCO project)

Since the STAGE II application is at the moment in a final testing phase, after the improvements and certain adaptations have been made to the initial application database and user-interface, examples of the visualisation (maps with graphs) for the common TA indicators and here performed TA analysis were not available for this paper.

5 RESULTS WITH DISCUSSION

After definition of the methodological approach for TA disparities and trends calculation and presentation, first step in the performed TA analysis included basic data quality assessment for the collected TA indicators values by the all project partners.

During this data quality assessment, data integrity checking included correction of the few omissions in collected TA indicators values, as well as removal of the zero values for missing ones, in order for the statistical analysis functions to work properly and give realistic values.

Also, TA indicators values assessment reveals that in period 2008-2016 data completeness (Data complet.) was the highest for the TA indicator "% of population in age 20-64 years" (94.44%) and the lowest for the "Number of foreign students and/or professors (66.67%), while on average completeness was the highest for the Economic/human capital indicators (87.24%). Overall, average completeness of the collected TA indicators data in period 2008-2016 was 83.49%, which was assumed as enough high completeness for the initial TA indicators analysis performance and results –TA trends- interpretation.

Second step of the TA analysis presented in this paper included indicators values analysis and interpretation of the identified TA disparities and trends in the Danube Region by the TA capitals. (Table 3.)

Here reported imperfect data completeness limits accuracy of calculated indicators values as well as reliability and quality of statistical analysis results interpretation, requiring later additional data collection and processing on side of project partners, including indicators values re-comparison and validation of conclusions made in this paper.

5.1 Environmental capital

Analysis of the 4 common TA indicators in the domain of Environmental capital revealed weak TA disparity trends between partner-countries (Fig.3) in the Danube macroregion. In other words, despite some variations in the TA indicators values during 2008-2016, cohesion levels stayed more-less the same, i.e. stable.

On average, trends for the minimal values, maximal values, average values and standard deviation values for this group of TA indicators were negative or decreasing, producing thus slight overall positive increase in the TA cohesion between the Danube Region countries.

Also, in the period 2008-2016 the biggest change was registered for the water consumption per capita, where both minimal and maximal values for this TA indicator decreased, making registered disparity as well as water consumption per capita in general in the Danube Region to decrease (-0.24). On the other side, due to small increase in the share of population connected to the urban waste water utilities with the secondary treatment in the Danube Region, this TA indicator had the highest disparity between partner-countries in the domain of environmental assets (0.48). Finally, TA disparity trend in the area of renewable sources usage for electricity generation was slightly decreasing, probably due to some partner-countries increased investments in the clean energy production, while number of days with air pollution by ozone kept in period 2008-2016 stable and negative.

While decrease in the consumption of water per capita is positive from the environment protection perspective, special policy measures and priorities should be given in future to enhancement of the air and urban waste water quality, as well as to renewable energy consumption, probably in the form of different financial and other stimuli, like tax exemptions for buying e-cars or tax increase for petrol/diesel cars.

5.2 Anthropic capital

Since slower increase of the protected areas in the Danube Region, where only maximal values increased and minimal stayed stable, TA disparity between the partner-countries for this TA indicator increased just slightly in period 2008-2016, keeping the total cohesion trend stable. However, in future, policy measures are needed for stimulating all Danube countries to expand protected areas, that is, to increase also today's minimal values for this TA indicator.

On the other side, due to the increased investments in high-speed broadband, decrease of disparity among the partner-countries for this TA indicator was enough significant to produce positive moderate increase of cohesion trend in the Danube Region in the same time period.

5.3 Socio-cultural capital

In general, TA indicators analysis for the Socio-cultural capital domain revealed general decrease of TA disparities, that is, increase in TA cohesion within the Danube Region.

This is the result of increased number of the UNESCO sites; increased minimal life expectancy values –both for male and female- due to better health services; and increase in both minimal and maximal values for gross disposable household income in the Danube Region in general in period 2008-2016. However, in the same period, there was on average increase of the population at risk of poverty or social exclusion in the partner-countries.

Also, trends for the minimal, maximal and average values for these TA indicators were positive or increasing, while standard deviation values had negative trends. These trends produced on average moderate decrease in TA disparities, that is, moderate increase in overall TA cohesion.

This means that socio-cultural asset TA capacities within the Danube Region were enhanced in period 2008-2016, so supported by TA policy measures in future these assets could underpin the retention of existing and/or attraction of new people, investments and other development resources.

5.4 Economic/human capital

Also, according to the TA indicators analysis for the Economic/human capital, trends of the minimal, maximal, average and standard deviation values were positive and increasing on average in period 2008-2016, while average TA disparities trends were negative in the same period. This means that TA disparities between countries in domain of economic/human assets decreased, and that TA capacity of the Danube Region became more coherent and improved in general.

Detailed analysis of the common TA indicators for this capital revealed:

- Overall share of the population aged 25-64 with tertiary education increased in the Danube Region, producing strong indicator values convergence (-0.86) and strong positive cohesion trend in the period 2008-2016. In other words, this evenly distributed and educated workforce should present

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strong TA factor for future investments and cohesive and sustainable development of the Danube Region;

- Moderate increase of the cohesion trend for the Research and development expenditure TA indicator was result of increase in both minimal and maximal shares of GDP invested by the partner-countries in the Danube Region between 2008 and 2016. Investments in R&D should be continually supported by policies in the future, since they could attract highly educated people and innovation capabilities to the Danube Region;
- General stable cohesion trend of the employment rate for male aged 20-64 years and slightly moderate decrease of cohesion trend for the employment rate for female aged 20-64 years, despite the strong positive trends of both minimal and maximal values for female employment during 2008-2016. Identified trends are assumed to be results of the previous inequalities between male and female employment among partner-countries in the Danube Region, which should be improved and supported by policies in the future period;
- General stable cohesion trend of the youth unemployment rate in the Danube Region, despite the increase in both minimal and maximal values trends as well as increasing trend of average values for this TA indicator between 2008 and 2016. The problem of youth unemployment should get more attention in the Danube countries policies, since it has direct influence of the other TA indicators values and TA of the Danube Region in general;
- General decrease in the share of employment in I and II sectors and increased employment in III sector, which produced stable TA disparity and cohesion trends among the partner-countries employment in the II sector, on one side, and moderate and strong cohesion trends in employment for I and III sectors respectively in period 2008-2016, on the other side;
- Weak disparity trends and stable cohesion trends for both Number of overnight stays of tourist and Share of tourism related employment TA indicators, where trends for both minimal and maximal values were positively increasing in period 2008-2016. This indicates improved TA and more evenly developed touristic capacities and offer within the Danube Region, as well as positive and stronger orientation of partner-countries to this economic sector probably in future;
- Despite disparities among the partner-countires in domain of % of FDI in GDP, where some Danube countries experienced decrease and others smaller increase of FDI percentage in period 2008-2016, there were increase in both average and standard deviation values for FDI, while cohesion trend stayed still stable;
- Moderate decrease in disparities and increase of cohesion trend for the Population growth rate and % of population in age 20-64 years TA indicators values were probably results of the current migration flows in Europe, where (prevailingly) younger population immigrate to the older –wealthier- EU Member states with better employment opportunities. These trends produced in period 2008-2016 slight decrease and certain balancing of the population growth rate in the Danube region, thus requesting special attention in territorial development policy measures definition in the future; and
- Linked to the previous TA indicators values and trends, the Aging index values in period 2008-2016 revealed the weak disparities and stable cohesion trend among the countries in the Danube Region, due to the notable increasing trend in the values for minimal ageing indices. These indices values demand targeted policy measures to be implemented in order for existing younger population to be retained and new one to be attracted to the Danube Region countries.

5.5 Institutional capital

Since the Institutional capital is measured by (only) one common TA indicator, comparative indicator analysis was impossible to be performed.

However, despite the noticeable TA indicator values increase in period 2008-2016, as well as moderate decrease in TA disparity followed by the strong cohesion trend, it should be noted that data completeness was merely 66.67%. This is because mainly older EU Member States actively participate in the academic/student exchange, supported by relevant EU and national programmes.

No.	TA INDICATOR	TRENDS (R^2) 2008-2016						
	ENVIRONMETAL CAPITAL	Data complet.	Min	Max	Avg	StDev	CV	Cohesion
1	Air pollution: Ozone concentration	73.81%	-0.0308	0.0375	-0.0317	0.3609	0.3477	▶
2	Population connected to urban waste water treatment with at least secondary treatment	71.43%	0.2651	-0.2863	-0.3041	0.0002	0.4814	▶
3	Electricity generated from renewable sources	81.75%	-0.1598	0.6445	0.2620	0.0479	-0.0964	▶
4	Consumption of water per capita	71.43%	-0.7918	-0.4928	-0.8604	-0.6202	-0.2403	▶
	ANTHROPIC CAPITAL	Data complet.	Min	Max	Avg	StDev	CV	Cohesion
5	% of terrestrial area protected (total and by ecological region)	74.60%	0.0000	0.8118	0.6875	0.9065	0.4773	▶
6	Population (or households) with accessibility to high-speed broadband (1 Mbit/second up and down)	92.06%	0.6175	-0.0560	0.9807	-0.9521	-0.9711	▲
	SOCIO-CULTURAL CAPITAL	Data complet.	Min	Max	Avg	StDev	CV	Cohesion
7	European cultural sites on the Unesco World Heritage List, 2010	99.21%	0.3000	0.0000	0.9030	-0.8601	-0.8998	▲
8	Life expectancy at birth by sex (Europe2020 indicator) - male	85.71%	0.9683	0.0005	0.6819	-0.7629	-0.8309	▲
	Life expectancy at birth by sex (Europe2020 indicator) - female	84.92%	0.9942	0.4464	0.6119	-0.8333	-0.8500	▲
9	Gross disposable household income	78.57%	0.3633	0.9409	0.8360	0.6656	0.1760	▶
10	People at risk of poverty or social exclusion (Europe2020 indicator) or % in risk of poverty	69.05%	0.8602	-0.0176	-0.0222	-0.0614	-0.1372	▶
	ECONOMIC/HUMAN CAPITAL	Data complet.	Min	Max	Avg	StDev	CV	Cohesion
11	Population aged 25-64 with tertiary education	84.92%	0.3138	0.7167	0.9125	0.0122	-0.8656	▲
12	Research & Development expenditure as % of GDP (Europe 2020 indicator)	80.16%	0.0538	0.0962	0.4774	0.1607	-0.5924	▲
13	Employment rate 20-64 years by sex [%] (regional) (Europe2020 indicator) - male	93.65%	0.0599	0.4703	0.0093	0.2807	0.4601	▶
	Employment rate 20-64 years by sex [%] (regional) (Europe2020 indicator) - female	93.65%	0.5616	0.9490	0.2166	0.4577	0.5426	▼
14	Youth unemployment rate	93.65%	0.2281	0.0084	0.2671	0.0330	-0.3149	▶
15	Share of employment by sector - I	87.30%	-0.0231	-0.3399	-0.3137	-0.7853	-0.5017	▲
	Share of employment by sector - II	85.71%	-0.7758	-0.8769	-0.6024	-0.0823	0.0682	▶
	Share of employment by sector - III	85.71%	0.8115	0.3543	0.8615	-0.9096	-0.9058	▲
16	Number of overnight stays of tourists per capita per year	89.68%	0.8679	0.5800	0.9203	0.8897	-0.0031	▶
17	Share of tourism related employment in total employment	72.22%	0.4407	0.7873	0.9091	0.4851	-0.0013	▶
18	% of GDP of foreign direct investment	76.98%	-0.2314	0.0589	0.1116	0.4424	0.2038	▶
19	Population growth rate	93.65%	0.0069	-0.1297	-0.2044	-0.0174	-0.5607	▲
20	% of population in age 20-64 years	94.44%	0.5655	0.0875	0.5442	-0.6333	-0.6331	▲
21	Ageing index	89.68%	0.8693	0.0353	0.1809	0.1312	0.0375	▶
	INSTITUTIONAL CAPITAL	Data complet.	Min	Max	Avg	StDev	CV	Cohesion
22	Number of foreign students and/or professors	66.67%	0.5983	0.9785	0.8618	0.0845	-0.7701	▲

Table 3: TA indicators trends within Danube Region in period 2008-2016

5.6 Towards TA policy recommendations

Based on the above TA indicators analysis, TA policy priorities in the future should be directed towards selective and targeted improvements in the domains of all TA capitals and assets within the Danube Region, where partner-countries disparities and specifics should be carefully observed when TA-relevant policy conclusions and decisions are to be made.

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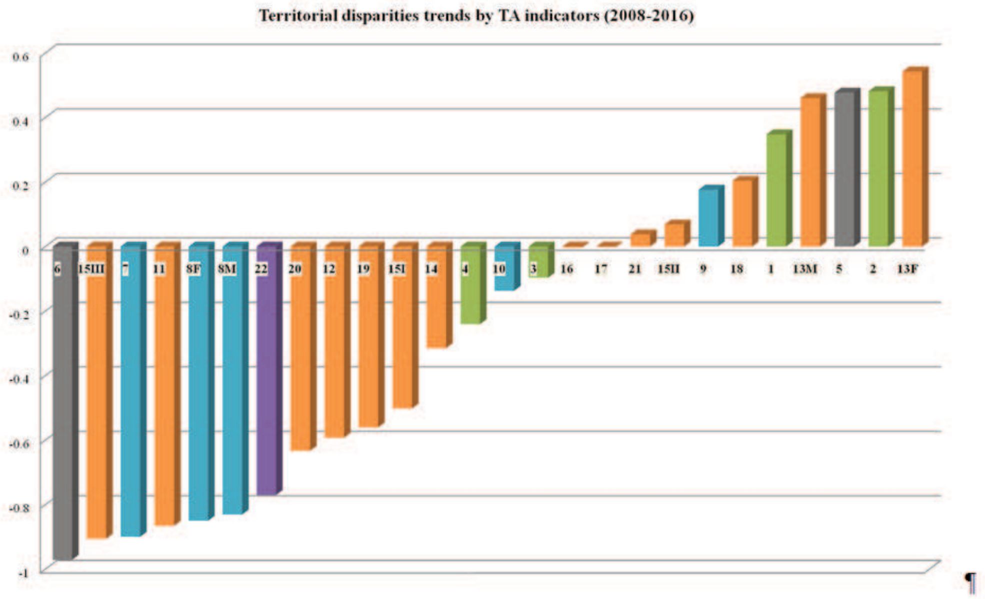

Fig. 4: Territorial disparities trends in period 2008-2016 by TA indicators (TA capitals: ■ Environmental, ■ Anthropic, ■ Socio-cultural, ■ Economic/human, and ■ Institutional)

Although additional insights are needed, performed analysis of the territorial disparities and trends by TA indicators in period 2008-2016 (Fig. 4) points to the need for policy measures mostly within the demography and environmental domains in the Danube region. These are domains where territorial disparities are the biggest and predicted to increase in future in absence of corrective or relevant policy actions. TA indicators for which the territorial disparity trends (CV) are the highest include (in decreasing order):

(1) Employment rate 20-64 years by sex [%] (regional) (Europe2020 indicator) – female,

(2) Population connected to urban waste water treatment with at least secondary treatment,

(3) % of terrestrial area protected (total and by ecological region),

(4) Employment rate 20-64 years by sex [%] (regional) (Europe2020 indicator) – male,

(5) Air pollution: Ozone concentration,

(6) % of GDP of foreign direct investment,

(7) Gross disposable household income,

(8) Share of employment by sector – II, and

(9) Ageing index.

This means that in order for general territorial cohesion goal to be achieved for the TA quality in the Danube Region, TA-relevant policy measures of the Danube countries should be prevailingly focus on the Economic/human and Environmental capitals and assets in the future.

At the same time, achieved positive territorial cohesion trends for the other common TA indicators should be preserved and further improved in accordance to the development context and priority changes within the Danube Region as well as individual partner-countries, targeting the goals and vision of the EUSDR and Europe 2020.

6 CONCLUSIONS

In this paper, initial findings of the TA analysis for the Danube Region in period 2008-2016 are presented. This analysis was performed using the values of 22 TA indicators values collected during the first year of Attractive Danube project implementation, while its methodological approach was based on the recommendations of the two ESPON projects relevant for territorial development policy and spatial planning in general, namely INTERCO and KITCASP projects. Results of this TA indicators analysis are part of the Attractive Danube project activities oriented to the project objective for establishment of the efficient and effective TA monitoring platform for evidence-based decision-making and policy management in the Danube Region.

On one side, TA indicators analysis revealed general territorial cohesion of the Danube Region or, at least, prevailing positive TA cohesion trend and no common TA indicator with strong territorial disparity trend in period 2008-2016. At the same time, outcomes of the TA analysis confirmed that methodology and approach chosen within the Attractive Danube project for the TA monitoring and platforms establishment are appropriate.

For the sustainability of the project results, here used TA indicators data for period 2008-2016 along the TA data that would be collected up to 2021, would be integral part of the transnational CO-TAMP and 11 national TAMPs platforms. It is expected that these TA platforms would be able to timely and efficiently inform TA policy management cycle and support evidence-based decision-making in each project partner country, as well as to support transnational coordination of TA policy priorities between them.
Also, based on the here described analytical results, it is assessed that results in the first year of project implementation provide good basis for the next phases of the Attractive Danube project, and that they would appropriately support planned institutional capacities building necessary for the effective TA policy management and democratic capacities improvement in the Danube Region.

Since the coefficient of variation, used here for the TA disparities and trends calculation, was limited just to the countries within the Danube region, it might be valuable for the Attractive Danube project results to include in the next TA analysis EU-level or other European macroregions' values for the same TA indicators for the benchmarking purposes.

Finally, due to emerging significant regional development disparities in Europe, introduction of the lower-level spatial units within the TA monitoring platforms, especially national TAMPs, should be considered for getting optimal TA analysis results and policy priorities decision-making outcomes in future.

7 LITERATURE

ESPON (2013a) KITCAPS Key Indicators for Territorial Cohesion and Spatial Planning. https://www.espon.eu/export/sites/default/Documents/Projects/TargetedAnalyses/KITCASP/DFR/D._KITCASP_Draft_Final_Report_Appendix_F_Guidelines_for_National_stakeholders_Bound_V3_31.07.13.pdf

ESPON (2013b) INTERCO Indicators of territorial cohesion – Final Report. https://www.espon.eu/export/sites/default/Documents/Projects/ScientificPlatform/Interco/INTERCO_Final-Report_Part-A_Executive-Summary.pdf

EU (2011) Territorial Agenda of the European Union 2020. http://ec.europa.eu/regional_policy/en/information/publications/communications/2011/territorial-agenda-of-the-european-union-2020

FALUDI, Andreas (2006) The European Spatial Development Perspective Shaping the Agenda. European Journal of Spatial Development, No 21. http://www.nordregio.se/Global/EJSD/Refereed%20articles/refereed21.pdf

HANELL, Tomas (2014) Territorial Cohesion in the Baltic Sea Region, Nordregio News Publication Issue. http://www.nordregio.se/Publications/Publications-2014/Monitoring-Territorial-Dynamics/

LINDBERG, Gunnar and DUBOIS, Alexandre (2014) How to Monitor Territorial Dynamics, Nordregio News Publication Issue. http://www.nordregio.se/Publications/Publications-2014/Monitoring-Territorial-Dynamics/

OECD (2004) The spatial monitoring system of the German Federal Office for building and regional planning (BBR) as a tool for political counseling. http://www.oecd.org/site/worldforum/33846622.pdf

SERVILLO, Loris, ATKINSON, Rob, RUSSO, Antonio Paolo (2011) Territorial attractiveness in EU urban and spatial policy: critical review and future research agenda. European Urban and Regional Studies, DOI: 10.1177/0969776411430289, http://journals.sagepub.com/doi/abs/10.1177/0969776411430289

SORIA-LARA, Julio A., ZÚÑIGA-ANTÓN, Maria, PÉREZ-CAMPAÑA, Rocio (2015) European spatial planning observatories and maps: merely spatial databases or also effective tools for planning?. Environment and Planning B: Planning and Design, Vol 42, Issue 5, pp 904 – 929. http://journals.sagepub.com/doi/abs/10.1068/b130200p

URL1: ESPON Inspire Policy Making by Territorial Evidence. https://www.espon.eu/main/

URL2: EUROPE 2020 A strategy for smart, sustainable and inclusive growth. http://ec.europa.eu/eu2020/pdf/COMPLET%20EN%20BARROSO%20%20%20007%20-%20Europe%202020%20-%20EN%20version.pdf

URL3: ATTRACTIVE DANUBE. http://www.interreg-danube.eu/approved-projects/attractive-danube

URL4: ATTRACT-SEE. http://www.attract-see.eu/

URL5: ATTREG. http://www.espon.eu/main/Menu_Projects/Menu_ESPON2013Projects/Menu_AppliedResearch/attreg.html

URL6: Danube Transnational Programme (DTP). http://www.interreg-danube.eu/

URL7: EU Regional or Cohesion Policy. http://ec.europa.eu/regional_policy/en/

WALSH, Cormac, BLAIR, Neale, HETHERINGTON, Jim, GLEESON, Justin (2012) Towards a Spatial Monitoring Framework for the Island of Ireland: a Scoping Study. http://iclrd.org/wp-content/uploads/2012/04/Spatial-Monitoring-Framework-for-the-island-of-Ireland.pdf

ŽIVKOVIĆ, Ljiljana (2017): A Proposal for the Spatial Planning Monitoring System in Serbia, ICCSA 2017

ŽIVKOVIĆ, Ljiljana, BARBORIČ, Blaž (2017) "Attractive Danube" – Improving Capacities for Enhancing Territorial Attractiveness of the Danube Region, REAL CORP 2017, http://programm.corp.at/cdrom2017/papers2017/CORP2017_17.pdf

ISBN 978-3-9504173-4-0 (CD), 978-3-9504173-5-7 (print)
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ŽIVKOVIĆ, Ljiljana, MARANI, Stefano, BERK, Sandi, DEŽMAN KETE, Vesna, TRAPANI, Francesco, ESPOSITO, Gianandrea, ŠPEH, Natalija, MILIĆ, Đorđe, ŽIVANOVIĆ, Tijana, BARBORIČ, Blaž (2015) Towards a Monitoring Information System for Territorial Attractiveness Policy Management in South East Europe. Geodetski vestnik, Vol 59, No 4, Ljubljana, Slovenia, pp 752-766. DOI: 10.15292/geodetski-vestnik.2015.04.752-766, http://issuu.com/mfoski/docs/gv_12015_4

reviewed paper

Automatisierte Detektion von Angsträumen und ihre Auswirkungen auf die nachhaltige Stadtentwicklung

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1 ABSTRACT

In den letzten Jahren ist der Begriff „Angstraum“ immer weiter in den Fokus der Öffentlichkeit gerückt. Um Handlungsempfehlungen für eine nachhaltige Stadtentwicklung geben zu können, gilt es, Räume zu identifizieren, in denen Menschen Angst empfinden. Das Leitthema des vorliegenden Forschungsprojektswar die Entwicklung und Validierung eines Datenmodells zur automatisierten Ableitung von Angsträumen auf Basis von Geoinformationen am Beispiel der Stadt Bochum (NRW). Dafür wurde zunächst auf Basis von Literaturrecherchen ein theoretisches Datenmodell zur systematischen Beschreibung von Angsträumen entwickelt. Anschließend wurde dieses mit vorhandenen Geoinformationen gefüllt, sodass mit Hilfe raumbezogener Analysen potenzielle Angsträume automatisch erzeugt werden konnten. Parallel wurde eine Bürgerbefragung durchgeführt, durch die, anhand von gezielten Fragen, reale Angsträume sowohl räumlich als auch hinsichtlich ihrer wesentlichen Merkmale standardisiert beschrieben wurden. Im Anschluss wurde durch eine Gegenüberstellung der Befragungsergebnisse mit den automatisiert ermittelten Angsträumen eine Validierung des Datenmodells durchgeführt. Durch dieses Vorgehen konnte eine erste Methodik entwickelt werden, um automatisiert aus den in einer Stadtverwaltung zur Verfügung stehenden Geodaten, Bereiche zu identifizieren und zu lokalisieren, in denen ein dringender Handlungsbedarf besteht.

Keywords: Angstraum, Stadtentwicklung, GIS, Nachhaltigkeit, Geodaten, Kommune

2 EINLEITUNG

Im Wahlkampf 2017 in Nordrhein-Westfalen war das Thema Sicherheit nahezu täglich in den Medien und auf Wahlplakaten präsent: „NRW-Landtag streitet über „Angsträume“ und „No-go-Areas“. Innenminister Ralf Jäger (SPD) wehrt sich gegen den Vorwurf der Opposition, er lasse in Nordrhein-Westfalen die Ausbreitung von so genannten „No-go-Areas“ zu. Der Begriff kommt aus dem US-amerikanischen Polizeijargon und beschreibt Stadtteile, in die sich Polizisten nicht mehr reintrauen. […] Jäger räumte aber ein, dass manche Viertel, besonders in den Großstädten, von den Bürgern als „Angsträume“ wahrgenommen würden. „Das ist ein subjektives Empfinden in dunklen Straßenzügen, schlecht einsehbaren Ecken oder Gegenden mit heruntergekommenen Häusern. Die Menschen empfinden diese Viertel als bedrohlich“, so Jäger […].“ (WAZ, 27.01.2017)

Dieser Artikel war Anlass dafür, sich in einem Studienprojektmit der Thematik der Angsträume und ihrer Auswirkungen auf eine nachhaltige Stadtentwicklung zu beschäftigen. Die grundlegende Forschungsfrage war, ob sich Angsträume mithilfe von Geoinformationen automatisiert ermitteln lassen und so die Stadtplanung frühzeitig auf mögliche Problemgebiete aufmerksam gemacht werden kann. Um diese Frage zu beantworten wurde innerhalb des Forschungsprojekts ein theoretisches Datenmodell aus Geodaten für das Untersuchungsgebiet Bochum entwickelt, mit dessen Hilfe Räume, in denen ein erhöhtes Angstpotenzial bestehen könnte, identifiziert werden konnten. Die so ermittelten potenziellen Angsträume wurden mit den Ergebnissen einer ebenfalls im Rahmen des Projekts durchgeführten Bürgerbefragung überprüft. Die Umfrage wurde für das Untersuchungsgebiet Bochum zum Zwecke der Validierung selbst entwickelt, durchgeführt und ausgewertet. Um die Ergebnisse auch auf andere Stadtgebiete oder beliebige Untersuchungsgebiete übertragen zu können, wurde im Anschluss ein eigenständiges GIS-Werkzeug entwickelt. Dieses Werkzeug könnte in der Zukunft bspw. Mitarbeitern der Stadtverwaltung ermöglichen, selbständig eine Analyse durchzuführen und damit mögliche Angsträume zu identifizieren.

3 THEORETISCHER HINTERGRUND

Seit 1950 ist die Anzahl der in Städten lebenden Bevölkerung um mehr als 20 % gestiegen (UN DESA, o. J.). Dieser rasante Anstieg stellt Stadtplaner vor große Herausforderungen und birgt Probleme u. a.

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bezüglich Segregation, Flächeninanspruchnahme, Mobilität oder Luftqualität. Eine nachhaltige Stadtentwicklung betrachtet die Stadt als Ganzes (Umweltbundesamt, 2016). Die Dimensionen der Nachhaltigkeit - Ökologie, Ökonomie und Soziales - sollen dabei in einem interdisziplinären Austausch der beteiligten Fachdisziplinen und Interessensgruppen berücksichtigt werden. Gleichwohl soll zur Erreichung der Globalen Nachhaltigkeitsziele, wie u. a. einer inklusiven, sicheren, widerstandsfähigen und nachhaltigen Gestaltung von Städten und Siedlungen, beigetragen werden (UN, 2015). Das übergeordnete Ziel einer nachhaltigen Stadtentwicklung ist es, eine hohe Lebensqualität für die Bürgerinnen und Bürger zu erreichen, was voraussetzt, dass sich die Bevölkerung in ihrem Lebensumfeld wohl und sicher fühlt.

In der Kriminalitätsforschung spricht man diesbezüglich von einem „subjektiven Sicherheitsgefühl“ bzw. analog einer „Kriminalitätsfurcht“ (Schewe, 2006; LKA, 2006). Die Kriminalitätsfurcht setzt sich aus drei Ebenen zusammen, die immer gemeinsam betrachtet werden müssen um ein realistisches Bild zu erhalten: erstens der personalen Ebene, die durch persönliche Opfererlebnisse hervorgerufen wird, zweitens der Sozial-Kontroll-Ebene, wonach die Kriminalitätsfurcht einen Verlust der informellen sozialen Kontrolle bedeutet, der durch soziale Desorganisation in Gemeinden und Wohnvierteln hervorgerufen wird und drittens in der Soziale-Problem-Perspektive, die durch soziale Konstruktionen und Skandalisierungen von der Politik und den Massenmedien dem Publikum angeboten werden (Boers & Kurz, 1997). Kriminalitätsfurcht beeinträchtigt das Verhalten und die Lebensqualität der Bevölkerung.

In einer Bochumer Studie zu Sicherheit und Sicherheitsgefühl (Feltes, 2016) gaben rund 50 % der Befragten an, dass sie sich nachts in ihrer Wohnumgebung ziemlich bzw. sehr unsicher fühlen. Personen mit Angst neigen z. B. dazu, außerhäusliche Aktivitäten einzuschränken (LKA, 2006). 17 % der Befragten bleiben aus Angst vor Kriminalität abends zu Hause und verlassen ihre Wohnung nicht, 21 % verzichten zum Selbstschutz auf die Benutzung öffentlicher Verkehrsmittel. 24 % der in der Bochumer Studie Befragten tragen eine Waffe, wie Stock, Pfefferspray, Elektroschocker o. ä., 43 % haben besondere Tür- und Fenstersicherungen bzw. Gitter in ihrer Wohnung eingebaut, 16 % haben einen Selbstverteidigungskurs besucht (Feltes, 2016). Die Summe dieser Verhaltensweisen kann zu einem Rückgang sozialer Aktivitäten im öffentlichen Raum führen. Das vermindert wiederum die Sozialkontrolle des öffentlichen Raumes, wodurch die Kriminalitätsfurcht weiter verstärkt wird (LKA, 2006). Diese fehlende Sozialkontrolle eines öffentlichen Raumes führt zu der Entwicklung sog. Angsträume. Typische Angsträume sind Bahnhöfe, Unterführungen, Parks, Tiefgaragen, Hafen- und Bahnhofsgegenden oder dunkle Wege mit viel Gebüsch (vgl. u. a. Adli, 2017). In einer Studie der Stadt Wuppertal (2015) wurden Angsträume kategorisiert in „1. Anlaufpunkte für Nutzerinnen und Nutzer des öffentlichen Personennahverkehr (ÖPNV) (Bsp. Bahnunterführungen, Bahnhöfe, Bushaltestellen usw.), 2. Einrichtungen für den PKW-Verkehr (Bsp. entlegene Parkplätze), 3. unbelebte weiträumige und großflächige Gebiete (Bsp. Gewerbegebiete, Grünflächen usw.), 4. Orte, die besonders von (einzelnen bzw. unbegleiteten) Fußgängerinnen und Fußgängern genutzt werden (Bsp. wenig frequentierte Plätze, Treppenanlagen, Fußgängerzonen, Unterführungen usw.)“ (Stadt Wuppertal, 2015; vgl. auch Kramer 1994; Kasperzak, 2000). Hiller (2010) definiert als Merkmale eines Angstraumes, dass es sich dabei um ein unüberschaubares Gebiet handelt, Versteckmöglichkeiten für mögliche Täter und nicht einsehbare Bereiche vorhanden sind, Blickbeziehungen und Orientierungsmöglichkeiten fehlen, keine Sozialkontrolle und keine Polizeistreifen vor Ort sind, die Beleuchtung mangelhaft ist und der Raum durch Vermüllung, Graffiti und Vandalismus verschmutzt ist. Sozioökonomische Faktoren des Gebiets spielen außerdem eine Rolle. „Insbesondere in sozial benachteiligten Stadtteilen fürchten sich deutlich mehr Bewohner vor Kriminalität“ (LKA, 2006). Diese allgemeinen Merkmale eines Angstraumes wurden im folgenden Verlauf der Studie verwendet, um zu versuchen, ein Modell zur automatisierten Ermittlung von Angsträumen mit Hilfe von Geoinformationen daraus abzuleiten (vgl. Kapitel 4.1).

Die personale Ebene der Kriminalitätsfurcht lässt sich mit dem Gefühl „Angst“ erklären. Angst ist ein „mit Beklemmung, Bedrückung und Erregung einhergehender Gefühlszustand, ein undeutliches Gefühl der Bedrohung“ (Duden, 2018). Häufig wird der Begriff Furcht synonym verwendet. Furcht ist dabei jedoch auf ein konkretes Objekt bezogen, wie z. B. die Angst vor Spinnen. Angst ist hingegen ein unbestimmtes Gefühl, das alleine durch den Gedanken an eine bedrohliche Situation ausgelöst werden kann (Tunner, 2000). Angst und Furcht sind individuelle Emotionen, die von jeder Person, abhängig u. a. von Geschlecht, Alter, kulturellem Hintergrund, Wohnortgröße und Opfererfahrungen unterschiedlich wahrgenommen wird (LKA, 2006). Tatsächlich ist es so, dass die Angst, Opfer eines Verbrechens zu werden, in keinem Verhältnis zur tatsächlichen Gefahr oder Häufigkeit eines Verbrechens steht (Feltes, 2016). Die Angst davor bleibt aber trotzdem bestehen (Adli, 2017). Angst lässt sich nicht wie Körpergröße direkt messen, sondern muss auf Basis von physiologischen, verhaltensmäßigen und subjektiven Auswirkungen ermittelt werden. Nach Becker (2004) stehen dafür Interviews, Beobachtungen und Fragebögen zur Verfügung. Physiologische Auswirkungen von Angst, wie eine Erhöhung von Puls-, Herz- und Atemfrequenz, Zittern, Schwitzen, ein erhöhter Adrenalinspiegel oder ein erhöhter Blutdruck lassen sich mit Hilfe von Sensoren messen und beobachten. Auch das Verhalten von Personen mit Angst lässt sich beobachten und mit Hilfe von Fragebögen als Fremdeinschätzung dokumentieren. Zur Messung von subjektiven Auswirkungen von Angst kommen Fragebögen oder strukturierte Interviews in Frage (Becker, 2004). In der Praxis existieren, insbesondere unter Berücksichtigung moderner Technologien, noch weitere Ansätze zur Messung von Angst, wie z. B. das Messen von Emotionen (vgl. u. a. Beyel et al., 2016), die Ableitung und Verortung von Schlagworten aus Social Media mit Hilfe von Social Media Mining, oder Apps, in die Freiwillige Standort, Uhrzeit und aktuelle Gefühlslage eingeben können. Das Angst- bzw. Unwohl-Gefühl von Personen an verschiedenen Orten wurde in dieser Studie mit Hilfe eines Fragebogens ermittelt (vgl. Kapitel 4.2). Dadurch sollte eine Validierung der mit Hilfe des theoretischen Modells identifizierten Angsträume erfolgen.

Kategorie	**Aspekte**	**Mögliche Datenquelle (Zuständigkeit)**
Architektur	Sichtbarkeit / Einsehbarkeit	Digitales Oberflächenmodell (Stadt Bochum)
	Anteil leerstehender Wohnungen	Zensus 2011 (Statistisches Bundesamt)
	Dichte der Bebauung	3D-Stadtmodell (Stadt Bochum)
Sozialkontrolle	Belebtheit eines Raums	Points of Interest (Regionalverband Ruhr), vgl. Tabelle 2
	Nutzungsfrequenz	Lärmdatensatz (Stadt Bochum)
Versteckmöglichkeiten	Beleuchtung	Beleuchtungsdatensatz (Stadt Bochum)
	Straßenbegleitgrün	Flächennutzungskartierung (Regionalverband Ruhr)
Unangenehme Orte	Unterführungen, Brücken, Tunnel	Basis-DLM (Bezirksregierung Köln)
	Bahnhöfe	
Flächennutzung	Gewerbe- und Industrieflächen	Basis-DLM (Bezirksregierung Köln), Flächennutzungskartierung (Regionalverband Ruhr)
	Bereiche ohne Wohnbebauung	
	Bahnanlagen	
	Grün- und Parkanlagen, Spiel-, Sport- und Freizeitanlagen, Friedhöfe, Kleingärten	
	Landwirtschaftliche Flächen, Wald	
	Verkehrsflächen	
	Flächen für Ver- und Entsorgung	
	Brachflächen	
Soziodemographie	Bevölkerungsdichte	Zensus 2011 (Statistisches Bundesamt)
	Durchschnittsalter der Bevölkerung	
	Anteil an unter 18-Jährigen	
	Anteil an Ausländern	
	Haushaltsgröße	
	Anteil an leerstehenden Wohnungen	

Tabelle 1: Aspekte zur Identifikation von Angsträumen

4 UMSETZUNG

Der erste Schritt der Studie bestand in der Entwicklung eines theoretischen Datenmodells, das auf den o.g. Erkenntnissen einer Literaturrecherche zur Beschreibung von Angsträumen basiert. Dieses Modell wurde mit vorhandenen Geoinformationen gefüllt. Anschließend wurden mit einem Geoinformationssystem räumliche

Analysen durchgeführt, sodass als Ergebnis potenzielle Angsträume einer Stadt automatisiert ermittelt werden konnten. Parallel wurde eine Umfrage entwickelt, mit der es möglich sein sollte, das Datenmodell sowie die ermittelten Angsträume zu validieren.

4.1 Datenmodell und Analysen

4.1.1 Konzeption

Zur Definition eines allgemeingültigen Datenmodells für die Lokalisierung von Angsträumen wurden, unter der Berücksichtigung vorliegender Studien und Untersuchungen zum Thema (vgl. Kapitel 2), im ersten Schritt Kategorien zusammengetragen. Diese sollten dabei jene Umstände wiederspiegeln, die Einflüsse auf die Entwicklung von Angsträumen haben. Als Kategorien wurden die städtebauliche Architektur, das Vorhandensein von Sozialkontrolle, Versteckmöglichkeiten, unangenehme Orte, Flächennutzung sowie soziodemographische Datenfestgelegt. Zu allen aufgestellten Kategorien wurden einzelne Aspekte identifiziert, die als messbare Faktoren in die Analyse eingehen könnten. Für die soziodemographischen Aspekte waren dies z. B. die Bevölkerungsdichte und die verfügbare Wohnfläche pro Bewohner. Daneben wurden auch die möglichen Datenquellen herausgesucht, die für die Berechnung des Modells verwendet werden könnten. Kategorien, Aspekte und mögliche Datenquellen sind in Tabelle 1 zusammengestellt.

4.1.2 Umsetzung

Die automatisierte Ableitung von Angsträumen wurde mit dem Geoinformationssystem ArcGIS for Desktop der Firma ESRI (Environmental Systems Research Institute) durchgeführt. Bei der technischen Umsetzung wurden die Lizenzstufe Basic sowie die Erweiterungen Spatial Analyst und 3D Analyst verwendet. Diese stellen eine Reihe räumlicher Modellierungs- und Analysefunktionen für Raster- und Vektordaten bereit (Tateosian, 2015). Im Allgemeinen wird durch die Bibliothek arcpy der Zugriff auf sämtliche Funktionen und Geoverarbeitungswerkzeuge sowie Erweiterungen ermöglicht, wodurch sie die Hauptkomponente zur Entwicklung von Anwendungen für ArcGIS darstellt (Tateosian, 2015; Zandbergen, 2015).

Vor der Durchführung der Analyse galt es, Vorbedingungen zu definieren. Zum einen wurden zur Begrenzung des Untersuchungsgebiets die Stadtgebietsgrenzen der Stadt Bochum festgelegt. Zum anderen sollte das Ergebnis abschließend ein Rasterbild darstellen, welches das Untersuchungsgebiet komplett überlagert. Die Ausdehnung der einzelnen Gitterzellen und damit die räumliche Auflösung bzw. der Detaillierungsgrad der Analyse, wurde auf 100 m festgelegt. Die zahlreichen Ausgangsdaten lagen mit verschiedenen Wertebereichen und Einheiten vor (Bsp. Meter, Prozent). Daher wurde für die Beschreibung der Angsträume eine einheitliche Skala mit einem Wertebereich zwischen 0 - „Wohlgefühl“ und 100 - „Angstgefühl“ festgelegt, auf das die Ausgangsdaten normiert wurden. Dadurch war es möglich, verschiedene Wertebereiche und Einheiten miteinander zu kombinieren und zu einem Gesamtergebnis zu aggregieren. Für die Darstellung wurde ein Farbverlauf zwischen 0 – „grün“ und 100 – „rot“ festgelegt.

Das Rastergitter, welches für das theoretische Datenmodell als Daten- und Aggregationsgrundlage diente, wurde Mithilfe des Werkzeugs Create Fishnet erzeugt. Die Lage des Gitters wurde an dem übergeordneten Koordinatengitter des Koordinatensystems ETRS89/UTM orientiert. Sämtliche Analysen wurden auf eine feste Ausdehnung bezogen. Dazu wurde die Verarbeitungsausdehnung auf das umschließende Rechteck um alle Polygone des Koordinatengitters festgelegt. Alle erzeugten Zwischenergebnisse wurden auf den Ausschnitt begrenzt und lagen damit exakt übereinander, sodass die Ergebnisse der einzelnen Auswertungen zu einem Gesamtergebnis zusammengefasst werden konnten. Im Folgenden werden ausgewählte Analysen zu den einzelnen Kategorien bzw. Aspekten (vgl. Tabelle 1) näher erläutert.

Die Beleuchtung in den Abendstunden ist ein entscheidender Faktor für die Entstehung von Angsträumen. Von der Stadt Bochum bzw. dem Tiefbauamt wurde für die Analyse ein Datensatz bereitgestellt, in dem sämtliche Leuchteinheiten im gesamten Stadtgebiet enthalten waren. Das Ziel der Analyse war das Ableiten eines Rasterbildes, welches die prozentuale Ausleuchtung pro Zelle beschreibt. Dazu musste zunächst ein spezifischer Lichtkegel um jeden Laternenstandort ermittelt werden. Die gelieferten Daten ließen keinen Rückschluss auf die beleuchtete Fläche zu. Da die einzelnen Laternen entlang einer Straße durchschnittlich einen Abstand von 30 Meter aufweisen, wurde ein Beleuchtungsradius von 15 Metern festgelegt, sodass keine Überlappung stattfindet, aber eine durchgängige Beleuchtung vorhanden ist. Nach der Bildung von entsprechenden Lichtkegelpuffern um die Laternenstandorte konnten die Puffer jeweils zusammengefasst und mit den Polygonen des Zielrasters verschnitten werden. Dadurch konnte für jede Rasterzelle der prozentuale Anteil der beleuchteten Fläche berechnet werden. Es wurde festgelegt, dass eine hohe Ausleuchtung (100 %) Angsträume verhindert und eine fehlende Beleuchtung (0 %) zu Angsträumen führt.

Bei der Betrachtung von Aufenthaltsorten von Personengruppen und der damit verbundenen Sozialkontrolle eines Raumes lassen sich anhand der Klassifizierung von Infrastrukturen Bereiche definieren, die einen Angstraum fördern. Der Regionalverband Ruhr (RVR) führt eine Datenbank über viele Points of Interest (POI). Diese liegen frei verfügbar vor und wurden bereits seitens des RVR in Ober- sowie Unterkategorien unterteilt. Den einzelnen Kategorien lässt sich ein Wert zuordnen, der das Angstpotenzial wiederspiegelt (s. Tabelle 2). Hierbei wurde ein Wertebereich zwischen 0 und 5 gewählt, der den Klassen 0 (0%) = kein Angstraumpotenzial bis 5 (100 %) = hohes Angstraumpotenzial entspricht.

Kategorie	**Unterkategorie**	**Angstpotenzial**
Bildung	Berufskolleg, Schulen	3
Freizeit, Kultur, Tourismus	Spielplätze, Bolzplätze	2
Gesundheit	Psychiatrie	3
Infrastruktur	Bahnhof	4
	Verwaltungen	2
Natur	Friedhöfe, Parkanlagen	3
Sammlung	Denkmal, Sehenswürdigkeit	2
Soziales	Suchtberatungsstelle, Obdachlose, soziale Einrichtungen	5
	Heim, Jugendfreizeitstätten	2
Sport und Wellness	Fußballplatz, Freibad	2

Tabelle 2: Bewerung des Angstraumpotenzials für die POI‘s

Nachdem die Klassifizierung durchgeführt wurde, mussten die punktuell vorliegenden Daten auf die Fläche interpoliert werden, damit anschließend dem Raster Werte zugeordnetwerden können. Dazu wurde wieder das Werkzeug Natural Neighbor genutzt. Das resultierende Raster konnte direkt für die Berechnung der Angsträume weiterverwendet werden.

Einen großen Einfluss auf Angsträume stellen auch die Bewegungsströme dar. Zumeist fühlen sich Personen in Situationen, in denen sie allein sind bzw. sich wenige Personen in ihrem Umfeld bewegen, unwohl (vgl. Kapitel 2). Detaillierte Bewegungsströme für Personen lassen sich jedoch nur mit viel Aufwand, z. B. durch Zählungen oder Auswertungen von Überwachungskameras, umsetzen und werden daher nicht durchgeführt. Stattdessen wurde dieser Aspekt in der vorliegenden Studie mit Hilfe der Lärmkartierung der Stadt Bochum abgebildet. Für Näherungswerte der Bewegungsströme wurde davon ausgegangen, dass an denjenigen Bereichen mit wenig Lärm ein geringer Durchgangsverkehr herrscht und damit wenige Personen auf der Straße sind. Städten und Gemeinden obliegt gemäß EU-Lärmschutzverordnung die Pflicht, sog. Lärmkarten zu erheben. Als Kenngrößen werden dabei die einheitlichen Größen Tag-Abend-Nacht-Lärmindex (L_{DEN}) und Nacht-Lärmindex (L_{NIGHT}) in der Einheit Dezibel (dB) verwendet. Bei der vorliegenden Untersuchung ist der Datensatz der Umgebungslautstärke in der Nacht von Interesse. Dieser gliedert sich in den Nachtlärmpegel der Straße und den des Öffentlichen Personen-Nahverkehrs (ÖPNV). Die Verteilung des Lärms liegt in Polygonen vor, welche direkt mit dem Werkzeug Polygon to Raster in ein Rasterbild überführt werden konnten. Durch die Definition der Verarbeitungsausdehnung und der Angabe der Ziel-Zellgröße von 100 Metern wurde ein Rasterbild entsprechend des Gesamtrasters erzeugt. Da pro Rasterzelle nur ein Wert für die weiteren Analysen genutzt wurde, galt es, den Wert zu identifizieren, der in einer Zelle am häufigsten bzw. flächenmäßig am meisten vertreten ist. Dazu wurden die Flächen entsprechend ihres Lärm-Werts zusammengefasst (Dissolve) und anschließend jeder Zelle der Wert mit der größten Fläche zugeordnet. Abschließend wurde eine Reklassifizierung durchgeführt. Dadurch wurde lauten Bereichen der Wert 0 = kein Angstraumpotenzial und sehr leisen Gebieten mit wenig Verkehr und entsprechend wenig Durchgang von Personen der Wert 100 = hohes Angstraumpotenzial zugeordnet.

Unangenehme, angsteinflößende Orte stellen Brücken, Tunnel und unterirdische Bahnhöfe dar. Diese lassen sich aus dem Datensatz des Basis-DLM filtern. Das Basis-DLM ist lagetreu und für eine Anwendung im Maßstab 1:10.000 erfasst (AdV, 2016). Die Geodaten werden darin in verschiedenen Layern bereitgestellt. Im Layer „Bauwerke im Verkehrsbereich“ sind Brücken und Tunnel und im Layer „Bahnverkehrsanlage“

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Bahnhöfe vorhanden. Bei diesen Bauwerken wurde auf eine prozentuale Einteilung verzichtet, da sie in ihrem gesamten Bereich einen negativen Einfluss auf Angsträume haben. Daher wurden die Rasterzellen mit den Bauwerken verschnitten und denjenigen, die solch ein Bauwerk enthalten, ein Wert von 100 zugewiesen.

Ein weiterer wesentlicher Aspekt istdie Flächennutzung. Dabei ergeben sich bei Flächen entsprechend ihrer Nutzung bzw. der baulichen Anlagen Bereiche, die einen negativen Einfluss erzeugen. Der Regionalverband Ruhr stellt eine Flächennutzungskartierung (FNK) zur Verfügung. Diese stellt das Stadtgebiet Bochum als Flächen mit einer Klassifikation bereit. Im ersten Schritt wurden sämtliche Flächen identifiziert, die negativ zu bewerten sind, wie z. B. Gewerbe- und Industrieflächen oder Brachflächen. Diesen wurde der Wert 100 zugeordnet. Die restlichen Flächen, die keinen Einfluss auf Angsträume haben, erhalten den Wert 0. Dadurch ergibt sich für das Stadtgebiet eine Verteilung der potentiellen Angsträume durch die Flächennutzung.

Im Jahr 2011 wurde der Zensus in Deutschland erhoben. Dabei wurden personenbezogene soziodemographische Merkmale, wie z. B. Alter, Geschlecht und Haushaltsgröße abgefragt. Diese Daten sind frei verfügbar und liegen flächendeckend zu Rasterzellen mit einem Abstand von 1000 Meter bzw. 100 Meter (Einwohnerdichte) aggregiert vor. Für die vorliegende Untersuchung wurden die Attribute Einwohnerdichte, Altersverteilung, Anteil der Unter18-Jährigen an der Gesamtbevölkerung, Anteil Ausländer, Anteil der leerstehenden Wohnungen und die durchschnittliche Wohnfläche je Wohnung ausgewertet. Um die Daten nutzen zu können, wurden diese auf den einheitlichen Wertebereich zwischen 0 und 100 normiert bzw. reklassifiziert. Es wurden zusätzlich die Datensätze transformiert, die nicht die Einheit Prozent aufwiesen sowie die Werte der Wohnfläche, Alter und Einwohner invertiert, da davon auszugehen ist, dass kleinere Wohnungen, geringeres Durchschnittsalter und weniger Einwohner in der Regel einen negativen Einfluss haben und damit zur Entstehung von Angsträumen beitragen. Aufgrund der kleinräumigen Bestimmung der Angsträume wurde zunächst eine Interpolation mit dem Verfahren und Werkzeug Natural Neighbor durchgeführt. Dadurch wurde die räumliche Verteilung abgebildet und es wurde direkt ein Raster erzeugt, welches dem Zielraster in Lage und Auflösung (100 x 100 Meter) entspricht. So wurden aus dem Zensus-Datensatz jeweils ein Raster zu Einwohnerdichte, Altersverteilung, Anteil Ausländer, Anteil der leerstehenden Wohnungen und durchschnittlicher Wohnfläche je Wohnung erstellt.

Durch Versteckmöglichkeiten und enge Wege wird ein ungutes Gefühl erzeugt. Die Sichtbarkeit bildet daher mit einen der wichtigsten Aspekte der Angsträume ab. Für die Berechnung von Sichtbarkeitsanalysen wurde auf das Digitale Oberflächenmodell (DOM) mit einer räumlichen Auflösung von 0,1 Meter zurückgegriffen. Das DOM beschreibt die Oberfläche mit allen darauf befindlichen Objekten (u. a. Häuser, Bäume, Sträucher). Es liegt für das Stadtgebiet flächendeckend vor, eignet sich jedoch aufgrund der großen Datenmenge nicht für die Berechnung des gesamten Untersuchungsraums. Innerhalb des Projekts wurde daher nur ein kleines Testgebiet extrahiert und damit eine Sichtbarkeitsanalyse durchgeführt. Für Sichtbarkeitsanalysen werden Standpunkte benötigt, von denen aus eine Sichtbarkeit bestimmt werden soll (GI Geoinformatik, 2013). Dazu wurden in dem Testgebiet zunächst zufällig alle 50 Meter Punkte generiert. Da viele dieser Standpunkte auf Privatgrundstücken bzw. auf unzugänglichen Flächen lagen, mussten nahezu 75 % wieder entfernt werden. Anschließend wurden mit dem Werkzeug 3D Analyst – Sichtbarkeit die Sichtbarkeit anderer Rasterzellen von den jeweiligen Standpunkten aus erzeugt. Das Ergebnis bildet ein Rasterbild (vgl. Abbildung 1), welches die Sichtbarkeit der einzelnen Rasterzellen anhand der Werte „0“ = nicht sichtbarer und „1 - rot“ = sichtbarerer Bereich unterteilt. Diese Sichtbarkeit kann anschließend auf das Raster übertragen und aggregiert werden sowie für die Analyse genutzt werden. Durch die enorme Berechnungszeit musste der Aspekt der Sichtbarkeit jedoch für das gesamte Untersuchungsgebiet unberücksichtigt bleiben.

Die Dichte der Bebauung könnte ebenfalls zusätzlich noch in das Modell aufgenommen werden. Die Grundlagendaten liegen flächendeckend für Lage und Höhe im 3D-Stadtmodell der Stadt Bochum vor. Zu diesem Zeitpunkt wird aber auf eine Berechnung verzichtet, da ein Indikator schwer zu bestimmen war.

Nachdem alle o. g. Indikatoren, bis auf die Sichtbarkeitsanalysen und die Dichte der Bebauung, flächendeckend bestimmt und daraus ein Rasterbild erzeugt wurde, konnte ein Gesamtergebnis berechnet werden. Dazu wurde aus den übereinanderliegenden Zellwerten, ohne Gewichtung, das arithmetische Mittel gebildet. Alle Indikatoren sind somit zu gleichen Teilen in das Ergebnis eingeflossen. In folgenden

Untersuchungen könnten die einflussreichsten Indikatoren mit Hilfe von Regressionsanalysen ermittelt und so das Ergebnis verbessert werden.

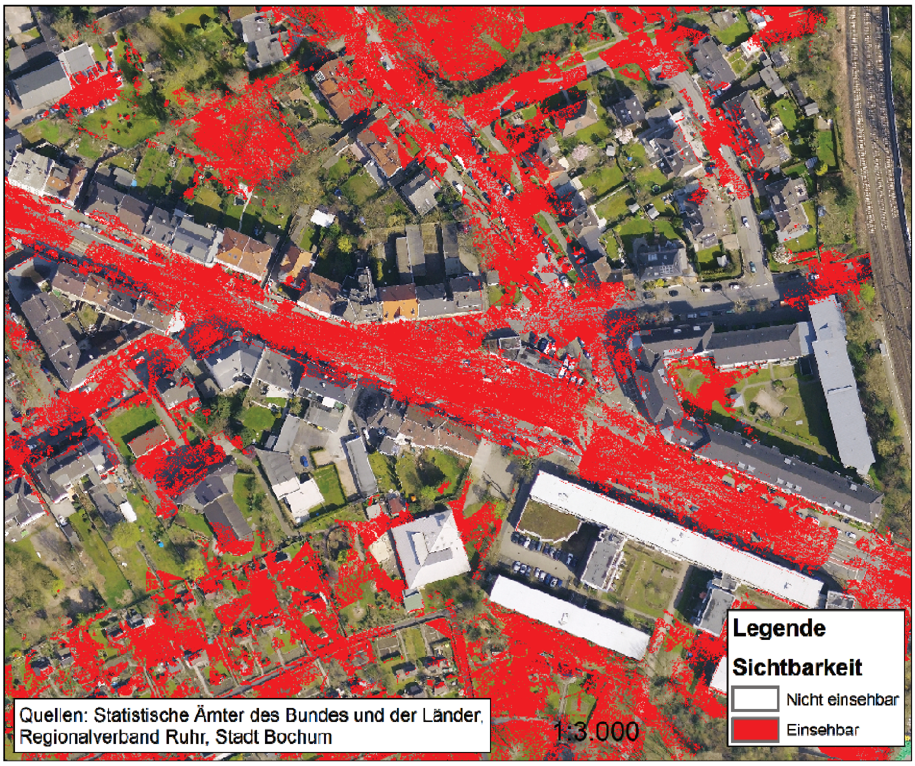

Abbildung 1: Sichtanalyse für das Testgebiet "Hammer Park".

4.1.3 Ergebnisse

Das Ergebnis der Analyse stellt für das Untersuchungsgebiet Bochum ein Rasterbild mit einer Zellgröße von 100 m x 100 m dar. Durch den Wertebereich zwischen 0 und 100 kann eine Einteilung in Prozent angegeben werden. Der Maximalwert einer Zelle, und damit ihr Angstraumpotenzial, beträgt 69 %, der Minimalwert 17 %.

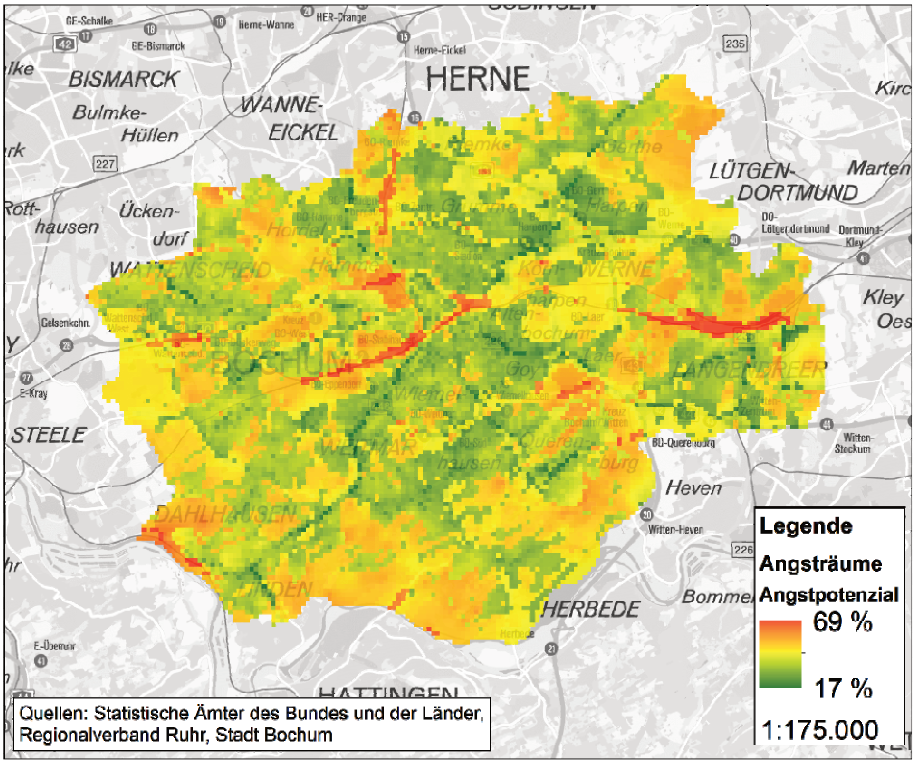

Abbildung. 2: Ergebnis der Angsträume-Analyse

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4.2 Bürgerbefragung

4.2.1 Konzeption der Befragung

Parallel zur Aufstellung des Datenmodells und der Durchführung der zugehörigen Analysen wurde eine Bürgerbefragung durchgeführt. Mit der Umfrage sollten bestehende Angsträume lokalisiert und die Ursachen für das Unwohlsein an diesen Orten identifiziert werden. Es wurde festgelegt, dass aufgrund der starken negativen Assoziationen, die durch den Begriff „Angst" hervorgerufen werden könnten, anstelle dessen das Wort „Unwohl" in der Umfrage verwendet werden soll (vgl. LKA, 2006). Hierdurch konnte der Fragebogen neutraler und lösungsorientierter formuliert werden.

Gegliedert wurde die Umfrage in zwei Teilbereiche. Im ersten Abschnitt sollten Teilnehmer der Befragung Unwohlbereiche im Stadtgebiet Bochum räumlich einordnen und beschreiben. Die Verortung erfolgte mittels einer interaktiven Karte über die Frage „Gibt es in Bochum Bereiche, in denen Sie sich unwohl fühlen" (vgl. Tabelle 3). Im Anschluss sollten die Eigenschaften des Unwohlpunktes näher beschrieben werden. Unter anderem sollte die genaue Gefühlslage an diesem Punkt auf einer Skala von „1 (etwas unwohl)" bis „6 (sehr unwohl)" eingeschätzt werden. Die Einordnung der emotionalen Stimmung sollte in der späteren Ergebnisanalyse eine genauere Unterscheidung der Angsträume ermöglichen. Zusätzlich sollten auch Tageszeiten, an denen Unwohlsein besteht, und Ursachen für die Gefühlslage durch die Teilnehmer genauer beschrieben werden. Die im Fragebogen vorgegebenen Gründe für das Unwohlgefühl, wie u. a. fehlende oder mangelhafte Beleuchtung, Kriminalität, bestimmte Personengruppen, Menschenleere oder nicht einsehbare Bereiche, wurden in Anlehnung an die Studie „Angsträume in Heidelberg - Das Sicherheitsempfinden von Frauen in ihrer Stadt" (Kramer et al., 1994) festgelegt. Außerdem wurde den Befragten die Möglichkeit gegeben, individuelle Gründe zu definieren. Für eine spätere Auswertungen der Angsträume hinsichtlich demographischer Gesichtspunkte wurden die Befragten zudem gebeten, Angaben zum Alter, dem Geschlecht, der Staatsangehörigkeit und zum Wohnort zu machen.

Bei der Definition und Evaluation aller im Fragebogen enthaltenen Fragen wurde ein besonderes Augenmerk darauf gelegt, dass die Fragen prägnant, eindeutig und einfach formuliert waren. Dies sollte zur Anwenderfreundlichkeit des Fragebogens beitragen und dafür sorgen, dass die Umfrage von jeder beliebigen Personengruppe in gleicher Weise beantwortet werden konnte.

Frage		**Antwortmöglichkeiten**
1.1	Gibt es in Bochum Bereiche in denen Sie sich unwohl fühlen?	*Interaktive Lokalisierung auf Karte*
1.2	Wie genau fühlen Sie sich an diesem Ort?	1 (etwas unwohl), … 6 (sehr unwohl)
1.3	Falls Sie sich unwohl fühlen, zu welchen Zeiten ist dies der Fall? *Mehrfachnennung möglich*	Morgens (Dämmerung) Tagsüber Abends (Dämmerung) Nachts
1.4	Was an diesem Ort trägt zum Unwohlsein bei? *Mehrfachnennung möglich*	Fehlende/mangelhafte Beleuchtung Räumliche Gestaltung Kriminalität Bestimmte Personengruppen Menschenleere Nicht einsehbare Bereiche Fehlende Polizeikontrolle Vermüllung Vandalismus Soziales Umfeld

Tabelle 3: Bürgerbefragungen zu Unwohlbereichen im Stadtgebiet Bochum

4.2.2 Umsetzung

Für die Umsetzung und Durchführung der Umfrage wurde die App „Survey123 for ArcGIS" der Firma ESRI gewählt. Diese Anwendung ermöglicht die Erstellung, Durchführung und Auswertung von Umfragen. Maßgebend für die Wahl der Software war, dass „Survey123" das Einbinden einer interaktiven Karte ermöglicht, sodass in der Umfrage geographische Punkte definiert und mit zusätzlichen Informationen versehen werden können. Wichtig war außerdem, dass verschiedene Zugriffsmöglichkeiten existieren um auf veröffentlichte Umfragen zuzugreifen. „Survey123“ ermöglicht unter anderem den Zugriff mit mobilen Endgeräten oder Desktop-PCs über eine native App oder über einen Internetbrowser. Dadurch eignete sich die Anwendung sowohl für eine persönliche Befragung vor Ort als auch für die Verbreitung über soziale Medien (vgl. ESRI, 2017).

Die Kartenapplikation sowie die benötigten Freitexte, Einfach- und Mehrfachauswahlfelder und Dropdowns wurden für die festgelegten Fragen mithilfe des bereitgestellten Web-Designers von „Survey123“ definiert. Mittels des „Drag & Drop“-Prinzips konnten benötigte Elemente schnell und einfach in die Umfrage integriert werden. Um eine möglichst hohe Beteiligung an der Umfrage zu erzielen, wurden die URL und ein zugehöriger QR-Code (Quick Response) zur Umfrage auf der Homepage und in den Social-Media-Kanälen (Bsp. Twitter, Facebook, Instagram) der Hochschule Bochum veröffentlicht. Zusätzlich zu der Onlinebefragung wurde auch eine persönliche Befragung von Passanten in der Innenstadt von Bochum durchgeführt. Durch die Interviews vor Ort sollte zum einen die Anzahl der Stichprobe erhöht werden und andererseits Personengruppen in die Umfrage integriert werden, die durch die bis zu jenem Zeitpunkt aktivierten Publikationskanäle nicht erreicht werden konnten. Nach Beendigung der Umfrage wurden die Ergebnisse der Befragung im File Geodatabase sowie Excel-Format online über die „Survey123“-Plattform heruntergeladen. Statistische Auswertungen wurden anschließend mit Excel, die räumlichen Analysen mittels ArcGIS und des freien Geoinformationssystems QGIS durchgeführt.

4.2.3 Ergebnisse

An der online und im Stadtzentrum von Bochum persönlich durchgeführten Bürgerbefragung haben insgesamt 95 Personen teilgenommen. 48 % der Befragten waren weiblich und 52 % männlich, was eine gute Durchmischung darstellt. Personen aus vier der fünf vorgegebenen Altersgruppen nahmen an der Umfrage teil. Dabei kamen mit 32,6 % Antworten die meisten aus der Gruppe der 16- bis 26-Jährigen. 82 % der Befragten gaben an, in Bochum zu wohnen, die übrigen 18 % kamen aus anderen Großstädten.

Für die Lokalisierung von bestehenden Angsträumen im Untersuchungsgebiet mussten zunächst die definierten Unwohlpunkte und Beschreibungen dieser Räume ausgewertet werden. Durch Vorliegen der Ergebnisse im File-Geodatabase-Format konnten die punktweise definierten Unwohlbereiche in einfacher Form auf einer Karte visualisiert und auf Basis ihrer Beschreibungen analysiert werden. Durch viele Befragte wurden Standorte in der Bochumer Innenstadt, genauer im Bereich um den Hauptbahnhof, als Unwohlbereich definiert.

Bei der Untersuchung der Angsträume war von besonderem Interesse, welche Gründe an den definierten Orten für ein Unwohlsein verantwortlich sind und ob sich diese Gefühle auf eine bestimme Tageszeit beziehen. Im Fragebogen waren zehn Gründe vorgegeben, zudem konnten die Befragten auch individuelle Angaben machen. Die mit Abstand am häufigsten genannte Ursache (23,2 %) waren „bestimmte Personengruppen”. Weitere häufig durch die Befragten genannten Gründe waren „Vermüllung” (10,6 %), „Kriminalität” (10,6 %) und die „räumliche Gestaltung” (9,2 %). Bei der Analyse der Tageszeiten fiel auf, dass das persönliche Unwohlbefinden besonders abends und nachts besteht. Diese Kombination wurde von 36,8 % der Teilnehmer gewählt. Bei 33,6% der Befragten hatte die Tageszeit keinen Einfluss auf das Unwohlgefühl. Es ist an dieser Stelle darauf hinzuweisen, dass die persönlichen Interviews in der Innenstadt stattgefunden haben, sodass möglicherweise die Umfrageergebnisse mit der räumlichen Lage korrelieren.

5 VERGLEICH ERGEBNISSE UND VALIDIERUNG DATENMODELL

Um Erkenntnisse über die Qualität des entwickelten Datenmodells zu erhalten, wurden die aus dem theoretischen Modell abgeleiteten Angsträume mit den definierten Unwohlbereichen aus der Umfrage verglichen. Für den Vergleich wurden zunächst die erstellten Darstellungen aus Kapitel 4 einander gegenübergestellt. Die visuell aufbereiteten Daten der Umfrage wiesen eine klare Konzentration der Unwohlpunkte im Bereich der Bochumer Innenstadt auf. Auch die Darstellungen aus dem theoretischen Modell (Abbildung 2) deuteten auf ein erhöhtes Potenzial von Angsträumen im Innenstadtbereich von Bochum. Eine Übereinstimmung der theoretisch ermittelten und durch die Umfrage erhobenen Angsträume bestand zudem im Bochumer Stadtteil Querenburg, in der Nähe der Universität. Alle per Umfrage ermittelten Angstorte wurden mit dem theoretischen Modell bestätigt. Weitere Befragungen, auch in anderen Stadtteilen, sollen folgen, um die Stichprobengröße zu erhöhen und damit die Validierung des Modells zu verbessern. Des Weiteren sollen in Folgeuntersuchungen die Daten aus der Befragung herangezogen werden, um die Gewichtung der einzelnen Faktoren und den Einfluss von demographischen Kenngrößen herauszuarbeiten.

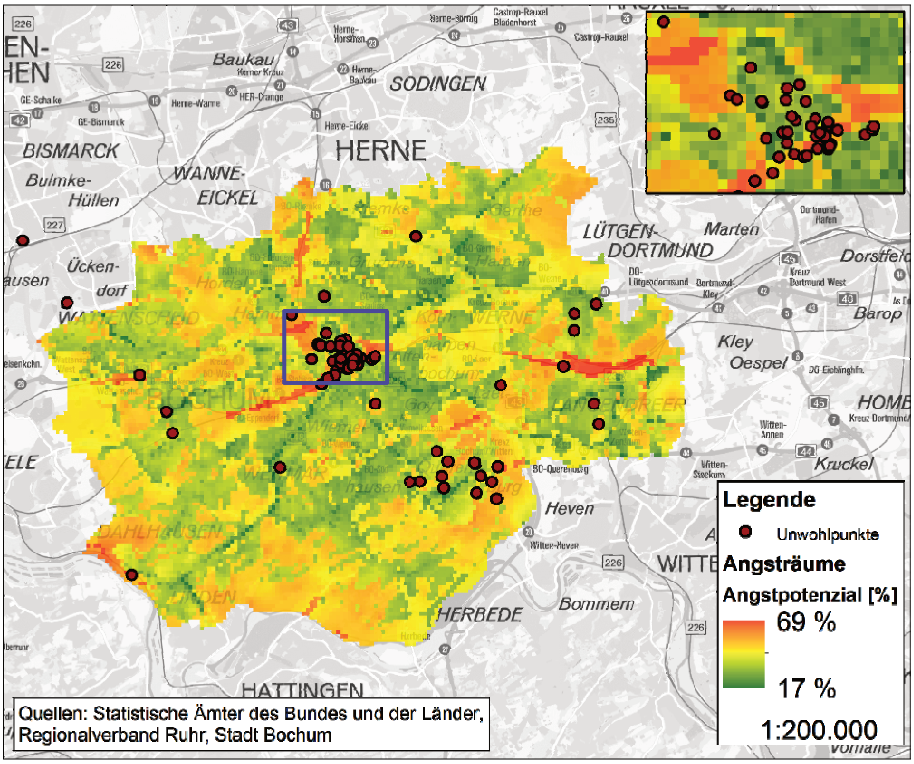

Abbildung 3: Vergleich der Analyse und der Umfrageergebnisse

6 FAZIT

Durch das erstellte GIS-Werkzeug konnte eine erste automatisierten Ermittlung von Angsträumen durchgeführt werden. Als Basis wurden ausschließlich Geodaten verwendet, die zum einen flächendeckend und frei verfügbar sind oder die in den einzelnen Fachabteilungen (Bsp. Amt für Geoinformation, Tiefbauamt) bereits vorliegen. Anhand der Kombination dieser Ausgangdaten konnte ein Rasterbild berechnet werden, welches mit einer prozentualen Skala die Kriminalitätsfurcht der Menschen in der Stadt Bochum wiederspiegelt. Bisher wurde die Thematik der Angsträume bei Stadt- und Regionalentwicklung gar nicht berücksichtigt. Dies begründet sich in der schwierigen Definition von Angsträumen und der fehlenden Datengrundlage. Das Modell bildet einen ersten Ansatz zur Bestimmung solcher Räume. Durch die Verwendung einer einheitlichen Skala und eines fest definierten Untersuchungsbereiches kann das Modell um weitere Faktoren erweitert werden. Bei der Ermittlung von Angsträumen ist die Partizipation von Bürgerinnen und Bürgern ein wesentlicher Faktor. Besonders für die soziale Dimension der Nachhaltigkeit ist es wichtig, dass sich die Menschen in der Stadt wohl fühlen. Daher sollten die Umfragen ebenfalls fester Bestandteil bei der Ermittlung von Angsträumen sein. Schlussendlich bleibt zu sagen, dass weitere, insbesondere interdisziplinäre, Forschungsprojekte über Angsträume durchgeführt werden sollten. Außerdem sollten mehr Städte die Thematik der Angsträume mit in die nachhaltige Stadt- und Regionalplanung integrieren.

7 QUELLENANGABEN

ADLI, M.: Stress and the City. Warum Städte und krank machen. Und warum sie trotzdem gut für uns sind. C. Bertelsmann. 2017

Arbeitsgemeinschaft der Vermessungsverwaltungen der Länder der Bundesrepublik Deutschland: Produktblatt Digitales Basis-Landschaftsmodell. Online verfügbar unter: http://www.adv-online.de/AdV-Produkte/Standards-und-Produktblaetter/Produktblaetter/binarywriterservlet?imgUid=fc770ae7-900f-6eff-de43-50376a112976&uBasVariant=11111111-1111-1111-1111-111111111111 (Abrufdatum 26.02.2018). 2016.

BECKER, J.: Computergestütztes Adaptives Testen (CAT) von Angst entwickelt auf der Grundlage der Item Response Theorie (IRT). Dissertation. Berlin. 2004

BEYEL, S., WILHELM, J., MÜLLER, C., ZEILE, P. & KLEIN, U.: Stresstest städtischer Infrastrukturen – ein Experiment zur Wahrnehmung des Alters im öffentlichen Raum. In: REAL CORP 2017 Tagungsband, 12-14 September 2017, pp. 689-698. Wien, 2017.

BOERS, K. & KURZ, P.: Kriminalitätseinstellungen, soziale Milieus und sozialer Umbruch. In: Boers K., Gutsche G., Sessar K. (eds) Sozialer Umbruch und Kriminalität in Deutschland. VS Verlag für Sozialwissenschaften. Wiesbaden. 1997.

DIN 18005-1: Schallschutz im Städtebau - Teil 1: Grundlagen und Hinweise für die Planung. 2002.

DUDEN: Dudenredaktion: „Angst“ auf Duden online. Online verfügbar unter: https://www.duden.de/rechtschreibung/Angst (Abrufdatum: 26.02.2018). 2018.

ESRI: Survey123 for ArcGIS. Online verfügbar unter: https://survey123.arcgis.com (Abrufdatum: 29.12.2017). 2017.

FELTES, D. T.: Handout zum Pressegespräch am 23. August 2016 im „Bochumer Fenster“. Bochum, 2016

FELTES, D. T.: Sicherheit und Sicherheitsgefühl in Bochum. Online verfügbar unter: http://www.kriminologie.ruhr-uni-bochum.de/images/pdf/Praesentation_Presse_August_2016_finale_Version.pdf (Abrufdatum: 26.02.2018). Bochum, 2016.

GI GEOINFORMATIK GMBH (Hrsg.).: ArcGIS 10.3 Das deutschsprachige Handbuch für ArcGIS for Desktop Basic und Standard mit Funktionen von ArcGIS Online für Desktopanwender. Wichmann. 2013.

HILLER, K.: Sicherheit im Stadtquartier – Angsträume und Präventionsmaßnahmen. , 2010.

KASPERZAK, T.: Stadtstruktur, Kriminalitätsbelastung und Verbrechensfurcht. Darstellung, Analyse und Kritik verbrechensvorbeugender Maßnahmen im Spannungsfeld kriminalgeographischer Erkenntnisse und bauplanerischer Praxis. Dissertation. Freiburg i. Br., 2000.

KRAMER, D. C., MISCHAU, A., FÜG, A., & A. f.: Angsträume in Heidelberg. Das Sicherheitsempfinden von Frauen in ihrer Stadt. Kurzfassung. Online verfügbar unter: https://www.heidelberg.de/site/Heidelberg_ROOT/get/documents_E-1575381299/heidelberg/PB5Documents/pdf/Sicherheitsstudie-Kurzf.p65.pdf (Abrufdatum: 12.01.2018). Heidelberg, 1994

KRAMER, D. C., MISCHAU, A., FÜG, A., & A. f.: Städtische Angst-Räume von Frauen am Beispiel der Stadt Heidelberg. In: ZUMA, Nachrichten 17 (1993), 33, pp. 45-63. Heidelberg, 1994.

LKA, Landeskriminalamt Nordrhein-Westfalen: Individuelle und sozialräumliche Determinanten der Kriminalitätsfurcht. Sekundäranalyse der Allgemeinen Bürgerbefragungen der Polizei in Nordrhein-Westfalen. 2006. Forschungsberichte Nr. 4/2006. Düsseldorf, 2006.

SCHEWE, C. S.: Subjektives Sicherheitsgefühl. In: Lange HJ., Gasch M. (eds) Wörterbuch zur Inneren Sicherheit. VS Verlag für Sozialwissenschaften, S. 322-325. Wiesbaden, 2006.

STADT WUPPERTAL: Angstraumkonzept 2015. Online verfügbar unter: https://www.wuppertal.de/vv/produkte/201/102370100000430335.php.media/626012/2015_02_24_Angstraumkonzept_komplett.pdf (Abrufdatum: 26.02.2018). Wuppertal 2015.

TATEOSIAN, L.: Python For ArcGIS. Springer International Publishing. 2015.

TUNNER, W.: Angst. In: Lexikon der Psychologie. Spektrum Akademischer VerlagHeidelberg.2000.Online verfügbar unter: http://www.spektrum.de/lexikon/psychologie/angst/956 (Abrufdatum 26.02.2018).

UMWELTBUNDESAMT: Stadtentwicklung. Online verfügbar unter: https://www.umweltbundesamt.de/themen/nachhaltigkeit-strategien-internationales/planungsinstrumente/umweltschonende-raumplanung/stadtentwicklung#textpart-1 (Abrufdatum 12.01.2018).Dessau-Roßlau. 2016.

UN DESA: Anteil der in Städten lebenden Bevölkerung in Deutschland und weltweit von 1950 bis 2010 und Prognose bis 2030. In Statista - Das Statistik-Portal. Online verfügbar unter: https://de.statista.com/statistik/daten/studie/152879/umfrage/in-staedten-lebende-bevoelkerung-in-deutschland-und-weltweit/ (Abrufdatum 18.01.2018).

UN, United Nations: Sustainable Development Goals. Online verfügbar unter: http://www.un.org/sustainabledevelopment/sustainable-development-goals/ (Abrufdatum: 26.02.2018). 2015.

WAZ, KORFMANN, M.: NRW-Landtag streitet über „Angsträume“ und „No-go-Areas“. Online verfügbar unter: https://www.waz.de/politik/nrw-landtag-streitet-ueber-angstraeume-und-no-go-areas-id209415527.html (Abrufdatum: 26.02.2018). Düsseldorf, 2017.

ZANDBERGEN, P. A.: Python Scripting for ArcGIS. Redlands, Esri Press. 2015.

ZEILE, P.: Urban Emotions and Realtime Planning Methods. In: REAL CORP 2017 Tagungsband, 12-14 September 2017, pp. 617-624. Wien, 2017.

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Big Data and Knowledge-based Urban System in Tehran

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1 ABSTRACT

Data, information and knowledge are essential sources of decision- making and policy- making processes in urban and regional planning and are considered to be an essential source to achieve urban planning goals. Big data is defined generally with respect to its size but this paper is focused mainly on urban and regional data, that is, data streamed from cities and regions which are regularly related to space and time. Big data has benefits of providing a detailed view of the activity patterns for multiplicity of urban populations, how cities function and can be managed, rather than a general feature by traditional statistics. In this context, application of big data has been rapid expansion in urban and regional studies and planning to cope with uncertainty and provide information requirement of decision- making processes. Appling big data in urban studies and planning processes and the practice of urban planning has been introduced as potential to more effective urban planning a more conscious decision- making.

Metropolitan planning of Tehran faces known and unknown contingencies which could affect the anticipated outcome of the planning system. This shows the necessity of availability to new sources of data in order to cope with inherent uncertainties and constrains posed upon this city's planning practice. The main questions presented by this paper are first, to explore the resources and potential of creating and appling big data –- as a knowledge resource -- in the planning and management system of Tehran, and second, how the applyication of big data affect and facilitate the function of urban planning and management in Tehran? A descriptive-analytic process has been adopted to answer this twofold question: first) tracing the creation and application of big data in urban planning around the world through systematic literature review, and second) analysis the creation and applicability of big data in Tehran planning and management system. This paper is to discuss potentials and challenges of creation, development and application of big data in the planning and management processes with a positive impact to improve urban policy- making in coping with known and unknown contingencies and uncertaitities throuh networking this type of date to other type of information and knowledge to establish a knowledge-based urban system as part of a knowledge management framework.

Keywords: urban planning, Tehran, urban system, knowlegde-based system, big data

2 INTRODUCTION

Urban planning systems are subject to uncertainties that might disrupt their functions and reduce their effectiveness. Such uncertainties may deactivate planning measures in short or long term and extend the challenge of planning in an uncertain world. In metropolises, being the socio-cultural, political, economic, and investment hubs with a multiplicity of planning problems, this challenge is even more intense. Regarding these challenges of providing suitable, complete, available and accurate data and information for planning systems, increasingly large application of big data in planning studies and practices is seen an opportunity for understanding how cities work and how we could manage them more efficient.

Big data is defined mainly with respect to its size and this paper we will focus on "urban and regional" big data, which means data driven from urban and regions and have spatial-temporal dimensions, which in comparison with traditional statistics reveals individual and people-oriented features continually, while traditional ones disclose general features in a specific time intervals.

The necessity of the discussion in this paper is to provide a research background for Tehran urban planning system in its path toward an intelligent city, which is part of its vision for 1404 according to "Tehran Structural-Strategic Plan" (2006). This plan also states that Tehran should provide necessary infrastructures to enhance its livability and global role through becoming a smart, global knowledge-bas city an increasing the ratio of knowledge economy.

The key questions presented by this paper are first, to discover the resources and potentials of creating and applying big data –- as a knowledge resource -- in the planning and management system of Tehran, and second, how the application of big data affect and facilitate the function of urban planning and management in Tehran.

3 LINKING INFORMATION AND KNOWLEDGE WITH URBAN PLANNING AND MANAGEMENT

There are varying -- though in some instances contradictory -- viewpoints about the linkage of information and knowledge and urban management and planning: First is that planning uses knowledge to increase its perception of the object under planning; while the result of such understanding is a greater ability to achieve society's objectives (Harris, 1987); and, second is that planning refers to those activities which lead to the production of information that is produced and then analysed to support decisions made by decision-makers (Hopkins and Schaeffer, 1985). An inference about linking the two is that information plays a central role in planning (Nijkamp& Rietveld, 1989: 232).

4 CONCEPTUAL FRAMEWORK OF BIG DATA IN URBAN MANAGEMENT AND PLANNING

The main areas of discussion of this paper are definition of urban big data, urban planning theory in big data era and resources, roles and applications of big data in urban management and planning. These main areas made conceptual framework of this paper.

4.1 Urban 'big data'

There are many definitions of 'big data' but one of the best is 'any data that cannot fit into an Excel spreadsheet'. This immediately gives one some idea of size. This definition also suggests that big data must be defined in relation to the standard tools that enable it to be processed to some purpose (Batty, 2013 :274). Traditional structured data sets can be thought of as a large cube. big data sets can consist of a large number of rows (or observations) that are described by a large number of fields (or variables). Many big data sets add a third temporal dimension that includes recurring observations over time. Many of these data sets can be joined to variables in other structured data sets using some common identifier. Since many of these records are tagged with geolocation or a time stamp, and sometimes both, time or location can often be used to join otherwise unrelated data sets (French et al, 2015: 194-2).

Urban big data is a massive amount of dynamic and static data generated from the subjects and objects including various urban facilities, organizations, and individuals, which have been being collected and collated by city governments, public institutions, enterprises, and individuals using a new generation information technology. Big data can be shared, integrated, analyzed, and mined to give people a deeper understanding of the status of urban operations and help them make more informed decisions on urban administration with a more scientific approach, thereby optimizing the allocation of urban resources, reducing the operating costs of the urban system, and promoting the safe, efficient, green, harmonious, and intelligent development of the cities as a whole (Pan et al., 2016:172).

4.2 Big data and urban planning theory

contradictory, discussions about the importance of "theory" in the application of big data in urban planning research have been raised: Anderson (2008) has posed the "death of theory" and argued that with the opportunity that of big data offer, we can easily detect the arrangements and correlations amongst different factors in the city and there is no need to figure and use explanatory models. He believes that with the application of big data, planners could put aside the tradition of " developing hypotheses, constructing models, collecting data to test those models" because now they know what people and systems do, without using explanatory theories: "with enough data, the numbers speak for themselves." Others who have tracked this idea that in the era of availability of real data, building model of that system does not make sense.

Other researches are opposed to this idea with the sense that theory could be replaced by the data itself, just when concerning with the short term management of urban systems in which planners could "observe the key parameters and optimize the performance of the system by replying to real time data feeds" (French et al, 2015: 7). Then while explanatory function of big data is beneficial for short-term management, it is inadequate to plan for an uncertain future (Klosterman, 2013). Researches in this line of thinking believe that "big data requires big theory" (west, 2013); data minus theory is worthless. As data become bigger, the amount of fake correlations rises exponentially (Taleb, 2013). Then what we realize from big data must be controlled through the lens of theory (Batty, 2013) which explains how different systems are linked to each other and how they are influenced by exogenous parameters (Batty, 2013). Big data could be used as an assistant in developing and testing theories about how the urban systems mechanisms, but not as an foundation required to plan for an uncertain future (French et al, 2015).

4.3 Urban big data types and acquisition

Urban big data describes the real-time status of various urban elements, including buildings, streets, pipelines, environments, enterprises, finance, commerce, products, markets, logistics, medicine, culture, education, traffic, public order, and population (Pan et al., 2016:172). Urban big data can be categorized into five types: sensor data on urban infrastructure and moving objects, user data on society and humans, governmental administration data, customer and transaction record data, and arts and humanities data (table 1).

Type	Example
Sensor data on urban infrastructure and moving objects	internet of Things; sensor system for managing environments, water, traffic, fuel gas, and buildings; mobile phone; monitoring camera
User data on society and humans	Participatory sensing system, social media, network use, global positioning system (GPS), and online social network
Governmental administration data	Public administration data on transactions, taxes and revenues, payment and registration; basic public data on population, traffic, lands, housing, and geography; confidential micro-data on personal employment, medical treatment, welfare, and education
Customer and transaction record data	Storage card and business records; fleet management system; customer data; data on public utilities and financial institutions; product purchase and service agreement
Arts and humanities data	Text, image, audio, video, language data, artistic and material culture, digital object, and other media

Table 1: type and Examples of urban big data. Source: Pan et al., 2016: 173

The big data can be typically categorized using the three methods below (Pan et al., 2016: 173):

- Supply side of urban functions: Urban big data is categorized in terms of the urban administration systems—that is, the clustering systems of existing urban hierarchy data. This categorization method promotes organizational development.
- Demand side of municipal services: Urban big data is categorized in terms of the stakeholders (e.g., residents, enterprises, non-profit institutions, and governmental organs). Urban big data can be further categorized, thus deriving various urban application service systems. This categorization method serves to promote applications.
- According to the reason for urban data generation: For example, urban big data may be categorized into sensor data based on the urban physical system, data from the economic activities of urban actors, data on the social activities of urban individuals and organizations, data on the scientific and educational activities of urban populations and actors, and data on urban life.

Urban big data can be categorized into five types in data acquisition perspective: GPS Log Data from Handheld GPS Devices, Mobile Phone Data (MPD), Smart Card Data (SCD), GPS Data from Floating Cars (Taxis), Volunteered Geographic Information (VGI).

The advantage of this type of data in comparison with traditional data is that, instead of providing a general statistic of the population in a geographical area, they continuously provide a variety of information about the patterns of individual behavior of a large number of urban and rural residents. Big data category in data acquisition has been described as follows (Hao et al, 2015: 96-100).

4.3.1 GPS Log Data from Handheld GPS Devices

The early application of GPS log data mainly revolved in transport parameter estimation and model calibration. It has advantages of high spatio-temporal precision and collected in realtime.

4.3.2 Mobile Phone Data (MPD)

MPD is the most common type of LBS (location-based services) data, Mobile phone data has advantages of high spatio-temporal precision and no extra equipments, with disadvantages of failing to obtain individual attributes and information bias. Due to large sample size, MPD could well identify urban spatio-temporal charateristics at micro scale as well as meso and macro scale, laying foundation for further spatial analysis and planning practices.

4.3.3 Smart Card Data (SCD)

SCD is traced from public transport, like buses, subways, public bicycles, etc. SCD is a kind of frequently used data with advantages of consistency, mass coverage, complete information and realtime update. Originally, SCD was deployed for bus line optimization, public transport site selection and public transport operation & management. Moreover, it is widely used in analysis of travel spatial distribution, travel distance, travel time, traffic flow and traffic community structure.

4.3.4 GPS Data from Floating Cars (Taxis)

GPS Data from Floating Cars is traced from vehicles equipped with GPS, and stored in text type, covering latitude & longitude, driving period, speed, and direction, etc. In China, floating cars trajectory data is mainly traced from taxis. Due to floating cars having high consistency with roads, GPS Data from Floating Cars (Taxis) has a wide application in analysis of transportation structure, travel pattern and traffic volumn simulation.

4.3.5 Volunteered Geographic Information (VGI)

VGI generates from emergence of online service platform providing geographical location, and it is mainly mined from check-in data from micro blog, search engine, platform for urban services. Since in these platforms, the geographic location of users along with preference, emotion, motivation and satisfaction of individuals has been stored, it is well applied to facilities site selection and evaluation.

Advantages and disadvantages of various types of big data are shown in table 2.

type of data	Advantages	Disadvantages
GPS Log Data from Handheld GPS Devices	(1) High spatio-temporal precision (2) Collected in realtime (3) Missing individual attributes may be partly supplemented by questionnaires and face-toface interviews (4) Overall trips could be obtained	(1) Failing to obtain information of individual attributes (2) Handheld equipments have to be distributed to individuals surveyed (3) Relatively hard to apply to general survey based on large sample size
Mobile Phone Data (MPD)	(1) High spatio-temporal precision (2) No extra equipments (3) Large sample size (4) Overall trips could be obtained	(1) Failing to obtain individual attributes (2) Information bias (3) Missing information may not be compensated
Smart Card Data (SCD)	(1) Consistency (2) Mass coverage (3) Complete information (4) Realtime update	(1) Relatively smaller sample size than MPD (2) Bias between real jobs-housing places and public transportation stations (3) Overall trips fail to be obtained, failing to reveal characteristics of individuals taking other kinds of non-public transportation such as walking and cycling (4) Relatively hard to extend study achievements to all cities (5) Failing to contain individual attributive information
GPS Data from Floating Cars (Taxis)	(1) Collected in realtime (2) Smaller bias between real jobs-housing places and sites of getting on the car and getting off the car than SCD	(1) Lacking high precision (2) Instability (3) Smaller sample size (4) Overall trips fail to be obtained
Volunteered Geographic Information (VGI)	(1) Realize refinement of individual attributive data (2) Well applied to facilities site selection and evaluation	(1) Smaller sample size (2) Information bias

Table 2: Type, advantages and disadvantages of various types of big data. Source: (Hao et al, 2015: 102)

4.4 Application of big data in urban management and planning

Application of urban big data in urban management and planning could be presented in the following categories:

4.4.1 Behavior data acquisition & analysis to recognize travel behavior

Individual behavior and its temporal-spatial changes are one of the main topics of urban planning modelling: Individual behavior data in different spatial time scales could be translated into spatial data. Researches using traditional spatial data, generally emphasizes on static ones, and ignores temporal variations, dynamic continuation, interpolation, and overlapping of temporal data. In these traditional ways, urban planning institutions regularly conduct travel surveys to update their regional "travel demand models". These surveys help them understanding travel behavior in their area and track its changes over time. However, the costs of these surveys, their low response rates, and the time required to perform them, limits their range and frequency. With the use of big data, new mechanisms for collecting travel behavior data can be designed and reinterpreted. Travel behavior is a key component of long-range transport planning, and also these new mechanisms affects planners' ability to predict land use changes (French et al, 2015: 8-9).

4.4.2 Urban disaster management

Traditional urban planning studies and theories mostly have emphasized long-term horizons: In the long run, months and years, what happens to cities. The concept of smart cities, with a focus on understanding the functioning of urban systems in the short-term horizons, has created a significant turning point in this emphasis: the rapid response of the contingency planning system in a very short term horizon. These applications can range from addressing urban transport system disruptions to housing market issues, social services and other services that were previously driven by trial and error practices. For example, the potential of this type of data in crisis management in urban transport systems can be noted: by tracking data from public transit smartcards, a large number of records are available, covering all those who pay for the use of the public transportation system (including buses, subways and trams) using a special type of smart card. This records include the stations that people log in to or from the transit system, and can be recorded in one-day, monthly, multi-month, or annual periods. Although, due to the fact that not all users use these types of cards, the comprehensiveness of the data set decreases, and it is questioned who does not use these cards (for example, tourists, casual users, those who do not afford paying for these cards, etc.), but the data available is very significant in terms of where usually users are logged in and where they leave the transportation system. Such data are potentially useful for detecting systemic disruptions of the system or selecting alternative paths at the time of any disruption in a part of the system (Batty, 2013: 227).

4.4.3 Spatial analysis

Using big data can directly describe the flow of space in cities and between cities and draw a complete, dynamic picture of urban and regional spatial structure. Researchers can represent the economic and social links between cities using mobile data and volunteer geographic data. Traditional methods of data collection on urban form and structure are mainly based on qualitative methods such as image interpretation, land use analysis and visualization, and questionnaire surveys. These methods are not capable of responding to the challenge of increasing uncertainty urban spaces. Using big data can support a dynamic urban space research and map out the complexity, mobility, and ambiguity of these spaces (Hao et al, 2015: 111-112).

4.4.4 Better Understanding of urban activity systems

Urban systems consist of more than just their infrastructure and transportation networks. Instead, these systems are comprised of a complex combination of land uses which changes over time, but at a slower rate of infrastructure and transportation patterns. For this reason, determining the land use patterns over time is more complicated from managing the flows on a transportation network and needs a theoretical foundation of how several systems are linked to each other and how they are influenced by exogenous parameters. (Batty, 2013).

Chapin and his associates (1979) theory of urban activity systems could be an option for this foundation: this theory describes how d urban landscape shapes the behavior of urban occupants. A household locates itself in to meet those needs and also regarding its budget constraints. Similarly, firms locate their offices to balance their needs to access to raw materials on one hand, and to workers and customers on the other hand.

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In the short time these actors work within a fixed pattern of land uses and infrastructure. But, over time the urban areas size, shape and form will change and the urban planners and policy makers system could form the urban landscape to make it easier for actors to meet their needs; they could make it “more user friendly” over time through infrastructure investments and changes in the land use pattern. Urban big data could be the suitable means to collect the data essential to comprehend these complex patterns.

Traditionally urban management systems have made planning decisions using partial data and basic understanding of how several parameters interact. Such decisions but it also unwanted consequences, like the social isolation, increased energy use, and other environmental impacts. (Duany and Plater-Zyberg, 2001). But applying urban big data offers the chance to realize these systems by details and to find correlation and causality that was simply not possible with occasional sampling through small surveys. Using big data can provide a precise view of how households, companies and institutions use urban space and quickly identify their patterns of behavior that define an urban area (French et al, 2015: 8).

5 IMPORTANT CONSIDERATIONS IN APPLICATION OF BIG DATA IN URBAN MANAGEMENT AND PLANNING

Big data offer many new opportunities for research and practice of urban planning. Whether these developments in data acquisition will be to our collective advantage or there is a dark side to these developments? In response to such questions, the following points has been considered.

5.1 Privacy and confidentiality

Big data can reveal the most personal aspects of our behavior from where we go, to who we visit and what we buy. Thus one of the most important challenges of big data in urban planning is privacy and confidentiality (Batty, 2013: 277). Aggregating data to larger geographic areas, like census tracts may be the solution in some cases, but part of the power of big data is that it is highly disaggregated. Significant attention needs to be paid to finding the proper balance between generating and sharing detailed data that may compromise the privacy of individuals and aggregating that data into groups too general to provide an enhanced understanding of the urban system and how individuals interact with it (French et al, 2015: 13).

5.2 Availability of big data to the public agencies

If big data is to serve the public interest, it needs to be made available to the public agencies entrusted with the long range planning function. But, to adequately engage the public, the whole set of stakeholders interested in setting the goals and policies to guide urban development needs

access to this data in some form. Obviously, most of these public agencies and certainly small citizen groups and non-profits need access to the data (French et al, 2015: 12).

5.3 New data analysis methods

Access to big data will also require better tools to visualize and analyze this information, especially when integrating data with new and existing urban models. Statistical methods that were useful for generalizing from small samples to larger populations are no longer appropriate tools. When you have all of the data describing a population or a system, the problem is not generalization, but data reduction and abstraction. Data analysis methods familiar to computer scientists have proven to be promising for generating understanding in a data-rich environment (French et al, 2015: 12).

6 PROPOSE AND APPLY A FRAMEWORK FOR TRACKING THE PRODUCTION AND APPLICATION OF BIG DATA IN TEHRAN URBAN MANAGEMENT AND PLANNING

In order to track the production and application of big data in Tehran urban management and planning system, a process including t steps has been used: firstly, to discuss the role of data in Tehran urban management and planning and the need for big data; second, to introduce the data sources in Tehran; third, to introduce the potential big data resources and also potential applications; and forth, to discuss opportunities and challenges of big data application in Tehran.

6.1 The role of data in Tehran urban management and planning

A fundamental source for setting-up any urban management and planning mechanism is knowledge and one major challenge and hindrance in urban policy-making processes is the lack of knowledge management framework encompassing accurate, potential, accessible and integrated information. Tehran has a multiplicity of decision-makers, policy-makers or participants who produces data and information but they do not share these data and information (Daneshpour, Mahmoudpour, and Ebrahimnia, 2013).

Urban big data as one of the most important sources of urban data continuously provides planners with a wealth of records about the patterns of behavior of the massive number of urban and rural residents, the functions of cities and how they could manage them.

The application of this type of data has expanded to meet the uncertainties and provide the needs of decision-making systems in urban and regional studies in the world. This means that access to new data sources is necessary to reduce the uncertainties and constraints in decision making in Tehran and can be used as an opportunity to strengthening its planning function. In addition, it could be consider as a tool to confront with the challenge of sharing data and information at inter-organizational, inter-sectional, and inter-regional levels, and between public and private sectors. (Daneshpour, Ebrahimnia, and Mahmoudpour, 2014). It can also be used to promote the use of information resources and to publicize data and intelligence and new information services. Also, by increasing the production, transfer and use of accurate information, the establishment of knowledge-based information systems in Tehran transition to smart city is facilitated.

6.2 Data and information production organizations in Tehran

Plan production process in Tehran can be introduced continuum of information production, information consumption and plan production as illustrated briefly in Table 3. Data and information production organizations collect and process the information they need and produce the necessary documents. These documents are available to consumer information organizations, and new documents and information are produced and delivered to planners.

The multiplicity, complexity of the relationships and interconnections between production and consumption organizations is evidence of the complexity of the data production and planning process, as well as the more complex implementation process of the plans. Because of such complexity, the need for the integration and coordination of the organizations involved in the production and consumption of information (the integrity of data, information and knowledge sources) becomes a more important.

Data and information production organizations	Data and information type	Planning Output
• Statistical Center of Iran (SCI) • Central Bank of Iran (CBI) • Tehran Municipality (TM) • Ministry of Roads and Urban Development (MRUD) • joint ventures of TM and MRUD • other government ministries • various research agencies/ researchers • private planning consultants • other information producers	• Population & their characteristic • physical characteristic of places and channels • activities and flows • other type of data	Policy documents Urban plans: • Tehran conurbation plan • Tehran structural-strategic plan • Tehran urban districts detailed plan (for 22

Table 3: Information production, information consumption and plan making processes in Tehran

data, information and knowledge have two main applications in Tehran urban planning process: first: data production, Processing and application to long term plan making and second: data production, Processing and application to short term urban management in organization such as municipality (operational management). One of the challenges of Tehran's urban management and planning in terms of production and application of data, in addition to the lack of available, correct and real-time urban data and information, urban data and information refers to data that product and process to use in urban plan making and management, is that there isn't belief in knowledge-based management systems among planners and decision makers. These challenges make urban organization's short to long decisions inefficient.

6.3 Application of big data in Tehran urban planning and managment

Big data is certainly enriching our experiences of urban planning and management, and it is offering many new opportunities for more informed urban decision-making and planning (Batty, 2013: 277). In the city of Tehran, big data as one of the data resource -along with other types of data- can help to shaping and development of knowledge-based planning and management system. Big data production in Tehran has begun in some governmental and nongovernmental organizations by development of new information technologies. The big data can be used to acquisition and analyze behavioral data to determining the travel behavior, especially for managing urban transport and traffic, improving land use patterns, and distributing services and managing crisis in Tehran. Table 4 shows the various types of big data produced in Tehran, along with the acquisition sources and organizations that produce such data and their application status in the planning and management of Tehran.

Big data type	Data Generation/ formation Resource	organizations in charge of formation in Tehran	The application in urban management and planning	Statues of application in Tehran
Sensor data on urban infrastructure	sensor system for managing environments (air quality monitoring sensors)	Tehran Department of environment	Urban Plan making	No/low
	mobile phone (Online Services Platforms)	Online Services Platforms such as: Online urban taxi application (sanp, tap30, …) Online Foods, goods and services request applications Other online services	Behavior data acquisition and analysis Spatial analysis	No/ low
	monitoring camera	traffic violation registration system of Tehtan Police Information and control centre of Tehran Police	Spatial analysis	No/ low
User data on society and humans	Participatory sensing system	Tehran Municipality (TM)	Spatial analysis Public participation	Somewhat
	global positioning system (GPS)	National cartographic centre	Behavior data acquisition and analysis	No/ low
	online social network	Iran national map and geocoding service (parsimap)		No/ low
Governmental administration data	Public administration data on transactions, taxes and revenues, payment and registration	Public and private banks Iranian National Tax Admission Organization Tehran orovince directorate of registration of documents and real estate of	National and provincial plan making	Yes/ in macro economic analysis
	basic public data on population, traffic, lands, housing, and geography	Statistical Center of Iran (SCI) Central Bank of Iran (CBI) Tehran Municipality (TM) Ministry of Roads and Urban Development Ministry of Health and Medical Education Iran Social Security Organization	Urban Plan making National plan making Spatial analysis	Yes/ Somewhat
Customer and transaction record data	customer data; data on public utilities and financial institutions	Tehran Smart Card	Behavior data acquisition and analysis	No/ low
Arts and humanities data	Text, image, audio, video, language data	National search engine motors	Urban Analysis	No/ low

Table 4: big data type in Tehran urban planning and management

6.4 Opportunities and challenges of big data application in Tehran

The production and application of big data in Tehran management and planning and system is not considered as one of the main sources of data production, and the generated data is not stored, processed or used, and despite the existence of new tools and systems for producing this data, data generated, is not used by Tehran urban management planning system. This means that the big data with a sensor and technology-based smart tool sources is not considered as an important source of data generation. However, this data could play an important role in improving the status of the two major problems in Tehran; traffic congestion and crisis management.

The big data produced in Tehran public institutions are not urban, integrated and compatible with the urban management and planning needs. Therefore, the challenges of producing and applying big data in Tehran management and planning system are summarized below:

- Ungenerality of production and application of big data in Tehran management and planning system.
- Not being processed and converted into practical knowledge in order to be used in Tehran management and planning system.
- Not being integrated with the other existing sources of data production in Tehran management and planning system.

Therefore, in order to capitalize on the advantages of application of big data in Tehran management and planning system, it is essential to first) strengthen the big data production infrastructure; second), create and strengthen big data processing and analysing tools for transforming them into the knowledge required for planning; third) strengthen and promoted the application of big data for decision making in Tehran management and planning system and improvement of the quality of urban services delivery; and forth) integrate the big and other needed urban data production.

If the above suggestions are used in Tehran management and planning system, it is possible to exploit the great advantages of big data and transforming this city into a smart, knowledge-based one would be facilitated.

7 CONCLUSION

A review of the resources related to the main question of this research, the tracing of big data applications in Tehran's management and planning, showed that some of the big data types were produced in Tehran. However, this kind of data is often not produced to facilitate urban planners' studies, then they are not processed and transformed into applicable knowledgeable in Tehran urban management and planning system. In addition, the problems associated with the lack of data integrative tools and procedures is the main challenge of urban management planning system which get worse with the lack of a supporting system to coordinate and unify the generated information and knowledge, the lack of a mechanism for measuring the credibility and accuracy of generated data, and the lack of a binding legal framework for knowledge sharingConclusion

8 REFERENCES

ANDERSON, Chris: The end of theory. Wired. Vol. 16, Issue 7, PP.7-16. 2008.

BATTY, Michael: Big data, smart cities and city planning. In: Dialogues in Human Geography, Vol. 3, Issue 3, PP. 274-279. 2013.

CHAPIN, F. Stuart. and KAISER, Edward J. And GODSCHALK David R. Urban land use planning. University of Il-linois Press. 1979.

DANESHPOUR, Zohre and MAHMOUDPOUR, Asrin and EBRAHIMNIA, Vahide. A knowledge management framework for integrated policy-making in Tehran. In The 6th Knowledge Cities World Summit. pp.377-389. 2013

DANESHPOUR, Zohre and EBRAHIMNIA, Vahide and and MAHMOUDPOUR, Asrin. Devising a knowledge management framework for integrated policy-making in Tehran. In HONAR-HA-YE-ZIBA MEMARI-VA-SHAHRSAZI Journal, Vol. 19, Issue 1, pp.57-70. 2014 (in Persian).

DUANY, Andres and PLATER-ZYBERK, Elizabeth and SPECK, Jeff . Suburban nation: The rise of sprawl and the decline of the American dream. Macmillan. (2001).

FRENCH, Steve and BARCHERS, Camille and ZHANG, Wenwen. Moving beyond Operations: Leveraging Big Data for Urban Planning Decisions. In 56th Annual Conference of Association of College Schools of Planning (ACSP), Portland, 2015.

HAO, Jinwei and ZHU, Jin and ZHONG, Rui. The rise of big data on urban studies and planning practices in China: Review and open research issues. In: Journal of Urban Management, Vol. 4, Issue 2, PP. 92-124. 2015.

Iran's High Council of Architecture and Urban Development, Tehran Structural-Strategic Plan", Iran's High Council of Architecture and Urban Development Publications. Tehran, 2006.

KLOSTERMAN, Richard E. Lessons learned about planning. In: Journal of the American Planning Association, Vol. 79, Issue 2, PP.161-169.2013.

NIJKAMP, Peter and RIETVELD Piet: "Information systems for regional policy evaluation". Ekistics 56, pp. 231-238.1989.

PAN, Yunhe and TIAN Yun and LIU Xiaolong and GU Dedao and HUA: Urban Big Data and the Development of City Intelligence. In Engineering, Vol 2, pp. 171–178. 2016.

TALEB, Nassim N. Beware the big errors of 'big data'. Wired Opinion, August.2013

WEST, Geoffrey. Big data needs a big theory to go with it. In: Scientific American, may.2013.

🏆 *reviewed paper*

City of the Future Constance: "Future City" – Quality instead of Square Meter

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1 ABSTRACT

Today, more than half of the world's population lives in cities, which generate 80 % of greenhouse gas emissions and consume 75 % of the energy used worldwide. By 2050, more than 70 % of the world's population will live in cities. This usually goes hand in hand with the increasing use of space and the simultaneous growth of per-capita residential space. However, the growth of cities must not necessarily signify a problematic development. To quote the architect and urban planner Jaime Lerner „City is not a problem, city is solution". Therefore, the "future city" implies a change of perspectives, away from the problem of growth, towards the challenge of growing smart and sustainable, for which suitable solutions within the respective city must be found.

This paper is based on the project "City of the Future Constance" which is supported by the German Ministry of Research and Education (BMBF) as part of the "Flagship Initiative City of the Future". Within the City of the Future initiative, local communities, businesses, civil society representatives and the scientific community cooperate with each other in order to implement processes and recommendations for action for the cities of the future in germany.

As part of the three-phase tendering, the first phase in the city of Constance focused on the question "How will we live and reside in the year 2030?". The foundations for the vision were laid during the workshops of the participatory symposium. Through the change of perspectives on fictitious persons from the year 2030 and with the help of prepared personal profiles, the - presumed - living and housing needs of different age groups and milieus were described very concretely. The concrete needs related to four fields of action City.Living, City.Mixed, City.Mobile and City.Intelligent.

Building on the vision developed jointly in the first phase, the focus in phase two is on reducing the per-capita residential space. This question will first scientifically elaborated and, finally, also structurally implemented in a model district in phase 3. The goal is to develop a superior planning toolkit, which provides orientation for the sustainable development of all areas of the action program with regard to housing, focusing in particular on the topic of space efficiency and the resulting topics in the planning focus. Within a multi-day workshop the planning toolkit is going to be used by stakeholders, citinzenry and planners to work out a comprehensive concept of development for the model district.

Keywords: Constance, municipal vision 2030+, urban planning, city of the future, planning toolkit

2 INTRODUCTION – CITY OF CONSTANCE

The city of Constance has already laid an important foundation stone for future urban development with its Action Program Housing. In addition to statements about the areas to be developed, the intended building density and the types of living, the Living Action Program also contains many qualitative statements. It addresses, for example, which target groups are to live in the future districts, how the rent level will be designed, as well as the aspired qualities of housing and open spaces.

Building on the Housing action program, the "City of the Future Constance" as research project offers the opportunity to once again reflect on future Constance neighborhoods: "How will we reside and live in Constance in 2030?"

3 CITY OF THE FUTURE CONSTANCE

3.1 Phase 1 – Development of the municipal vision 2030+

The city of Constance faces a variety of challenges in the context of urban development. On the one hand, general population growth, increasing number of households and simultaneously increasing living space per household are leading to an overall increase in housing demand. On the other hand, the geographic location of the city, the lake, the EU's external border and numerous protected areas require a highly economical and space-saving approach to land development.

Against this background, the first phase of the “City of the Future Constance” project dealt with the development of a shared vision for Constance in the year 2030, building on the Action Program Housing, with a focus on the question "How will we live and reside in the year 2030?”.

The action program sets the direction in housing development: Which areas must be cultivated? What and how much is going to be built? What qualities should neighbourhoods offer? What does the price level look like?

The framework for neighbourhood development is already in place. Up to now, the structural qualities of the individual neighbourhoods have mostly been redefined and implemented in the individual projects. The City of the Future project now offers the opportunity to discuss the future design of the neighborhoods in a broad participatory process and in a thematically differentiated fashion.

In the first phase of the project, which ran from June 2015 to May 2016, various events were held to discuss the topics of the city of the future.

Fig. 1: Hidden object scene – Vision 2030+ City of Constance.[1]

The citizenship has the word: »Develop the Future«

As part of the symposium "Develop the Future", various experts from the fields of urban planning, politics and science provided food for thought for the future development of the city of Constance. Citizens had the opportunity to contribute their ideas about city in 2030 in workshops accompanied and moderated by representatives of science.

Science has the word: »Explore the Future«

In a workshop with scientific representatives of the universities of Constance possible issues for the second phase of the Zukunftsstadt project were discussed and defined. In particular, it was about how possible forms of cooperation between the different disciplines, but also between the universities can be designed and which disciplines and stakeholders should be involved in phase 2 of the project.

The administration has the word: »Organizing the Future«

In a workshop on process organization, the internal administrative process for planning new neighbourhoods was discussed. Representatives from all municipal offices as well as the representative for the disabled and

[1] http://www.zukunftsstadt-konstanz.de/assets/images/wimmelbild-zukunftsstadt-konstanz-2000x1359-1400x951.png

the representative for citizen participation and civic engagement of the city of Constance discussed their roles as well as inter-agency cooperation in the process and worked together on this. The inclusion of other stakeholders (e.g. from private sector and civil society) was also considered as a first step.

The vision: What are the neighborhoods of the future?

The foundations for the vision were laid during the workshops of the participatory symposium. Through the change of perspectives on fictional persons from the year 2030 and with the help of prepared personal profiles, the - presumed - living and housing needs of different age groups and milieus could be described very concretely. A total of more than 80 working groups, consisting of around 350 participants in total, worked on this topic. The concrete needs related to the fields of action City.Living, City.Mixed, City.Mobile and City.Intelligent, which were defined during the symposium..

3.2 Phase 2 – Planning and implementation concept of the Vision 2030+

Based on the developed visions in the first phase, the second and still ongoing phase is about working out solutions of how to achieve more living quality with using less space. This is the central issue for the city of Constance seeking to establish a new reference for the future construction of living areas in the city.

Spatial efficiency and sustainability are considered the most important criteria for designing future neighbourhoods in the city of Constance. The challenge lies in reconciling spatial efficiency (e.g. using less space) while improving living quality. The city takes a scientific approach first to understand the full bandwich of the issue and then transmit the theoretic insights into the physical design of real city space.

The overarching goal is not only to build a new district, but to develop a planning toolkit (see 3 Planning Toolkit) as reference for the future Action Programme Housing with reference to connected planning issues.

"Christiani-Wiesen" as model district

The goal of phase two is establish "Christiani-Wiesen" - a site with the size of 2 hectare - as model of sustainable urban planning. The designated area is part of the Action Programme Housing and is as such well-suited to work as urban living lab due to its size and planning conditions. Thus, the rather small site (see Figure 2) could become an initiator for future urban development of greater scope, e.g. in the area "Nördlich Hafner" that is home to 2.500 residential units.

Fig. 2: Model district – Christiani-Wiesen.[2]

[2] http://www.zukunftsstadt-konstanz.de/assets/images/plangebiet-web-1400x947.jpg

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Like in the first phase, discussions and exchange of opinions with project partners and stakeholders were essential in the second phase. In order to ensure efficient and goal-oriented communication, different event formats had been created. The outcomes of those events not only constitute the basic content for developing the toolkit, they also strengthen the future cooperation in the project. The following events are held periodically during the course of the project:

StuDialog

Exchange is crucial to this event in which students of different disciplines from the universities of Constance come together for dialogue in mixed and small groups (e.g. the department of psychology and architecture). The goal is not only to get to know each other, but to engage in a substantive discussion, exchange ideas and results and mutual impulse. In this way, it is possible for the participants to reflect on own outputs, get to know other perspectives and to correct where necesairy.

StuDialog+

The platform provides students to present and to discuss their intermediate results to the citizens and other students. The event offers a small “market place” where selected projects can be discussed with interested citizens. The selection of participants is well balanced with students and citizens.

Symposium Zukunftsstadt

In the course of the project “Zukunftsstadt” two main symposia are held. Those events are the main platform for exchange in the project with presentations from students, experts, as well as workshops, working groups and the opportunity for citizens from Constance to participate. The goal is to connect the different actors in order to work together on the idea of the future city.

Planning Workshop and Toolkit Evaluation

The main event for transferring the knowledge of the research and scientific work to an urban design concept and to use the planning toolkit is going to be a planning workshop at the end of the projects second phase. The three-day-workshop will combine evaluation of the planning toolkit with stakeholders and experts, a planning competition of three planning teams as well as civic participation and involvement.

On day one stakeholders are going to intensely discuss the structure and content of the planning toolkit. By attending the evaluation process, the planning teams are getting substantial information for the concept work. On the second and third day, the three planning teams – compounds of urban designers and landscape architects – are working on a concept for the Christiani-Wiesen site. These concepts will not only cover an urban design draft but also ideas for an integrated and holistic development approach. The public will get the chance to be part of the planning process by getting timeframes for discussion with the planning teams. Presentations of the intermediate results as well as public consultation will be offered on both the evenings of the planning days.

After a two weeks period for concept revision of the planning teams, the project`s scientific committee is going to choose the best concept for further development. The concept is then going to be the foundation for the application for phase 3 and for further planning and development.

3.3 Phase 3 - Implementation of the vision in "real laboratories"

The third phase is devoted to the implementation of the concepts developed in the second phase. The model district for this will be the “Christiani-Wiesen” mentioned under 2.2 Phase 2 – Planning and implementation concept of the Vision 2030+. The exact start time of this third phase is currently unknown.

4 PLANNING TOOLKIT

The planning toolkit created as part of the “City of the Future Constance” project focuses on the criteria of sustainable urban planning, which are characteristic of the urban development goal "Smart growth: quality instead of square meters". The guiding question of the concept is: How can a high quality of life / living and increased space efficiency be reconciled?

The toolkit offers various approaches to convey this theme, while promoting dialogue between the various stakeholder groups involved. The basis of the entire toolkit is the student work at the HTWG and the University of Constance, which have been combined in currently 30 criteria of sustainable urban development based on the set of criteria of the German Sustainable Building Council DGNB. These documents clarify the parameters that are important for each criterion, the actors involved, existing urban framework programs of the city of Constance and urban planning issues, as well as example solutions.

The technical implementation of the toolkit is based on MediaWiki[3] which is a free and open-source wiki software. As shown in the flowchart below, by using the toolkit, the user can directly access the individual criteria, or access them based on their importance for individual urban design planning topics or individual stakeholders.

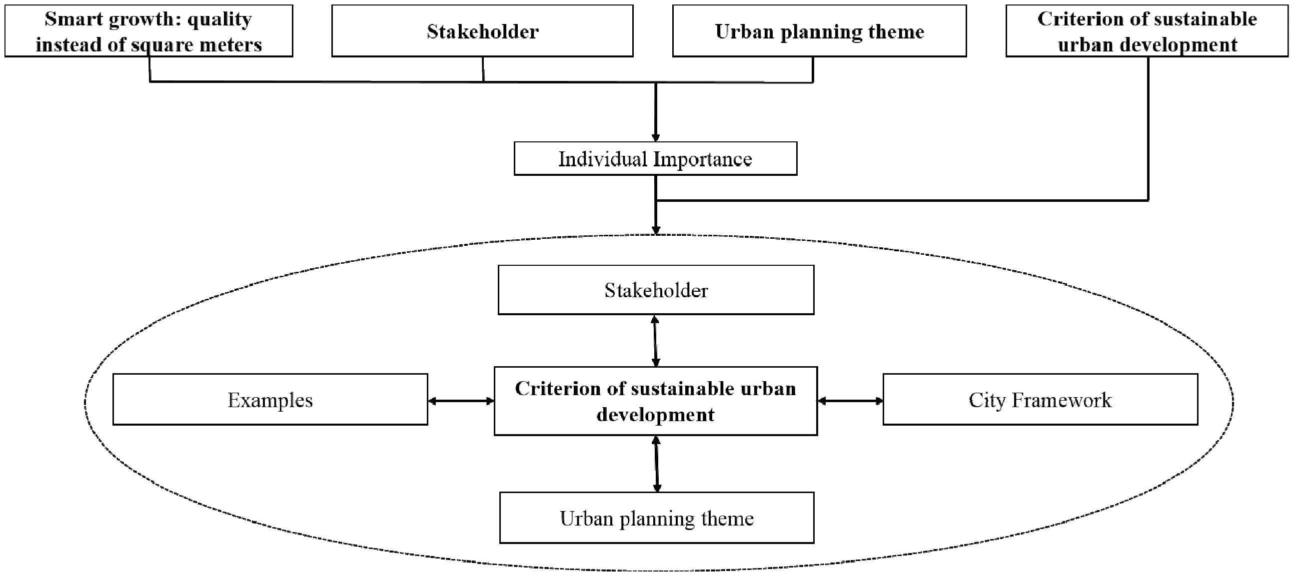

Fig. 3: Flow chart – Planning toolkit

The division into three categories "very important", "good to know" and "unimportant" differs from planning topic to planning topic as well as from actor group to actor group. Common to all is the key question under which the classification was created. The division of the criteria into importance arises in an open process in which all involved stakeholders in the city planning process are integrated. By transparently communicating the classification according to the stakeholder group, each user has the opportunity to move into the other stakeholder group and thereby gain more understanding of the different positions.

Due to the design as a Wiki the toolbox is a system open to all involved stakeholders and able to react to current developments. It also should be expanded by working with it and previously unobserved topics should be integrated during its lifetime. The resulting transparency is intended to stimulate successful joint collaboration.

5 TRANSFERABILITY OF APPROACHES

The project`s results are not bound to on-site implementation in Constance. Further and continuous editing and addition of content of the planning toolkit is a major objective. By making the toolkit available for different user groups (local authorities, science, stakeholders, public) the permanent growth of the toolkit as knowledge platform is ensured.

The planning toolkit as well as the knowledge of the Christiani-Wiesen development is going to be transferred to all further and upcoming housing projects in Constance. The usability of the toolkit (including a specific adaption) for other cities with comparable planning tasks or parameters is obligatory.

Beyond the use on a local level, the project may set impulses for revision of legislation and funding programs on a national level within ministries or government departments, especially concerning projects with a strong focus on efficient use of (urban) space, which is a major task for growing cities in Germany.

The project set new standards for co-working processes of local authorities, local science and research partners. Within the working process, a strong partnership of co-creation between the city of Constance and both of the universities evolved. This partnership could be a prototype for future tasks in other cities.

[3] https://www.mediawiki.org/wiki/MediaWiki

The strong participation of the public and the experiences gained in the planning events is going to be a model for future planning processes in Constance and will be part of the knowledge pooled in the Wiki toolkit, thus it is going to be available for other cities as well.

6 CONCLUSION

The project not only marks a new level of co-creation between city authorities and the local science community but also is a new initiation for sustainable and resilient development of new housing quarters in Constance. The planning toolkit as adaptable instrument could be used by other cities and local authorities in their processes of planning and urban development and also by universities as basic tool for research in the field of urban development. Furthermore, the use of the toolkit will give initiatives and interested residents an overview of the complexity of planning topics and the possibility for meaningful participation on a contentual level in planning processes. The use, the growth and further development of the toolkit by many different stakeholders will be a main goal beyond the project and a substantial project output.

Cities and communities need to be more than ever a scientific partner and proactively take part in research. The fast spatial and social changes require a deep understanding of specific local weaknesses and strengths as well as the adaption and implementation of new concepts into the local understanding of planning. In particular, this currently concerns the need of higher spatial efficiency within urban developments. Minimizing the spatial impact is not only an architectural task but requires solutions on many different planning levels. The city of Constance will offer solutions in the fields of architecture, sharing communities, mobility and multi-used spaces.

Not only the scientific outcome contributes to the solution of upcoming tasks in the field of urban development but also the participation of citizens and future inhabitans within the planning processes. As users of newly developed spaces and housing quarters, they will be the key to a well-working local urban community and well-used architectural concepts and urban spaces. For that reason it is evident to build a public understanding of planning tasks and to participate residents, stakeholders, initiatives and future users/residents in the planning processes at a very early point. In this regard the local authorities need to find practicable process tools. In many cases, the adjustment and combination of different “classic” tools such as plannings workshops and competitions is required to achieve the desired outcome. The national legislation also has to assume the liablity of finding ways to offer the best organizational toolkit to local authorities.

7 REFERENCES

http://www.zukunftsstadt-konstanz.de/, project website of the “Zukunftsstadt Konstanz” project, Marken- & Designstudio Eminent. 2018, Konstanz.

https://www.mediawiki.org/wiki/MediaWiki, website of MediaWiki, 2016.

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City of the Future Ludwigsburg: Co-Creation in Urban Development Processes

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1 ABSTRACT

In the face of the trend towards digitization, the consensus that successful urban solutions shall collectively be conceived and developed as a societal task is becoming increasingly present (Sørensen & Torfing, 2016). As we cannot elude the digitization of our built surroundings and everyday lives, we can make use of technology in a way that cities become more livable for the individual and address overarching goals such as sustainability and resilience. In addition to a variety of conventional and innovative participation methods, digital tools create options for integrating local actors into decision-making and implementation processes relevant to urban development. But what do new integrated approaches look like? How is it ensured that the impulses of a heterogeneous stakeholder landscape are equally respected? And how can cities commit to incorporating the results created in open ideation processes within traditional urban planning?

In order to develop new and successful solutions to existing problems, co-creation focuses on the cooperation of transdisciplinary actors who jointly address challenges in a "process of creation" (Dörk & Monteye, 2011). In this context, practical experience is considered as equally valuable as expertise knowledge and specialized skills. Thus, regardless of professional backgrounds, in such a co-creation process solutions are developed at eye level, from the initial idea to the (prototype) implementation. In relation to the wide variety of urban challenges we are currently facing, co-creation approaches offer a new format for stakeholder participation in urban development processes. Moreover, they promise the creation of holistic and sustainable (systems') solutions with a great innovative potential (Mulder, 2014).

This paper is based on the projetct »City of the Future Ludwigsburg« which is funded by the German Ministry of Research and Education (BMBF) as part of the »Flagship Initiative City of the Future«. Within this initiative, local stakeholders, communities, businesses, the creative industries, civil society representatives and the scientific community cooperate in Ludwigsburg in order to implement processes and recommendations for action in Germany's future cities.

As part of the three-phase tendering, in the city of Ludwigsburg the first phase focused on the joint development of a comprehensive concept for the planning and implementation of a sustainable and holistic vision 2030+. Against this background, currently phase two addresses digitization and urban space amongst others by hosting three consecutive events in the so-called »Makeathon« format. They address the future of urban space and urban development with a focus on digital solutions. To carry out these events, a workshop space was implemented which is called »urban laboratory« (Stadtlabor). Within this lab innovative ideas and possible measures for "upgrading" public space are identified and evaluated with regard to their overall benefits and their potential to improve their quality (Stadtverwaltung Ludwigsburg, 2018).

The aim of the joint research project between Fraunhofer IAO and the city of Ludwigsburg is to test the structured co-creation process as a new governance format. Thus, impulses with regards to content and processes can be given for the city administration and politics, that flow into strategies as well as plans.

Keywords: makeathon, public space, digitisation, urban planning, co-creation

2 INTRODUCTION

With the trend of growing challenges on the one hand and digitization on the other, the consensus that collective designing and developing of urban solutions should become a societal task is getting increasingly relevant (Sørensen & Torfing, 2016). Even though we cannot elude the digitization of our built surroundings and everyday lives, Smart City solutions should not primarily be developed by IT companies. Instead, Smart Cities shall be a place for people by people that make use of technology in a way that cities become more livable for the individual and also address overarching societal goals such as sustainability and resilience (Mulder, 2014). For example, digital tools enable new options for integrating local actors into decision-making and implementation processes relevant to urban development. But what do corresponding governance formats look like? And how can it be ensured that the impulses of heterogeneous stakeholders are equally considered?

3 OPEN INNOVATION FOR URBAN DEVELOPMENT

Inspired by the opening up of former companies and research internal processes in the context of open innovation, the demands of citizens for a stronger participation in decision-making processes concerning urban development rise against the background of NIMBY (not-in-my-backyard) and DIY (do-it-yourself). At the same time, the issues which cities are facing are becoming more complex and can only be dealt with together with users, providers, planners and decision-makers. In particular, the process of digitizing our cities, which describes a highly abstract process for many people, will change our lives so drastically that it requires the involvement of urban actors in making significant decisions. At the same time, we cannot elude digitization.

While the Smart City is still under criticism of being heavily driven by IT companies (Hollands 2015), there has been a general consensus that new urban solutions need to be developed collectively as a societal task to ensure better results (Sørensen & Torfing, 2016). The term “better” in this context not only describes the potentials a solution holds for a certain problem – a side that tech companies usually focus on – but also the assessment of environmental and societal impacts – aspects that improve the quality of life, when respected in the design of solutions. As of today, such effects are hardly considered at all and secondly, if they are assessed, it is done by “experts” by profession. The discourse about open innovation offers a new possibility: Integrating a variety of stakeholders in innovation processes and giving them a larger influence on the actual outcome. In this regard, digitization enables new forms of governance in urban development that take into account the knowledge, needs and competencies of citizens as well as the local economy, science and social initiatives. Through transdisciplinarity, new application and research relevant impulses can be implemented in urban development that originate from the urban administration practices as well as the living environment. Such impetuses are crucial for developing innovative solutions that meet today's and tomorrow's user requirements.

4 CO-CREATION - CREATING SOMETHING TOGETHER

The staged model of involvement by Sherry Arnstein, the “Ladder of Citizen Participation”, which defines eight intensity levels of participation, clearly shows the difference between information provision as least form of participation and the complete submission of decision-making authority (Arnstein, 1969). According to the understanding of the authors of this paper, participation is more likely to be interpreted as a mix and match logic: for each issue, an individual combination of participation intensities is necessary in order to gain a successful outcome. The central aspects of “co-creation” – the term for creating something together as a team – are therefore idea generation and cooperation.

In order to develop new solutions in accordance with urban challenges, the co-creation approach focuses on the cooperation of transdisciplinary actors who jointly address challenges in a "process of creation" (Dörk & Monteye, 2011). Regardless of the professional background, something is going to be created, from the initial concept suggestions to the (prototype) implementation. The following three basic rules are considered by the authors of this article as essential for co-creation:

(1) CREATIVITY: Finding answers to complex questions and challenges requires a complex set of skills, (everyday) knowledge and expertise. Co-creation formats encourage creativity in the development of innovative and multi-demand solutions through the integration of heterogenous actors.

(2) IDENTITY: In the design of the direct living environment, the identification of the users with the public urban space is relevant. By addressing needs and developing solutions collaboratively, the identification potential can be maximized, which in turn leads to a sense of responsibility for what has been created and its context, and is accordingly relevant for the acceptance and stabilization of new solutions.

(3) SOLIDARITY: The integration of heterogenous skills, expertise and knowledge requires the cooperation of different actors on an equal footing. The focus in the creative process is on 'learning from each other' and refers to the everyday knowledge of residents and users, the knowledge about formal urban development processes (such as legal restrictions or process flows) as well as technology expertise.

5 CASE STUDY LUDWIGSBURG: THREE MAKEATHONS BETWEEN ANALOG AND DIGITAL REALITY

The city of Ludwigsburg is playing a pioneering role in the German state Baden-Wuerttemberg in the sense of sustainable and integrated urban development and at the same time keeping track of the future (Nevens et al., 2013). The digitization of urban space therefore plays an equally important role in terms of the content of local projects and in terms of methodological approaches to digitize urban space by involving different stakeholders in urban development processes. This fundamental idea is also reflected in a research project, which is being carried out as part of the second phase of the City of the Future competition in Ludwigsburg. The funding agency’s major objective, the German Ministry for Education and Research (BMBF), is that the participating municipalities develop a comprehensive concept for the planning and implementation of a sustainable and holistic vision 2030+, which was developed jointly with the cities’ citizens in the first phase of the research project. Perspectively, the third phase, which is expected to follow in 2018, is dedicated to the concrete implementation of the vision in so-called "real labs".

Against this backdrop, Ludwigsburg will host three consecutive events in a Makeathon format in the second funding phase of the competition, which will address the future of urban space as well as urban development of the future with a focus on new digital solutions. It is important, on the one hand, to gain new insights and approaches through transdisciplinary cooperation. On the other hand, innovative ideas and possible measures for "upgrading" public space shall be identified and evaluated with regard to their usefulness and potential. The aim of the research project is to test the structured co-creation process as a new governance format which creates better solutions for the digitization of public urban space. Impulses will mainly be generated for the city administration and politics.

While the first Makeathon in July 2017 dealt with the design and construction of the so-called city lab, the second and third events focus on the urban environment and the city quarter surrounding the lab. Together with a heterogenous mix of local actors, city-relevant issues are worked on and solution ideas are prototypically transferred into urban space. The digital level in the context of expanded reality is understood as an integral part of the developed solutions. According to the objective of the Makeathons the following building blocks are considered as central for the conception and execution:

Enabler: Initiated by the City of Ludwigsburg, the Makeathons are jointly designed and implemented by the applied research institute Fraunhofer IAO and the local creativity incubator Tinkertank.

Problem: The thematic basis is a challenge or problem formulated as openly as possible by the city, thus providing sufficient space for the creative solution development process. The reference for application in the urban context will be defined in the Makeathons through the spatial and thematic localization in “Weststadt”, an urban quarter, which has a high development dynamics.

Actors: Participants are to be selected according to their expertise and their relationship to the local context in order to develop solutions for the urban needs. They represent the local creative industries, local companies, different departments of city administration as well as citizens of the neighborhood. Accordingly, they cover a differentiated set of skills and knowledge. It is important that I the co-creation process practical experience, e.g. from citizens, is considered as equally valuable as expertise knowledge and specialized skills in the fields of programming or urban development.

Process: In order to develop targeted solutions within the 15-hour open innovation process, the course of the Makeathons is divided into three phases: Idea generation, experimentation and prototype development. Each phase is preceded by a group-finding phase during which participants find a suiting team according to their interest. The integration of the results is ensured by the continuous dialogue between the working groups and the exchange between the assigned mentors.

City lab: The venue of the Makeathon series fulfills not only a workshop function but also serves exhibition and information. The space designed in the first Makeathon offers the infrastructure and equipment for further co-creation processes and alters with every event. It is the goal to open up the location in order to enable participation in ongoing urban development processes and to consolidate it in this space.

Materials: Digital and analog materials are the basis for the creative process and are introduced at the beginning of the Makeathon. They are mostly donated by local companies expressing their support for this new format. In the process, the participants will be supported in the use and processing of the materials by the mentors. Thus, the participants can also familiarize with formerly unknown (digital) materials.

6 DIGITAL METHODS OPEN UP A NEW DESIGN SPACE

Cities are always more than what is caught at first sight. Therefore, it is obvious to extend the digitization of urban space with an appropriate dimension of visualization and communication. This approach is pursued through the integration of augmented and virtual reality with its diverse application possibilities in the Makeathon format and will be used in two ways: as a process-accompanying tool for prototype development and testing on the one hand, but also as a tool for the design representation in constructed urban space on the other hand.

Using augmented reality visualizations, which expand the real world by adding virtual aspects (Zeile, 2017) ideas and design proposals from the Makeathon will be integrated into an actual urban space and visualized to evaluate their suitability and potential in the real environment. Possible future developments such as the integration of trees or a bench in a concrete urban setting as well as historical views of a street can also be projected into real urban space. This offers the chance to inform and visualize plans before they are realized. In addition, the Makeathon may also produce analogue prototypes, such as temporary architectural interventions on parking areas or so-called pop-up furniture for public spaces, which in turn can be supplemented by digital elements, such as additional information on locally recorded weather data or used building material to generate value for users.

Virtual reality, on the other hand, describes the interactive presentation and perception of a computer-generated reality (Zeile, 2017). For example, 360° camera shots can be brought to life for users using a suitable output device (such as a head-mounted display) and enriched with additional content without being at the point of capture.

Last, but not least, an interactive platform in the project brings together these two approaches and provides space for the discussion of the ideas developed in the Makeathons as well as stimulates the further analogue and digital development of these ideas based on particular demands and skills, even outside the city lab and apart from the Makeathons (Stadtverwaltung Ludwigsburg, 2018).

7 PROTOTYPES SHOW DEVELOPMENT PATHS

The Makeathon results in prototypes, that are physical representations of the ideas generated and developed during the process, functional but simplified. The prototypes represent an approach to a system, an application or a product and help to get a first impression about the form or functionality, to test, to reflect and to develop further. Quickly developed prototypes are seen as a cost-effective and useful tool to test ideas early on and adapt according to feedback from potential users and affected people (Kujala, 2003).

The prototypes created in the Makeathons in Ludwigsburg address different topics and differ in their technological design as well as in their functionality:

An interactive city model, which emerged from the first Makeathon as part of the inventory of the city lab, intends to stimulate public discourse within and about the city quarter in focus (Fig. 1). It is designed as an interactive table where different information levels are projected onto a physical 3D city model. For example, an emotional mapping heatmap visualizing spots where stressful situations during cycling and pedelec rides in Ludwigsburg occur, was added to the city model in the second Makeathon (Fig. 2). For the development of the heatmap, the participants were equipped with sensors that can detect stress on the basis of temperature fluctuations and skin conductivity as well as a camera and a GPS tracker. Several rides on bicycle and pedelec were carried out in the Weststadt and the obtained data visualized, indicating the need for action. The expansion of the physical city model through additional virtual layers is to be realized in further Makeathons. In addition to projected maps (e.g. a traffic simulation), information about particular buildings can be displayed via a movable marker whose location is tracked by a webcam. The user can move the marker over the model to retrieve extra information, e.g. about the buildings' names. Furthermore, the whiteboard-like materials used to build the city model enable users to write ideas and suggestions directly on the model, which can later be erased.

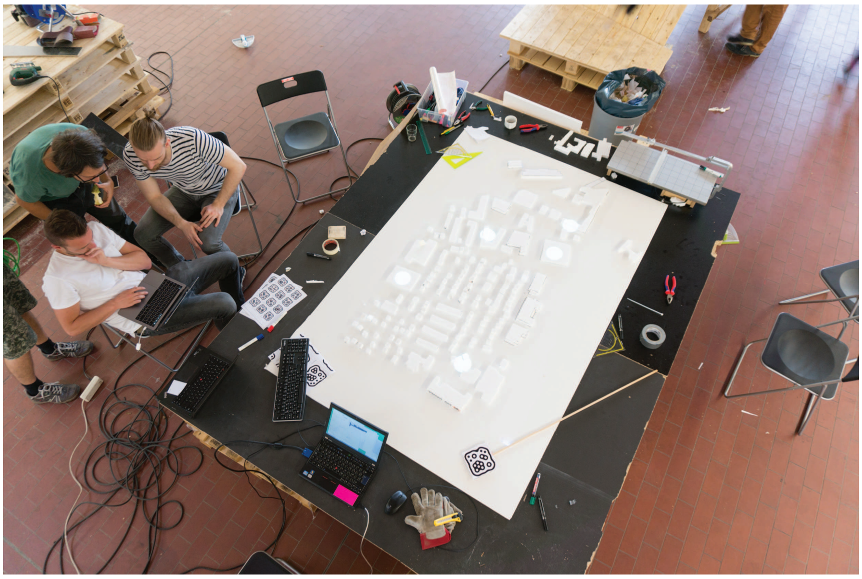

Fig. 1: Prototype for an interactive augmented reality city model displaying different layers of information as result of Makeathon 1 (Fraunhofer IAO 2017).

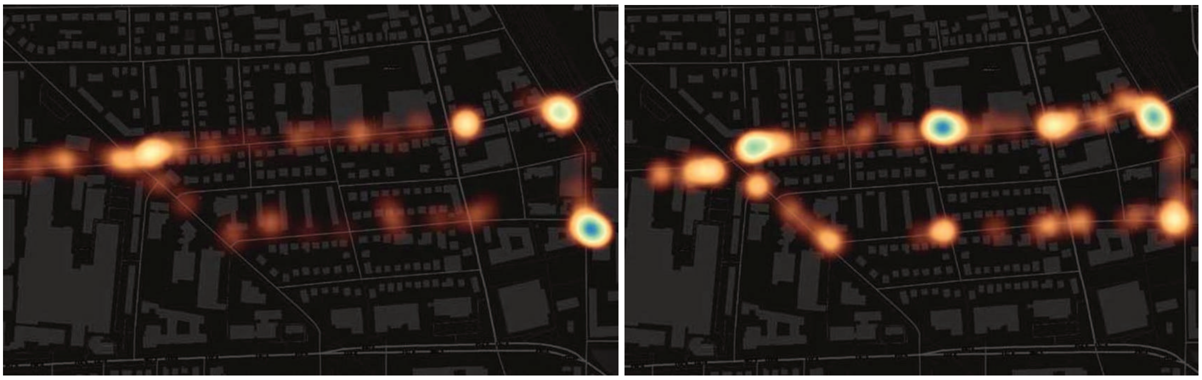

Fig. 2: Heatmap displaying stress during bicycle rides in the project area in the morning (left) and in the afternoon (right) as result of Makeathon 2 (Fraunhofer IAO 2017).

Fig. 3: Virtual city tour prototype enabling citizens to participate in past, present and future urban developments in Ludwigsburg as one of the results of Makeathon 2 (Fraunhofer IAO 2017).

A second prototype solution addressing the discovering the city track of the Makeathon, is a virtual city tour (Fig. 3): Augmented reality representations can be displayed in Ludwigsburg's urban space using a smartphone and QR codes. The content ranges from so-called video walks with residents and experts through the city quarter Weststadt speaking about historical as well as future developments to interactive collages augmented with additional information and 360°-visualizations. The system can easily be added on and be widely used in the future for multiple purposes, such as the city's 300 year anniversary in 2018. Moreover, it addresses new levels of knowledge transfer and networking in urban areas.

8 CONCLUSION

It is the authors' understanding that quality of life will be improved by technological innovations in Smart Cities, only if solutions are co-created and responsibilities are shared by different stakeholders participating in urban development processes on eye level. Therefore, it is the research project's goal to test Makeathons as new co-creative governance format in urban development processes aiming at better, more liveable cities. It has to be mentioned, that new governance formats shall not replace traditional and approved ones. It is their combination which shall create value. In accordance with the mix and match logic of participation intensities, the right mixture has to be chosen dependent on the pursued goals. Also, in this research project Makeathons are not tested against a variety of other formats, but they are tested qualitatively in which ways different stakeholders can benefit from this format in the context of urban development. This format's major challenge is reflected in securing that the results from the co-creation process, which are mainly stimulated by local stakeholders' demands and needs, actually find their way into the official urban development processes; from concept to action. In analogy to Roger's innovation theory, the critical step is the transition from an invention to an innovation (Rogers 2010). The collective development of a solution with provider (city) and user (citizens, industry, etc.) in a co-creation process is crutial for its applicability, which can be used synonymous for the diffusion of a newly invented solutions in space and society. Even though the final Makeathon has to be carried out and evaluated before results can be summarized, it can be concluded that this format enables participating in urban development processes for groups which do not necessarily participate in other existing formats. The two carried out Makeathons have brought a variety of stakeholders together in a positive and constructive participation process and have created valuable results for the city. The different results are picked up by the city administration in various projects, which can be understood as the main outcome of the project and which proves the benefitial impacts of this format, e.g. using emotional mapping for traffic planning will be extended from this prototype to other city quarters and the necessity of better orientation in the project area will be incorporated in a number of internal projects.

Is the understanding shared that collectively developed solutions will be better applicable and the framing conditions respected, Makeathons as a new governance format could enable future Smart City projects to create solutions as an answer to true urban demand between the individual and society and at the same time reduce skepticism towards new solutions and ensure usability and comprehension.

9 REFERENCES

ARNSTEIN, S. R. (1969). A ladder of citizen participation. Journal of the American Institute of planners, 35(4), 216-224.

DÖRK, M., & MONTEYNE, D. (2011). Urban co-creation: envisioning new digital tools for activism and experimentation in the city. In Proceedings of the CHI Conference (pp. 7-12).

HOLLANDS, R. G. (2015). Critical interventions into the corporate smart city. Cambridge Journal of Regions, Economy and Society, 8(1), 61-77.

KUJALA, S. (2003). User involvement: a review of the benefits and challenges. Behaviour & information technology, 22(1), 1-16.

MULDER, I. (2014). Sociable smart cities: Rethinking our future through co-creative partnerships. In International Conference on Distributed, Ambient, and Pervasive Interactions (pp. 566-574). Springer, Cham.

NEVENS, F., FRANTZESKAKI, N., GORISSEN, L., & LOORBACH, D. (2013). Urban Transition Labs: co-creating transformative action for sustainable cities. Journal of Cleaner Production, 50, 111-122.

ROGERS, E. M. (2010). Diffusion of innovations. Simon and Schuster.

SØRENSEN, E., & TORFING, J. (2016). Co-initiation of collaborative innovation in urban spaces. Urban Affairs Review, 1078087416651936.

STADTVERWALTUNG LUDWIGSBURG (2018): Zukunftsstadt. Die Ludwigsburger Kreativschmiede. URL: http://zukunftsstadt.meinlb.de/, accessed on 12.02.2018.

ZEILE, P. (2017). Echtzeitplanung–Dynamische Systeme in der Stadtplanung. Geoinformationssysteme, 78-89.

reviewed paper

Crowding Density in Urban Environment and its Effects on Emotional Responding of Pedestrians: Using Wearable Device Technology with Sensors Capturing Proximity as well as Psychophysiological Emotion Responses while Walking in the Street

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Keywords: stress, biometric sensor, psychophysiology, urban crowd density, restoration

1 INTRODUCTION

Worldwide urbanization in many areas leads to very high urban density livingconditions, for example, in Hong Kong, there are about 40,000 people per km2 (Berlin:4000 p/km2).

Beside many other factors of urban infrastructure, pollution, transportation congestion etc. high urban population density feeds in an urban environment which is characterized by large pedestrian crowding in streets. Peen, Schoevers et al. (2010) could show that mood disorders and anxiety disorders are more prevalent in urban than in rural areas. Furthermore, stress recovery is faster and more complete when people are exposed to videos of natural rather than urban environments (Ulrich, Simons et al. 1991).

As this might be a pervasive feature of shortening social distance and recurrent invasion to personal space, it seems to be prevalent risk high urban density. Tost (2015) underlined that mental health is impaired by shortening social distance and invasion to personal space as one main featureof high density urban environment, beside high level of socio-spatial complexity and heterogeneity. Cox, Houdmont et al. (2006) propose a model of the effects of high density. They suppose that high density leads to the perception of crowding which evokes an experience of stress. This stressful experience has a negative impact on individual and organizational health. As one of the moderators of the relation between high density and the perception of crowding they propose a lack of control over the situation, i.e. the ability to control the proximity to others which can reduce stress.

While the covariaton of crowd density and stress load seems quite obvious, only few studies can be found which examined this relationship with empirical data on an individual level. High density often leads to the perception of limited space which can also be called crowding (Walden and Forsyth 1981). In a crowded situation, people feel uncomfortable, stressed, tense, annoyed and frustrated. This is also physiologically measurable – crowded conditions are related to decreased skin resistance, increased respiratory rate and cortisol level, higher blood pressure and an overall increased stress-related arousal (Aiello, Nicosia et al. 1979, Walden and Forsyth 1981).

Aiello, Nicosia et al. (1979) point out that children are more competitive, more aggressive and less motivated under high density. According to them, the increased aggression might be a result of frustration and competition that occurs when resources are scarce which is more likely the more people are present.

For a deeper understanding of these findings the concept of personal space seems to be quite helpful.

According toSommer (1959), personal space is an area with invisible boundaries which is surrounding a person's body. Unlike a territory, personal space is not stationary, but rather carried around by the person whose body is building the center of this space. Wabnegger, Leutgeb et al. (2016) point out that personal space might be a phylogenetically acquired trait which has evolved throughout evolutionary history to prevent aggression within and between species or groups. Personal space usually determines interpersonal distance and its effects on psycho-physiological responses to varying distances.

In his Proxemic Theory, Hall (1966) distinguishes four different zones of interpersonal distance: intimate, personal, social and public distance (each with close and far phases). People seek to maintain these distances from other people to prevent unsolicited touch by strangers (Vine 1982) and they form the personal space. Entering sombody's personal space is usually a sign of familiarity or intimacy.

However, in urban high density living conditions, it can proof difficult to maintain everybody's personal space, for example when walking in a crowded street. This physical proximity and intrusion into personal space (especially the personal or intimate distance) by strangers are experienced as being uncomfortable anddisturbing by many people.When somebody intrudes into someone else's personal space the results are anxiety, stress, flight, aggression and negative mood (Allekian 1973, Efran and Cheyne 1974, Altman 1975, Smith and Knowles 1978, Kanaga and Flynn 1981).

Smith and Knowles (1978) could show in their study that short distances (i.e. personal space invasion) lead people to crossing the street faster and having more unpleasant, rude and aggressive impressions of the intruder than with long distances. Moreover, subjects were less likely to help another person recover a lost object after this person has been invading their personal space(Konečni, Libuser et al. 1975). Kaya and Erkip (1999)demonstrated in their study that people in the high-density condition showed more withdrawal behaviors than people in the low-density condition which indicates that they felt more intrusion into their personal space under the high-density condition because the interpersonal distance was shorter. Such withdrawal behaviors are a means to protect one's personal space in crowded situations. Examples are nonverbal behaviors like avoiding eye contact, increasing interpersonal distance and moving or turning away (Hall 1966, Demian 1978).

From this background it seems reasonable to assume that everyday walking in highly crowded streets means to experience a trajectory of mostly involuntary intrusions of the own and others' extrapersonal space causing momentary stress responses. But if assuming with Wabnegger, Leutgeb et al. (2016)that personal space is an evolutionary acquired disposition to respond emotionally when other people are crossing one's ambient space, it seems necessary to widen the scope of its efficacy by connecting to biopsychological findings of emotional responding. According biopsychological emotion theory (Panksepp 1982, Ekman 1992, Izard 1993, Panksepp and Watt 2011, Levenson 2014) there are separate basic appraisal-reaction sets, which developed as functional systems for survival in an evolutionary process (Izard 1993, LeDoux 1998, Levenson 2014). Even if there is no consensus of how many elementary or prototypical emotional systems there are, (see Von Scheve (2014) for an overview), it seems that fear, anger, sadness, joy, disgust and curiosity make the core of elementary emotional responses to internal and external stimuli (Turner, Doxa et al. 2001).

There seem to be also consensus, that the core mechanism evoking emotional response syndromes consists of a non-voluntary, continuous neural appraisal process of internal and external stimulation (Ortony and Turner 1990, Izard 1993, LeDoux 1998, Scherer 2001, Lang and Bradley 2010, Levenson 2014). According to a standard psychobiology textbook (N. Birbaumer and W. Jänig 2010) an emotional response is triggered by the outcome of neuro-affective appraisal process, with appraisal being an automatic, non-deliberate, namely non-conscious process (Zajonc 1980, N. Birbaumer and W. Jänig 2010), by which features of situational stimuli are matched with prototypes like danger, reward expectation, novelty and loss/separation.

This neural emotional reaction to stimuli then unfolds on several dimensions, namely as changes in physiological functions, in muscular-skeleto system (posture, gesture and facial expressions), as well as in motivational tendency and subjective feelings(Levenson 2003, Levenson 2014).

In sum, one can assume that walking and moving in higly crowded streets in high-density urban areas, which means to encounter people by crossing their personal space as well as having them crossed the own personal space will elicit emotional response in real-time, presumably aversive, but maybe also appetitive. We will examine this question by applying an unobtrusive wearable sensor technology capturing the flow of personal space intrusions by passive infradredbodysensorfusioned with psychophysiological signal data, by which emotional responses are identified in real-time on a second-by-second resolution. Our leading questions are: Does random involuntary crossing of personal space while walking in crowded streets evoke emotional responses? Does the trajectory of personal space crossings and their accumulation have an impact on short term psychological attentional impairment respectively restorative need?

2 DATA AND METHOD

2.1 Sample

The subjects (n=30, age mean= 24.77, age sd= 0.718) are Chinese people studying and living in Hong Kong, but no longer than 5 years. These people are relatively familiar with Hong Kong living surroundings but would still keep curiosity to the environment. Additionally, they have no heavy mental illness history, no symptom systemic sweating (secondary) and no experience of suffering from accident events in the past month.

2.2 Design

The study uses a within-subject and between-subject measurement design. Subjects weretold to walk a selected route consisting of two parts: the district ofTsimShaTsui and Kowloon Park. TsimShaTsuidistrict is is a commercial center in Hong Kong with very high pedestrian density.

The sample was split into groups, with one group of subjects starting the route either by walking the park path first and then the street part. The other groups of subjects walked the same route but started street path first and then the park path.

All subjectscame to a predefined at meeting point, where body sensors were attached. Before starting the walk they went through a smartphone app with specifictests and questionnaires. After having walked the first route part (park path or street path), they return to meetingpoint a and repeated went through the smartphone app. After having walked the second part of the total route they again returned to the meeting point, where they went through the app questionnaire a third time.

At selected predefined spots, subjects were told to orient themselves in specific direction and then using the smartphone app to answer several questions about their subjective evaluation of the visible environment. At the end of the route walking socio-demographic information and general urban attitudes were collected by the smartphone app.

For city street part of the route at the four corners indicating begin of each street path, subjects were asked to suspend walking to experience the coming streetscape for ten seconds and answer the questionnaire in the mobile phone.

Group A			Group B		
Park	T(Pre-test)	• ***Skin Conductance*** • Questionnaire • Attention Blink test • Hearing test • Sound test	T(Pre-test)	• ***Skin Conductance*** • Questionnaire • Attention Blink test • Hearing test • Sound test	**City**
	1-2-3-4	• Experiencing • Restorative Component Scale • Thermal Perception	5-6-7-8	• Skin Conductance • Experiencing • Restorative Component Scale • Thermal Perception	
Middle Test	T(Middle-test)	• ***Skin Conductance*** • Questionnaire • Attention Blink test • Hearing test • Sound test	T(Middle-test)	• ***Skin Conductance*** • Questionnaire • Attention Blink test • Hearing test • Sound test	**Middle Test**
City	5-6-7-8	• ***Skin Conductance*** • Experiencing • Restorative Component Scale • Thermal Perception	1-2-3-4	• ***Skin Conductance*** • Experiencing • Restorative Component Scale • Thermal Perception	**Park**
	T (Post-test)	• ***Skin Conductance*** • Questionnaire • Attention Blink test • Hearing test • Sound test	T (Post-test)	• ***Skin Conductance*** • Questionnaire • Attention Blink test • Hearing test • Sound test	

Table 1: Study Desing

2.3 Walking Path

The predefined urban street walking path is in TsimShaTsui, Hong Kong. TsimShaTsui is a famous commercial center in Hong Kong. In addition to a big shopping mall, there are lots of retails, restaurants and exhibition areas. Its pedestrian volume is huge every day.

The urban street path encompasses four roads: Nathan Rd (streetpath 1), Peking Rd (streetpath 2), Hankow Rd (streetpath 3) and Haiphong Rd (streetpath 4). These four roads are different from many perspectives. Nathan Rd is a city main road with four lanes separated by central isolation greening zone. Peking Rd has two lanes in same direction, without greening on any sides. An entrance of a shopping mall is on the right side of Peking Rd, which forms a big public space for people activity. The width of Hankow Rd is equal to two lanes, but utilization of one of them is parking, and the other side planted with street trees. Haiphong Rd

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located between the city part and the man-made park, therefore, old and tall trees in the park could be observed on Haiphong Rd.

Figure 1: Map of walking route with 4 street paths

Data collection was conducted during April 2017. On each experimental day, two to four subjects were asked to experience the predefined city walking path around mid-noon separately. The instructor gave the basic experimental introduction to the subjects at the meeting place whose location is near the man-made park.

2.4 Psychophysiological signals and emotion responses

The smart-band which was used in this study was developed by the company Bodymonitor, a spin-off from Gesis Leibniz Institute for the Social Sciences, as tool to measure peripheral body signals like electrodermal activity and skin temperature as indicators of primary emotional responses like stress and interest.

Figure 2: sensor wristband

The sensor wristband captures and saves locally skin conductivity and skin temperature at a rate of 10 HZ with 10 Bit resolution. Besides these psycho-physiological informative parameters, skin contact quality as well as ambient temperature are measured simultaneously. This enables the detection of crucial artefacts in skin conductivity and skin temperature caused by changing contact quality of skin and transducers.

Validity of capturing electrodermal arousal was confirmed by experimental research (Papastefanou 2013), as well as by several field studies (Hogertz 2010, Bergner et al. 2011, Bergner et al. 2013, Hijazi et al. 2016, Steinitz et al. 2014).

The sensor wristband comes with a classification algorithm, which was developed by Papastefanou (2016) from the background of the biopsychological framework of emotion described above. In this framework of basic emotions(Ekman 1992, Levenson 2003)physiological responses are seen as a central dimension in manifestation of neuro-affective appraisal of stimuli.Levenson, Carstensen et al. (1991) and atmostKreibig's (2010, 2014) review have shown that specific emotional states are correlated with specific physiological arousal reflected in peripheral parameters like skin conductivity, skin temperature, heart rate variability. This means that a kind of elementar valence (aversive vs. appetitive) of physiological emotion responding can be identified.

EDA based emotion response type	„feelings“ connotations
appetitive arousal „orientation, surprise, expecting reward“	joy, curiosity, suprise, newness
aversive arousal („Flight-Fight-Response, expecting loss“)	fear, anger, tension, stress, discomfort
Balance	Vigilance, well-being, hedonic pleasure
Retraction	Shut-off, dis-interested, mental witdrawal, tired, deeply relaxed

Table 2: typology of aversive and appetitive EDA emotions

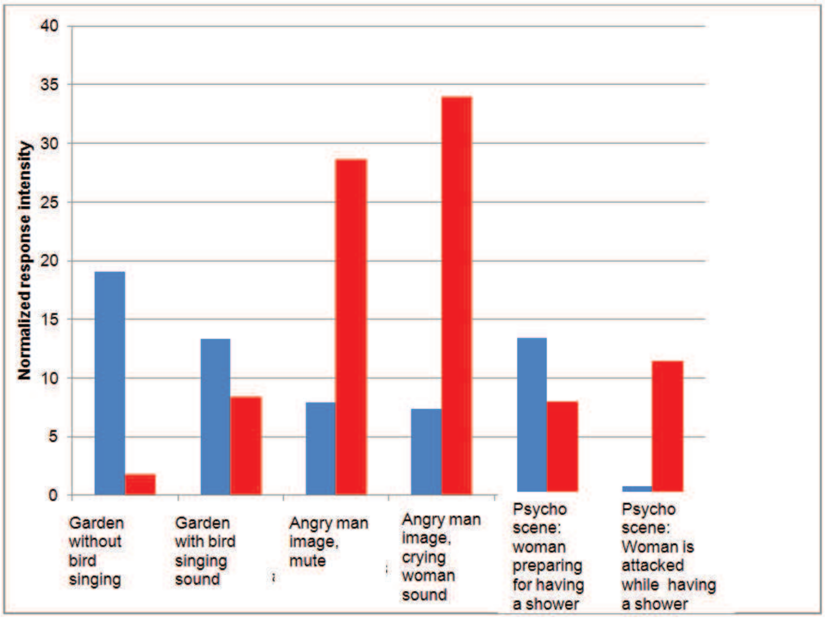

Figure 3: Intensity of aversive and appetitive EDA-response by ground truth emotion induction stimuli. Notes: Blue denotes appetitive responses, red denots aversive responses, n=30, own calculations.

Rainville, Bechara et al. (2006)report that basic emotions like anger, fear, happiness and sadness are also associated with distinct patterns of physiological changes.

From these studies electrodermal activity (EDA, also known as galvanic skin response GSR or skin conductivity) seems to be the most simple and effective indicator of emotional arousal. Electrodermal activity reflects directly sweat gland activity, which is directly enervated by neural signals of sympathicus nervous systems, while sympathicus nervous excitation is closely connected to brain structures of neuro-affective negative (avoidance) or positive (approach) appraisal (Boucsein 1995, Boucsein and Backs 2009). While it is experimentally verified by (Setz, Arnrich et al. 2010) and (G. Papastefanou 2013), that EDA as a single parameter allows to identify stress reactions, Hijazi et al. (2016) also showed that EDA changes cleaned for artifacts and noise can be used validly for identifying emotional responses to aversive stimuli as well as emotional reactions to appetitive stimuli. For further corroboration we calculated mean response strength for aversive and appetitive responses to different audiovisual stimulation (based on images and sounds of the IAPS and IADS). Results in figure confirm once again, that

As this classification is based on signal data with a 10 Hz resolution, we finally get a database with moments of a 10th of a second as basic observation units. Thereby the whole data set is hierarchically level data set with subjects and their moments of time over the whole observation period. For each moment of time there is information available about the emotional class of a given arousal response. This data on emotion reaction occurrence can be used as binary (yes vs no occurrence) as well as metric information (momentary strength of the response).

2.5 Indicating crossing personal space by passive infrared sensor

In addition to psychophysiological sensors, by way of a hardware interface the sensor-band was extended by a motion infra-red sensor, whose technical design and body positioning allowed for detecting people crossing the personal space of walking subject at varying distances.

We used the slight motion type ofpassve infrared sensor by Panasonic (NaPiOn) designed to cover a wide area, to detect human presence in an ambient space of up to 2 m distance from sensor position (see figure). The sensor, rather than emitting light such as from LEDs, detects the amount of change in

infrared rays that occurs when a person (object), whose temperature is different from the surroundings, moves. 1. As this sensordetects temperature differences, it is well suited to detecting the motion of people by their body temperature (see figure below). The infrared sensor was positioned about the level of the subjects sternum. So the sensor responds with a signal, when a human body moves through the conical space area of the sensors sensitivity (figure).

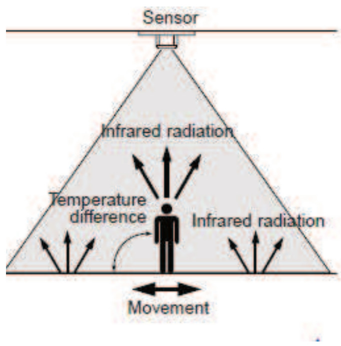

Figure 4: Movement detection mechanism by passive infrared sensor

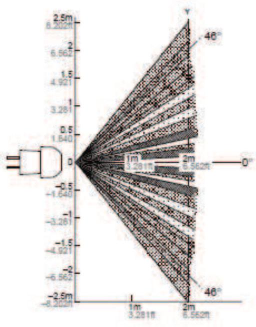

Figure 5: Detection sensitivity space of slight movement detection PIR

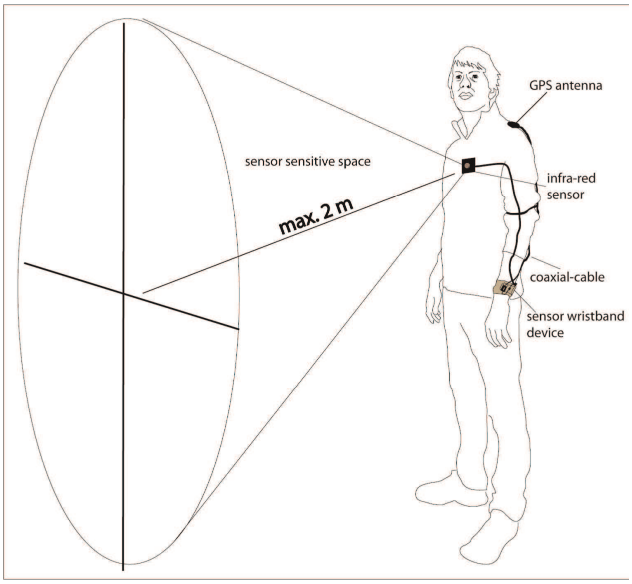

Figure 6: Sensors and wristband body positioning and indication of sensor-based person space

When human bodies moved through the sensor sensitive space, the sensor output a signal, which is stored locally in the wristband (along with signals of the other sensors). This signal was transformed into yes/no information for each moment of data collection. The data collection moments were given by 10 Hz recording, which means a 10th of a second. These moments are the units of observations in a hierarchically structured data set with subjects as top level.

2.6 Data set and statistical analysis

The data set is build up by psychophysiological as well as passive infrared motion sensor signals at a rate 10 Hz. So after emotion classification of electrodermal signals and motion detection signals, for each 10th of a second over the whole observation period of walking the urban street route, we reduced the data to binary information about occurrence of an emotional response as well as on occurrence of motion in the 2 m personal space.

As we are dealing with a hierarchically structured data set, we run multilevel statistical analysis by modeling the covariation of personal space movement as mixed regression model with random intercept. As EDA phasic responses typically show a bell curve shape over time, we choose the amplitude maximum as binary indicator of emotion response occurrence. For dealing with binary dependent variable we use the logit model. In this model binary information about moving through 2-m personal space is incorporated as independent variable. As we do not have information about distance of to persons entering the personal space we used as a proxy additional lagged information about personal space crossing. In an exploratory manner we included five lagged entery variables, namely in the moment simultaneously with emotional response, moments 1 second , 2 seconds, 3 seconds, 4 seconds and 5 seconds before. Finally, to control for accumulation of emotional responsivity over the street paths we included path duration information for each

3 RESULTS

3.1 Crossing personal space as crowd density indicator

When we look first on how much time subjects needed to walk down the pre-defined streets of the urban we find clear differences between the street paths, with street path 3 which subjects needed most time to walk down and street path 4 with least walking time (see table 3). This walking duration differences are due to physical length of the street paths as well their crowdedness.

Using the signal data of the motion sensor we find different frequencies of having had people crossing the personal space while walking the street path (see Table 4). Taking the ratio of mean number of person space crossing to the length of the street path (metres) we get an indicator of crowd density as being experienced by pedestrians walking through the streets. We see that streetpath 2 and streetpath 4 could be labeled as mostly crowded.

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citypath	mean duration in minutes	Physical length (meters)
streetpath 1	4.2	178
streetpath 2	4.8	96
streetpath 3	5.4	178
streetpath 4	3.5	96

Table 3: Mean duration of walking in different street paths

Urban streetpath	Mean number of personal space crossings	mean personal space crossings per meter
streetpath 1	36.4	0.20
streetpath 2	24.1	0.25
streetpath 3	38.8	0.22
streetpath 4	25.2	0.26

Table 4: mean number of personal space crossings while walking in different street paths

To analyze the relationship between personal space crossing and subsequent emotional responding while subjects walk in crowded streets we estimated the odds ratios of emotional response occurrence at each measured moment of time (namely a 10^{th} of a second), predicted by preceding occurrence of personal space crossing by other pedestrians. In table 5 results for aversive emotional responses are reported. We find for the model 1, which is based on data of the whole walking route, that subjects, who experience personal space crossings subsequently - namely in the next 2 seconds – will have an increased probability to elicite an aversive emotional response.

But obviously this holds true only for street paths 1 und 4. For street path 2 and street path 3 we do not find any significant effect of personal space crossing on subsequent emotional responding. Interestinglyin street path 1, the aversive emotional response occurs simultaneously with personal space crossing, whereas in street path an aversive response is elicited even 1 or 2 seconds after personal space crossing.

	Model 1	Model 2	Model 3	Model 4	Model 5
VARIABLES	Total route	Street path 1	Street path 2	Street path 3	Street path 4
Crossing Personal Space (PS) (no lag)	1.183***	1.351**	1.051	0.943	1.273*
	(0.077)	(0.169)	(0.153)	(0.115)	(0.171)
CrossingPS 1-second lag	1.139**	0.94	1.212	1.061	1.188
	(0.0751)	(0.133)	(0.168)	(0.125)	(0.163)
CrossingPS 2-second lag	1.146**	1.221	1.17	0.856	1.270*
	(0.0755)	(0.158)	(0.165)	(0.108)	(0.171)
CrossingPS 3-second lag	1.012	0.979	0.942	0.901	1.084
	(0.0696)	(0.136)	(0.143)	(0.112)	(0.153)
CrossingPS 4-second lag	1.04	1.182	0.951	0.81	1.128
	(0.0708)	(0.155)	(0.145)	(0.104)	(0.157)
CrossingPS 5-second lag	1.093	1.057	0.913	1.027	1.178
	(0.0732)	(0.143)	(0.141)	(0.121)	(0.162

Subjects variation	1.200***	1.629***	1.275***	1.296***	1.220***
	(0.057)	(0.211	(0.082)	(0.0883)	(0.0648)
Constant	0.0752***	0.0754***	0.0604***	0.0669***	0.0669***
	(0.00593)	(0.00983)	(0.00568)	(0.00643)	(0.00577)
Observations	287,641	54,941	80,790	93,140	58,740
Numberofsubjects	30	30	30	30	30

Table 5: Effects of crossing personal space on occurrence of aversive emotional response while walking in urban street paths (odds ratios, mixed effects logit models). Notes: SE of logit coefficients in parentheses, models controlled for momentary duration of path. *** p<0.01, ** p<0.05, * p<0.1

Crossing one's personal space means that people are getting aware, that other people are getting close to oneself, so out of the crowd they got specific attention attention as thei approach. Finding in table 10 show, subjects automatically respond with aversive arousal. But from a theoretical point of emotional responding, approaching people, who get close by crossing the personalspace, might also elicit an response of curiosity or interest, generally appetitive. As we have also data available about non-aversive, appetitive responses we can examine, if person space crossing also triggers appetitive responses. In table 6 results are reported for the whole route (model 1) and for the four street paths separately (models 2 -5).

For the whole route moments we find no significant relationship between crossing personal space and appetitive responding. This seems due to heterogeneity between the street paths. Namely, we find a significant effect of personal space crossing on appetitive response when walking in street path 1 or in street path 2, but not in street paths 3 or 4. For streetpath 2 we even find a prolonged effect of personal space crossing up to second 3 after crossing. This lag effect means, that as people come closer to the subject they even got more interesting. For streetpath 1 we find a significant increased appetitive response probability at those moments when others a crossing personal space.

VARIABLES	Appetitive response Total route	Appetitive response Street path 1	Appetitive response Street path 2	Appetitive response Street path 3	Appetitive response Street path 4
Crossing Personal Space (PS) (no lag)	1.061	1.287*	1.428***	0.818	0.848
	(0.0784)	(0.18)	(0.196)	(0.12)	(0.155)
Crossing PS 1-second lag	0.979 (0.0746)	0.972 (0.151)	0.947 (0.151)	1.074 (0.141)	0.934 (0.164)
Crossing PS 2-second lag	1.104	0.953	1.314*	1.182	0.995
	(0.0804)	(0.15)	(0.186)	(0.149)	(0.17)
Crossing PS 3-second lag	1.05	0.86	1.371**	1.087	0.93
	(0.078)	(0.141)	(0.191)	(0.142	(0.163)
Crossing PS 4-second lag	1.033	1.134	1.111	0.995	0.952
	(0.0771)	(0.167)	(0.168)	(0.134)	(0.165)
Crossing PS 5-second lag	0.860*	0.699**	0.85	0.897	1.075
	(0.0691)	(0.125)	(0.143)	(0.126)	(0.178)

Subjects variation	1.086***	1.129***	1.423***	1.104***	1.158***
	(0.0237)	(0.0392)	(0.14)	(0.0301)	(0.0477)
Constant	0.0838***	0.0857***	0.0694***	0.0751***	0.102***
	(0.00451)	(0.00585)	(0.00775)	(0.00468)	(0.00763)
Observations	287,641	54,941	80,790	93,140	58,740
Numberofsubjects	30	30	30	30	30

Table 6: Effects of crossing personal space on occurrence of aversive emotional response while walking in urban street paths (odds ratios, mixed effects logit models). Notes: SE of logit coefficients in parentheses, models controlled for momentary duration of path. *** p<0.01, ** p<0.05, * p<0.1

4 DISCUSSION AND CONCLUSIONS

From the background that personal space seems to be an important concept for understanding emotional dynamics in crowded streets, we first time used a sensor device to indicate dynamically personal space of subjects walking in an urban street. Personal space operationally is thereby defined as the sensitivity area of a passive infrared sensor for slight motions with max. 2 m distance from the subject. Crossing this sensitive area means that somebody gets into or close the subjective personal space. Our findings show that this sensor approach is feasible and provides meaningful results: it can be used to calculate an indicator of experienced crowd density. Difference of experienced crowd density ratio between the different street paths of the test route is a preliminary result which support its validity.

We further examined the relationship between personal space crossings – indicated by signals of motion in an area distance of 2 m or less – emotional responding. We find significant effects of personal space crossing on aversive and appetitive emotional responses, based on EDA arousal classification. This means that walking in crowded streets as they are typical for a business district like TsimShaTsui, leads to a series of involuntary personal space crossing, which then evokes aversive emotions, as assumed by proximity theory. But finding that personal space crossing also leads to appetitive emotional response points to some neglected aspect of the functioning of personal space: namely its meaning as area/space which defines the subjective relevance of encountering other people by chance. When people come close into one’s ambient personal space arousal processes start and lead to aversive responses but also to appetitive response. Obviously the urban context plays a significant role to when an occurrence of personal space crossing is emotionally evaluated as negative or positive (in the meaning of interest).

By the present analysis we can not uncover the specific aspect of the different street paths of the test route, to make personal space crossing eliciting aversive or appetitive responses.

But as the data of the Hong Kong study also measured geo-position on a second-by-second level, a further step in analyzing urban antecedents of personal space emotion effect could be done. Dynamic geo-position data of longitude and latitude can be used to operationally define small urban spatial segments of walking in the street. Then the relationship between personal space crossings and emotional response could be examined for specific street segments and their urban structural characteristics.

Showing that personal space can be validly be measured by body sensors, opens up further analyses about how moving in crowded streets elicits emotional responses, whose accumulation over the path walked might add to what people finally feel as stress load in high density urban areas. As data on psychological outcomes after having walked in urban streets are available by the Hong Kong study, an another analysis can focus on how over the sequence of involuntary and non-controllable aversive reactions they do accumulate and determine subjective feelings of reduced attention performance and heightened stress load.

5 REFERENCES

Aiello, J. R., et al. (1979). "Physiological, Social, and Behavioral Consequences of Crowding on Children and Adolescents." Child Development50: 195-202.

Allekian, C. I. (1973). "Intrusions of territory and personal space: An anxiety-indicing factor for hospitalized oersons - An exploratory study." Nursing Research22(3): 236-245.

Altman, I. (1975). "The Environment and Social Behavior: Privacy, Personal Space, Territory, and Crowding."
Boucsein, W. (1995). "Die elektrodermale Aktivität als Emotionsindikator /Electrodermal activity as an indicator of emotions." Biopsychologie von Stress und emotionalen Reaktionen.
Boucsein, W. and R. W. Backs (2009). "The psychophysiology of emotion, arousal, and personality: Methods and models." Handbook of digital human modeling1(35): 1-9.
Cox, T., et al. (2006). "Rail passenger crowding, stress, health and safety in Britain." Transportation ResearchPart A(40): 244-258.
Demian, L. (1978). Invasions of personal space: a field experiment. Dissertations and Theses. Portland, Portland State University: 62.
Efran, M. G. and J. A. Cheyne (1974). "Affective concomitants of the invasion of shared space: Behavioral, physiological, and verbal indicators." Journal of Personality and Social Psychology29(2): 219-226.
Ekman, P. (1992). "An argument for basic emotions." Cognition & emotion6(3-4): 169-200.
G. Papastefanou (2013). Experimentelle Validierung eines Sensor-Armbandes zur mobilen Messung physiologischer Stress-Reaktionen, GESIS, Köln.
Hall, E. T. (1966). The hidden dimension, 1st ed. New York, NY, US, Doubleday & Co.
Izard, C. E. (1993). "Four systems for emotion activation: Cognitive and noncognitive processes." Psychological review100(1): 68.
Kanaga, K. R. and M. Flynn (1981). "The Relationship Between Invasion of Personal Space and Stress." Human Relations34(3): 239-248.
Kaya, N. and F. Erkip (1999). "Invasion of Personal Space Under the Condition of Short-Term Crowding: A Case-Study on an Automatic Teller Machine." Journal of Environmental Psychology19: 183-189.
Konečni, V. J., et al. (1975). "Effects of a violation of personal space on escape and helping responses." Journal of Experimental Social Psychology11: 288-299.
Lang, P. J. and M. M. Bradley (2010). "Emotion and the motivational brain." Biological psychology84(3): 437-450.
LeDoux, J. (1998). The emotional brain: The mysterious underpinnings of emotional life, Simon and Schuster.
Levenson, R. W. (2003). "Blood, sweat, and fears." Annals of the New York Academy of Sciences1000(1): 348-366.
Levenson, R. W. (2014). "The Autonomic Nervous System and Emotion." Emotion Review6(2): 100–112.
Levenson, R. W., et al. (1991). "Emotion, physiology, and expression in old age." Psychology and aging6(1): 28.
N. Birbaumer and W. Jänig (2010). "Motivation und Emotion." Physiologie des Menschen.
Ortony, A. and T. J. Turner (1990). "What's basic about basic emotions?" Psychological review97(3): 315.
Panksepp, J. (1982). "Toward a general psychobiological theory of emotions." Behavioral and Brain sciences5(3): 407-422.
Panksepp, J. and D. Watt (2011). "What is basic about basic emotions? Lasting lessons from affective neuroscience." Emotion Review3(4): 387-396.
Peen, J., et al. (2010). "The current status of urban-rural differences in psychiatric disorders." Acta Psychiatrica Scandinavica121(2): 84-93.
Rainville, P., et al. (2006). "Basic emotions are associated with distinct patterns of cardiorespiratory activity." International journal of psychophysiology61(1): 5-18.
Scherer, K. R. (2001). "Appraisal considered as a process of multilevel sequential checking." Appraisal processes in emotion: Theory, methods, research92(120): 57.
Setz, C., et al. (2010). "Discriminating stress from cognitive load using a wearable EDA device." IEEE Transactions on information technology in biomedicine14(2): 410-417.
Smith, R. J. and E. S. Knowles (1978). "Attributional Consequences of Personal Space Invasions." Personality and Social Psychology Bulletin4(3): 429-433.
Sommer, R. (1959). "Studies in Personal Space " Sociometry22(3): 247-260.
Turner, A., et al. (2001). "From Isovists to Visibility Graphs: A Methodology for the Analysis of Architectural Space." Environment and Planning B: Planning and Design28(1): 103-121.
Ulrich, R. S., et al. (1991). "Stress Recovery During Exposure To Natural And Urban Environments." Journal of Environmental Psychology11: 201-230.
Vine, I. (1982). "Crowding and Stress: 2. A Personal Space Approach." Current Psychological Reviews2: 1-18.
Von Scheve, C. (2014). Emotion and social structures: The affective foundations of social order, Routledge.
Wabnegger, A., et al. (2016). "Differential amygdala activation during simulated personal space intrusion by men and women." Neuroscience330: 12-16.
Walden, T. A. and D. R. Forsyth (1981). "Close encounters of the stressful kind: Affective, physiological, and behavioral reactions to the experience of crowding." Journal of Nonverbal Behavior6(1): 46-64.
Zajonc, R. B. (1980). "Feeling and thinking: Preferences need no inferences." American Psychologist35(2): 151.

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Defining Economic Typologies based on an Economic Activities Database

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1 ABSTRACT

Economy and especially economic activities play a fundamental role in cities and in surrounding areas: it keeps the city functioning, in terms of jobs, goods and services. Considering this fundamental role of economy and economic activities and the vast amount of space it uses, it should be deeply studied and understood in order to guarantee a solid future to the sector itself and the cities.

This paper respesents an attempt to research more in depth this matter: it tries to show how economy is organised and structured in a city and surrounding areas and how it can be analysed and considered by policy makers. The aim is to define economic types that represent the frame on which different types of spatial policies, ideally one for each economic location type, should be developed and implemented by policies makers.

The project is based on a visual economic activities database. This contains information on all the visible economic units where people work or that are meant to be worked in. The study areas are the northern part of Brussels and two other areas located in Flanders (Belgium). Thanks to this visual inventory, we first tried to define a GIS methodology that defines and subdivides the economic fabric into different areas, according to the concentration of economic activities. This work is based on the hypothesis that the morphology of parcels with economic units on them is an indicator of location choice of companies. Secondly, we combined the database of economic activities with the data on economic fabric concentration in order to define and analyse different economic location types which represent potential economic locations for companies.

In this paper we will explain the method used for the data elaboration and the difficulties encountered during the work. We will also discuss how this new economic location types could be used as an instrument in a planning or policy process to define the future perspective for a specific area.

Keywords: GIS, economy, spatial polices, mapping, economic types

2 INTRODUCTION

In the research project „Segmentatie van werklocaties in Vlaanderen“ (van Dinteren, Muskens, Geudens, & HaskoningDHV, 2015) the conceptual framework looks for product-market-combinations in spatial economic planning. The basic idea is to link a group of companies to a specific location, because the area provides them with the necessary amenities. In economic site location theory, the location would then have homogenous conditions such as real estate price, transport cost, labor cost, agglomeration effect, monopoly and access to international trade (Cabus & Saey, 1997; Friedrich, 1929; Van Meeteren et al. 2013).

From the perspective of spatial planning practitionner, a vast number of economic activities seems randomly placed, regardless their location in dense urban areas, suburbs or the countryside. However, when looking at the mapping of economic activities, some of the locations might have a direct link to Walter Christaller's Central Places theory (Christaller, 1933), eg the marketing principle may be observed in shopping streets, the transportation principle around metro stations, and the administration principle in the location of hospitals. Moreover, we can use other parts of economic site location theory to give us some more insights (Cabus & Saey, 1997; Van Meeteren et al., 2013), but this is only possible if the available data on economic location/activity is accurate (Gruijthuijsen et al., 2018).

In this paper we will present a first attempt of dividing a real territory into different types of existing economic fabric. We will use three sample areas: the Brussels Northern Area, Hasselt and Koksijde-Veurne, because they represent the extent of the variation in the Belgian Northern economic territory. From the result we will discuss if we can observe a correlation between the companies present in a certain area and their assumed motivation, based on theory, to choose this site. The motivation can also be captered in interviews, which are not described in this paper, but are part of the overall research-trajectory.

In a next step, we can experiment with the types in current spatial planning processes. The visualization of the diversity of types and the scales of economic activities, combined with the subsequent analysis can be considered as a set of information that can be used in a urban development and economic policy making process. We believe that this new information about economy we provide through this project represents a concrete tool that politicians, policy makers and planners could use in order to fill the knowledge gap about the city economy that they are facing nowadays. Spatial practitioners find specific functions and activities fundamental to keep the city functioning. Ferm and Jones mention: to provide goods and services to its businesses and residents, to deal with its waste, to provide materials for its construction, and so on (Ferm & Jones, 2016). In the last decades many European cities, (eg London, Copenhagen, Antwerp,…) have set up policies and processes aimed to deindustrialize, while encouraging a rapid growth of services, knowledge economy and housing. Many industrial and logistic activities however are necessary to keep an office building functioning. Activities related to catering, cleaning, furniture, maintenance and fit out, office equipment and supplies, print and copy, security, waste disposal and more are consequently located away from the central areas, often clustered in the suburbs of even further out in the countryside (Ferm & Jones, 2016). Despite this, those activities are vital to the efficient functioning of the city and in supporting its global role (Harris, 2013).

In addition to the results of first phase (Fig.1), where the creation of an economic activities database and its first analysis form a solid base for the future development of the project (Giaretta & Zaman, 2017), we expanded the mapping to a contiguous territory in the Brussels Northern Area. Additionnaly BCI and the Katholieke Universiteit of Leuven in collaboration with Departement Omgeving of the Flemish government worked on a related research project (Gruijthuijsen et al., 2017). The project aimed to extend the economic activities mapping while adding new areas in Flanders (5 study areas in different regions), and at the same time it improved the methodology and the successive data analysis. The project studied more in detail how companies are distributed and mixed together.

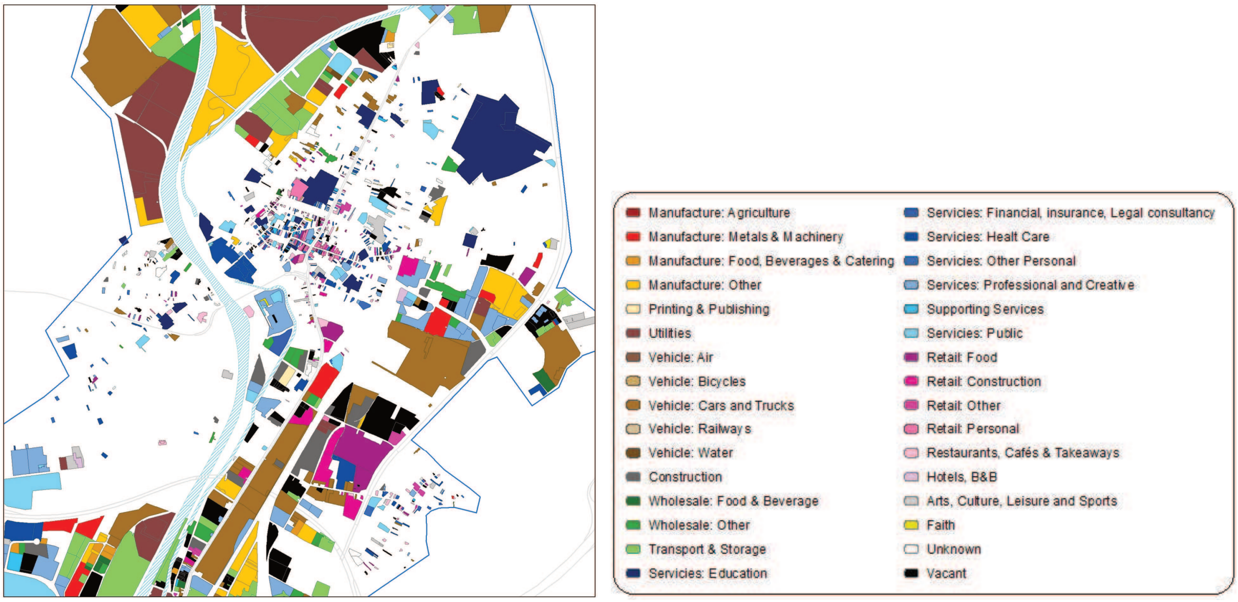

Fig.1 Dominant economic use map and categories (Giaretta & Zaman, 2017)

BCI and KULeuven take cityshape and city-parts as a starting point for the search for new typology of economic locations (the perspective of the spatial practicioner first). They set of with this first definition of economic location types, that were discussed in two workshops focussing on defining economic types. This proved that is possible to define economic types based on an economic activities map and, in addition of this that policy makers and planners can discuss and work together on this topic (Gruijthuijsen et al, 2018).

In this paper we show the approach we followed for the economic location types definition. In this research, we do not take the parts of the shape of the city as a starting point: we first look at the economic activities in space and their spatial relations. Afterwards we combine them with other spatial information about neighbourhoods. The research question was if this method results in another typology of economic locations than the BCI/KULeuven typology.

We decided to use only the data contained in the two economic activities database created by us and KU Leuven, processed in GIS using Arcmap software. The data we used are: parcels identification numbers (Capakey), economic units activity codes and the dominant economic use of the each parcel. All the other data contained in the databases like presence of housing, number of buildings and storeys on a parcels and other non dominant economic uses were not considered.

3 PROXIMITY BETWEEN ECONOMIC ACTIVITIES AS A BASIC CONCEPT

To define the typology of economic areas we use a four-step approach. The construction of the typology of economic areas is an analysis and interpretation based on Waldo Tobler's first law of geography „everything is related to everything else, but near things are more related than distant things" (Tobler, 1970). The aim is to define clusters of similar activities or similar mix of activities, with a specific proximity. Proximity represents a good indicator of how companies work on the field, and why they are located in a specific area. As mentioned proximity can be considered as one important factor in a company location choice because of the presence of:

- a shared infrastructure that is used by all the companies in that specific area,
- an agglomeration effect, where companies share the same clients or use similar spaces, e.g ground floors in a shopping streets,
- spatial policies or regulation effects that in some cases can justify the presence of multiple companies on the same site, such as office parks, port areas, industrial zones, etc.,
- a spatial monopoly, eg retail companies in the vicinity of IKEA.

The first step is to run the ‚NEAR' tool in ArcGIS and to calculate the distance from each parcel with economic activities to the nearest. The results are represented in three categories: (1) the parcels that are adjacent, (2) the parcels that are close to the next parcel where proximity might be significant, and (3) parcels that are far away from the next where an relation to the next company is not likely to be caused by proximity. The threshold between the second and third category is based on a visual comparison between three calculations: the upper decile, upper quintile and MEAN+1,92*STDEV. This empirical method to choose the threshold seems the most appropriate one, as the distribution of the data is not normal, indeed very skew, often with a long or fat tail (Fig.2).

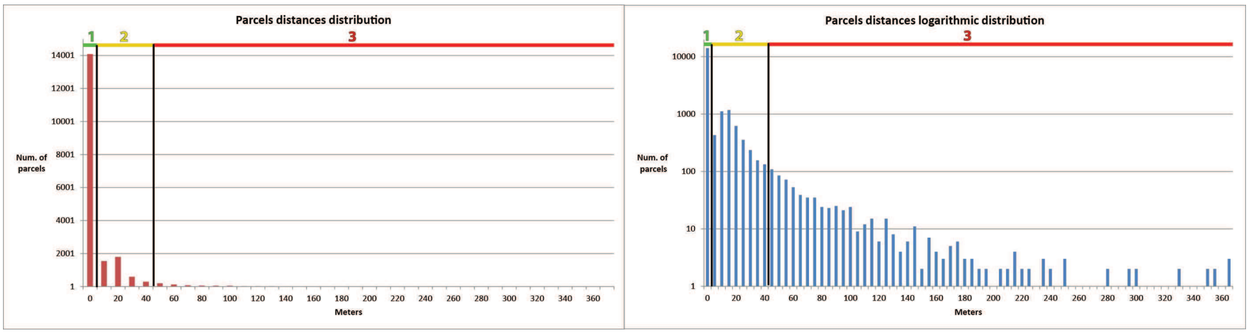

Fig.2: Data distribution for Brussels case study area (frequency table)

The second step takes the sensitivity of the data to the proximity calculation in account. Some companies use two parcels, but are no part of a continuous fabric of adjacent activities. From the first category, we select the parcels that might be wrongly classified as ‚adjacent to other activities'.

In the third step we interpret the categorisation of parcels with economic activities by manually subdividing the study area in three morphological zones: areas with (1) continuous economic fabric, (2) areas with discontinuous economic fabric and (3) areas with dispersed economic activities. The specific tools used and problems faced to create this morphology are discribed in chapter 4.

From this morphology, we futher subdivide the areas based on the presence of specific economic activities in the fourth step. This subdivision is the first version of the typology of economic locations, further elaborated in chapter 5.

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The complete four step approach uses the dominant economic use for each parcel contained in the economic activities database we created in the first phase of the project. The information about the use of space enables us to subdivide the three morphologies in a total of twenty-two different economic location types. The falsification of this subdivision in 22 types will be part of the third phase of our research. We will use the typology in current spatial planning processes, and evaluate the assumption that the types correspond to specific product-market-combinations. Next to the pragmatic test, we will further analyse the distribution of activities in each of the categories, and reveal the sensitivity of the subdivision in types.

4 MORPHOLOGY, IN SEARCH OF OBJECTIVATION

In this chapter we present the morphology analysis we carried out. We first explain why the study of the economic morphology in a specific area can help to explain how companies are spread and organized, then the GIS procedure we followed and the results we obtained.

With the term economic morphology, we consider the distribution of economic functions related to a specific context. Economic functions are defined by all the cadastral parcels with at least one economic unit on it. These parcels and their uses were obtained from the visual economic activities database Departement Omgeving and BCI/KULeuven developed. The study of economic morphology is important in order to define an area from an economic point of view. The aim of this phase was to subdivided the economic fabric in different zones, based on the continuity of the fabric itself. The continuity or discontinuity is a clear indicator about the presence of different economic dynamics defined by companies located in each area.

As mentioned, morphology classification was carried out while combining a first GIS analysis phase followed by an interpretation of the results. At first we tried to define the different classes only using an automated GIS procedure that could have been afterwards replicated in different case study areas leading to similar results. Soon we realised that this was not possible. To simplify the procedure, a phase of interpretation was introduced to get a reasonable result in terms of morphologies definition for each sample.

Starting from the cadastral map shapefiles we filtered out all the parcels without an economic use in it. In order to select just the parcel with an economic use we made a "join” between the cadastral map shapefile and the dominant economic use table created in the conomic activities database, based on parcels identification number (Capakey). In the Brussels case study we then merged the two filtered cadastral shapefile (Brussels and Flanders ones) into a single one and exported it as a new shapefile. This last step was necessary in order to run the “near” tool, this function determines the distance from each feature in the input features to the nearest features in the near features. We used this tool in order to determine the nearest distance between parcels (Features), that in our project represent the indicator on which proximity is based. A new field with nearest distance between parcels was then added to the attribute table and used for results analysis (Fig. 3)

Hasselt_dominant

FID	Shape *	CAPAKEY	SHAPE_Area	NEAR_DIST
1390	Polygon	71327G0617/00M005	682,412071	20,705268
839	Polygon	71323C0069/00V002	145,089727	21,102984
869	Polygon	71323C0472/00P000	606,131134	21,213977
1603	Polygon	71323C0463/00C002	2240,932788	21,636924
1628	Polygon	71323C0416/00N000	763,235666	21,796248
1088	Polygon	71326F0078/00W002	162,642291	22,181234
1087	Polygon	71326F0078/00B004	173,586902	22,370949
1630	Polygon	71323C0425/00S000	1218,451139	22,536906
1038	Polygon	71327G0124/00S003	359,151713	23,54399
1408	Polygon	71328D0043/00W000	152,532479	23,575631
1556	Polygon	71326F0088/00K011	311,499489	24,078407
710	Polygon	71322A0378/00N003	1039,551576	24,294629
891	Polygon	71323C0670/00H002	1244,412146	24,866328
968	Polygon	71323C0617/00K002	613,174658	24,866328
916	Polygon	71326F0088/02B000	196,931762	26,126979
782	Polygon	71322A0537/00N003	694,922696	26,781418
824	Polygon	71322A0505/00T000	301,555279	26,793019
1641	Polygon	71322A0508/00M000	4556,633181	26,793019
871	Polygon	71323C0476/00R002	237,680978	27,075398
1521	Polygon	71326F0092/00S009	131,233432	27,266841
1162	Polygon	71326F0388/00X000	128,099175	27,558575
1545	Polygon	71322A0515/00M000	2266,601925	27,779286
1274	Polygon	71322A0526/00P000	389,935783	27,880501
1124	Polygon	71327G0631/00D003	244,156875	27,997977
1169	Polygon	71327G0638/00H004	234,63624	27,997977
880	Polygon	71323C0141/00G002	188,324609	28,307889

Fig.3: Economic parcels and near distance table (Hasselt case)

From the “near” table, we started the results analysis in order to define different types of economic morphologies based on distances between parcels. Three different categories plus a fourth one, and their related shapefiles were defined: Continuous economic fabric, discontinuous economic fabric, disperse economic fabric and ad as last undefined economic fabric (Fig. 4a).

Each category is defined as follow: “Continuous economic” fabric indicate all the parcels located next to each other, in which the distance to the closest one is zero and is represented with a green colour, “discontinius economic fabric” is defined as parcels where near distance is between zero and the threshold one explained in chapter 3 and is represented using a yellow colour, remaining parcels with a near distance bigger than the threshold one are part of the “disperse economic fabric” category and is represented using a red colour. The last category, the „adjacent to other activities“, needs a specific explanation. During the analysis of distances we saw that isolated companies, who are on more than one parcel located one next to each other, were defined by GIS “near” tool as part of the continuous economic fabric. This do not represent what really happens on the field, companies located in a open space or in a low density area are not comparable from a location point of view with the ones located in a continuous economic fabric even if they appear in the same category. In order to filter out the described parcels we first used the GIS “dissolve” tool on the continuous economic fabric shape, that creates a new coverage by merging adjacent polygons that have the same value for a specified item, and then we recalculated the near distance. We then selected and exported into a new shapefile the undefined parcels. These parcels can belong to any of the three categories. Those parcels are the ones where the near distance is bigger than the data population mean and with an area smaller than 5400m² (based on empirical observation as described in chapter 3).

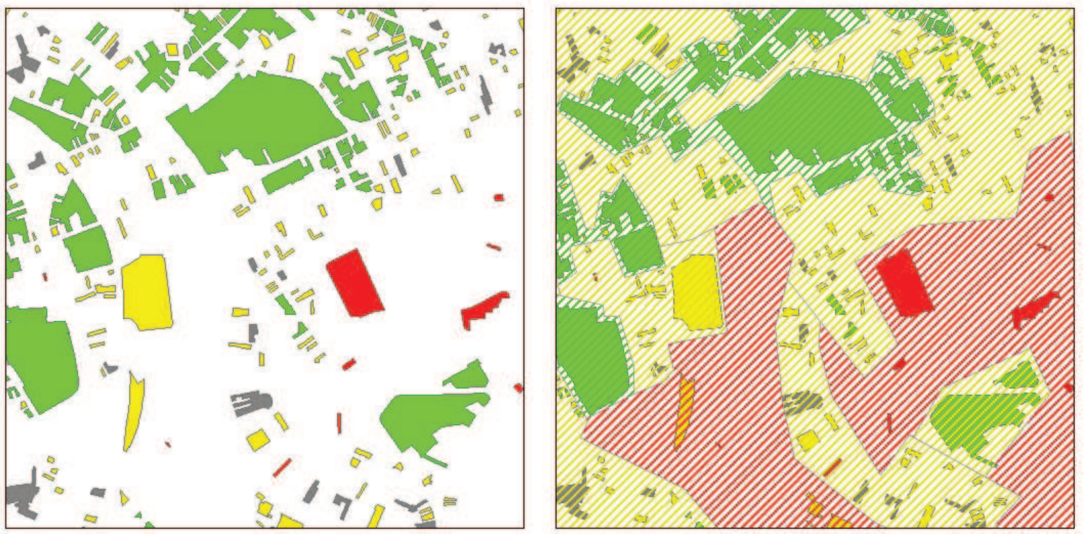

Fig. 4a Morphology at parcel level and Fig. 4b. Morphology at area level

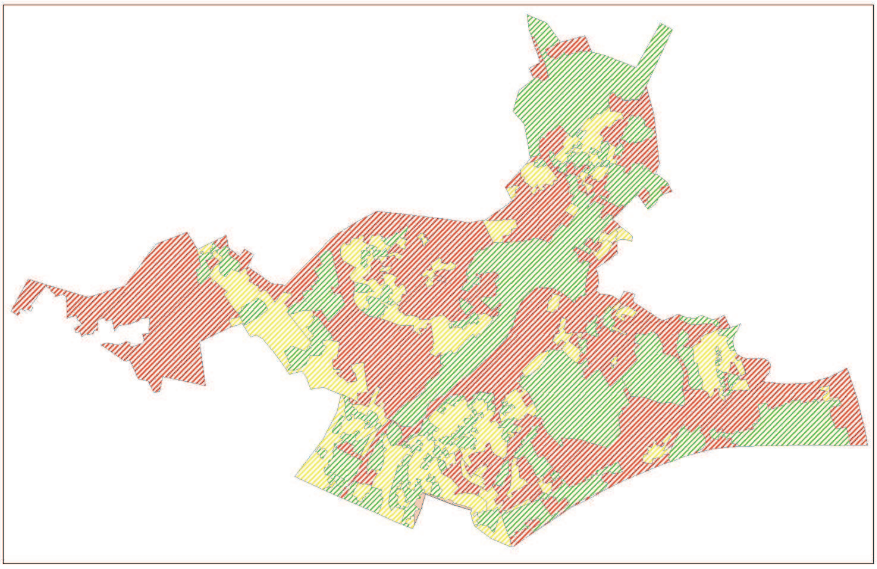

Fig 5a: Morphology for Brussels Northern area

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As a final step of this phase, we interpreted the GIS analysis result. This consisted in transforming the three above-mentioned categories from a set of polygons made out of parcels (Fig. 4a), in morphologic areas able to cover the entire surface of each case study area (Fig. 4b). In order to do that we edited the areas in shapefiles while splitting those into polygon and then coding them according to the morphologies definitions. As a result we obtained a subdivision of the areas in polygons able to represent the different morphologies, as shown in Fig. 5a-c.

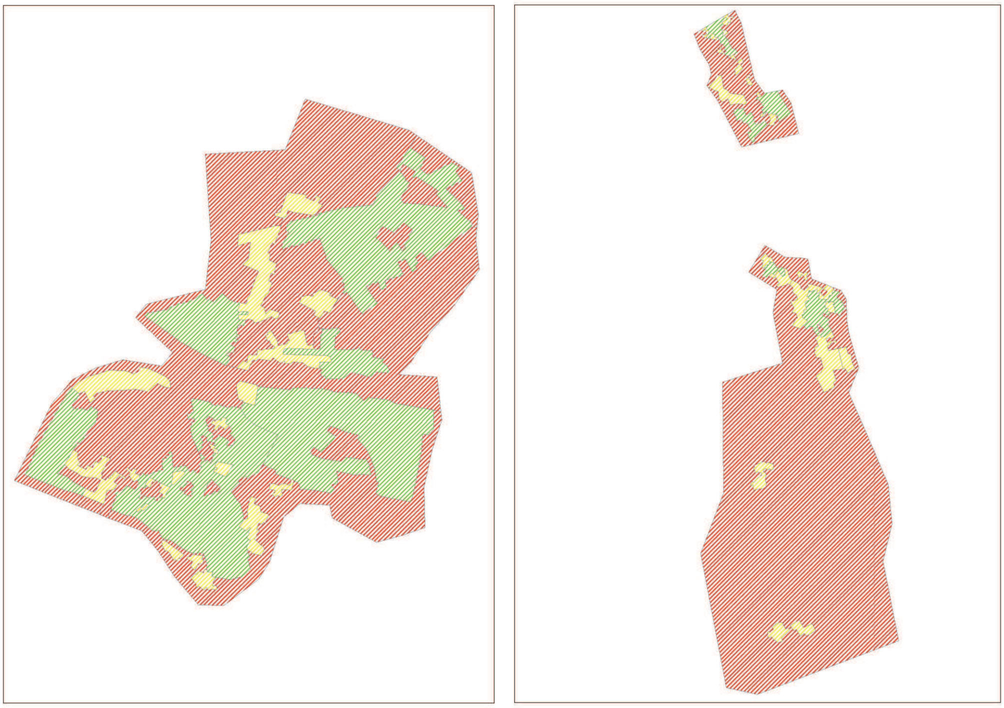

Fig. 5b Morphology for Hasselt and Fig.5c Morphology for Koksijde-Veurne

5 TYPOLOGIES

In this chapter, we present the economic location types we defined in our project. The types of observed (or potential) economic locations for companies are defined as areas located in the same morphological zone, as explained in chapter 4, that are characterized by the same economic fabric continuity and by the predominant presence of an economic use, or a combination of uses.

The definition of types is based on an analysis of the three typologies of economic morphology, that were presented in the previous chapter, combined with the dominant economic use map derived from our economic activities database. This phase is based on a visual interpretation of the two combined layers, aimed to identify first the presence of patterns in the economic structure and then, secondly, clusters of activities inside those patterns. In doing so, we were able to define different economic location types.

Starting from the three main morphological groups, a total of 22 different economic location types were defined. The first two groups represent the “Continuous economic fabric” and the “Discontinuous economic fabric” areas and are splitted in a total of 7 categories each, based on activities codes and their distribution. The third group represents the “Disperse economic fabric” subdivided in a total of 8 categories. The main difference between the first two groups and the last one is based on the data we considered for types definition. In the first two cases, the combination of the economic dominant use and morphology layers gave an adequate amount of information to develop the economic location types. From this combination we derived mainly economic patterns and activities clusters inside a morphological area. Examples of clusters we identified are areas where retail, restaurants and bars represent the main activities and there are almost no other economic uses (11 and 21); same for areas characterized by the only presence of service related activities (12 and 22). Another example of monofunctional type is identified by the portion of economic fabric where activities are related just to art, culture and sport and are not isolated (13 and 23). Combination of manufacture, wholesale, transport companies and car related activities in a same area easly define an industrial cluster (14 and 24). Big and isolated activities clusters are represented by hospitals, sport facilities, shopping centers or other activities that usually take a large amount of space and present different sizes and uses if compared with surroundings (17 and 27). Areas where retail and services co-exist together without one prevailing over the other are identified as mixed retail/services areas (15 and 25). In some cases activities related to industry (manufacture, wholesaler, car dealers and repairers, etc.) are also part of a services and retail mixed area, for this reason a different mixed type was defined (16 and 26). Figure number 6b-d show the results in terms of economic location types for the first two groups, based on the observation and interpretation of the mentioned data layers combination.

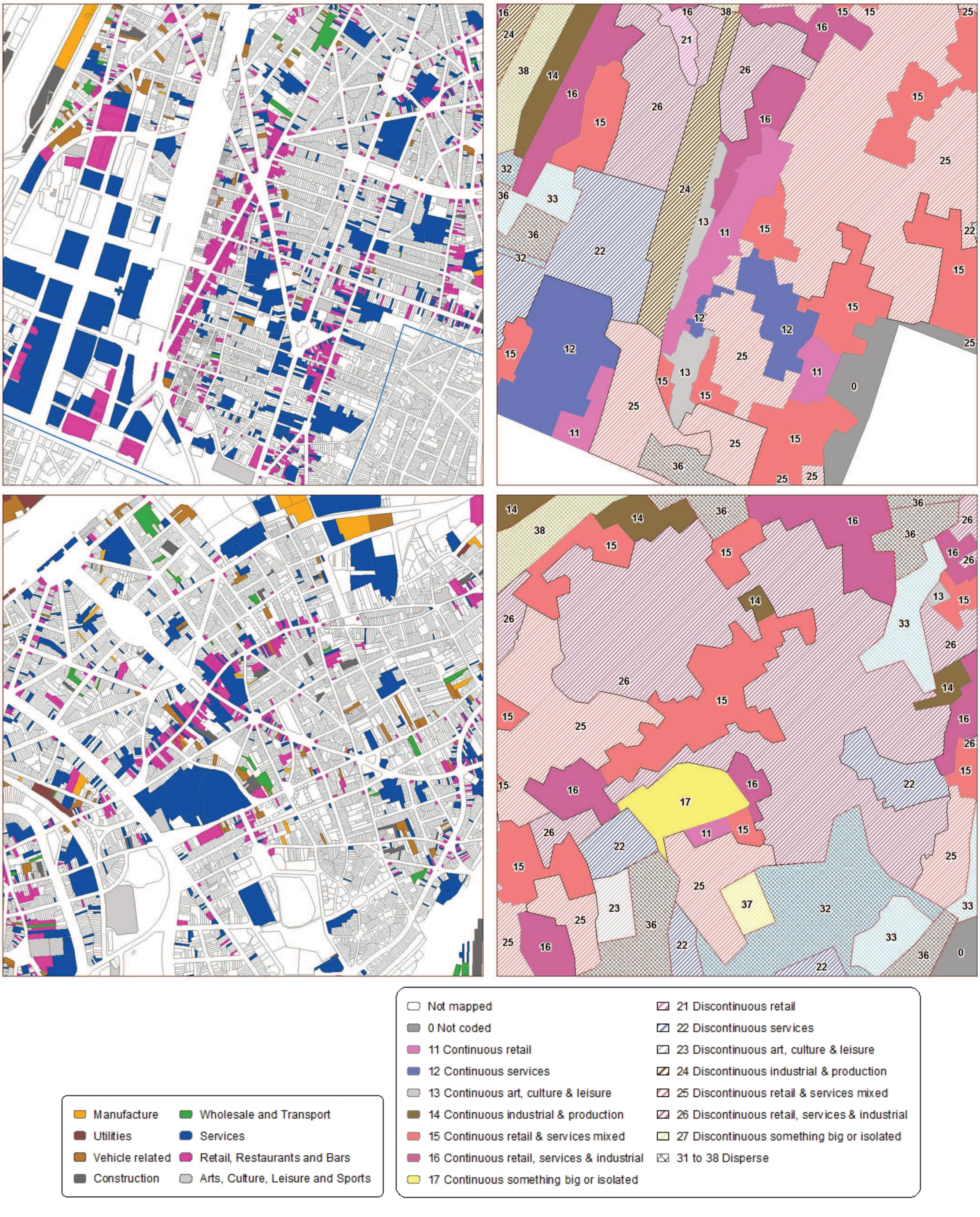

Fig. 6a (top left): Dominant economic use ‚North Station‘, Fig. 6b (top right): Economic location types‚North Station, Fig. 6c (bottom left): Dominant economic use ‚Helmet‘, Fig. 6d (bottom right): Economic location types ‚Helmet‘

In the last group, the dispersed one, we realised that the information contained in the mentioned data layers, combined with longer distances between economic activities, were not enough to identify patterns and define

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economic location types based on a simple observation. For this reason other data were necessary. Despite this, external data sources were not used. The complementary data we used were already contained in our database, and consisted of the cadastral map parcels and buildings. Thanks to this, we were able to identify building clusters, isolated buildings, empty and open space areas, which consist of a fundamental set of informations for the types definitions in a disperse environment. Six different categories were defined (Tab 1.), based on the presence of: bulding clusters, economic activities and parcels. Two other categories complete this group, "big and isolated activities" and "farms". These two represent exceptions because in comparison with the other categories, they show different dynamics in relationship with surroundings areas and activity regulations.

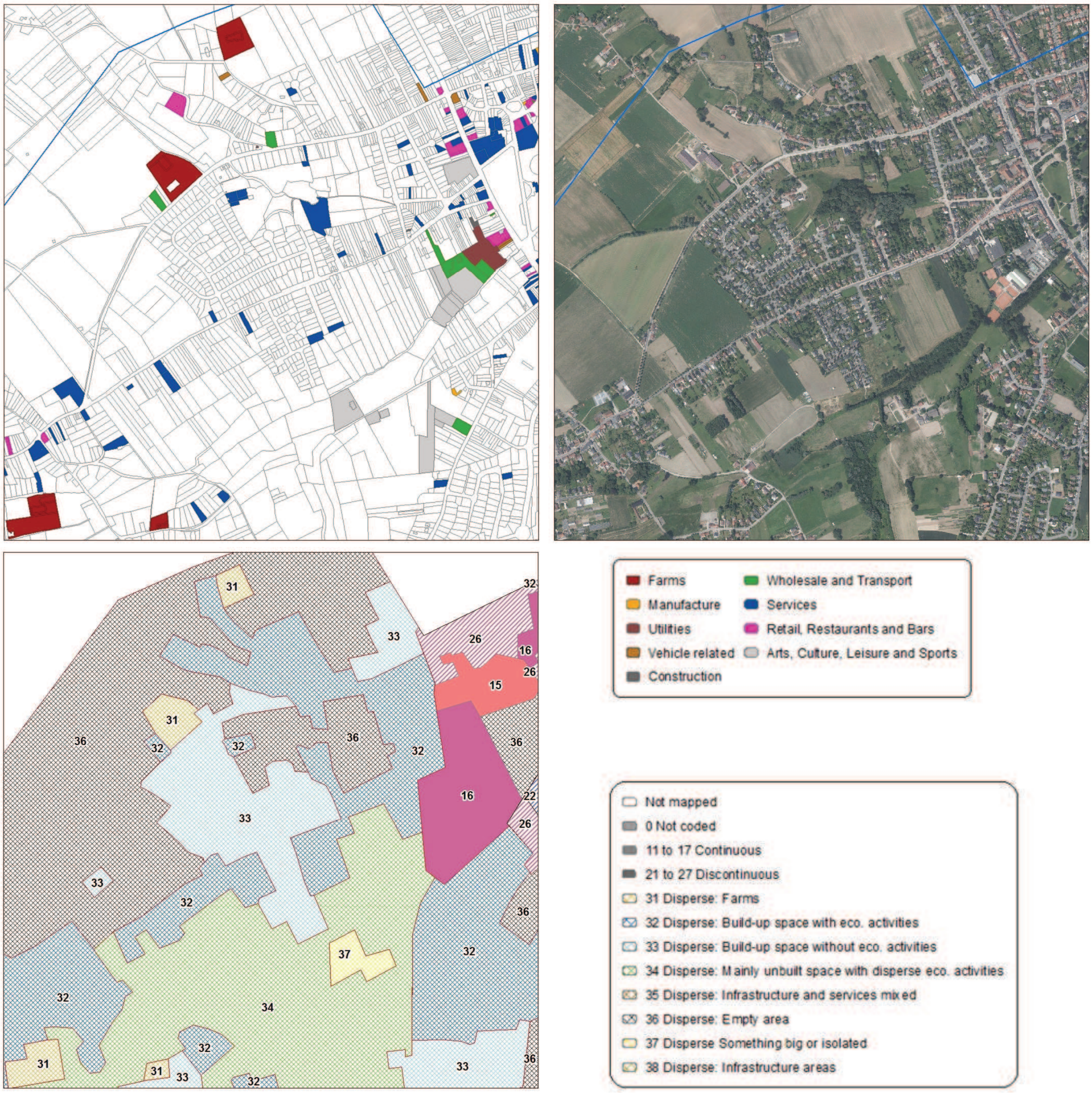

Fig. 7a: Dominant economic use, Fig. 7b: Area orthophoto, Fig. 7c: Economic location types

Category	Building cluster	Economic activities	Parcels
Build-up space with economic activities	√	√	√
Build-up space without economic activities	√	X	√
Mainly unbuilt space with disperse economic activities	X	√	√
Infrastructure and services mixed	X	√	X
Infrastructure areas	X	X	X
Empty areas	X	X	√

Tab. 1: Disperse categories definition

For the attribution of the economic location type code, we first splitted the economic morphology polygons in an editing sessions using GIS. Then we created a new field in the attribute table and finally recoded each new polygon using the respective economic type code.

6 DISCUSSION

In search for knowledge about the location of economic activities, the Departement Omgeving of the Flemish government started with mapping of activities. In this paper we proposed an attempt to define different types of economic fabric. We believe that these types should be useful for spacial economic policy making in the future.

The combination of the expanded Brussels Northern area mapping and the mapping in the Flemish study-areas (BCI/KULeuven) in different territories was fundamental for types definitions. Among others the differentation in urban form (metropolitan, suburban, local centre, coastal), density and transportation infrastructures is broad in the sample. The results of the mapping show a broad differentiation in presence and patterns of economic activities but also a repetition of patterns in the different study-areas.

Refering to Tobler’s first law we used distances between economic activities as a starting point for division of the mapped territory, applying the near function in GIS. This application supports the researcher to objectivate drawing lines between the areas packed with economic activities and those with less, in order to get away from pre-conceived ideas of urban structures. Adding variation of activity types makes it possible to define economic location types.

So, a location type can be described using two characteristics: proximity and variation in combination of activities. The continuous and discontinuous economic fabric areas can each be divided in the same types considering the combination of activities. To define types in the dispersed economic fabric area, supplementary information is added. Types in dispersed economic fabric area are defined referring to agrarian economic activity and non-economic function(s) of the area.

Especially in the continuous economic fabric area, the map shows us location types that look familiar for the spatial practitioner: predominant retail in shopping streets, predominant services in CBD, industrial area etc, defining them is rather easy. On the other hand, some of the types prevail on locations we would not expect or they appear in another spatial pattern. Examples of this are the services areas (12) close to shopping streets (11) or a small retail and services area (15) close to a metro station. The mark of the areas in the discontinuous areas is more submissive to coincidence and interpretation, what makes the exact area demarcation more unsure. Especially the knowledge of this areas is fundamental for a future policy on mixed use. Further research will be conducted on this kind of areas, including the extent of mapping.

The more precise the marking of locations, the more it becomes possible to describe the location types quantitatively, for example with the mesures used in the study (BCI) (Gruijthuijsen et al., 2017) or distribution of activities amoung types.

This dataset and spatial typology give extra opportunities to combine the results with other data. As stated in (Gruijthuijsen et al., 2018) some location types can be enriched by other data. Further research will make it possible to know which of the types can be located without the intensive mapping, using existing data. The prevalance of different types can also be combined with maps defining settlement and urban structure (resulting from on-going research).

The research shows that, starting from the mapping of economic activities, we are able to define a typology of economic activities. As we base our research on Tobler’s first law, we assume that there is a possible relation between companies. This relation could be limited to one or more site location choice factors. In the continuous economic fabric we can propose the following relations:

- A shopping area (11) has a shared market, similar real estate prices, and an agglomeration effect
- A mixed shopping and services area (15) has a shared market, similar real estate prices, and an agglomeration effect
- A industrial area (14) has a specific set of regulations, a shared infrastructure, similar real estate prices and a shared accessability
- A services area (12) has a specific set of regulations and similar real estate prices

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- Something big (17) has its own rules and history

Similarly, we can think of shared motivations between companies in other areas. For dispersed and discontinuous areas this is however more difficult to do.

Between different areas in the same type, there will be big differences (eg real estate price or transport cost), but we state that companies find the same set of location factors decisive.

Overviewing the whole we are convinced that the differences between types gives already a useful set of information for policy preparation. The aim is to define economic types that represent the frame on which different types of spatial policies, ideally one for each economic location type, should be developed and implemented by policies makers.

7 REFERENCES

Cabus, P., & Saey, P. (1997). Consistentie en coherentie van het ruimtelijk structuurplan Vlaanderen in het licht van de actuele stedelijke en regionaal-economische ontwikkeling.

Christaller, W. (1933). Die zentralen Orte in Süddeutschland. Gustav Fischer, Jena

Ferm, J., & Jones, E. (2016). Beyond the 'post-industrial' city: valuing and planning for industry in London. Urban Studies.

Friedrich, C. J. (1929). Alfred Weber's theory of the location of industries. Chicago Illinois: The university of Chicago Press.

Giaretta, F., & Zaman, J. (2017). Can an economic activities inventory fill the knowledge gap about the economic sector in a policy making process? Paper presented at the Real Corp 2017, Wien.

Gruijthuijsen, W., Steenberghen, T., Vanneste, D., Zaman, J., Pennincx, I., De Mulder, S., Horemans, E., Vermoesen, K. (2018). Assessing expanding space use versus infill for economic activities. Paper presented at Real Corp 2018, Wien.

Gruijthuijsen, W., Vanneste, D., Steenberghen, T., Van Liere, S., Roelofs, B., Verweij, K., Groen, M., De Groot, C., Hubers, J. (2017). Segmentatie III: ruimteproductiviteit, verweving en ruimtelijk rendement van economische locaties. Research commissioned by Vlaams Departement Omgeving and Vlaams Agentschap Innoveren en Ondernemen.

Harris, R. (2013). Servicing the services and smart sheds. Retrieved from http://www.ramidus.co.uk/wp-content/uploads/2015/06/ramidus-servicing-the-services-and-smart-sheds.pdf

Tobler, W. R. (1970). A Computer Movie Simulating Urban Growth in the Detroit Region. Economic Geography, 46 (Supplement: Proceedings. Internationals Geograpical Union. Commission on Quantitative Methods), 7.

van Dinteren, Muskens, Geudens, & HaskoningDHV, (2015). Segmentatie van Werklocaties Vlaanderen, research commissioned by Ruimte Vlaanderen.

Van Meeteren, M., Boussauw, K., De Kool, D., & Ronse, W. (Eds.). (2013). Het Vlaams gewest als polycentrische ruimte: van semantiek tot toepassing. Brussel: Ministerie van de Vlaamse Gemeenschap Departement Ruimte Vlaanderen.

DESENT: Smart Decision Support System for Urban Energy and Transportation

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1 ABSTRACT

The focus of this paper is on the DESENT project, which aims to develop, test and disseminate a comprehensive decision support system for smart energy and transport in cities. Transport energy consumption modelling, building supply and energy demand tools are combined to provide a common decision support system for appraisal of city-wide energy use. The system will be set up as planning toolbox that consists of several models and tools providing different functionalities to show actual data for energy demand and transport energy demand and furthermore allow to predict the energy demand on building and city level for future planning scenarios. Thus, the relationships between sustainability objectives, transport, spatial design of the built environment and rational use of energy are considered.

The paper describes the concept and structure of the planning toolbox and its models and tools developed so far. Furthermore, it outlines methodologies developed and the data acquisition process for the city of Weiz, which serves as one of the pilot cities in the project.

Keywords: energy demand prediction, smart city development, transport energy demand, uncertain supply, optimal energy distribution

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2 INTRODUCTION

The design of living spaces with a high quality of life is one of the core challenges of the 21st century, a century of urbanisation and rural exodus, the use of information and communication technology in almost all areas as well as the change of the demographic structure, especially in European society (Calvillo, C., et al, 2016) (Eremia, M., et al 2017). In this context one of the most important factors of government policy is security of energy supply (Brown, M.H., 2001). Therefore, concerns such as growing energy demands, limitations of fossil fuels and threats of CO2 emission and continuous climate change underpin the high demand for resource conservation and resilience in urban areas.

Today approximately 50 % of all people worldwide live in cities (for Europe it's almost 75 % of the total population) (Kotzeva, M., et al., 2016) (European Commision, 2012), and by 2050 an increase to 70 % is predicted. Urban regions are focal points of resource consumption and emissions - in Europe around 80 % of energy is used in urban areas (Nabielek, K. et al, 2016) and in 2050 cities will be responsible for 75 % of global carbon emissions (Lufkin, B., 2017). Thus, cities will in future define the need for space and infrastructure, products and services (Obernosterer, R., et al., 2012), (Grimm, N., et al.,2008), (Hammer, S., et al., 2011). As a result, the conservation of energy resources must primarily start in the cities and consider all levels of energy planning, including also the areas of spatial planning, building stock and transport, as well as the areas of economy, society, politics and administration to gain high acceptance. This will help raise awareness among the public, and in particular among different stakeholders, that are willing to invest in resource-efficient technologies and be a success factor for the "city of the future" (Chourabi, H. et al., 2012).

The design of urban areas has a significant bearing on the balance of building and transport energy use, which are the two sectors that are directly affected by urban planning (Steemers, 2003). City planning knows a wide variety of key figures that characterise neighbourhoods, districts and cities. However, which of these figures describe a city with future potential, a "city of the future", cannot be clearly defined. As a rule, urban typologies are captured in terms of their resource efficiency through quantitative values (e.g., land use, energy measures, density metrics). Although key figures regarding certain properties of urban areas allow first conclusions about resource efficiency, they do not give a complete picture without considering the user behaviour. Thus, the key elements of urban energy systems are (1) land use and activity location, (2) use pattern (peoples' behaviour), (3) built environment (buildings and transport) and (4) supply technologies and fuel (Keirstead, J. 2010).

So far, studies and models have dealt with future effects and optimisation potentials, e.g. for energy savings individually for the building, transport and energy sector (Keirstead, J. 2010) (Hegger, M. et al., 2012). There also have been multiple efforts to develop tools for urban energy systems modelling. These include for example GIS based tools for estimating the spatial pattern of energy requirements in an urban area (Girarding, L., et al 2008), or a model for the optimisation of flexibilisation technologies in urban areas (Alhamwi, A., 2017). Moreover, a model assessing the interactions of heat demand and locally available heat sources (Mori, Y., 2007), an open tool (called TEASER) for urban energy modelling of building stocks, (Remmen, P., 2018) or a model combining demand estimation with an energy-management optimisation module (Brownsword, R.A., 2005). While these applications are quite diverse, they demonstrate two important features of existing urban energy system models (Keirstead, J. 2009).

- First, such models must include a representation of the spatial and temporal variation of urban energy demand. This can lead to significant input requirements, e.g. in form of GIS data or building design information specifications, but building up the urban system from individual components allows the aggregate effects of small changes to be assessed more readily.
- Second, these models seek to explore both the supply and demand sides of urban energy use, for example by optimising provision strategies.

However, in addition to these positive characteristics, these examples also show that current practice consists largely of detailed models built for the assessment of a single aspect of existing systems. This means that these tools have limited applicability beyond the specific problem case, increasing the resources required for data collection and validation in new contexts. Furthermore, they are unable to offer a truly integrated perspective on urban energy use across all sectors and stages of the design process.

Furthermore, the increase of renewable sources for electrical and thermal energy generation will require flexible and secure supply systems (Remmen, P., 2018). In spite of the fast development of new energy solutions, current predictions of energy consumption leave much room for improvement and a sophisticated approach is required to develop smart solutions (Keirstead, J., 2009). Linking energy demand of buildings with the energy consumption for transport can be difficult as the energy consumption occurs at different times and places. An integrated decision support tool needs to consider an activity-based approach with a special emphasis on individual consumers' daily activities and trips (Arentze, T.A. & Timmermans, H.J.P, 2005). This allows to trace individual consumer's activity-travel behaviour and gives the chance to predict the energy consumption in time and space. Only thus, a holistic decision support system can provide detailed knowledge about when and where people consume energy and moreover enables to predict future energy demand based on different scenarios. Thus, the development of models that can reduce uncertainties regarding future energy demand / supply and furthermore support decision making in sustainable urban energy planning are crucial for (smart) cities.

3 DESENT PROJECT

The overall goal of the project DESENT is to develop and test a comprehensive decision support system for energy and transportation in small and medium-sized cities, that are showing a will to carry out energy plans and achieve ambitious climate goals. The specific objectives of the project are to

- create models for future energy consumption prediction at building level in different types of buildings and for transport,
- develop an integrated framework for dynamic building energy simulation at the district level,
- investigate how the developed planning tool can reduce the uncertainty on energy demand predictions and how it leads to improved energy infrastructure / service provision decisions,
- integrate the developed models into state-of-the-art simulation tools, in order to develop enhanced decision support systems which provides scientific evidence in support of policy options,
- investigate the effects of the products and services enabled by the integration of personal transportation, building energy and power services;
- test/implement the models and tools, demonstrate and evaluate the capabilities of the tools through the case studies in several demo cities.

Regarding the last point, the Austrian town Weiz near Graz, with about 11,300 inhabitants is involed as one of the three pilot cities within the project.

DESENT will aim at developing a practicable ICT solution, which will accelerate the spread of the integrated real-time transport and building energy monitoring. The planning toolbox developed will help companies and governments understand energy use behaviour and customer responses to different policies. It will capture the behavioural adaption of customers at a microscopic scale. A continuous observation of energy consumption and user responses will provide more insights into the specific roles and interactions of and between various stakeholders.

4 METHODOLOGY AND DATA ACQUISITION

During the project different programs and tools (based on Excel, MATLAB, ArcGis etc.) will be developed and merged into a comprehensive planning toolbox for descision making regarding the energy system (on building and district level) for a short- and long-term perspective.

The modular designed planning toolbox provides data that will be integrated into a geographical information system (GIS) for the analysis and evaluation of different future energy and transport policies. To predict the energy demand and transport energy demand the toolbox comprises different models on the level of single users, buildings and the overall system (city) - see Figure 1.

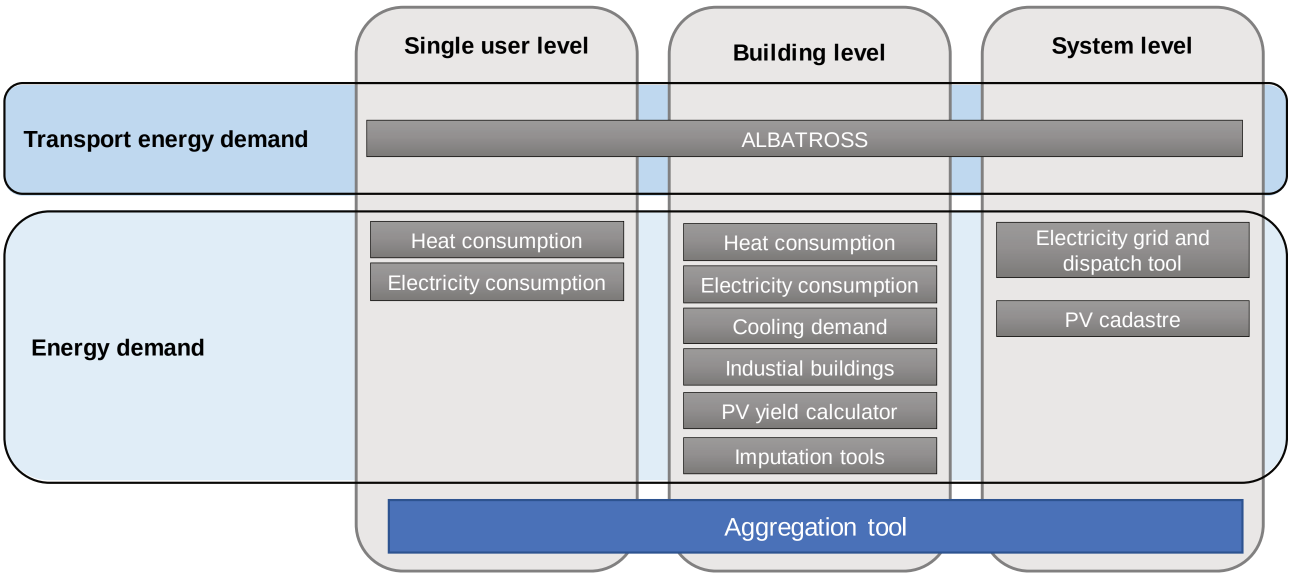

Fig. 1: Models and tools on single user, building and system level

Since testing of the support systems is a core part of the project, the city of Weiz (Austria) played a major role in the discussion of the charactaristics and functionalities of the models and tools. This also translates to the data required and furthermore provided by the tools as well as the benefits and results for different target groups/stakeholders. Based on this involvement a consensus on the structure, elements and features of the toolbox could be achieved. The models and tools rely heavily on the data provided. As such the quality of the data considered is of major importance. Further steps included the agreement on the interfaces between the tools on single-user, building as well as on system level. As part of the agreement process the necessary parameters for the tools were defined. To ensure the efficient interaction between the different tools, the data format of the tools, based on the available data, was unified.

4.1 Transport energy demand

4.1.1 Description of model

For the prediction of the transport energy demand an agent based simulation model, called Albatross, will be used. Three different versions of the model have been developed between 2000 and 2010.The first version of Albatross is a prototype of the model, examing the feasibility of key theoretical ideas and modeling approach (Arentze T.A., & Timmermans, H.J.P, 2000). The second version addressed the limitations of Albatross I and developed an approach to intergrate the stated choice models with the system. It also rederived the decision tables for a large national travel survey in the Netherlands (Arentze T.A., & Timmermans, H.J.P, 2005, 2007). Albatross III updated the decision trees with new datasets (Arentze T.A., & Timmermans, H.J.P, 2007). It more systematically redesigned decision tables about task and resource allocation.

In this project, Albatross III will be extended but less focused on the theoretical development and more on applying the model at city level. The Albatross has been extended to predict the energy demand of travel behaviour at individual level for a certain city. It includes the following three extentions.

(1) First, to reflect the possibilities of including new mobility options that have been / will be introduced in the market. Therefore, the set of transport modes that is included in the travel demand forecasting model has been expanded. The car options are now differentiated according to engine type (gasoline, diesel, hybrid, electric) to make Albatross more sensitive to differences in energy consumption and emissions.

(2) Second, to mitigate the pollution and energy consumption problem caused by conventional vehicles, it is important to predict the market penetration of new mobility tools. A stated adaptation model has been built to predict social acceptance of new technology for smart energy use, which refer to electric vehicles, car sharing and E-bike. A pivoted stated choice experiment was designed to capture the decision among car sharing, E-bike and electrical car considering life events impacts. Heterogenous behaviour across respondents in the decision-making process regarding the trade-off between shared and conventional mobility, respective to electric cars is observed. This model will be integrated into the Albatross for predicting individual energy consumption for travel by different transport modes.

(3) Third, the current version of Albatross only predicted movement based on a four-digit postcode. To predict spatial distribution energy consumption and emission by transport in a city, a traffic assignment model is needed in order to obtain the information of traffic flow on road segments. It compromises the microscopic energy consumption prediction. The activity-travel demand, which is generated using the model based on the synthesised population in demonstration cities, will be assigned on the road networks. The transport energy demand will be predicted, based on the assigned traffic flow and the energy consumption model.

The enhanced model will provide consistent information on the time use of individuals for activities and trips, which serves as information source for energy consumption prediction for transport on building level.

4.1.2 Required information and data gathering

To obtain the data required for the transportation model a two-fold strategy was implemented: On the one hand a mobility questionnaire was prepared with the aim to understand people's energy consumption behaviour and the acceptance of households to use new energy facility and transport technologies. The survey thus involves questions about household characteristics, housing situation, availability of transport mode, life trajectory as well as attitudes and perceptions. For the prediction of the energy demand for transport based on the predicted activity-travel agenda, moreover road network data, population data and national travel survey data has been collected. On the other hand, travelling data for the micro-simulation-model will be collected by using a mobility app that allows to collect GPS-data of users.

4.2 Energy demand on single-user and building level

4.2.1 Description of tools

The main objective of the tools for the energy demand on single user and building level is to provide qualitative and quantitative information on the demand of energy services in different types of buildings. Specific objectives are (1) to develop an integrated model for dynamic building simulation that enables analyses of the energy demand in buildings and analyses of demand flexibility on basis of real time data and (2) to develop a model to predict energy demand of buildings in case of missing data. At this stage of the project real time data doesn't refer to the energy consumption in real time, but rather to real energy consumption data, e.g. the actual fuel consumption per year. In a further step it is planned to extend the tools by integrating real time values (load profile data).

Thus, the following different tools to analyse and predict/estimate the energy consumption in buildings have been developed:

- Tool Heat consumption:

The tool shows the buildings requirement for thermal heat incl. the amount of heat required for hot water and compares the data with benchmarks. It calculates the heating costs as well as the CO2-emissions of the different buildings.

- Tool Electricity consumption:

The tool shows the buildings requirement for electricity incl. the amount of electricity required for hot water and compares the data with benchmarks. It calculates the electricity costs as well as the CO_2 emissions of the different buildings.

- Tool Cooling demand:

The tool shows the buildings requirement for cooling and compares the data with benchmarks. It calculates the cooling costs as well as the CO_2 emissions of the different buildings.

- Tool PV-Yield calculator:

The tool aims at a user-friendly and validated program for different user groups. The tool determines the annual feed-in energy as accurately as possible for grid-connected PV-systems and allows a quick and precise estimation of the expected solar yield at a specific location. Based on the electricity consumption and load profiles of different building types, the tool can be used to determine the optimum design for PV systems on building level.

- Tool Industrial buildings:

The tool shows the energy consumption, based on actual consumption data to integrate the energy consumption of the building into the "Aggregation tool". It isn´t possible to predict the energy demand in all types of buildings only based on calculations. There are benchmark values for different types of buildings, but most of them refer to the total energy consumption, and the waste heat potential is rarely examined. Especially for commercial as well as industrial buildings realistic predictions without measuring the energy flows are practically impossible. The tool aims to find an easy and economical way to integrate the quality and quantity of the demand of energy services in buildings, where the energy demand cannot be assessed with the aid of the other tools.

Furthermore, different Imputation tools will be implemented that aim to complete missing data based on the ratio between existing data and statistical data e.g. missing information about the year of construction of a certain building. The usage of these tools requires a standardised address code of each building, to ensure that all existing input-data at the end of the calculation are linked to the original building. Missing data are not ignored or replaced by random data, but rather an attempt is made to replace them with plausible values.

4.2.2 Required information and data gathering

For the above described tools, the different types of buildings to be examined (single family houses, apartment buildings, multi-storey buildings, office buildings, supermarkets, schools, hotels, hospitals, industrial and other buildings) were specified, and the relevant data for these tools were defined. It was determined, that the calculations will be done on the basis of actual data (for the city of Weiz the main data source is the GWR[1]), or, if no data is available, assumptions (based on statistical values) within the tools will provide the required results. Where corresponding data was obtained, these data were validated and integrated into the tools. In addition to the assessment of the energy- and CO_2 emissions in individual buildings the results of the various tools are integrated into the "Aggregation tool" which is used for the functionality of investigating the effects of future developments within a city.

4.3 Energy demand on system level

The main objective of the tools for the energy demand on system level is to develop a dynamic model for optimisation and operation analysis of distributed energy infrastructure at district level. Specific objectives are (1) to simulate the interaction between grid operators, users and local infrastructure, (2) to investigate how improved predictions on the demand side will reduce the uncertainty and (3) to specify in which way improved energy demand prediction leads to improved energy dispatch. Therefore, the following tools will be developed.

4.3.1 Electricity grid and dispatch tool

The purpose of the electricity grid and dispatch tool is in a first step to calculate the strain on the distribution grid considered. Taking consumption and generation into account the tool can facilitate both a DC and an AC-loadflow (Zimmermann, R.D. et al, 2011) calculation scheme. The grid tool will be used to define whether the local electricity grid is capable of handling changes in the structure of the system, such as increases in PV-capacity, additional e-mobility, more electrical power to heat components. The tool is capable of doing both, single time-step calculations and multi-time-step calculations regardless of the given resolution of data. When it comes to using loadflow calculation the quality of data is very important, this refers to both the grid data itself as to the data about consumption and generation.

In a second step the tool will be extended by an electricity dispatch tool that will enable the user to add information on the development and changes in the energy system. Through the input of these changes and developments the tool will be able to calculate the effects which occur as a result from these inputs. With this information at hand, the future dispatch of energy can be planned.

For the grid in Weiz detailed grid data was not obtainable, only a digitalised map of the distribution grid corridors is available. Using GIS to reference the different lines and by using avaiblabe statistical data on line types in distribution grids, a surrogate grid was created. For obtaining the data for consumption and generation, the aforementioned tools will be used to create load profiles where measurements are not available. The resulting loadflows will, in the case of Weiz, thus only be an estimation.

4.3.2 PV-cadastre

This tool aims at identifying suitable surfaces in urban areas for the installation of solar photovoltaic panels (PV-panels) and should give an overview on the photovoltaic potential in the city. The calculations are based on the building stock data, as only on-roof systems will be considered. Thus, the surface area, the orientation and inclination of the building's roofs are the basis to perform the calculations. Furthermore, the solar radiation data must be collected. The tool calculates (and maps) the potential at district and city level and furthermore allows on the one hand public bodies (municipalities, local authorities) to integrate energy spatial planning in their policies and on the other hand, the grid operators to assess how much PV could be installed at secondary and primary cabin level. The main important datasets for the city of Weiz are the cadastre map, the Solardachkataster Steiermark and the solar radiation data (Kreuzer, B., 2016).

4.4 Aggregation tool

The Aggregation tool will combine all results and enables to predict future demand for various scenarios. This tool aims at collecting all the available data and calculating the required results by calling up the different tools on building level. In addition, the results will be aggregated on different resolution levels, depending on who the user is. Currently the resolutions (1) pin-point (building level), (2) block of buildings, (3) district and (4) city are being implemented. Through this aggregation tool the energy demand side will be

[1] Gebäude- und Wohnungsregister (GWR) is operated by Statistik Austria and contains site and building specific information of a municipality/city e.g. address of site, buildings, building data (year of construction, surface area, etc.) and information on construction measures.

depicted and all current information on energy demand will be made visible. Through the modular approach and the unified data interfaces, the aggregation tool can easily be modified for different cities.

5 SMART DECISION SUPPORT SYSTEM FOR URBAN ENERGY AND TRANSPORTATION

The objective of the decision support system is to assist city representatives and administrators enhance the efficiency of the energy supply while improving environmental indicators. The planning toolbox will fulfil the following functionalities that can be summed up into three stages, providing different results and insights:

(1) STEP 1 Acquisition of the current status: The goal of this step is to provide the current status of energy and transport demand for different spatial resolutions (single user, building and city level). Missing data will be imputed based on existing values and statistics. This step thus provides the necessary information on single user basis that should inform citizens about their energy performance via the usage of an app (currently under development). In addition, on district or city level, based on the existing infrastructure, analyses regarding the actual energy demand, fuel type used, CO_2 emissions, etc. of the city can be performed. This information will allow to highlight areas within the city, which are the most relevant contributors to the variable considered. This will furthermore enable city planners and developers to locate targets better for future changes in the city.

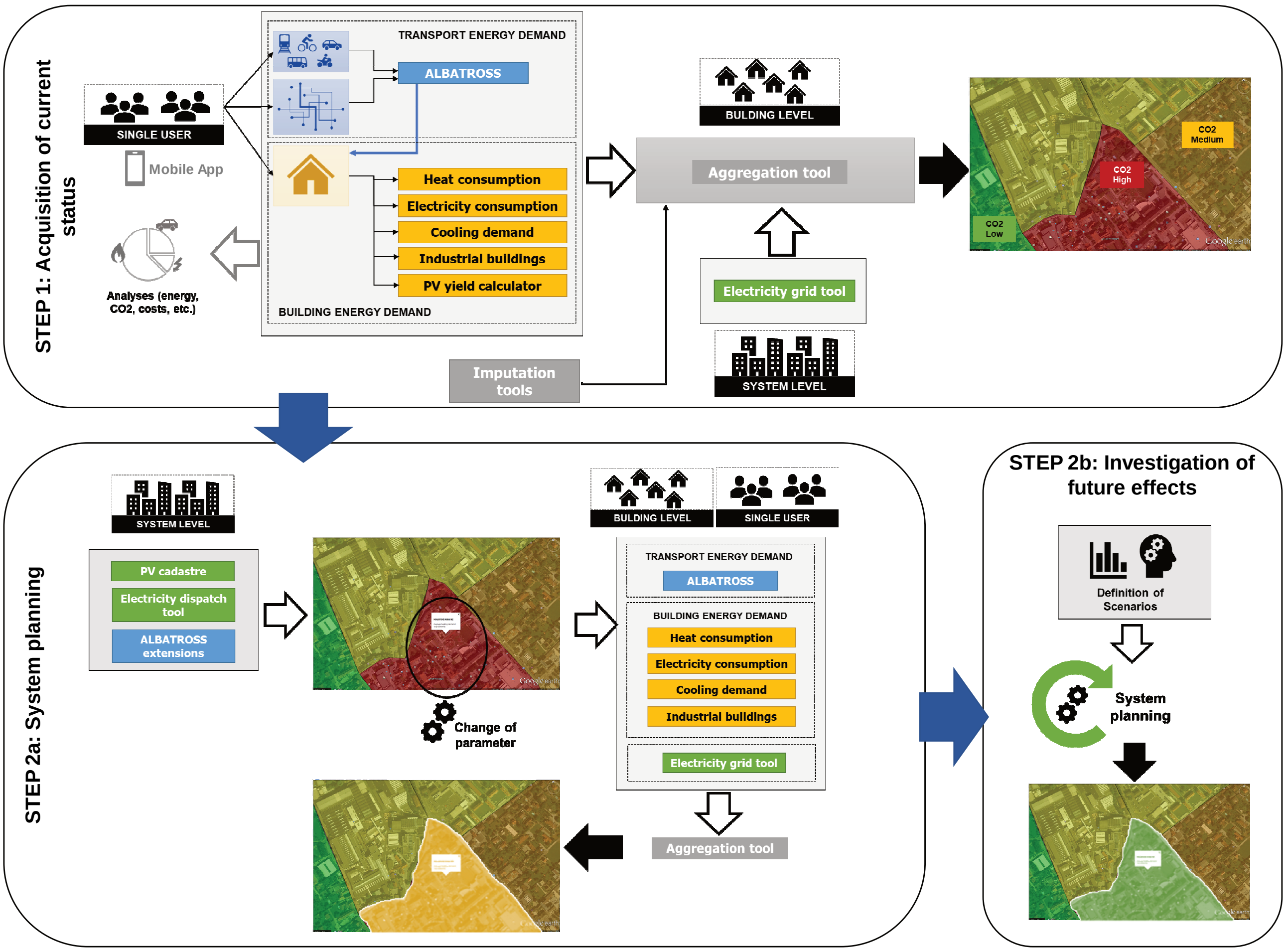

Fig. 2: Structure and functioning of the "DESENT planning toolbox"

(2) STEP 2a System planning: Adapting the system to reach future climate/energy/city goals is challenging as changes in the system need to be directed at those stakeholders which cause a "problem" in the first place. For instance, if CO_2 emissions through heating need to be reduced, one needs to know who is responsible for the emissions. This information is obtained in STEP 1. In STEP 2a this information is used and the effects of changing certain system parameters for these initial stakeholders will be investigated, for instance a change of the heating system. To do so the tools on single user and building level will be used to predict the resulting changes. Recalculating the relevant parameters under the changed conditions will highlight the effects of the parameter-change on the different spatial resolution levels. This will give the opportunity to

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specifically intervene in the city's energy and transport system, by identifying the necessary changes in the system, that will lead to the best results.

(3) STEP 2b Investigation of future effects: In a further step, the planning toolbox will allow to investigate future effects regarding the urban energy system. These are based on changes which can result from general energy policy decisions, for instance, a substitution of a percentage of oil-fired heating systems with district heating within a city, or changes in the energy behaviour, for example general increase in electricity consumption. This will permit to investigate the resulting effects on the overall system.

The overall structure and functioning of the decision support system, comprising all models and tools, is shown in Figure 2.

6 CONCLUSION

One of the innovative insights of DESENT is, the implementation of the developed tools in real cities. Thus, an integrated approach and co-creation process has been facilitated to achieve the planned goals and to understand and address the various challenges of the cities involved (Weiz, Helmond and Steinkjer). As expected, the early involvement and support of cities in helping to create the knowledge tools and data collection can best ensure the delivery of good quality work. This process ensures the transformation to a sustainable and smart city and contributes to solve major problems that come along with continuous urbanisation.

So far, the conceptual tools to analyse and predict energy consumption on building level based on annual data have been created. For this, comprehensive data of the city of Weiz has been provided. The current results show that the data quality is often not sufficient which usually requires the imputation of data with the help of statistical information. The results are combined with the grid models, that also consider a PV-cadaster tool. Moreover, Albatross is extended and comprises a traffic simulation model to predict the spatial distribution of vehicles on a specific road segment of the city network by different times of day. Currently all data and tools are being linked together to an aggregation tool, allowing future scenario predictions.

Although still under development, we believe DESENT decision support tool offers a powerful platform for the modelling of urban energy systems. The capabilities presented in this paper show that the planning toolbox allows users on the one hand to evaluate their energy consumption behaviour on single-user and building level and on the other hand to evaluate holistic urban energy strategies from the early master plan stage through assessing the impacts of a specific (future) energy supply strategy.

7 ACKNOWLEDGEMENT

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8 REFERENCES

ALHAMWI, A., Medjroubi, W., Vogt, T., Agert, C.: GIS-based urban energy systems models and tools: Introducing a model for the optimisation of flexibilization technologies in urban areas. In: Applied Energy, Vol. 191, pp. 1-9, 2017.

ARENTZE, T.A., & Timmermans, H.J.P.: Albatross, A learning-based transportation oriented simulation system. EIRASS: Eindhoven University of Technology, Eindhoven, The Netherlands, 2000.

ARENTZE, T.A., & Timmermans, H.J.P.: Albatross V2: A learning-based transportation oriented simulation system. Eindhoven, 2005.

ARENTZE, T.A., & Timmermans, H.J.P.: Congestion pricing scenarios and change of job or residential location. In: Journal of Transport Geography, Vol. 15, pp. 56-61, 2007.

ARENTZE, T.A., & Timmermans, H.J.P.: Robust approach to modeling choice of location in daily activity sequences. In: Transportation Research Record, Vol. 2003, pp. 59-63, 2007.

BROWN, M.H, Rewey, C., Gagliano, T.: Energy Security. National Conference of State Legislatures. Washington, DC; 2001.

BROWNSWORD, R.A., Fleming, P.D., Powell, J.C.: Sustainable cities – modelling urban energy supply and demand. In: Apllied Energy, Vol. 82, Issue 2, pp. 167-180, 2005.

CALVILLO, C., et al.: Energy management and planning in smart cities. In: Renewable Sustainable Energy, Rev. 55, pp. 273-287, 2016.

CHOURABI, H.: Understanding Smart Cities: An integrated framework. In: International Conference in System Science, pp. 2289-2297, 2012.

EREMIA, M., Toma, L., Sanduleac, M.: The Smart City Concept in the 21st century. In: Procedia Engineering, Vol. 181, pp. 12-19, 2017.
EUROPEAN COMMISION: Cities of tomorrow, Brussels, 2012.
GIRARDIN, L., Dubuis, M., Darbellay, N.: Energis: A geographical information based system for the evaluation of integrated energy conversion systems in urban areas. In: 21st International Conference on Efficiency, Cost, Optimization, Simulation and Environmental Impact of Energy Systeme, Kraków, Poland, 2008.
GRIMM, N.: Global change and ecology of cities. In: Science, Vol 319, Issue 8, pp. 756-760, 2008.
HAMMER, S.A., Keirstead, J., Dhakal, A., Mitchell, J., Colley, M., Connell, R., Gonzalez, R., Herve-Mignucci, M., Parshall, L., Schulz, N., Hyams, M.: Climate change and urban energy systems. Climate Change and Cities: First Assessment Report of the Urban Climate Change Research Network, Rosenzweig, C., Solecki, W.D., Hammer, S.A., Mehrotra, S., pp. 85-111, Cambridge, 2011.
HEGGER, M.: UrbanReNet: Vernetzte regenerative Energiekonzepte im Siedlungs- und Landschaftraum, 2012.
KEIRSTEAD, J., Samsatli, N. and Shah, N.: SynCity: An integrated tool kit for urban energy systems modelling. In: Proceedings of the 5th Urban research symposium. Marseille, France, pp. 28-30, 2009.
KEIRSTEAD, J.: Identifying lessons for energy-efficienct cities using an integrated urban energy system model, 2010.
KOTZEVA, M. et al: Urban Europe, Statistics on cities, towns and suburbs. Luxembourg, 2016.
KREUZER, B.: Der Solardachkataster derSteiermark, Land Steiermark, Graz, 2016.
LUFKIN, B.: 50 grand challenges for the 21st century, http://www.bbc.com/future/story/20170331-50-grand-challenges-for-the-21st-century (accessed 13/01/2017)
MORI, Y., Kikegawa, Y., Uchida, H.: A model for detailed evaluation of fossil-energy saving by utilizing unused but possible energy-sources on a city scale. In: Apllied Energy, Vol. 84, Issue 9, pp. 921-935, 2007.
NABIELEK, K., HAMERS, D., EVERY, D.: Cities in Europe. The Hague, 2016.
OBERNOSTERER, R., Karitnig, A., Lepuschitz, B.: City Dialog. Evaluierung der Forschungsfelder und Technologiepfade für die Stadt der Zukunft durch Dialog mit relevanten Akeuren, Villach, 2012.
REMMEN, P., Lauster, M., Mans, M., Fuchs, m., Osterhage, T., Müller, D.: TEASER: an open tool for urban energy modelling of building stocks. In: Journal of Building Performance Simulation, Vol. 11, Issue 1, pp. 84-98, 2018
STEEMERS, K.: Energy and the city: density, buildings and transport. In: Energy and Buildings, Vol. 35, Issue 1, pp. 3-14, Cambridge, 2003.
ZIMMERMANN, R.D., Murillo-Sánches, C.E., Thomas, R.T.: MATPOWER: Steady-State Operation, Planning and Analysis Tools for Power Systems Research and Education. In: Power Systems, IEEE Transactions on, Vol. 26, Issue 1, pp. 12-19,

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reviewed paper

Dorf Neu Denken

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1 ABSTRACT

Grundlage für diesen Beitrag ist die Forschungsarbeit “Dorf neu denken” (Mirkes 2017), die in Teilen hier vorgestellt wird. Das Paper beleuchtet dabei schlaglichtartig die Situation im ländlichen Raum (in Luxemburg) unter den Fragestellungen der kulturellen historischen Bezüge zwischen Stadt- und Landleben, der Bedeutung von Landschaft und ihrer Veränderung und der Frage, was ist “Zuhause”. Demgegenüber stehen Zukunftsprognosen “für Dörfer mit Zukunft” (Seitz 2015). Am Beispiel der Gemeinde Consdorf/Luxemburg wird das adaptierbare Modell “Dorf neu denken” erläutert und diskutiert, ob und wie fern dieses Modell ein zukünftiges Instrument der Entwicklung von Dörfern im ländlichen Raum im Digitalen Zeitalter sein kann.

Keywords: Entwicklungskonzept, Raumstruktur, Digitalisierung, Zukunftsvision Dorf, ländlicher Raum

2 EINLEITUNG

“Die Zukunft ist die Stadt” (Fischbach 2010, p. 297) ist eine immer wieder kehrende Aussage von Zukunftsforschern. Die Stadt bietet nach einschlägiger Expertenmeinung eine effiziente Lösung für die Organisation von Wohnen, Arbeit und Leben auf kompaktem Raum an. Dabei wird jedoch oftmals vergessen, dass Städte flächenmäßig einen kleinen Teil der Gesamtfläche ausmachen und, dass in Europa zur Zeit noch über 50 % im „ländlicheren Raum“ wohnen (Eurostat). Der ländliche Raum ist ein wesentlicher Bestandteil unserer Kultur (Henkel 2012, 147ff) und droht teilweise durch die Abwanderung in die Städte ihre kulturelle Identität zu verlieren oder zumindest zu veröden. Dieses ungenutzte Potenzial im ruralen Raum verleitet somit auch Rem Koolhaas im Jahre 2018, sich allem „Nicht-Städtischen“ zu widmen für eine Ausstellung in Manhattan (Koolhaas 2017).

Vor allem in einem kleinen Land wie Luxemburg mit seiner sehr begrenzten Landesfläche und trotzdem stetig ansteigender Bevölkerungszahl ist es notwendig, sich mit dem “Potenzial ländlicher Raum” oder eben “Dorf neu denken” auseinanderzusetzen. Hierbei geht es nicht nur um ein Konzept oder Modell für eine Art Upgrade der Dörfer in Hinsicht auf Energiestandards, Ressourcenschonung oder andere Maßnahmen als Reaktion auf den Klimawandel. Es geht auch nicht um ein wie aus zahlreichen Dorferneuerungsprogrammen bekanntes „Aufpolieren “, sondern um Ansätze, wie Dörfer im ländlichen Raum neu gedacht werden können. Im Vordergrund steht dabei, dass wesentliche und ursprüngliche Qualitäten solcher Ortschaften zu nutzen und wiederzuentdecken, um den Bedürfnissen der Bewohner wieder gerecht zu werden. Es geht um die Identität dieser Ortschaften, die geschichtliche und kulturelle Verantwortung, damit diese ihren kulturellen Charakter nicht verlieren.

Was wird heute noch als ländlicher Raum bezeichnet und lässt sich dieser überhaupt noch von der Stadt unterscheiden? Dies ist eine im urbanisiertem Europa eine mehr als berechtigte Frage. Außerdem lebt laut Bevölkerungsfond seit 2008 erstmals die Hälfte der Weltbevölkerung in Städten, was einerseits auf die Attraktivität dieser verweist und andererseits auch erklärt, warum sich fast alle Planer auf diese Ballungsräume fixieren und in ihnen die Zukunft sehen (UNFPA 2007).

Die sich früher stark unterscheidenden Lebensweisen zwischen Dörfern und Städten existieren schon längst nicht mehr und auch die Beziehung zwischen Stadt und Land hat sich somit grundlegend verändert. Die Landwirtschaft hat sich von den dörflichen Strukturen entkoppelt. Globale Tendenzen bestimmen über die Dorfentwicklung mehr als je zuvor. Die umgebende Natur und die kulturellen landschaftlichen Aspekte spielen jedoch kaum noch eine Rolle.

Die urbane Lebensweise wird also zunehmend ländlichen Raum gelebt, was dazu führt, dass Dörfer zu Schlaforten werden. In den Dörfern kennzeichnet sich dies durch kleine aneinander gereihte Parzellen mit ihren freistehenden Häusern, die „kleine private Oasen“ bilden, die kaum oder gar nicht mit ihrer Umgebung in Verbindung stehen.

Bei dem Konzept „Dorf neu denken“ geht es nicht um Nostalgie, Denkmalschutz oder Dorferneuerung, sondern darum ein räumliches und zukunftsorientiertes Konzept zu entwickeln. Dieses hat die Aufgabe Dörfer räumlich neu zu strukturieren und deren Wachstum und Veränderung auf eine organische Art und Weise zu unterstützen, um eine authentische Identität, die unserem Zeitgeist entspricht, zu bilden.

Dörfer stehen durch die schnellen gesellschaftlichen Veränderungen vor großen Herausforderungen. Sie müssen mehr als nur in einer wirtschaftlich-global gelenkten und digitalisierten Welt zurechtkommen, sondern auch auf zukünftige Raumansprüche und Probleme reagieren können. Diese sind z. B. Klimawandel, Ressourcenknappheit und eine wachsende Bevölkerung. Davon abgesehen versuchen wir Menschen ständig unsere Lebensqualität zu verbessern, was zu permanenten Veränderungen führt. Diese ambitionierten Ansprüche an den ländlichen Raum benötigen für die jeweiligen Dörfer und die umliegende Kulturlandschaft starke Konzepte und Visionen.

3 GRUNDLAGEN

Im folgenden Kapitel wird kurz auf die Situation im ländlichen eingegangen, der Frage nachgegangen, „Was ist Zuhause“ sowie die Studie „Dörfer mit Zukunft“ kurz erläutert.

3.1 Situation im Ländlichen Raum

Historisch betrachtet hat die Entwicklung unserer Gesellschaft den ehemaligen Gegensätzen von Stadt und Land vieles zu verdanken. Diese waren für die Stadt die öffentlichen Räume, die den Stadtbürgern eine Freiheit verschafft haben, von der wir heute noch profitieren (Siebel 2016). Nicht erst durch die Industrialisierung bildete der ländliche Raum einen Gegenpol zur Stadt, der eher als natürlicher, gesunder und menschenwürdiger Raum klassifiziert wird. Der rurale Raum hat unser Bewusstsein für unser Umfeld und unsere Umwelt bis heute geschärft (Henkel 2012). Allerdings haben durch die Globalisierung die Dörfer ihren Bezug zur Landwirtschaft fast komplett verloren. Eine globale Lebensmittelversorgung hat die Bezüge zwischen Stadt und Land disruptiv verändert und die ehemalige starke Bindung zur umliegenden Landschaft gelöst.

Abb.1: Wohnstraße Consdorf (Mirkes 2017)

„Die ganze Gesellschaft ist urbanisiert. Stadt und Land sind keine gesellschaftlichen Gegensätze, sondern ein Mehr oder Weniger vom Gleichen“ (Siebel 2004:17). „Daher muss heute jeder Versuch, den Unterschied von Stadt und Land auf Basis gesellschaftsstruktureller Gegensätze zu bestimmen, scheitern“ (Siebel 2016:17). Diese Zitate zeigen, dass sich innerhalb der letzten 10 Jahre auf den Dörfern ein fast ebenso urbanisierter Lebensstil etabliert hat wie im städtischen Umfeld.

Auf europäischer Ebene wird von einer komplett abgeschlossenen Urbanisierung ausgegangen. Je nach Sichtweise diskussionswürdig, jedoch sind zumindest alle mitteleuropäischen Länder in dieser Entwicklung einbezogen (Siebel 2016). Die Bewohner im ländlichen Raum pendeln größten Teils täglich in die umliegenden Städte zum Arbeiten. Die meisten Dörfer haben sich zu Schlaforten entwickelt. Baustrukturell wachsen Dörfer durch die nebeneinandergereihten Einfamilienhäuser unkontrolliert in jegliche Himmelsrichtung, was zur Folge hat, dass die Dorfränder nicht mehr eindeutig definiert sind und unnatürliche Dorfformen in der Landschaft entstehen (s. Abb. 1). Hier findet eine Art Zersiedlung statt.

Die eigene Parzelle dient als Rückzugsort von der stressigen Arbeitswelt in Form von einer kleinen privaten grünen Oase. Diese Lebensweise hat kaum noch eine Beziehung zum Dorfkern, weder noch zur umgebenden Kulturlandschaft, sondern hat sich vom Lokalen gelöst. Die vorhandenen Strukturen im ländlichen Raum werden den heutigen urbanen Gewohnheiten nicht mehr gerecht. Subtile Lösungsansätze werden benötigt, damit wir unsere Landschaft nicht nach dem Tabula-Rasa-Prinzip verbauen und unsere historisch-kulturellen Wurzeln kappen.

Durch ein stetig wachsendes und flächendeckendes Telekommunikationsnetzwerk und der alltäglichen Nutzung von Smartphones hat sich das Kommunizieren und der Zugriff auf Daten und Wissen von realen Orten gelöst (Dirksmeier 2009). Socialmedia-Plattformen haben diese realen Orte, mit denen wir uns identifizieren, zu einem großen Teil ersetzt. Allerdings kann dieser virtuelle Raum, größten Teils im privaten Eigentum von Unternehmen, den öffentlichen Raum nicht ersetzen (Boie 2014). Verstärkt wird dieser Trend dadurch, dass der Aufenthaltsort des Users kaum noch eine Relevanz ist. Physischer und virtueller Raum verschmelzen.

Geprägt wird das Dorfbild heute zwar noch meistens von sogenannten Ikonen, traditionell den Kirchengebäuden im Dorfzentrum. Diese sind jedoch meistens leere Hüllen, mit denen wir uns im persönlichen Alltag nicht wirklich identifizieren können. Diese Bauten haben jahrhundertelang zur aktiven Identität und Authentizität der Orte beigetragen und sind heute zu toten Monumenten geworden, mit der gleichen Auswirkung auf das Dorfzentrum. Jedoch ist diese Sehnsucht nach Umgebung, Kontext und des „sich Identifizierens mit dem Lokalen“ in diversen gesellschaftlichen Tendenzen zu spüren, beispielhaft ist hierbei das Revival der Gartenstadt (Müller 2016) oder Urban-Gardening (Klöckner 2012) zu nennen.

WERTE DER KULTURLANDSCHAFT

- Die historische Kulturlandschaft enthält wichtige Dokumente der Vergangenheit. Sie ist Zeuge unserer kulturellen und gesellschaftlichen Entwicklung, welche sich räumlich ablesen lässt.
- Die historische Kulturlandschaft besteht aus vielen Kontrasten und einer gefälligen Adaption an die Natur, welche uns ästhetisch wie auch sinnlich inspiriert.
- Die traditionelle Kulturlandschaft lehrt uns einiges über die Biodiversität und eine bessere ökologische Balance, als dies die modernisierten Agrarlandschaften tun.
- Eine gepflegte historische Kulturlandschaft ist wirtschaftlich interessant durch charmante (gepflegte) historische Bauten, die auf dem Immobilienmarkt beliebt sind.
- Die vorhandene Kulturlandschaft bedeutet für viele Menschen Orientierung, Zuhause (Heimat), Harmonie und Geborgenheit. Sie steht auch für das Ursprüngliche, das Geheimnisvolle und Unerklärliche, wie z.B. ein Waldstück oder ein altes Haus.

Abb. 2.: Werte der Kulturlandschaft, Einge Darstellung nach Henkel 2012 (Mirkes 2017)

Unsere Umgebung und Natur beschreiben wir gerne mit dem komplexen Wort Landschaft. „Die Natur, die in ihrem tiefen Sein und Sinn nichts von Individualität weiß, wird durch den teilenden und das Geteilte zu

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Sondereinheiten bildenden Blick des Menschen zu der jeweiligen Individualität «Landschaft» umgebaut (Simmel 1913)“. Da es in Europa keine wahrhaftige Natur gibt, können wir nur von einer vom Menschen kultivierten Umgebung sprechen, der sogenannten Kulturlandschaft. Diese wurde in den meisten Regionen hauptsächlich durch die Landwirtschaft geprägt. Die selten gewordenen Bilder mit abgegrenzten Fluren durch Wallhecken ergeben für uns Menschen ein „natürliches“ Landschaftsbild. Dieses idyllische Bild hat sich längst an den meisten Orten nach der Flurbereinigung zu einer im industriellen Stil bewirtschafteten Agrarlandschaft entwickelt. Diese idyllischen Bilder vom Dorf, die wir meistens im Kopf haben (Henkel 2012) und der dazugehörigen Kulturlandschaft sind vor allem prägend für das Dorfbild und die Identität der Bewohner im ländlichen Raum (s. Abb. 2). „Das Dorfbild wurde von der Topografie, also der Landschaft geprägt und von dem, was der Mensch dort hinein gebaut hat. Dieses Zusammenspiel, vielmehr noch dieses Zusammenwachsen, nennen wir Kulturlandschaft und meinen damit das harmonische Gefüge von Feldern, Gärten, Wegen und Bauten“ (Calteux 1997). Deswegen ist es, wichtig die Kulturlandschaft zu schützen, die einer enormen Spannung aus wirtschaftlichen und kulturellen Bedürfnissen ausgesetzt ist. Um auch in Zukunft die Lebensqualität der Bewohner eines Landes oder einer Region zu gewährleisten, ist es wichtig bei Zukunftsvisionen eine gesunde Balance in der Kulturlandschaft zu finden.

Durch aktuellen Kommunikationstechniken werden uns diese idyllischen Bilder vom Dorf und vom ländlichen Raum als imaginäre Produkte eingeprägt, die sozusagen die frühere Landschaftsmalerei ablösen (Pretterhofer et al. 2010). Diese Sehnsüchte nach einer „heilen Welt“ versuchen zum Beispiel die künstlich erzeugten Rauminseln, wie es die „Center Parcs“ z. B. sind, die geografisch betrachtet eine Art Nicht-Ort bilden, zu stillen. Durch das Verlangen nach Identifikation werden Konzepte gebraucht, die subtil mit der vorhandenen Kulturlandschaft und den bestehenden Strukturen umgehen können und die Menschen nicht ihrer Heimat und Kultur berauben. Dem ländlichen Raum kommen somit wesentlich bedeutendere Aufgaben zu als nur als Erholungsgebiet, Pufferzone und Ausweichmöglichkeit vom städtischen hektischen Leben zu sein.

3.2 Was ist “Zuhause”?

„Zuhause“ ist mehr als nur ein Einfamilienhaus, das im luftleeren Raum steht, sondern es muss lokalisiert sein um sich mit seiner Umgebung identifizieren zu können. Die Einbindung in die Umgebung spielt eine wichtige Rolle, doch darüber hinaus braucht es noch weitere Anker in der Umgebung, damit eine authentische Identität entsteht (Pretterhofer et al. 2010). Laut Abels ist Identität „[…] das Bewusstsein, ein unverwechselbares Individuum mit einer eigenen Lebensgeschichte zu sein, in seinem Handeln eine gewisse Konsequenz zu zeigen und in der Auseinandersetzung mit Anderen eine Balance zwischen individuellen Ansprüchen und sozialen Erwartungen gefunden zu haben“ (Abels 2017, p. 231).

Ein weiterer wichtiger Teil der Identität spielt sich im sozialen Bereich ab. Wir alle fühlen uns einer gewissen sozialen Klasse zugehörig und die daraus folgenden Handlungen sind logischerweise mit dem realen Raum verknüpft. Somit gehören der soziale und der reale Raum zu unserer eigenen Lebensgeschichte dazu. Gerade im ländlichen Raum hat man sogar bei passiver Verhaltensweise eine gewisse Kommunikation und soziale Kontrolle über die Nachbarschaft. Somit spielt der soziale Raum eine zentrale Rolle, der nach Bourdieu „die erste und letzte Realität [ist]“ (Bourdieu 2006).

Das Dorf hat deswegen im Vergleich zur Stadt den Vorteil, auf einfachen Wege das Potenzial zu entfalten, Gemeinschaft wieder als Teil in die Identität einzubeziehen. Um diesen Identitätsträger im ländlichen Raum zu schaffen, brauchen Dörfer in Zukunft Flächen für räumliche Strukturen, die einem urbanen Lebensstil gerecht werden, die mit ihrer Umgebung verbunden sind und die die Spannungen der sozialen Unterschiede aushalten.

Weitere Elemente für die Identität sind die Sprache und die Dialekte, die früher (nicht nur in Luxemburg) von Dorf zu Dorf leicht unterschiedlich waren. Dieses Merkmal als Art der Identifikation ist schon weit verschwunden, einerseits durch einen hohen Anteil an Ausländern (Großherzogtum Luxemburg 2017) und andererseits der quer durch das Land ziehenden Einheimischen.

Neben der Einbindung in die Kulturlandschaft ist auch die Beziehung zum Dorfkern relevant. Dieser wird hauptsächlich von dem Kirchengebäude geprägt, welcher meistens als Hauptidentitätsträger im Dorfbild erscheint. Da diese immer mehr zu einer leeren Hülle wurde, funktioniert sie nur noch als Symbol und Monument. Der Dorfkern wird so immer mehr zu einer toten Kulisse. Die Kirche, welche noch bis in die 60er einer der wichtigsten Rollen im Dorf gespielt hat (Calteux 1989) und auch nicht fassbare Dimensionen und Räume lokalisiert wie es z. B. ein Friedhof (Foucault 2006), hat immer noch ihre Funktion als Identitätsträger im Dorf- und Landschaftsbild. Für alle neu zu entwickelnden Konzepte ist dies ein Kernelement, dass das Dorfzentrum mit den alten vorhandenen Strukturen in neue räumliche Strukturen zu integrieren ist.

In der Art, wie sich von der Kirche aus die Dorftypologie über hunderte von Jahren langsam und organisch entwickeln konnte, ist es in Zukunft wichtig in einem städtebaulichen Maßstab in dieser Konsequenz die Dorfflächen und deren Verknüpfung mit der Kulturlandschaft weiter zu denken. Diese Flächen müssen auch die sozialen Spannungen aushalten, die durch die urbanen Lebensweisen im ruralen Raum entstanden sind. Dies ermöglicht dann, dass sich durch Regionalisierung und Globalisierung das Lokale, das Einzigartige, das Authentische und das Ursprüngliche eines jeden Ortes nicht verdrängen lässt.

3.3 Dörfer mit Zukunft

Zu der Frage, welche sonderbaren Funktionen Dörfer in Zukunft zustehen können, gibt es unterschiedliche Tendenzen, die z. B. das Zukunftsinstitut in sechs verschiedene Typen zusammengefasst hat, die hier kurz vorgestellt werden (Zukunftsinstitut 2016):

(1) Health Village

Beim „Health-Village“ handelt es sich um Pflegedörfer für ältere Menschen, mit dem Ziel, deren Lebensqualität zu verbessern. Sie dienen auch jüngeren Generationen als Gesundheitsurlaub, Wellness und Kurangeboten.

(2) Bio-Oase

Die „Bio-Oase“ bildet eine Art Knotenpunkt für Bio-Landwirtschaft, Gastronomie und Tourismus, die sich in Form einer kleinen Dorfgemeinschaft organisieren.

(3)Energiedorf

Das Energiedorf nutzt das Potenzial eines Dorfes aufgrund seiner Größe sich energieautark zu organisieren. Als Selbstversorger ist es nicht mehr von globalen Energienetzwerken abhängig und kann als Prototyp für neue Konzepte eine Vorreiterfunktion übernehmen.

(4) Kreativer Hub

Der „kreative Hub“ nutzt das Dorf als Knotenpunkt für neue Arbeitstrends wie zum Beispiel Co-Working-Spaces, flexible Arbeitszeiten, Homeoffice, Freelancing und Kollaboration, was Dank der heutigen Kommunikationstechnologie möglich wurde. Außerdem bietet die vorhandene Umgebung viele Angebote, die zurzeit durch Campus-Angebote versucht werden künstlich herzustellen.

(5) Einsteiger-Kommune

Die „Einsteiger-Kommune“ bietet sozial anders organisierte Lebensformen in der Gemeinschaft zu leben, wie z. B. das bedingungslose Grundeinkommen oder wie es im Vorarlberg in Langenegg ausprobiert wurde, wobei es darum ging das Dorf durch eine eigene Tauschwährung zu stärken.

(6) Downshifting-Dorf

Das „Downshifting-Dorf“ ist als Gegenpol zur hektischen und stressigen Stadt gedacht. Hier dreht sich alles um einen entschleunigten, landidyllischen und genießenden Lebensstil, ähnlich wie bei der Slowfood-Bewegung in der Gastronomie.

Ein interessantes Referenzprojekt ist das sogenannte „ReGen-Village“. Ziel dieses Dorfes ist es so wenig wie möglich Fläche zu verbrauchen um die Natur zu schützen und mit der eigenen Dorffläche als Selbstversorger auszukommen (s. Abb. 3). Dieses Konzept, das eine Antwort auf die Versorgung der wachsenden Weltbevölkerung sucht, wurde von James Ehrlich erfunden und vom dänischen Architekturbüro Effekt in ein räumliches Konzept umgesetzt. Die Idee ist es, dass jeder Output von einem Prozess wieder der Input für einen anderen Prozess ist, wie z. B. Aquaponics funktionieren damit keine Restprodukte entstehen. Ebenfalls gibt es soziale Bereiche, die die Gemeinschaft in dem Dorf stärken und das Bewusstsein für Gesundheit und Umwelt wecken (Effekt 2016).

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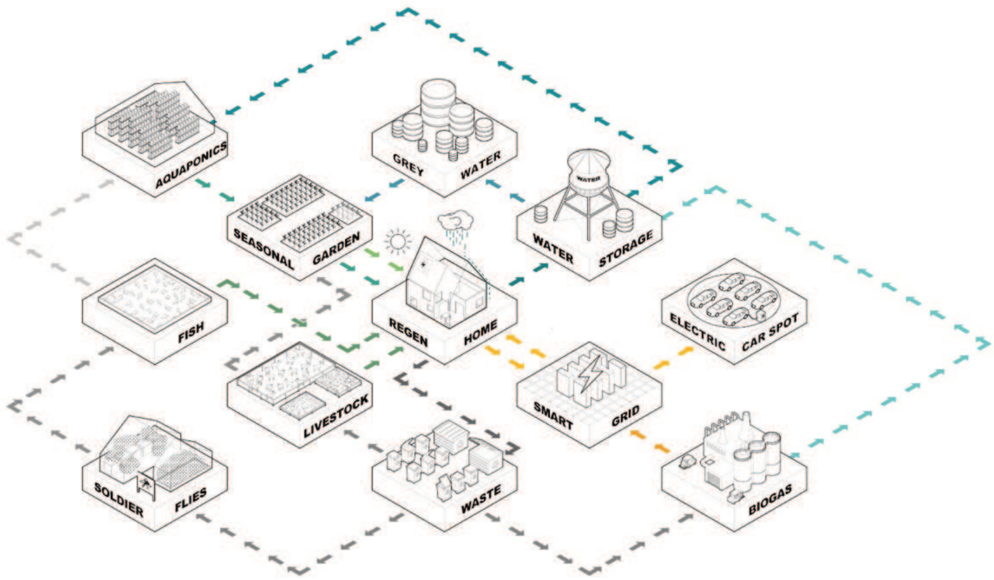

Abb. 3: ReGen System (Effekt 2016)

Dieses Konzept scheint eine relativ ideale Lösung zu bieten. Doch gehen solche Zukunftsmodelle kaum bis gar nicht auf schon vorhandene Typologien ein. Die große Herausforderung ist es, Konzepte zu entwickeln, die mutig und zukunftsorientiert sind, sich aber auch mit dem Bestand und der vorhandenen Umgebung auseinandersetzen. Die Frage ist, welche neuen räumlichen Strukturen, Konzepte und Strategien können den neuen Lebensformen gerecht werden und dabei das Dorf wiederbeleben und trotzdem einen Bezug zur ursprünglichen Identität herstellen, welche dem Dorf einen Charakter verleihen.

4 DAS KONZEPT “DORF NEU DENKEN”

Das Konzept „Dorf Neu Denken“ wird modellhaft am Beispiel Consdorf in Luxemburg vorgestellt, das sich in der Region Müllerthal befindet. Das Denken in Modellen ist hier wichtig, damit das Konzept auch auf andere Dörfer und Dorftypen adaptiert werden kann (s. Abb. 4). Dabei sind natürlich die Grenzen der Skalierbarkeit zu beachten, die für jeden Ort geprüft werden müssen. In abstrahierter Weise wird hier ein Modell entwickelt, das Aussagen zur zukünftigen Nutzung von Flächen und strukturellen Maßnahmen trifft, um ein solches Konzept tragfähig zu gestalten. Diese Vision dient als Leitbild, wie wir in Zukunft mit unseren Dörfern umgehen können. Eine Schablone zur direkten Umsetzung in einen Masterplan kann es aber aufgrund der individuellen Eigenarten eines jeden Dorfes nur bedingt liefern.

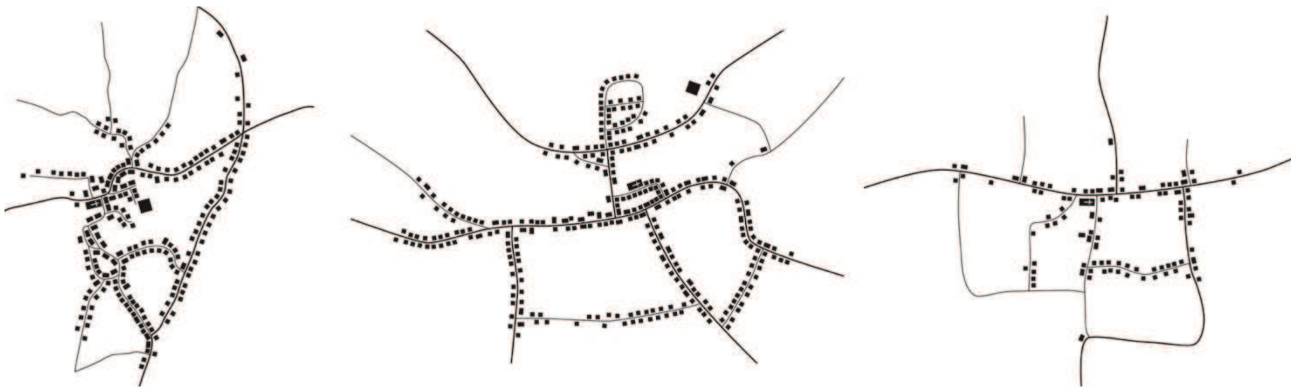

Abb. 4. Dorftypologien (Mirkes 2017)

4.1 Richtlinien für “Dorf neu Denken”

Dorf Neu Denken basiert auf 6 folgenden Richtlinien, die auf viele andere Dörfer angewandt werden können.

(1) Dörfer brauchen eine klare Grenze zu ihrer Umgebung, damit sie nicht willkürlich in die Landschaft hineinwachsen. Außerdem dient die Begrenzung auch zum Schutz der Kulturlandschaft und garantiert auf längere Zeit genügend regenerative Freifläche, das bei dem Anspruch einer immer höheren Lebensqualität und einer begrenzten bebaubaren Fläche eine immer größere Herausforderung wird. Das Modell (s. Abb. 5)

zeigt so auch auf, dass Dörfer sich nicht zu Inseln in der Landschaft entwickeln sollen, sondern eine Verzahnung mit der Kulturlandschaft erstrebenswert wäre, damit auch das Lokale gestärkt wird. Zu berücksichtigen sind jedoch bei allen Dörfern die räumlichen Begebenheiten, da vor allem die Topografie der Entwicklung der Raumstrukturen eine wichtige Rolle gespielt hat. Typologisch sind die Dörfer ähnlich organisiert, Form und Struktur sind jedoch oftmals grundsätzlich verschieden.

(2) Die Dichten der Bauweise müssen über die Dorffläche so verteilt werden, dass sie den Strukturen im Dorfzentrum bis zum Dorfrand gerecht werden. Der Dorfkern mit der Kirche im Zentrum ist oft dicht bebaut. Der dichtere Dorfkern wird von einer lockereren Bauweise (meistens Einfamilienhäuser) umgeben. Das Modell zeigt wie einerseits die Flächen effizient genutzt werden können, ohne dabei vollständig zu bebauen. Um das zu erreichen, werden die Häuser um gemeinschaftlich genutzte Grünflächen, sogenannte Allmenden herum angeordnet. Diese sorgen dafür, dass das Dorf nicht durch eine zu dichte Bebauung seinen dörflichen Charakter verliert.

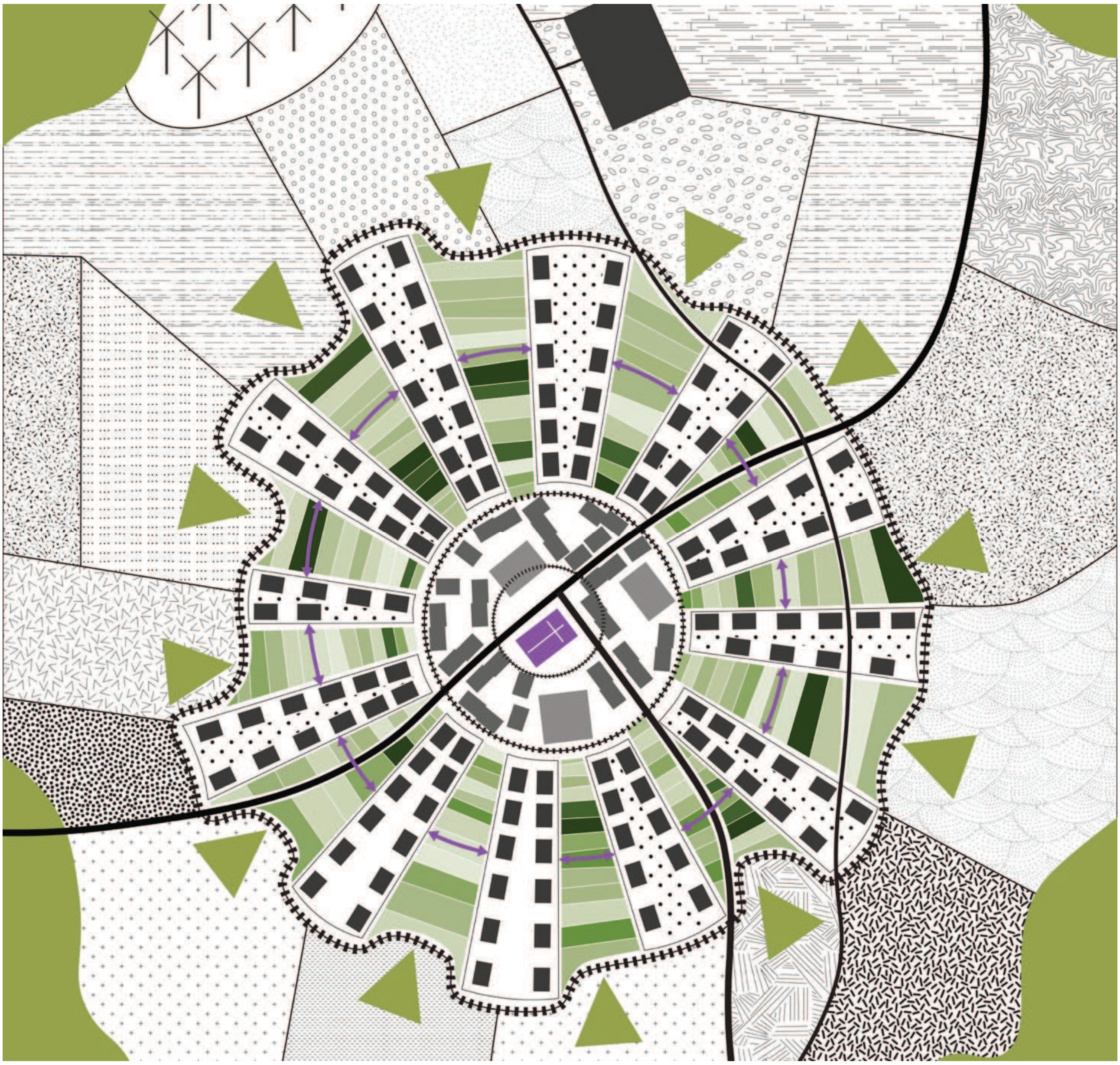

Abb. 5. Modellschema Dorf neu denken (Mirkes 2017)

(3) Außerhalb des Dorfes wird eine benötigte Fläche zur Energieversorgung eingerichtet. Diese sorgt dafür, dass das Dorf nicht mehr komplett an globale Energienetzwerke gebunden ist, sondern teilweise zum Selbstversorger wird.

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(4) Landwirtschaftliche Betriebe können sich wegen ihrer Größe nicht mehr innerhalb des Dorfes befinden. Diese liegen am Dorfrand oder in der Agrarlandschaft, da sie sowieso in einem industriellen Stil geführt werden.

(5) Das Dorf organisiert sich nicht mehr ausschließlich nach Straßen und Linien, sondern wird flächig gedacht. So entsteht Raum für Nachbarschaften, die ein gemeinschaftliches Leben im Dorf ermöglichen. Das daraus entstehende aktive Dorfleben, stärkt wiederum die Dorfidentität.

(6) Das Dorfzentrum soll öffentliche Bereiche und Gebäude beinhalten. Diese können situationsbedingt durch „öffentliche" Bereiche verknüpft sein in der sogar durch eine Art Shared-Space der Autoverkehr mit integriert wird.

Das gesamte Dorf wird durch grüne Allmende Flächen räumlich neu strukturiert. Allmende sind Flächen gemeinschaftlichen Eigentums, die hier kooperativ öffentlich rechtlich von der Gemeindeverwaltung geregelt sind. Die Wohnhäuser richten sich an den Grünflächen aus. Dadurch, dass die Allmendeflächen die bestehenden Flurnamen tragen, sind sie identitätsstiftend und stellen eine Verbindung zu den historischen Wurzeln her. Die nach dem Sharing-Prinzip genutzten Grünbereiche bieten viel Platz für alle Anwohner. Auch diese sind ähnlich wie Genossenschaften organisiert, wo z. B. mehrere Haushalte eine Wiese gemeinsam zum Anbau von Gemüse, Obst, zum Imkern oder als Reitplatz nutzen können. Außerdem bieten diese Flächen eine allen Bewohnern zugänglichen Ort zur Gemeinschaft und einer aktiveren Nachbarschaft, mit der man sich einfacher identifizieren kann. Somit gibt es verschiedene Stufen von öffentlichen Wegen, Wiesen und Bereichen bis hin zu privaten Gärten und Terrassen an den Häusern. Die Bewohner können die gemeinschaftlichen Flächen aktiv nach ihren Bedürfnissen mitgestalten und somit auch aktiv an der Dorfentwicklung teilnehmen. Durch die räumliche Verzahnung der Allmende Flächen mit der Umgebung, bestehend aus Feldern und Wäldern, wird wieder eine Verknüpfung zu Kulturlandschaft hergestellt.

Abb. 6. Detail Dorfkern (links) Wohnen an Allmendefläche (rechts) (Mirkes 2017)

Die Allmendeflächen bilden im gesamten Dorf ein grünes Netzwerk, das für Fußgänger und Radfahrer ausgelegt ist. Dadurch müssen Straßen nicht noch weiter ausgebaut werden. Das Dorf wird nicht weiter in Linien entlang der Straßen entwickelt, sondern die gesamte Dorffläche wird mit einbezogen. Das Ziel ist es, das Dorfzentrum zu Fuß oder mit Fahrrad innerhalb von 10 Minuten für die Dorfbewohner erreichbar zu machen (s. Abb. 6 rechts).

Der Dorfkern soll sich wieder mehr auf die öffentlichen Bereiche und Gebäude konzentrieren, was im Falle von Consdorf einiges an Umstrukturierung bedarf (s. Abb. 6 links). Dadurch lässt sich der Dorfkern wieder langsam beleben. Hier ist es wichtig, Gebäude wie die Kirche und das Rathaus über eine gemeinsame Fläche zu verbinden, die den Verkehr in dem Bereich über einen Shared-Space regelt. Diese Fläche kann z. B. für ein Dorffest genutzt werden. Gebäude wie die Kirche bieten natürlich auch Raum für Dialog, der für jeden zugänglich ist. Hier sind diverse kleine Eingriffe gefragt, die zum Teil große Wirkung auf das Dorfleben haben können. Wichtig ist hier ein verantwortungsbewusster und geschickter Umgang mit den vorhanden Freiflächen und deren Vernetzung untereinander.

Abb. 7. Atmosphäre/Collage Allmende „op Bierg“ (Mirkes 2017)

Abb. 8. Lageplan Consdorf Dorf neu denken (Mirkes 2017)

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Dieses Konzept bietet somit eine Grundlage, damit Dörfer heute und in Zukunft auf eine organische Art und Weise wachsen können (s. Abb. 8). Dafür nutzen sie ihre vorhandene Struktur und Typologie und entwickeln diese den zukünftigen Ansprüchen entsprechend weiter, ohne dabei radikal mit den historischen Wurzeln brechen zu müssen. Des Weiteren können die Dörfer dann auch verantwortungsbewusst mit der Kultur und den Traditionen von Regionen und Ländern umgehen, ohne dabei als potemkinsche Dörfer zu erstarren.

5 DISKUSSION UND AUSBLICK

In unserer globalen digitalisierten Gesellschaft, in der Veränderung die einzige Konstante ist, wird Modernisierung durch Technik großgeschrieben. Die Frage ist, ober wir überhaupt noch reale Räume benötigen oder ob wir nicht besser alles auf eine virtuelle Ebene verschieben? Ist es ausreichend, den Ländlichen Raum auf infrastruktureller Ebene zu modernisieren? Ist der Aufwand berechtigt, räumlich strukturelle Veränderungen in diesen Bereichen durchzuführen, um zukunftsfähige und den Bedürfnissen entsprechenden Bereiche weiter zu entwickeln in einem lokalen Kontext?

Vor allem im ländlichen Raum brauchen wir Strukturen und Bauten, die einerseits den strukturellen Bedürfnissen angepasst sind und trotzdem auch sich mit ihrer Umgebung verbinden. Andererseits geht es um die Verantwortung für eine Kultur und historische Wurzeln eines Landes oder Region. Nur durch eine verantwortungsbewusste und auf mehreren Ebenen spielender Baukultur können wir auch diesen Abdruck unserer Zeit durch real gebaute Räume weitergeben. Jedoch geht es nicht nur darum, welchen Ausdruck unsere gebaute Zeit auf die nächste Generation hinterlässt.

Dörfer müssen in ihrer realen gebauten Form auf den Menschen attraktiv sein. Schnelles Internet allein ist kein Grund im ländlichen Raum zu wohnen. Deswegen brauchen wir Strukturen, die unseren Lebensstilen gerecht werden und uns sogar etwas Räumliches bieten, das wir in der Stadt vielleicht so nicht haben können.

Deswegen wird es von einer immer größeren Bedeutung, dass sich z. B. im telekommunikativen Bereich Planer und Ingenieure gegenseitig ergänzen und nicht jeder auf seiner Ebene an dem anderen vorbeiplant. Durch ein intelligentes Verknüpfen dieser verschiedenen Ebenen können ganz spannende reale Räume entstehen, die eine gewisse Authentizität besitzen.

Die Technologie kann so attraktiv und fortschrittlich sein wie sie will, so lange sie nicht in der Realität für die Menschen greifbar wird, kann sie diese auch nicht begeistern. Die Atmosphäre von menschlichen Räumen ist somit für den technischen Fortschritt ausschlaggeben (s. Abb. 7). Wenn die Schnittstelle zwischen dem Virtuellen und dem Alltag besteht, dann wird sie auch angenommen. Das Gleiche gilt für das gebaute Umfeld, das ebenfalls nur die Menschen zufriedener stellt, wenn es den wahren Bedürfnissen der Menschen entgegenkommt. Denn alles, was wir planen, entwickeln und entwerfen muss auf das Wesen des Menschen zugeschnitten sein und nicht umgekehrt.

6 LITERATUR

ABELS, H. (2017). Identität. Wiesbaden: Springer Fachmedien Wiesbaden.

BOIE, J. (2014, December 1). Freiheit von Facebooks Gnaden. Süddeutsche Zeitung, p. 11.

BOURDIEU, P. (2006). Sozialer Raum, symbolischer Raum (1989). In J. Dünne (Ed.), Raumtheorie: Grundlagentexte aus Philosophie und Kulturwissenschaften (1st ed., Suhrkamp-Taschenbuch Wissenschaft, Vol. 1800). Frankfurt am Main: Suhrkamp.

CALTEUX, G. (1997). Ein Querschnitt durch das Wohnen und Leben im Großherzogtum Luxemburg (Vol. 2). Esch-sur-Alzette: Editions Phi & Kremer-Mueller & Cie.

DIRKSMEIER, P. (2009). Urbanität als Habitus: Zur Sozialgeographie städtischen Lebens auf dem Land. Zugl.: Bremen, Univ., Diss., 2009 u.d.T.: Dirksmeier, Peter: Stadt und Habitus (Urban studies). Bielefeld: Transcript Verl.

FISCHBACH, R. (2010). Die Zukunft ist die Stadt – doch was ist die Stadt der Zukunft? In H. Müller (Ed.), Von der Systemkritik zur gesellschaftlichen Transformation: [Transformationsforschung: Aufgaben und Probleme, Marxismus und Praxisphilosophie, Praxiswissenschaft und Utopistik, Wirtschaftstheorie und gesellschaftliche Transformation, Potentiale und Perspektiven der urbanen Praxis ; die Beiträge dokumentieren nicht nur die Vorträge der PRAXIS-Tagung, die im Februar 2010 von der Initiative für Praxisphilosophie und Konkrete Wissenschaft in Nürnberg veranstaltet wurde …] (1st ed., Studien zur Philosophie & Wissenschaft gesellschaftlicher Praxis, Vol. 3). Norderstedt: Books on Demand.

FOUCAULT, M. (2006). Von anderen Räumen (1968). In J. Dünne (Ed.), Raumtheorie: Grundlagentexte aus Philosophie und Kulturwissenschaften (1st ed., Suhrkamp-Taschenbuch Wissenschaft, Vol. 1800). Frankfurt am Main: Suhrkamp.

GROßHERZOGTUM LUXEMBURG. (2017). Bevölkerung und Multikulturalität. LE PORTAIL OFFICIEL GRAND-DUCHÉ DE LUXEMBOURG. http://www.luxembourg.public.lu/de/le-grand-duche-se-presente/luxembourg-tour-horizon/population-et-multiculturalite/index.html. Accessed 10 January 2018.

HENKEL, G. (2012). Das Dorf: Landleben in Deutschland - gestern und heute. Stuttgart: Theiss.
KLÖCKNER, R. D. (2012). Freiraum und Urban Gardening: Urban Gardening als konstruktiver Baustein der Freiraumversorgung stark verdichteter Quartiere. Diplomarbeit. Hamburg.
MIRKES, J. (2017). Dorf neu denken. Master Thesis. Karlsruher Institut für Technologie (KIT), Karlsruhe.
MÜLLER, R. (2016). Neue Wohnlösungen: Die Gartenstadt der Zukunft. Frankfurter Allgemeine Zeitung. http://www.faz.net/aktuell/wirtschaft/immobilien/neue-wohnloesungen-die-gartenstadt-der-zukunft-14375354.html. Accessed 10 January 2018.
PRETTERHOFER, H., SPATH, D., & VÖCKLER, K. (2010). Land: Rurbanismus oder Leben im postruralen Raum. Graz: HDA - Haus d. Arch.
SEITZ, J. (2015). Dörfer mit Zukunft. In Zukunftsinstitut (Ed.), Trend Report 2015. Frankfurt am Main.
SIMMEL, G. (1913). Philosophie der Landschaft. Die Güldenkammer. Eine bremische Monatsschrift, 3(II), 635–644.
SIEBEL, W. (2016) Die Kultur der Stadt. 2. Auflage. Berlin: Suhrkamp Verlag (2015)
SIEBEL, W. (2004); S. 35ff. In: Siebel, W. (2016): Die Kultur der Stadt. 2. Auflage. Berlin: Suhrkamp Verlag (2015); S. 17
UNITED NATIONS POPULATION FUND UNFPA (2007): state of world population 2007.; S. 1. Abgerufen am 21.12.2016 von https://www.unfpa.org/sites/default/files/pub-pdf/695_filename_sowp2007_eng.pdf

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Driving Factors of Urban Expansion in Peri-Urban Areas of Greater Cairo Region

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1 ABSTRACT

Since the early 1980s, the Greater Cairo Metropolitan Region (GCMR) has witnessed a rapid urban expansion that has been mainly concentrated in the peri-urban areas (PUAs). Most of this expansion was against urban planning laws and has presented a critical challenge to the urban environment. It has also led to spatial fragmentation and loss of enormous agriculture lands. This research analyses the urban expansion in the PUAs of the GCMR, during the period (2001-2017) using GIS and remote sensing. In addition to presenting a set of driving factors of this expansion, which were extracted from the literature review and previous studies. The results of this research show that the urban expansion rate during the mentioned period reached to 461 hectares per year. Moreover, the population growth and accessibility were the most significant driving factors in the PUA of the GCR.

Keywords: Greater Cairo region, metropolitan region, peri-urban areas, driving factors, urban expansion

2 INTRODUCTION

Urban expansion in developing countries has generally been more rapid and chaotic and the most of this expansion was directed to peri-urban areas (Mbiba and Huchzermeyer, 2002, Dutta, 2012). Peri-urban areas (PUAs) have been commonly defined as transitional zones located between the city and the countryside which are neither strictly rural nor urban (Allen 2003). The urban expansion of metropolitan cities usually occurs in peri-urban areas, where the rural villages are spread. Thereafter, a merging process happens with existing villages, which creates distorted areas in terms of land tenure, land use, access to services, and other measures of social, economic and political integration (McGregor, Simon, and Thompson 2006).

Recently, several scholars discussed the driving factors of urban expansion in the PUAs in developing countries through different case studies, for instance (Braimoh and Onishi 2007) mentioned that the migration from rural areas was the primary cause of urban expansion in the PUAs of Lagos in Nigeria. While (Lawanson, Yadua, and Salako 2012) argued in their study of Lagos and Ibadan in Nigeria that the affordable rent in PUAs was the most important factor. (Appiah et al. 2014) discussed two other factors in Ghana; the demands for new housing and the accessibility of settlements. (McGregor, Simon, and Thompson 2006) argued that speculation in the housing market is a very important factor in urban expansion process in PUAs in developing countries.

However, many of metropolitan regions in developing countries have a shortage of this kind of studies. The Greater Cairo Metropolitan Region (GCMR) in Egypt is considered one of these regions. Notwithstanding that the most of urban expansions of the Greater Cairo Metropolitan Region (GCMR) were directed to the PUAs during the last 30 years. The driving forces in PUAs have not been studied in a separate study till now, whereas the most of previous studies focused on the driving forces of urban expansion in the main urban agglomeration mainly and rarely referring to other parts out of the main agglomeration. For example, (Osman T et al., 2015) investigated the driving forces in the west part of the PUAs only. While (Mohamed 2012) presented the driving factors in the urban peripheries within 5 km only around the GCMR during his study of urban growth for Cairo. As well, (Salem 2015) showed the economic factor which influences the urban expansion process in the GCMR. On the other hand, (Nada 2014) explained the legal factor of urban expansion in the PUAs during his study of the urban expansion policies in Egyptian cities.

Therefore, the goals of this study are measure the urban expansion in the PUAs of the GCMR during 2001 – 2017, then analyse the driving factors in all PUAs within the boundary of the GCMR and finally give some recommendations for planners and decision makers to improve the plans in these areas.

3 METHODS AND DATA

3.1 Study area

Greater Cairo Metropolitan Region (GCMR) is located at latitude 30° 06′ N and longitude 31 28′ E. The region comprises; Main agglomeration, New Urban Communities (NUC) and peri-urban area (PUA). PUAs are situated in north and west of the main agglomeration. (see Fig. 1)

Currently, peri-urban areas represent a quarter of the region's population (approximately 5 million inhabitants). In addition, the annual rate of growth for these areas reached to 3.3%, while the average of GCR not exceed than 2.1% (Salem 2015).

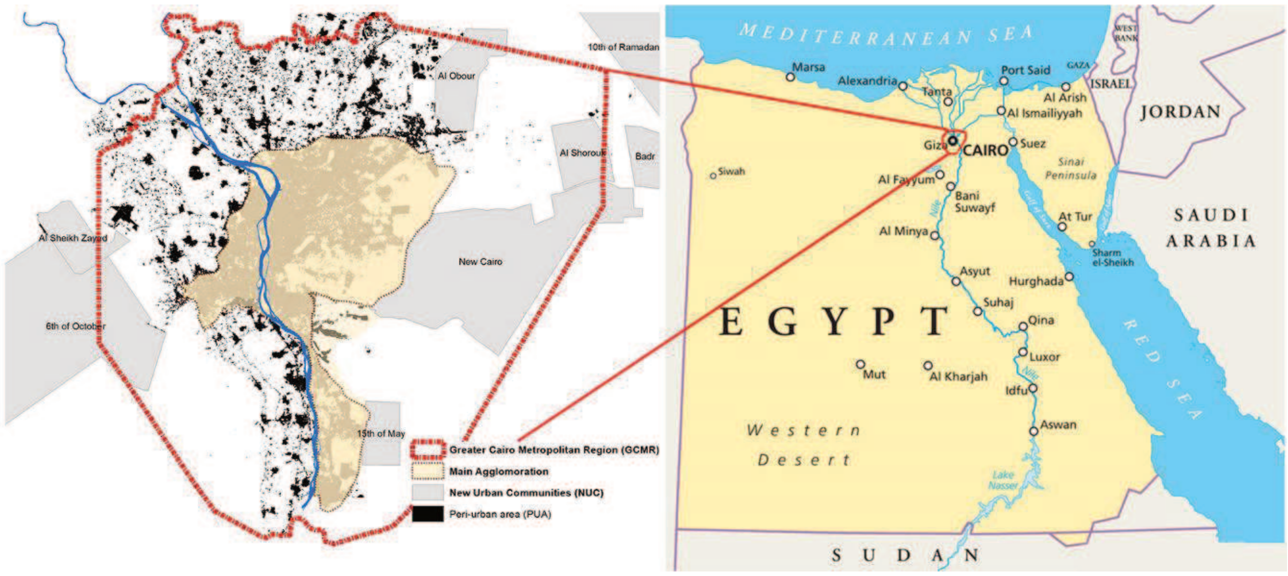

Fig. 1 Study area

The size of settlements in PUA varies greatly, from small villages and hamlets with populations of less than 5000 persons to huge agglomerations of more than 100,000 persons. Although, the role of agriculture has diminished significantly in these areas, the most of these still classified as rural areas(World Bank 2008).

3.2 Data

The basic data source for the urban expansion within the study area was Landsat imagery from 2001, 2007 and 2017. As supplementary data, 1/10,000 and 1/5000 detailed land use for 2001 and 2007 taken from land use database of General Organization of Physical Planning (GOPP) in Egypt. In addition to Google Earth Pro for reference of 2017 image. On the other hand, we used Arc GIS tools to create Triangular Irregular Networks (TIN) files in order to analyse the topography of the GCMR; therefore, a better understanding of the natural driving factor of urban expansion there.

3.3 Extraction of peri-urban area, Image Classification and Accuracy Assessment

The peri-urban areas (PUA) of Greater Cairo Region (GCR) were extracted from the Landsat images using Extract by Mask in Arc GIS. The supervised classification was applied using Arc GIS to determine the land cover type. About 150 training sites (signatures) were chosen in each image to represent four land cover classes; urban area, agricultural land, water and desert. The maximum likelihood algorithm was applied for classification process.

Later, 100 random points were selected at each classified image on a stratified random approach and compared digitally with the corresponding pixels of the original images as a reference data. Kappa index was applied to compute the accuracy, which showed accuracy rate 87.3%, 88.4% and 92.1% for 2001, 2007 and 2017, respectively.

3.4 Change Analysis

The post-classification change detection is one of the most accurate and quantitative techniques. This process was carried out using Land Change Modeler (LCM) in Terrset software. The purpose of using this technique of change detection was not only to estimate the urban expansion of urban land area between 2001 and 2017, but also to highlight the spatial trend of change. In the light of change analysis, we could determine the most important driving factors of urban expansion in PUA.

4 RESULTS AND DISCUSSIONS

The urban expansion in PUA OF GCMR encroached on a wide area of agricultural lands between 2001-2017. The urban expansion from 2001 to 2007 was estimated at 2,300 ha, with an average loss of 383 ha per year. While, the urban expansion increased significantly from 2007 to 2017 to reach to 5400 ha, with an average loss of 540 ha per year, as shown in Fig. 2

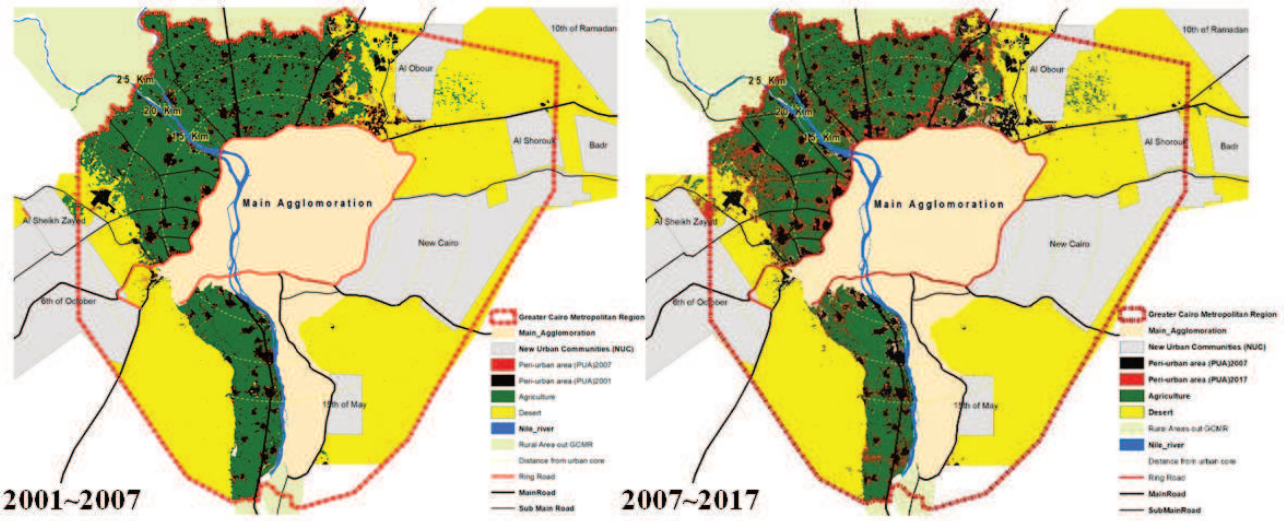

Fig. 2 Urban expansion in PUA OF GCMR from 2001 to 2007 and from 2007-2017

Urban expansion exists within agricultural areas just like scattered islands. Over the 2001-2017 period it was calculated that agricultural land lost was running at an average of 461 hectares per year, with an annual reduction of 0.73%. (The total area under agriculture was calculated to be 63,000 hectares in 2001.)

The most of urban expansion has occurred within a radius of about 20 km from the urban core of main agglomoration. The direction of urban expansion was mainly toward north and northeast, especially along or near main and sub main roads.

Some experts argueth that the significant impact on the spread of urban expansion in PUAs during the last few years is a reflection of the weak of Egyptian government during and after the 25th of January Revolution (Nada 2014). However, Others argue that the high rate of urban expansion reflects the nature of housing demand and related mechanisms that governed the expansion process in GCMR .

Year	Population of PUA (1000 person)	Urban expansion in PUAs from previous census (ha)	Rate of lose (ha/year)
1986	1661.5	-	-
1996	2857.5	5120	512
2001	3412.2	2350	470
2007	3942.3	2300	383
2017*	5231.4	5400	540

Table 1. Urban expansion in PUA (Source: CAPMAS, General Census of Population and Housing, * the population estimated)

4.1 Identifying driving factors of urban expansion

The process of urban expansion in PUAs is driven by a set of factors. This section will discuss these factors, depending on the findings that were derived from the literature review and previous studies of the GCMR.

4.1.1 Population Growth

According to (MHUUC 2016) and (World Bank 2008), the primary driving force for urban expansion in the PUAs is the accelerated population growth. According to last official census, the population growth rate of PUAs reached to 3.1% annual, while the population growth rate in the main urban agglomeration not eceed than 2% annual [15]. The increased population translated to more urban expansion. However, urban expansion in PUA outpaced population growth[1], see table 1.

4.1.2 Accessibility

According to the study of (JICA 2008) and (Osman, Divigalpitiya, and Arima 2016), the accessibility was the main factor for urban expansion in the villages around the GCMR.

The accessibility in this study was measured in terms of the connectivity to roads and railways, which facilitate the connection with main agglomeration area. The occurrence of a large part of urban expansion was observed adjacent to roads and railways that are attractive to both residents and businesses. Within the northern areas, the greatest urban expansions of settlements were happened, particularly in the following axes, (see Fig. 3.):

- First, the northeast axis (Cairo - Balbes agricultural road), where Al-khosos – Siryaqus - Abu Zabal
- Second, the north axis (Cairo - Alexandria agricultural road), where Qalyub and Sindiyun
- Third, the northwest axis (Ard AL lewa road), where Bashtil- Burtus - Manshiyyat al-Qanatir

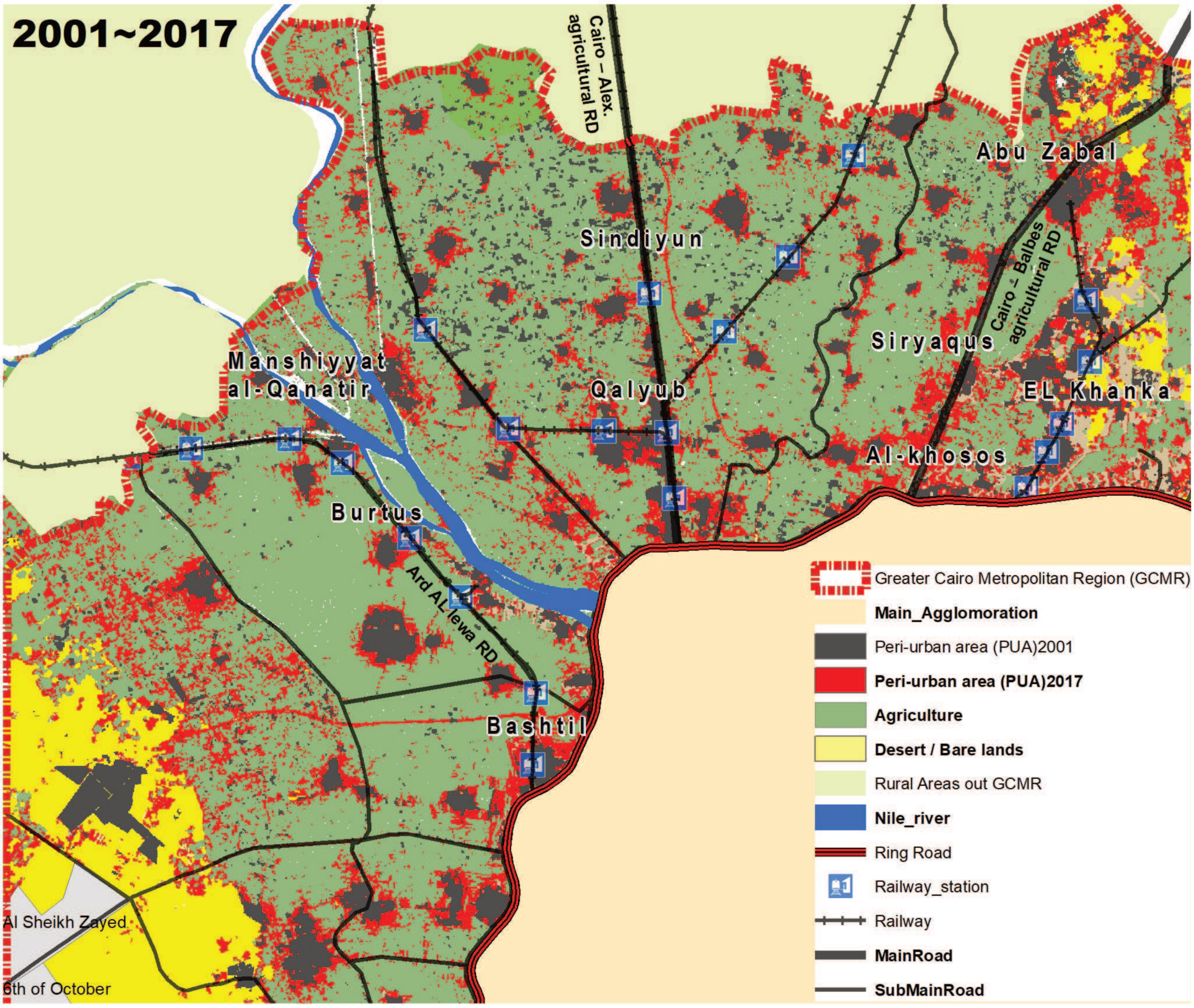

Fig. 3 The connectivity to roads in the northern part in the PUA of the GCMR

4.1.3 Topography

Based on the results of (Mohamed 2012), the regional topography was an influencing factor which drove the urban expansion toward agricultural lands, particularly in the northern frontiers. This study made an overlay

[1] Some scholars argue that the increased speculation on the agriculture lands in this area is the reason for the increase of the urban expansion than the population growth, and this point will be explained in the economic factor.

of the PUAs on a topographic layer to show how was the expansion of PUAs was directed in the light of this topography.

In general, most of the built-up area of the GCMR exist on a semi-flat area, its topography less than 70 m above sea level. This flat area extends to the north and south parallel to the Nile river. Unlike the north and the south, the topography of the eastern and western parts exceeds than 200 meters above sea level. This rugged terrain represents a constraint for urban expansion in both directions.

That's why the most of urban expansion during all expansion stages was directed mainly to the PUAs in the north and western north of the GCMR. In addition to the south but the opportunities for expansion there are limited due to the narrow agricultural plain, see the fig. 3

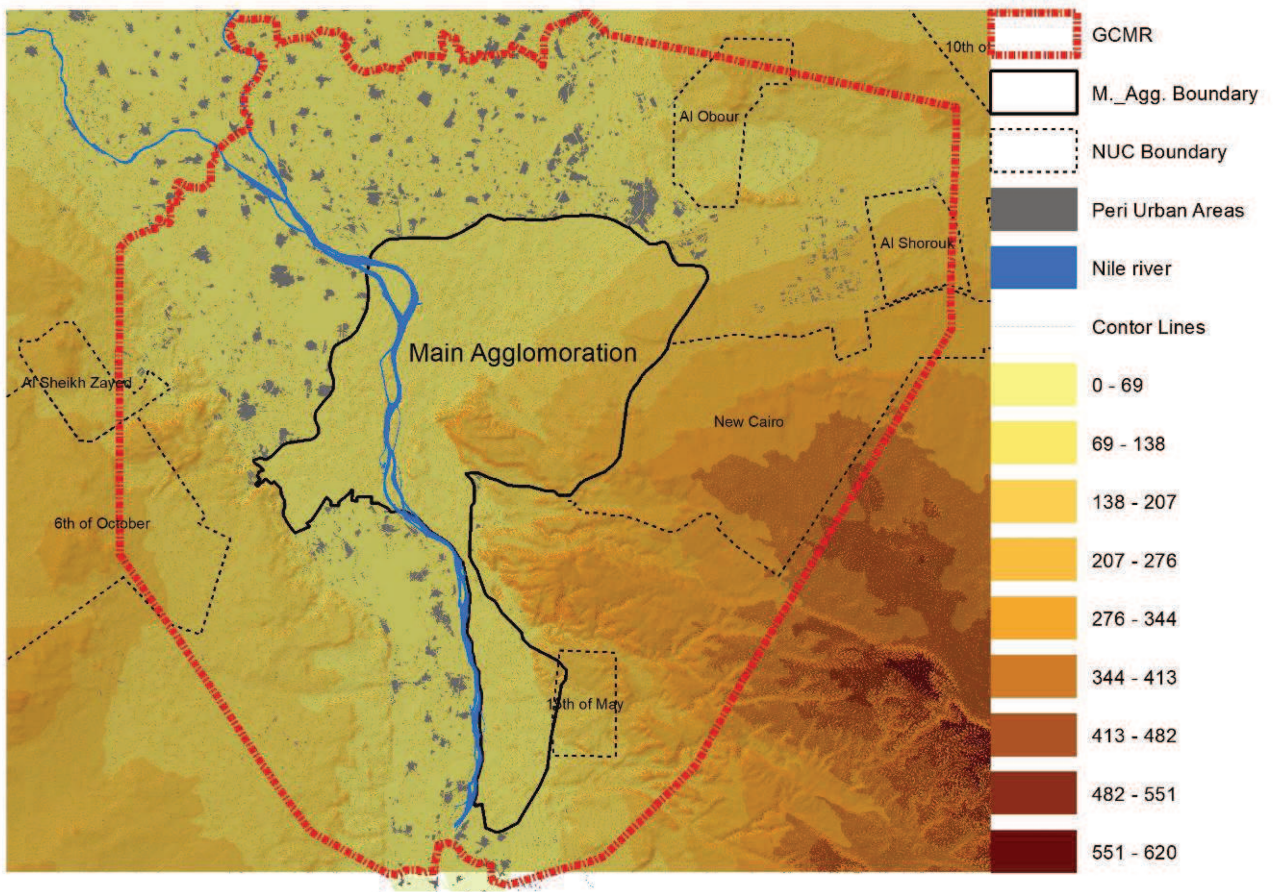

Fig. 4 Topography of GCMR

4.1.4 Economic and legal factors

Based on (MHUUC 2016) and (Salem 2015), the economic factor became one of the main driving factors for urban expansion in PUAs. There are many economic factors which push the urban expansion in PUAs. For instance, the affordable lands in PUAs are attracting the recent marriages and new immigrants, unlike the land values in the new urban communities (NUC) and the main agglomeration. At the same time, the expansion process in the PUAs is very gainful, where the price of the converted lands (from agriculture to buildings) exceed between 8 to 12 times the price of the same agricultural land(World Bank 2008). Moreover, almost all agricultural land in PUAs are privately held, so agricultural lands are easily bought and sold and subdivided into residential lands. For these reasons, the speculation on lands is very common in these areas.

On the other hand, Since urban expansion on agricultural land is officially prohibited, so the government cannot force planning procedures to manage the urban expansion in PUAs. As well as, officially the PUAs of GCMR are classified as rural, so there is no urban planning or land management carried out by government during last decades.

5 CONCLUSION

The findings of the research revealed the high rate of urban expansion in the PUAs in the GCMR, where the rate ranged between 383-540 hectare per year during the last decades. The urban expansion in (PUAs) was scattered and occurred within radius of about 20 km from the urban core of the main agglomeration. The most significant driving factors for this expansion according to the case study of GCMR were the population growth and accessibility of areas. Moreover, the topography of and land values in GCMR are contributed in direction of urban expansion towards the PUAs.

The decision makers must recognize and track the rapid population growth and the increasing concentration of urban expansion in these areas. As well, the government should utilize restricted policies to adjust urban expansion in the agriculture lands, which consider very important resource for all Egyptians. At the same time, these driving factors of urban expansion can be used to direct the future development in the GCMR and enforce planning policies

The research suggests more future research on the mechanisms of land management in PUAs, especially for the lands which situated along major roads, which the most of expansion occurred in it. The research also points to the importance of reconsidering the typology of the PUAs as rural areas. Thus, preparing the necessary plans for these areas should consider it as an integral part of the GCMR.

6 REFERENCES

Allen, Adriana. 2003. “Environmental Planning and Management of the Peri-Urban Interface: Perspectives on an Emerging Field.” Environment&Urbanization 15. http://journals.sagepub.com/doi/pdf/10.1177/095624780301500103 (November 1, 2017).

Appiah, Divine Odame, John Tia Bugri, Eric Kwabena Forkuor, and Peter Kojo Boateng. 2014. “Determinants of Peri-Urbanization and Land Use Change Patterns in Peri-Urban Ghana.” Journal of Sustainable Development 7(6): 95–109. http://www.ccsenet.org/journal/index.php/jsd/article/view/40299.

Braimoh, Ademola K., and Takashi Onishi. 2007. “Spatial Determinants of Urban Land Use Change in Lagos, Nigeria.” Land Use Policy 24(2): 502–15. http://www.sciencedirect.com/science/article/pii/S0264837706000846 (January 9, 2018).

Dupont, Veronique Ed. (Centre De Sciences Humaines). 2006. “Peri - Urban Dynamics : Population , Habitat and Environment on the Peripheries of Large Indian Metropolises.” In Population (English Edition), , 1–151. http://horizon.documentation.ird.fr/exl-doc/pleins_textes/divers15-11/010036511.pdf (November 1, 2017).

Geneletti, Davide, Daniele La Rosa, Marcin Spyra, and Chiara Cortinovis. 2017. “A Review of Approaches and Challenges for Sustainable Planning in Urban Peripheries.” Landscape and Urban Planning 165: 231–43. http://www.sciencedirect.com/science/article/pii/S016920461730021X (October 9, 2017).

JICA. 2008. 1 The Strategic Urban Development Master Plan (SDMP) Study For Sustainable Development Of The Greater Cairo Region.

Lawanson, Taibat, Omoayena Yadua, and Idris Salako. 2012. “An Investigation Of Rural -Urban Linkages Of The Lagos Megacity, Nigeria.” Journal of Construction Project Management and Innovation 2(2): 464–81.

McGregor, Duncan, David Simon, and Donald Thompson. 2006. The Peri-Urban Interface. Approaches to Sustainable Natural and Human Resource Use.

MHUUC. 2016. Third United Nations Conference on Housing and Sustainable Urban Development (Habitat III) Arab Republic of Egypt National Report.

Mohamed, Hereher E. 2012. “Analysis of Urban Growth at Cairo, Egypt Using Remote Sensing and GIS.” Natural Science 4(6): 355–61.

Nada, Mohamed. 2014. “The Politics and Governance of Implementing Urban Expansion Policies in Egyptian Cities.” Égypte/Monde Arabe 11(11): 18. http://journals.openedition.org/ema/3294 (January 15, 2018).

Osman, Taher, Prasanna Divigalpitiya, and Takafumi Arima. 2016. “Driving Factors of Urban Sprawl in Giza Governorate of Greater Cairo Metropolitan Region Using AHP Method.” Land Use Policy 58: 21–31. http://dx.doi.org/10.1016/j.landusepol.2016.07.013.

La Rosa, Daniele, Davide Geneletti, Marcin Spyra, and Christian Albert. 2017. “Special Issue on Sustainable Planning Approaches for Urban Peripheries.” Landscape and Urban Planning 165: 172–76. http://www.sciencedirect.com/science/article/pii/S0169204617300774 (October 9, 2017).

Salem, M. 2015. “Peri-Urban Dynamics and Land-Use Planning for the Greater Cairo Region in Egypt.” In WIT Transactions on The Built Environment, WIT Press, 109–19. http://library.witpress.com/viewpaper.asp?pcode=SD15-010-1 (January 17, 2018).

World Bank. 2008. Towards an urban sector strategy in Egypt.

reviewed paper

Entwicklung eines verkehrsbezogenen und bewusstseinsbildenden Multimodalitätstools für ländliche Räume

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1 ABSTRACT

Multimodales Mobilitätsverhalten, also die bewusste Nutzung unterschiedlicher Verkehrsmittel für die alltägliche Mobilität, kann einen Beitrag zur nachhaltigen Mobilität leisten. Ziel ist es, starre Mobilitätsmuster zu reflektieren, gegebenenfalls aufzubrechen und optimierte Transportlösungen zu finden, die die ökonomischen, ökologischen und sozialen Strukturen sicherstellen. Das Forschungsprojekt MULTMOTIV widmete sich dieser Aufgabenstellung am Untersuchungsbeispiel des ländlichen Raumes. Dabei wurde die aktuelle Wissenslage über multimodales Verkehrsverhalten von Personen, die im ländlichen Raum wohnen, verbessert, erstmalig österreichweit Multimodalität umfassend erhoben und darauf aufbauend in einem partizipativen Prozess Werkzeuge, Maßnahmen und Methoden sowie ein Konzept für ein verkehrsbezogenes und bewusstseinsbildendes Multimodalitätstool für die Planung, Politik, Umsetzung und Evaluierung im Kontext der Multimodalität ausgearbeitet.

Keywords: Multimodalität, ländlicher Raum, Multimodalitätstool, Mobilitätsverhalten, Bewusstseinsbildung

2 EINLEITUNG

2.1 Ausgangslage und Problemabriss

Welche Optionen an Verkehrsmitteln Personen zur Nutzung vorhanden sind, hängt von vielen angebotsseitigen Faktoren, also von der Frage ab, welche Verkehrsmittel räumlich und zeitlich zur Verfügung stehen.

Bei der physischen Ortsveränderung im Personenverkehr bieten ländliche Regionen meist deutlich weniger Alternativen zum motorisierten Individualverkehr (MIV) als urbane Regionen. Dies ist einerseits durch die teils dispersen siedlungsstrukturellen Gegebenheiten sowie geringen Bevölkerungsdichten, also der vergleichsweise geringeren Nachfrage, andererseits aufgrund mangelnder finanzieller Ressourcen für den öffentlichen Verkehr und die daraus resultierende begrenzte Netzabdeckung, also des Angebots, bedingt. (Scheiner et al. 2016: 151)

Die oftmals unzureichende infrastrukturelle Erschließung gekoppelt mit vergleichsweise größeren Distanzen lassen zudem deutlich weniger Spielraum für den Einsatz von nicht motorisierten, umweltfreundlichen Beförderungsmöglichkeiten. (Klinger 2017: 229)

Das überschaubare, wenig dichte und beschränkte Verkehrsangebot (öffentlicher Verkehr und zum motorisierten Individualverkehr ergänzende Angebote) in den ländlichen Gemeinden sowie das oftmals geringe Bewusstsein der ländlichen Bevölkerung für bestehende Mobilitätsdienste erschweren nachfrageseitige Multimodalität zu Gunsten des motorisierten Individualverkehrs (Unbehaun et al. 2014: 119). Zusätzlich wird ein monomodales Mobilitätsverhalten, meist auf den MIV ausgerichtet, durch subjektive Qualitäts- bzw. Flexibilitätsansprüche und objektive Zwänge (z.B. Zeitbudget, Finanz- und Verkehrsmittel, Koordinierungserfordernisse, Zugangsbeschränkungen in Form von Betriebszeiten, Befindlichkeit der Person) verstärkt, während möglicherweise (doch) vorhandene, jedoch eventuell nicht bekannte Alternativen verfügbar wären. Nachfrageseitig spielt neben objektiven Zwängen und subjektiven Restriktionen (z.B. Einstellungen, Gewohnheiten, aber auch besonderen Bedürfnissen, Unvollständigkeit der Information) vor allem die Leistbarkeit von Mobilität eine wesentliche Rolle. Das Mobilitätsverhalten ist in den meisten Fällen so lange stabil, so lange die täglichen Anforderungen, Bedingungen und Bedürfnisse stabil sind. (Cerwenka et al. 2007: 163)

Gardner und Abraham (2011: 301) nennen drei Bereiche, in welchen Maßnahmen zu einer Veränderung des Mobilitätsverhaltens führen können. Sie fokussieren sich in diesem Zusammenhang auf eine Veränderung des Mobilitätsverhaltens in Richtung reduzierter Autonutzung. Diese Bereiche, in denen aktiv Einfluss genommen werden kann, sind (1) Infrastruktur (z.B. Busspuren, Rad- & Fußwege etc.), (2) politische legislative Maßnahmen (z.B. City-Maut) und (3) psychologische Strategien, die auf die Veränderung von Einstellungen und Wahrnehmungen abzielen. Letztere werden dabei am stärksten akzeptiert, sind am wenigsten kostenintensiv und können ein vielversprechender Weg zur Reduktion der Pkw-Nutzung sein, wenn entsprechende Alternativen zur Verfügung stehen.

Bereits bestehende und etablierte Plattformen (z.B. AnachB, Scotty, GoogleMaps) liefern einen grundsätzlichen Überblick über mögliche Verkehrsangebote im ländlichen Raum. Ein auf die konkreten Bedürfnisse der Bevölkerung ausgelegtes Tool zur aktiven Förderungen eines multimodales Verkehrsverhalten existiert in dieser Form jedoch noch nicht. Vor diesem Hintergrund und der Tatsache, dass ein multimodales Verkehrsverhalten einen ökologischen Mehrwert in Bezug auf die Reduktion von Treibhausgasemissionen darstellen kann, besteht der Bedarf einer Entwicklung eines Multimodalitätstools für Gemeinden und Regionen im ländlichen Raum.

2.2 Zielsetzung

Im vorliegenden Paper werden die Ergebnisse des vom Bundesministerium für Verkehr, Innovation und Technologie geförderten Projektes MULTIMOTIV systematisch aufbereitet und dargelegt. Zielsetzung des Projektvorhabens war

- die Verbesserung des Verständnisses von Multimodalität in ruralen Räumen (auf allgemeiner Ebene, also sowohl für die Bevölkerung sowie Planer und Entscheidungsträger) einerseits und
- die partizipative Erarbeitung von Werkzeugen und Methoden der Bewusstseinsbildung für Planung, Politik, Umsetzung und Evaluierung (Multimodalitätstool, siehe Seite 6) andererseits.

Im Fokus stand die Entwicklung eines Multimodalitätstools. Das Tool sollte einerseits auf einer standardisierten Methode aufbauen und daher allgemein anwendbar sein, andererseits aber so flexibel sein, dass es auf die Situation in der jeweiligen ruralen Gemeinde bzw. Region angepasst werden kann. Die Anwendung des Tools soll dazu führen, dass in der Gemeinde bzw. Region ein Prozess angestoßen wird, der dazu führt, dass Bewusstsein für Multimodalität geschaffen wird bzw. neue multimodale Mobilitätsangebote entstehen. Der partizipative Ansatz bei der Entwicklung des Tools stellte einen wesentlichen Qualitätsaspekt dar. Der Mehrwert für eine Gemeinde bei der Entwicklungs des Tools ergibt sich aus dem Potenzial, bestehende Mobilitätsmuster der Bevölkerung aufzubrechen und auf die Anforderungen und Bedürfniss der Bevölkerung ausgelegte Verkehrsstrategien zu formulieren. Dadurch können bestehende Umsteigewiderstände verringert werden und der Grundstein für die Förderung eines multimodalen Verkehrsverhaltens gelegt werden.

2.3 Methodik und Herangehensweise

Im Rahmen einer Sekundärdatenanalyse (Sichtung relevanter Literatur und Datengrundlagen) wurde der State of the Art für rurale Räume erhoben und anhand von Praxisbeispielen die Praktikabilität von Multimodalität in ruralen Räumen geprüft. Um eine umfassende Betrachtung der Thematik sicherzustellen (z.B. Ermittlung des aktuellen Verständnisses, Bewusstseins und subjektiv wahrgenommenen Angebots multimodaler Mobilität sowie die Identifikation von konkreten Bedürfnissen für multimodales Verkehrsverhalten bzw. auftretende Barrieren), erfolgte eine groß angelegte Erhebungsphase (Einzelinterviews, Fokusgruppen, Zukunftswerkstätten) in drei ausgewählten Testgemeinden in Österreich (Kirchberg an der Pielach, Ottensheim und St Georgen bei Salzburg). Mit der Auswahl der drei Gemeinden sollte sichergestellt werden, dass Unterschiede und Gemeinsamkeiten in Bezug auf die Anforderungen und das Verständnis von Multimodalität anhand drei rural charakterisierter Untersuchungräume identifziert werden, sodass Wünsche, Bedürfnisse, Anforderungen, Bedingungen und Möglichkeiten für die Realisierung von multimodalen Verkehrsverhalten frühzeitig identifziert werden konnten. Im Rahmen der in Österreich erstmals durchgeführten Multimodalitätserhebung (telefonisch-postalische Erhebung inkl. non-response Analyse) galt es, Multimodalität zu beschreiben und analysieren. Dafür wurde aus den jeweils von den Gemeinden zur Verfügung gestellten Personen- und Haushaltsregistern die Bruttostichprobe gezogen und erforderliche Erhebungsmaterialien (Fragebogen, Wegeprotokoll) erstellt. Um die jahreszeitlichen Effekte im Mobilitätsverhalten abbilden zu können, wurden je Gemeinde über einen Zeitraum von zwölf Monaten vier Erhebungsphasen (im Frühling, Sommer, Herbst und Winter) durchgeführt.

Basierend auf den Erhebungsergebnissen fand in den jeweiligen Gemeinden ein Partizipationsprozess statt, bei dem gemeinsam mit Gemeindevertreterinnen, Gemeindevertretern, Bürgerinnen und Bürgern geeignete Werkzeuge und Methoden zur Förderung von Multimodalität diskutiert und entwickelt wurden.

Aufbauend auf den Ergebnissen erfolgte die Entwicklung eines Multimodalitätstools, welches einerseits auf einer standardisierten Methode aufbaut, andererseits aber so flexibel sein soll, dass es auf situationsspezifische Gegebenheiten in der jeweiligen ländlichen Gemeinde bzw. Region angepasst werden kann. Die Anwendung des Multimodalitätstools soll dazu führen, dass in der Gemeinde bzw. Region ein Prozess angestoßen wird, an dessen Ende verbesserte multimodale Mobilitätsangebote stehen.

Im Rahmen einer Wirtschaftlichkeitsanalyse wurde untersucht, unter welchen Bedingungen ein möglicher betriebswirtschaftlicher Nutzen (aus Betreibersicht bzw. aus Sicht potenzieller Nutzerinnen und Nutzer) des entwickelten Multimodalitätstools gegeben ist und welche Kosten und welcher Nutzen (betriebswirtschaftlich und volkswirtschaftlich) ein Einsatz des Multimodalitätstools für potenzielle Nutzerinnen und Nutzer (z.B. Gemeinden) bedeuten würde. Eine abschließende Potenzialabschätzung diente dazu, das Projektvorhaben in Hinblick auf die Praktikabilität und das Anwendungspotenzial zu untersuchen und Weiterentwicklungsmöglichkeiten aufzuzeigen.

3 DEFINITION MULTIMODALITÄT IM RURALEN RAUM

3.1 Ruraler Raum

Die Klassifizierung von Raumgefügen wird auf europäischer Ebene anhand einer OECD-Einteilung auf NUTS-3-Ebene („Nomenclature des unités territoriales statistiques") vorgenommen. Die NUTS-3-Gliederung unterteilt territoriales Gebiet in kleine, räumliche Einheiten und differenziert zwischen den Kategorien „überwiegend ländlich", „intermediär" oder „überwiegend städtisch". (OECD 2010: 2)

Diese Einordnung stützt sich auf den jeweiligen Bevölkerungsanteil der jeweiligen Gemeinden, gemessen an der Gesamtbevölkerungszahl ihrer NUTS-3-Region. So handelt es sich um „überwiegend ländliche" Gemeinden, wenn mehr als 50% der Wohnbevölkerung einer NUTS-3-Region in „ländlichen" Gemeinden lebt (Statistik Austria 2012: 3).

Räumliche Gebiete können nicht nur anhand ihrer Einwohnerdichte, sondern auch aufgrund der Raumstrukturen bzw. -typologien (z.B. agrarisch dominierte Gebiete, touristische Gebiete, wirtschaftlich diversifizierte Gebiete) unterteilt werden. (ÖROK 2011: 87)

3.2 Multimodalität

Der Begriff Multimodalität ist im Personenverkehr nicht eindeutig definiert. Die bereits abgeschlossene Sondierungsstudie OPERMO (Neumann et al. 2016) hat sich dabei zum Ziel gesetzt, eine operationalisierbare Definition zu erarbeiten. Eine Begriffsdefinition erfolgte auf der angebotsseitigen, einstellungsrelevanten bzw. nachfrageseitigen Ebene.

Bei der angebotsseitigen Definition wird ein Verkehrssystem als multimodal bezeichnet, wenn den Verkehrsteilnehmerinnen und Verkehrsteilnehmer für ihre konkreten Mobilitätsbedürfnisse mindestens zwei Verkehrsmittelalternativen zur Verfügung stehen. Hierbei ist zu bedenken, dass Qualitätsaspekte (z.B. die zeitliche Komponente, sprich eingeschränkte Betriebszeiten des öffentlichen Verkehrs) beim multimodalen Angebot eine Rolle spielen. So müssen Mobilitätsbedürfnisse in den jeweiligen zeitlichen, räumlichen und inhaltlichen/funktionalen Anforderungen Berücksichtigung finden.

In der zweiten Ebene wird nach der Einstellung bzw. Haltung von Verkehrsteilnehmerinnen und Verkehrsteilnehmern differenziert. So wird Multimodalität als eine Einstellung bzw. Haltung von Personen bezeichnet, die offen für die Nutzung verschiedener Verkehrsmittel sind und für jeden Weg das jeweils für sie optimale Verkehrsmittel wählen.

Die nachfrageseitig ausgerichtete Definition von Multimodalität beschreibt das individuelle Verkehrsverhalten von Verkehrsteilnehmerinnen und Verkehrsteilnehmern, also die realisierte Mobilität aus den objektiv verfügbaren Verkehrsmittelalternativen. Multimodales Verkehrsverhalten einer Person ist somit die tatsächliche Nutzung unterschiedlicher Verkehrsmittel (z.B. MIV, ÖV, Fahrrad, zu Fuß) in einem bestimmten Zeitraum (z.B. eine Woche, sprich von Montag bis Sonntag). (Neumann et al. 2016: 41)

4 MULTIMODALITÄTSERHEBUNG UND KONZEPTION MULTIMODALITÄTSTOOL

4.1 Multimodalitätserhebung in drei Testgemeinden

Basierend auf der Begriffsdefinition von Multimodalität sind Verkehrsteilnehmerinnen und Verkehrsteilnehmer multimodal, wenn in einem bestimmten Zeitraum unterschiedliche Verkehrsmittel genutzt werden. Im konkreten Anlassfall ist die Dauer des Erhebungszeitraumes auf eine 7-Tages-Woche festgelegt worden. Um eine Vergleichbarkeit mit den Datensätzen der Mobilitätserhebung „Österreich unterwegs“ sicherstellen zu können, erfolgte ein weiterer Beobachtungszeitraum der zwei Werktage Dienstag und Donnerstag.

Bei der Ergebnisaufbereitung (siehe Abbildung 1) ist die Divergenz beider Betrachtungszeiträume (Dienstag und Donnerstag mit einer ganzen Woche) auffallend. Bei der Betrachtung einer ganzen Woche reduziert sich der Anteil derer, die nur ein Verkehrsmittel nutzen. Im Zeitraum von einer Woche ist es deutlich leichter zu beispielsweise monomodalen Pendelwegen an Werktagen andere Wege wie z.B. Freizeitwege mit anderen Verkehrsmitteln zurückzulegen. Anzumerken gilt hierbei, dass nicht nur monomodale, sondern auch bereits an Dienstagen und Donnerstagen multimodale Verkehrsteilnehmerinnen und Verkehrsteilnehmer im längeren Beobachtungszeitraum mehrere Verkehrsmittel nutzten.

Werden die Anteile der sich multimodal verhaltenden Personen im Detail betrachtet, so fällt die Dauer des Untersuchungszeitraumes ins Gewicht. Je nach Gemeinde sind zwischen 18 und 30 Prozent Menschen multimodal unterwegs, wenn statt zwei Tagen die Verkehrsmittelwahl einer ganzen Woche abgefragt wird. Von diesen Personen, die sich an Dienstagen und Donnerstagen monomodal, im Wochenverlauf insgesamt aber multimodal verhalten, nutzen 55 Prozent in der Woche zwei Verkehrsmittel, 31 Prozent drei Verkehrsmittel und nur 14 Prozent vier oder mehr Verkehrsmittel. Das bedeutet, dass Monomodalität an Dienstagen und Donnerstagen nicht zwangsläufig Monomodalität im gesamten Wochenverlauf bedeutet.

Im saisonalen Vergleich zeigt sich eine Abnahme des multimodalen Verkehrsverhaltens; konkret eine Abnahme der Anzahl der genutzten Verkehrsmittel in den Wintermonaten. Diese ist darauf zurückzuführen, dass der Nutzungsanteil von Zufußgehen oder Fahrradfahren aufgrund von Witterungseinflüssen sinkt.

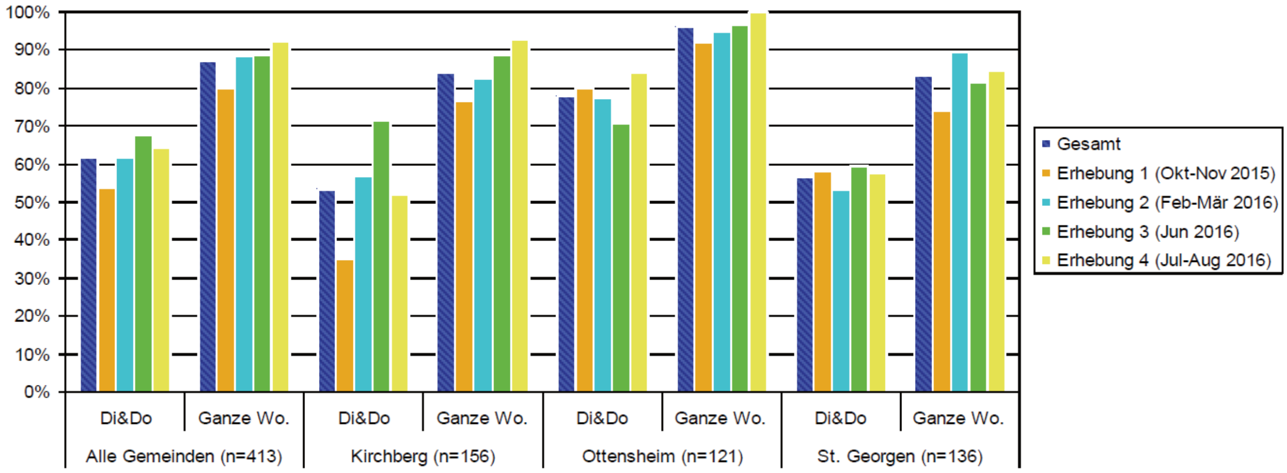

Abbildung 1: Anteil multimodaler Personen an Stichprobe im saisonalen Vergleich

Bei der Betrachtung des multimodalen Verhaltens in den drei Testgemeinden war interessant festzustellen, welche Verkehrsmittel genutzt bzw. kombiniert wurden:

- Bei denjenigen Teilnehmerinnen und Teilnehmern, die an Dienstagen und Donnerstagen nur ein Verkehrsmittel genutzt haben, war das in der überwiegenden Mehrheit der Pkw, meist als Fahrerin oder Fahrer, aber auch stark als Mitfahrerin oder Mitfahrer. Mit großem Abstand dahinter kommen die reinen Fußgängerinnen und Fußgänger wie auch noch einmal dahinter die Radfahrerinnen und Radfahrer. Diese Verteilung ist ein weiterer Hinweis auf die Möglichkeit, fast alle Wege mit dem Pkw zurückzulegen, bzw. auf die Unmöglichkeit dies nur mit anderen Verkehrsmitteln (z.B. dem Rad) zu machen. Ähnliches gilt, wenn der Beobachtungszeitraum auf eine Woche erweitert wird. Der Pkw dominiert, jedoch gibt es auch einen erheblichen Fußgängeranteil. Diejenigen, die die ganze Woche nur zu Fuß gehen, sind häufig ältere Menschen, die aus unterschiedlichen (nicht erhobenen) Gründen keinen Pkw oder andere Verkehrsmittel nutzen (können) und ihre Wege im näheren Wohnumfeld zurücklegen (müssen).

- Auch bei zwei genutzten Verkehrsmitteln ist die mit Abstand beliebteste Kombination das Fahren mit dem MIV (als Lenkerin oder Lenker) und das Zufußgehen. In Ottensheim ist ebenso die Kombination von Zufußgehen und Mitfahren im MIV stark vertreten. Im Wissen, dass die MIV-Mitfahrten in Ottensheim überdurchschnittlich weit sind, handelt es sich hierbei vermutlich vor allem um Fahrgemeinschaften von Pendlerinnen und Pendlern. Auch die Kombination von MIV (als Lenkerin oder Lenker) und Fahrrad erfreut sich – vor allem in Kirchberg und St. Georgen – starker Beliebtheit. Dort ist aber noch stärker die Kombination aus Fahrten mit dem MIV als Fahrerin oder Fahrer sowie als Mitfahrerin oder Mitfahrer dort vertreten. Der ÖV, der bei den Monomodalen überhaupt nicht vertreten war, taucht in verschiedenen Kombinationen – mit Zufußgehen, dem Rad oder dem MIV – auf, kommt aber durchweg nur auf einstellige Ergebnisse.
- Bei der Kombination von drei verschiedenen Verkehrsmitteln wird deutlich, dass der Umweltverbund alleine für die Teilnehmerinnen und Teilnehmer kein zufriedenstellendes Mobilitätsangebot darstellt. Sind an Dienstagen und Donnerstagen einige wenige noch ausschließlich damit unterwegs, findet sich keine/-r mehr, für die/den dies in der ganzen Erhebungswoche ausreichend wäre. Häufiger genutzte Kombinationen sind solche, bei denen ein Verkehrsmittel des Umweltverbunds (das Rad oder der ÖV) durch den MIV (als Lenkerin oder Lenker) ersetzt wird. Die in Kirchberg und St. Georgen bei Weitem beliebteste Kombination ist die des MIV (als Fahrerin oder Fahrer und Mitfahrerin oder Mitfahrer) mit dem Zufußgehen. (Neumann et al. 2017: 117)

Das räumliche Gefüge ist bei multimodalem Verkehrsverhalten ein wesentlicher Faktor. So fällt beispielsweise auf, dass der Anteil monomodaler Verkehrsteilnehemerinnen und Verkehrsteilnehemer in jenen Gemeinden relativ gering ausfällt, in denen ein gutes Angebot an Verkehrsmitteln und zentralen Nahversorgungseinrichtungen gegeben ist.

Bei der Betrachtung aller Wege der Erhebungsteilnehmerinnen und Erhebungsteilnehmer und der dafür von ihnen gewählten Verkehrsmittel ergibt sich der Modal Split (siehe Abbildung 2). Bei diesem fällt neben der starken Präsenz des MIV ein recht hoher Fußwegeanteil auf.

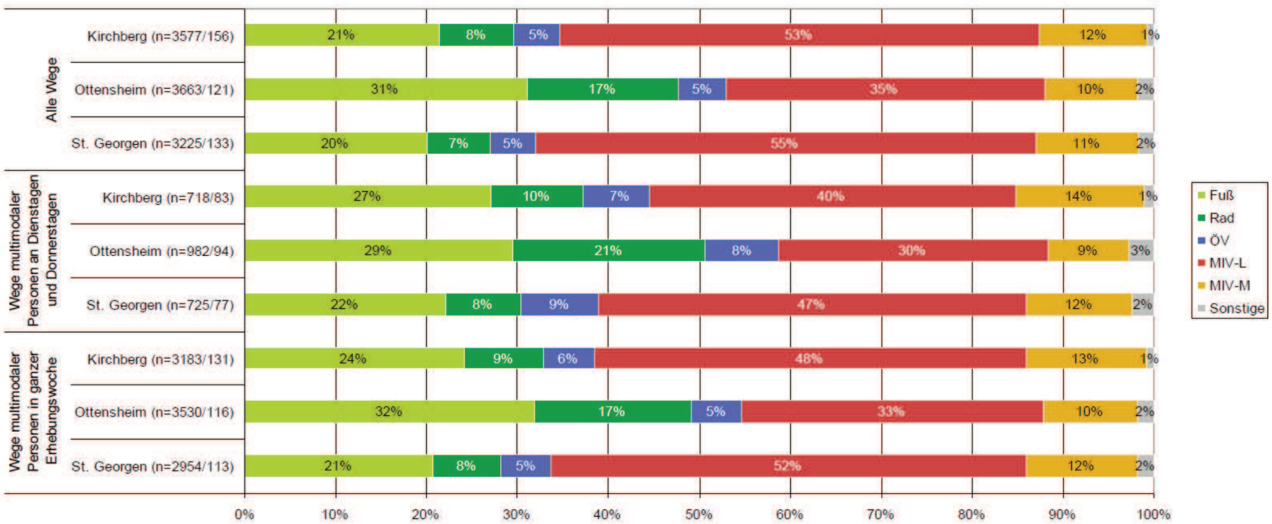

Abbildung 2: Modal Split; Alle Gemeinden; Ganzes Jahr (Alle Wege: n=10465 Wege von 410 Personen)

Die Erhebung der Motive der Verkehrsmittelwahl hat gezeigt, dass Radfahren und Zufußgehen vor allem dann attraktiv sind, wenn sie die einfachsten und bequemsten Optionen sind. Auch der Wunsch fit zu bleiben oder zu werden spricht für die Wahl dieser aktiven Mobilitätsformen. Umweltaspekte spielen, wenn überhaupt, erst danach eine Rolle. Bei den Gründen nicht zu Fuß zu gehen oder Rad zu fahren stehen das Wetter und die Entfernungen zu Zielen an erster Stelle der Ursachen, welche die Nutzung dieser Verkehrsmittel einschränken. Der ÖV wird dann genutzt, wenn er die einfachste Möglichkeit ist oder auch, wenn keine andere Alternative bereitsteht. Gründe gegen seine Nutzung sind Umständlichkeit, Zeitaufwand und/oder das fehlende Angebot. Für den MIV sprechen seine Zeiteffizienz und die Einfachheit der Nutzung,

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sowie die Möglichkeit Güter oder andere Personen einfach transportieren zu können. Gründe ihn nicht zu nutzen sind die fehlende Verfügbarkeit eines Fahrzeugs bzw. die Verfügbarkeit von Alternativen (in diesem Fall: MIV-Alternativen als Selbstfahrerin oder Selbstfahrer bzw. Mitfahrerin oder Mitfahrer).

Modul 1 – Erhebung des IST-Zustandes

Im Modul 1 „Erhebung des IST-Zustandes“ werden die Mobilitätssituation sowie die vorhandenen Rahmenbedingungen in der Gemeinde analysiert. So wird die Raum- und Siedlungsstruktur (z.B. räumliche Situation in der Gemeinde (dispers, zentralisiert), Topographie, Versorgungseinrichtungen, Freizeit- und Erholungseinrichtungen, Arbeitsplätze) sowie das Verkehrsangebot (z.B. vorhandener ÖV/Erschließung mit dem ÖV, Radinfrastruktur, E-Ladeinfrastruktur, Bike-/Carsharing, bestehende Mitfahrvereine) erarbeitet. Modul 1 wird von ExpertInnen gemeinsam mit MitarbeiterInnen der Gemeinde (z.B. Mobilitätsbeauftragten) erarbeitet und dient als Grundlage für alle weiteren Module.

Beteiligte: MitarbeiterInnen der Gemeinde, MobilitätsexpertInnen

Dauer: 72h (Besprechungstermine mit der Gemeinde à 8h, Nachbereitungen à 8h)

Modul 2 – Erarbeitung des ZIEL-Zustandes

Das Modul 2 „Erarbeitung des ZIEL-Zustandes“ dient dazu, gemeinsam festzulegen, wohin sich die Mobilitätssituation sowie die Rahmenbedingungen in der Gemeinde entwickeln sollen. Dabei stehen folgende Aspekte im Vordergrund:
- Analyse und Bewertung der IST-Situation (Stärken/ Schwächen in Bezug auf Faktoren, die die Multimodalität fördern)
- Identifikation der Handlungsfelder
- Festlegen von Zielen und Teilzielen zur Förderung von Multimodalität (inkl. Zeithorizont, Kosten, Umsetzungsebene und Auswirkungen auf MIV/ Rad- /Fußverkehr) unter Berücksichtigung der SMART-Kriterien (=spezifisch, messbar, attraktiv, realistisch und terminierbar)

Im Modul 2a wird der ZIEL-Zustand von MobilitätsexpertInnen gemeinsam mit MitarbeiterInnen der Gemeinde erarbeitet.

Beteiligte: MitarbeiterInnen der Gemeinde, MobilitätsexpertInnen

Dauer: 72h (Besprechungstermine in der Gemeinde à 8h, Bearbeitungstage à 8h, Nachbesprechungstermine in der Gemeinde à 8h)

Im Modul 2b wird der ZIEL-Zustand von MobilitätsexpertInnen gemeinsam mit der Bevölkerung erarbeitet.

Beteiligte: Bevölkerung, MitarbeiterInnen der Gemeinde, MobilitätsexpertInnen

Dauer: 72h (Besprechungstermine in der Gemeinde à 8h, Workshops vor Ort à 8h, Bearbeitungstage à 8h, Nachbesprechungstermine in der Gemeinde à 8h)

Modul 3 – Multimodalitätserhebung

In Modul 3 „Multimodalitätserhebung“ wird das Mobilitätsverhalten der Bevölkerung, deren Bedürfnisse und Wünsche hinsichtlich Mobilität sowie die Möglichkeit und Bereitschaft Fahrgemeinschaften anzubieten bzw. in Anspruch zu nehmen mittels Fragebögen und Interviews erhoben. Modul 3 ist eine Ergänzung zu Modul 1 und dient der vertiefenden Analyse der Mobilitätssituation in der Gemeinde. Folgende Ergebnisse werden in Modul 3 erarbeitet:
- Anzahl, Länge und Dauer der zurückgelegten Wege je teilnehmender Person
- Anteil der einzelnen Verkehrsmittel an den zurückgelegten Wegen
- Multimodalität in der Gemeinde („wie multimodal ist meine Gemeinde“)
- Anteil an Wegen < 2 km bzw. < 10 km zur Abschätzung des Verlagerungspotentials vom MIV auf Fuß- oder Radverkehr

Modul 3 wird von MobilitätsexpertInnen mit organisatorischer Unterstützung durch MitarbeiterInnen der Gemeinde durchgeführt. Die ExpertInnen zeichnen sich dabei für Vorbereitung, Durchführung und Auswertung verantwortlich, die Gemeinde für den Kontakt zur Bevölkerung (Informationsschreiben, Bereitstellung der Adressdaten bzw. Versand der Fragebögen).

Beteiligte: MobilitätsexpertInnen, MitarbeiterInnen der Gemeinde, Bevölkerung

Dauer: 160h (Stundenreduktion durch Mitarbeit der Gemeinde bei Vorbereitung möglich)

Modul 4 – Aktivitätenplan

Aufbauend auf Modul 2 beinhaltet das Modul 4 folgende Inhalte:
- Festlegung von Aktivitäten, die die Gemeinde setzen wird, um Multimodalität zu fördern
- Aktivitätenplan mit Bewertung der ausgewählten Aktivitäten, Umsetzungshorizont, Kosten und Priorität
- Gereihter Aktivitätenplan mit Zeitplanung, Zuständigkeiten und Verantwortlichkeiten
- Vereinbarung über Kommunikationsstrukturen (intern/ an die Öffentlichkeit) während der Umsetzungsphase des Aktivitätenplans.

Empfohlen wird, dass die im Modul 4 festgelegten Aktivitäten durch einen Gemeinderatsbeschluss offiziell bestätigt werden.

Im Modul 4a wird der Aktivitätenplan von MitarbeiterInnen der Gemeinde mit Unterstützung durch MobilitätsexpertInnen erarbeitet.

Beteiligte: MitarbeiterInnen der Gemeinde, MobilitätsexpertInnen

Dauer: 56h (Vorbereitung à 8h, Termine mit der Gemeinde à 8h, Nachbereitungen à 8h)

Im Modul 4b wird der Aktivitätenplan unter Beteiligung der Bevölkerung mit Unterstützung von MobilitätsexpertInnen erarbeitet.

Beteiligte: Bevölkerung, MitarbeiterInnen der Gemeinde, MobilitätsexpertInnen

Dauer: 88h (Vorbereitung à 8h, Termine mit der Gemeinde à 8h, Workshops vor Ort à 8h, Nachbereitungen à 8h)

Modul 5 – Ex-Post-Evaluierung

Im Modul 5 „Ex-Post-Evaluierung“ werden die gesetzten Aktivitäten dokumentiert und hinsichtlich ihrer Förderung von Multimodalität evaluiert. Ziel dieses Modules ist es, aus den Erfahrungen der umgesetzten Aktivitäten zu lernen. Folgende Ergebnisse werden in Modul 5 erarbeitet:
- Festlegung von Indikatoren und Kennzahlen für die Evaluierung
- Dokumentation der gesetzten Aktivitäten (Sammlung von Kennzahlen, Daten und Informationen)
- Evaluierung der gesetzten Aktivitäten hinsichtlich ihrer Wirkung auf Multimodalität.

Modul 5 wird von ExpertInnen mit teilweise organisatorischer Unterstützung durch MitarbeiterInnen der Gemeinde durchgeführt.

Beteiligte: MobilitätsexpertInnen, MitarbeiterInnen der Gemeinde

Dauer: 56h (In Summe eine Arbeitswoche als begleitender Prozess über die gesamte Dauer des Bewusstseinsbildungsprozesses)

Abbildung 3: Multimodalitätstool

4.2 Multimodalitätstool für Planung, Politik, Umsetzung und Evaluierung

Das Multimodalitätstool versteht sich als ein Beratungsinstrumentarium für Gemeinden, um multimodales Mobilitätsverhalten in der Gemeinde bzw. Region zu fördern. Der Fokus liegt dabei auf dem Aspekt der Bewusstseinsbildung und Folge dessen auf dem Versuch des Aufbrechens von bestehenden gewohnten Mobilitätsmustern. Durch die Anwendung des Multimodalitätstools soll in Gemeinden das Bewusstsein für Multimodalität geschaffen werden und in weiterer Folge das Bewusstsein der Nutzerinnen und Nutzer dafür geschärft werden, welches Verkehrsmittel bzw. welche Verkehrsmittelkombination für ihren jeweiligen Weg optimal ist.

Für das Multimodalitätstool (siehe Abbildung 3) wurde ein modularer Aufbau entwickelt, der es ermöglicht, flexibel auf die gemeindespezifische Situation einzugehen. Die Module, die sich in einem Baukasten-System zeitlich und inhaltlich unterschiedlich zusammensetzen können, ermöglichen einen auf die Gemeinde zugeschnittenen bedarfsgerechten Mobilitätsentwicklungsprozess.

5 DISKUSSION

Es kann davon ausgegangen werden, dass sich das Multimodalitätstool positiv auf den Mobilitätssektor auswirkt, der Impact – bedingt durch die Betrachtung von ausgewählten Teilaspekten des Multimodalitätstools – jedoch als untergeordnet einzustufen ist. Die Potenzialabschätzung des Multimodalitätstools kann der Tabelle 1 entnommen werden (Neumann et al. 2017: 201).

		Multimodalitätstool *Module: 1, 2b, 3, 4b, 5*
Bewusstsein	Möglicher Einsatz unterschiedlicher Verkehrsmodi *(A)*	Unter Einbindung aller Beteiligten und Einholung relevanter Informationen (Modul 2 und Modul 3), kann basierend auf dem Modul 1 eine bedarfsgerechte Planung (v.a. Modul 2a und 4a) ermöglicht werden. Grundvoraussetzung dafür ist die Erhebung von realen Mobilitätsverhalten und Mobilitätsbedürfnissen (Modul 3). So kann die nachfrageseitige Bereitschaft zur Nutzung von unterschiedlichen Angeboten bzw. zum Anbieten von z.B. Fahrgemeinschaften erörtert und darauf aufbauend ein für die Gemeinde attraktives Verkehrssystem geschaffen werden.
	Bereitschaft zur Variation von Verkehrsmodi *(N)*	Im Rahmen von insbesondere mehrstufigen Beteiligungsprozessen (Modul 2b, Modul 4b) kann das Bewusstsein und in Folge dessen das Verhalten mitunter stark verändert werden. Durch das Fachwissen der Expertinnen und Experten kann das Bewusstsein für die Nutzung alternativer bzw. dem MIV-ferner Beförderungsmöglichkeiten gestärkt werden. Ebenso kann die Bereitschaft, an Fahrgemeinschaften teilzunehmen, gesteigert werden. Die Ergebnisse aus diesen Prozessschritten tragen dazu bei, den Anteil an aktiven Mobilitätsformen und des ÖV am Modal Split zu erhöhen.
	Möglichkeit zur Verkettung von Verkehrsmodi *(A)*	Basierend auf den definierten Zielsetzungen und der Gemeinde zugrundeliegenden Rahmenbedingungen (Modul 1) werden gemeinsam mit der Bevölkerung (Modul 2b und 4b) unterschiedliche Maßnahmen zur Verkettung von Verkehrsmodi von A nach B gesetzt. Die Evaluierung ermöglicht weiters, die gesetzten Aktivitäten bzw. die Akzeptanz des multimodalen Verkehrsangebots zu überprüfen und gegebenenfalls ad hoc Adaptierungen vorzunehmen.
	Bereitschaft zur Verkettung von Verkehrsmodi *(N)*	Durch mehrstufige Beteiligungsprozesse (Modul 2b und 4b) kann das Bewusstsein und in Folge dessen die Bereitschaft zur Verhaltensänderung mitunter stark verändert werden. Die Ergebnisse aus diesen Prozessschritten tragen dazu bei, den Anteil an aktiven Mobilitätsformen und des ÖV am Modal Split zu erhöhen. Es kann davon ausgegangen werden, dass zwar die Bereitschaft zur Nutzung unterschiedlicher Verkehrsmodi geschärft, jedoch zur Verkettung von unterschiedlichen Verkehrsmodi entlang einer Wegekette als ein längerfristiger Prozess angesehen werden kann.
Umsetzung	Einsatz unterschiedlicher Verkehrsmodi *(A)*	Die Basis für den Einsatz unterschiedlicher Verkehrsmodi wird im Modul 4b gelegt - aufbauend auf der Mobilitätserhebung (Modul 3) und unter Einbindung der Bevölkerung (Modul 2b) kann ein bedarfsgerechtetes und von den Nutzerinnen und Nutzern als positiv wahrgenommenes Verkehrsangebot geschaffen werden. Ein Erfolgsfaktor ist dabei die Einbindung von Verkehrsverbünden sowie Akteuren im Bereich Transport und Verkehr.
	Verkettung unterschiedlicher Verkehrsmodi *(N)*	Es kann davon ausgegangen werden, dass basierend auf der Mobilitätserhebung (Modul 3) künftig ein bedarfsgerechtes Verkehrssystem geschaffen werden kann, welches von der Bevölkerung angenommen wird. Mit der Bereitstellung eines breiteren Angebots an Verkehrsmitteln kann davon ausgegangen werden, dass Verkehrsteilnehmer "wahlfreier" bei der Nutzung von unterschiedlichen Verkehrsmodi werden. Voraussetzung dafür ist die Harmonisierung und der Ausgleich von objektiv und subjektiv feststellbaren Restriktionen, die mittels des Multimodalitätstools durch die Involvierungsprozesse unterschiedlicher Akteure (Modul 2b und Modul 4b), mit der Erhebung von Mobilitätsbedürfnissen (Modul 3) und mit den kontinuierlichen Evaluierung (Modul 5) gegeben ist.
	Finanzierung/ Ticketing *(A)*	Ein Auseinandersetzen mit den individuell verfügbaren Finanzmitteln (Finanzbudget) lässt Rückschlüsse auf die Zahlungsbereitschaft künftiger Nutzerinnen und Nutzer schließen (im Rahmen des Moduls 3 gilt es die Zahlungsbereitschaft zu erheben) und ermöglicht ein entsprechendes nutzerfreundliches Ticketing, um die Investitions- bzw. Instandhaltungskosten der gesetzten Maßnahmen mit den Einnahmen auszugleichen (siehe Modul 4b). Die Finanzierung kann einerseits entsprechend dem bereitgestellten Angebot, andererseits in Abhängigkeit der tatsächlichen Inanspruchnahme des Angebots erfolgen. Die Gemeinde kann mit Hilfe des Multimodalitätstools und in Absprache mit den Verkehrsverbünden eine Anreizwirkung (z.B. Zuschüsse und Subventionen) schaffen. Dadurch kann das Bewusstsein für alternative bzw. multimodale Lebensstile geschärft werden.
	Nutzung mehrerer Verkehrsmodi *(N)*	Es kann davon ausgegangen werden, dass bei (1) der Erhebung von Mobilitätsbedürfnissen (Modul 3) und Modul 2) Beteiligung der Bürgerinnen und Bürger (Modul 2b und Modul 4b) neben dem Bewusstsein (Stichwort Umweltbewusstsein) auch die Nutzung von verschiedenen Verkehrsmitteln gefördert wird. Im Rahmen von Modul 5 können umgesetzte (Verkehrs-)Projekte bewertet und evaluiert bzw. die Akzeptanz untersucht werden.

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	Zeiteinsparung/ Erreichbarkeit *(A)*	Die Erreichbarkeiten bzw. Reisezeiten sind abhängig von der Anzahl und der Qualität der zur Verfügung stehenden Kanten und Verkehrsmittel zwischen zwei oder mehreren Knoten. Die Verbesserung der Erreichbarkeiten kann durch eine Reduktion des Ressourceneinsatzes (Zeitreduktion) oder durch die Ausweitung des Einzugsbereiches bei gleichbleibendem Zeitaufwand erreicht werden. Es kann davon ausgegangen werden, dass bei steigender Anzahl an (qualitativ hochwertigen) Beförderungsmöglichkeiten jener mit den geringsten Zeitkosten gewählt werden kann. Einen wesentlichen Beitrag zum künftigen Angebot an Mobilitätsalternativen liefern die Module 4b und 5.
Wirkungen	Zeiteinsparung *(N)*	Abhängig von den finanziellen Ressourcen und der sozialen Rolle sowie Wertehaltungen kann davon ausgegangen werden, dass mit einem multimodalen Verkehrsangebot nachfrageseitig aufgrund der zur Verfügung stehenden unterschiedlichen Alternativen, die präferierte Beförderungsmöglichkeit gewählt wird. Im Rahmen des verfügbaren Zeit- und Geldbudgets werden durch die Attraktivitätssteigerung mehrere Beförderungsmöglichkeiten wahrgenommen.
	Komfort *(N)*	Einen Wandel des Bewusstseins für den Mobilitätskomfort von multimodalen Mobilitätsformen kann durch die Anwendung der Module 2b und 4b erfolgen. Die Ergebnisse aus diesen Prozessschritten tragen dazu bei, den Mobilitätskomfort für multimodale Wegeketten zu verbessern und den Anteil aktiver Mobilitätsformen und des ÖV am Modal Split zu erhöhen.
	Sicherheit *(N)*	Die Erhöhung der Verkehrssicherheit im Zusammenhang mit multimodaler Mobilität kann auf unterschiedliche Weise erfolgen. Im Zuge der Erhebung des IST-Zustandes (Modul 1) können Informationen zu bisherigen Unfallorten, unsicheren Verkehrssituationen (fehlende Sichtbeziehungen, mangelnde Markierungen etc.) erhoben und im Rahmen der Zielerarbeitung (Modul 2a) die Entwicklung von Verkehrssicherheitsprogrammen für die nachfolgende Aktivitätenformulierung erstellt werden.
	Image *(N)*	Das Image bzw. die Imagebildung steht in starker Korrelation mit der Bewusstseinsbildung. Mittels des Multimodalitätstools können die Vorteile von multimodalem Verkehrsverhalten (Bewegung bzw. aktive Mobilität ist gesund, reduziert Stress und bereitet Vergnügen) hervorgehoben und dadurch das Image gesteigert bzw. in Folge dessen eine Verhaltensänderung erzielt werden. Das Modul 4 (Kommunikation mit der Öffentlichkeit) eignet sich insbesondere zur Imagebildung.
	Reduzierung neg. Effekte *(A)*	Es kann davon ausgegangen werden, dass mittels des Multimodalitätstools Maßnahmen (Modul 4a) gesetzt werden, welche die negativen externen Effekte des Verkehrs reduzieren bzw. das Verkehrssystem nachhaltig stärken. Dabei wird versucht das Verkehrssystem, sprich die unterschiedlichen einzelnen Verkehrsangebotslösungen (ÖPNV, öffentlicher Fernverkehr, Taxi-Service, Fahrrad etc.) zu vereinen bzw. gesamtheitlich zu betrachten.
	Beitrag zur gesundheits fördernder/aktiver Mobilität *(A)*	Durch die Einbindung der Bevölkerung (Modul 2b und 4b) kann einerseits auf Grundlage der individuellen Bedürfnisse ein Angebot für eine gesundheitsfördernde aktive Mobilität geschaffen und andererseits der Grundstein für eine langfristige Bewusstseinsänderung gelegt werden. Durch den Bewusstseinswandel kann mitunter die Nachfrage nach aktiver Mobilität wiederrum steigen. Dieser kann im Rahmen des Evaluierungsprozesses (Modul 5) untersucht werden.
	Kostenwahrheit *(A)*	Ein nach außen hin transparenter Entscheidungs- und Planungsprozess sowie die nach dem Verbraucherprinzip angelasteten Kosten sind wesentliche Bestandteile für ein gut funktionierendes und nachhaltiges Verkehrssystem. Mit dem Multimodalitätstool wird ein erster Schritt in die richtige Richtung unternommen.
	Kostenreduktion *(A)*	Kosteneinsparungen können durch eine effektive (Neu-)Planung bzw. Umorganisation (z.B. Linienführungen) oder Substitution des bestehenden Verkehrsangebots (z.B. geändertes Nutzerverhalten; mitfahren statt selbstfahren) realisiert werden. Bei der Umorganisation kann dies für die Betreiberinnen und Betreiber des öffentlichen Verkehrs von Vorteil sein, bei der Substitution für private Haushalte.
	Verbesserung der Wettbewerbs-fähigkeit *(A)*	Es ist davon auszugehen, dass das Multimodalitätstool zu einer Verbesserung der Kompatibilität des Verkehrssystems beiträgt und dadurch ein Alleinstellungsmerkmal aufgebaut werden kann und in Folge dessen die Wettbewerbsfähigkeit steigt.
	Steigerung der regionalen Wertschöpfung *(A)*	Es ist davon auszugehen, dass eine Verbesserung des Verkehrssystems - bedingt durch die Verbesserung der Erreichbarkeiten - eine positive Wirkung auf die regionale Wertschöpfung hat.
	Neupositionierung in der Region *(A)*	Es kann davon ausgegangen werden, dass durch ein multimodales Verkehrsangebot (Modul 4) ein Alleinstellungsmerkmal aufgebaut werden kann. Dadurch können sich Gemeinden in der Region neu positionieren und als Best-Practice für andere Gemeinden profilieren.
	Resilienzsteigerung *(A)*	Es kann davon ausgegangen werden, dass mittels des Multimodalitätstools Maßnahmen (Modul 4) gesetzt werden, die das Verkehrssystem stärken.
	Harmonisierung unterschiedlicher Interessen *(A)*	Durch die mehrfache Einbeziehung der Bevölkerung und das Abwägen unterschiedlicher Interessen in den einzelnen Prozessschritten, können Interessen frühzeitig abgewogen und Konflikte (z.B. Umweltziele der öffentlichen Hand können im Konflikt mit der Gewinnmaximierung privatwirtschaftlicher Akteurinnen und Akteure stehen) vermieden werden.

Bewertungsschlüssel

starkes Potenzial		Angebot/angebotsseitig	*(A)*
mittleres Potenzial		Nachfrage/nachfrageseitig	*(N)*
schwaches Potenzial		keine Wirkung	

Tabelle 1: Potenzialabschätzung Multimodalitätstool

6 SCHLUSSFOLGERUNGEN UND CONCLUSIO

Stadt- und Verkehrsentwicklungsprozesse unterliegen komplexen Sachverhalten, bei denen es im Sinne einer nachhaltigen und zukunftsorientierten Planung der Involvierung aller Beteiligten bedarf. Für die Weiterentwicklung der Verkehrsinfrastruktur bzw. für die Etablierung von nachhaltigen und innovativen Mobilitätsangeboten gilt es, die Bedarfslagen der Bevölkerung zu eruieren. Das aktive und iterative Auseinandersetzen mit der aktuellen Situation unter Berücksichtigung übergeordneter (Klima-)Strategien, technologischer Entwicklungen (im Bereich Mobilität) etc. sowie die Auseinandersetzung mit den konkreten Mobilitätsbedürfnissen lassen Spielraum für die Integration neuer Verkehrskonzepte offen. Durch die Einbindung der Bevölkerung in den Planungsprozess kann systematisch eine Bewusstseinsänderung beim individuellen Verkehrsverhalten induziert werden. Das Multimodalitätstool hat durch eine gesamtheitliche Betrachtung von Rahmenbedingungen, Mobilitätsbedürfnissen, Abstimmung von Zielsetzungen und künftigen Maßnahmenbündel durch Abstimmung unterschiedlicher Interessen durchaus das Potenzial, die alltägliche Mobilität der Gemeindebewohnerinnen, Gemeindebewohner, Beschäftigten und Erwerbstätigen sowie von (Tages-)Touristinnen und (Tages-)Touristen nicht nur zu verbessern, sondern das Gesamtverkehrssystem nachhaltig zu gestalten und somit einen Beitrag zur Erreichung von politischen Vorgaben, wie beispielsweise übergeordneter Klimastrategien, zu leisten.

Die zielgerechte Erfassung der Entwicklungen im Rahmen eines kontinuierlichen Monitoring sichert Schritt für Schritt eine nachhaltige Mobilität.

7 REFERENCES

CERWENKA, Peter; KLAMER, Michael; HAUGER, Georg; HÖRL, Bardo (2007): Handbuch der Verkehrssystemplanung. Österreichischer Kunst- und Kulturverlag, Wien.

GARDNER, B; ABRAHAM, Ch (2011): Psychological correlates of car use: A meta-analysis. Transportation Research Part F: Traffic Psychology and Behaviour. Volume 11, Issue 4, 300-311.

KLINGER; Thomas (2017): Moving from monomodality to multimodality? Changes in mode choice of new residents. Transportation Research Part A 104 (2017) 221-237.

NEUMANN, Alexander, HUBER, Günther, KLAMER, Michael, HAUGER, Georg, ANGELINI, Alessandra, VLK, Tamara, MOLITOR, Romain, STAUDNER, Margarethe, OBERMAYER, Christian, KANTER, Olivia, CLEES, Liette, NIEGL, Martin, KOCH, Helmut, SCHÖGENAUGER, Rainer, PALACZ, Barbara, RISSER-CHALOUPKA, Christine, HAUPT, Juliane, HARTWIG, Lukas, PIRUSKINS, Girts (2017): MULTIMOTIV, Multimodalitätstool für ruale Räume. Bundesministerium für Verkehr, Innovation und Technologie, Wien.

NEUMANN, Alexander, SCHUBERT, Alex, KLAMER, Michael, HAUGER, Georg, VLK, Tamara, WANJEK, Monika, MOLITOR, Romain, OBERMAYER, Christian, BAUER-IBILI, Stèphanie, KIGILCIM, Benjamin, HAUPT, Juliane, RISSER, Ralf (2016): OPERMO-Endbericht, Operationalisierung der Multimodalität im Personenverkehr in Österreich. Mobilität der Zukunft, Ausschreibung 2012. Bundesministerium für Verkehr, Innovation und Technologie, Wien.

OECD (2010): OECD Regional Typology. Directorate for Public Governance and Territorial Development, 22. February 2010.

ÖROK (2011): Österreichisches Raumordnungskonzept ÖREK2011, Handlungsräume 2020.. Geschäftsstelle der Österreichischen Raumordnungskonferenz. Rema Print Druck- und Verlagsgesellschaft m.b.H., Wien.

SCHEINER, Joachim, CHATTERJEE, Kiron, HEINEN, Eva (2016): Key events and multimodality: A life course approach. Transportation Research Part A 91 (2016) 148-165.

STATISTIK AUSTRIA (2012): Stadt-Land Typologie der Europäischen Kommission unter Berücksichtigung der Erreichbarkeit nach NUTS 3-Regionen. In: STATISTIK AUSTRIA online, erstellt am 24. Februar 2012, abgerufen am 09. Juli 2015, Wien.

UNBEHAUN, Wiebke, FAVRY, Eva, GERIKE, Regina, HADER; Thomas, KNOLL, Bente, SCHWANINGER, Teresa, UHLMANN, Tina (2014): Unterwegs zwischen Erwerbs- und Familienarbeit. Eine Analyse in den niederösterreichischen Regionen Triestingtal und Schneeberland. Verkehr Und Infrastruktur. Kammer für Arbeiter und Angestelle für Wien, Wien.

reviewed paper

Examining the Role of Public Transport Interchange Hubs in Supportive Public Transport Integration in City of Johannesburg

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1 ABSTRACT

The focus on developing integrated urban public transport systems have become major priorities globally, particularly in developed and transitional economies in order to achieve effective mobility. Similarly, increasing the connectedness and efficiency of urban public transport modes has become a necessity within cities of developing countries. Subsequently, the City of Johannesburg formulated relevant policies, strategies and frameworks that seek to inform the development and operation of efficient and integrated urban public transport systems. Thus, interchange hubs are starting points of public transportation ride and the first points of interaction commuters have with the available service. Subsequently, this study aims to eximine the role of public transport interchange hubs in supportive of integration between Gautrain and Rea Vaya BRT operations in Johannesburg metropolitan city, using a phenomelogical case study survey design and mixed methods approaches consisting of spatial, quantitative and qualitiative data. The exploratory approach was used to formulate the research problem for comprehensive investigation, whereas descriptive approach was used to gather broad and accurate information. Research techniques such as social media, crowd-sourcing, and interviews were used to collected data. Whilst data analysis and interpretations were conducted with techniques such as Echo-Echo, main content analysis, Geographic Information Technologies.This study presents novel data analysed into empirical results suggesting that public transport interchange hubs plays a pivotial influence in supportive the integration of Gautrain and Rea Vaya operations in city of Johannesburg. The findings further reveal the complexity of spatial and commucative platforms in multiplicity of urban public transport modes resulting in complex models of urban public transport operations.

Keywords: public transport, efficiency, interchange hubs, commuters, Gautrain, Rea Vaya BRT, integration.

2 INTRODUCTION

In contemporary years, increasing emphasis has been placed on the development of intermodal transport hubs as tools with which to improve urban mobility. Mobility appears as a fundamental component of the daily lives of people. However, mobility patterns are clearly linked to urban density and the relative location of activities. Hence, Integration of multimodal transport systems has received particular interest in recent years to promote mode switch. In developed and transitional economies, where transit is widely spread, commuters are served by an intermodal transport system, integrating a number of bus routes and a rail line connected at different transfer stations (Paulley and Webster, 2017). In such a system, commuters may need one or more transfers to complete their journey. Hull (2008) emphasized the importance of maintaining interoperating and interconnectivity across service providers to optimize intermodal public transport systems. Long transfer times significantly deteriorate the service quality when the system is operated without coordination. Effective intermodal integration significantly enhances the attractiveness and productivity of a combined bus and rail transit system (Hickey, 1992). Indeed, maintaining a stable headway along a bus route is difficult due to traffic congestion, vehicle breakdown, incidents and the variation of demand over time and space (Filippi et al., 2013). Pure schedule synchronization for connecting routes at transfer stations may not reduce the transfer time effectively (Datta, 2015). Conversely, holdings times added into the schedules of coordinated routes required to increase the probability of successful connection.

Conversely, integration of multimodal urban public transport system has remained on of the major policy agenda for a relatively long time in the City of Johannesburg. Increasing the connectedness and efficiency of urban public transport systems has become a major issue for the City of Johannesburg, owing its culpabilities to the historic segregation and rapid urban population growth (Moswane and Gumbo, 2016). The City of Johannesburg formulated relevant policies, strategies and frameworks that seek to inform the development and operation of efficient and integrated urban public transport systems. Thus, interchange hubs are starting points of public transportation ride and the first points of interaction commuters have with the available service. Subsequently, this study aims to eximine the role of public transport interchange hubs in supportive of integration between Gautrain and Rea Vaya BRT operations in Johannesburg metropolitan city, using a phenomelogical case study survey design and mixed methods approaches consisting of spatial, quantitative and qualitiative data.

3 STUDY AREA: LOCALIZING THE CONETEXT

The greater Johannesburg metropolitan city is the political capital and the largest economic hub of the Republic of South Africa, yet it is the smallest in terms of physical size in its located province of Gauteng, as depicted by figure 1. The City of Johannesburg covers an area of 1,645 square kilometers, starting from Orange Farm in the South to Midrand in the North (Smith, 2013). The City of Johannesburg is the driving economy or an economic engine of the country and a place of opportunity to many. It is the most densely urbanized area of the Republic and it is home to 11.3 million publics.

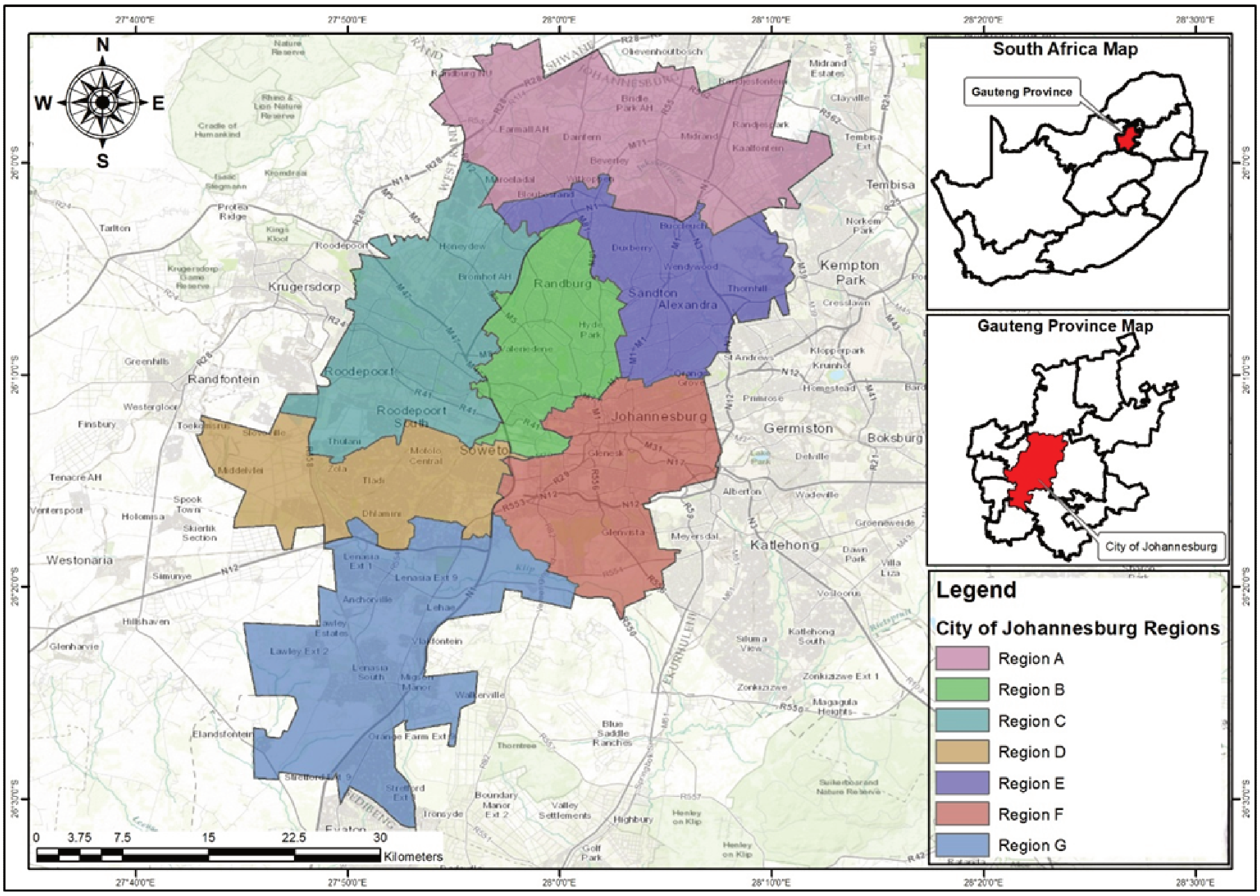

Figure 1: City of Johannesburg Map (Source: Author, 2017)

The Rea Vaya BRT and Gautrain are located in City of Joahnnesburg of Gauteng province, Republic of South Africa. The Rea Vaya operates only under the jurisdiction of the City of Johannesburg in southern part. Whilst Gautrain operates within the three metropolitan cities in Gauteng province which include City of Tshwane, City of Johannesburg and City of Ekurhuleni in the East Rand of Gauteng Province. The three metros, as mentoned earlier they form the region which is the economic hub of the Republic of South Africa and are only cities in the entire African continent that has a rapid transit train. These tow public transport modes started operating during the 2010 FIFA World Cup which was hosted by South Africa.

4 METHODOLOGY

The study adopted a phenomelogical case study survey research design. A mixed-methods research aapporach was used, where spatial qualitative and quantitative data was collected and analysed. The study examined the role of public transport interchange hubs in supportive public transport integration in City of Johannesburg, thus the exploratory apprach was used to formulate the research problem for comprehensive investigation, whereas descriptive appraoch was used to gather broad and accurate information. Key onformat interviews were used conducted with key informant officials from Johannesburg Roads Agency (JRA), Gautrain Management Agency (GMA) and Gauteng Department of Roads and Transport to give more accurate information on the role of Johannesburg Park Station in supportive of the urban public transport integration in City of Johannesburg. In addition, socia media data and crowd-sourced data were collected from echoecho. Whilst data analysis and intepretations were conducted using techniques such main content analysis, Geographic Information Technologies.

5 THE JOHANNESBURG PARK STATION, THE CITY OF JOHANNESBURG INTERCHANGE HUB AND ITS ROLE IN SUPPORTIVE PUBLIC TRANSPORT INTEGRATION

The approach to the Concept interchange, the Johannesburg Park Station taken in the City of Johannesburg is a wide one, as it is stated in the document Towards Commuter Intermodality in the EU (2004), "intermodilty is a policy and planning principle that aims to provide a commuter using different modes of transport in a combined trip chain with seamless journey". Henceforth, the intermodality is crucial for the integration of various modes of public transport into one efficiency system. Conversely, the co-presence of multiple modes of public transport, even at the same building is not enough for an interchange, an interchange approach should focus on transfers' easiness and should aim at a seamless trip. This further yields a sharp distinction between station and interchange. Whereas stations are mainly about access and dispersal to a transport system, interchange involve interconnection of various transport systems. The Johannesburg Park Station, an interchange hub of the City of Johannesburg is one of the most important components of urban transport. It is created and evolves with socio-economic and transport development in Johannesburg Metropolitan City, whereas simultaneously having aggregation and scale effects on the City. However, factors that have an impact include socio-economic development, urban structure regional transport conditions, and the need for sustainable development. Figure 2 illustrate the location of Johannesburg Park Station within the City of Joahannesburg.

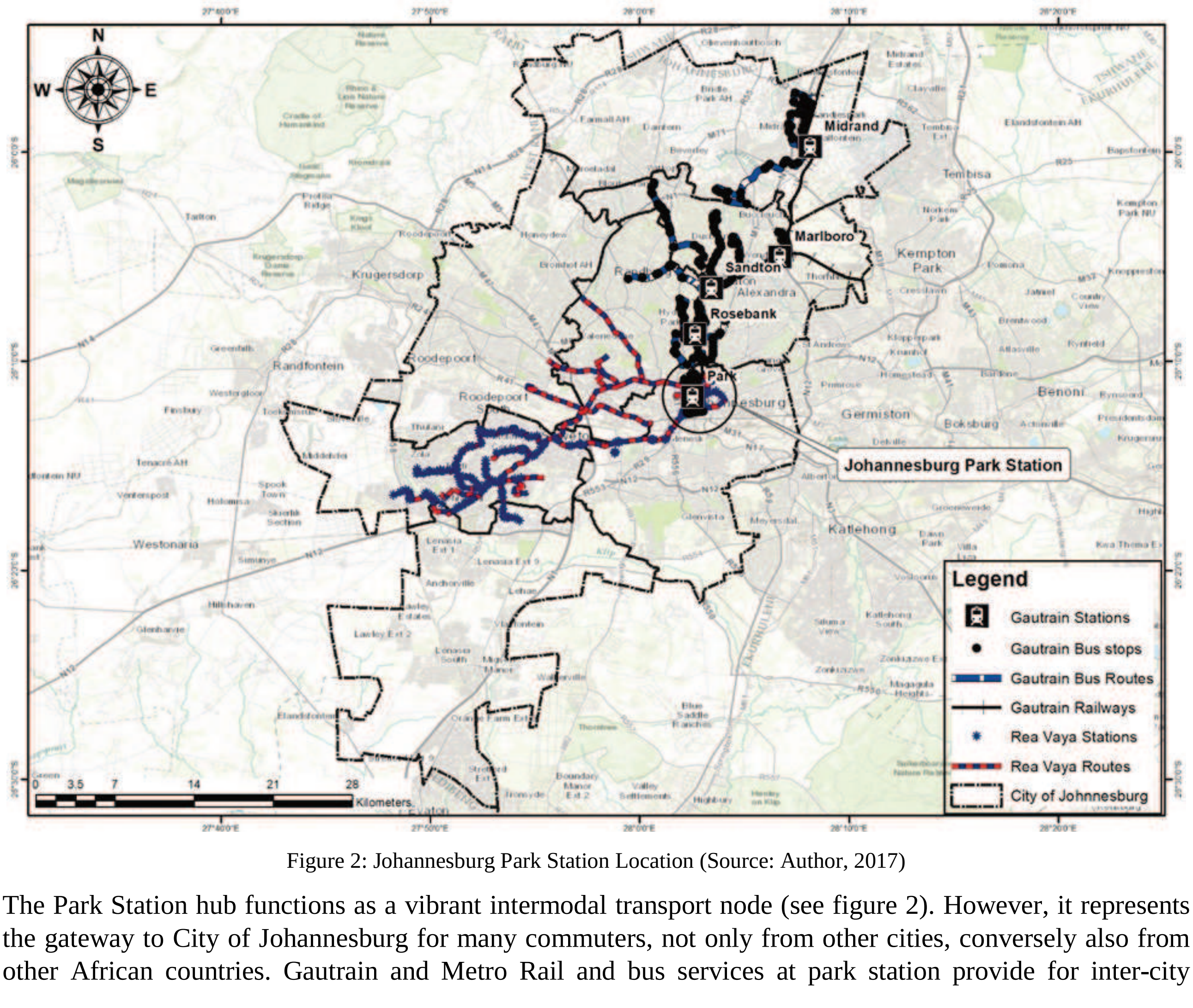

Figure 2: Johannesburg Park Station Location (Source: Author, 2017)

The Park Station hub functions as a vibrant intermodal transport node (see figure 2). However, it represents the gateway to City of Johannesburg for many commuters, not only from other cities, conversely also from other African countries. Gautrain and Metro Rail and bus services at park station provide for inter-city

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transport as well as intra-city and regional transport services. The Park Station hub provides access to the inner city, and it also provide access to Braamfontein, a well-established high-density precinct that has undergone significant regeneration in contemporary years. Also Braamfontein hosts a diversity of government departments, education facilities (of which Wits University is the most prominent), student accommodation, local retail businesses, and financial and municipal institutions. Due to Braamfontein's urban function, plenty of people commute on a daily basis through the area, resulting in pressure on the levels and standards of service delivery.

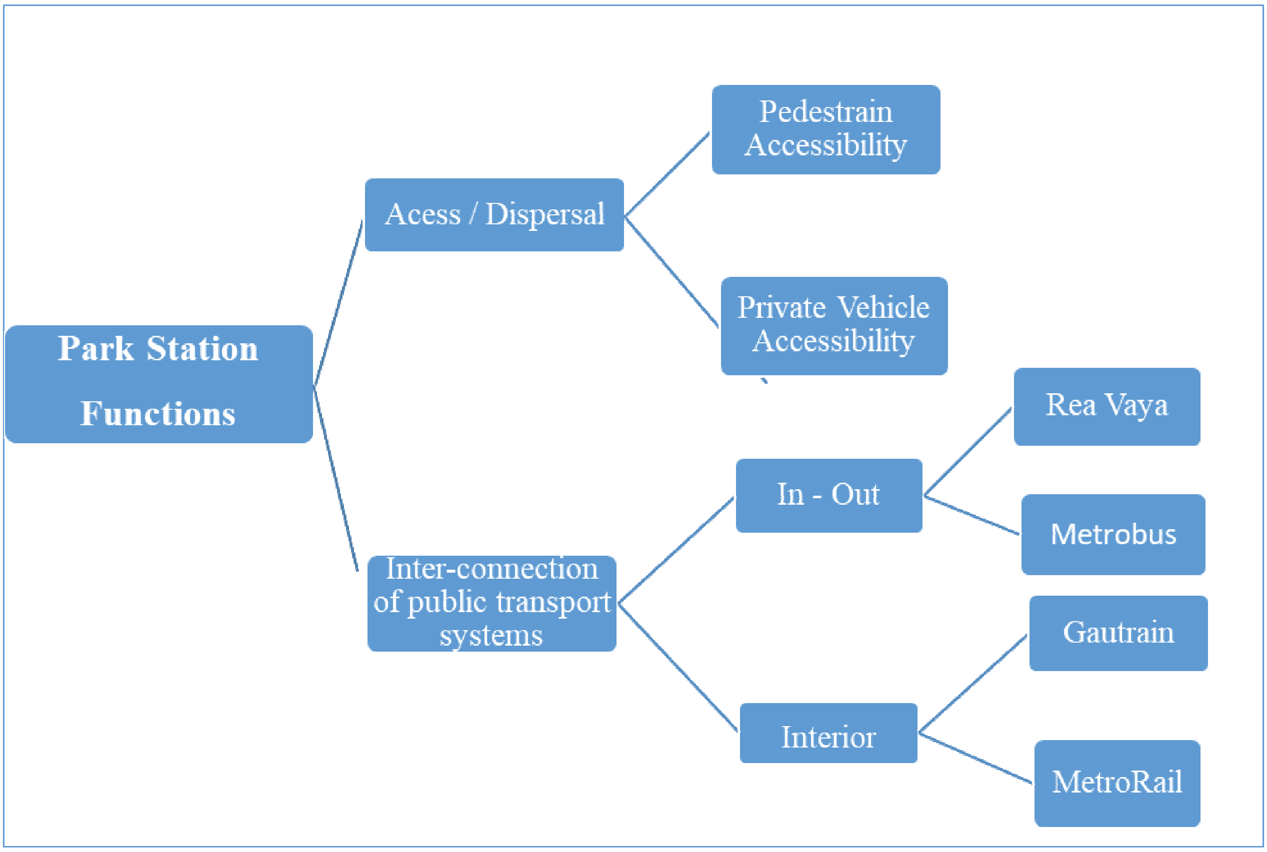

Figure 3: Park Station Functions and Urban Environment (Source: Author, 2017)

The Interchange is characterised by a mixture of high intensity land uses ranging from clustering of mostly commercial land use to the south of the interchange to a concentration educational and other government, commercial, parking and other mixed land uses to the north. Because of the high intensity of land uses in the area as well as the high volumes of people working or visiting government, educational or commercial facilities, public parking is a necessary requirement. Given that Park Station is a prominent transport terminal in Johannesburg, Gauteng, and South and southern Africa, distribution terminals in the form of bus stations, metro rail stations and platforms, and taxi ranks are located in the close proximity to the Park Station precinct. The Gautrain Park Station, bus routes as well as the Bus Rapid Transit routes should also be noted as an essential feeder and distributor routes in the area.

The Johannesburg Park Station provides for an integrated and effective of routing and circulation that reduces the number of transfer required; ensure safety for higher level of commuter; promotes the use of public transport and non-motorised modes of transport; and also encourages the integrated development of surrounding land uses. The Park Station links various modes of transport in one location, wjile also improving the efficiency of land uses and other resources. Each transport mode at the Johannesburg Park station supports the other by helping to redistribute commuter overloads among them and caters to commuters commuting requirements and demand. Thus, the diverse needs and features of each transport mode should be considered during the planning and design state to develop a sustainable and viable design, particularly in terms of contruction and operation in order to achieve effective mobility.

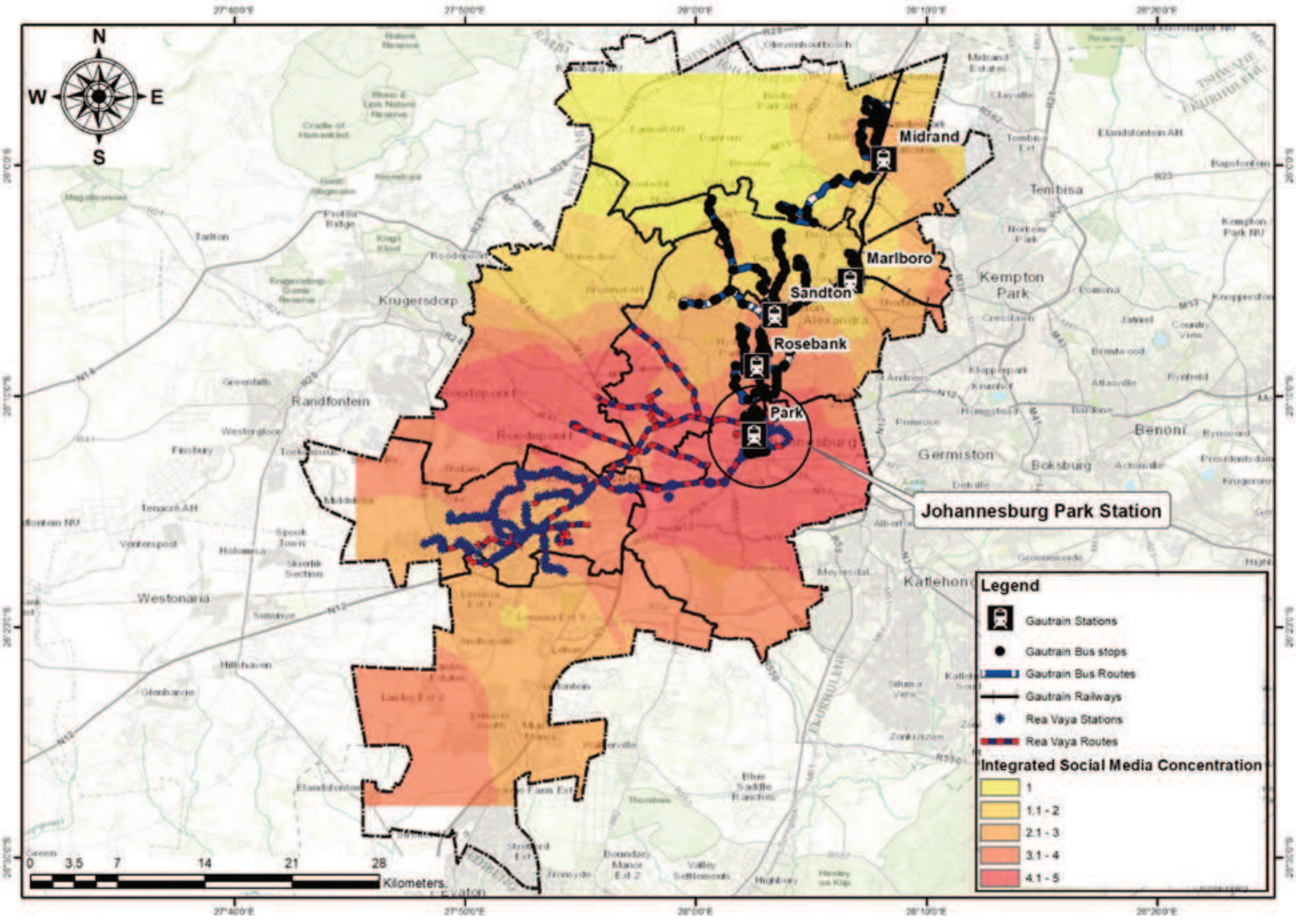

Figure 4: Johannesburg Park Station and Integrated Social Media Concentration Analysis

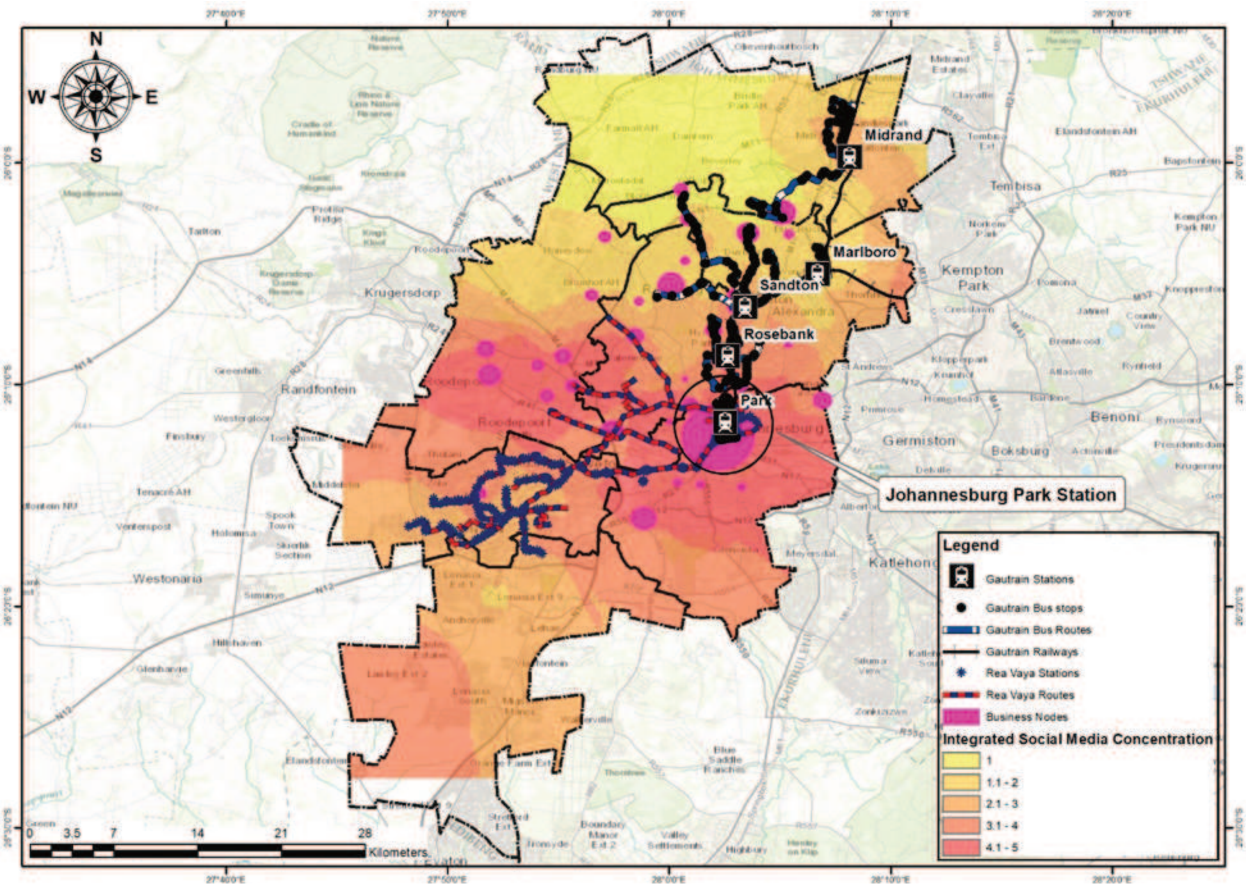

Figure 5. Park Station and Integrated Social Media Concentration

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Editors: M. SCHRENK, V. V. POPOVICH, P. ZEILE, P. ELISEI, C. BEYER, G. NAVRATIL

Given that the commuter concentration zones of the Gautrain and Rea Vaya were overlapped on a ratio of 50:50, to ascertain which stations should be used as the initial geolocations to promote multi-mobility. The Johannesburg Park Station had the highest integrated commuter concentration as display in figure 4. With this high commuter integration, improving commuter transfer in the geolocation would be a good idea, as the infrastructure and commuter numbers are already pre-existing. Moreover, it will be cost effective for the Johannesburg Park Station operators to partner with various Rea Vaya and Gautrain agencies towards promoting multi-mobility within the Johannesburg Metropolitan region, then building separate infrastructure, as the Gautrain links commuters to economic and business nodes in the Northern parts of the city, namely: Rosebank, Sandton, Marlboro and Midrand; and Rea Vaya links commuters to in the Southern part of the City, as presented in figure 5.

5.1 nIntegration of Existing Transport Systems around the Hub

5.1.1 <u>Influence of Johannesburg Park Station on the Nearby Road Network</u>

The Johannesburg Park Station draws in large commuter flows in a short time, generally during the rush hours when a large number of trains, buses, and long-distance commuter transport coaches arrive. During the period of immediately after trains or coaches such Gautrain and Metrorail have arrived, commuters need to be distributed to their various destinations by various modes of transport such as Gaubus, Rea Vaya, Metrobus or walking, a process which will be supported by the surrounding road network. However, the surrounding road networks need to be accommodate the large flow of commuters and vehicles from the Park station to minimize congestion that can hamper the normal operation of the Johannesburg traffic network. Thus, Johannesburg Station was planned to take into consideration the demand for gathering and distributing commuters.

Figure 6 Shows the Johannesburg Park Station surrounded by an existing road network which forms a ring road network by connecting surrounding roads with interchanges and the South and North Johannesburg roads. The ring road has three access points, which help reduce traffic congestion due to large commuter flows on the surrounding road network.

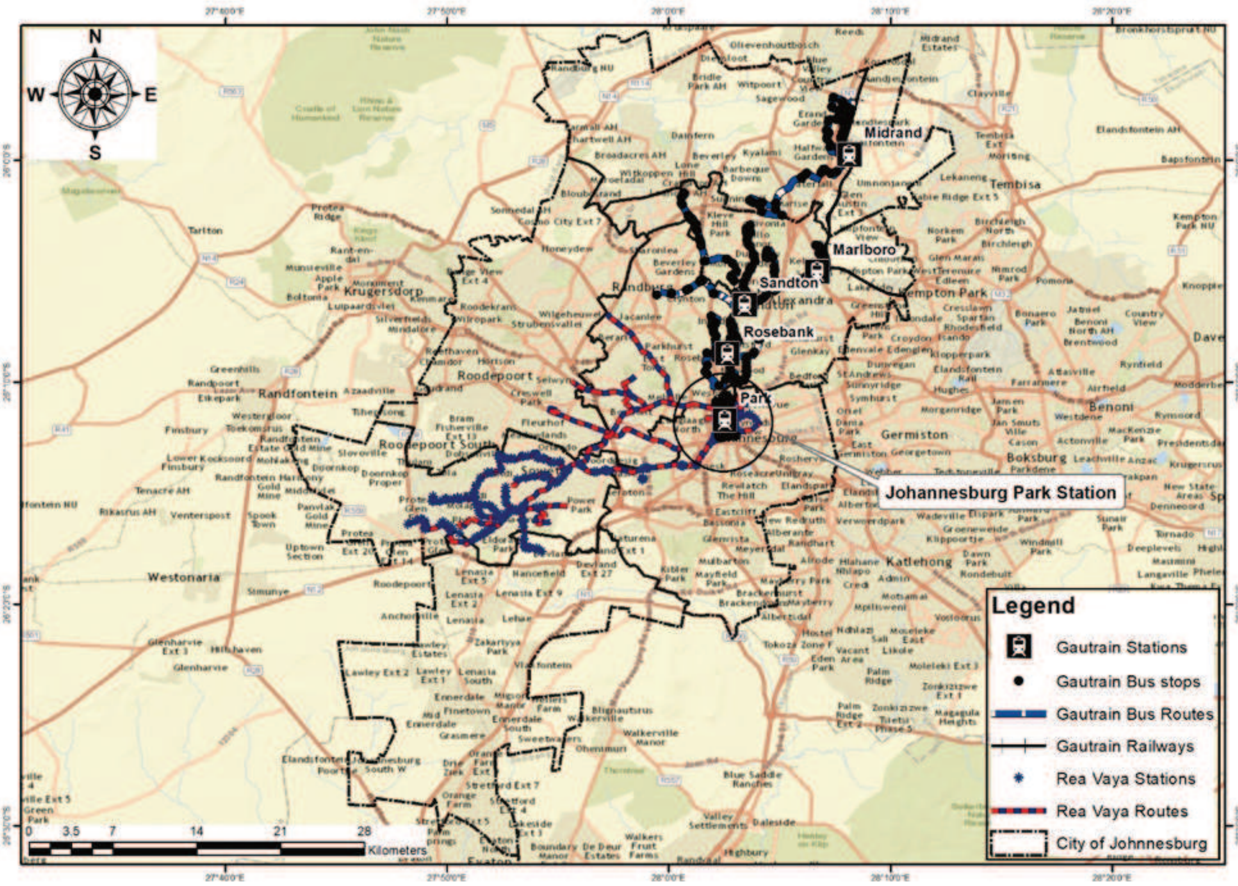

Figure 6. The Johannesburg Park Station surrounding road networks

5.1.2 Transit Mode share targets

Transit mode share is the percentage of commuters using a precise type of transportation, for instance bus, train, taxi, car or non-motorized transport. Moreover, it way refer to the number of trips that commuters take in relation to their preferred mode of transport. Conversely, gauging transit mode share enables hub operators and planners to get an overview of commuter demand, develop strategies (in terms of policies, structure and layout, and marketing) to create a more balanced mode share, and identify the best way to integrate different transportation modes. In the case of Johannesburg Park Station, initial estimates predicted that the Metrorail would accommodate 40% of the total number of commuters, whereas the remaining 60% would use buses, taxis and private vehicles. Nevertheless, according to this comparative ratio, it was found that surrounding roads did not have sufficient capacity to deal with such a huge volume of commuters, henceforth, another subway line, the Gautrain was built during the preparation 2010 FIFA World Cup to pass through the Johannesburg Park Station, to accommodate and shift the 60% of the total number of commuters towards the use of the line. This resulted to a corresponding decrease in road traffic.

Analysing transit mode share within the range of influence of the interchange hub enables planners to manage traffic demand as well as passenger behaviour. Therefore, it should be noted that non-motorized transport, such as walking, cycling and other variants has not been taken into account when shrewd the transit mode share for public transport interchange stations in South Africa. In fact almost all public transport stations in Johannesburg do not contain parking areas for bicycles. However, these bicycle parking areas were consequently reduced for the following reasons: (i) cycling has gradually been replaced by perceived “convenient” methods of transport, such trains, buses and private cars; (ii) the volume of private vehicles is rapidly increasing and private vehicles have proven to be more popular than bicycles; (iii) cycle parking provision should be improved, ta there is a high risk of bicycles getting stolen when commuters leave the in station overnights.

5.2 Potential Benefits of Johannesburg Park Station

There are number of city-wide benefits that resulted from the establishment of the Johannesburg Interchange hub, the Park Station. As supported by local residents, jurisdiction and operators, the Park Station provides for an effective system of routing and circulation that reduces the number of transfer required; ensures safety for higher level of commuters; promotes the use of public transport and non-motorised modes; and encourages the coordinated development of surrounding land uses. In addition, Park Station enhance service integration, reduces the time and distance penalties of rail to rail and rail to bus interchanges.

Currently, plenty of middle-income residents in Johannesburg have abandoned private automobile in favour of public transport. Whereas auto ownership has been on the rise in past 2 decades, the economic boom of the democratic era in South Africa has brought a dramatic rise in the number of auto-oriented trips. However, the prospect of an integrated system of the Park Station and accompanying land uses persuade many of the residents to rely on public transport for most trips., effectively lessening the negative impacts of auto mobile use, for instance urban congestion, inefficient use of resources and poor air quality. For example, the location of business nodes and commercial activities near the park station to address the growing trend towards ‘trip chaining’ between work and home.

Moreover, another potential benefit of the Park Station is the improvement in the quality of public transport services feeding into the city. Subsequently, park station plays an essential role in safer, more efficient, off-street boarding and alighting; and in better travel times, particularly during rush periods. Conversely, if the Rea Vaya bus priority can improve the speed and reliability of bus services, it will offer opportunities to extend the catchment area Gautrain stations and increase the importance of bus feeder systems.

6 CONCLUSION

To conclude, study examined the role of public transport interchange hubs in supportive of integration between Gautrain and Rea Vaya BRT operations in Johannesburg metropolitan city. Moreover, study presented novel data analysed into empirical results suggesting that public transport interchange hubs plays a pivotial influence in supportive the integration of Gautrain and Rea Vaya operations in city of Johannesburg. The Johannesburg Park Station, an interchange hub of Johannesburg metropolitan City facilitate urban mobility by integrating existing urban public transport network. It also enhances the journey experience through people-oriented facilities and feature. Beyond improving urban mobility, the interchange hub also function as a major element of urban development and renewal. The huge pontetial of interchange hub is that it highlights the need for a guide that can be used by planners, government agencies, and other experts to learn from the good practice that is being developed. The findings further reveal the complexity of spatial and commucative platforms in multiplicity of urban public transport modes resulting in complex models of urban public transport operations. Conversely, it is recommended that there should conscious efforts in planning and developing public transport interchange hubs that are integrated to promote efficiency of public transport systems. In addition, the diverse needs and features of each transport mode should be considered during the planning and design state to develop a sustainable and viable design, particularly in terms of contruction and operation in order to achieve effective mobility.

7 REFERENCES

Bajracharya, B., Cattell, D. and Khanjanasthiti, I: Challenges and opportunities to develop a Smart City: A case study of Gold Coast, Australia. In: Journal of Real Corp, pp 119-129, Vienna, 2014.

Bakici, T., Almirall, E., & Wareham, J. (2013). A smart city initiative: The case of Barcelona. Journal of the Knowledge Economy, 4(2), 135–148.

Ben Derudder & Peter J. Taylor (2017): Central flow theory: comparative

Brakewood, C., Roja, F., Robin, J., Sion, J., Jordan, S. 2014. Forecasting mobile ticketing adoption on commuter rail Forecasting Mobile ticketing adoption on commuter rail. J. of Public Transportation, 17, 1–19.

Bululukova, D., Wahl, H. and Ballner, M: European Academic Smart Cities Network Renewable Urban Energy Systems, Sustainable mobility and ICT Technology Nexus for Smart Cities studies. In: Journal of Real Corp, pp 207-215, Vienna, 2014.

Cardinale, T., Paula, L. & Zucchi, G: The city of Matera and the Sass: Smart places with a Dantean Attraction. In: Journal of Real Corp, pp 665-674, Vienna, 2014.

Chen, C., Bian, L., Ma, J: From traces to trajectories: How well can we guess activity locations from mobile phone traces?. In: Transport Research Part C: Emer. 46, 326-337, 2014.

City of Johannesburg: Integrated Development Plan 2013/16. In: www.joburg.org.za, 2013.

City of Johannesburg: Strategic Integrated Transport Plan Framework. In: www.joburg.org.za, 2013. connectivities in the world-city network, Regional Studies, DOI: 10.1080/00343404.2017.1330538

Dachs, W: Gautrain: A case study. In: www.gautrain.co.za, 2011.

Deloitte: Africa is ready to leapfrog the competition through Smart Cities Technology. In: www.deloitte.com, 2014.

Di Pietro, L., Guglielmetti Mugion, R., Mattia, G., Renzi, M. F., Toni, M. 2015. The Integrated Model on Mobile Payment Acceptance (IMMPA): An empirical application to public transport. Transportation Research Part C: Emerging Technologies, 56, 463–479

Dreskovic, N. and Nurkovic, R: Influence of Transport on Urban and Rural development in Bosnia and Herzegovina. In: Journal of Real Corp, pp 287-293, Vienna, 2014.

Fang, Z., Shaw, S.L., Tu, W., Li, Q., and Li, Y: Spatiotemporal analysis of critical transportation links based on time geographic concepts: a case study of critical bridges in Wuhan, China. In: Journal of Transport Geography. 23, 44-59, 2012.

Hasan, S. & Ukkusuri, S., 2014. Urban activity pattern classification using topic models from online geo-location data. Transportation Research Part C: Emerging Technologies, 44(doi:10.1016/j.trc.2014.04.003), pp. 363-381

Moyo, T & Musakwa, W (2016). Using crowdsourced data (twitter & facebook) to delineate the origin and destination of commuters of the Gautrain public transit system in South Africa. ISPRS annals of the photogrammetry, remote sensing and spatial information sciences, Volume III-2, 2016 XXIII ISPRS Congress, 12–19 July 2016, Prague, Czech Republic. doi:10.5194/isprsannals-iii-2-143-2016. pp 150

Navarrete, F.J. and de Dios Ortúzar, J., 2013. Subjective valuation of the transit transfer experience: The case of Santiago de Chile. Transport Policy, 25, pp.138-147.

Rae, A., 2009. From spatial interaction data to spatial interaction information? Geovisualisation and spatial structures of migration from the 2001 UK census. Computers, Environment and Urban Systems, 33(3), pp.161-178.

reviewed paper

Expanding Cities – Diminishing Space: Will Cities Remain Liveable, Accessible, Human-Oriented Places: for Whom and How?

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The CORP 2018 brief of 'Expanding Cities – Diminishing Space'[1] rests on the unassailable credo in techno-fixes. The argument here is that while technologies have always influenced urban change, cities have evolved with techno-fixes in combination with many other development processes. As evidence shows that with globalisation development has become more unevenly distributed in urban space what matters is whether techno-fixes are contributing or alleviating uneven spatial and social justice and urban quality of life.

Keywords: city shape, urban change, holistic solutions, city governance, urban expansion

1 "CITIES ARE GROWING" – ROLE OF TECHNO-FIXES

Regarding urban dynamics, CORP2018 affirms that cities are always expanding - sideways, upward, downward, and in use over time – by attracting and concentrating people hungry for more space. In that way they are encroaching on assumed precious countryside, living above their ecological footprint by consuming more than their fair share of finite resources and polluting the environment. Indeed, population is driving urban growth with 3.3 billion people living in cities in 2014 (54%) expanding to 5 billion by 2030 (66%). [2] Under pressure city managers are looking for short term fixes: punitive, such as traffic congestion charging, or divisive, such as attributing more road space to the strongest lobbies. For planners though a key question is whether there is a pathological threshold of space-time concentrations in cities.

CORP18 also affirms that retreat – probably meaning shrinkage - and regeneration areas are getting smaller with the contribution of short lifespans of certain types of modern buildings. What is not mentioned but matters for urban quality of life is the pressure on the public realm and open spaces inside cities, due to speculative activities generated by rising land and property values, in turn driven by more users of the city - residents, workers, visitors. but equally importantly by remote investors, financiers, real estate property owners, landlords.

Help is claimed to be at hand. The 'smart city' ideology states that technologies can fix urban problems and control urban activities. CORP2018 confirms that "by means of information and communications technologies cities are transformed into smart organisms designed to work perfectly to create a high standard output in terms of knowledge, carbon footprint, mobility and logistics, big data, etc." A critical issue is what role techno-fixes are playing in the production of increasingly privatised, non convivial spaces.

It is worth remembering that, in the past, techno-fixes have not reduced physical-material urban demands and, contrary to expectations, have often led to their growth. For example, the introduction of mass international telecommunications technology in the 1960s had increased - not reduced - face to face interaction, thus contributed to expanding transportation, including transatlantic flights. Current techno-fixes – including 'smart city approaches' – may well improve urban efficiency and profitability, but at a social price which has not been factored into the equation. For example, Alistair Bathgate, the leader of Blue Prism, a software company which substitutes human labour with robots rejects 'robo-geddon', but his reference to RWE-Npower where 2 managers suffice to oversee 300 robots carrying out the work of 600 dismissed full time staff seems to contradict his optimistic view. 3

[1] CORP2018 Conference Topics
Cities are growing. Retreat and regeneration areas are getting smaller. This brings along enormous challenges and threats. At the same time there are unprecedented technologies that might help solve the issues.
Can "Smart Technologies" and "Smart Cities" be the answer on how to handle the challenges of urban growth?
What is the role of urban planning in those highly dynamic developments? Let us discuss these issues at REAL CORP 2018!

[2] United Nations Population Fund.

[3] Evening Standard, Business interview with Alastair Bathgate, CEO of Blue Prism

2 'SMART CITY': DEFINITIONS AND STRATEGIES

Smart cities, initially promoted by ICT corporations, spread throughout the world, although definitions of 'smart city' vary widely, ranging from narrow focus on infrastructure to enabling citizens and communities to act smarter. One 'smart city' definition close to the 'smart city market' promoters has been devised by ITU. [4]

"A smart sustainable city is an innovative city that uses information and communication technologies (ICTs) and other means to improve quality of life, efficiency of urban operation and services, and competitiveness, while ensuring that it meets the needs of present and future generations with respect to economic, social and environmental aspects."

'Smart cities' became almost interchangeable with 'eco-cities'[5] when the latter resorted to the techno-approach of 'smart cities'. A differentiated definition of eco-cities arose from a global survey of 79 eco-cities[6] which identified their common features as they shifted from conceptual experiments to practice-led projects embedded in policy. Subsequently, the International Eco-City Initiative quantified eco-city policies and technological implementations by developing and using eco-city indicators, standards and frameworks.[7] Based on the analysis of 170 eco-city initiatives their Bellagio report evaluated their international effectiveness as a measure of 'sustainable urbanism'. A desk appraisal of eco-cities and smart cities in Asia identified communalities and diversities of conceptual-cultural, eco-design, and eco-innovation policies and practices and concluded that quality of life remained the essential criterion of sustainability.[8] Another comparative analysis explored transferable lessons about eco-cities between Europe and China.[9] Austin Williams goes as far as discarding any attempt at defining eco-cities or smart cities in China, although he uses the terms to analyse China's recent urban development processes with focus on China's use of ICT and other advanced technologies in urban development.[10]

The stance here is that planning and urban development are not led just by physical or technical drivers but are interdependent with citizen interventions. It is beyond the scope of this short position paper to verify/falsify the quantitative part played by ICT in urban development, management and usage.[11] Instead the paper refers to the IEEE models[12] to illustrate a mainstream techno-perspective of smart cities in urban development which also acknowledges citizen demands. Beyond that, it selects two opposing standpoints, a theoretical-ideological-formal non-techno-fix one developed in 'The Robust City'[13] and a pro-techno-fix one

[4] Definition of 'smart city by ITU (International Telecommunication Union), a United Nations specialised agency for information and communication technologies. . http://www.itu.int/en/ITUT/focusgroups/ssc/Pages/default.aspx

[5] The original definition of ecocity was coined by Richard Register:
“ -An ecologically healthy human settlement modeled on the self-sustaining resilient structure and function of natural ecosystems and living organisms
- An entity that includes its inhabitants and their ecological impacts
- A subsystem of the ecosystems of which it is part — of its watershed, bioregion, and ultimately, of the planet
- *A subsystem of the regional, national and world economic system.”* http://www.ecocitybuilders.org/why-ecocities/the-solution/ecocity-definition/
Richard Register, 1987, Ecocity Berkeley: Building Cities for a Healthy Future, North Atlantic Books, with definition of ‘ecocity

[6] Already in 2009 eco-cities were occurring globally but remained locally diverse. Simon Joss, Eco-Cities – a global survey 2009, governance and sustainability. 2010. International Eco-Cities Initiative. Westminster University.

[7] Simon Jost (ed).Tomorrow's city today, eco-city indicators, standards and frameworks, Bellagio conference report 2012. International Eco-Cities Initiative. University of Westminster

[8] Judith Ryser. 2013. Asian Eco-Cities, a critique. In: FuturArc, the voice of green architecture in Asia, march-April 2013, I Volume 29.

[9] Judith Ryser, 2013, Eco-cities in Action, sustainable development in Europe: lessons for and from China? In: EU-Asia Dialogue, Sharing European and Asian Best Practices and Experiences. 2014. Konrad Adenauer Stiftung. .

[10] Austin Williams, China's Urban Revolution, 2017, Routledge

[11] As an indication, the then DTI (UK Department of Trade and Industry, estimated the global market for smart city solutions and additional services required to deploy them at US$ 408 bn. by 2020. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/249423/bis□13□1217□smart□city□market□opportunties□uk.pdf

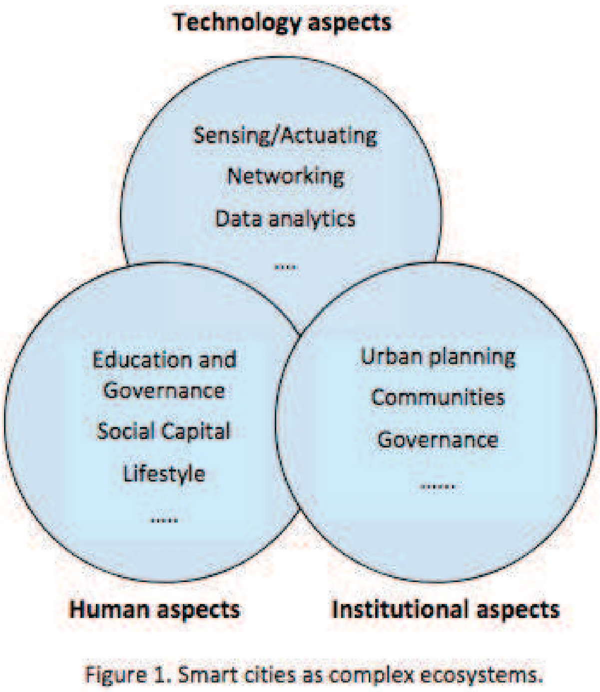
[12] Institute of Electrical and Electronics Engineers, http://smartcities.ieee.org

[13] Tony Hall. The Robust City, 2017, Routledge

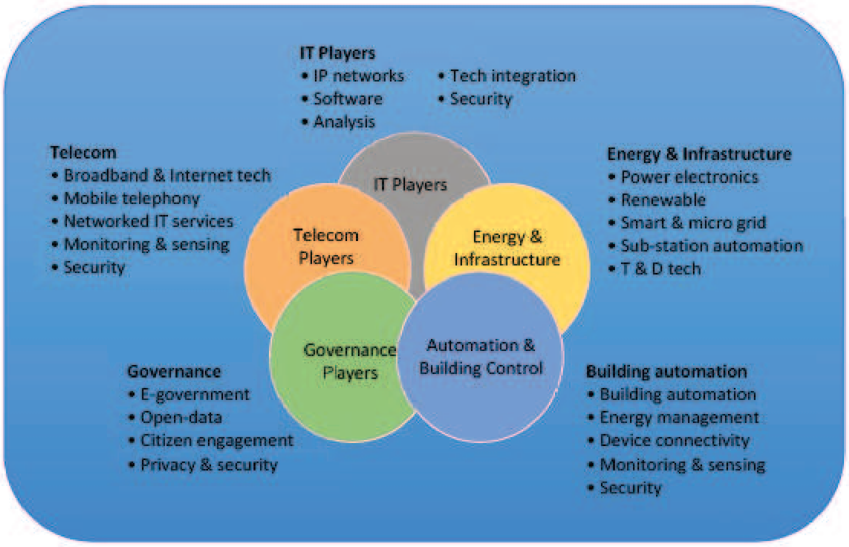
based on 'China's Urban Revolution'[14] to discuss the contribution of technology to urban development and how it relates to other planning considerations and citizens' aspirations.

3 IEEE MODELS

Without entering into their technological details of the IEEE models[15] what needs mentioning is that the ICT trends identified by IEEE aim to support urban functions, such as infrastructure monitoring, act as backbones of digital media enterprises, household security, citywide transportation monitoring, etc. All that requires ICT infrastructure ranging from low bandwidth wireless technologies for free citywide services to dedicated fibre optics for backbone needs. The IEEE paper attributes little attention to issues of data security and privacy when publicly collected information is made available to third (mainly private) parties, which is IEEE's way to engage citizens but intends to deal with security, privacy and environmental sustainability at a later stage.



Dia 1. IEEE, Smart Cities As Complex Ecosystems. Source: https://smartcities.ieee.org/articles-publications.html



Dia 2 IEEE: Technological ecosystems, player groups. Source: https://smartcities.ieee.org/articles-publications.html

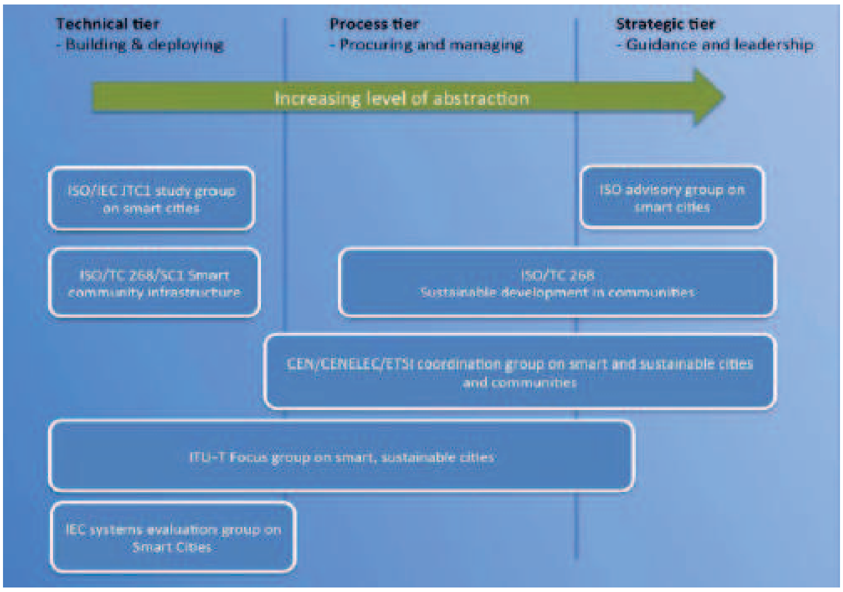
[14] Austin Williams. China's Urban Revolution, understanding Chinese eco-cities, 2017, Bloomsbury

[15] Rodger Lea, Smart Cities" An Overview of the Technology Trends Driving Smart Cities, March 2017, IEEE, https://www.ieee.org/publications_standards/publications/periodicals/ieee-smart-cities-trend-paper-2017.pdf

The model shows the concept of 'smart city as complex ecosystems' consisting of three overlapping components: technology aspects (sensing, actuating, networking, data analytics, etc), institutional aspects (urban planning, communities, governance, etc), and human aspects (education and governance, social capital, lifestyle, etc). Neither culture nor environment figure in this concept of the 'smart city market'.

CORP2018 mentions that "sometimes the impression prevails that technology is seen as a self-purpose". The interests of ICT corporations are clearly underpinning the IEEE models. This is usefully related to a geo-political shift from industrial to managerial and currently financial capitalism.[16] It is worth considering that financing has become an inherent part of many global ICT corporations.

The IEEE emphasis lies on technology. The diagram of the 'technological ecosystem in smart cities'[17] shows the key five players: IT, telecom, energy & infrastructure, automation & building control and governance. Human and institutional aspects - assessed in quantitative and qualitative metrics - are seen to assist in creating value for the entire ecosystem in terms of financial values, quality of life, health, education and time.



Dia 3 IEEE: Smart Cities: major standards bodies involved. Source: https://smartcities.ieee.org/articles-publications.html

A key issue is standardisation to facilitate interoperability of all these ICTs and data sets collated from a wide variety of sources. Standards are seen to smooth adoption of new technologies and to provide a trusted framework for city authorities and practitioners. Coordination and standard provision are taking place at three levels: strategic, process and technical. Indicators for city services and quality of life are providing guidance to city leadership for strategic sustainable development of communities. Standards for procuring and managing smart city projects and activities are assisting cities in adopting smart city technologies. At the technical level, information technology standards are set for smart city ICT reference frameworks and indicators related to smart city infrastructure needs. The diagram shows the main international standard bodies operating in these three domains.

4 "ARE 'SMART CITIES' THE SOLUTION OR PART OF THE PROBLEM OF CONTINUOUS URBANISATION AROUND THE GLOBE?"

The techno-fix lobby is convinced that electronic management and monitoring of cities will fix all urban dysfunctions and may be able to contain the urbanisation process. In reality, techno-fixes are at best a means to specific ends to improve urban conditions for citizens. Yet, they are often used as tools to achieve other goals, such as surveillance and centralised control of urban activities. The 'smart city' approach builds urban development strategies mainly on techno-fixes, including those emanating from supply side motivations, ranging from sectoral material gains to ideological postulates. No matter how 'smart cities' are defined or

[16] For a concise account of these structural shift in world economies, see Liem Hoang Ngoc, Les Theories Economiques, petit manuel heterodoxe, 2017, La Dispute

[17] Rodger Lea, Smart Cities", op.cit

what magic ICT toolboxes they are applying, they have not proven to be a panacea for solving all urban problems.

4.1 Management of continuous urbanisation beyond smart cities

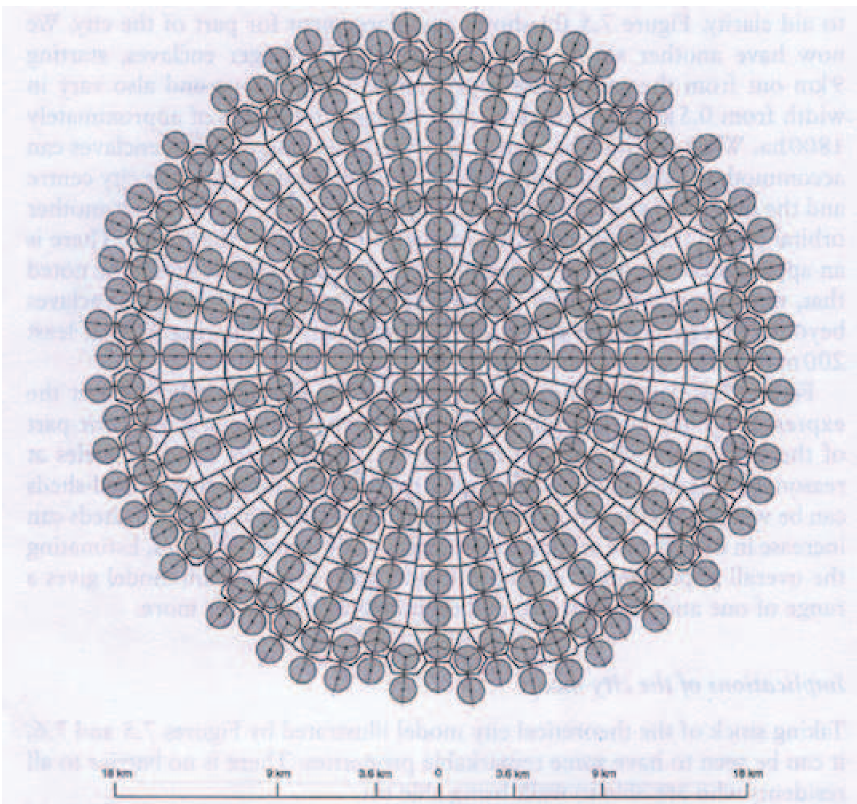
It may be easy to be mesmerised by the many advanced technologies which are being applied to urban development, but other interventions besides techno-fixes play a part in the control and management of urbanisation. In democratic societies, accountability to the citizenry is key to the development process and the legitimacy of its control. Accountability is rooted in the political decision making apparatus, embedded in turn in institutions which comprise planning. In this context planning is political as it is subjected to the political apparatus empowered to devise planning laws and regulations. Therefore, the issue of managing continuous urbanisation cannot be reduced to the role of 'smart cities'.

Long term strategies of urban change have to address problems beyond short-term techno-fixes, not only because they are taking a long time to implement in a democratic context, but they have to negotiate assumptions regarding the wants and desires of future city dwellers who are notoriously diverse, moreover with changing minds about their livelihood influenced by circumstances mostly outside their control. Holistic solutions for longer term urban futures are a long standing ex ante aspiration of planners. By definition such solutions are impossible to verify against the 'hic-et-nunc' reality. Strategic planning is at best speculative, albeit guided by rational arguments and supported by empirical measures resting on a historic 'evidence base'.

4.2 Techno-fix-less urban growth

Some planning positions omit techno-fixes altogether.

An example is 'The Robust City'.[18] Discarding democratic political realities and institutional constraints it builds on the premise that urban form is more durable than anything else in cities and therefore the best guiding principle of urban development. Inspired by the formal ideas of garden cities, this mainly two dimensional vision of concentric city growth focuses on housing, supports unrestricted use of the private car and proposes large amounts of 'green' areas as reserves for future infrastructure location. However, this techno-fix free alternative is not convincing as a future of sustainable cities.



Dia 4 Ideal-type city model based on urban form, designed by Tony Hall in The Robust City, 2017, Routledge

[18] Tony Hall The Robust City, 2017, Routledge

4.3 Pragmatic view of smart city solutions for ultra-rapid urbanisation

Austin William's position is that contemporary proposals for future urban betterment - techno fixes as well as utopian dreams – have to be mapped or integrated into existing material space-time and evaluated accordingly. His understanding of Chinese eco-cities or smart cities which he does not feel need defining is based on the current stage of China's urban revolution. He acknowledges that sheer economic growth had been underpinning physical urban development until recently. Having reached enormous progress in economic wellbeing of Chinese society and facing structural change with ensuing slow down of this growth, the Chinese have started to incorporate ecological considerations in their urban development strategies. No enthusiast of environmental design his view is that this strategic reorientation is not motivated by environmental concerns but expresses a pragmatic endorsement of global trends towards sustainability to attract inward investment. Even rather insufficient measures against urban air pollution are seen in this perspective.

He reviews a wide range of eco-cities - interchangeable with 'smart cities' - which have recently emerged all over China, how China uses ICTs and other advanced technologies in urban development, and what role global ICT corporations and international design interests are playing. Among the many urban experiments figure also 'failed' attempts at 'smart development'. He acknowledges that the pace and type of such developments conceived to overcome nature was facilitated by a centralised political regime, therefore not easily comparable with sustainable development elsewhere. He embraces the many techno-fixes to which China's urban revolution has resorted and sees them as opportunities for China's future economic expansion based on more R&D and innovative, higher value added products, for example in the field of renewable energy generation.

4.4 Tianjin Eco-city

Dia 5 Tianjin Eco-city vision; source: Tianjin municipal government. http://www.kurzweilai.net/chinese-move-to-their-eco-city-of-the-future

The Sino-Singapore Tianjin Eco-city project conceived as a Low Carbon Living Lab (LCLL) is quite typical for Chinese eco-cities in the way it resorts to techno-fix contributions a self-drive electric car infrastructure functioning in a normal traffic system by GM; a low energy lighting system by Philips; a self emptying rubbish disposal system by Envac Sweden; government buildings collecting rainwater for reuse, being powered by geothermal energy, having window shutters which move with light and being heated with solar energy. Overall Tianjin is expected to derive 28% of energy utilisation from renewable sources40% less energy consumed compared with similar buildings, 30% recycled materials used in building construction. Tianjin gained several 'green' awards.

4.5 "Unprecedented technologies: smart technologies, smart cities"

From these few examples of 'smart urban development' it is not possible to identify which technologies are relevant to urban development, management and sustainability in the short or the long term. Most probably their importance may change over time while further technological innovations are joining them. While 'smart technologies' include monitoring systems, big data, data analytics, sensors, satellites, customer records management systems (CRM), intelligent transportation systems (ITS), ICT monitoring and control instruments for use of utilities, networking and communications, cloud computing, low power WAN technologies, 3/4G, open data made available for free by cities and other public sector agencies and many more. Others are in the pipeline and will also influence urban development, although their impact would have to be monitored, analysed and assessed once they are in use. Among those directly influencing urban life are robotics, artificial intelligence, drones, driverless electric cars, cyber physical systems (CPS), 5G, the Internet of Things (IoT) and edge computing. The frailty of many of these technologies should be kept in mind. A power cut, a network failure, hackers steeling data can jeopardise bring whole systems and bring them to a standstill.

Despite diverse uses of 'smart technologies any holistic view of cities will have to take off from the 'is-state', regardless of how unevenly understood and interpreted it may be. Moreover, it has to rely on incomplete, imperfect and out of date empirical 'facts' on which to build urban change. These constraints provide a temporary real world context for the contributions of 'smart technologies' and how they may help or hinder urban development and sustainable urban living.

5 "WHAT ABOUT PEOPLE LIVING IN THE CITY?"

The techno-fix agencies tend to conceive and use people essentially as sources to advance their smart technologies. They are monitoring their behaviour often without their knowledge and using the observations mainly without their consent as inputs to big data. IEEE[19] concludes that companies capable of tapping into this source of information reap advantage through differentiation.

5.1 Techno-fix notion of citizen engagement

IEEE assesses cities according to commercial criteria whereby comprehensive citizen engagement strategies would establish a closer dialogue between citizens and their cities to reap benefits from citizens and collective wisdom of the urban community. IEEE considers citizen engagement as a complementary aspect of smart cities. However, citizen engagement is equated with the ICT industry's reliance on smart city techno-data gathering and management. Harnessing these technologies provides the opportunity for techno-fix providers to tap into the collective intelligence of cities, and partly understand what citizens (workers, businesses, tourists etc.) do and need in their daily lives in cities. In its overview of technology challenges and enablers of the smart city market IEEE is listing the following innovative tools to communicate with citizens: phone-in reporting possibilities, hackathons, events with developers and crowdsourcing city data from citizens. Alternatively, the EU is promoting co-design and user-centric processes for advanced technology services.[20] IEEE, the EU and other techno-fix promoting agencies believe that such connections between techno-providers and citizens are contributing to citizen empowerment to improve their daily lives.

5.2 Where are the citizens in other planning and development models?

Citizens as active users and contributors to cities do not fair much better in the form based 'The Robust City' scenario evoked above. They figure merely as abstract economic and social forces to make the point that the proposed physical city structure is best able to accommodate the noticeable changes these forces are undergoing over the long term. Citizens in the People's Republic of China are equally insignificant in the civilising mission of the state. In its laudable pursuit of lifting the Chinese population out of poverty also in remote areas the state is resorting to macro-economic strategies with little concern for local impacts and supports techno-fix based practices without seeking user consent.

This paper takes a more humanistic stance and argues that what matters in equal importance with utilitarian survival strategies are subjective, emotional or ideological standpoints as an important part of 'virtual' and

[19] IEEE: Institute of Electrical and Electronics Engineers, http://smartcities.ieee.org

[20] e.g. European Union's citizen city project, The market place of the European innovation partnership EIP-SCC on smart cities and communities aims to match techno-fix solutions with projects http://ec.europa.eu/eip/smartcities/

non material reality, besides rational 'objective' facts. Urban change fixers who are discarding them may well end up in disappointment, at least in countries where social movements have some clout. The premise here is that urban technologies are only one element of urban change, and behavioural, socio-cultural, economically aspirational dimensions are of equal weight in transforming cities into more liveable, accessible and human-oriented places.

Are people willing to be tied into a 'there-is-no-other-way' techno-fix environment without their say or being labelled off as technophobes? Are there viable 'low-tech' alternatives which are less ephemeral and less resource consuming, with users exercising greater direct control over them? Why should people not have the right to choose an alternative, more sustainable way of life based on the preservation of non-renewable resources and careful use of renewable ones, focused on quality of life rather than accumulation of material goods, convivial urbanity rather than neck-breaking competitiveness? Are cities not about for and about people and their quality of life? Saskia Sassen makes the case for diversity to preserve urban innovation capacity which depends on cohabitation between the powerful and the powerless in a cosmopolitan whole.[21]

Why are there suspicions about the techno-fix world with its supply generated push to consumption, its in-built redundancy philosophy, its practice of creative destruction, its ambiguity between overt and covert agendas, its oligopolistic critical mass, its little transparent power structure, its use of commercial secrecy to protect its links with the political establishment? Why should the only model of urban living rely on binary opposites, either or, instead of and-or? The Chapter on "How to Mobilise Cooperation between 'Top-Down' (techno-neo-liberal economy driven) and 'Bottom-Up' (human and collectivity driven) Urban Change is making the case for synergy between a wide range of approaches to urban regeneration and development which combines techno-fixes with other modus operandi.[22]

There is a lot of frustration among the urban public about their built environment, access to it and mobility through it. Lack of openness, be it between the 'techno-fixers' and the public or the politicians and the citizens is creating mistrust and frustration. Those who choose to move to the margin of urban society are and remain few and far between, but other reactions are rife, such as withdrawal from material into virtual reality of social media and techno-gadget based communication.

6 "HOW TO DESIGN SAFE, LIVEABLE, HEALTHY PLACES TO LIVE?"

Perhaps the first question should be: who is supposed, authorised or legitimised to design (and build and manage) liveable healthy places to live? There are many competing contenders: planners, urban designers, architects, neighbourhood communities, individuals and also the techno-fixers. Due to their position of strength developers, land-owners, financiers demand to have their say as well. This leaves the users, the citizens in a weak position. At best they are able to get hold of a piece of land on which to design and build their own homes. The North Amsterdam experience is such an example, very limited in numbers and scope, although it has produced interesting innovative institutional and realisation solutions rather than design or techno ones.[23] Similar governance and co-design innovations have been developed and applied in Antwerp, while in Brussels area based 'contrats de quartiers' (neighbourhood contracts) were offered to residents to be able to remain in the Canal area also after regeneration.

Perhaps as important as techno-fixes are innovations of governance practices to achieve urban development fit for the 21st century able to satisfy citizen expectations. Urban governance, akin to national governance consists of vertically integrated decision making structures: political or other power-based silos with their self-interests. They may explain the paucity of integrated undertakings, be it in planning, urban policies or anything else claiming to deal with society as a whole. Nevertheless, the complexity of contemporary cities requires some division of labour. The 'is-state' is divided and competitive instead of cooperative and

[21] http://theconversation.com/investment-in-urban-land-is-on-the-rise-we-need-to-know-who-owns-our-cities-63485, 6 August 2016. Investment in urban land is on the rise – we need to know who owns our cities. Saskia Sassen. The Conversation.

[22] Judith Ryser & Milena Ivkovic (eds). Urban Challenges, an alternative approach. 2018 (forthcoming). Chapter 3 by Judith Ryser, How to Mobilise Cooperation Between 'Top-Down' and 'Bottom-Up' Urban Change? Chapter 1 Resilient and inclusive urban change by Andries Geerse 7& Larissa Guschl.

[23] Isocarp congress 2015, Workshop on alternative development in North Amsterdam curated by the Pakhus de Zweijer NGO. Proceedings CD published by Isocarp. www.isocarp.org

consensus building. The challenge of holistic urban development is how to get from here to there: how holistic aspirations can be democratically corroborated. Governance innovation is just as important for successful inclusive and participatory urban development than any techno-fixes which have clearly their place but need to be integrated into the context of other demands and priorities. Planning has clearly a role to play in this urban dynamic. It is important though to acknowledge the limitations of planning and reconsider to role of planning in a world of rapidly changing technical as well as societal circumstances which are constantly reshaping cities.

Unfortunately, economic concerns, underpinning also the techno-fix industries, are overshadowing the environmental and social dimensions of balanced sustainable urban development. They are not only affecting urban policies but also the monitoring and evaluation methods. This means that the true dysfunctions of such economy dominated policies are hard to come by as they are rarely incorporated at their proper weight in evidence base research. Equally unfortunate is the observation that little seems to be learnt from past mistakes. Neither are ready-made sound bites critically examined and adjusted in the light of patent discrepancies with reality. For example there is no evidence of the constantly advocated trickle down effect of investing in the strongest sectors; quite the reverse it leads to increasing social and spatial polarisation instead.

A spatial example is how urban policies are paying lip-service to the merits of the public realm and its importance in fostering urban life of congregation and conviviality, but tend to give in to speculative pressures. When land and property prices are rising influenced by greater and more intensified use of the city by residents, workers, visitors, but also due to investors, financiers, real estate property owners, landlords, developers are demanding to privatise the public realm and thus reducing public open spaces in the city for all to use freely. Even if they are made accessible in some ways, privatised open spaces are controlled and restricted by private interests and defy the notion of the urban commons.

7 IN LIEU OF CONCLUSION

This paper discussed the role of techno-fixes in urban development and the impact on planning and people. It leads to the following questions:

- What role does techno-fix play in such urban change?
- What role is there for urban planning and how does it relate to techno-fixes in a highly dynamic development culture driven by the neo-liberal economy?
- What urban places will such a symbiosis between reinvented planning and techno-fixes produce and will they be safe, healthy and liveable?

Innovative technology has always contributed to urban development and change and has been a driver for improved liveability. What matters for ICTs and 'smart city' techno-fixes as well as their users is that they are universally accessible and facilitating urban living. This means diverse solutions, including decentralised ones which local communities can run themselves. There are many exciting examples of mobile telephony in remote regions of sub-Saharan Africa. In Europe, the city of Stockholm has installed, owns, manages and rents out a 'grey fibre' network throughout the urban region early on, making communication services accessible to all users geographically and available to all ICT service providers as communication infrastructure.

reviewed paper

Exploring the Applicability of Location Based Services to Determine the State Routes Transport Networks Integratedness in the City of Johannesburg

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1 ABSTRACT

In cities of the developing countries, particularly in African, Asian and Latin American continents; there have been growing concerns in terms of the state of public transportation systems. One of the main among the concerns have been lack of well-integrated, reliable and efficient public transport systems. This is particularly so in urban centres, due to rapid growth of the urban population coincided with the end of colonialism, giving rise to large scale economic, spatial and structural transformation of urban landscapes. The consciousness of the need for well-functioning innovative public transport systems by all spheres of governments and the private sector institutions has prompted precipitate action in the past decades to invest in innovative transport systems. Conversely, just like any other rapid growing metropolitan municipalities in developing and emerging economies, the city of Johannesburg has not been released with regards continuous public transport challenges. In the past decade, the City of Johannesburg has actively participated in the development of the first fast train system; the Gautrain in conjunction with two other metropolitan cities within the province. To support the innovative train system, the city also invested in and developed the Rea Vaya; a rapid bus system. However, the state of connectedness of the rail and road route networks within the city have not been well documented. Therefore, this study aims to delineate the extent routes network integration among Gautrain and Rea Vaya within the Johannesburg urban public transport system and how working relationships could be improved. The study adopted a phenomelogical case study survey design that applied mixed-method approaches to gather spatial, qualitative and quantitative data. The exploratory approach was used to formulate the research problem for precise investigation whilst the descriptive approach was used to gather complete and accurate information. Research techniques such as crowdsourcing, interviews, social media was used to collected data. Whilst data analysis and interpretations were conducted with techniques such as main content analysis, Geographic Information Technologies and Echo-Echo. Research findings; indicate that there are limited areas where the route networks between the public transport systems are connected. The large sections of the networks are disintegrated. The work recommends conscious efforts in planning and developing both rail and road route networks that are integrated to promote efficiency of public transport systems.

Keywords: integration, route networks, urban public transport, multimodal integrated system, rail-networks, City of Johannesburg.

2 INTRODUCTION

In cities of the developing countries, particularly in African, Asian and Latin American continents; there have been growing concerns in terms of the state of public transportation systems. One of the main among the concerns have been lack of well-integrated, reliable and efficient public transport systems. This is particularly so in urban centres, due to rapid growth of the urban population coincided with the end of colonialism, giving rise to large scale economic, spatial and structural transformation of urban landscapes. The consciousness of the need for well-functioning innovative public transport systems by all spheres of governments and the private sector institutions has prompted precipitate action in the past decades to invest in innovative transport systems.

On the other hand, mobility in urban context is continously adapting and transforming to quotidian challenges, as can be perceived with the global shift towards smart city planning. This shift towards encourage communities to utilising multi-mobility modes and public transport in their everyday commute has led to a lessening in the negative impacts of private-car–dependence (such as congestion which has become a norm in major roads in urban areas) in the developed cities (Miranda and Rodrigues da Silva, 2012). Typically, sustainable urban mobility describe movement patterns or city transport networks, which are utilizing active travel modes, energy efficient renewable forms of energy, or shared vehicles wherever possible, resulting in low carbon output per commuter journey (Banister, 2005). Integrated multimodal networked public transport have emerged as a mobility paradigm, utilizing transfer pontential to provide maximal service for a reasonable and efficient operating budget, providing a genuinely feasible alternative to the automobile travel for many trips within urban areas (Goodwin et al., 1991).

Conversely, just like any other rapid growing metropolitan municipalities in developing and emerging economies, the city of Johannesburg has not been released with regards continuous public transport challenges. In the past decade, the City of Johannesburg has actively participated in the development of the first fast train system; the Gautrain in conjunction with two other metropolitan cities within the province. To support the innovative train system, the city also invested in and developed the Rea Vaya; a rapid bus system. Conversely, the state of connectedness of the rail and road route networks within the city have not been well documented. Therefore, the aim of this paper is to delineate the extent network integration among Gautrain and Rea Vaya within the Johannesburg urban public transport system and how working relationships could be improved.

3 CONCEPTUAL FRAMEWORK: INTEGRATION IN URBAN PUBLIC TRANSPORT PROVISION

Literature on cummuters need for integrated urban public transport has been well documented (Jackiva et al., 2015; Nunes et al, 2014, Musakwa and Moyo, 2016; Filippi et al., 2013), henceforth contempory there has been a global growth in research on how to achieve integrated public transport operations in cities around the world. According to Reggiani (2001), “the term transport intergration denominates concepts such as technical, economic, organizational, information and policy-based concepts; and solutions that pledge the coninuity of travels from door to door. Nevertheless, transport integration is mainly focused on connecting various transportation modes operating in certain transport system, providing solutions to facilitate commuters between the modes and assuring efficient, smooth and afe flow of commuters from their origins to their destinations (Ibrahim, 2003).

Integration of an urban public transportation is defined as an organizational process by which components of the commuter public transportation system (Network and infrastructure, information and marketing components, fares and ticketing systems) and a variety of carriers, (Kourtit and Nijkamp, 2012) who serve different transportation modes, interact more closely and efficiently, to generate an overall improvement in service quality level and enhanced performance of the combined public and individual transportation. In particular, the implementation of various transport integration solutions may results in the benefits such as reduction of travel times, transportation costs, environmental pollution and traffic congestion (Paulley and Webster, 2017). Transport integrating solutions may improve the urban public transport system accessibility and overall competitiveness as well as assure better utilization of different transportation means and infrastructure.

Moreover, integration of urban public transportation is mostly determined by the pattern of land use, the nature of the transportation systems, and the characteristics of the traveller (Hidalgo and King, 2014). Travel cost, time, distance, and the choice of travel mode are all important. The closer the origin and destination to the main transportation system the higher the level of connectivity (De Abreu Freire & Painho, 2014). The wider the variety of modes for travelling between a given origin and a particular destination the greater the connectivity. In addition, the less time and money spent in travel the more places that can be reached within a certain budget and the greater the connectivity (Datta, 2015). In order for the concept of connectivity to be useful for evaluation of the need for and effectiveness of transportation and land use planning policies it needs to be translated into measures of connectivity.

There are different types and forms of transport integration in the urban areas. These include integration of different modes of public transportation; integration of public and individual transportation; integration of transportation policy with other policies concerning spatial planning and city management; spatial integration based on the application of efficient land use strategies (such as multimodal terminals and interchange platforms, shared lanes for means of public transportation) (Paulley and Webster, 2017). Moreover, infrastructural integration based on development of various technical solutions in transportation infrastructure (for instance passageways connecting public transportation stops, overpasses, underpasses, shared stops for public transportation); organizational integration (for instance metropolitan tickets various transportation modes and coordinated timetables); economic integration focused on introduction of various measures supporting sustainability and efficiency of the public transportation systems (for example integrated tariffs). Informational integration (passengers' information systems; web pages; electronic travel planners) (Kourtit and Nijkamp, 2012).

4 STUDY AREA

The Johannesburg Metropolitan City is well-developed economic hub and the ever fatst growing city in terms of the population, economy and development in South Africa. The city is located in the Gauteng Province, and covers an area of approximately 1, 645 km2 (City of Johannesburg, 2013). It is divided into seven regions, namely Region A, B, C, D, E, F and G. Besides, Johannesburg being the over populated and economic hub of South Africa, the Johannesburg metropolitan City as well as its neighbouring metropolitan cities (City of Tshwane and City of Ekrhuleni) share the most innovative transportation mode, the Gautrain in Gauteng connecting these three functional cities into one capital and economic region (see figure 1). Subsquently, routes of urban public transport systems, commuters movement patterns and accessibility become central issues within the Johannesburg Metropolitan City perpetuated by demand.

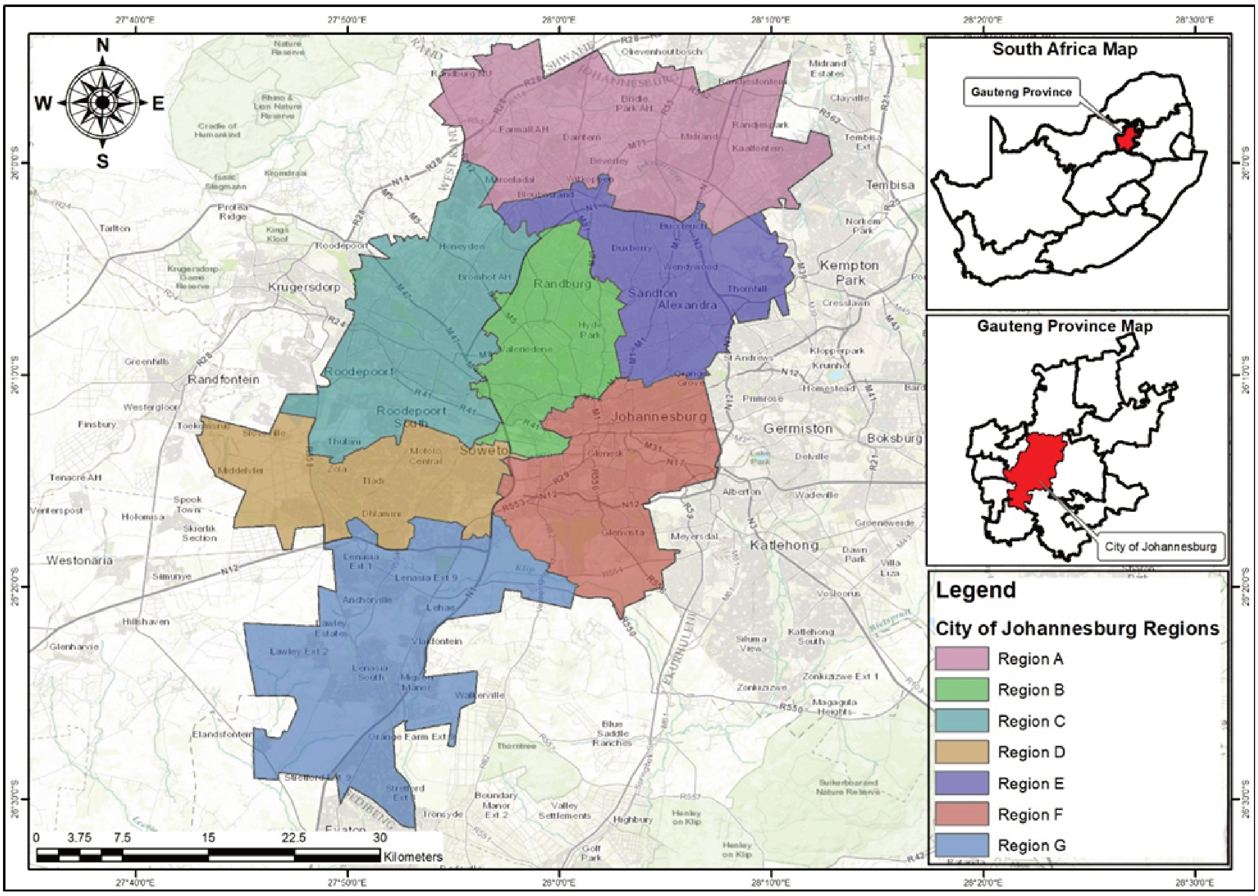


Figure 1: City of Johannesburg Map (Source: Author, 2017)

The city of Johannesburg has been defined as a world class African city. This definition entails that the city will strive to become a smarter city, but what is it to be 'smart', does it only involve decision-making or the use of advanced technology? Scholars have over the years articled that at the core of development of smart cities is the need for developments which improves the quality of life of the citizens (Kummitha & Crutzen, 2017; Bakici et al., 2013; Ferreira et al., 2017). Currently the city of Johannesburg is promoting transit oriented developments (TOD) in previously marginalised areas by focusing on development on economic and business nodes (see figure 1). However the existing urban public transportation network is spatial segregated and there is little to no clear collaboration between the various public transit providers (namely the Reya Vaya; Gautrain/bus; Metro Bus/rail; Meter-taxis; Mini-bus taxi; and Uber), as they are developed and operated separately. Hence this presents a knowledge gap of how to connect commuters and these places of economic and business activities.

Urban public transport is at the heart of the City of Johannesburg's development agenda. The has been making efforts in the city to create Transit Oriented Development (TOD) Urban renewal as a way of building ‚corridor of freedom' (Gauteng Deapartment of Roads and Transport, 2013; Steer, 2012). Johannesburg Metropolitan Municipality caters for both non-motorized and motorized urban public transportation. These incldue Gautrain, Rea Vaya BRT, Metrobus, Metrorail, Putco, Minibus Taxis, Uber and dedicated bicycles lanes for private cycle lanes for private bicycle cyclists. Public transportation in Johannesburg Metropolitan City is used by the youth to commute to school, to get to service centres and recreational areas; adults to commute to work and recreational areas and by old aged citizens to commute for leisure and to get to basic services. Conversly, for the purpose of this study two urban public transport modes are explored on state of routes integratedness.

The Rea Vaya BRT and Gautrain are located in City of Joahnnesburg of Gauteng province, Republic of South Africa. The Rea Vaya operates only under the jurisdiction of the City of Johannesburg in southern part. Whilst Gautrain operates within the three metropolitan cities in Gauteng province which include City of Tshwane, City of Johannesburg and City of Ekurhuleni in the East Rand of Gauteng Province. The three metros, as mentoned earlier they form the region which is the economic hub of the Republic of South Africa and are only cities in the entire African continent that has a rapid transit train. These two public transport modes started operating during the 2010 FIFA World Cup which was hosted by South Africa. They also operate along mixed land used as well as major economic, institutional and social nodes such as the Johannesburg Park Station, OR Tambo International Airport, FNB Stadium, Emirates Airline Park Stadium, Sandton and so on.

5 METHODOLODY

The study adopted a phenomelogical case study survey design that applied mixed-method approaches to gather spatial, qualitative and quantitative data. The study examined the applicability of locstion based services to define the state of public transport routes integratedness and movement patterns of commuters within Johannesburg Metropolitan City. The exploratory approach was used to formulate the research problem for precise investigation whilst the descriptive approach was used to gather complete and accurate information. Key informant interviews were also conducted with key informant personnel from Johannesburg Roads Agency (JRA), Gautrain Management Agency (GMA) and Gauteng Department of Roads and Transport to give complete and accurate information on Gautrain and Rea Vaya Routes Integratedness in Johannesburg Metropolitan City.

Data from Echo-Echo was used to gather social media comments on the urban public transport modes and locations co-ordinates of where the comments were made. The co-ordinates were converted into shape files, which inturn were used to create the krigging maps. Conversly, these maps display High Commuter Concetrations zones and Low Commuter Concetrations Zones and help to track the movement patterns of commuters using urban public transport and survey questions about origin and desination were included to validate locations and create maps with possible routes eminating from various locations to major nodes of the City of Johannesburg. The data in this study were analysed and interpreted thematically, semantically and spatially through techniques such as content analyisis and Geographic Information Technologies. The study period is from January to August 2017, and the spatial, qualitative and quantitative analysis were triangulated to yield viable results.

6 MODES OF PUBLIC TRANSPORT AND THEIR ROUTES INTEGRATEDNES WITHIN THE JOHANNESBURG METROPOLITAN CITY

6.1 Moving with Gautrain

Gautrain in one of several strategically integrated Gauteng Provincial Governement projects to meet future transport demands anticipated becoause of economic and population growth (Ruwanpathirana and Perera, 2015). It is also referred to as a mega-engineering project. It is a state-of-art rapid rail connection between City of Johannesburg (Africa's business capital), City of Tshwane, and City of Ekurhuleni (Moosajaa, 2015). The gautrain has been identified as the backbone for public transit provision in the Gauteng province, since acoording to Gauteng City Region (GCR) can best described as a cohesive cluster of cites, towns and urban nodes which collectively make up the economic hub of South Africa, generating more than 36% of the coountry's Gross Domestic Product (GDP), whilst covering less than 2% of the South Africa's total surface area. Figure 2 illustrate Gautrain routes and stations map.

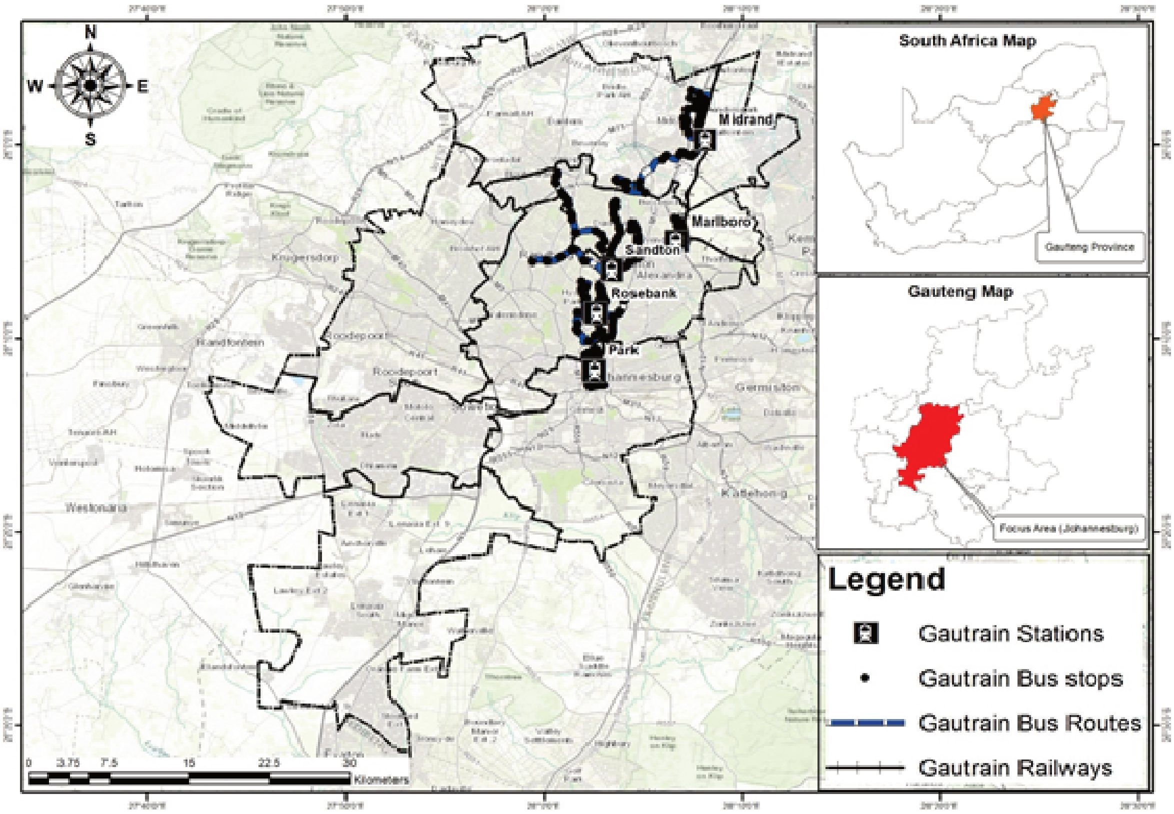


Figure 2: Gautrain routes and stations map (Source: Author, 2017)

In terms of routes network, the Gautrain alone operates in three metropolitan cities in Gauteng province namely City of Johannesburg, City of Pretoria and Ekurhuleni Metropolitan municipality. It has only 10 functional train stations, namely Park, Rosebank, Sandton, Marlboro, Midrand, Centurion, Pretoria, Hatfied, OR Tambo and Rhodesfield . However, the Gautrain within jurisdiction of City of Johannesburg operates in the upper spaces such as Rosebank, Sandton, Randburg and Fourways. Gautrian does operate on the southern spaces of the Johannesburg, and conversly there are pontetial clients and need for expansion and integration with Rea Vaya that is currently operating in that area (See figure 2).

6.2 Relying on Rea-Vaya

The Rea Vaya Bus Rapid Transit (BRT) is a fairly new bus system in the city of Johannesburg. Its launch in 2009 was met with much uncertainty, but great hope as a new public transport initiative for the city. The system can be found in many different areas across the greater urban fabric of Johannesburg, connecting the south to the north and the east to the west. It covers a route of 325 km to date and continues to be in the process of expanding (COJ, 2015). The system is made up of trunk routes that keep to the designated lanes and are connected by the stations along the route. The T1 route runs from Thokoza Park in Rockville, Soweto and ends in Ellis Park. There are more than 15 bus stations across this route that facilitates access onto the buses. The main trunk routes are supported by complimentary and feeder routes that navigate other parts of the city. These feeder buses use the main routes of the road network like other vehicles and public transport systems. Figure illustrate Rea Vaya Bus Stations and Bus Route. Figure 3 illustrate Rea Vaya Bus Stations and Bus Routes.

In terms of routes network, Rea Vaya Operates in Region A to F within the Johannesburg Metropolitan City. It operates in different phases and has systematic hierarchical routes that connect micro city centers in the metropolitan city of Johannesburg. It has completed the construction of Phase 1A and 1B and currently developing Phase 1C. Rea Vaya's Phase 1A has a trunk route operating between Ellis Park in Doornfontein and Thokoza Park in Soweto, linking with several feeder routes Soweto (Rea Vaya, 2016). Feeder buses run from Protea Glen to Thokoza Park and from Eldorado Park to Lakeview (Rea Vaya, 2016). The route covers

325 km of special lanes and intersections while feeder and complementary buses carry passengers to the trunk route stations.

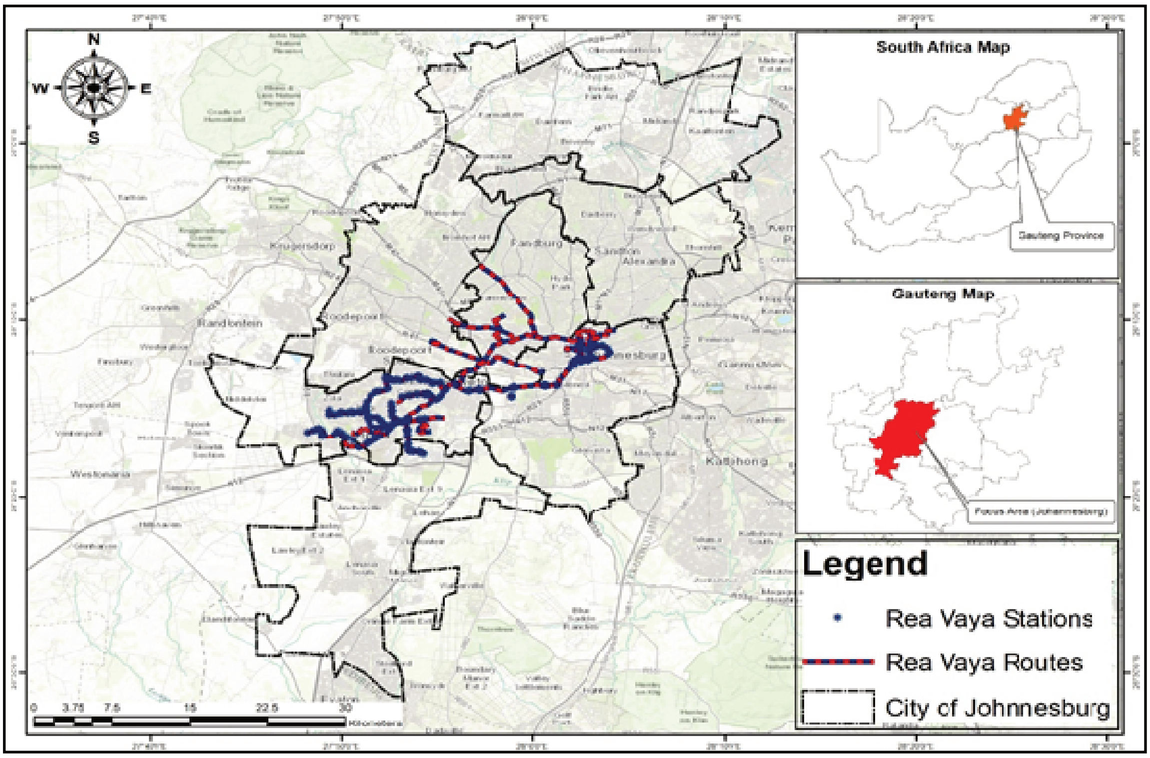


Figure 3: Rea Vaya routes and stations map (Source: Author, 2017)

The inner city circular route travels around the Central Business District from Hillbrow and Braamfotein, to Ellis Park in the east and Chancellor House on the western edge of the city (Rea Vaya, 2015). The Phase 1B has routes that operate through Cresta, Windsor West, Parktown, Yeoville. In addition, routes that operate to and from University of Johannesburg Soweto Campus are being added. The route starts in Noordgesig in Soweto and travels through Pennyville, New Canada, Highgate, Auckland Park and Braamfontein to Parktown, Metro centre and Rissik Street in the CBD.

The route has made it possible for commuters to easily reach key public healthcare centres such as the Rahima Moosa, Helen Joseph and Charlotte Maxeke hospitals as well as educational institutions such as University of Johannesburg, Wits University, Milpark College, Parktown Boy's High School and Barnato Park High School. Feeders run to and from Leaglen, Stormhill, Florida, Cresta, Yeoville and Parktown. There are also additional feeders in Soweto from Pemville and Mapetle. These routes are now linked to the Metro Centre Rea Vaya loop, which travels to the inner city through Braamfontein.

Rea Vaya's current focus is the development of Phase 1C following the completion of Phase 1B. Phase 1C will run from: Parktown to Alexandra; then Alexandra to Sandton, with complementary services between the CBD and Ivory Park; and from the CBD to sunninghill on Oxfords and Revonia. Future plans also include extending the Phase 1C route from Sandton to Ranburg by 2018, and possibly extending the Phase the trunk route from Soweto Highway to Dobsonville, enabling feeders to services areas such as Braamfisherville. Construction for the routes and stations has already started in the Sandton area. The Rea Vaya trunk routes from the CBD to Sunninghill through Oxford Road and Ivory Park to Sunninghill will be prioritized after 2018. The three interchanges will be at Sandton, Alexandra and Westgate, where a number of station modules will be clustered and there will be integration with other modes of transport, including walking and cycling.

With its intention to be one of the most sustainable forms of public transport in the city, the Rea-Vaya is noted as cost effective, safe and relatively reliable. It is considered as an inherent component of the city's future urban form as it is one of the main elements of the corridors of freedom initiative. Finally, the Rea-Vaya is referred to as one of the most determined initiatives by the city, being spread headed by a woman and having a completion goal of three years from ground breaking to implementation and operation (Moosajee, 2015).

6.3 Analysis of Gautrain and Rea Vaya Routes Integratedness

The findings of this study indicate that there are limited areas where the route networks between the public transport systems are connected (see figure 4). Currently, the Gautrain operates in the upper spaces of Johannesburg, such as Rosebank, Midrand, Sandton, Randburg and Fourways. Whilst the Rea Vaya does not have existing networks in these locations. Rea Vaya's Phase 1A has a trunk route operating between Ellis Park in Doornfontein and Thokoza Park in Soweto, linking with several feeder routes Soweto. Feeder buses run from Protea Glen to Thokoza Park and from Eldorado Park to Lakeview. The Rea Vaya has proven successfully in improving accessibility to economic opportunities for locations which were once spatially segregated in Johannesburg. As can be seen with the network flowing from Soweto moving upwards to the inner CBD in Braamfontein. Most of the Rea Vaya stations seem to be well located as they are within the high commuter concentration zone (see figure 4).

The existing urban public transport network is spatial segregated, and there is little to no clear collaboration between the Gautrain and Rea Vaya, as they are developed and operate separately. Hence this presents a knowledge gap of how to connect commuters to places of economic and business activities. Conversly, from the works of modern day scholars(Filippi et al., 2013; Nune et al., 2014), the network integration of th public transport systems will lead to improved service delivery, inter-connectivity of places of economic activity and improve quality of life. Therefore, for City of Johannesburg to promote smart mobility, there is need for development of planning support systems which will guide the growth and integration of the existing and future public transport systems.

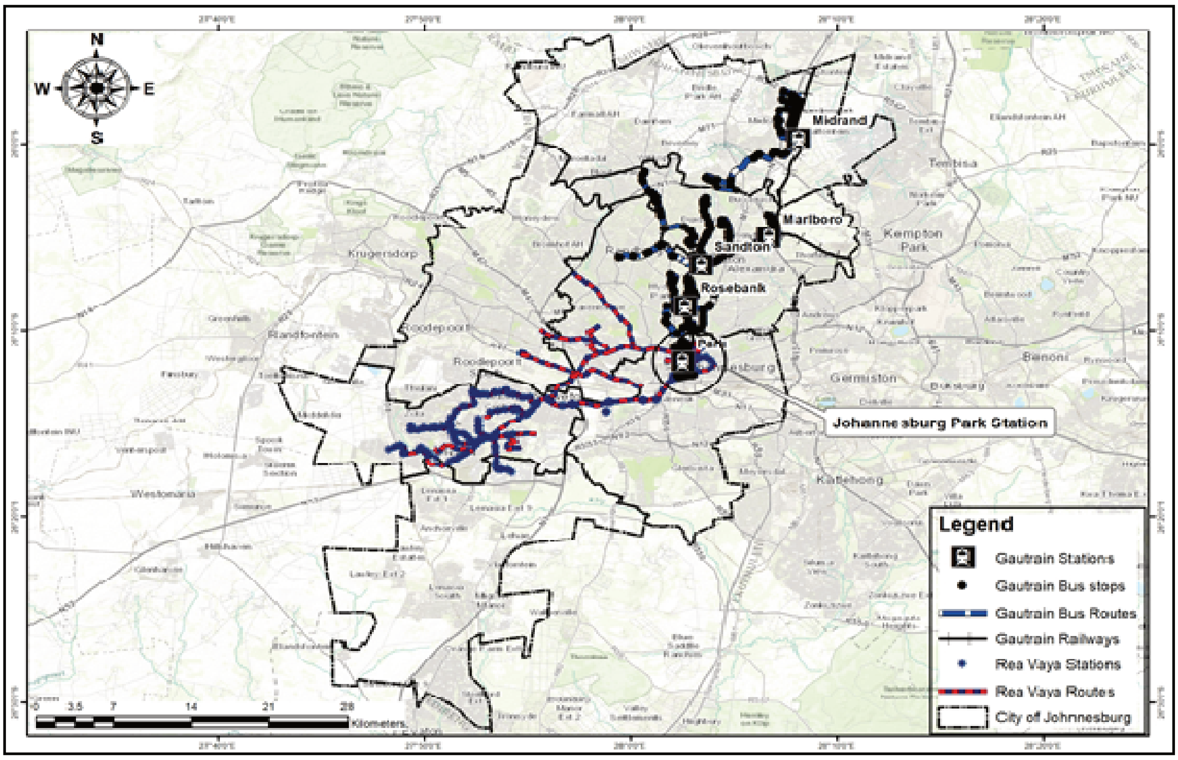


Figure 4: Public transport routes integratedness within (Source: Author, 2017)

On the other hand, the Johannesburg Park Station hub function as vibrant intermodal transport node (see figure 4). It is a major public transport interchange where public transport network integrate, and commuters from all over Johannesburg, South Africa, Africa transfer from trains and buses to minibus and more. Gautrain and Rea Vaya services at Park station provide for inter-city transport as well as intra-city and regional transport service. Given that Johannesburg Park Station is a prominent transport terminal in Johannesburg, Gauteng, South Africa, and Africa, distribution terminals in the form of bus stations, rail stations and taxi ramks are located in the close proximity to the Park Station precinct. The Gautrain Park Station, bus routes as well as the Rea Vaya Bus Rapid Transit routes should also be noted as an essential feeder and distributor routes in the area.

6.4 Gautrain and Rea Vaya Social Media Commuter Concentration

Accordingly, from the findings, the majority of the commuters are located near the stations, this is due to the current stations are located in melting points of commuters, such as the Park Station, which is located in the Johannesburg CBD and acts as main interchange hubs of Johannesburg and an entry point for most regional and local commuters, also it is at the close proximity to MTN Taxi rank and Bree Taxi Rank located only 10 minutes away. This hub has a high connectivity of public transportation level. Notable areas which are currently not serviced by the Gautrain and Rea Vaya, include Roodepoort; Randburg; Woodmead; Magaliessig; Honeydew; Fourways; Lenasia; Glenvist; and Lawley. The commuter concentration zones of the Gautrain and Rea Vaya were then overlaid on a ratio of 50:50, to ascertain which stations should as the initial geolocations to promote multi-mobility. Park Station had the highest integrated commuter concentration as shown in figure 5.

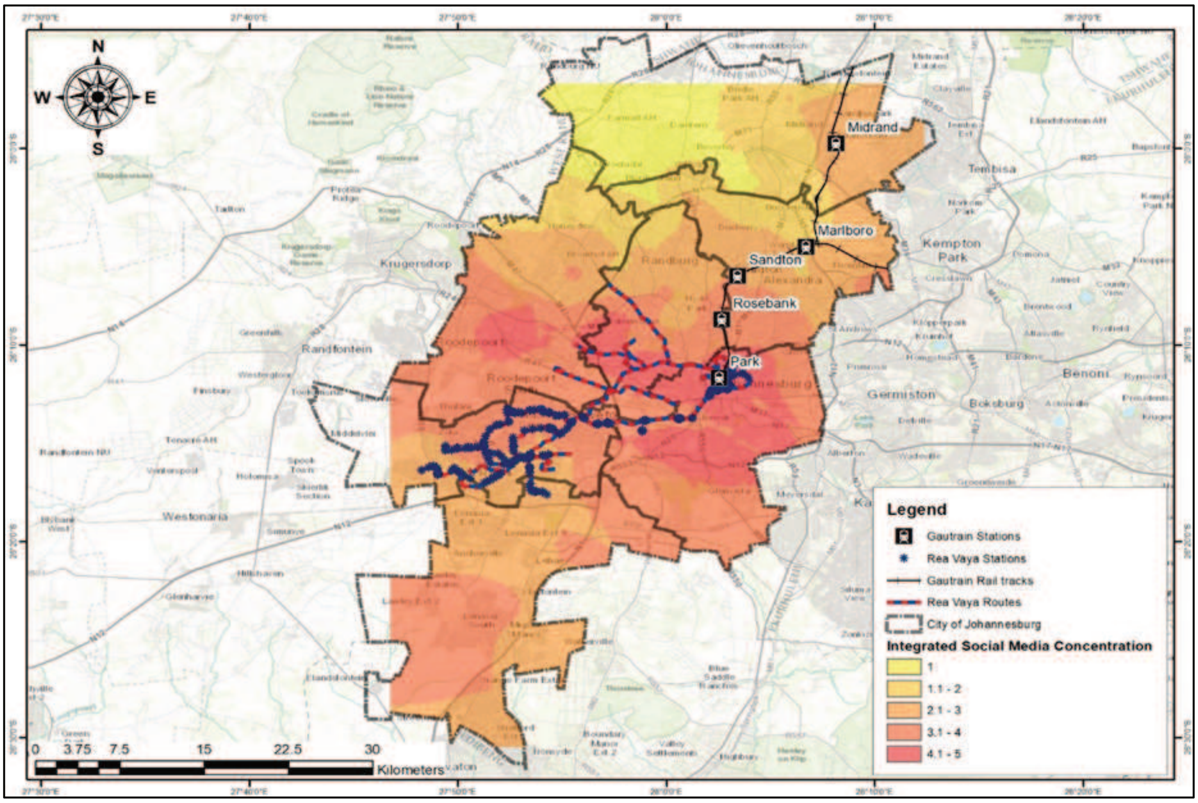


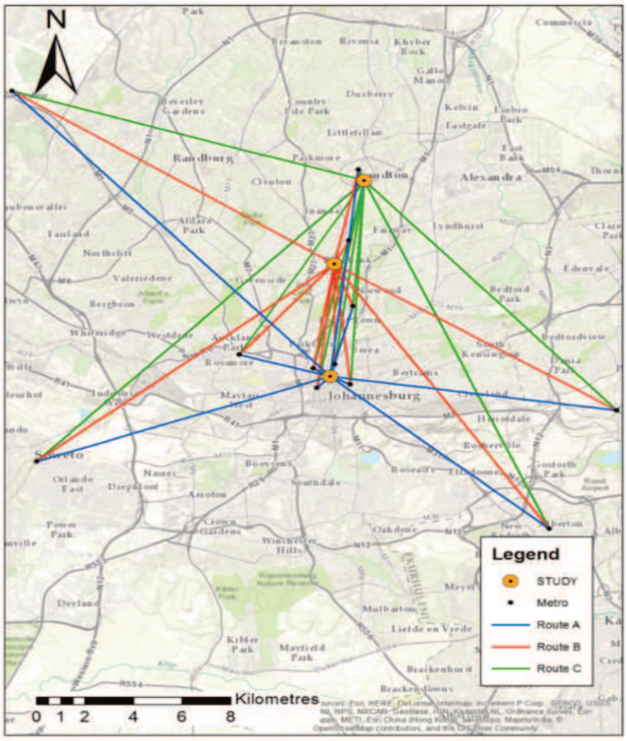
Figure 5: Routes Network Integratedness (Source: Author, 2017)

With this high commuter integrated, improving commuter transfer in the geolocation would be a virtuous starting point, since the infrastructure and commuter number are already pre-existing. While variations in income levels may be a factor to prevent inter-transfer between the two modes commuters should be given an incentive for using both modes of transit in one trip, such as a discount in commuter fares or points which can be later redeemed for a discount. This would build on the existing commuter concentration, and further attract other commuters to join the system. Moreover, as it would be cost effective for the two public transit provides to partner towards promoting multi-mobility within City of Johannesburg, then building separate infrasture, as the Gautrain would link commuters to economic and business hubs in the morthern zones of Johannesburg, Namely: Sandton, Rosebank, Marlboro and Midrand; and the Rea Vaya would integrate commuters to areas of economic and business nodes in the southern zones of the city.

6.5 Gautrain and Rea Vaya Commuters Movement within the City of Johannesburg

The movement of commuters within the city changes with time (Mitchell and Casalogno, 2005), as a result of developing transportation systems in addition to innovations within the Information and Communication Technologies Sector. While exploring the state of public transport networks integratedness within City of Johannesburg in this endeavour, it is essentially to understand the commuters movement within various areas of the city (Ambrosino et al., 2014).

Conversely, figure 6 and 7 illustrate the possible origin and destination areas of Gautrain and Rea Vaya commuters who form part of the study. From the results it can be deduced that from each location, commuters has two or three possible routes that they can take when travelling from their origin to destinations. For instance a commuter has two or three possible routes that he/she can take when travelling between Johannesburg Park Station and Sandton.



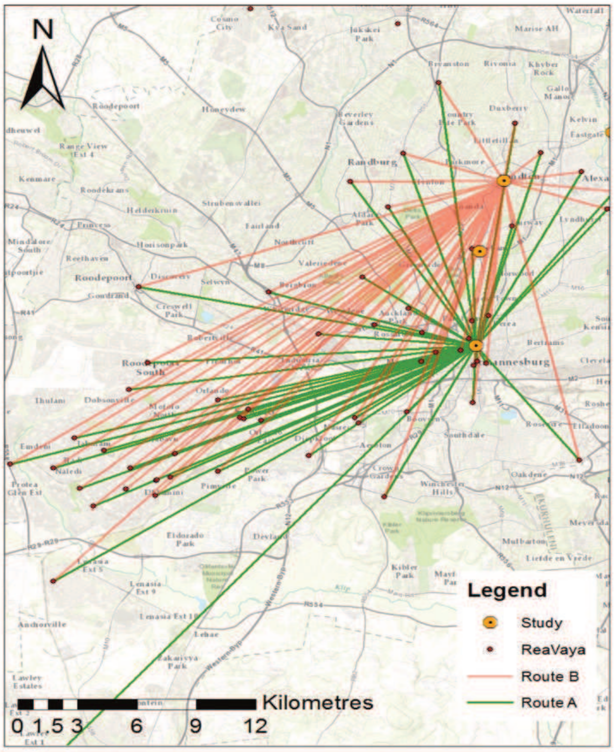


Figure 6: Gautrain Movement of commuters (Source: Author, 2017), Figure 7: Rea Vaya Movement of commuters (Source: Author, 2017)

These routes may be dierect links from their origin to their destinations on or may be interconnected through other stations as alternative routes to reach their destinations of choice conviently. The two modes of public transport in Johannesburg metropolitan city constantly need to track the movement of their commuters because of change in origin and destinations over time, thus the idea of location based services is applicable in tracking commuter movement patterns through geo-locational patterns that display commuter concetration zones. Therefore, the idea is for the servoce provider to reach out to commuters in the form of expanding services or contracting emergency and temporary urban public transport in times when required most, such as traffic congestions and tracking social media feeds using location based services analiysis software such as Echo-Echo to manage their social media platforms effectively which in turn renders real-time and effective service to many of its commuters and the public at large.

7 CONCLUSION

To conclude mobility is continously adapting and transforming to quatidian challanges, and be perceved with th global shift towards smart city planning. The shift towards encourage commuties to utilizing multi-mobility modes and public transport in their everyday commute, to promote the reduction in the negative imapcts of private-car-dependnce in the urban contexts. This study delineated the extent routes network integration among Gautrain and Rea Vaya within the Johannesburg urban public transport system. The study findings; indicated that there are limited areas where the route networks between the public transport systems are connected. The large sections of the networks are disintegrated.

However, it is recommended that conscious efforts in planning and developing both rail and routes networks that are integrated to promote efficiency of public transport systems. The network integration of the public transport systems will lead to improved service delivery, inter-connectivity of places of economic activity and improve quality of life. Therefore, for City of Johannesburg to promote smart mobility, there is need for development of planning support systems which will guide the growth and integration of the existing and future public transport systems. Typically, sustainable urban mobility describe movement patterns or city transport networks, which are utilizing active travel modes, energy efficient renewable forms of energy, or shared vehicles wherever possible, resulting in low carbon output per commuter journey. Integrated multimodal networked public transport have emerged as a mobility paradigm, utilizing transfer pontential to provide maximal service for a reasonable and efficient operating budget, providing a genuinely feasible alternative to the automobile travel for many trips within urban areas.

8 REFERENCE

Chen, C., Bian, L., Ma, J: From traces to trajectories: How well can we guess activity locations from mobile phone traces?. In: Transport Research Part C: Emer. 46, 326-337, 2014.

City of Johannesburg: Integrated Development Plan 2013/16. In: www.joburg.org.za, 2013.

City of Johannesburg: Strategic Integrated Transport Plan Framework. In: www.joburg.org.za, 2013. connectivities in the world-city network, Regional Studies, DOI: 10.1080/00343404.2017.1330538

Dachs, W: Gautrain: A case study. In: www.gautrain.co.za, 2011.

Deloitte: Africa is ready to leapfrog the competition through Smart Cities Technology. In: www.deloitte.com, 2014.

Di Pietro, L., Guglielmetti Mugion, R., Mattia, G., Renzi, M. F., Toni, M. 2015. The Integrated Model on Mobile Payment Acceptance (IMMPA): An empirical application to public transport. Transportation Research Part C: Emerging Technologies, 56, 463–479

Dreskovic, N. and Nurkovic, R: Influence of Transport on Urban and Rural development in Bosnia and Herzegovina. In: Journal of Real Corp, pp 287-293, Vienna, 2014.

Fang, Z., Shaw, S.L., Tu, W., Li, Q., and Li, Y: Spatiotemporal analysis of critical transportation links based on time geographic concepts: a case study of critical bridges in Wuhan, China. In: Journal of Transport Geography. 23, 44-59, 2012.

Forsyth, C. and Chitor, R., 2012. For Big Data Analytics There’s No Such Thing as Too Big: The Compelling Economics and Technology of Big Data Computing. White Paper. San Jose, CA: Forsyth Communications.

Hasan, S. and Ukkusuri, S.V., 2014. Urban activity pattern classification using topic models from online geo-location data. Transportation Research Part C: Emerging Technologies, 44, pp.363-381.

Hollenstein, L. and Purves, R., 2010. Exploring place through user-generated content: Using Flickr tags to describe city cores. Journal of Spatial Information Science, 2010(1), pp.21-48.

Jayasinghe, A., Sano, K. and Rattanaporn, K., 2017. Application for developing countries: Estimating trip attraction in urban zones based on centrality. Journal of Traffic and Transportation Engineering (English Edition), 4(5), pp.464-476.

Kummitha, R.K.R. and Crutzen, N., 2017. How do we understand smart cities? An evolutionary perspective. Cities, 67, pp.43-52.

Mishra, S., Welch, T.F. and Jha, M.K., 2012. Performance indicators for public transit connectivity in multi-modal transportation networks. Transportation Research Part A: Policy and Practice, 46(7), pp.1066-1085.

Mishra, S., Welch, T.F. and Jha, M.K., 2012. Performance indicators for public transit connectivity in multi-modal transportation networks. Transportation Research Part A: Policy and Practice, 46(7), pp.1066-1085.

Mokoena, B.T., Musakwa, W. and Moyo, T., 2017. Developing the Well-Located Land Index to Establish Smart Human Settlements for the Ekurhuleni Municipality, South Africa. In Planning Support Science for Smarter Urban Futures (pp. 95-112). Springer International Publishing.

Moyo, T. and Musakwa, W., 2016. Using crowdsourced data (Twitter & Facebook) to delineate the origin and destination of commuters of the Gautrain public transit system in South Africa.

Nanni, M., Trasarti, R., Furletti, B., Gabrielli, L., Van Der Mede, P., De Bruijn, J., De Romph, E. and Bruil, G., 2014. Transportation planning based on GSM traces: a case study on ivory coast. In Citizen in Sensor Networks (pp. 15-25). Springer, Cham.

Navarrete, F.J. and de Dios Ortúzar, J., 2013. Subjective valuation of the transit transfer experience: The case of Santiago de Chile. Transport Policy, 25, pp.138-147.

Rae, A., 2009. From spatial interaction data to spatial interaction information? Geovisualisation and spatial structures of migration from the 2001 UK census. Computers, Environment and Urban Systems, 33(3), pp.161-178

This paper was removed due to conference non-appearance of the speaker.

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reviewed paper

GIS-BIM Interoperability for Regeneration of Transurban Areas

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1 ABSTRACT

In order to manage analysis and project processes at a territorial, urban and architectural scale, linking information to metric data is an increasingly important topic.

At a geographic and cartographic stage, the function of storing, managing and viewing data and information is performed by GIS (Geographic Information Systems), where vector features as points, lines, polygons are gathered in layers connected to an attribute table.

In a similar way, when scale factor increases, for buildings and other engineering works there is a growing necessity to preserve data or attributes together with the features where they belong. For this purpose, a major role is played by BIM (Building Information Modeling), a modelling process in which the parts of a building are hierarchically organized and every feature is connected to an information table containing all data useful for the ongoing working process or for managing the life cycle of the modelled building or infrastructure.

While the two systems are similar in concept, at the moment they suffer lack of mutual communication, especially in conveying informations from a platform to another.

Studying relationships and possible connections between different data storage environments like GIS and BIM is one of the research topics of DATA – Developing Abandoned Transurban Areas, a research project now in progress at University of Padova, involving Departments of Civil, Architectural and Environmental Engineering and Industrial Engineering.

The main goal of the project is to design pilot regeneration scenarios for wasted or underused places, focusing on a part of the western peri-urban area of Padova marked by the overlapping of partially abandoned industrial or commercial buildings, transport infrastructures like a ring road and a railway, residential fabric and green or agricultural land.

Among DATA key features there is a multi-scale approach: in a framework where urban peripheries are considered a relation system between a city and the surrounding territory, the project aims to combine the methods of urban and territorial analysis with a design concept in which industrial landmarks or empty spaces become the core of possible urban transformations.

Therefore, starting from data mining and management related to the areas of interest, procedures for GIS to BIM data transfer are surveyed and implemented; then, the buildings, facilities and building complex involved in scenarios design will be modelled in detail, and relevant building-scale information will be added.

At the moment, within the project, a pipeline to convert a GIS map of the buildings in our area of interest into a BIM 3D model provided with all the information of the GIS layer has been developed. Then, when the BIM model is modified, its updated attributes can be taken back to the GIS level.

The aim of this paper is to describe the workflow for GIS-BIM interoperability in DATA project, results achieved at the moment and future goals and applications.

Keywords: urban regeneration, GIS, BIM, interoperability, urban projects

2 GIS, BIM AND INTEROPERABILITY FOR URBAN PROJECTS

2.1 Overview

The development and widespread diffusion of digital modelling tools for building and infrastructures is creating new architectural and engineering project management standards, which are now being recognized in a growing number of countries and administrations. One of its key features is interoperability between different project scopes – like architecture, structures and plants – and between different operation fields. In recent years, the framework of Smart City in its strongest forms has been facing criticism because it appears not to be able to provide effective solutions to a number of urban critical issues, often involving social and economical conflicts.[1] Nevertheless, the use and integration of digital technologies in urban planning and design, whether considered a supporting tool and not a solution itself, may offer good chances to simplify processes and operations and to enhance the capabilities of decision makers and urban actors.

Research and practices for GIS-BIM data transmission fit into this conceptual layout.

In Building Information Modeling, the virtual database connected to any model, together with communication power of 3D viewing, makes the data interpretation easier and more user-friendly. The main purpose of a 3D model at a urban scale is to share, manage and analyse, in a smart way and on a common platform, information coming from various sources and useful for the governance of buildings, infrastructures and other engineering works laying on the territory. Monitoring transformation processes from the general to the particular and back would allow a look at territorial planning strategies, their site-specific feasibility and then again at their urban impact. Within these processes, the digital city becomes a high-performance test model. While GIS models are meant to acquire, manage and view georeferenced data, generating data aggregations which can be represented as 2D thematic maps, BIM allows to link information to 3D geometric features of buildings and to export them in specific software for different scopes and time phases.[2] Despite the kind and quantity of data available for each one of these systems is unlimited, it is still complicated to convey information from a digital environment to another.

2.2 Exchange formats and processes

Since for most of their history GIS and BIM software have been developed separately and for different purposes, at the moment there is no tool able to automatically convert features and attributes from one level to another. There are instead several procedures, usually based on the definition and conversion of open exchange formats.[3] An accurate review of researches on the state of the art of integration can be found in Liu et al., 2017. Essentially, one can say that in this field there are two main exchange formats: CityGML, developed By Open Geospatial Consortium, and Industry Foundation Classes or IFC, by buildingSmart. CityGML is more GIS-related, and allows to represent 3D city models provided with semantic features. It is structured into Levels Of Detail (LOD), from 0 to 4 with the higher levels corresponding to higher modelling complexity. On the other side, IFC format is the main interoperability tool within BIM. In an IFC model entities are divided in categories and can belong to different Levels of Development (LODt), from 100 to 400. This concept is in some ways similar to those of Level of Detail, but refers to the phases of design process for a building or an artefact.

A common way to connect GIS and BIM levels is to operate conversions, translations or extensions in the existing standards. This brought to a great number of experiments using plug-ins or even developing new intermediate formats to bridge the distance. One of the most popular semi-automatic conversion methods is so-called Extract, Transform, Load (ETL), which is performed by platforms like Feature Manipulation Engine and also by companies like Esri and Oracle.

Another data integration system is the one based on Semantic Web Technologies. Here, the output is no actual visual model but instead a shared set of reference ontologies containing common information, and available both for CityGML and IFC conversion.

Every method has its pros and cons and fits different needs and requests. At this stage of research there is still no killer app to reduce the complexity of the processes providing accurate results.

It may be worthwhile, finally, to mention recently explored and still less standardised fields such as Landscape Information Modeling (LIM) or Infrastructure Information Modeling (IIM).

[1] For example see Buck, While, 2017; Glasmeier, Christopherson, 2015
[2] De Marchi et al, 2016
[3] For thorough reviews on GIS-BIM integration, see Liu et al, 2017; Song et al, 2017

3 THE DATA PROJECT

3.1 Research context

"DATA – Developing Abandoned Transurban Areas" is a project involving Department of Civil, Environmental and Architectural Engineering and Department of Industrial Engineering of University of Padova. It is a research project funded by Veneto Region through European Social Funds, and lasts one year. It started in June of 2017, so it will conclude in June of 2018.

The aim of the project is to design pilot transformation scenarios for transurban areas awaiting regeneration. The last decades in evolution of Western cities, especially in Italy, have been marked by growth, sometimes poorly planned, of urban territories. Along the city borders that led to incorporation of suburbs and proliferation of junk spaces and infrastructures, while relocation or closing of industrial, commercial or public service activities produced a large number or decommissioned or underused sites.

Such phenomena also have environmental costs in terms of soil consumption and sealing: soil is now considered a hardly renewable resource, and so future urban development should lean on transformations of existing spaces rather than further expansion. This raises issues about reuse of neglected buildings or places to reactivate functions and social activities.

These processes can be regarded as systemic in contemporary dynamics of city fringes. In order to understand their inner working and how to change them, it is possible to locate sample areas which feature the described spatial settings. There, context-based procedures to collect and select and analyse data can be tested, and pilot design scenarios connecting urban and architectural scale can be developed.

3.2 Area of interest

The case study for DATA is located in West Padova, one of the municipalities with the highest level of soil consumption in Italy. Here, beyond a railway and a near ring road, lays a sparse urban fabric, structured along two penetration axes. A canal marks the western physical border and municipality boundary. This city part features a mix of buildings and crops and some big architectural complexes: the former cattle market area, the main cemetery, two barracks, one of which is decommissioned and a former mental hospital, now a health complex.

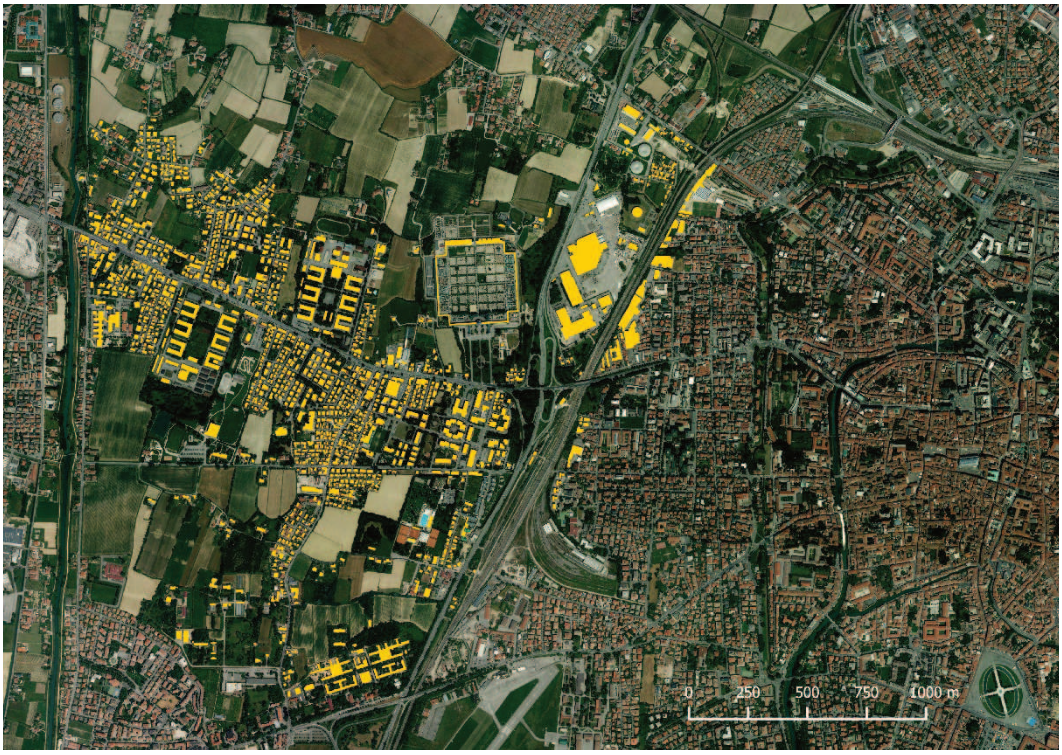

Fig. 1: Map of the area of interest in relation to the centre of Padova.

The urban landscape is marked by industrial landmarks and infrastructures that stand out in the surrounding residential fabric. This zone serves as a good example for issues and potential of peri-urban environments, as

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the presence of transport infrastructures produces a disconnection from the city center but could also breed connection nodes. Besides, sites now underused and agricultural softscape could be the core of sustainable urban development.

3.3 Planned interventions

DATA project aims to combine and mash up different skills. It is indeed organized in six topics, managed by research fellows and their supervisors:

- WebGIS and data mining;
- Building and Land Information Modeling;
- Design scenarios;
- Urban planning and feasibility studies;
- Urban mining;
- Data management and ICT.

The first phase of the project, still ongoing, has been dedicated to define targets in detail, to find and discuss analysis methods and to set interactions between involved research fields.

A masterplan has been realized, showing transformation concepts for the study area:

- Opening to the city the big architectural systems;
- Connecting areas now fragmented by infrastructures;
- Bringing the green to the foreground.

The concept of pilot scenarios means that analysis developed and actions planned for the chosen peri-urban environment may be replicated in other urban regions, in Padova or elsewhere, which show similar features.

4 PROCEDURES AND RESULTS

4.1 GIS data collection and fusion

To check the feasibility of the process of data transmission from GIS environment to BIM, a test has been performed on a sample area, corresponding to the core intervention zone of DATA project, in the western periphery of Padova. The selected base data were an excerpt of the Regional Technical Map, with information about the function of buildings, and a portion of the municipality map of volumetric units, that is architectural volumes with their heights as an attribute. These data were provided by public administrations, and in particular Veneto Region Geoportal for the Technical Map and Padova Municipality for the volumetric building map. Therefore, they are highly reliable for analysis and planning processes.

Since useful information were on different layers, a data fusion was necessary. It has been performed on QGIS software, chosen as the main GIS work platform for its versatility, usability by researchers and free availability.

Therefore, attributes of volumetric map and Regional Technical Map were integrated through a spatial join. The new obtained layer was then cleaned deleting unnecessary attributes and indexed, that is every polygon in the layer has been provided with a progressive ID number to make it recognizable.

The selected attributes for GIS-BIM conversion, for each polygon representing a building, are:

- ID code
- Function code
- Function description
- Bottom elevation above sea level
- Top elevation above sea level
- Height

Finally, geometrical entities underwent topology check and correction, to avoid reading errors by the BIM software: in this case the chosen one was Autodesk Revit, probably the most common authoring software in this field and one of the most suitable on the interoperability side. The GIS layer was now ready to be exported.

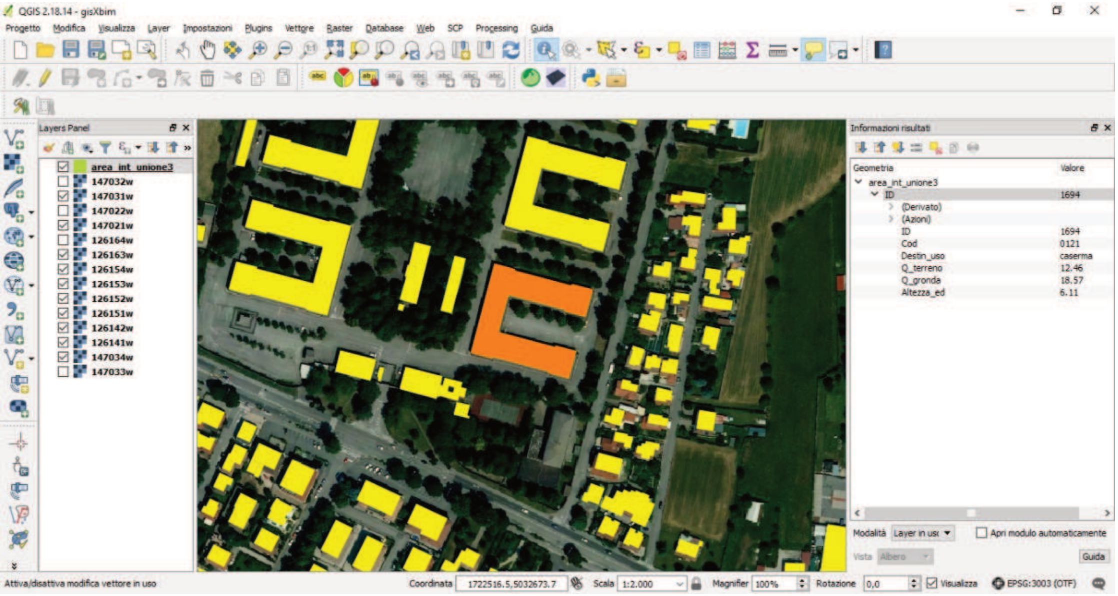

Fig. 2: A selected building in QGIS, showing the values of his attribute table fields.

4.2 Creation of BIM model

The process of data transfer and generation of a BIM 3D model based on 2D vectors has been carried on by Dynamo. It is an open source software available as a Revit plug-in and centered on visual programming, or algorithmic management of workflows through editing of objects and diagrams instead of code scripting.

Although sometimes it may clash with the complexity of sequences and procedures to follow to achieve the requested output, if properly used visual programming can be a very effective tool to simplify such sequences. In this case, in fact, the script implemented in Dynamo was able to import the shapefile exported from QGIS and read its features and attributes. Starting from building height values, extrusion solids were generated by converting polylines into volumes. The script automatically associated to these solids all the other parameters coming from the GIS layer, with corresponding values.

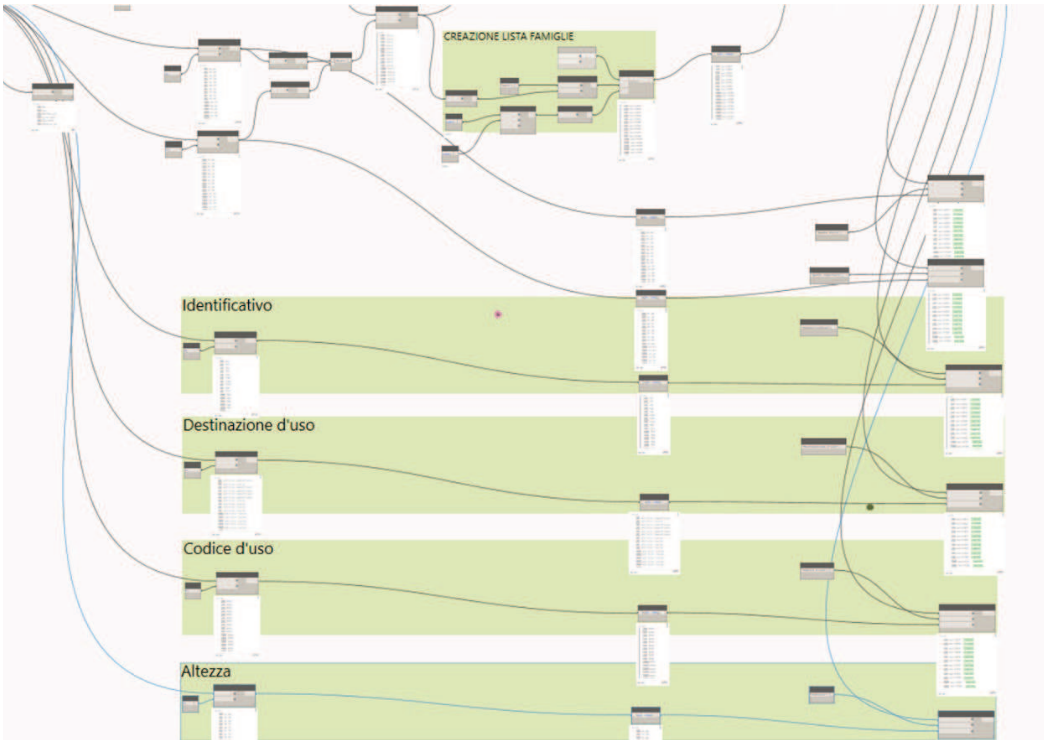

Fig. 3: A sample from the Dynamo GIS-BIM data conversion process.

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More in detail, the first step was importing and reading the shapefile from QGIS; then, polylines in the GIS file were detected, obtaining building geometries. Information related to ground elevation and height of each building were used to displace and extrude every geometry. Solid geometries were finally imported in Revit as masses, associating instance properties coming from the GIS attribute table to every BIM family created.

The output is a 3D model of a portion of Padova, where every building is by itself a simplified three-dimensional model provided with all the information also loaded in GIS environment: a dynamic graphical and tabular database which can be enquired to obtain specific information.

Besides its capabilities as a data repository, the model is also a good visual tool to depict 3D spatial features of the investigated area and can serve as a background for renderings, videos and other visual communication activities for the DATA project. As a simple use case with the sample attributes used, different colors can be assigned to buildings according to their functions, thus producing an easy-to-read model displaying as-is situation and, editing some parameters, possible design scenarios.

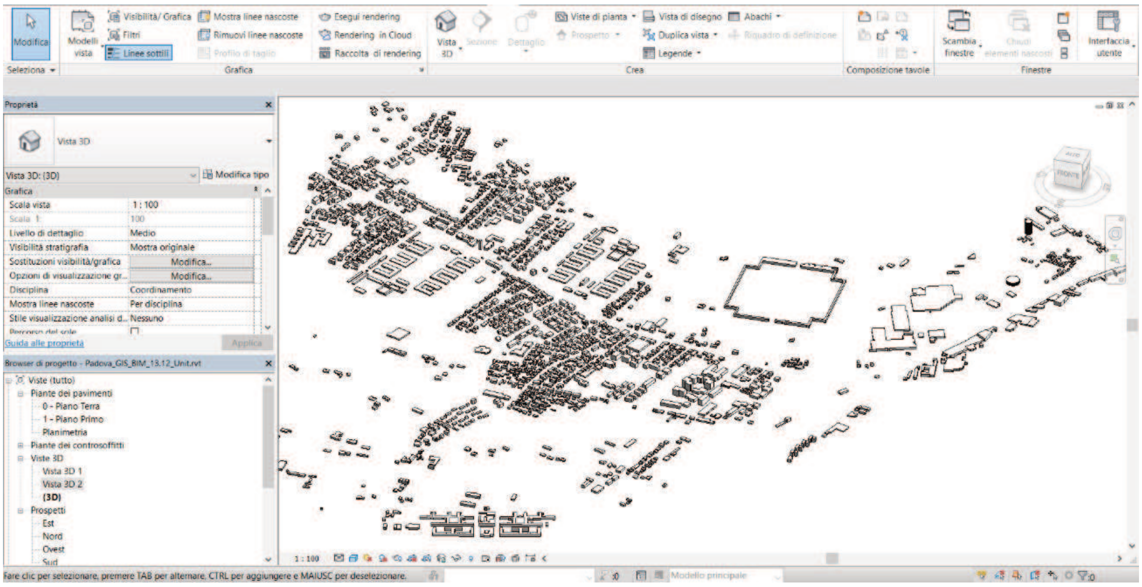

Fig. 4: The Revit BIM model obtained from the original shapefile.

When enquired, the same features in BIM and GIS show of course the same values. It is possible to further enhance the accuracy of the BIM model by moving buildings to their real elevation above sea level, since this data is available. Anyway, this is an operation more suitable for areas with relevant differences in height, rather than almost plain areas like the sample one.

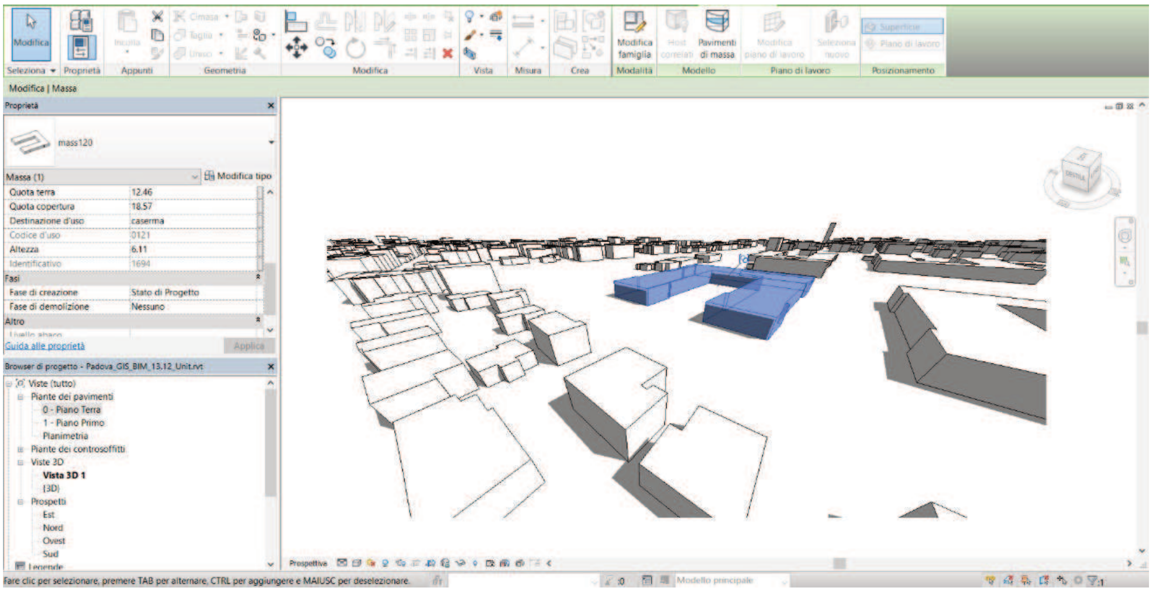

Fig. 5: The building selected in QGIS now viewed in Revit, showing the same attribute values.

4.3 Possibility of reverse process

Once realized a 3D as-is model, it can of course be modified: projected volumes can be included, parameter values can be updated and other ones coming from field survey can be added. For full interoperability all these new information should be carried back on the original GIS layers.

There are at least two different ways to do it, one related to geometry and the other to associated information. On the drawing side, as-built volumes added or edited in Revit can be brought back to QGIS by exporting a plan view of the model to a CAD format, for example DXF, appointing the proper reference system if necessary and then importing new or modified entities in QGIS, where they can be integrated to an existing layer.

Regarding information, from the Revit model it is possible to extract a CSV attribute table; on QGIS, a tabular join can be performed on it, if there is a common field between the two tables to integrate. In this way, additional parameters or new values for existing ones can be conveyed to the GIS level.

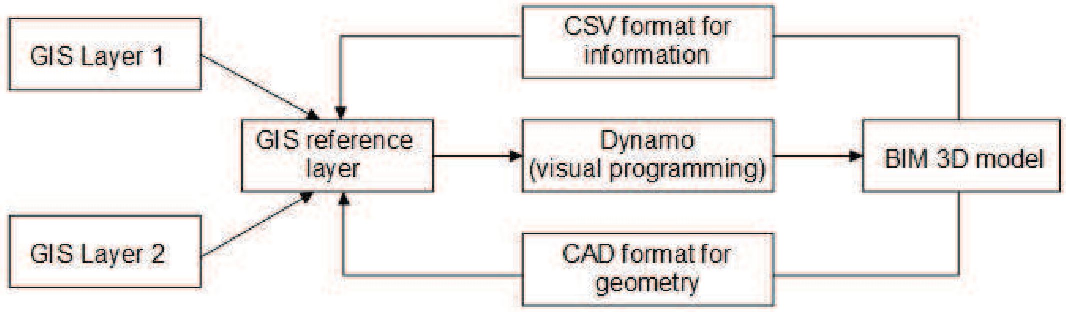

Fig. 6: A layout of the proposed workflow.

5 CONCLUSION

The procedure described above puts a direct connection between two major software, respectively QGIS and Revit. It is more oriented to data transmission from GIS to BIM than to the construction of a detailed BIM model, but limited to its purposes it is very accurate and perfectly replicable. In the coming months, within DATA project, further tests will be made to improve some passages and possibly to add new data related to the development of design scenarios and the creation of a communication platform.

The performed workflow is just a sample of what is possible to do to manage more efficiently multi-scale AEC operations4. Its range of applications is wide: it could be a support for implementing and updating a 3D digital building cadastre by public administrations, thus reducing data storage fragmentation; but it could also be used in a great number of urban transformation processes, each one of them would require specific and detailed data. For example, considering our area of interest, to enhance energy sustainability data about energy performance category of buildings may be collected, together with building orientation and climate data; for real estate management projects, a series of detailed social and economic data surveyed on field could be combined with a building-scale map of empty dwellings.

6 REFERENCES

BARBATO, D.: Il BIM e l'AR: strategie per la gestione del patrimonio edilizio. In: Linee di ricerca nell'area del disegno – 3 (ed. Carlevaris, L.), pp. 175-188, Ermes. Servizi Editoriali Integrati srl. Torino, 2015.

BILJECKI, F., STOTER, J., LEDOUX, H., ZLATANOVA, S., ÇÖLTEKIN, A.: Applications of 3D City Models: State of the Art Review. In:ISPRS International Journal of Geo-Inf.ormation, 4, pp. 2842-2889. 2015.

BUCK, N. T., WHILE, A.: Competitive urbanism and the limits to smart city innovation: The UK Future Cities initiative. In: Urban Studies, Vol. 54(2) 501–519. 2017.

DE MARCHI, M., SENGAR, B., FURZE, J. N.: Prospects for Sustainability in Human–Environment Patterns: Dynamic Management of Common Resources. In: Mathematical advances towards sustainable environmental systems (eds. FURZE, J. N., SWING, K., GUPTA, A. K., MCCLATCHEY, R., REYNOLDS, D.), pp. 319-347. Springer. 2016.

EL MEOUCHE, R., REZOUG, M., HIJAZI, I.: Integrating and managing BIM in GIS, software review. In: International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences, Volume XL-2/W2, ISPRS 8th 3DGeoInfo Conference & WG II/2 Workshop, 27-29 November 2013, pp. 31-34. Istanbul, 2013.

EL-MEKAWY, M.: Integrating BIM and GIS for 3D city modeling: the case of IFC and CityGML, TRITA SoM 2010-11, Stockholm. 2010.

EL-MEKAWY, M., ÖSTMAN, A., HIJAZI, I.: A Unified Building Model for 3D Urban GIS. In: ISPRS International Journal of Geo-Information, 1, pp. 120-145. 2012.

GLASMEIER, A., CHRISTOPHERSON, S.: Thinking about smart cities. In: Cambridge Journal of Regions, Economy and Society 8, pp. 3-12. 2015.

LIU, X., WANG, X., WRIGHT, G., Cheng, J. C. P., LI, X., LIU, R.: A State-of-the-Art Review on the Integration of Building Information Modeling (BIM) and Geographic Information System (GIS). In: ISPRS International Journal of Geo-Information 6, 53. 2017.

OSELLO, A., MOGLIA, G., DEL GIUDICE, M., BOIDO, C.: BIM e GIS per la metodologia DIMM(ER). In: Italian Survey and International Experience (eds. Giandebiaggi P., Vernizzi C). pp. 975-982, Gangemi Editore, Roma. 2014.

RAFIEE, A., DIAS, E., FRUIJTIER, S., SCHOLTEN, H.: From BIM to geo-analysis: view coverage and shadow analysis by BIM/GIS integration, Procedia Environmental Sciences 22, pp. 397-402. 2014.

ROLANDO, A., ORENI, D., SCANDIFFIO, A.: Basi di dati geografici e modelli per la rappresentazione della città e del territorio. Questioni metodologiche per l'uso di software GIS e BIM. In: Territori e frontiere della rappresentazione; XXXIX Convegno Internazionale dei Docenti delle Discipline della Rappresentazione, XIV Congresso della Unione Italiana per il Disegno, UID, pp. 1625-1630, Napoli. 2017.

SONG, Y., WANG, X., TAN, Y., WU, P., SUTRISNA, M., CHENG, J. C. P., HAMPSON, K.: Trends and Opportunities of BIM-GIS Integration in the Architecture, Engineering and Construction Industry: A Review from a Spatio-Temporal Statistical Perspective. In: ISPRS International Journal of Geo-Information 6, 397. 2017.

TAE-WOOK, K., SEUNG-HWA, P., CHANG-HEE, H.: BIM/GIS-based Data Integration Framework for Facility Management. In: GEOProcessing 2016: The Eighth International Conference on Advanced Geographic Information Systems, Applications, and Services, pp. 100-105. 2016.

Integration of PRA with GIS for Planning of PERI Urban Areas

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1 INTRODUCTION

Urbanization is a worldwide phenomenon, since mid 20th century both developed and developing countries across the world are experiencing rapid urban growth with or without adequate/ necessary infrastructure. Urban settlements are continuously growing in size all well as in numbers. Urban development at the dawn of the new millennium is characterized by fading structural boundaries and the outward shifting of urban gravitational centres incorporating a growing area of rural landscape; agriculture once the predominant space consuming and economic factor within rural-urban fringe is largely losing this position and today it mainly functions as reserve potential for urban expansion (Zsilincsar, 2003).

Cities are the hubs of opportunities of livelihood and prosperity. Urbanization across the world is the outcome of rapidly growing and expending cities to host influx of population. The increasing number of urban residents are a result of three developments; expansion of cities, where the growth of the cities is absorbing villages surrounding the cities, migration from rural to urban areas and high population growth in the cities themselves (Bakary, 2005). Increase in size of a city does not only mean expansion of city boundary, but also aggregation of urban infrastructure such as roads, airports, etc. This expansion often referred to as urban sprawl which has significant impacts on the environment. Nowadays urbanization is no longer typical for the growth of cities or towns only, but it influences the process in the rural countryside as well (Antrop, 2004). The real modification of landscapes is induced by elements of urbanization such as residential or industrial land development.

The areas outside the city boundary are characterized by intermittent and scattered demonstration of the city in some non-farm residences and estates with commuting patterns to the city. The rural – urban fringe is an area of mixed rural and urban population and land use which begins at a point where agricultural land uses appear near the city and extends up to a point where villages have distinct urban land uses or where some persons, at least, from the village community commute to the city daily for work or other purposes. The area beyond the city limits but contiguous to it, having other municipal towns, Census towns or fully urbanized villages, constitute so-called urban fringe, which is the part of the rural urban fringe zone (Ramachandran, 1989).These peripheral areas of the cites are known by various names viz. urban fringe, rural-urban fringe, dynamic edge outskirt, city edge, peri –urban, rural urban interface, etc.

Keywords: PRA, peri-urban, integration, GIS, planning

2 PERI URBAN AREAS AND ITS ASSOCIATED ASPECTS

Peri urban areas undergo constant change in landuse, the predominant landuse is agriculture with encroachments of residential and industrial estates (it is an area into which the city expands). The agricultural landholdings are small, intensive in nature, devoted to produce perishable commodities for the nearest urban markets. Peri-urban area has typical characteristics, contains both urban and rural features, more specifically speaking, it can be distinguished as an interface urban and rural ecosystems. Basically the areas undergo transition from rural ecosystem towards urban ecosystem. Conflicts between landuses are predominant characteristics of peri-urban regions. The agricultural lands are prime attraction to the builders who develop residential colonies in the rural-urban fringe. These areas experience inadequate social amenities and public utilities, environmental degradation due to haphazard/ uncontrolled settlement and infrastructure development, lack of interest to maintain environmental quality and to retain functional green areas - arable land, forests, recreational areas, etc. At the initial stage, development takes place without any forward development plan. These areas devoid of urban amenities like solid waste disposal as well as sewage disposal, here partially treated water and sewage waste are utilized for irrigation of agricultural land. Peri urban areas lack in clarity of planning and development jurisdiction and the rural-urban fringe is a problem area from the point of view of administration because nobody is responsible for the management of complex problems. Gradually it becomes zone of chaotic urbanization leading to sprawl. Peri-urban areas are outside formal urban boundaries and urban jurisdictions which are in a process of urbanization and which therefore progressively assume many of the characteristics of urban areas (Oloto, and Adebayo, 2010). Planning for Peri urban areas is tough challenge to the urban planners.

Planning and management of peri-urban areas is governed by the dynamics of rural hinterland, regional perspectives and city planning approaches. The local tradition practice influences the evaluation of each factor. Population size, population density in built-up areas, infrastructural characteristics, administrative boundaries and predominant economic activities are the main variables conventionally used to distinguish rural from urban (Tacoli and Cecilia 1998). The characteristics of peri –urban area is summarized as below:

(a) Dynamic mosaic of rural and urban ecosystems:

Peri urban areas are characterized by dynamic mosaic of 'natural ecosystem' primarily engaged in agricultural activity and 'urban" ecosystem' recently developed to fulfill the demand of expanding urban area. This area undergoes constant change with respect to its use. For instance, the agricultural lands, open spaces, areas under vegetation covers get converted to residential, commercial, industrial infrastructural landuses, etc. The development of this area is need based and governed by the demand of urban expansion. Mostly the conversion of landuse happens haphazardly and unplanned manner become the habitat of lower income groups,. Generally, development takes placed without considering the factors like environmental sensitivity, traditional practices, physiographic characteristics etc.

(b) Changing social structures

The Peri urban areas experience constant but irregular process of urbanization. As an outcome of this the social composition of peri-urban systems is highly heterogeneous and subjected to alteration over time. Small farmers, informal settlers, industrial entrepreneurs and urban middle-class commuters use to co-exist in the same territory with different and often competing interests, practices and perceptions. This areas used to attract rural to urban migrants. Planning and management for this heterogeneous, social composition need people participation in decision making process.

(c) Institutional landscape

The peri-urban area experiences congregating of sectoral and overlapping institutions with varied spatial and physical responsibilities. It is subjected to the change of geographical location and physical structure of Peri urban area. Private sector institutions, nongovernmental and community-based organizations intervene in the management of peri-urban areas in isolated manner sometimes without clear articulation or leadership from government structures. In some cases, Peri-urban areas contain territory of multiple administrative unit. Weak inter sectoral linkage with limited power in sectors like water supply, energy, waste management, transportation, etc create chaotic urban development susceptible to natural and man-made disasters . There is a need for integration of people participation/ tradition practice with the modern technology based planning for Peri urban areas.

3 PERI URBAN AREA – INDIAN PERSPECTIVE

In our country both number of cities and its geographical area are continuously progressing. During year 1951, the country had only five cities with population of more than one million, according to 2011 census of India the number has increased to 53 and it is estimated that, it will be 70 cities by 2031. Similarly, in the year 2011 there are three cities in the country having population more than 10 million populations and it is estimated that this number will become six by 2031. Indian cities are experiencing both horizontal and vertical expansion. The growth of cities beyond its administrative limits became more familiar and challenging task for planners and urban administration. The development of fringe areas becomes a practice than being only a theory. Its genesis is influenced by various factors related to physical and socio-economic aspects which ultimately encroaches into the natural resources existing around major cities. The driving forces for genesis of peri urban areas are socio-economic, political, technological, institutional, natural and cultural. The factors like increasing land value, congestion, desire to own land, inadequate infrastructure facility, population growth in cities, deterioration of living conditions, desire to own a house, availability of communication facilities and higher transport accessibility outside the city and community or friends influence encourage the development of peri-urban areas.

3.1 Urban growth and development of Peri urban areas

During year 1991 the urban population of India was 217 million (27.5 per cent) and it became 377 million (31.16 per cent) in 2011. About 43 per cent of population live in cities or urban agglomerations with a population more than 1 million, the number of these cities has also increased from 35 in 2001 to 53 in 2011. Out of 53 urban agglomerations, the three largest urban agglomerations or megacities (with a population of more than 10 million) are Greater Mumbai urban agglomeration (18.4 million), Delhi urban agglomeration (16.3 million) and Kolkata urban agglomeration (14.1 million). These urban agglomerations are followed by Chennai urban agglomeration (8.7 million) and Bangalore urban agglomeration (8.5 million). During the first decade of the economic reforms there was substantial growth in the population of megacities but this has slowed considerably in the period 2001–11 (Government of India , 2011a).The remainder of the 57 per cent of the urban population in India resides in the growing peripheries of the cities in ‘statutory towns’ and ‘census towns’. Statutory towns are towns with municipalities or corporations, whereas census towns are agglomerations that grow in peripheries of big cities and rural areas and do not have effective urban governance structures or requisite urban infrastructure such as safe drinking water supply, waste disposal facility, sanitation, roads etc. The number of statutory and census towns in India increased from 5,161 in 2001 to as many as 7,935 in 2011 with a population of 215 million.

The transformation of agriculture land is inevitable with urbanization. The process of lanuse transformation includes and acquisition for industrial, commercial, real-estate and infrastructure development; land acquisition for the creation of special economic zones (SEZs); and selling of agriculture land by farmers for the construction of houses by individual owners. The distress in agriculture – manifest in low incomes and unemployment caused by the economic reforms – has resulted in some increase in rural to urban migration (Kundu, 1997; Mitra and Murayama, 2008). Alongside diminishing prospects in agriculture there are also other factors such as droughts, difficult working conditions and growing debt, which contribute to rural-urban migration (Krishna et al., 2014).

Urbanization of former villages and the reclassification of rural areas, following the extension of cities' boundaries, have been significant components of urban growth in 2001–11 (Bhagat, 2011). The intrusion of cities in to the rural hinterland generates complex condition where urban and rural activities and or institutions are juxtaposed. The migrants from rural to urban areas primarily settles in the slums, unauthorised colonies and villages of Peri urban areas devoid of basic amenities like water, sanitation or health, resulting in severe public health problems. Studies documenting the process of urbanisation and its impact on the lives of the people and the water bodies in the peri-urban areas of Gurgaon and Hyderabad in India also show how water security, which was earlier ensured by numerous water bodies in and around cities, has been under threat by landuse changes, land grabbing, and environmentally negligent development focused on growth through unsustainable means (Prakash et al., 2011). For those peri-urban communities still involved in smallholder farming this often involves reliance on recycled wastewater which is becoming increasingly contaminated, as traditional village ponds which were recharged by rainwater disappear in the development process, and other water sources become less accessible (Amerasinghe et al., 2013; Marshall et al., 2010).

During 12th Five Year plan Government of India has given special attention to Peri Urban areas. During this plan under Rajeev Awas Yojana (or RAY, a social welfare programme to provide housing for the urban poor) initiatives are taken to provide affordable housing for the urban poor in the peri urban areas. Further, the Town and Country Planning Office (TCPO) of the Ministry of Urban Development also suggests to conserve agricultural land , to protect of forest and water resources judiciously for the development of this transitional zone. However, despite some formal recognition at this level, peri-urban areas have largely been neglected in policy and practice.

3.2 Urban planning Initiatives in India

The Government of India (GoI) has taken various initiatives such as National Commission on Urbanization, 74th Constitutional Amendment Act, Urban Development Plan Formulation and Implementation Guidelines, Jawaharlal Nehru National Urban Renewal Mission, National Urban Information System, Rajiv Awas Yojana, National GIS, Smart City, Swachh Bharat, Atal Mission for Rejuvenation and Urban Transformation, etc.

During early1980s National Commission on Urbanization under the Chairmanship of Charles Correa was appoint by GOI to analyze the state of urbanization with reference to the demographic, economic, infrastructural, environmental, physical, shelter, energy, communication, land, poverty, aesthetic and cultural aspects and to identify priority action areas and it had also made projections of future needs and estimated the available resources. The commission prepared basic guidelines for the specific action plan in priority areas along with policy frames and suggestion of basic approaches for the encouragement of manageable urbanization and also the methods of creating networks of interactions as an ongoing process among government, academic and research institutions and citizen groups. The recommendations of the Commission had not been finalized and yet to be implemented as policy.

To keep this economic transformation in tune with needs and requirements at the grass-root level, it is essential that the people and their representatives participate actively in the planning and implementation of the programmes at local level. The Constitution (Seventy Forth Amendment) Act, 1992 has introduced a new part namely, Part IXA in the Constitution, which deals with the issues relating to municipalities. The main provisions introduced by Act are constitution of municipalities, composition of municipalities, composition of ward committee, duration of municipalities, etc. This amendment has provided a constitutional form to the structure and mandate of local bodies. It has made urban local bodies to perform as democratic and self governing institution at grassroot level.

Since 1996, due to rapid growth of population and reasons like globalization and liberalization, the towns and cities have become more dynamic in nature. Urban areas are subjected to challenges in terms of requirements of infrastructure and other basic services and amenities. The Urban Development Plan Formulation and Implementation (UDPFI) Guidelines have been framed to incorporate the provisions of the various legal and policy/ guidelines of the respective Ministries and departments, best practices of the States as examples and the planning system in vogue. An interrelationship between them is proposed for a sustainable urban and regional development.

Jawaharlal Nehru National Urban Renewal Mission(JnNURM) was launched in 2005 to encourage cities to commence steps for bringing phased improvements in their civic service levels. The mission of JnNURM was to development in the context of urban conglomerates focusing to the Indian cities. JnNURM aims at creating ‘economically productive, efficient, equitable and responsive Cities’ by a strategy of upgrading the social and economic infrastructure in cities, provision of Basic Services to Urban Poor and wide-ranging urban sector reforms to strengthen municipal governance in accordance with the 74th Constitutional Amendment Act, 1992.

National Urban Information System (NUIS) initiated by Ministry of Urban Development (MoUD) in 2006 for creation of multi-scale (1:10,000, 1:2000, 1:1000) hierarchical urban geospatial database on thematic content using satellite, aerial and GPR techniques. It generated GIS based maps for preparation of Master Plan for selected cities.

Rajiv Awas Yojana (RAY) The scheme was launched in 2009 as a continuation of JnNURM. It envisages a “Slum Free India" with inclusive and equitable cities where every citizen has access to basic civic infrastructure and social amenities and decent shelter.

Ministry of Urban Development during 2015 has launched the Smart city mission transformation with the objective to support cities to enable them to offer core infrastructure and provide a decent quality of life to its citizens along with a clean and sustainable environment and application of ‘Smart’ Solutions. The aim is to achieve sustainable and inclusive development. The mission aims to develop a replicable model which will act like a light house to other aspiring cities.

During 2015 the Ministry of Urban Development has launched Atal Mission for Rejuvenation and Urban Transformation (AMRUT) with the aim to formulate GIS-based Master Plan for selected AMRUT cities. The geospatial technologies is used for formulate a master plan for decision-making, effective land use management and utilization, spatial growth management, enable project planning and urban management.

4 PLANNING FOR PERI URBAN AREAS

With the growth and expansion of a city, gradually the peri-urban areas become the part of cities and the development of new Peri- urban areas take place. These are dynamic zones with chaotic urbanization leading to sprawl. The expansion of urban areas is steadily advancing leading to engulfing of adjacent rural areas and other urban centres to form corridors. These changes have far reaching implications to environment and social well-being of the population and pose a challenge to sustainable urban development. These areas witness inadequacy of infrastructure facility. To keep pace with economic development these areas undergo environmental stress. Moreover, there is lack of identity and proper planning and management across all sectors of governance, finance and infrastructure delivery for this area. As these areas have enormous potential to accommodate urban development, therefore, these is need to understand of the challenges and opportunities of Peri-urban areas . Planning for resilient Peri urban areas should consider socio economic condition, environmental quality, infrastructure facility, disaster management, etc. aspects along with the existing physical environment and indigenous cultural landscape of Peri urban areas.

4.1 The issues and needs of planning of Peri – urban areas

In India the socio-economic development of Peri-urban is governed by population growth in cities caused by migration, deterioration of living conditions in the cities, the desire to own a house, availability of communication facilities and higher transport accessibility outside the city and community or friends influence. The issues related to peri urban areas are as follows:

(a) Lack in clarity of planning and development jurisdiction - Peri-urban areas lack in clarity of planning and development jurisdiction. Its issues are multi facets in nature.

(b) Absence of responsible administrative body The basic issues of development of Peri –urban areas lies in the absence of responsible administrative body for planning and development. Peri urban areas are characterized by multiple transformations like physical, morphological, socio-demographic, cultural, economic and functional, hence it experiences conflicting land uses, juxtaposition of rural and urban activities, lack of environmental consideration in development, inadequate infrastructure, degradation of environmental quality and susceptible to natural and man-made disaster.

(c) Dynamic chaotic development pattern - The landuse is originally agricultural and arable land is devoted to produce perishable commodities (e.g. vegetables, fruits, flowers and dairy products). With the expansion of urban territory, haphazard and unplanned encroachment of residential and industrial estates takes placed in agricultural and open spaces.

(d) Inadequate infrastructure facility - The social amenities and public utilities are inadequate and irregularly spaced in this areas . Peri urban areas are cheap destination for the urban poor, rural to urban migrants, unskilled labors and distress agricultural workers. Low affordability of the dwellers along with regular addition of population without planning intervention leads to inadequate infrastructure facility.

(e) Degradation of environmental quality: This area experiences constant change in landuse. The environmental impacts of development are not taken into consideration. All these leads to uncontrolled settlement and infrastructure development, lack of interest or attention to retain green areas, arable land, forests, recreational areas, etc. As a consequent of this, there is no forward development planning and control on landuse change. Degradation of environmental quality is the outcome of limited urban management, inappropriate phasing of development, nonexistence of integrated conversion of agricultural and forest lands to urban land use and informal holdings. All these leads to deforestation, depletion of natural resources. Moreover, Peri urban areas, not only receive solid waste from the core city but its own generated waste also is not managed.

(f) Crisis of natural resources: The development of Peri urban areas is need based. It has potential to accommodate the future development of the city. It is generally observed that the initial development takes place adjacent to the city boundary and gradually it spreads outwards and captures surrounding areas without conserving the surface water resources, natural vegetation etc. Previously in many urban fringe areas, development used to take place on the wet land (after filling them), nowadays most of these towns are facing water scarcity. Unplanned extraction of groundwater is also depleting the ground water table.

(g) Susceptible to disaster: With the growth of cities it occupy surrounding hinterland in different forms, such as in radial sprawl, ribbon sprawl, leap frog sprawl ,. The physiographical feature like watershed boundary , low lying areas, flood plain areas etc are not taken into consideration. Sometimes these leads to urban flood.

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4.2 Planning for Peri urban areas

Government of India has taken various schemes ad programmes for urban planning, management, development and improvement for cities. But except Rajeev Aawas Yojana hardly any initiatives are taken for peri urban areas. Urban development efforts are limited within the city boundary. Even for AMRUT and NUIS programmes GIS based data are being generated for the cities only. For sustainable development of the Peri urban areas, GIS based data for the Peri urban areas are urgently needed.

4.2.1 GIS as a tool for Peri Urban Planning

Remote sensing offers updated time series data for urban land use/land cover mapping and environmental monitoring.. The modern technology of remote sensing helps to collect physical data rather easily with speedy and on repetitive manner , GIS is a tool to analyze the spatial data and capable to generate numerous options for future planning, identification of potential areas etc. Therefore, remote sensing and GIS technologies together are now providing tools for advanced ecosystem management and projection of urban growth and its potential impacts.

GIS has the capacity to analyze the information quantitatively and capable to provide best possible option. It can not incorporate aspects related people participation. As the Peri urban areas are indigenously belong to the rural people, therefore, Participatory Rapid Appraisal (PRA) along with GIS will offer the best possible option for planning for Peri-urban areas.

4.2.2 PRA as a tool for Peri Urban Planning

The objective of PRA is to include the knowledge and opinions of rural people in the planning and management of development projects and programmes. PRA is not only used for collection of information by also it involves the community in plan preparation process. It include qualitative aspects of information. It gives the answer of how and why. For instance, in India there are various indigenous technologies which are being used for water harvesting. With urbanization these techniques are now extinct and the cities are facing scarcity of water. If potential water harvesting areas along with techniques are marked on the GIS based maps, then the integration of qualitative and quantitative information will be able to solve the basic infrastructure problem of Peri urban areas.

5 CONCLUSION

Peri-urban areas lack in clarity of planning and development jurisdiction. Its issues are multi facets in nature. The landuse is originally agricultural and arable land is devoted to produce perishable commodities (e.g. vegetables, fruits, flowers and dairy products). With the expansion of urban territory, haphazard and unplanned encroachment of residential and industrial estates takes placed in agricultural and open spaces. The social amenities and public utilities are inadequate and irregularly spaced. This area experiences constant change in land use. The environmental impact of development is not taken into consideration. All these leads to uncontrolled settlement and infrastructure development, lack of interest or attention to retain green areas, arable land, forests, recreational areas, etc. As a consequent of this, there is no forward development planning and control on landuse change. The basic issues of development of Peri –urban areas lies in the absence of responsible administrative body for planning and development.

Development of peri-urban areas without considering environment aspects, local natural resources and tradition practice leads to chaotic urbanization. The sustainable development of peri urban area needs resource mapping in combination with local traditional practice. The modern technologies like remote sensing and geographical information system (GIS) allow us to collect physical data rather easily with speed and on repetitive basis, GIS helps to analyze the data spatially with various options of modeling and other planning processes. Participatory Rural Appraisal (PRA) aims to incorporate the knowledge and opinions of rural people in the planning and management of development projects and programmes, The integration of PRA with GIS will help the planners to prepare the plan where both traditional knowledge and modern technology are used to prepare development plan. In this paper attempts are made to understand the characteristics and issues associated with peri-urban areas and how both traditional and modern techniques can be used to prepare sustainable development plan for Peri-urban areas..

Schemes like PURA (Providing Urban Amenities in Rural Areas) aims to provide urban amenities and livelihood opportunities in rural areas to bridge the rural-urban divide, thereby reducing migration from rural to urban areas. This scheme has the scope to integrate PRA with GIS for planning of the peri urban areas.

6 REFERENCES

1. Amerasinghe, P et al. (2013) Urban wastewater and agricultural reuse challenges in India. International Water Management Institute (IWMI). https://cgspace.cgiar.org/ handle/10568/39932
2. Antrop M. (2004). Landscape change and the urbanization process in Europe. Landscape and urban planning, (67), 9-26 University of Ghent, Belgium.
3. Ashraf T.M, Deway R.W et al (1994). Remote sensing and image interpretation: 4th edition. Wiley & Sons.
4. Bakary K. (2005). The rural-urban environment linkage: Integrating the Brown and Green environment agendas in urban-rural linkage approach to sustainable development, UN HABITAT.
5. Bhagat, RB (2011) Emerging pattern of urbanisation in India. Economic and Political Weekly 46(34): 10–12. http://tinyurl.com/bhagat-rb-2011
6. Krishna, A et al. (2014) Slum types and adaptation strategies: identifying policy-relevant differences in Bangalore. Environment and Urbanization 26(2): 568–585. http://journals.sagepub.com/doi/ abs/10.1177/0956247814537958
7. Kundu, A (1997) Trends and structure of employment in the 1990s: implication for urban growth. Economic and Political Weekly 32(4): 1,399–1,405
8. Luck, M. and J. G. Wu. (2002). A gradient analysis of the landscape pattern of urbanization in the Phoenix metropolitan area of USA. Landscape Ecology 17(4):327-339
9. Oloto, E.N. and Adebayo, A.K (2010). The new Lagos- challenges facing the peri-urban areas and its relationship with its city centre, Planning of suburbs, third theme, Lagos, Nigeria
10. Prakash, a et al. (2011) Changing waterscape in the periphery: understanding peri-urban water security in urbanizing India. oxford University Press. www.idfc.com/ pdf/report/2011/Chp-11-Changing-Waterscapes-in-thePeriphery.pdf
11. Ramachandran, R. (1989). Urbanization and urban systems in India, Delhi: Oxford University Press.
12. Rees, William E (1992), “Ecological footprints and appropriated carrying capacity: what urban economics leaves out”, Environment and UrbanizationVol 4, No 2, pages 121–130
13. Tacoli, Cecilia (1998), “Rural–urban interactions; a guide to the literature”, Environment and Urbanization Vol 10, No 1, pages 147–166.
14. TCPO (2014) Towards responsive urban and regional planning. Town and Country Planning organisation, Ministry of Urban Development, government of India.
15. UN (2012). Africa and Asia to lead urban population growth in next 40 years. UN news centre
16. Zsilincsar, W (2003)’ the rural urban fringe: Actual problems and further perspectives”. Geografshi Vestnik 75(1): 41-58

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Integrativer Ausbau der Bahninfrastruktur im Städtebau

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1 ABSTRACT

Bahntrassen innerhalb von städtischen Gebieten eine andere Vorgangsweise notwendig wäre, um auf alle aus heutiger fachlicher Sicht relevanten Aspekte einer Stadtentwicklung ausreichend eingehen zu können. Diese Kritik resultiert aus der Situation, dass in Verbindung mit einem Neubau/Ausbau einer Bahntrasse auch eine Überprüfung deren räumliche Integration überprüft und in Verbindung mit neuen städtebaulichen Optionen oder Anforderungen verbessert werden sollte.

Vor allem die Umweltgesetzgebung fokusiert die Prüfung der Akzeptanz einer Bahntrasse auf alle relevanten Schutzgüter, läßt aber dabei eine räumliche Begutachtung – über „Landschaft“ hinausgehend – nicht zu. Die gesetzlich vorgegebene Betrachtung des Menschen ist auf dessen medizinische Sensibilität orientiert, nicht aber auf funktionelle Bezüge beiderseits der Trasse, die nur über einen umfassenderen Betrachtungsansatz gewährleistet wären.

Der Beitrag thematisiert diese Themenstellung anhand von Praxisbeispeielen und formuliert entsprechende Vorschläge für eine integrativ orientierte Planung und Umsetzung.

Keywords: Umweltverträglichkeit, Integration im Städtebau, Beteiligungen, Bahnausbau, Planungsschritte

2 AUSGANGSLAGE

2.1 Hochrangiger Infrastrukturausbau als Zielsetzung

Problemstellung: Beim Ausbau und der Modernisierung der wesentlichen Bahn-Infrastruktur zur Sicherung zukunftsweisender Nah- und Fernverkehrstrassen und auch S-Bahntrassen im Stadtgebiet (z.B. Wien) sowie in der Ballungsrandzone (z.B. Zentralraum Linz) müssen Trassenabschnitte umweltgerecht ausgebaut werden. Mit der Orientierung der Bahn auf Emissionsminderung werden die Trassen-Korridore entsprechend den Anforderungen des UVP-G 2000 (u.a. Lärm-/Erschütterungsschutz, etc.) optimiert, aber die Qualität der durchquerten städtebaulichen Strukturen werden oft erheblich beeinträchtigt. Die teilweise bereits bestehenden trassenbedingten Beeinträchtigungen werden durch hohe Lärmschutzwände und gestalterische Kompensationsmaßnahmen nur teilweise aufgehoben, die bereits begrenzten Entwicklungschancen der benachbarten Siedlungsgebiete bleiben aber zusätzlich beeinträchtigt. Integrativ orientierte Lösungen sind bei einem auf die Zukunft orientierten Trassenausbau innerhalb der Siedlungsgebiete erforderlich, die in die rechtliche Situation (z.B. Bahn als Maßnahmenträger, Gemeinden/Städte und die Region als Beteiligte), die Planungs- und Kostenträgerschaft, die Beteiligtenprozesse und in die Planungspraxis eingreifen.

Hochrangiger Infrastrukturausbau hat in städtischen Gebieten – wie auch natürlich generell – mehrere wesentliche Aufgaben zu erfüllen die auf die Einhaltung der gesetzlich vorgegebenen Umweltziele geplant, geprüft und umgesetzt werden müssen:

- Als zentrale Vorgabe für einen Ausbau einer Hochleistungs-Bahn-Trasse (HL-Bahn) sind die Erhöhung der Ausbaugeschwindigkeit und der Transportleistung zu sehen – als wesentliche Zielsetzung für den Fernverkehr gemäß EU-Vorgabe und auch als Genehmigungskriterium.
- Parallel zum HL-Ausbau ist vielfach auch eine Verbesserung der lokalen/regionalen Versorgung im ÖPV angestrebt – wobei dies v.a. durch die Haltestellenwahl in Siedlungsnähe angestrebt wird.
- Voraussetzung und Begleitung dieser Zielsetzung ist die Optimierung des Eisenbahnbetriebes (v.a. Geschwindigkeit, Frequenz, Sicherheit) unter Berücksichtigung der Eisenbahntechnischen Vorgaben
- Daraus resultiert eine Anpassung des Gleiskörpers – fallweise mit einer Trassenverbreiterung (Zulegung von zwei weiteren Gleispaaren für den Regionalverkehr) aufgrund der geschwindigkeitsbedingten der größeren Kurvenradien.
- Problematisch kann dies sein bei einem zu engen Trassenkorridor, wenn dessen Verbreiterung oder Verschwenkung aus Mangel an verfügbarer Fläche nur durch Inanspruchnahme von angrenzenden (privaten) Flächen möglich ist. Bei der eventuell erforderlichen Konzentration des Trassenausbaues

auf einen engeren Trassenkorridor entstehen erhebliche Probleme für die angrenzenden Siedlungsbereiche (v.a. zu knappe Abstandsflächen, visuelle und gestalterische Beeinträchtigungen, Lärm und Erschütterung).

- Zusätzlich ist die Niveaulage zu beachten, die insbesondere für HL-Trassen nur Steigungen im 0/00-Bereich erlaubt.
- Aus Gründen der Sicherheit sind bestehende Querungen/Kreuzungen aufzulösen – damit werden bestehende funktioneller Verbindungen von Siedlungsbereichen natürlich unterbrochen.
- Vorrang hat beim Ausbau die Erhöhung des Lärmschutzes, wobei dieser weniger aufgrund der Personenzüge als vielmehr wegen der lärmintensiveren Güterzüge erforderlich ist.
- Die aufgrund der erforderlichen Trassenanpassungen entstehenden Gelände- und Raumveränderungen können nur durch eine dem Trassenraum angepasste Landschaftsgestaltung kompensiert werden.
- Diese Begleitmaßnahmen bezüglich des Orts- und Landschaftsbildes haben allerdings vielfach nur eine kalmierende Funktion – der trassenabhängige Eingriff wird damit visuell verringert.

Nicht unwesentlich für die aktuelle Problemstellung ist allerdings die rechtliche Ausgangssituation, die aufgrund der Anforderungen des UVP-Gesetzes (§ 1 „Aufgabe der UVP“) die Konzentration der Projektwerberin auf die Trassenoptimierung, die weitestgehende Planung auf den eigenen Grundstücken (Trassenkorridor) sowie die Beantwortung der Frage hinsichtlich der Auswirkungen des (konkreten) Projektes auf den Menschen verlangt, wobei natürlich der Dialog mit der betroffenen Öffentlichkeit einzuhalten ist (Zitat):

Es sind

(1) „die unmittelbaren und mittelbaren Auswirkungen festzustellen, zu beschreiben und zu bewerten, die ein Vorhaben

(a) auf Menschen, Tiere, Pflanzen und deren Lebensräume,

(b) auf Boden, Wasser, Luft und Klima,

(c) auf die Landschaft und

(d) auf Sach- und Kulturgüter

hat oder haben kann, wobei Wechselwirkungen mehrerer Auswirkungen untereinander miteinzubeziehen sind,

(2) Maßnahmen zu prüfen, durch die schädliche, belästigende oder belastende Auswirkungen des Vorhabens auf die Umwelt verhindert oder verringert oder günstige Auswirkungen des Vorhabens vergrößert werden,

(3) die Vor- und Nachteile der vom Projektwerber/von der Projektwerberin geprüften Alternativen sowie die umweltrelevanten Vor- und Nachteile des Unterbleibens des Vorhabens darzulegen und

(4) bei Vorhaben, für die gesetzlich die Möglichkeit einer Enteignung oder eines Eingriffs in private Rechte vorgesehen ist, die umweltrelevanten Vor- und Nachteile der vom Projektwerber/von der Projektwerberin geprüften Standort- oder Trassenvarianten darzulegen.“

Es fällt auf, dass die Begriffe „Stadtraum“ und „Siedlungsraum“ konkret nicht genannt werden sondern – neben der raumbildenden „Landschaft“ muss der „Mensch“ betrachtet werden, inwieweit dieser durch schädliche Auswirkungen berührt wird. Natürlich sind Maßnahmen zur Verhinderung oder Verringerung dieser Effekte darzustellen sowie günstige Auswirkungen, diese Betrachtung bleibt aber immer auf das konkrete Bahn-Projekt begrenzt. Sofern damit eine generelle Umweltverträglichkeit nachgewiesen werden kann (aber nicht die beste unter allen denkbaren Varianten oder Alternativen), kann das geprüfte Projekt genehmigt werden. Umfassende Lösungen im Sinne eines Stadtumbaues im Trassenkorridor können im Rahmen der Planung für eine Umweltverträglichkeitserklärung (UVE) damit nicht gefordert werden – womit die ungünstige Abgrenzung der Trasse und deren Wirkungen gegen den umgebenden Siedlungsraum ohne dessen strukturelle und funktionelle Einbeziehung ersichtlich wird.

Die Betrachtung des die Trasse umgebenden Raumes – und damit die Wirkungen auf den Siedlungsraum bzw. die städtebauliche Struktur – bleibt allerdings den Sachverständigen für die Prüfung der UVE in

Hinblick auf die Einhaltung der Schutzgüter vorbehalten. Für diese besteht die Notwendigkeit einer erweiterten Betrachtung, die allerdings in diesem späten Stadium der Prüfung eventueller Wirkungen auf den Raum durch die Eingrenzung auf den konkreten Projektantrag erheblich begrenzt wird. Eine entsprechende Anforderung an die Sachverständigen ist gleichfalls im UVP-Gesetz 2000 enthalten in § 12 „Umweltverträglichkeitsgutachten" Abs. 3 Pkt 5:

„Das Umweltverträglichkeitsgutachten hat fachliche Aussagen zu den zu erwartenden Auswirkungen des Vorhabens auf die Entwicklung des Raumes unter Berücksichtigung öffentlicher Konzepte und Pläne und im Hinblick auf eine nachhaltige Nutzung von Ressourcen zu enthalten."

Nachteilig ist dabei allerdings, dass diese Prüfung der Wirkungen letztlich auch nur auf den bereits in der UVE abgegrenzten und behandelten Siedlungsraum eingehen kann. Wenn dabei festgestellt wird, dass keine negativen Auswirkungen (v.a. Lärm, Erschütterung) durch die neue Bahntrasse zu erwarten sind und diese durch Begleitmaßnahmen ausreichend minimiert werden können (aktiver und passiver Lärmschutz, begleitende Landschaftsgestaltung mit ökologisch relevanten Maßnahmen), wird eine umfassende Betrachtung des Siedlungsraumes nicht erforderlich. Entscheidend für die Bestätigung der „ausreichenden" Maßnahmen sind einerseits die Einhaltung von gesetzlichen und normativen Vorgaben (gemäß Stand der Technik) und die andererseits fachliche Beurteilung der Sachverständigen.

3 TRASSENAUSBAU VERSUS STADTUMBAU/-ENTWICKLUNG

Die aufgrund der gesetzlichen Vorgaben erforderliche Trassenplanung versucht, unter Beachtung plausibler Schutz- und Ausgleichsmaßnahmen die aktuell bestehenden Trassenkorridore den künftigen Anforderungen anzupassen. Anhand von zwei Vorhaben wird aufgezeigt, welche Lösungen zur Sicherung einer gesetzlich definierten Umweltverträglichkeit konzipiert werden und einer Genehmigung gemäß den Bestimmungen des UVP-G 2000 zugeführt werden sollen. Ein integrativ orientierter Stadtumbau bzw. eine städtebaulich integrierte Trassenplanung kann dabei natürlich nicht zur Diskussion stehen.

3.1 Westbahntrasse im Raum Leonding

Die im Rahmen der UVP geprüfte und als umweltverträglich beurteilte Trassenplanung sieht vor, innerhalb des bestehenden Trassenkorridors den Ausbau der HL-Trasse umzusetzen. Nur in wenigen Teilabschnitten werden geringe Teile der angrenzenden Flächen – in Privatbesitz oder öffentliche Flächen – für den erforderlichen Ausbau, für die Anpassung an neue Kurvenradien oder die parallel vorgesehen zusätzlichen Gleise für den Regionalverkehr benötigt. Die geplanten Trassen bleiben mehrheitlich somit auf Bahngrund und werden in annähernd gleicher Niveaulage neu erstellt. Zur Minderung negativer Wirkungen werden einerseits begleitende Lärmschutzwände errichtet (bis zu 6 m Höhe gegenüber angrenzender Wohnbebauung oder öffentlichen sensiblen Einrichtungen) und andererseits zur Minderung von Erschütterungen – sofern erforderlich – mit einem dämpfenden Unterbau versehen.

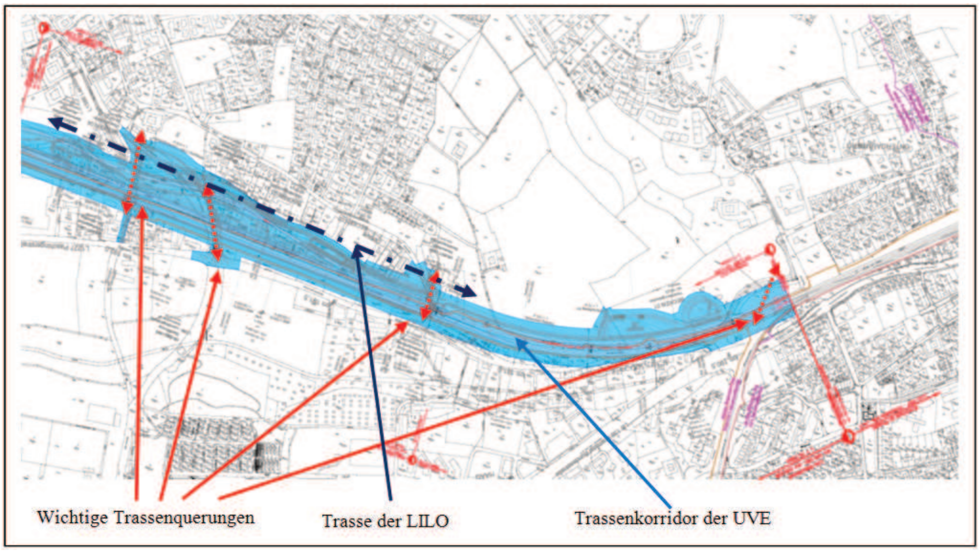

Fig. 1: Gesamter Planungsraum incl. Trassenplanung für den Ausbau der HL-Trasse im Raum Leonding (UVE/Stand 2015)

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Für wesentliche landschaftsgestalterische Maßnahmen stehen in diesem Trassenabschnitt relativ wenige Flächen zur Verfügung, mehrheitlich wird versucht, mit Bepflanzung den Gleiskörper oder die Lärmschutzwände abzuschirmen.

Fig. 2: Flächenwidmung im Raum Leonding und Betrachtungsraum (UVE/Stand 2015)

Zusätzlich erschwerend für eine umfassende Gestaltung sind:

- trassenquerende Straßen und Geh-/Radwege,
- die Trasse der teilweise parallel geführten Linzer-Lokalbahn/"LILO" (neu ausgebaut vom Linzer Hauptbahnhof nach Eferding erst im letzten Jahrzehnt)
- die Anbindung der Pyhrnbahn, die von der Westbahn gegen Süden abzweigt und natürlich
- teilweise unmittelbar angrenzend an den Bahnkorridor bestehende private Nutzungen (Wohnbebauung, landwirtschaftliche Betriebe, Gewerbeeinrichtungen etc.).

Anhand der Abbildungen werden die wesentlichen Details der Planung verdeutlicht, der im Rahmen der UVP betrachtete trassenbezogene Wirkungsraum sowie der aus fachlicher Sicht eigentlich insgesamt zu behandelnde Planungsraum für die Suche nach einer umfassenden – integrierten – Ausbauplanung und Stadtentwicklung.

Der in der Abbildung dargestellte Planungsraum umfasst den zumindest in eine städtebauliche Planung einzubeziehende städtischen Siedlungsraum, der sich sehr heterogen erweist: Neben mehrheitlich dem Wohnen vorbehaltenen Siedlungsgebieten befinden sich neben der Bahntrasse Gewerbe und Industrie, öffentliche Einrichtungen sowie vor allem auch noch landwirtschaftlich bewirtschaftete Bereiche. Auch wenn für diese derzeit in der Flächenwidmung keine bauliche Nutzung vorgesehen ist, in eine langfristig orientierte Entwicklungsplanung sind diese Flächen aber einzubeziehen.

Anhand der beiden Abbildungen – gesamter Planungsraum mit Trassenkorridor sowie Flächenwidmungsplan – wird erkennbar, dass die bestehende Trasse nur bei wenigen Abschnitten eine Querung und damit funktionelle Verbindung zulässt. Vor allem in Bereichen mit beiderseits der Trasse bestehenden oder geplanten Wohngebieten bzw. Nutzungen mit hoher kommunaler Bedeutung stellen die fehlenden Trassenquerungen ein erhebliches Defizit dar.

Die im Rahmen der UVP fachlich allenfalls umweltverträglich beurteilte Einhausung mit Beibehaltung der Niveaulage stellt für die Stadt Leonding keine befriedigende Lösung dar. Die wesentlichen Kompensationsmaßnahmen für die Reduktion von Lärmbelastungen (Lärmschutzwände) würden den bestehenden Trennungseffekt erheblich verstärken. Der zusätzlich erforderliche aktive und passiver Lärmschutz (u. a. mit speziellen Fenstern) und die vorgesehenen landschaftsgestalterischen Begleitmaßnahmen würden den Eindruck eines durch eine bedeutende Verkehrsinfrastruktur geprägten Stadtraumes verstärken.

Eine nachhaltige städtebauliche Lösung wäre die Tieferlegung und Überplattung der Trasse in Verbindung mit einer trassennahen Neukonzeption des Siedlungsraumes, ähnlich der Überdeckung dem Autobahnzubringer in Linz "Am Bindermichl", mit der eine funktionelle Verbindung bisher getrennter Siedlungsbereiche ermöglicht wurde. Natürlich würde in Leonding eine tiefgreifende Neukonzeption aller Verkehrstrassen, Querungen und begleitender/abzweigender Bahntrassen sowie technischer Infrastruktur erforderlich werden, womit der Anspruch einer umfassenden Planung unter Einbindung aller inhaltlich berührter Interessenten/fachlich Beteiligten erforderlich wird.

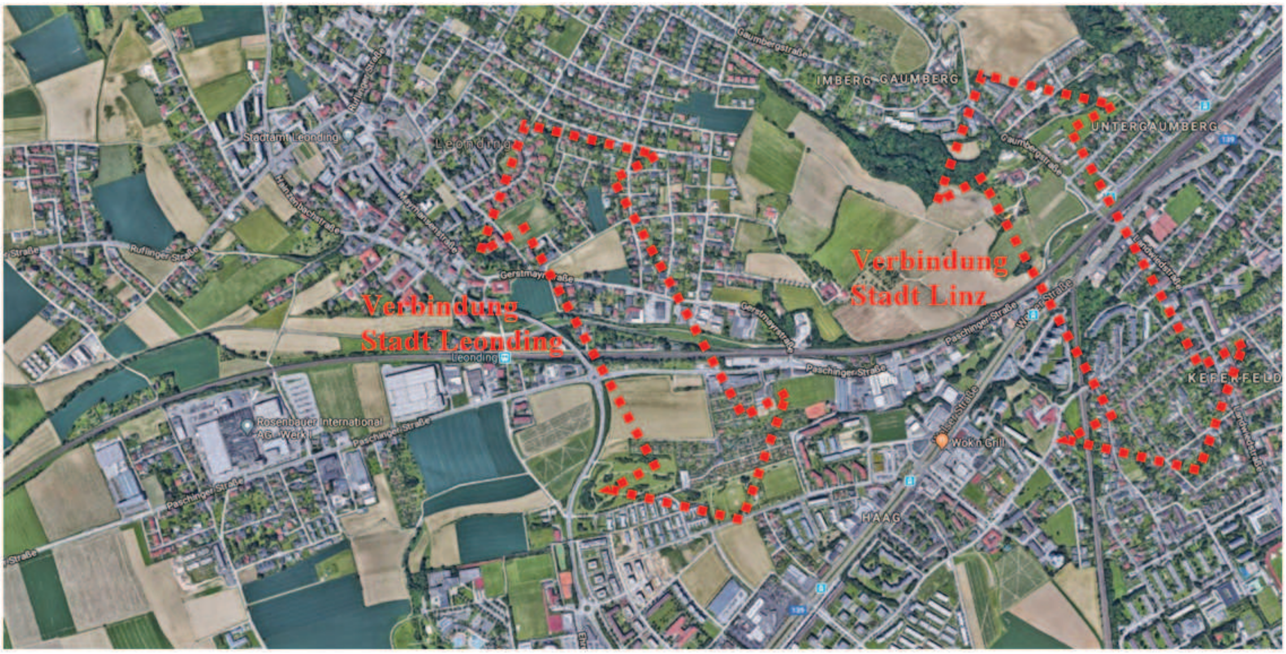

Fig. 3: Bebauung im Raum Leonding und Betrachtungsraum (Luftbild); (Google Maps, online am 09.01.2018)

Mit den Pfeilsymbolen werden im Luftbild die wesentlichen Zonen angegeben, in denen über die Bahntrasse Verbindungen der Stadtteile angestrebt werden sollten – betreffend Leonding und auch Linz. Gleichzeitig wird auch nachvollziehbar, welcher Planungs- und Umsetzungsaufwand – neben dem Umfang der räumlichen Eingriffe - getätigt werden müsste, um das angestrebte Ziel einer „Vereinigung" der Siedlungsbereiche zu erreichen.

Von der Stadt Leonding wird eine umfassende Neuplanung angestrebt, die allerdings nicht nur aufgrund der hohen Kosten auch bei Einbindung aller relevanter Institutionen schwer zu realisieren ist. Auch die Eingriffe in die Stadt- und Inftarstuktur sowie in die berührten Bahnnetze erfordern einen kompletten Neuanfang, der vor allem den Ausbau der Westbahntrasse/HL-Trasse vermutlich auf Jahrzehnte verzögert. Eine Tieferlegung der Bahntrassen verlangt vermutlich auch eine Adaption des Hauptbahnhofes in Linz sowie aller betroffenen Haltestellen.

Dieses Ergebnis der Überlegungen zeigt einmal mehr auf, dass für eine nachhaltige Optimierung der Bahninfrastruktur im städtischen Entwicklungsraum mit Zentralraumfunktion frühzeitig ein umfassender integrativer Planungsansatz mit den begleitenden regionalpolitischen Entscheidungen und Festlegungen beginnen muss. Aufgrund der Ergebnisse der UVP könnte aus heutiger Sicht aufgrund der abgeschlossenen Prüfung des Projektes die HL-Trasse im Raum Leonding auf der bestehenden Trasse ausgebaut werden mit umfangreichen Lärmschutz (aktive und passive Maßnahmen) sowie Ausgleichsmaßnahmen in den angrenzenden Grün- und Siedlungsbereichen – wobei natürlich nicht unwesentliche Eingriffe in den Bestand erfolgen müßten.

3.2 Verbindungsbahn Wien-Hütteldorf – Wien-Meidling

Die derzeit erstellte Planung für den Ausbau der "Verbindungsbahn" zu einer leistungsfähigen Schnellbahn-Trasse für die S 80 hat das Ziel, eine attraktive Verbindung des ÖPV am Westrand der Stadt Wien von der bestehenden Westbahn (Bahnhof Hütteldorf) zum Bahnhof Meidling herzustellen. Die bereits bestehende Trasse soll für diese Funktion ertüchtigt werden, indem verschiedene Ziele angestrebt werden:

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- Herstellung einer attraktiven Verbindung durch die Stadt von Hütteldorf über den Bahnhof Meidling und den Hauptbahnhof bis nach Simmering und weiter in die Seestadt Aspern.
- Ausbau der bestehenden Gleiskörper (gleiche Bahntrasse) für eine höhere Geschwindigkeit und Gesamt-Fahrzeit von ca. 30 Minuten.
- Im Abschnitt der Verbindungsbahn erfolgt der Ausbau bzw. Neubau der Haltestellen Hietzinger Hauptstrasse, Speising und Stranzenbergbrücke mit Anbindungsmöglichkeiten an innerstädtische Bus- und Straßenbahnlinien.
- Ausbildung der neuen Bahntrasse in Hochlage in dem Bereich Hietzinger Hauptstraße und der Auhofstraße
- Erhaltung der kreuzungsfreien Querung der Bahntrasse bei der Hietzinger Hauptstraße und der Auhofstraße,
- Auflassung der niveaugleichen Eisenbahnkreuzungen Veitingergasse, Jagdschlossgasse und Versorgungsheimstraße, wobei Über- oder Unterführungen für Fußgänger und Radfahrer sowie fallweise auch neue kreuzungsfreie Querungen für PKW untersucht werden.

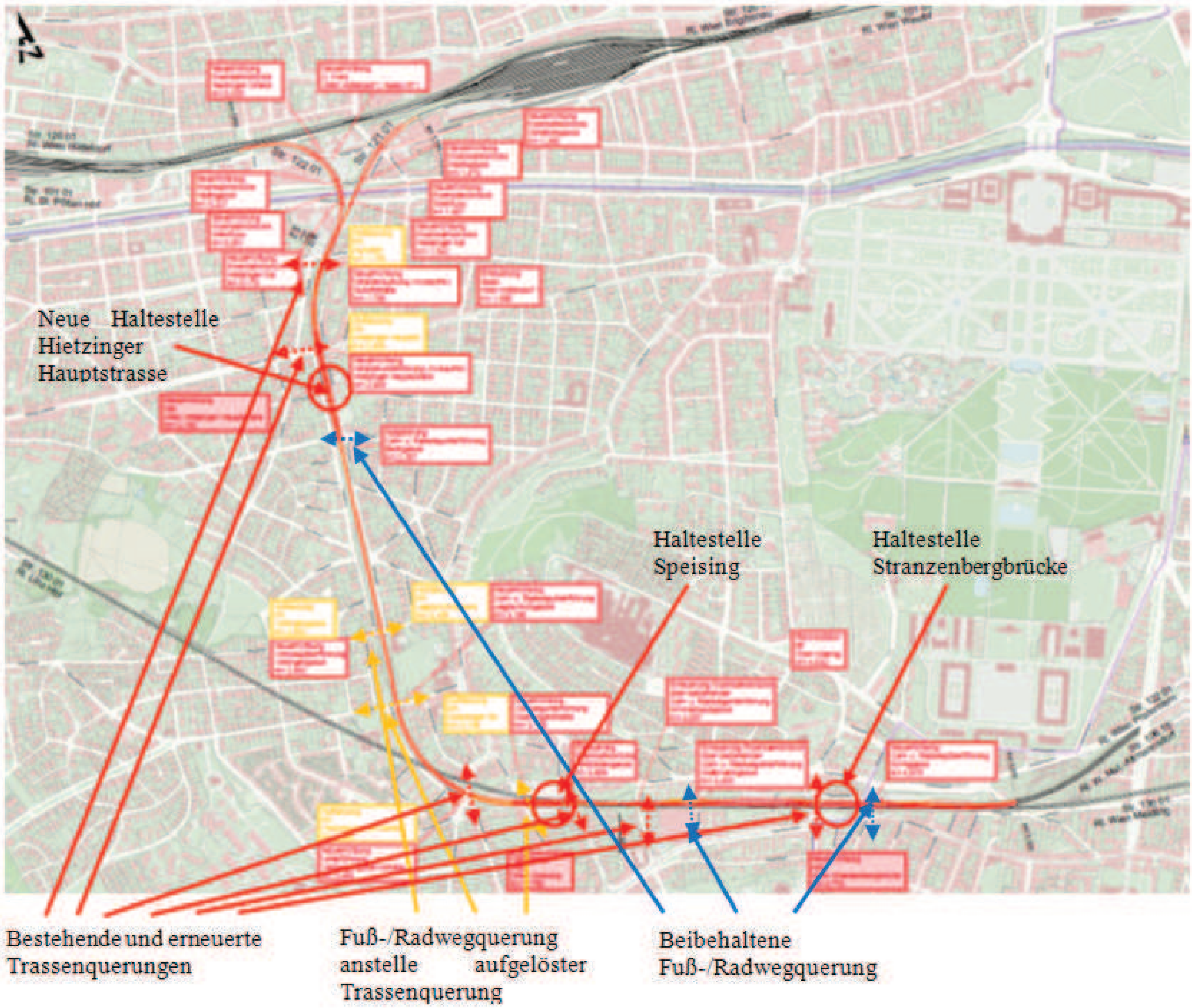

Fig. 4: Gesamter Planungsraum incl. Trassenplanung für den Ausbau der S-Bahn-Trasse im Wien/12., 13. und 14. Bezirk (UVE Konzept/Stand 2016)

Das vorliegende Trassenbild zu den vorgesehenen Maßnahmen ist aufgrund der noch nicht abgeschlossenen Planungen nicht endgültig und muss – nicht zuletzt aufgrund der Kritik der Bewohner der angrenzenden Siedlungsbereiche beiderseits der Trasse – in den wesentlichen Details noch optimiert werden. Vor allem die teilweise ersatzlose Auflassung von Straßenquerungen – ersetzt durch Rad-/Fußwegquerungen – führt neben der zu erwartenden Lärmbelastung zu einer nachvollziehbaren Kritik. Auch die vorgesehene Hochlage der

Bahntrasse im Abschnitt Auhofstraße und Hietzinger Hauptstraße stellt besondere Anforderungen an Lärmschutz und Stadtbild in Verbindung mit den visuellen Beeinträchtigungen.

Die Siedlungsgebiete beiderseits der Bahntrasse haben sich in den vergangenen Jahrzehnten – wenn nicht bereits vor 1900 – zu bevorzugten Wohngebieten entwickelt, u.a. auch bedingt durch die bisher trotz Bahntrasse mehrheitlich ruhigen Lagebedingungen infolge der niedrigen Bahnfrequenz. Infolge des jetzt anstehenden Ausbaues der Trasse zu einer leistungsfähigen S-Bahn-Trasse (S 80) erfolgt natürlich eine wesentliche Aufwertung der ÖPV-Verbindung, allerdings verursacht die unmittelbnare Nahelage der Trasse gegenüber den Wohn-/Villengebieten teilweise eine erhebliche Veränderung der Wohnqualität.

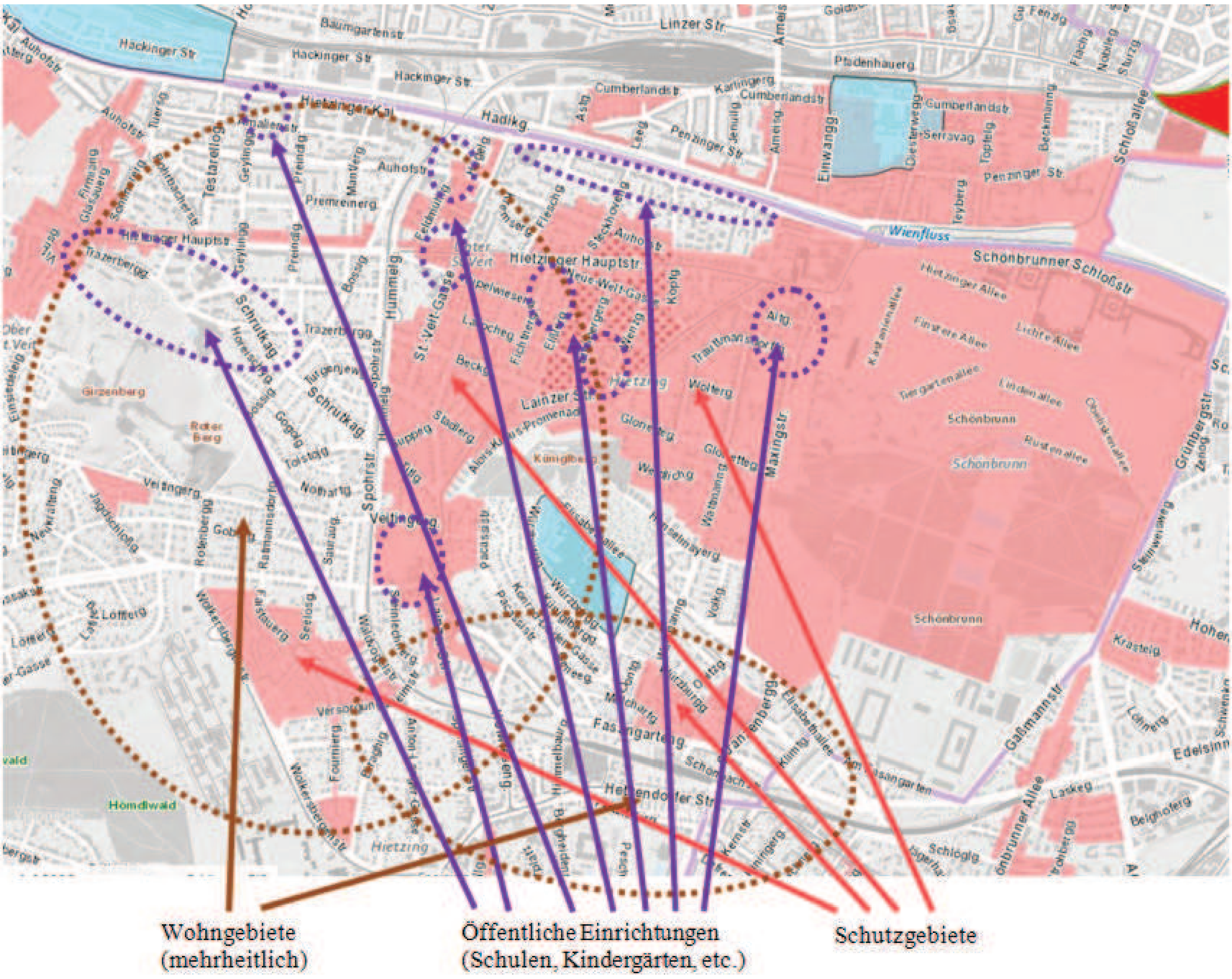

Fig. 5: Gesamter Planungsraum für den Ausbau der S-Bahn-Trasse im Wien/12., 13. und 14. Bezirk (Stadt Wien Flächenwidmungsplan, online am 09.01.2018)

Nicht vergessen werden darf zusätzlich - bedingt durch die veränderten Querungsangebote –die teilweise erschwerte Erreichbarkeit der öffentlichen Einrichtungen (Schulen, Kindergärten, Einkaufsangebote, Dienstleistungen etc.). Auch wenn davon auszugehen ist, dass diese Angebote fußläufig ausreichend erreicht werden können, für den Individualverkehr ergeben sich in Einzelfällen aber teilweise Erschwernisse. Mit dem Ausbau der Trasse bestehen natürlich erhebliche Probleme, die einer befriedigenden und vor allem von der Bevölkerung angenommen Lösung bedürfen:

- Sichergestellt werden müssen ausreichende Angebote für die Querung der Trasse – sowohl für Fußgänger und Radfahrer als auch im IPV und ÖPV. Erschwert dies durch teilweise disperse Lage der verschiedenen sozialen Einrichtungen und Schulen, die von beiden trassennahen Siedlungsbereichen erreicht werden müssen.
- Das bauliche und gestalterische Konzept muss den unterschiedlichen Gegebenheiten im Trassenkorridor entsprechen – teilweise als "Stadtbahn" in Hochlage, teilweise als begrünte Bahnlinie in Tieflage und mit Grünraumausstattung.

- Erforderlich ist eine räumlich integrierte Lösung der Trassenbildung, die einer Nachbarschaft zu qualitative hochwertigen Wohnbereichen entspricht.
- Erschwert jede Lösung durch die Nievaulage der Bahntrasse bei der Querung von Wienfluß und den diesen begleitenden Hauptverkehrsstraßen – infolge der Anbindung an die Westbahn ist eine Tieflage der Trasse in diesem Abschnitt nicht möglich.

Zumindest im Trassenabschnitt bei Tolstojgasse/Suppegasse wäre zu prüfen, ob eine Querung der Bahntrasse aufgrund deren Tieflage zwischen hohen Geländeböschungen möglich ist – in Verbindung mit einer Überdeckung der Bahntrasse. Damit würde die Verbindung der benachbarten Siedlungsbereiche wesentlich verbessert, wobei das Straßenbild auf eine früher angedachte Querung schließen lässt.

Fig. 6: Gesamter Planungsraum für den Ausbau der S-Bahn-Trasse im Wien/12., 13. und 14. Bezirk (Google Maps, online am 09.01.2018)

Aufgrund der noch nicht abgeschlossenen Planung zur "Verbindungsbahn" – der Abschluß wird derzeit für Ende 2018 angekündigt - stellen die hier erfolgenden Aussagen gewissermaßen ein generelles Anforderungsprofil dar. Eine abschließende Beurteilung des Trassenkorridors bleibt deshalb der Diskussion und Prüfung im Rahmen des folgenden UVP-Verfahrens vorbehalten.

4 EMPFEHLUNEGN ZU EINER STÄDTEBAULICHE INTEGRIERTEN TRASSENPLANUNG

4.1 Städtebauliche Planungsstufen

Ein umfassend konzipierter städtebaulicher intergierter Ansatz für eine Planung einer Bahntrasse im städtischen Raum müsste aus fachlicher Sicht folgende Schritte/Abfolge enthalten:

- Bestimmung des funktionellen und strukturellen Entwicklungs- und Planungsraumes beiderseits des Trassenkorridors aufgrund der Zielsetzungen sowohl des Landes Oberösterreich (v. a. Zentralraum/Region), der Stadt Linz als auch der Stadtgemeinde Leonding.

- Bildung einer Entwicklungsträgerschaft und Planungsgemeinschaft mit allen berührten Institutionen (z. B.: in Raum Leonding das Land Oberösterreich/Zentralraum Oberösterreich, die Stadtgemeinde Leonding, die ÖBB, andere Verkehrsträger). Einbindung aller wesentlichen Entscheidungsträger mit Umsetzungskompetenz.
- Erarbeitung und Vorlage konkreter kommunaler/regionaler Entwicklungskonzepte im erweiterten Planungsraum mit trassenübergreifenden Zielen (Strukturen und Funktionen).
- Festlegung der Entwicklungsziele für diesen Teilraum der Stadt Leonding im Rahmen eines partizipativen Planungsprozesses unter Einbeziehung aller relevanter Personengruppen, NGO`s etc..
- Beschluß der Konzepte als umzusetzende Leitplanung (mit Konkretheitsgrad) von allen berührten Gebietskörperschaften – Aufnahme in regionale und kommunale Leitplanungen.
- Sicherung der städtischen Standort- und Entwicklungsqualität (Aufhebung von Siedlungsgrenzen entlang von Bahntrassen) neben ausgebauter moderner Bahninfrastruktur.
- Prüfung der denkbaren/plausiblen Alternativen und Varianten für einen integrierten städtischen Trassenausbau – analog einer Strategischen Umweltprüfung (SUP).
- Festlegung des Trassenkorridors aller Bahntrassen in Abstimmung mit allen an der partizipativen Planung beteiligten Interessenvertretungen.
- Neukonzeption/Änderung der städtischen Nutzungs- und Baustruktur im festgelegten Planungsraum mit den wesentlichen räumlichen Abgrenzungen (v.a. Flächenwidmung) – einschließlich Abgrenzung des neuen Trassenkorridors und begleitender technischer Infrastruktur und Querungen sowie aller umweltrelevanter Festlegungen.
- Konzeption und Umsetzung landschaftsgestalterischer Maßnahmen.
- Erarbeitung und Vorlage der Umweltverträglichkeitserklärung (UVE)/Projektplanung zur Einleitungn einer Umweltverträglichkeitsprüfung (UVP)

In dem Schema zu einer gestuften Vorgangsweise und Planung werden die wesentlichen Schritte bis zur UVP dargelegt –vorgeschlagene (links) und aktuelle (rechts) Vorgangsweise:

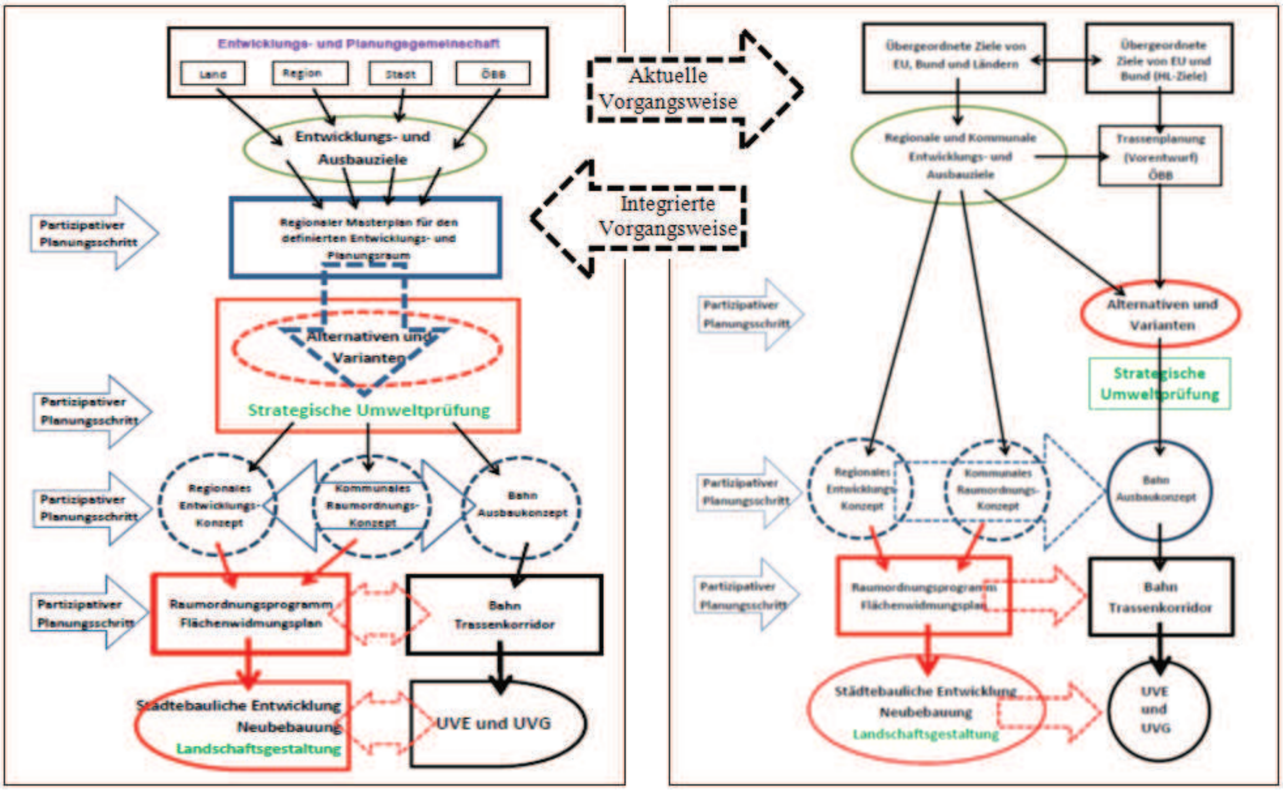

Fig. 7: Schema zu einer gestuften Vorgangsweise und Planung/Vorschlag - Aktuell

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4.2 Konsequenzen eines integrativen Planungsansatzes

Folgende Konsequenzen lassen sich aufgrund der kurzen Analyse bestehender Planungen für die Bahn innerhalb städtischer Bereiche formulieren:

- Überprüfung der Zielvorgaben im UVP-Gesetz hinsichtlich der Schutzziele „Landschaft“ und „Mensch“ in Hinblick darauf, dass der besiedelte „Raum“ als alleinstehendes Kriterium und darin insbesondere der städtische Siedlungsraum expressis verbis nicht erfasst ist.
- Erweiterung des Infrastrukturauftrages der Bahn dahingehend, dass die Beurteilung von funktionellen/strukturellen Wirkungen im Themenbereich „Raum-/Stadtplanung über den eigentlichen Trassenkorridor hinausgehen sollte – dazu ist ein gestufter Ansatz erforderlich, der auf die unterschiedlichen räumlichen Tiefen der verschiedenen Wirkungen eingeht.
- Grundsätzlich Einbindung der trassenbezogenen Gebietskörperschaften (Stadt/Gemeinde, Land/Region) in einen umfassenden Planungs- und Entwicklungsprozess, in dem alle Beteiligten frühzeitig – neben der Bahn als Projektwerberin – auch die parallelen begleitenden Handlungs-, Planungs- und Umsetzungserfordernisse eingebunden werden.
- Gemeinsame Erarbeitung eines Entwicklungskonzeptes unter Einschluss von Trassenvarianten als grundlage für eine begleitende SUP zur Sicherung der bestmöglichen Ausbauentscheidung
- Abstimmung der begleitenden räumlichen Ausbau- und Umbaumaßnahmen zur Sicherung der Umsetzung der integrierten städtebaulichen Planung.
- Sicherung der Kosten-/Finanzierungsbeteiligung der trassennahen beteiligten Gebietskörperschaften (Stadt/Gemeinde, Land/Region).
- Konzept eines gestuften Planungs- und Entwicklungsauftrages: Strategische Umweltprüfung (SUP) – Masterplan – kommunales/regionales Entwicklungskonzept – integriertes Verkehrskonzept/-planung – Flächenwidmung – Ausbauplanung
- Einbindung des Planungs- und Ausbauprozesses in eine umfassende Öffentlichkeitsarbeit entsprechend einer repräsentativen Bürgerbeteiligung

5 ZUSAMMENFASSUNG

Für einen städtebaulich integrierten Planungsansatz im Bereich von innerstädtischen Bahntrassen ist eine auf den berührten Stadtraum abgestimmte Vorgangsweise erforderlich. Dies erfordert neben einer Überprüfung der Vorgaben auf gesetzlicher Ebene (UVP-Gesetz) auch eine genenell erweiterte Arbeitsweise. Die Einbeziehung aller inhaltlich berührten Institutionen und Interessenten auf fachlicher, politischer und gesellschaftlicher Ebene führt natürlich zu einem partizipativen Planungs- und Umsetzungsansatz. Erforderlich wird damit eine andere Trägerschaft, die Bahn kann nicht als „Verursacher“ angesehen werden, vielmehr als Initiator einer Überprüfung aktuell bestehender Siedlungsstrukturen und Nachbarschaften, die gemeinsam mit der Neugestsaltung des ÖPV auch zu neuen Zielen geführt werden kann.

6 REFERENCES

RIS: UVP-Gesetz 2000 vom 14.01.2018
RIS: SUP gemäß UVP-Gesetz 2000 vom 14.01.2018
ÖBB/RaumUmwelt: UVE zur Trasse der HL-Bahn Linz-Marchtrenk, Wien-Linz, 2014
BMVIT: UVP-GA zur HL-Trasse zwischen Linz und Marchtrenk; Wien, 2017
ÖBB/Büro Pistecky: Konzept zur Trasse der Verbindungsbahn; Stand 2016
Prisma: Städtebauliches Konzept Bregenz/Zentrum; Stand 2017
forschung planung beratung/TU-Wien: Konzept zur Zentrumsentwicklung Bad Gastein, Wien 2014
Stadt Wien/MA 21: Flächenwidmung Wien; Stand Jänner 2018
Stadtgemeinde Leonding DORIS, Toposill: Flächenwidmung Leonding, UVE, Stand 2014
Stadt Linz, DORIS, Toposill, Stadtplanung: Flächenwidmung Linz; UVE, Stand 2014

🏆 *reviewed paper*

Land oder Stadt, das ist die Entscheidung einer persönlichen Raumplanung

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1 ABSTRACT

Drei Regionen waren es, in denen ich vor einem Jahr Interviews zum Thema 'Land und Stadt' führte. Es waren: Düsseldorf und Umland in NRW, Berlin und Umland in Brandenburg und Wien und Umland in Niederösterreich. Die Ergebnisse waren jeweils pro Land und contra Stadt und viceversa. Doch das Erstaunliche war, dass höchst selten ein raumplanerisches Gerüst mit top umgesetzter Infrastruktur allein zur Wohnentscheidung geführt hatte. Immer war es auch die Gefühlslage des Einzelnen und sein Wissen um die Gegebenheiten. Die Konsequenz: Die Entscheidung 'aufm Land' oder 'in der Stadt' zu leben hängt eng mit der ganz persönlichen Raumplanung zusammen. Dahin kommen wir in vier Gedankenschritten.

(1) Menschenorientierte Orte

Land und Stadt, hier wie dort ist der Mensch gewohnt zu wohnen und zu leben. Bei seiner persönlichen Raumplanung steht für ihn die ldee der menschenorientierten Orte im Vordergrund. Lebenswert, barrierefrei innerhalb notwendiger und sicherer Kommunikationsstrukturen! Dieserart Lebensqualität liegt auch mal zwischen den Polen, in der Zwischenstadt.

(2) Grenzen erzwingen Entscheidungen

Mit der traditionellen Betrachtung dieses lebendigen Gebildes kommen wir an unsere Grenzen. Nicht nur Bedingungen unseres endlichen Daseins – von Jung zu Alt – stellen uns vor generelle Herausforderungen. Auch ganz individuell stehen wir vor Entscheidungen, was wir gern tun, noch gern tun können. Grenzen erkennen und sie gegebenenfalls überwinden wird zum Gebot.

(3) Selbstwertgefühl führt zu gesellschaftlichem Miteinander

Um unser Selbstwertgefühl zu entdecken, gerade dort wo wir leben, brauchen wir Anschübe. Sie schaffen uns den Rahmen für Entscheidungen, einen eindeutigen Bezugspunkt – einen Ort – zu haben oder ihn zu wählen, wo wir zuhause sind. Dafür gibt der Referent Anschübe (HUBS) zum Sich-Sicher-Sein im eigenen Selbstwertgefühl. Ein neues gesellschaftliches Miteinander, grenzensprengend, speziell JUNG und ALT, bildet sich am Horizont.

(4) Erfolgreich als Anschub-Instrument (HUB) ist die Schwellen-Methodik

Der Referent stellt die Schwellen-Methodik als Anschub-Instrument (HUB) vor. Darin steckt ein wegweisendes Momentum: Die Schwelle als Horizont der Entscheidung definiert sich in drei-facher Gestalt, kann dabei (fast gleichzeitig) Hindernis als auch Katapult sein. Sie fordert und ermöglicht eine eindeutige Aussage zu der Frage „Lust auf Land vs. Lust auf Stadt?“

(5) Persönliche Raumplanung

Bei Anwendung der Schwellen-Methodik sind eindeutige Entscheidungen zur persönlichen Raumplanung möglich. Es ist eine rationale Entscheidung, bei der 'Gefühl' und 'Wissen' zusammengeführt werden. ERGO: Für jede und jeden die ganz persönliche Raumplanung!

Keywords: Anschub, Entscheidung, Land vs. Stadt, persönliche Raumplanung, Schwellenmethodik

2 IN 4 SCHRITTEN ZUR PERSÖNLICHEN RAUMPLANUNG

Stadt-Räume wachsen bis sie zugewachsen sind. Schon seit ewigen Zeiten hat die Raumplanung stets die Grenzen angepeilt. Schliesslich hatte sich eine Stadt zu entwickeln, Raumplanung wurde da synonym zu Städtebau gesehen, wo Architekten sich zu Meisterleistungen herausgefordert fühlten.

Aber Räume sind nicht nur Bauplätze là pour là sondern Aufenthaltsorte von Menschen, unser aller Lebensorte.

Es ist an der Zeit sich zu besinnen, dass der, der an einem Ort wohnt oder sich zu einem Ort hingezogen fühlt, seine eigene Raumplanung betreibt. Menschen von heute mögen nicht unbedingt global denken, doch ihr Interesse geht längst über die Stadtgrenzen hinaus.

Das Land, das Leben auf dem Lande, gerät in unseren Fokus, ein Raum, wo nach Herzenslust geplant werden kann, wie Menschen leben und wohnen wollen. Als erste haben das die Programmmacher der europäischen Fernsehsender erkannt. Krimis und Romanzen, die auf dem Lande spielen, erfreuen sich grosser Beliebtheit. Es sind Blicke aufs Land, wo die Post oft nicht mehr ist aber abgeht. „Kein schöner Land in dieser Zeit!“ Also raus aufs Land: „Muss i denn, muss i denn zum Städele hinaus ..“, die stinkenden Hundehaufenbäume hinter sich lassen, hin zu den blühenden Apfelbäumen der Streuwiesen.

Individuelle Raumplanung ist angesagt. Der 'wohnende' Mensch mischt in der Raumplanung mit, dort wo er wohnt oder dort, wo er leben möchte.

4 Gedankenschritte möchte ich vorstellen, um Raumplanung – über alle Massnahmen der Infrastruktur hinaus – als eine sehr persönliche Aktion begreifbar zu machen.

Es gibt eine Vorgeschichte, in 2017.

Drei Regionen waren es, in denen ich vor einem Jahr Interviews zum Thema 'Land und Stadt' führte. Es waren: Düsseldorf und Umland in NRW, Berlin und Umland in Brandenburg und Wien und Umland in Niederösterreich. Die Ergebnisse - ganz wie erwartet - jeweils pro Land und contra Stadt sowie pro Stadt und contra Land.

Doch das Erstaunliche war, dass höchst selten ein raumplanerisches Gerüst mit top umgesetzter Infrastruktur allein zur Wohnentscheidung geführt hatte. Immer war es auch die Gefühlslage des Einzelnen und sein Wissen um die Gegebenheiten.

Die Entscheidung 'aufm Land' oder 'in der Stadt' zu leben hängt eng mit einer ganz persönlichen Raumplanung zusammen.

Nun, in 4 Gedankenschritten kommen wir zu einem methodischen Konstrukt, das Entscheidungen ermöglicht, die den Charme von Eindeutigkeit haben.

3 MENSCHENORIENTIERTE ORTE – EIN TERMINUS IN DER AUSSCHREIBUNG DIESER VERANSTALTUNG

Land und Stadt, hier wie dort ist der Mensch gewohnt zu wohnen und zu leben.

Bei seiner persönlichen Raumplanung steht für ihn die ldee der menschen-orientierten Orte im Vordergrund. Lebenswert, barrierefrei innerhalb notwendiger und sicherer Kommunikationsstrukturen! Dieserart Lebensqualität liegt auch mal zwischen den Polen, in der sog. Zwischenstadt.

Zweierlei Wünsche hören wir immer wieder:

> „Ach, ich würde gern auf dem Lande leben, mehr an der Natur teilhaben.“

Oder:

„Ja, in der Stadt zu leben, das hat was. Da kann ich noch am Leben teilnehmen.“ <

In der Regel verführen diese Wunschvorstellungen zur Resignation. Doch es geht auch anders:

Wir resignieren eben nicht.

Vielmehr recherchieren wir – jeder von uns, wo unsere Schwellen liegen.

Klären wir vorab, was Schwellen sein können.

Nach Goethe sind Schwellen Entscheidungs-Horizonte. Da wird sogar das Betreten der Tür-Schwelle zu einem Ereignis. Und Handke berichtet uns von der Leidenschaft des Schwellensuchers. Doch – konzentrieren wir uns auf die praktische Handlebarkeit. In meiner jüngsten Buch-Veröffentlichung ist die Schwelle in aller Begrifflichkeit vorgestelllt.

Drei Arten von Schwellen gibt es:

- Schwelle S1 ist ein Handicap, das es zu akzeptieren gilt, d.h., wir lassen wie es ist.
- Schwelle S2 ist ein Handicap, das mit Kreativität überwunden werden kann.
- Schwelle S3 ist ein Katapult; dieses Sprungbrett zu treffen ermöglicht, mit geringstem Aufwand die grössten Sprünge zu machen

Mit der Schwellendifferenzierung nach S1, S2, S3 kommt eine 'neue Mobilität' in den Blick.

Wir fragen uns: „Was geht denn davon, was ist machbar – auf Zeit?“ Beweglichkeit zeigen wir. Und Beweglichkeit ist Mobilität!

4 GRENZEN ERZWINGEN ENTSCHEIDUNGEN

Mit der traditionellen Betrachtung, wie Menschen 'aufm Land' oder 'in der Stadt' leben und wohnen, kommen wir an unsere Grenzen. Nicht nur Bedingungen unseres endlichen Daseins – von Jung zu Alt – stellen uns vor Herausforderungen. Individuell stehen wir vor Entscheidungen, was wir gern tun, noch gern tun können.

Grenzen erkennen und sie ggf. überwinden wird zum Gebot für viele, letztlich für uns alle.

Um die Grenzen erfassen zu können, helfen uns Trends, speziell in den Bereichen Architektur 'Neues Wohnen', Sozialaustausch Jung : Alt wie Nachbarschaftshilfe.

4.1 Trend in der Architektur 'Neues Wohnen'

Im Neubau und bei Modernisierungen stehen nicht mehr die strukturell orientierten Immobilien mit Optik, Grundfläche, Lage und Kosten im Mittelpunkt. Heute steht die Bedarfsdeckung durch passende Funktionalitäten der Wohnimmobilien im Vordergrund. Sicherheit und Barrierefreiheit dominieren die Anforderung an den Wohnbereich.

Drei Beispiele, die vielfach ergänzt werden können: stufenlose Eingänge, breite Türen, bodengleiche Duschen. Klingt alles nach Seniorenwohnungen! Sind es auch.

Aber diese Erleichterungen sind inzwischen der Wunschtraum junger Familien. Geh-Hilfen sind da Kinderwagen gleichgestellt, Bewegungsfreiheit im Zimmer geniessen nicht nur Alte mit steifen Knien sondern auch spielende Kinder oder zuhause im Home Office arbeitende Freiberufler. So werden Wohnhilfen und Wohnkomfort als Neues Wohnen verstanden.

4.2 Trends im Sozialaustausch Jung : Alt

Noch viel zu wenig ist erkannt, dass hier ein grosses Potenzial der Begegnung besteht. Unser Durchblick scheint verstellt, durch den Eindruck, dass Familien sich selbst zu helfen haben. Wo das geschieht – prima! Doch inter-familiäre Kommunikation wird immer weniger. Die weiten bis unendlichen Entfernungen zwischen Opa/Oma und Enkel/Enkelin sprechen Bände.

Aber – da gibt es ja die Wahlverwandtschaften: Junge Singles als auch Jung-Familie hier und ältere oder alte Singles als auch die Alt-Ehepaare dort!

Sie sind nicht das Ergebnis einer Patchworkfamily. Irgendwann geht’s los mit der Begegnung von Älteren und Jüngeren, von Jung und Alt.

Altbekannt sind Begleitungen, Beaufsichtigungen und so manches drumherum.

Nicht so bekannt sind Ansätze, dass Jüngere nach einem Coach für die Berufsplanung oder Start up-Gründung Ausschau halten, und Ältere genau diese Rolle einnehmen. Für wohnen und leben hat sich inzwischen das Modell 'Wohnen für Hilfe' etabliert. Kurz skizziert: eine Ältere überlässt einen Teil ihrer Wohnung einem Jüngeren. Man einigt sich darauf, dass der Jüngere einen definierten kleineren Mietbetrag zahlt (oder auch keinen) und dafür einen definierten Zeitraum der Älteren als Gegenüber zur Verfügung steht, für Haushaltsleistungen und für Kommunikation allgemein, bis hin zu einem Gespräch über Gott und die Welt.

4.3 Trend: Nachbarschaftshilfe

Nachbarschaftshilfe - welch wunderbares Wort! Und uns seit langem bekannt.

Eine Wohlfühl-Aktion!Aus dem Wort kommt heraus, dass mein Dienst am Anderen genauso gemeint ist wie des Anderen Dienst an mir.

Dass wir alle Nachbarn haben – und selbst welche sind, nun, das haben wir in jüngster Zeit wieder mit der Flüchtlingskrise bemerkt.

Nachbar hat in der Ursprungsbedeutung – zumindest im Lateinischen – auch was mit 'ähnlich' zu tun. Und leben wir nicht recht ähnlich sind wir nicht in einer globalen Welt, wie Weltbürger? Sind damit sowieso alle Nachbarn? Nicht nur der Gegenüber auf dem Hausflur oder neben meinem Haus ist gemeint. Die Vielfalt der Begegnungen ist hier grenzenlos – im wahren Sinne des Wortes.

Um innerhalb dieser geöffneten Grenzen traditioneller Gegebenheiten zu einer eindeutigen Entscheidung zu finden, bedarf es eines sicheren Selbstwertgefühls.

5 SELBSTWERTGEFÜHL FÜHRT ZU GESELLSCHAFTLICHEM MITEINANDER

Um unser Selbstwertgefühl zu entdecken, gerade dort wo wir leben, brauchen wir Anschübe. Sie schaffen uns den Rahmen für Entscheidungen, einen eindeutigen Bezugspunkt – einen Ort – zu haben oder ihn zu wählen, wo wir zuhause sind. Ein neues gesellschaftliches Miteinander, eben alte Grenzen sprengend, speziell im Verhältnis JUNG : ALT, bildet sich am Horizont.

Wenn wir dann unsere Schwellen ausmachen, bei dem, was wir wollen, haben wir alle Freiheiten, so zu leben, wie wir wollen, wann wir wollen, mit wem wir wollen, wo wir wollen.

Denn 'die Schwelle ist die Quelle', damit wir unsere Ziele in den Blick bekommen und sie auch erreichen.

Die Mehrfachnennung von 'wollen' soll zeigen wie wichtig dieser Impuls, diese Absicht ist. Der eine, die andere kennt das noch aus Schule und Hochschule. Als 'volo velle' = 'Ich will wollen' gab es vor Jahrhunderten im Zeitalter der Scholastik darüber einen heftigen Streit, in den Akademien. Mag sein, dass es seit dieser Zeit den Begriff gibt, ein Streit, der nur um seiner selbst willen geführt wird, sei (nur) akademisch.

Wenn wir unsere Überlegungen auf den Punkt bringen, wo's um die Entscheidung über wohnen und leben geht, darf unser Fokus nur auf einen einzigen Punkt zentriert sein.

Wir werden dann merken: Auf dieser eindeutigen Grundlage bewegen wir uns wie auf ein Motivations-Surfbrett. Es verschafft uns den Antrieb das auch umzusetzen was jede und jeder will. Bei allem hilft uns der Trend. Er verleiht Flügel, dieses österreichisch geflügelte Wort! Im Nachbarlichen gibt es keine Grenzziehungen zwischen Jung und Alt, zwischen Menschen verschiedener Herkunft, zwischen Menschen, die arbeiten und denen, die nicht arbeiten (können).

Der Anfang für Nachbarschaftshilfe ist, für die eigene Sensibilität aufmerksam zu sein, auch in gewissem Maße neugierig. Und das durchaus in näherer oder weiterer Umgebung! 'In der Stadt' spricht man von Nachbarn bei bis zu 100 Meter Entfernung, 'aufm Land' von bis zu X Kilometern.

Wir verstehen: Wohnen muss also nicht in Abgrenzung enden. Auch die dadurch bedingte Kommunikation kann zu einem tragenden Bestandteil werden. Begegnung ist angesagt. „Alles wirkliche Leben ist Begegnung“, sagt der Religionsphilosoph Martin Buber. 'Wirklich leben' geht nicht, ohne sich zu bewegen. Nun, für die Bewegung brauche ich Raum – besser: Räume, Wohn- und Lebensformen, in denen wir zur Lebensqualität finden. Man begegnet sich. Die Freude am Miteinander steht im Vordergrund. Die Wohnsituation bietet da an vorderster Stelle Realisierungsmöglichkeiten jeder Art.

Mit unseren Begegnungen ist also unser Leben in Bewegung. Ja, 'menschen-orientierte Orte' kennzeichnet eine neue Mobilität. Was können wir dafür tun, dass jene nun eintritt? Jeder von uns und bei jedem von uns?

6 ERFOLGREICH ALS ANSCHUB-INSTRUMENT (HUB) IST DIE SCHWELLEN-METHODIK

Wir hörten: Die Schwelle als Quelle für unsere Entscheidung stellt sich in dreifacher Gestalt, markiert durch die Konsequenz, die es anzuwenden gilt, wenn die Recherche zu den relevanten Schwellen abgeschlossen ist.

Schwelle S3 > Sprungkraft entwickeln

Schwelle S2 > Kreative Umwege gehen

Schwelle S1 > Status quo (keine weitere Kraft hineinstecken)

Mit der Schwellen-Methodik wird es sofort konkret, mit den Fragen:

(a) Wer bin ich?

(b) Was will ich?

(c) Was brauche ich?

Einzelaspekte sind zu vernachlässigen. Wichtig ist das Ergebnis, welche Schwellen sich herauskristallisieren. Denn die Kenntnis der Schwellen benötige ich um die Entscheidung zu treffen, ob ich künftig 'aufm Land' oder weiterhin 'in der Stadt' leben möchte.

Ein Wort noch zum Analyse-Start, dem A Wer bin ich?: Es verführt darüber hinwegzusehen, hinwegzugehen – 'Ich kenne mich ja.' Doch lassen wir uns von den ur-alten Weisheiten leiten. Bevor die Probleminhaber von der Pythia , dem Orakel zu Delphi , vor 2500 Jahren eine Lösung erfuhren, mussten sie an einem Stein vor der Tür vorbei. Dort stand eingemeisselt (in griechisch natürlich): Erkenne dich selbst!“ Bekannt ist auch, dass immer wieder Ratsuchende der Pythia Weisungen völlig falsch interpretierten. In der Regel hatten jene den Stein nicht beachtet und sich nicht der Frage gestellt: 'Wer bin ich?'

In der Analyse haben sich mir Schwellen verschiedenster Art als relevant herausgestellt. Schwellen, die – für sich genommen – nichts mit 'wohnen und leben' zu tun haben müssen. Offensichtlich haben sie es für mich aber doch, sind womöglich für die Entscheidung das Zünglein an der Waage.

Das erinnert mich an den Kauf meines ersten größeren Autos, wo auch unser großer Hund im sogenannten Kofferraum des Autos mit Schrägheck Platz finden musste. Der Verkäufer stimmte zu, dass ich den Hund auffordern durfte, mit einem Satz bei geöffneter Hecktür hineinzuspringen. Damit ich sehen konnte ob er denn hineinpasst. Ohne mit seinen Tatzen am Lack zu kratzen (weswegen der Verkäufer später von seiner Angst, dass solches geschieht berichtet hatte) machte es sich unser Hund sofort gemütlich. Das Auto wurde gekauft. Zurück blieb ein irritierter Verkäufer. Noch nie war ihm passiert, dass der Platz für einen Hund die eigentliche Entscheidung des Autokaufs war.

Um zur Entscheidungsfindung zu „wohnen und leben 'aufm Land' und 'in der Stadt'“ zu gelangen, habe ich bei den gefundenen Schwellen eine Zweiteilung zu beachten:

- Fragestellung A: Was liegt mir am Herzen?
- Fragestellung B: Was weiss ich zum Thema?

Gefühl und Wissen müssen also zusammengefasst werden.

Zum Schluss zählt nur eine einzige Entscheidung für und wider.

7 PERSÖNLICHE RAUMPLANUNG

Bei Anwendung der Schwellen-Methodik sind eindeutige Entscheidungen zur persönlichen Raumplanung möglich. Es ist eine rationale Entscheidung, bei der 'Gefühl' und 'Wissen' zusammengeführt werden. Insofern ist es für dich die ganz persönliche Raumplanung!

8 REFERENCES

Niemann, K.: Lust auf Land vs. Lust auf Stadt? Die Schwelle ist die Quelle! Norderstedt 2017

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Large Housing Estates – Analysing the Morphologic Similarities and Differences of a Specific Town Planning Concept

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1 ABSTRACT

Urban Landscapes show different urban structures. The physical face of cities is the result of complex city planning and general principles of spatial planning. And this physical face can be seen as the theater of life influencing life quality, social justice, mobility patterns, etc. In this work we focus on a specific phenomenon in post-war Germany: the town planning concept of large housing estates and their physical realizations. Same principles seem to lead to very similar urban structures and morphologies. However, over time different principles of spatial planning directions were applied for large housing states in the 1950/60s (the principle of the 'structured and low dense city') and the 1970/80s (the principle of 'urbanity by density') in Western Germany and for the entire time period until 1990 in the German Democratic Republic (the principle of the 'socialistic city'). In this stuy we analyze whether large housing estates resulted in similar or different urban morphologies. And, whether different urban morphologies developed across variations of the specific town planning concept applied. To do so, we base our work on spatial data capturing the large housing estates in Level of Detail-1 (LoD-1) 3D building models and the street network. These geoinformation are derived from multi-sensoral Earth observation data as well as from Volunteered Geographic Information (VGI) (in our case from OpenStreetMap). For the measurements and analyses of the morphologies of large housing estates we develop and apply spatial features such as building density, floor space index, orientation of buildings, orientations of streets, among others. We reveal that different directions of the same town planning concepts for large housing estates generally create physical variabilities of the urban morphologies within a relatively small range. A closer look, however, reveals that variations do exist and that specific town planning principles had de facto influence on the resulting morphologies.

Keywords: large housing estates, volunteered geographic information, remote sensing, urban morphology, urban structure

2 INTRODUCTION

Building types and their spatial arrangement predominantly define the appearance of a city. These structures are often the physical result of urban planning ideas, a mixture of changing ideas over long periods of time, and related social and economic developments (Heineberg, 2006). Across the globe spatial layouts of the built structure are of high variability from informal, organic, irregular, complex, often high dense utilizations of space to formal, planned, geometric, structured and often low-dense lay-outs. In the domain of town planning manifold concepts have been developed such as the garden city (e,g, Will & Lindner, 2012), new towns (e.g. Hardy, 1991), large housing estates (Dekker & Van Kempen, 2005), among many others. They all aim to steer city building to bring the physical structure into geometric order (e.g. Patel, Crooks & Koizumi, 2012) and with it to create a physical environment for a better, new society (e.g. Streich, 2011). In general these town planning concepts formulate specific goals and provide architectural guidelines with a range of variations in realizing them (Reicher, 2014).

A specific phenomenon in post-war Germany are large housing estates. With about five million people living in these estates in Germany today (BBSR, 2015) and about 41 million (excluding the former USSR) in Europe (Dekker & van Kempen, 2004), this concept remains of high relevance for living spaces. In the following we aim at spatially describing and analyzing the built-up morphologies of such large housing estates for differents parts of Germany. To do so, we compile land cover information on the built structures (houses and streets) using a multi-source approach: We use OpenStreetMap data (OSM, 2017), very high resolution satellite data as well as ground-based photographs for deriving three-dimensional city models at individual building level. Based on these geoinformation we aim at quantitatively comparing large housing estates based on one main question and two variations of it: Do large housing estates feature similar or different urban morphologies? And have different urban morphologies developed across variations of the specific town planning concept applied? And have different urban morphologies developed within the respective town planning concept?

Inherently these questions carry varying spatial locations of large housing estates and, thus, for periods of construction before 1990 different political systems in them. Beyond, these questions carry references to different periods of construction as well.

2.1 Large housing estates

After the second world war there was an urgent demand for new housing units in Germany. This was due to destroyed buildings, population growth, or rising individual demand for living spaces. The “Federal Ministry Environment, Nature Conservation, Building and Nuclear Safety” – as it is called today – defined large housing estates by the following indicators: built after 1945, functional independent estates, dense, high-rise, homogeneous settlement structures, larger than 2,500 housing units, and predominatly social housing development (BMUBau, 1994).

Due to different political systems until 1990 the town planning concepts related to large housing estates varied between Western and Eastern Germany. The “structured and low-dense” city was the main concept in Western Germany in the 1950s and 1960s. It featured a spatial (and often dogmatic) separation of functions between residential or commercial areas (Heineberg & Krajewski, 2014). The concept included large green spaces and recreation areas in close distances. In the 1960s this concept was adapted to “urbanity by density” (Heineberg & Krajewski, 2014). This conceptual idea featured the spatial integration of urban functions and aimed at higher utilization of space. In eastern Germany the town planning concept of the “socialistic city” was applied. It was meant to be socially inclusive. Social differences should not be seen by built environments (Bähr & Jürgens, 2009). In comparion to the “structured and low-dense” concept, the urban functions were spatially mixed (Senatsverwaltung für Stadtentwicklung und Umwelt, 2012; Altrock, Grunze & Kabisch, 2018).

	Town planning concept	City	Settlement	Time period of construction				Living units
				1950s	1960s	1970s	1980s	
Western Germany	Structured, low-dense mixed large housing estate	Braunschweig	Weststadt [B]		X			>5,000
		Bremen	Neue Vahr	X	X			>10,000
		Karlsruhe	Waldstadt	X	X			>5,000
	Urbanity by density	Berlin	Gropiusstadt		X	X		>10,000
		Braunschweig	Weststadt [C]			X	X	>5,000
		Dortmund	Scharnhorst-Ost		X	X		>5,000
		Frankfurt a.M.	Nordweststadt		X	X		>5,000
		Hamburg	Steilshoop		X	X	X	>5,000
		München	Neuperlach		X	X		>10,000
		Regensburg	Königswiesen			X	X	>2,500
Eastern Germany	Socialistic city	Berlin	Hellersdorf				X	>10,000
		Dresden	Gorbitz			X	X	>10,000
		Erfurt	Nord		X	X	X	>10,000
		Jena	Neulobeda		X	X	X	>10,000
		Leipzig	Grünau			X	X	>10,000

Table 1: Large housing estates in Germany - the 15 selected study sites

2.1.1 Selection of study sites

In 1994, 240 large housing estates were documented in Germany (BMVBS, 2013). For our quantitaive analysis of the built structures, we select 15 large housing estates (Table 1) by the following criteria:

- study sites which have been built under the guildline of one of the three town planning concepts: “structured and low-dense”, “urbanity by density” or “socialistic city” and thus, the selected samples inherently refer to different periods of construction or political systems.
- study sites across entire Germany for a basically geographic even distribution.

Table 1 provides an overview of the 15 selected study sites, their names and locations, their related town planning concepts, their construction time and the size by living units.

Fig. 1: Three-dimensional view of the urban morphology of the sample Dortmund Scharnhorst-Ost

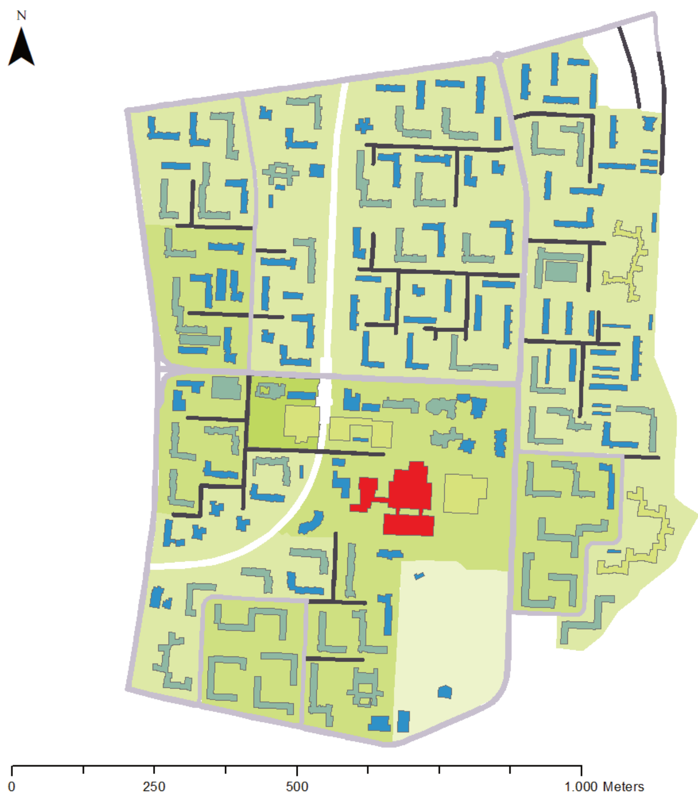

Fig. 2: Two-dimensional view of the urban morphology of the sample Dortmund Scharnhorst-Ost illustrating the spatial features building size, building density and type of street

Figure 1 gives an impression of the derived geoinformation in a three-dimensional perspective for the example of the large housing estate of Scharenhorst-Ost in Dortmund. The figure illustrates the planned,

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geometric alignments or the different building types or heights. Figure 2 illustrates further spatial features such as the building ground floors sizes, the building density and the types of streets used for quantitatively measuring the patterns.

3 METHODOLOGY

Our approach aims at comparing the built-up structures, i.e. the buildings and the streets definig the structures and patterns of large housing estates. The measurement of spatial patterns is, however, a complex task and needs a clear definition of the spatial units of measurement and the spatial indicators applied.

In this study we rely on three different scales – the individual object, the block unit and the district. At the level of individual objects we capture the elements consitituting the urban structure and pattern we are interested in; these are the building footprints, their heights and the streets (compare Fig. 1). We use the block level to aggregate the geoinformation of individual objects onto structural information such as building density (Wurm et al., 2014). The block unit is generally defined by a spatial entity which captures a structurally homogeneous area, often circeled by the street network (Taubenböck & Kraff, 2014). However, if the street network is not close meshed we introduce additional borders at obvious structural change overs of the built environment (e.g. from a built area into a park area). We use the district level to aggregate all generated geoinformation – either structural information on block level such as building density, or layout information which has not been aggregated onto block units such as street orientation. In consequence, the aggregation onto the district level is the ultimate spatial entity of comparing the spatial indicators between study sites; the comparison relies either on medians, means or the variability of measured values visualized in boxplots.

For a quantitative spatial analysis of the urban structures we use eight spatial indicators: Five indicators capture the appearance of building structures and three indicators capture the layout of the streets. We rely these indicators based on the suggestions for measuring the morphology of cities and their structures by Taubenböck, Kehrer & Wurm (2015). The five indicators capturing the building structures are: 'building density'; it is calculated in percent as the sum of all building ground floors per block unit; 'floor space index'; it is a non-dimensional number calculated by the sum of the available floor space per block unit; 'row house ground floor areas'; it is derived in percent as the share of building groundfloors belonging to row developments relative to all building ground floors per block unit; 'height of buildings' is calculated as the avaerage height of buildings in meters per block; and 'orientation of row development'; it is calculated by the main orientation of each individual building in degree.

The three indicators capturing the layout of the street network are: 'Percentage of non-linear streets'; it is calculated as the percentual share of street curves relative to the street network of the entire district; 'percentage of dead end streets'; it is calculated as share of dead ends relative to the entire amount of street segements of network per district; and 'orientation of streets'; it is calculated in degree based on the main orientation of every street segment. The histogramm at district level allows conclusion on the degree of geometric layouts.

For a descriptive analysis of the structural patterns we use boxplots provding the variability and medians of the measured indicators building density and floor space index at district level. For row house ground floors and building heights we simply use the mean values, and for orientation of row developments we use histogramms displayed in spider charts.

For the analysis whether settlement morphologies and patterns of large housing estates differ statistically we apply a single-factor analyis of variance (ANOVA). We apply the analysis for the spatial features, 'building density' and 'floor space index' at block level, and 'row house ground floor areas', 'height of building' and 'orientation of row development' at individual objects level. For the street layout we apply the single-factor analyis of variance onto the spatial features 'percentage of non-linear streets', 'percentage of dead end streets' and 'orientation of streets'. The ANOVA analyzes the differences among group means and their associated procedures (such as "variation" among and between groups) (e.g. Bahrenberg et al., 2008). In consequence, the approach tests if differences are more frequently than random, thus statistically significant. The variances among averages within a group of data are therefore compared to averages between groups of data. The data groups in our case are our spatial features quantitatively measuring spatial pattern of our large housing estates. The amplitude of the variance between groups measures the differences, with the determination of significance set to 0.05 (5%).

For the analysis which town planning concept features statistically different urban morphologies in general we apply a honest significance test (Tukey-HSD). We apply the same to detect which large housing estates within one town planning concept feature significant different spatial characteristics. The approach compares the values of the individual data groups to each other. Non-significant differences will be classified as one data group.

4 RESULTS

The results are structured into two different sections – a descriptive section giving insights into the measured structures of the large housing estates and an analytical section providing a statistical analyses for classifiying similarities of the measured structures.

4.1 The measured structures of large housing estates

Built-up structures and lay-outs found across the globe show a very high variance – from organic, irregular, complex high dense utilizations of space for example in slum areas to geometric, ordered low dense utilizations of space e.g. in suburbs. Using the example of building density, the documented variance spans from 10% density in suburbs (Taubenböck, Kehrer & Wurm, 2015) to 90% density in informal slums (Taubenböck, Kraff & Wurm, 2018).

In relation to this high variability of structural layouts found across the globe, the measured structural variability for the town planning concept of large housing estates is very low; using the example of one spatial feature –building density–, the utilization of space is with measured values generally from 13% to 19% also comparatively low. Figure 3 illustrates the measured results in boxplots for two examples of the introduced spatial features: building density and floor space index.

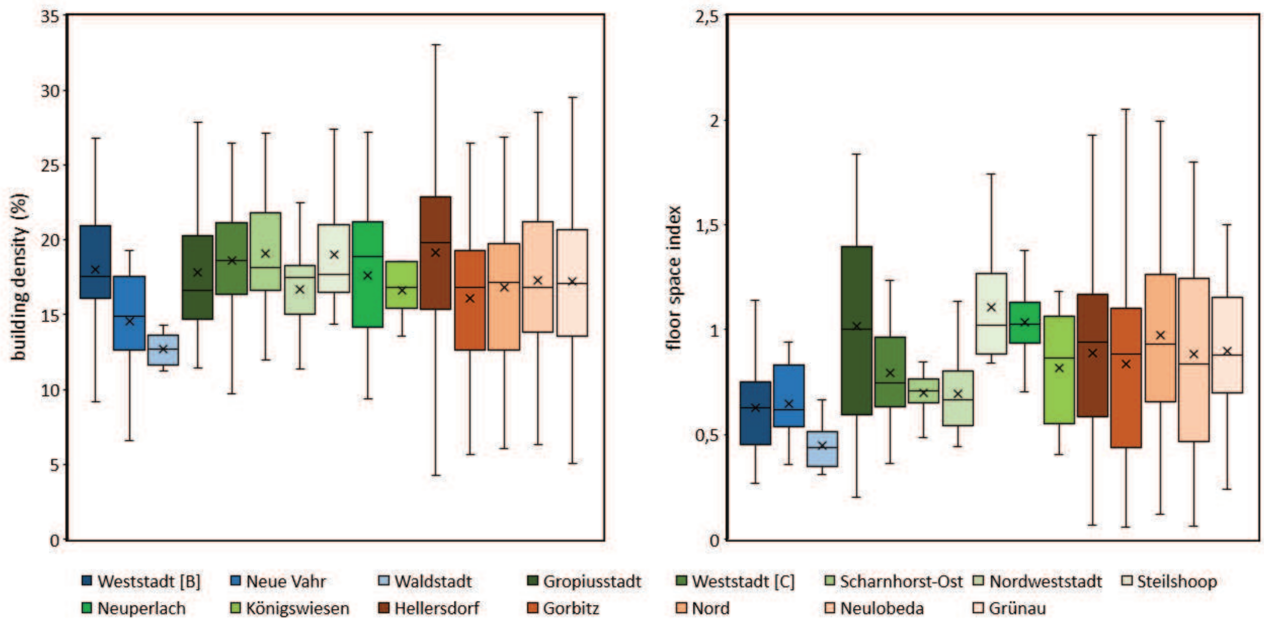

Fig. 3: Boxplots illustrating the building density of large housing estates; ordered by town planning concepts – blue: structured and low dense; green: urbanity by density; orange: socialistic city.

In general, we find building densities varying in median from a minimum of 12.7% in Waldstadt in Karlsruhe to a maximum of 19.1% for Scharnhorst-Ost in Dortmund. In relation to other structural urban types mentioned above, the relating structural variance within this specific town planning concept can be considered very low showing the steering effects of guidelines (and land use regulation) for architectural realization.

The floor space index reveals a varying usage of space from a minimum median of 0.4 in Waldstadt in Karlsruhe to a a maximum median of 1.1 in Steilshoop in Hamburg. It is remarkable that the 'structured and

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low dense' large housing estates mirrows its conceptual goal in de facto lower dense built structures with medians of 0.4 to 0.65 and low variances. For the concept of 'urbanity by density' the variability is highest with medians from 0.65 to 1.1, while the 'socialistic' city results in very homogeneous densities of a floor space indices of 0.9 across the samples.

The measured row house ground floor areas vary in median from the minimum of 357m² in Nordweststadt in Frankfurt a. M. to very large building footprints with 4,585m² in Steilshoop in Hamburg as maximum. It is remarkable that again, the variance of physical realizations is highest for the town planning concept of 'urbanity by density', while both other concepts result in relatively homogeneous row house sizes. The socialistic city features constantly larger row house sizes.

The measured heights of buildings show that in median large housing estates are characterized by heights of about 15 – 20m, which relates to about 5 floors. However, the variance of measured buildings heights is generally high as many building structures also show heights of up to 70m (e.g. Gropiusstadt in Berlin) or 50m (e.g., Neue Vahr in Bremen, Neuperlach in Munich or Gorbitz in Dresden).

Regarding the 'orientation of row development' we expected –as it is typical for most town planning concepts – that regular, geometric spatial building layouts are dominating. These layouts would resonate in geometric orientations either in parallel or orthogonal alignments. Figure 4 illustrates these row development lay-outs in spider charts using histograms of measured orientations.

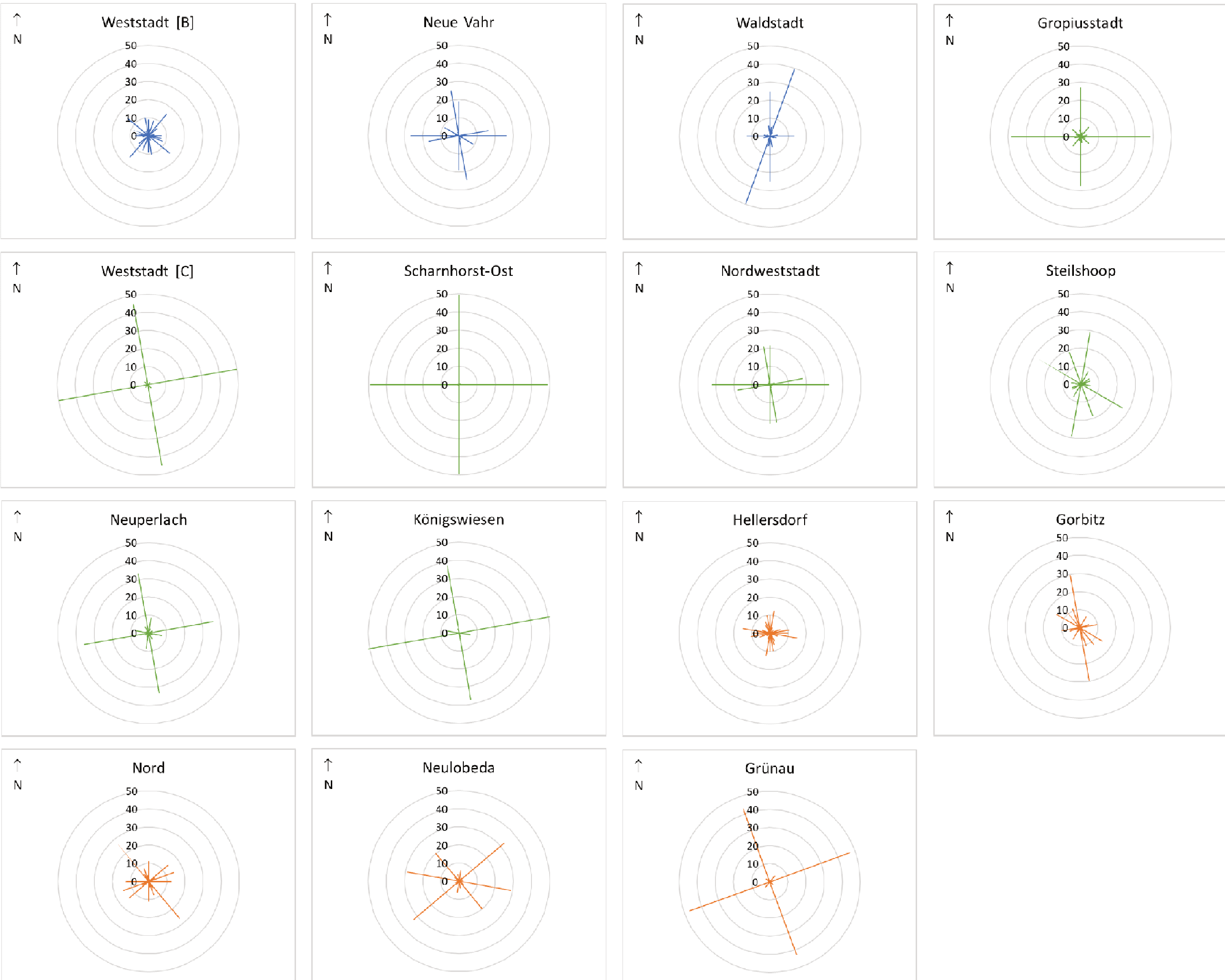

Fig. 4: Spider charts illustrating histograms of building orientations in large housing estates –blue: structured and low dense; green: urbanity by density; orange: socialistic city.

We find that some large housing estates almost perfectly meet the hypothesis that these town planning concepts result in perfect geometric, regular layouts. Perfect examples are Weststadt [C] in Braunschweig, Scharnhorst-Ost in Dortmund, Königswiesen in Regensburg and Grünau in Leipzig, which feature exclusivly row development alignments in parallel or orthogonal spatial order. However, the hypothesis is not met everywhere. For instance, in Hellersdorf in Berlin or Weststadt [B] in Braunschweig the row development alignments are realized in more non-regular layouts.

The lay-outs of streets are measured by the three spatial features 'percentage of non-linear streets', 'percentage of dead end streets' and 'orientation of streets'. For the spatial feature 'percentage of non-linear streets' a clear trend within or across town planning concepts is not recognizable in our results. The town planning guildines seem to not affect the street layouts. Beyond this, we also measure for the feature 'percentage of dead end streets' high variabilites: We find no significant dependence of this structural element with respect to the town planning concept. However, we find in general that this structural element with the objective of traffic calming in residential areas is a typical instrument established by planners. This element is often used for more than a 20% share (maximum is Waldstadt in Karlsruhe with 45%) of the entire street network in the quarter. The spatial feature 'orientation of streets' is strongly related to the spatial feature 'orientation of streets'. As examples, Weststadt [C] in Braunschweig or Scharnhorst-Ost in Dortmund do feature almost perfect geometric, regular layouts not just for the building developments, but also for the street orientations. This shows the dependence of street layouts and building structure alignment.

4.2 Morphological similarities and differences across and within large housing estates – a statistical classification

4.2.1 Morphological differences across town planning concepts for large housing estates

We apply the ANOVA to identify statistical differences between the urban morphologies of the three town planning concepts. The urban morphology is described by the introduced spatial features on buildings and streets. In addtion, the Tuckey-HSD creates statistical groups within the specific spatial features. Table 2 presents the respective results of the ANOVA and the Tukey-HSD between the town planning concepts. The same numbers indicate similarities for the measured spatial features. Different numbers indicate statistical deviations for the respective spatial feastures.

Parameter	Structured, low-dense, mixed large housing estate	Urbanity by density	Socialistic city
building density	1	2	2
floor space index	1	2	2
building size	1	2	3
building height	1	2	2
building orientation	3	2	1
street orientation	2	2	1

Table 2: Results of the ANOVA and the Tukey-HSD test between the town planning concepts and classification into sub-groups

In general, we find for the town planning concept of the 'structured, low dense large housing estates' characteristic spatial features differing from the other concepts. As the concept suggests by terminology, lower built-up densities are realized (with higher shares of urban green spaces). With an average building density of 15.9% and a floor space index on average of 0.53 the usage of space is significantly below the averages measured across our 15 samples in Germany. Beyond, row house footprints are on average with 621m² signifcantly smaller and building heights are with 13.5m on average significantly lower than the measured building morphologies in other large housing estate planning concepts. The building orientations are measured to be predominantly in geometric order of parallel or orthogonal arrangements, as it is characteristic for plannend quarters. The anaylsis of the street layout reveals no charcteristic arrangement for this town planning concept regarding percentage of non-linear streets, dead end streets or orientation of streets.

For the town planning concept 'urbanity by density' we find in general that spatial features deviate significantly from the structured, low dense conceptual idea. We measure the ultilization of space (e.g. by building densites and floor space index) is higher by trend (e.g. Neuperlach in München 17,6 % or Gropiusstadt in Berlin): The conceptual requirement of creating more urbanity has been reached by increasing two dimensional building densities; however, absolute numbers reveal that the increase compared to the structured, low dense concept is with a few percent relatively low. The increase in utilization of space

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predominattly can be referred to the floor space index, which has been increased on average from 0.5 to about 0.8. When relating this town planning concept to the one of the socialistic city the measured spatial features show many similar structural elements (e.g. building density, floor space index and building height).

Consequently, we find for the concept of the 'socialistic city' significant structural deviations from the structured, low dense concept, and partly similar structural features to the concept of urbanity by density. As examples, realized building densities, floor space indices and building heights correspond to the concept of urbanity by density. Building sizes as example are on average with 1,578 m² significantly larger than for the other two concepts.

Concluding we find that different directions of the same town planning concepts due to political background or construction times have influence on the realized built structures. However, the general physical variability of the large housing estates appear to be within a realtively small range.

4.2.2 Morphological differences within town planning concepts for large housing estates

Here, we apply the ANOVA and the Tuckey-HSD to identify statistical differences within the three town planning concepts. Therefore, we apply only the basic population of data per town planning concept for the analysis. And, we create sub-groups within the town planning concepts. Table 3 presents the respective results of the ANOVA and the Tukey-HSD. The same letters (A, B, and C) indicate to which town planning concept the respective large housing estate belongs to. The same number indicates statistical simularities within the spatial features of the settlements of one town planning concept. Lower numbers indicate lower average values. If more than one number is given, the structural appearance belongs to more than one sub-group. Settlements indicated with a star are unique.

Parameter	Weststadt [B]	Neue Vahr	Waldstadt	Gropiusstadt	Weststadt [C]	Scharnhorst-Ost	Nordweststadt	Steilshoop	Neuperlach	Königswiesen	Hellersdorf	Gorbitz	Nord	Neulobeda	Grünau
building density	B 2	B 1 2	B 1*	C 1	C 1	C 1	C 1	C 1	C 1	C 1	A 1	A 1	A 1	A 1	A 1
floor space index	B 1	B 1	B 1	C 2 3	C 12	C 1	C 1	C 3	C 2 3	C 12	A 1	A 1	A 1	A 1	A 1
building size	B 2	B 2	B 1*	C 2	C 3	C 2	C 1*	C 4*	C 3	C 2	A 2 3	A 1	A 123	A 1 2	A 3
building height	B 1	B 2*	B 1	C 123	C 12	C 1	C 1	C 123	C 2 3	C 3	A 1 2	A 1	A 2 3	A 3	A 123
building orientation	B 2*	B 1*	B 3*	C 4 5	C 1	C 5*	C 2 3	C 3 4	C 12	C 1	A 2	A 1	A 2	A 2	A 1
street orientation	B 2	B 1*	B 2	C 1 2	C 1	C 2	C 1 2	C 1 2	C 1	C 12	A 2	A 1	A 1 2	A 1 2	A 1

Table 3: Results of the ANOVA and the Tukey-HSD test within the town planning concepts and classification into sub-groups

Within the concept of the 'structured, low dense' we detect generally similar built morphologies. Predominately row house developments and sporadic high rise buildings are charateristic with low floor space indices.

Within the concept of 'urbanity by density' we measure similar structures; however, more morphologic variations between the settlements exist. As urban land use planning defines maximum densities, it is not surprising that measured densities remain within a small range. They do not show significant differences among our selected seven samples with a minimum density measured of 16.6% for Königswiesen in Regensburg vs. a maximum of 19.1% for Scharnhorst-Ost in dortmund. However, at indivdual building level land use planning provides grades of freedom to architects. Consequently, building sizes, building heights as well as the orientation of the streets reveal many different types of design.

Within the concept of the 'socialistic city' we find highly homogenous morphologies of building structures. Serial building types produce very similar morphologies across space and time. No significant differences in building density, floor space index, orientation of the buildings as well as streets could be identified among the five samples. In general, the measured variations between the urban morphologies are significantly smaller then within the other two concepts. However, some grades of freedom in architectural or town planning realizations are identifed as for example comparatively high spatial variance of building density or floor space index across block units within one area is measured.

Concluding we find that the same town planning concept creates generally homogoenous urban morphologies; although variations exist across examples of large housing estates, they remain within a relatively small range.

5 DISCUSSION

In this work we classify the urban morphology of large housing estates and relate their structures and patterns to different town planning concepts. The approach of combining multi-source geodata (VGI and remote sensing) proves capable of measuring and modeling the built appearance of cities. The geodata we use for the analysis are at the spatial level of individual buildings and street segments where we assume we capture the urban morphology well. Today the capabilities of very high resolution multi-temporal remote sensing data even allow the documentation of changes of the built-environment at LoD-1 (e.g. Leichtle et al., 2017). In consequence, in future physical adaptations in these large housing estates can be monitired.

In general, the measurement of urban morphologies has been documented as a complex task due to the manifold influences of thematic, spatial and calculative issues (e.g. Openshaw, 1983; Taubenböck et al., 2016). Based on the literature we apply commonly suggested features, i.e. a combination of thematic spatial features such as building density, floor space index or street orientations. Beyond, we apply the often suggested spatial entity of block units for aggregation. Thus, we assume that it allows to characterize the built environment in a comprehensive multidimensional way. However, we have to ackowledge that further spatial features such as green fraction or the like, which characterize the spatial appearance as well may provide additional relevant information not considered in our study. Beyond, the trends identified for urban morphologies in large housing estates are based on a relatively small sample of 15 and are thus at risk to be not fully representative. It also remains an open question how the physical realizations of large housing estates in other parts of Europe or across the globe relate to our samples analyzed.

6 CONCLUSION

In this study we find that the town planning concept of large housing estates and their guidelines in physical realization lead to – from a very general perspective – similar physical built structures and spatial layouts. A closer inspection reveals that different epochs with different guiding ideas ("structured and low-dense", "urbanity by density" and "socialistic city") of town planning concepts led to varying physical realizations of the built environment. This, in turn shows that abstract town planning guidelines hold certain degrees of freedom. Assuming that the built structure seen as the theater of life (Jacobs, 1961) has significant influence on the society (as suggested for example by Saunders, 2010) a consequential analystical step forward would now be the systematic correlation with socio-economic parameters such as income, quality of life, subjective feelings, etc. in these areas. This analysis would be a necessary reflection of the specific town planning concept and its capability of providing living environments of high quality.

7 REFERENCES

Altrock, U., Kunze, N. & Kabisch, S. (2018): Großwohnsiedlungen im Haltbarkeitscheck. Springer. pp.335.

Bähr, J. & U. Jürgens (2009): Regionale Stadtgeographie. 2. Auflage. Westermann. Braunschweig.

Bahrenberg, G., Giese, E., Nipper, J. & Mevenkamp, N. (2008): Statistische Methoden in der Geographie. Multivariate Statistik. Gebr. Bornträger, 386 S.

BBSR = BUNDESINSTITUT FÜR BAU-, STADT- UND RAUMFORSCHUNG im BUNDESAMT FÜR BAUWESEN UND RAUMORDNUNG (BBR) (Hrsg.) (2015): Energetische Sanierung von Großwohnsiedlungen – Vertiefende Modellprojekte der Umsetzung integrierter Stadtteilentwicklungskonzepte. In: BBSR-Online-Publikation, Nr. 06/2015. Bonn.

BMBAU = DER BUNDESMINISTER FÜR RAUMORDNUNG, BAUWESEN UND STÄDTEBAU (1994): Großsiedlungsbericht 1994. Unterrichtung durch die Bundesregierung. Hrsg. v. Bundesregierung. Drucksache 12/8406. Bonn.

BMVBS = BUNDESMINISTERIUMS FÜR VERKEHR, BAU UND STADTENTWICKLUNG (2013): Stadtumbau und differenzierte Entwicklung von Großwohnsiedlungen. Antwort der 78. Bundesregierung auf die Kleine Anfrage der

ISBN 978-3-9504173-4-0 (CD), 978-3-9504173-5-7 (print)
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Abgeordneten Heidrun Bluhm, Dr. Kirsten Tackmann, Herbert Behrens, weiterer Abgeordneter und der Fraktion DIE LINKE. – Drucksache 17/12155 –. Berlin.
Dekker, K. & Van Kempen, R. (2004): Large Housing Estates in Europe: Current situation and developments. Journal of Economic and Social Geography, vol 95(5), pp. 570-577.
Dekker, K. & Van Kempen, R. (2005): Large Housing Estates in Europe: A contemporary overview. In: Van Kempen, R., Dekker, K., Hall, S. & Tosics, I: Restructuring large housing estates in Europe. The Policy Press, Bristol, UK.
Hardy, D. (1991): From Garden Cities to New Towns. Chapman & Hall, London.
Heineberg, H. (2006a): Geographische Stadtmorphologie in Deutschland im internationalen und interdisziplinären Rahmen. In: Ganz, P., Priebs, A. & R. Wehrhahn (Hrsg.). Kulturgeographie der Stadt. Kieler Geographische Schriften 111. Selbstverlag des Geographischen Instituts der Universität Kiel. Kiel.
Heineberg, H. & C. Krajewski (2014): Stadtgeographie. 4. Auflage. UTB Schöningh. Paderborn.
Jacobs, J. (1961): The Death and Life of Great American Cities. Random House, 480 S.
Leichtle T, Geiß C, Wurm M, Lakes T & Taubenböck H (2017): Unsupervised change detection in VHR remote sensing imagery – an object-based clustering approach in an urban environment. International Journal of Applied Earth Observation & Geoinformation, 54, pp. 15-27.
Openshaw, S. The Modifiable Areal Unit Problem. Norwick: Geo Books; ISBN: 0860941345. OCLC:12052482; GeoBooks: Norwhich, UK, 1983.
Open Street Map (2017): Available online: http://www.openstreetmap.de/ (accessed on 18 January 2018).
Patel, A., Crooks, A. & Koizumi, N. (2012): Slumulation: An agent-based modeling approach to slum formations. Journal of Artifical Societies and Social Simulation 15 (4), p. 10.
Reicher, C. (2014): Städtebauliches Entwerfen. 3. Auflage. Springer Vieweg. Wiesbaden.
SAUNDERS, D. (2010): ARRIVAL CITY – THE FINAL MIGRATION AND OUR NEXT WORLD. KARL BLESSING VERLAG, P. 576 .
Senatsverwaltung für Stadtentwicklung und Umwelt (2012): IBA-Symposium. Leben mit Weitsicht – Großwohnsiedlungen als Chance. Living with a Vision – Large Housing Estates as an Opportunity. Adrian-prozessnavigation. Berlin.
Streich, B. (2011): Stadtplanung in der Wissensgesellschaft. VS Verlag für Sozialwissenschaften.
Taubenböck, H. & Kraff, N. (2014): The physical face of slums – A structural comparison of slums in Mumbai, India based on remotely sensed data. Journal of Housing & the Built Environment. vol. 29, issue 1, pp. 15-38.
Taubenböck H, Kraff N & Wurm M (2018): The Morphology of the Arrival City – A global categorization based on literature surveys and remotely sensed data. Applied Geography. Accepted.
Taubenböck, H., Kehrer, J. & Wurm, M. (2015): Zu Stein gewordene Philosophien – Die Morphologie geplanter Wohnviertel. SpringerSpektrum. S. 135-147.
Taubenböck, H., Standfuß, I., Klotz, M. & Wurm, M. (2016): The physical density of the city – Deconstruction of the delusive density measure with evidence from European megacities. ISPRS Internatl. Journal of Geo-Information, 5(11), pp. 1-24.
Will, T. & Lindner, R. (2012): Gartenstadt: Geschichte und Zukunftsfähigkeit einer Idee. W.E.B. Verlag, p. 312.
Wurm, M., d'Angelo, P., Reinartz, P. & Taubenböck, H.(2014): Investigating the Applicability of Cartosat-1 DEMs and Topographic Maps to Localize Large-Area Urban Mass Concentrations. IEEE Journal of Selected Topics in Applied Earth Observations and Remtoe Sensing 7(10), pp. 4138-4152.

reviewed paper

Megacities Spatiotemporal Dynamics Monitored with the Global Human Settlement Layer

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1 ABSTRACT

Megacities are urban agglomerations hosting at least 10 million inhabitants. The rise in number, population size, and spatial extent of megacities are among the most prominent manifestations of the process of urbanisation taking place in the contemporary urban age.

Until recently, urban growth has been quantified with data derived from satellites mainly for single megacities or for a limited subset of them. With the current advances in Remote Sensing and data processing, the integration of satellite data with other datasets could become a key contributor to the data revolution and support more complete urban studies and better informed policymaking. Although many remote sensing-derived products exist, few are open and free and possess the adequate resolution, information and contents to monitor the process of urban expansion. This research article builds on the premier open and free geospatial information contained in the Global Human Settlements Layer (GHSL) data package (produced at the European Commission - Joint Research Centre). This research takes advantage of existing GHSL data to identify megacities and to analyse their spatial and demographic change over the last 25 years (between 1990 and 2015). This paper quantifies how much and how fast megacities have expanded in spatial and demographic terms, and we provide graphical examples of the different manifestations of growth across megacities.

The main findings of our research reveal an average demographic growth in megacities exceeding 2% a year between 1990 and 2000, and of 1.9% a year between 2000 and 2015. In the first period (1990 to 2000), megacities have expanded faster than the global average and more than the average of other urban centres. In the second period, global urban population increase has been greater than that of megacities. The comparative analysis of megacities however, reveals swift population growth in several cases: in seven cities population more than doubled between 1990 and 2015, and in six the average annual population growth exceeded 4% a year. Spatial expansion of megacities tends to occur at rates slower than that of population. In 27 cities built-up per capita has decreased over 25 years, by more than 10% in 17 cities. Megacities also differ in population density (in 2015), which in five is above 10,000 inhabitants per square kilometre, while in others, especially the ones in high-income countries, density remains around half this figure.

Results highlight the value of new remote sensing-based data and methods for mapping and characterizing global urbanisation processes, in a consistent and comparable manner across space and time. The provision of open and free data ensures methods and findings can be audited and analyses extended to other cities, while the temporal dimension enables monitoring urbanisation and intergovernmental policies on sustainable urban development.

Keywords: planning urban growth, earth observations, megacities, urban expansion, GHSL

2 DETERMINANTS OF URBAN ANALYSIS: SPACE, DEMOGRAPHY, AND TIME

Over the past few decades the human species has increased its urban character. The process of urbanisation has supposedly achieved a planetary reach [(Brenner 2013)] even though estimates about the share of global population living in urban areas are not homogeneous. Recently, multisectoral policy agendas on sustainable urban development have proliferated (Post-2030 Development Agenda and thematic international frameworks) while narratives and analyses of the trajectories of urban development at the city level were mainly conducted for case study cities. Megacities, the urban agglomerations where population reaches 10 million or more inhabitants, have captured the attention of scholars across several disciplines. Since the 1990s research has focused on: the junctions between globalisation and urbanisation [(Burdett et al. 2007); (Taylor 1999)], on the socio-economic traits of megacities [(Friedmann 1986); (Stratmann 2011); (Derudder 2012), and (Kraas 2007)] and more recently on case studies to monitor the process of growth of megacities [(Taubenböck et al. 2012), (Bagan and Yamagata 2012), (Angel et al. 2015)]. Contemporary technology and information sources, especially remote sensing imagery, allow to capture the process of spatial expansion of urban areas [(Bruzzone and Marconcini 2009); (Potere et al. 2009); (Pesaresi et al. 2011)]. Technological advances can be merged with the traditional concepts and methods of urban analysis [(Ayeni 1979)] to fully support the understanding of human settlements and to guide sustainable urban development [(Geertman, Toppen, and Stillwell 2013)].

The analysis of urban expansion is a domain in which earth observation data are extensively used [(Mundia and Aniya 2005), (Xiao et al. 2006), (Seto et al. 2011)]. The proliferation of products that use satellite imagery to detect land cover typologies has supported a conspicuous scholarship focusing on the spatial growth of human settlements. In particular, some research has been dedicated to mapping urban extent [(Schneider, Friedl, and Potere 2010)], to monitor the changes of the extent of urban land over time (1990-2000) across few case study cities [(Schneider and Woodcock 2008)], to monitor the changes in the urbanized area of 27 megacities across time (1975-1990-2000-2010) [(Taubenböck et al. 2012)], to map spatial changes in a large number of cities [(Angel et al. 2015)], or to detect changes in land use in one megacity [(Bagan and Yamagata 2012)]. Accordingly, a conspicuous amount of urban analysis with remote sensing information has provided characterisation of the spatial and physical components of urban areas.

The demographic component of urban growth has traditionally been the main indicator to describe the process of urbanisation since the first studies on this phenomenon [(Davis 1955)]. Although the very definition of urbanisation (ibid.) has a pure demographic nature (i.e. the ratio between the population of urban areas over the national total), data availability and quality have oftentimes limited these studies [(Cohen 2006)]. Comparative analysis of urbanisation and urban growth requires homogeneous datasets. This requirement was unmet for long, both in terms of geographical coverage and historical depth [(Satterthwaite 2010), (Brenner 2013)]. Most urban analyses with a focus on demography (i.e. [(Montgomery 2008) and (Taubenböck et al. 2012)] refer to population figures contained in the World Urbanization Prospects, a report periodically produced by UNDESA. Downscaling the analysis of urban growth from global and national levels to that of the individual city has considerably advanced thanks to the Global Human Settlement Layer (GHSL) project of the European Commission - Joint Research Centre. The GHSL contains information on human settlements across four epochs (1975-1990-2000-2015) and has global coverage. The data package includes for each grid cell the densities of built-up areas, population distribution and classification of land surface according to a settlement model. Data production is based on the detection of built-up areas from Earth Observation (EO) data [(Pesaresi 2014); (Pesaresi, Ehrlich, et al. 2016)], the modelling of population distribution [(Freire et al. 2016)], and the DG-Regio-OECD degree of urbanisation model [(Dijkstra and Poelman 2014)] - a population-based definition of human settlements. The application of this model to the GHSL data supports the proposal and ongoing discussions on a global harmonised definition of cities and settlements – a voluntary commitment of the European Union[1], The Food and Agriculture Organization of the United Nations (FAO), the Organisation for Economic Co-operation and Development (OECD) and World Bank.

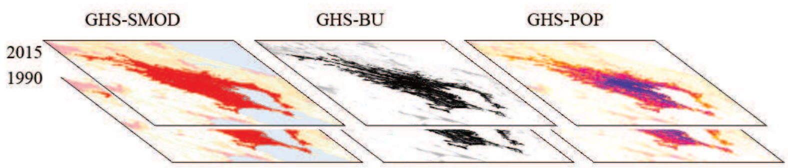

Figure 1 Layers of the GHSL Suite used in the study. Settlement Model (left), Built-up Grid (centre), Population Grid (right)

[1] https://ec.europa.eu/commission/commissioners/2014-2019/cretu/blog/presenting-voluntary-commitments-eu-meet-new-urban-agendas-objectives_en

The discussion on a global definition of cities was first announced at the UN-Habitat III conference organised by UN-Habitat to adopt a policy framework to guide sustainable urban development for the next 20 years. In this framework, the GHSL data have become a baseline dataset to produce the Global Human Settlement (GHS) Settlement Model (SMOD). The GHS SMOD allows to identify human settlements and their extent by mapping types of urban areas in a consistent and systematic manner across the globe. With the GHSL data it is ultimately possible to analyse several characteristics of a human settlement among which: the process of urbanisation [(Pesaresi, Melchiorri, et al. 2016)], urban and rural growth [Melchiorri and Siragusa, 2018 –forthcoming, (Melchiorri 2017)], and population densities [(Smith 2017)]. The aim of this research paper is to identify systematicly all megacities in the world in 2015 with the GHSL data package, and analyse in a comparative way the trajectory of their spatial and demographic change that took place in between 1990 and 2015. In this wrok, we define megacities the urban centres in the GHS SMOD data (2015), where population reaches at least 10 million people in 2015. The contribution broadens existing research for several reasons: the number of case study city is expanded, the number of indicators adopted to characterise the process of urban growth is extended, the time span of the analysis is prolonged to 2015, the spatial and demographic components are derived from a single and consistent data package to identify interdependences. In addition, the methods adopted are replicable and the materials used are open and free. This allow extending the research to any of the other 10 thousand urban centres mapped by the GHSL data.

3 MATERIALS AND METHODS

The GHSL is a suite of global spatial information data sets to map the human presence on Earth across different epochs. In this work, we are using the analytics extracted using the GHSL data package P2016[2] released as open and free data during the UN Habitat III conference. The three thematic layers in GHSL are:

(1) GHS Built-up grid, containing multitemporal information about density of built-up area [(Pesaresi et al. 2015)];

(2) GHS Population grid, containing multitemporal information about population distribution [(JRC and CIESIN 2015)];

(3) GHS SMOD grid, [(Pesaresi and Freire 2016)] classifying each 1km square of the land mass into one of three classes (urban centres, urban clusters or rural area) by analysing population and built-up density grids.

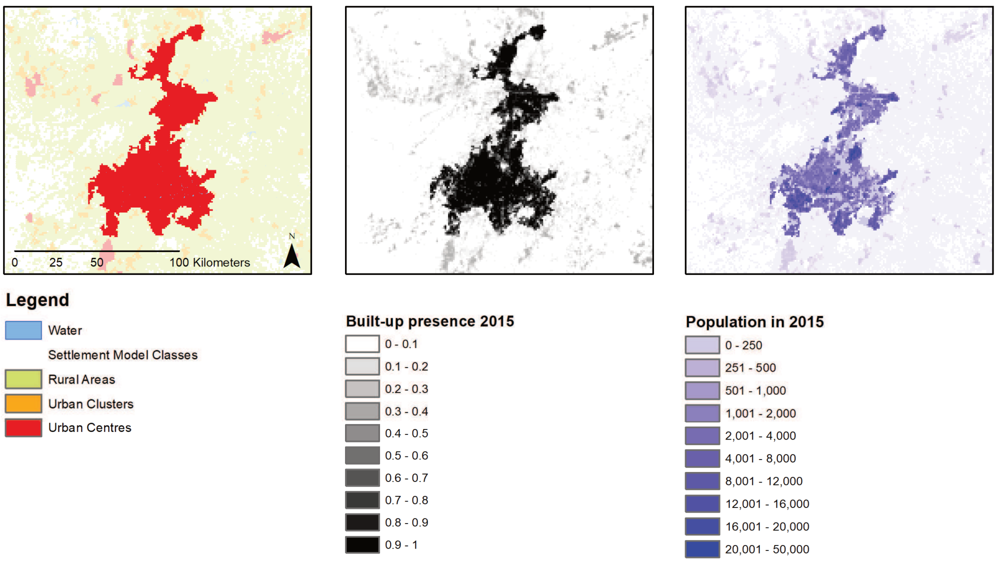

Figure 2 Settlement model (left), built-up areas (centre), and population density (right) in Johannesburg (2015)

The layers are available at various spatial resolutions: approximately 38m (GHS Built-up grids), 250m (GHS Built-up grids and GHS Population grids) and 1km (all the layers in the package), for each epoch (1975-1990-2000-2015). For the purpose of this city level analysis, we used the family of GHSL grids at 1km resolution. Despite finer resolutions being available, the adoption of input data at finer resolution (i.e. at 250m) is appropriate for more in depth analysis of individual case studies. For a comparative purpose the

[2] http://ghsl.jrc.ec.europa.eu/datasets.php#2016public

patterns of built-up and population dynamics are clearly observable at the 1km resolution. One example of the geospatial information used for the research is displayed in Figure 2. The GHSL layers are available in a grid format as follows. The earth surface is divided into 1km² grid cells, and each cell contains values for the density of built-up areas (GHS Built-up grid), population (GHS Population grid) and the settlement model typology (GHS SMOD grid). The grid approach makes possible to overcome administrative boundaries for data collection and reporting. Data required to perform the presented analysis were produced through spatial analysis with GIS software, taking as input the GHSL data packages available on the Joint Research Centre Global Human Settlements website.[3] Additional information on the individual urban centres were sourced from country summaries.[4] The GHSL Settlement Model grid classifies settlements in three categories: Urban Centres, Urban Clusters and Rural Areas. Urban Centres are urban agglomerations having at least 50 thousand inhabitants, population density is above 1.5 thousand inhabitants per square kilometre or built-up density is above 50% [(Dijkstra and Poleman 2014)]. Accordingly, megacities are Urban Centres where population in 2015 is at least 10 million. This work builds on the preliminary snapshot of megacities proposed in the Atlas of the Human Planet 2016 [(Pesaresi, Melchiorri, et al. 2016)] and it goes furhter presenting a comparative analysis of the spatial and demographic changes that took place in the individual megacities between 1990 and 2015 using the data extracted from the GHSL suite. Megacities are here compared vis-á-vis the following eight indicators: a) total population (1990 and 2015) and change (between 1990 and 2015); b) total built-up surface (1990 and 2015) and change (between 1990 and 2015); c) population density in 2015; d) area in 2015 e) built-up per capita per epoch and change. In the article, we provide tables and maps to illustrate and quantify the size of megacities. In the analysis of megacities with GHSL we have calculated the indicators using both statistical tools and spatial analytics. Despite the relevance of this novel information, space constraints forced to communicate the findings with digits in the text, with few tables, and only more rarely with maps.

4 RESULTS

In the GHS SMOD 2015 it is possible to identify around 13 thousand urban centres. The analysis of the statistics generated for these centres (accounting population and built-up areas) identifies 32 urban agglomerations with a population of 10 million people or more – Figure 4. These 32 megacities are home to some 618 million people in 2015, equivalent to 10% of the global urban population. Between 1990 and 2015 population in megacities has grown more than the global average of urban areas (aggregate of urban centres and clusters), and also more than the global average of urban centres (52%) –Figure 3. Comparing the average yearly population growth[5] in the period 1990-2000 population in megacities has grown faster than in any other settlement class (above 2% a year). In the second period (2000-2015) both the average growth of global urban population, and that of urban centres has been greater than that of megacities.

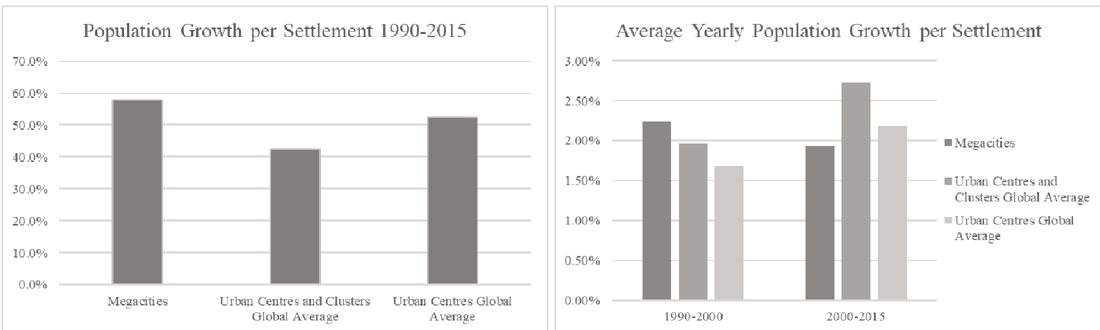

Figure 3 comparison of relative population growth in settlement typologies (left), and yearly population growth per epoch (right)

Figure 4 shows the list of the 32 urban centres megacities and respective statistics. The following sub-sections synthetically quantify the indicators adopted to characterise megacities.

[3] http://ghsl.jrc.ec.europa.eu/data.php

[4] Summaries are are supporting materials for the global discussion on the city and settlement definition. Example of country summary for Belgium http://ghsl.jrc.ec.europa.eu/gate.php?waw=205021135170

[5] $Average\ yearly\ population\ growht = \frac{\%\ population\ change_{epoch1,2}}{year\ span_{epoch1,2}}$

N	Megacity	Country	Built-up (sqkm)			Population (millions)			BU/capita (m)	Pop Density (inhab/sqkm)
			Year 1990	Year 2015	Change 90-15	Year 1990	Year 2015	Change 90-15	Year 1990	Year 2015
1	Guangzhou	China	1979	3666	85.2%	24.30	46.04	89.5%	80	5620
2	Cairo	Egypt	1626	2020	24.2%	24.1	37.84	57.0%	53	5134
3	Jakarta	Indonesia	3184	3867	21.5%	19.7	36.40	84.4%	106	6051
4	Tokyo	Japan	3551	3874	9.1%	28.0	33.74	20.4%	115	6214
5	Delhi	India	890	1184	33.0%	15.5	27.63	78.8%	43	11058
6	Kolkata	India	700	844	20.6%	21.3	26.87	26.2%	31	5838
7	Dhaka	Bangladesh	256	498	94.5%	10.2	24.83	144.5%	20	9067
8	Shanghai	China	889	1738	95.5%	10.5	24.67	134.8%	70	7514
9	Mumbai	India	661	825	24.8%	16.7	23.41	40.4%	35	13870
10	Manila	Philippines	840	932	11.0%	12.6	22.45	78.0%	42	9850
11	Seul	Republic of K	878	1086	23.7%	17.6	22.13	25.9%	49	8757
12	Mexico City	Mexico	1219	1390	14.0%	17.2	20.09	16.5%	69	8234
13	Sao Paulo	Brazil	1659	1696	2.2%	15.3	20.02	30.7%	85	8907
14	Beijing	China	1949	2217	13.8%	7.9	19.90	150.7%	111	6641
15	Osaka	Japan	2288	2357	3.0%	16.1	16.53	2.8%	143	4990
16	New York	USA	2900	3540	22.1%	14.1	15.19	8.0%	233	3364
17	Bangkok	Thailand	1046	1366	30.6%	6.2	15.16	142.8%	90	5382
18	Moscow	Russian Fede	1115	1298	16.4%	10.5	14.50	38.0%	90	7316
19	Buenos Aires	Argentina	1418	1610	13.5%	10.5	14.25	35.3%	113	6251
20	Istanbul	Turkey	680	866	27.4%	7.8	14.23	83.1%	61	10181
21	Los Angeles	USA	4495	4734	5.3%	12.0	14.20	18.5%	333	2616
22	Karachi	Pakistan	297	379	27.6%	7.8	13.21	70.2%	29	18471
23	Tehran	Iran	658	730	10.9%	7.6	12.78	67.4%	57	8488
24	Changzhou	China	504	1570	211.5%	7.1	12.22	71.6%	128	4162
25	Ho Chi Minh	Viet Nam	425	676	59.1%	4.5	11.78	163.5%	57	7917
26	Johannesbur	South Africa	2610	3170	21.5%	5.4	11.63	115.7%	273	2972
27	Lagos	Nigeria	701	1064	51.8%	6.0	11.57	92.7%	92	8736
28	Chaozhou	China	1478	1563	5.8%	8.3	11.49	38.6%	136	3451
29	Lahore	Pakistan	183	427	133.3%	6.4	11.47	78.8%	37	8658
30	Bangalore	India	225	422	87.6%	4.1	10.61	160.4%	40	13572
31	Paris	France	1349	1456	7.9%	9.0	10.22	14.1%	142	5249
32	Chennai	India	289	480	66.1%	6.6	10.03	52.9%	48	9531

Figure 4 List of the 32 megacities and corresponding statistics (sorted by population in 2015)

4.1 Population

The population size of the above centres varies. Chennai slightly exceeds the 10 million inhabitant threshold, while Guangzhou, the most populated urban centre in the globe exceeds 45 million inhabitants. Fifteen megacities have a population ranging between 10 and 15 million inhabitants. Population changes in the period 1990-2015 are prominent in almost all megacities. In 31 urban centres population increased by more than 1 million in 25 years (only in Osaka growth has been lower, about 440 thousand inhabitants). In Delhi, Cairo, Shanghai, Dhaka, and Jakarta population increased between 60 and 145% equivalent to more than 10 million inhabitants in each of the centres. Overall, in 2015 megacities hosted about 225 million more people than 25 years earlier, an increase of 58%. Most notable average annual population increases between 1990 and 2000 took place in Ho Chi Minh City, Dhaka, Bangalore (above 5%).

4.2 Built-up

The most populated megacities are not the ones having the most built-up surface [(Melchiorri and Siragusa 2016)]. The present morphological form of megacities is derived from GHS Built-up grids. Karachi and Los Angeles have similar population in 2015, but the total built-up surface mapped in Karachi is 379 square kilometres, while that detected in Los Angeles (the megacity accounting for the largest built-up surface in 2015) exceeds 4.5 thousand square kilometres (12 times the built-up surface in Karachi). Considering the changes in built-up surface over the observed period, the most considerable relative expansion of built-up took place in Changzhou where detected built-up areas triple between 1990 and 2015, and in Lahore and Shanghai where they double. In absolute terms in Changzhou and Guangzhou built-up has increased the most. In both centres, in 2015 GHSL accounts one thousand square kilometres more built-up areas compared to 1990. Megacities having the smalles expansion of built-up surface are Sao Paulo, Osaka, Tehran, Karachi, Chaozhou and Manila. In all these built-up growth was below 100 square kilometres. Overall, over the observed 25 years built-up expanded by 25% in the 32 megacities.

4.3 Built-up per capita

This indicator is the ratio between the total built-up detected within the megacity and its population (to identify interdependence between patterns observed in sections 4.1 and 4.2). Highest built-up per capita ratios are observed in Los Angeles (330 square meters), Johannesburg, and New York (above 200 square meters in both); the lowest are found in Dhaka (20), Karachi, and Kolkata (under 20). The multitemporal change (1990-2015) in Built-up per capita in megacities is mostly negative (it declines in 27 megacities). In ten megacities[6] it declined between 10 and 20%, and in seven[7] by more than 20%. The magnitude of built-up per capita reduction has been most considerable in Johannesburg (-211 square meters per inhabitant, or -45%), and Beijing (-134, or -55%). However, the most salient changes in the built-up per capita might be observed in cities like Dhaka and Karachi where the availability of built-up per capita was limited already in 1990 (25 square meters per inhabitant in Dhaka and 43 in Karachi), but it has reduced further (by more than 5 square meters in the first and by 10 in the second). A potentially positive trajectory is observed in Lahore where built-up per capita increased by 30% (8 square meters per inhabitant) between 1990 and 2015, reaching 30 square meters per person.

4.4 Area

The areal extent of megacities (the area of the Uurban centre in the Settlement Model) has been extracted from the GHSL only for the epoch 2015. Their extent in 2015 are quite diverse: two megacities (Karachi and Bangalore) cover an area under one thousand square kilometres, nine an area between 1 and 2 thousand square kilometres, ten between 2 and 3 thousand, four between 3 and 4 thousands, two both between 4 and 5 thousands (New York and Kolkata) and between 5 and 6 thousands (Los Angeles and Tokyo), while Jakarta, Cairo and Guangzhou exceed 7 thousand square kilometres. Although the propositions above might be meaningful per se, the calculation of the indicator quantifying the surface of megacities is most useful as parameter to calculate the population density indicator (section 4.5).

4.5 Population Density

One example of population density (inhabitants per square kilometre) at the megacity level as extracted from the GHSL[8] is visible in Figure 2. In 2015 there are five megacities where overall population density exceeds 10 thousand inhabitants per square kilometre: Karachi, Mumbai, Bangalore, Delhi and Istanbul. A second indicator to monitor population density has been extracted taking as areal operator the extent of built-up areas.[9] It is in fact the reciprocal of the built-up per capita and it depicts the modelled density of people per unit of built-up area. The highest overall concentration of people per square kilometre of detected built-up occurs in Dhaka with nearly 50 thousand people per built-up unit, followed by Karachi (35 thousand), and Kolkata (32 thousand). Over the observed period (1990-2015), the density of population per built-up has decreased in Lahore (-8,000 people), Changzhou (-6,300), Chennai (-1,800), New York (-500) and slightly in Osaka. Most considerable increase took place instead in Dhaka (+10,000), Manila (+9,000) and Karachi (+8,600). Especially in Dhaka and Karachi, densities were already very high in 1990 (40,000 in Dhaka and 26,000 in Karachi).

5 DISCUSSION

The previous section has provided the results of the data analysis and has proposed elements of comparative statistics of multitemporal changes of the selected indicators across megacities. This section presents the most salient traits to characterise the „facts behind urban expansion“. To make this explicit and to show alternative trajectories of change, we selected three pairs of megacities for which we show the changes in the settlement model class, the built-up coverage and the population density at the 1km grid level. This section presents exemplary cases of urban expansion to manifest: changes in the areal extent of the urban centre megacity (Kolkata and Bangalore), changes in built-up areas (Lagos and Karachi), and to show the change in population (Beijing and Lahore) at the grid level.

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6 Sao Paulo, Cairo, Buenos Aires, Chaozhou, Guangzhou, Karachi, Bangalore, Delhi, Tehran, and Manila.

7 Lagos, Jakarta, Istanbul, Ho Chi Minh City, Bangkok, Johannesburg, and Beijing

8 A classification of population threshold has been applied.

9 $People\ per\ Built\ \ up_{epoch} = \frac{Population_{epoch}}{built-up_{epoch}}$

The change in the spatial extent of megacities is linked to the characteristics of the settlement in 1990. Figure 5 shows for Kolkata (left) and Bangalore (right) the extent of the megacity in 1990 (yellow) and in 2015 (dark red). The extent of Kolkata in 2015 includes 19 individual settlements classified as urban centres in 1990. The process of spatial and demographic growth has led to them merging between the two epochs. In particular, the spatial expansion tends to occur within the perimeter of the megacity in 2015 (especially in the eastern and western end of the megacity). In Bangalore, instead, the pattern of expansion has been incremental from the single centre already existing in 1990. Other seven megacities[10] have grown around a single urban centre core; all other megacities enclose in their form in 2015 multiple urban centres that were separated in the previous epoch, marking the evolution from a polycentric status in 1990. Most prominent examples of the conjunction of centres took place in Guangzhou, Dhaka, Kolkata and Cairo.

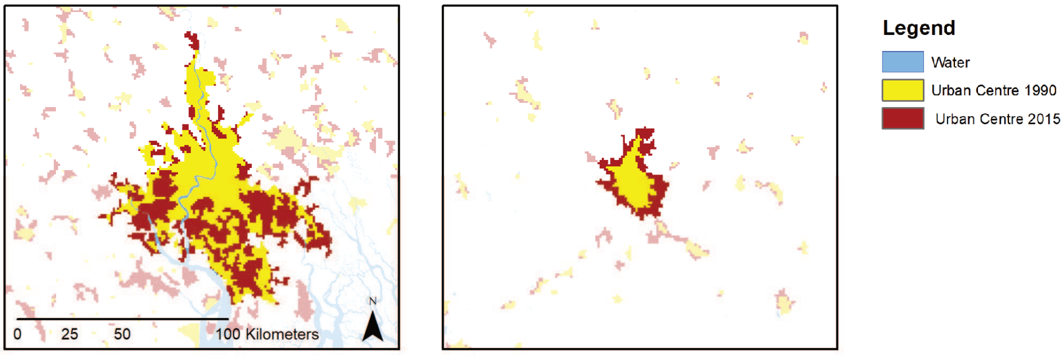

Figure 5 Change in the urban centre extent from a polycentric pattern in 1990 (Kolkata, left) and monocentric core (Bangalore, right)

The second pair of megacities (Figure 6) shows the increment in the built-up coverage at the pixel level. In Lagos (left), substantial increase of built-up surface took place in the outer edges of the urban centre. In these areas, built-up change has been frequently between 0.9 and 1. Such change show how some areas in the edges of the city become fully built (or almost fully) in 25 years, while there was almost no built-up detected in 1990. In contrast to Lagos, in Karachi, most evident changes in built-up occurred within the perimeter of the urban centre form of 1990.

Figure 6 Change in the Built-up areas 1990-2015 in Lagos (left) and Karachi (right)

The last example (Figure 7) shows the changes in population density modelled at the 1km pixel level. In Beijing population grows especially in the core (dark red color), where population change per pixel is frequently above 7.5 thousand people, and also in the fringes. Instead in Lahore, population in the core declines (blue) while it increases around the core.

Some final considerations should be drawn on the interdependence between built-up and population growth and on the magnitude of the spatial and demographic change that occurred in megacities over the past 25 years. Figure 8 (left) shows the reason for the frequent decline in the built-up surface per capita. Most megacities have grown (in relative terms) in population more than in built-up surface (upper left part of the chart).

[10] Los Angeles, New York, Buenos Aires, Moscow, Tehran, Istanbul and Karachi.

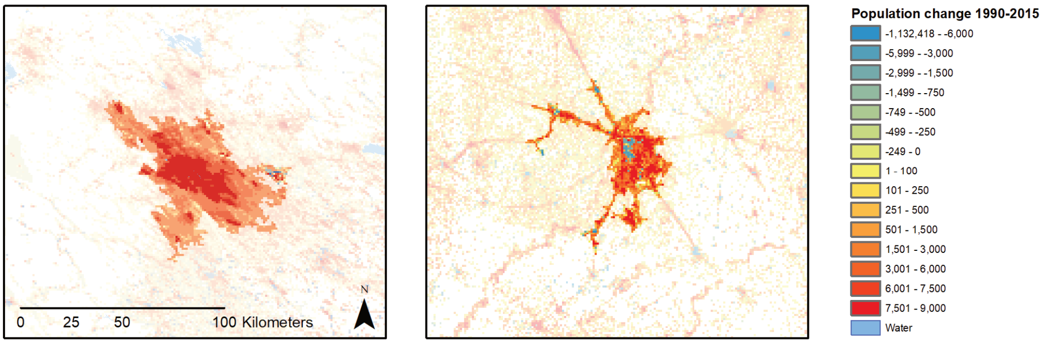

Figure 7 Change in population 1990-2015 in Beijing (left) and in Lahore (right)

Figure 8 displays the second proposition to express the substantial spatial and demographic growth of megacities over the observed period. The two charts (right) display the share of population and built-up areas already present in 1990 compared to the total estimate in 2015. In several megacities (Tokyo, Paris, Chaozhou, Los Angeles, Osaka and Sao Paulo) 90% of the extent of built-up reached in 2015 was already there in 1990. Concerning population, in 1990 seven megacities had half or less of the population they contain in 2015. This latter phenomenon can also be related to the number of Urban Centres that were reaching the megacity threshold in 1990 (extracted from GHSL Settlement Model 1990). These were Tokyo, Guangzhou, Cairo, Kolkata, Jakarta, Seoul, Mexico City, Mumbai, Osaka, Delhi, Sao Paulo, New York, Manila, Los Angeles, Buenos Aires, Shanghai, Moscow and Dhaka, altogether they hosted in 1990 nearly 300 million inhabitants. Among the seven megacities in which population doubled, five were not megacities in 1990, and in the other two (Dhaka and Shanghai) population in 1990 was just above 10 million (10.2 in Dhaka and 10.5 in Shanghai).

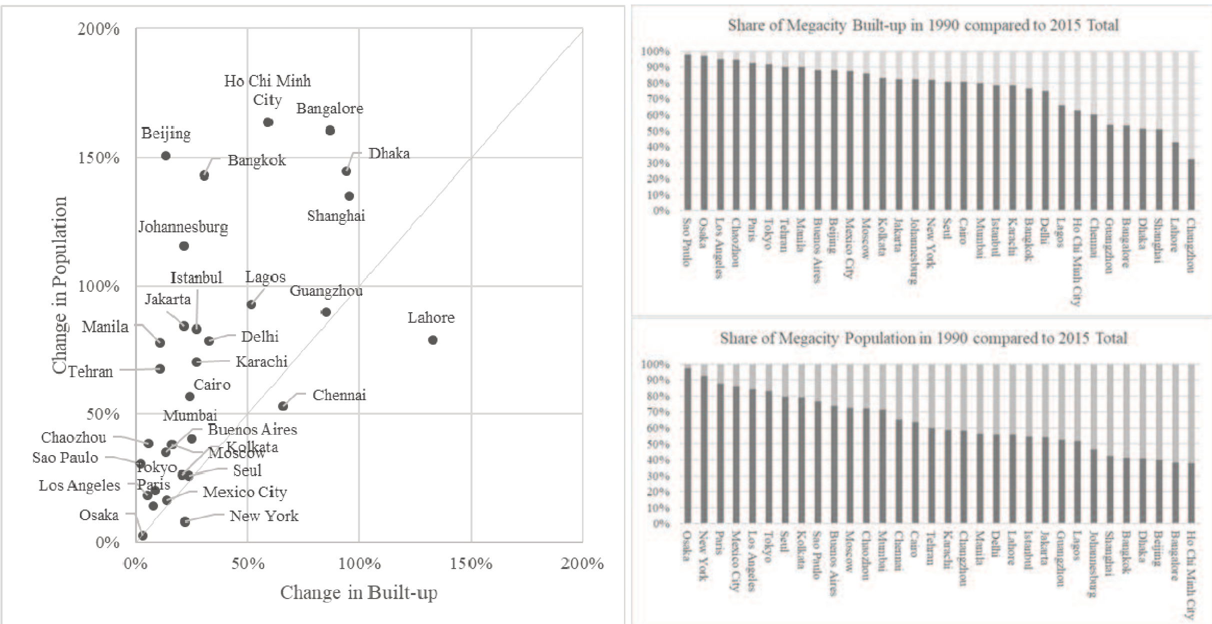

Figure 8 Relative change of built-up areas and population 1990-2015 (left), share of megacity population in 1990 compared to 2015 total (upper right), and share of megacity built-up in 1990 compared to 2015 total (lower right)

6 CONCLUSION

This paper analysed the recent process of urban growth in current megacities. Although megacities have been observed from various angles and information sources, this study extended the number of case studies, expanded the number of indicators to characterise urban growth, and has simultaneously analysed the spatial and demographic components of urban growth to manifest the interdependence between these two determinants. This study was made possible thanks to the open and free release of the Global Human Settlements Layer suite of data and tools. In particular, this study exploited the possibility to compare individual cities across space and time thanks to the characteristics of the GHSL. The GHSL produced information for the four epochs 1975, 1990, 2000 and 2015 as these satellite imagery from which the informaiton were derived were organized and made available as open data for those time invervals. With the multitemporal coverage it was possible to monitor the rise in number and the growth in population in today's megacities. To this end it is key to have periodical updates of the dataset. This is dependent on the availability of suitable satellite imagery and updated national census to feed the GHSL workflow.

In this work, we adopted a multisectoral toolkit that combines statistical and spatial analysis to quantify and display the process of urban growth in megacities. The study also underlines the added value of characterizing urban expansion through statistics and spatial analysis. The analysis is illustrated with graphical representations of the spatial evolution of the urban extent, built-up and population change of a few cities (Kolkata and Bangalore, Lagos and Karachi, Shanghai and Lahore). In the comparative analysis of these illustrative cases, it was possible to showcase the alternative trajectories of urban change. In some megacities urban growth manifested as conjunction of multiple urban centres (polycentric nature), while in others revealed an expansion from a single core. Built-up expansion took place oftentimes at the edges of existing cores and more rarely within. Population change mostly occurred in the original cores, and on the fringes, and in few cases a decline in population was observed in city cores.

The paper also presented a replicable methodology to analyse the process of urban expansion in other urban centres using the GHSL data. Further work could analyse in more detail the process of growth by grouping megacities in population classes in 1990 or by annual population increase. More detailed studies, especially with a restricted sample of megacities could be explored adopting the GHSL at 250m resolution, aiming at a finer characterisation of the urban dynamics below the city scale.

7 REFERENCES

ANGEL, S., A. M. Blei, D. M. Civco, P. Lamson-Hall, J. Parent, N. Galarza Sanchez, and K. Thom. 2015. Atlas of Urban Expansion - The 2015 Edition. Edited by New York: The NYU Urbanization Project, Cambridge MA: The Lincoln Institute of Land Policy, and Nairobi, Kenya: U.N. Habitat.

AYENI, Bola. 1979. Concepts and Techniques in Urban Analysis. Croom Helm Series in Geography and Environment. London: Croom Helm.

BAGAN, Hasi, and Yoshiki Yamagata. 2012. "Landsat Analysis of Urban Growth: How Tokyo Became the World's Largest Megacity during the Last 40years." Remote Sensing of Environment 127 (December):210–22. https://doi.org/10.1016/j.rse.2012.09.011.

BRENNER, N. 2013. "Theses on Urbanization." Public Culture 25 (1 69):85–114. https://doi.org/10.1215/08992363-1890477.

BRENNER, Neil, and Christian Schmid. 2015. "Towards a New Epistemology of the Urban?" City 19 (2–3):151–82. https://doi.org/10.1080/13604813.2015.1014712.

BURDETT, Richard, Deyan Sudjic, London School of Economics and Political Science, and Alfred Herrhausen Gesellschaft für Internationalen Dialog, eds. 2007. The Endless City: The Urban Age Project by the London School of Economics and Deutsche Bank's Alfred Herrhausen Society. London: Phaidon.

COHEN, Barney. 2006. "Urbanization in Developing Countries: Current Trends, Future Projections, and Key Challenges for Sustainability." Technology in Society 28 (1–2):63–80. https://doi.org/10.1016/j.techsoc.2005.10.005.

DAVIS, Kingsley. 1955. "The Origin and Growth of Urbanization in the World." American Journal of Sociology 60 (5):429–37. https://doi.org/10.1086/221602.

DERUDDER, Ben, ed. 2012. International Handbook of Globalization and World Cities. Elgar Original Reference. Cheltenham ; Northhampton, MA: Edward Elgar.

DIJKSTRA, Lewis, and Hugo Poleman. 2014. "A Harmonised Definition of Cities and Rural Areas: The New Degree of Urbanisation." Publications Office of the European Union.

FREIRE Sergio, Kytt MacManus, Martino Pesaresi, Erin Doxsey-Whitfield, and Jane Mills. 2016. "Development of New Open and Free Multi-Temporal Global Population Grids at 250 M Resolution." In . Helsinki.

FRIEDMANN, John. 1986. "The World City Hypothesis." Development and Change 17 (1):69–83. GEERTMAN, Stan, Fred Toppen, and John Stillwell. 2013. Planning Support Systems for Sustainable Urban Development. Berlin, Heidelberg: Springer.

GEERTMAN, Stan, Fred Toppen, and John Stillwell. 2013. Planning Support Systems for Sustainable Urban Development. Berlin, Heidelberg: Springer

JRC and CIESIN. 2015. "GHS Population Grid, Derived from GPW4, Multitemporal (1975, 1990, 2000, 2015)." European Commission, Joint Research Centre, JRC Data Catalogue.

KRAAS, Frauke. 2007. "Megacities and Global Change: Key Priorities." The Geographical Journal 173 (1):79–82. https://doi.org/10.1111/j.1475-4959.2007.232_2.x.

MELCHIORRI, Michele. 2017. "Analyzing Urban and Rural Settlements with Remote Sensing: Comparing National Trends of Rural Growth with the Global Human Settlement Layer." In Proceedings of the Joint Conference ISOCARP-OAPA - 53rd ISOCARP Congress. ISOCARP.

MELCHIORRI, Michele, and Alice Siragusa. 2016. "City Analysis Using the GHSL." In Atlas of the Human Planet 2016: Mapping Human Presence on Earth with the Global Human Settlement Layer. Publications Office of the European Union.

MONTGOMERY, M. R. 2008. "The Urban Transformation of the Developing World." Science 319 (5864):761–64..

MUNDIA, C. N., and M. Aniya. 2005. "Analysis of Land Use/Cover Changes and Urban Expansion of Nairobi City Using Remote Sensing and GIS." International Journal of Remote Sensing 26 (13):2831–49. https://doi.org/10.1080/01431160500117865.

PESARESI, Martino. 2014. “Global Fine-Scale Information Layers: The Need of a Paradigm Shift.” In Conference on Big Data from Space (BiDS’14), edited by Pierre Soille and Pier Giorgio Marchetti, EUR 26868 EN:8–11. ESA-ESRIN, Frascati, Italy: JRC. https://doi.org/10.2788/1823.

PESARESI, Martino, Daniele Ehrlich, Stefano Ferri, Aneta Florczyk, Sergio Freire, Matina Halkia, Andreea Julea, Thomas Kemper, Pierre Soille, and Vasileios Syrris. 2016. “Operating Procedure for the Production of the Global Human Settlement Layer from Landsat Data of the Epochs 1975, 1990, 2000, and 2014.” JRC Technical Report EUR 27741 EN. Ispra, Italy: Publications Office of the European Union. http://publications.jrc.ec.europa.eu/repository/handle/JRC97705.

PESARESI, Martino, Michele Melchiorri, Alice Siragusa, and Thomas Kemper. 2016. “Atlas of the Human Planet 2016. Mapping Human Presence on Earth with the Global Human Settlement Layer.” EUR 28116 EN. Luxembourg: Publications Office of the European Union.

PESARESI, Martino, Daniele Ehrlich, Aneta Floczyk, Sergio Freire, Andreea Julea, Pierre Soille, and Vasileios Syrris. 2015. “GHS Built-up Grid, Derived from Landsat, Multitemporal (1975, 1990, 2000, 2014).” European Commission, Joint Research Centre, JRC Data Catalogue.

PESARESI, Martino, and Sergio Freire. 2016. “GHS Settlement Grid Following the REGIO Model 2014 in Application to GHSL Landsat and CIESIN GPW v4-Multitemporal (1975-1990-2000-2015).” European Commission, Joint Research Centre, JRC Data Catalogue

SATTERTHWAITE, David. 2010. Urban Myths and the Mis-Use of Data That Underpin Them. Helsinki: WIDER. http://hdl.handle.net/10419/54031.

SCHNEIDER, Annemarie, Mark A. Friedl, and David Potere. 2010. “Mapping Global Urban Areas Using MODIS 500-M Data: New Methods and Datasets Based on ‘urban Ecoregions.’” Remote Sensing of Environment 114 (8):1733–46. https://doi.org/10.1016/j.rse.2010.03.003.

SCHNEIDER, Annemarie, and Curtis E. Woodcock. 2008. “Compact, Dispersed, Fragmented, Extensive? A Comparison of Urban Growth in Twenty-Five Global Cities Using Remotely Sensed Data, Pattern Metrics and Census Information.” Urban Studies 45 (3):659–92. https://doi.org/10.1177/0042098007087340.

SETO, Karen C., Michail Fragkias, Burak Güneralp, and Michael K. Reilly. 2011. “A Meta-Analysis of Global Urban Land Expansion.” Edited by Juan A. Añel. PLoS ONE 6 (8):e23777. https://doi.org/10.1371/journal.pone.0023777.

SMITH, Duncan A. 2017. “Visualising World Population Density as an Interactive Multi-Scale Map Using the Global Human Settlement Population Layer.” Journal of Maps 13 (1):117–23. https://doi.org/10.1080/17445647.2017.1400476.

STRATMANN, Bernhard. 2011. “Megacities: Globalization, Metropolization, and Sustainability.” Journal of Developing Societies 27 (3–4):229–59. https://doi.org/10.1177/0169796X1102700402.

TAUBENBÖCK, H, T Esch, A Felbier, M Wiesner, A Roth, and S Dech. 2012. “Monitoring Urbanization in Mega Cities from Space.” Remote Sensing of Environment 117:162–176.

TAYLOR, Peter J. 1999. “Worlds of Large Cities: Pondering Castell’s Space of Flows.” Third World Planning Review 21 (3):3.

XIAO, Jieying, Yanjun Shen, Jingfeng Ge, Ryutaro Tateishi, Changyuan Tang, Yanqing Liang, and Zhiying Huang. 2006.
“Evaluating Urban Expansion and Land Use Change in Shijiazhuang, China, by Using GIS and Remote Sensing.” Landscape and Urban Planning 75 (1–2):69–80. https://doi.org/10.1016/j.landurbplan.2004.12.005.

Menschen mit Demenz – unterwegs im öffentlichen Raum. Situationen und Unterstützungsmöglichkeiten

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1 ABSTRACT

Im Projekt „Demenz in Bewegung“ wird die außerhäusliche Mobilität von Menschen mit Demenz erforscht. In Österreich leben an die 130.000 Personen mit Demenz, wobei sich beobachten lässt, dass sich sowohl die Personen mit Demenz, als auch ihre Zu- und Angehörigen aus dem gesellschaftlichen Leben und der außerhäuslichen Mobilität mit fortschreitender Krankheit zunehmend zurückziehen. Um diesem Phänomen entgegenzuwirken und allen Personen außerhäusliche Mobilität zu ermöglichen, werden die Mobilitätsbedürfnisse und -erfahrungen von Menschen mit Demenz untersucht.

Im Projekt wurde im Jahr 2017 eine empirische Studie durchgeführt, in der Menschen mit Demenz unmittelbar ihre Erfahrungen, Wünsche und Bedürfnisse bei ihren Wegen im öffentlichen Raum und beim Nutzen von öffentlichen Verkehrsmitteln in die Forschung einbringen konnten. Um nun die Ergebnisse dieser partizipativen Mobilitätsforschung für verschiedene verkehrsplanerische Berufsgruppen aufzuarbeiten, werden im Jahr 2018 – in partizipativen Dialogen mit Stakeholdern – Handlungsempfehlungen erarbeitet.

Keywords: Verkehrsplanung, Empfehlungen, Stadplanung, Inklusion, Demenz

2 STAND DES WISSENS

In Österreich lebten 2014 Schätzungen zufolge 130.000 Personen mit Demenz, aufgrund eines kontinuierlichen Altersanstiegs in der Bevölkerung wird bis zum Jahr 2050 von einer Verdoppelung des Anteils ausgegangen. Zwei Drittel der Menschen mit Demenz sind Frauen. Dies ist u.a. auf die höhere Lebenserwartung von Frauen und das erhöhte Erkrankungsrisiko im hohen Alter zurückzuführen (Höfler, Sabine et al.: 2015). 80 Prozent der Menschen mit Demenz leben in Österreich zuhause.

Die häufigste Demenzform ist die Demenz bei Alzheimer'scher Erkrankung. Auch wenn wissenschaftliche Forschungen sowie Fachexpertinnen und -experten zunehmend von „cognitive disorders“, individuellen Verläufen oder „Phasen“ (Fercher, Petra; Sramek, Gunvor: 2013) und weniger von „Stadien“ der Demenz sprechen, wird in der klinischen Praxis Demenz oft in drei Schweregrade (Mini-Mental-State Examination MMSE) eingeteilt: Bei „leichter Demenz“ treten zeitliche und örtliche Orientierungsprobleme auf, Vergesslichkeit, Probleme bei komplexen Aufgaben und ein häufiges Verleugnen von Defiziten. Bei „mittelschwerer Demenz“ sind die betroffenen Personen zu Zeit und Ort desorientiert, haben Probleme bei Alltagsverrichtungen wie z. B. Körperpflege, Langzeitgedächtnis ist beeinträchtigt und es können Angst, Unruhe, Apathie usw. auftreten. Die „schwere Demenz“ ist durch lückenhafte Erinnerung, Persönlichkeitsveränderungen, Verkennen nahestehender Personen, Verlust des Sprechvermögens sowie fortschreitende Immobilität gekennzeichnet (Sepandj, Asita: 2015, 4ff). Eine andere Einteilung des Fortschritts der Demenz kommt von Naomi Feil und Vicki de Klerk-Rubin (2013). Hier werden vier Phasen definiert: „Phase I“ beschreibt die beginnende Demenz und ist charakterisiert durch eine mangelhafte Orientierung und Unzufriedenheit sowie Ungeduld, den Personen ist oft selbst bewusst, dass sie vergesslicher werden, leugnen dies jedoch meist oder schieben ihre Vergesslichkeit auf andere, auch sind sie oft nicht in der Lage über Gefühle zu reden; „Phase II“, auch „mittlere Demenz“ genannt, ist durch eine zeitliche Verwirrtheit und Reisen in die Vergangenheit gekennzeichnet, das Kurzzeitgedächtnis verblasst mehr und mehr; in der „Phase III“, der fortgeschrittenen Demenz, werden Bewegungen wiederholt und ersetzen teilweise die Sprache, die Personen sind kaum mehr in der Lage den Zusammenhang von längeren

Sätzen zu verstehen; die „Phase 4“ bzw. „schwere Demenz“ steht für den Rückzug der Person nach innen und zunehmende Bewegungseinschränkung.

Sich selbstverständlich bewegen zu können, ist der Schlüssel für jegliche Formen des sozialen Miteinanders und einer selbstbestimmten Lebensführung – auch bei Menschen mit dementieller Beeinträchtigung und deren An- und Zugehörigen. Allerdings kommt es bei Personen mit Demenz und ihren Zu- und Angehörigen im fortschreitenden Prozess zu einem Rückzug aus verschiedenen gesellschaftlichen Bereichen. Bedingt durch diesen Rückzug wird auch die außerhäusliche Mobilität stark eingeschränkt und es kommt zu einer Isolation der Personen. Anja Rutenkröger (2014, 4ff) fasste aktuelle wissenschaftliche Untersuchungen zusammen und kam zum Schluss: Bewegung reduziert das Risiko an Demenz zu erkranken um 30 bis 50 Prozent. Bewegung kann kognitive Funktionen bei bereits erkrankten Personen signifikant verbessern (Rutenkröger, Anja: 2014, 7). Mit diesem Ergebnis bestätigte sie den Befund, der bereits 2008 in der Ausgabe von DeSSorientiert „Let´s move – Bewegung und Demenz“ (Demenz Support Stuttgart: 2008) publiziert wurde.

Um einerseits Menschen mit Demenz und den Zu- und Angehörigen die selbstständige Mobilität zu ermöglichen und andererseits mit der Förderung der Mobilität und der Bewegung das Risiko an Demenz zu reduzieren, ist es notwendig und eine bedeutende gesellschaftliche Aufgabe die (sozialen, räumlichen und technischen) Umwelten so zu gestalten, dass Personen mit Demenz nicht verletzt oder stigmatisiert werden (Heimerl, Katharina: 2015, 268f).

In den vergangenen Jahren wurde dieser Frage nach der gesellschaftlichen Teilhabe von Menschen mit Demenz und wie diese ermöglicht werden kann, nachgegangen. Eine Perspektivenverschiebung wurde mit der Konzeption von Demenz als Behinderung bewirkt: Es stehen nun nicht die Defizite der Betroffenen im Mittelpunkt, sondern es werden die Wechselwirkungen zwischen den individuellen Kompetenzen und den Umweltbedingungen reflektiert. Dabei rücken die strukturellen Bedingungen, welche Menschen mit Demenz behindern, ins Zentrum (vgl. Gronemeyer, Reimer: 2013). Diese Sichtweise wurde auch in der 2015 von der österreichischen Bundesregierung in Auftrag gegebenen und ausgearbeiteten „Demenzstrategie. Gut leben mit Demenz“ übernommen, in der auf die UN-Behindertenrechtskonvention Bezug genommen wird. Ziel der Demenzstrategie ist demgemäß ein Abbau der einstellungs- und umweltbedingten Barrieren, welche Menschen mit Demenz an der vollen, wirksamen und gleichberechtigten Teilhabe an der Gesellschaft hindern (Juraszovich, Brigitte et al.: 2015).

3 DAS FORSCHUNGSPROJEKT “DEMENZ IN BEWEGUNG”

Im Projekt „Demenz in Bewegung“ (gefördert vom BMVIT Programm „Mobilität der Zukunft“) wird die außerhäusliche Mobilität von Menschen mit Demenz erforscht und dem Unterwegssein im öffentlichen Raum und den Alltagswegen der Personen mit Demenz nachgegangen. Folgende Forschungsfragen werden behandelt: Welche subjektiven Bedeutungen hat Mobilität für Menschen mit Demenz? Wie sehen der Bewegungsalltag und die Bewegungsmuster von Menschen mit Demenz im öffentlichen Raum mit Fokus auf die Nutzung der öffentlichen Verkehrsmittel aus? Was fördert bzw. hindert die außerhäusliche Mobilität? Wie nutzen Menschen mit Demenz öffentliche Verkehrsmittel? Welche Unterstützung bzw. Hürden gibt es bei der Nutzung von öffentlichen Verkehrsmitteln bzw. den Hin- und Rückwegen von den Haltestellen in die Wohnungen für Menschen mit Demenz? Wann und warum hört jemand auf hinauszugehen? Welche technischen Maßnahmen (z. B. aus der Verkehrsinformation, der Verkehrstelematik) sind notwendig, um Menschen mit Demenz die Mobilität außer Haus zu ermöglichen? Welche Usability-Anforderungen ergeben sich an (informationsgestützte) Verkehrstechnologien aus Sicht von Menschen mit Demenz sowie deren An- und Zugehörigen? Welche sozialen Interventionen (z. B. kompetente Begleitung) sind notwendig, um Menschen mit Demenz die Mobilität außer Haus zu ermöglichen? Welche zentralen Schlussfolgerungen und Empfehlungen zur Unterstützung der außerhäuslichen Mobilität von Menschen mit Demenz lassen sich für die Berufs- und Personengruppen generieren, die für die Planung und Gestaltung von öffentlichen Verkehrsmitteln und Räumen befasst sind?

Das Projektkonsortium setzt sich aus folgenden Institutionen zusammen:

- IFF – Institut für Palliative Care und OrganisationsEthik, Universität Klagenfurt, Wien, Graz
- B-NK GmbH – Büro für nachhaltige Kompetenz, Wien: Ingenieurbüro für Landschafts- und Verkehrsplanung sowie Unternehmensberatung mit Schwerpunkten Gender- und Diversityforschung

- CS Caritas Socialis GmbH, Wien: Tageszentren, stationäre und mobile Betreuung von älteren Menschen und Sterbenden
- Wiener Linien: Anbieter von öffentlichen Verkehrsdienstleistungen (Bus, U-Bahn, Straßenbahn) in Wien

Die Teilnehmenden konnten sich in ein bis drei Teilbereiche des Projektes einbringen: Narrative Interviews, der Begehungsstudie und der Usability Studie.

In den narrativen Interviews erzählten Menschen mit Demenz ihren Alltag, sprachen über ihre Mobilität früher und heute und artikulierten Probleme, mit denen sie im öffentlichen Raum konfrontiert sind. In der Begehungsstudie begleiteten die Forscherinnen die Personen mit Demenz zu Fuß oder mit den öffentlichen Verkehrsmitteln auf ihren Alltagswegen. Dabei hat eine Forscherin mittels teilnehmender Beobachtung während des Gehens bzw. Nutzens von öffentlichen Verkehrsmitteln Barrieren und Probleme festgehalten, während die zweite Forscherin mithilfe von leitfadengestützten Interviewfragen validierend die Erfahrungen, Hürden, Orientierungspunkte und unterstützenden Faktoren erhoben hat. Bei den gemeinsamen Wegen konnten Orientierungsmerkmale, Strategien, Bedürfnisse und Barrieren festgestellt werden, welche für die Menschen mit Demenz hilfreich bzw. hinderlich sind. Wesentliche Erkenntnisse über die Orientierung im öffentlichen Raum wurden zudem in der Usability Studie gesammelt. In dieser wurden Menschen mit Demenz gebeten, Orientierungsaufgaben mit Hilfe von Wiener Stadtplänen und Bezirksplänen sowie mit Hilfe von Fahrplänen der Wiener Linien zu lösen. Die befragten Personen erzählten und zeigten auf, wie sie ihre Wege zu Hause aus planen und welche Hilfsmittel für diese Planungen verwendet werden. Ebenfalls in der Usability Studie wurde erhoben, welche am Markt befindlichen technischen Geräte Personen mit Demenz unterstützen können und wie Menschen mit Demenz gegenüber diesen neuen Technologien und Hilfsmitteln eingestellt sind.

Insgesamt waren an der Studie bislang 27 Menschen mit Demenz beteiligt, darunter 16 Frauen und 12 Männer. 23 der Teilnehmerinnen und Teilnehmer nahmen am narrativen Interview teil, 15 an der Usability Studie und 14 an der Begehungsstudie. Das kalendarische Alter der Beteiligten lag zwischen 48 und 92 Jahren. Die Wohn- und Pflegesituation der Teilnehmenden unterteilte sich in Personen in Pflegeheimen, Tageszentren, Wohnhäusern und zu Hause lebende mit und ohne externer Betreuung.

Erste Ergebnisse zu den empirischen Erhebungen liegen bereits vor. (Knoll, Bente et al.: 2017; Reitinger et al.: 2018)

3.1 Orientierung

In Bezug auf die Orientierung auf Plänen, bei der Wahl einer bestimmten Route und während des Redens über Hürden und Probleme im öffentlichen Raum spielte die Wohnsituation der Teilnehmenden eine große Rolle und es konnten Unterschiede zwischen den Personen abhängig von ihrer Wohnsituation erkannt werden. Im Folgenden werden die verschiedenen Wohnsituationen jeweils kurz beschrieben. An der Studie nahmen Personen teil, die zu Hause in der eigenen Wohnung, alleine oder mit Betreuung durch Partnerinnen und Partner und/oder fachlicher Unterstützungspersonen lebten, Personen, die von der eigenen Wohnung einen Tag bis mehrmals die Woche ein Tageszentrum besuchen, Personen, die in einer geriatrischen Kurz- oder Langzeitpflegestation untergebracht sind, sowie Personen, die in einer betreuten Wohnsituation leben.

3.1.1 Zu Hause – Eigene Wohnung

Teilnehmerinnen und Teilnehmer der Studie, die zu Hause in der eigenen Wohnung leben, haben großteils bereits seit vielen Jahren bis Jahrzehnten den gleichen Wohnsitz. Das „Grätzel" wurde im Laufe der Jahre durch Alltags- und Berufswege gut erkundet und „mentale Karten" der näheren Umgebung sind abgespeichert worden. Die Personen konnten, sofern die Demenz es zuließ, daher gut über den öffentlichen Raum rund um ihren Wohnsitz Auskunft geben, über die früheren Wege berichten, sich auf Stadtkarten orientieren und bei Spaziergängen nannten die Personen meist ein konkretes Ziel oder eine Route, die sie den Forscherinnen zeigen wollten. Die Personen leben entweder alleine und wurden regelmäßig von den Kindern besucht, mit einer Partnerin oder einem Partner, die oder der sie betreut. Zwei Familie wurde durch fachlich ausgebildete Personen unterstützt und begleitet.

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3.1.2 Tageszentrum

Tageszentrumsgäste kommen ein- bis mehrmals pro Woche von der eigenen Wohnung ins Tageszentrum. Die Anreise ist sehr unterschiedlich: Einige kommen mit dem Fahrtendienst, andere reisen selbstständig mit den öffentlichen Verkehrsmitteln an oder werden von Begleitpersonen, meist nahestehenden Angehörigen, mit den öffentlichen Verkehrsmitteln oder mit dem Auto gebracht. Nachdem die Personen bislang kaum bis gar nicht die nähere Umgebung des Tageszentrums erkundet hatten (bzw. dies auch nicht konnten), wurden die Spaziergänge im Rahmen der Begehungsstudie oft ohne einem konkreten Ziel durchgeführt und die Umgebung wurde von den Menschen mit Demenz gemeinsam mit den Forscherinnen erkundet. Bei diesen Spaziergängen konnten die Orientierungspunkte gut erfragt und nachvollzogen werden, da es keine „mentalen Karten“ gab.

3.1.3 Geriatrische Kurz- und Langzeitpflege und Betreuung Wohnheim/Pflegeeinrichtungen

Personen, die in einer geriatrischen Kurz- und Langzeitpflege leben, haben, ähnlich wie die Teilnehmenden aus den Tageszentren, meist nur wenig Bezug zur Umgebung. Oft ziehen die Personen aus anderen Bezirken in die Pflegeeinrichtung. Die selbstständige Mobilität der Personen hängt dabei sehr stark von den Regeln und personellen Möglichkeiten der jeweiligen Einrichtung ab, dem körperlichen Zustand der Person sowie der Vorgeschichten. Zum Teil ist es den Personen aufgrund der Demenz und/oder aufgrund der körperlichen Beeinträchtigungen nicht möglich bzw. erlaubt, selbstständig den öffentlichen Raum zu erkunden und spazieren zu gehen. In einigen Fällen begleiten Zivildiener oder ehrenamtliche Helfende die Menschen auf ihren Spaziergängen.

3.1.4 Betreutes Wohnen

Die Einrichtung, die betreutes Wohnen anbietet und in der die Begehungsstudie durchgeführt wurde, liegt im Norden von Wien und sozial betreute barrierefreie Einzelwohnungen für Frauen und Männer, die keine ständige medizinische oder pflegerische Versorgung benötigen sowie für wohnungslose Personen, die eine dauerhafte Teilbetreuung brauchen. Die Wohneinheiten unterteilen sich jeweils in ein Bad, eine Kochnische und einen Wohn-/Schlafbereich. Viele der Bewohnerinnen und Bewohner ziehen aus anderen Bezirken in das Betreute Wohnen und erkunden nach ihrem Einzug die nähere Umgebung und eignen sich diese an. Nach einer Eingewöhnungszeit und einigen Erkundungstouren wird von den Personen eine „mental map“ angefertigt. Manche Personen haben auch fixe Routen, die sie mehrmals die Woche bis täglich gehen.

3.2 Wege-Muster von Menschen mit Demenz

Unter den Teilnehmerinnen und Teilnehmern der Begehungsstudie gibt es unterschiedliche Motive und Ziele, um hinauszugehen und einen Weg zu Fuß zurückzulegen. Zum einen gibt es jene, die um des Gehens willens hinausgehen und gerne einen Spaziergang machen oder sich bewegen wollen. Zum anderen werden Weg-Ziele genannt, wie der Wunsch in einen Park zu gehen und im Grünen zu sein. Bei einigen liegt das Ziel oft auch darin Besorgungen, wie zum Beispiel einen Einkauf, zu erledigen.

Jene, die gerne Spaziergänge machen, haben wiederum unterschiedliche Motivationen, dies zu tun. Manche gehen regelmäßig die gleichen Runden, andere wiederum lassen sich treiben, und wieder andere haben ein Ziel vor Augen, und gehen dann den gleichen Weg wieder zurück. Bei ersteren steht die Bewegung und das Gehen an sich eindeutig im Vordergrund. Personen, die beim zu Fuß Gehen ein Ziel, wie zum Beispiel ein Geschäft oder einen Park vor Augen haben, gehen zum einen, um ihr Ziel zu erreichen und sich dort aufzuhalten oder ihre Besorgungen zu erledigen oder Termine wahrzunehmen. Oft spielen dabei aber auch Bewegungsdrang oder Gedanken an die eigene Gesundheit und das eigene Wohlbefinden eine Rolle.

Folgende Muster der Spaziergänge konnten aufgrund der empirischen Erhebung festgestellt werden:

- „Immer geradeaus“: Zwei Häuserblöcke und dann wieder zurück
- „Mein Bankerl“
- „Meine Runde“
- „Mein Ziel“: Arzt, Einkaufen, Besuch
- Immer in Bewegung oder „Der Weg ist das Ziel“
- Immer in Bewegung oder „Das Ziel verändert sich“

- Luftschnappen
- Draußen: Nur mehr mit Begleitung

4 HANDLUNGSEMPFEHLUNGEN

Um einerseits generell das Wissen um Demenz bzw. Alzheimer'sche Erkankung in der Gesellschaft zu erweitern und somit zu einer Ent-Sigmatisierung der Erkrankung beizutragen und um andererseits auf die Personen und ihre Bedürfnisse aufmerksam zu machen, ist es wichtig – auch im verkehrs- und stadtplanerischen Kontext – den handelnden Personen Hintergrundwissen zu vermitteln und konkrete Handlungsfelder aufzuzeigen.

Die Grundlagenstudie, die im Rahmen des Projekts „Demenz in Bewegung" erarbeitet wird, zeigt deutlich auf: So unterschiedlich wie jede und jeder von uns ist, so unterschiedliche sind die Bedürfnisse von Menschen mit Demenz. Eine jede Betroffene und ein jeder Betroffener ist durch Erlebnisse und Erfahrungen geprägt, eignete sich im Laufe des Lebens verschiedene Strategien an, legte sich bestimmte Handlungsroutinen und Abfolgen im Alltag fest und spezialisierte sich – beispielsweise aufgrund des Berufs – auf verschiedene Fertigkeiten und Fähigkeiten. Auf solch, über viele Jahre, gut eingeprägte und routinierte Abläufe und Handlungsmuster können Menschen mit Demenz je nach Tagesverfassung zurückgreifen.

Prinzipielle Grundsätze	**Generelle Ideen** **Umsetzungsschritte**
Aufmerksam sein	Wissens-Aufbau zu Demenz, demenziellen Veränderungen, kognitiven Einschränkungen etc. Statistiken, Studien, Expertise zum Thema einholen Expertinnen und Experte befragen
Menschen mit Demenz wahrnehmen und wahrnehmen, erkennen	Wissen um die Definitionen und Phasen, Wissen um die Krankheit
In Kontakt treten	Mit Angehörigen, Expertinnen, Experten, weiteren Fachpersonen „out of the box" in Kontakt treten Fachexpertinnen und -experten zu Vorträgen einladen
Demenz in der eigenen Organisation zum Thema machen	Wissens-Transfer und Wissensaufbau in der eigenen Organisation voranbringen Input für das eigene Organisationsleitbild nutzen Strategische Unternehmensziele überprüfen Fachspezifische Weiterbildungen organisieren Fachkompetenz im Unternehmen aufbauen Erfahrungen der Mitarbeiterinnen und Mitarbeiter (die ggf. Angehörige von Menschen mit Demenz sind) ernstnehmen
Menschen mit Demenz als Individuen sehen → individuelle Lösungen sind erforderlich	Skills-Aufbau, Coaching, Schulungen, Validation (Naomi Feil) Austausch mit Selbsthilfegruppen von Menschen mit Demenz Direktes In-Kontakt-Treten mit dem Individuum, mit Menschen mit Demenz, deren An- und Zugehörigen
Menschen mit Demenz als heterogene Gruppe wahrnehmen, erkennen und sehen	In Kontakt treten mit Vertreterinnen und Vertretern, Expertinnen und Experten Erkennen, dass Menschen mit Demenz vielfältige und unterschiedliche Bedürfnisse und Ansprüche (sowie „gesunde" Menschen auch) haben Überprüfen der eigenen Dienstleistungen, Angebote, Services, ob diese den Ansprüchen und Bedürfnissen (Stichwort: Orientierung) von Menschen mit Demenz entsprechen

Es ist schwer möglich für die Gesamtheit von Menschen mit Demenz allgemein gültige Aussagen zu treffen, Menschen mit Demenz brauchen individuelle Lösungen und passgenaue Hilfestellungen. Oft sind die Beeinträchtigungen, die ältere Menschen mit Demenz erfahren, schwer von Einschränkungen durch

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körperliche, altersbedingte Gebrechen zu trennen. Demenz reiht sich oft ein in ein multimorbides Krankheitsbild. Allerdings sind Menschen mit Demenz – allgemein gesprochen – eher anfälliger auf Reizüberflutung und benötigen klare, gut leserliche und einfache Strukturen und Formen, um sich orientieren zu können oder die Orientierung wiederzufinden. Diese klare und offene Struktur ist auch bei der Kontaktaufnahme notwendig. In der personenkonzentrierten Kommunikation stellt sich der kontaktsuchende Mensch auf die Bedürfnisse, Gefühle und die Stimmungslage des Gegenübers ein, um empathisch die Welt nachzufühlen und zu verstehen. Durch diese Art der Kommunikation werden Fragen auf der Metaebene und daraus resultierende Überforderungen ausgespart, da der Fokus unmittelbar auf die Person (mit Demenz) gerichtet ist.

Aufbauend auf den Auswertungen der empirischen Erhebungen im Projekt „Demenz in Bewegung“ werden konkrete Handlungsempfehlungen für die verkehrs- und stadtplanerische Praxis zum Umgang mit Menschen mit Demenz mit Fokus auf das Unterwegs Sein mit öffentlichen Verkehrsmitteln und im öffentlichen Raum entwickelt. Die Handlungsempfehlungen werden nun für drei Zielgruppen, die im Mobilitätsumfeld von Personen mit Demenz agieren, partizipativ erarbeitet. Bei der Bearbeitung werden folgende Zielgruppen adressiert:

(1) Fachplanerinnen, Fachplaner, Entscheidungsträgerinnen und Entscheidungsträger, die mit Belangen der öffentlichen Verkehrsmittel, der Verkehrsinfrastruktur sowie der Stadtplanung befasst sind;

(2) Mitarbeiterinnen und Mitarbeiter von Verkehrsunternehmen, wie Buslenkerinnen und Buslenker, Straßenbahnfahrerinnen und Straßenbahnfahrer, U-Bahn-Aufsicht;

(3) Forschungs- und Entwicklungscommunity, die an der Schnittstelle Verkehr/außerhäusliche Mobilität und Ambient Assisted Living (AAL) tätig sind und technologische und/oder kommunikationsbasierte Produkte und Services in den Bereichen Verkehrsinformationstechnologie, Verkehrstelematik, Verkehrssystemen etc. für die Zielgruppe Menschen mit Demenz entwickelt.

Da die folgenden Zielgruppen in sehr unterschiedlichen Bereichen tätig sind und mit unterschiedlichen Aufgaben betraut sind, werden jeweils maßgeschneiderte und passende Empfehlungen erarbeitet.

4.1 Empfehlungen an Fachplanerinnen, Fachplaner, Entscheidungsträgerinnen und Entscheidungsträger im Bereich öffentlicher Verkehr und Stadtplanung

Wie bereits eingang erwähnt, benötigen Fachplanerinnen, Fachplaner, Entscheidungsträgerinnen und Entscheidungsträger, die mit Planungs- und Entscheidungsfragen des öffentlichen Raums betraut sind, umfassende Informationen über die verschiedenen Nutzungsgruppen, die sich im öffentlichen Raum aufhalten und diesen nutzen. Unter diese Gruppen finden sich unter anderem auch Menschen mit Demenz, die besondere Bedürfnisse bei der Orientierung oder der Ausgestaltung des öffentlichen Raums haben. Aufgrund der Hochaltrigkeit der meisten Menschen mit Demenz treffen Maßnahmen für ältere Personen auf diese Zielgruppe ebenfalls zu. So profitieren Menschen mit Demenz von einer alltagstauglichen Stadtplanung, der Barrierefreiheit, einer Planung für Viele und einer Planung, die den Fokus auf Fußgängerinnen und Fußgänger richtet.

4.2 Empfehlungen an Mitarbeiterinnen und Mitarbeiter von Verkehrsunternehmen

Mitarbeiterinnen und Mitarbeiter von Verkehrsbetrieben, wie Busfahrerinnen, Busfahrern, Straßenbahnfahrerinnen, Straßenbahnfahrer, Kontrollorinnen und Kontrollore oder auch Mitarbeiterinnen und Mitarbeiter im Informationsmanagement, stehen auch in direktem Kontakt mit Menschen mit Demenz. Sie helfen bei Problemen, sprechen die Personen an, wenn diese die Orientierung verloren haben und „herumirren“ oder werden mehrmals von den Personen mit der immer gleichen Frage angesprochen. In all diesen Fällen sind Grundkenntnisse der Validation nach Naomi Feil als Form der personenzentrierten Kommunikation hilfreich, um Menschen mit Demenz einfühlende Hilfestellungen geben zu können. Es ist auf eine empathische und wertschätzende Kommunikation, bei der auf die individuellen Bedürfnisse des Gegenübers eingegangen wird, zu achten. In der Kommunikation ist auch relevant, die Würde des Menschen zu achten, einfühlend auf die Probleme der Person mit Demenz einzugehen und mit Feingefühl dem Problem auf den Grund zu gehen und passgenaue Lösungen zu finden.

4.3 Empfehlungen an die Forschungs- und Entwicklungscommunity in der Verkehrsinformationstechnologie

(Technologische) Alltagsgegenstände, wie Smartphones, Fernseher, Notfalluhren unterliegen laufenden Weiterentwicklungen und Veränderungen. Dies ist besonders für Menschen mit Demenz schwer, da sie sich neue Abfolgen in der Bedienung und andere Oberflächen schwerer merken können und neue Informationen schnell wieder vergessen. Viele der Technologien werden mit dem Hintergrund entwickelt, dass diese die Menschen im Alltag unterstützen. Aus diesem Grund ist es besonders bei der Entwicklung von Produkten für ältere Menschen und Menschen mit Demenz nicht zielführend komplette Veränderungen vorzunehmen.

5 AUSBLICK

Diese Empfehlungen werden mithilfe von Reflexionsworkshops mit Stakeholdern praxisnah entwickelt. Zu den Workshops werden Vertreterinnen und Vertreter der Zielgruppen und Organisationen, wie des Netzwerks „Demenzfreundlicher Bezirk“, Stadtplanung/Planungspraxis und Verkehrsdienstleister, Forschungs- und Entwicklungscommunity eingeladen. Aufbauend auf die Workshop-Ergebnisse werden die Handlungsempfehlungen finalisiert. Durch diese Aktionen soll das Verständnis der unterschiedlichen involvierten Zielgruppen untereinander verstärkt werden und Austausch bzw. der Kooperationsgedanke zwischen den Akteurinnen und Akteuren gestärkt werden.

Im Vortrag sollen die Handlungsempfehlungen im Detail vorgestellt und diskutiert werden.

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7 REFERENZEN

Demenz Support Stuttgart (2014): Let's move II - Bewegung und Demenz. In: dess orientiert (2/14), zuletzt geprüft am 22.09.2016.

Feil, Naomi; Klerk-Rubin, Vicki de (2013): Validation. Ein Weg zum Verständnis verwirrter alter Menschen. 10., durchges. Aufl. München, Basel: E. Reinhardt (Reinhardts gerontologische Reihe, Bd. 16).

Fercher, Petra; Sramek, Gunvor; Feil, Naomi (2014): Brücken in die Welt der Demenz. Validation im Alltag. 2., durchges. Aufl. München: Reinhardt (Reinhardts gerontologische Reihe, Bd. 52).

Gronemeyer, Reimer (2013): Das 4. Lebensalter. Demenz ist keine Krankheit. München: Pattloch.

Heimerl, Katharina (2015): Ethische Herausforderungen für die Sorgenden von Demenzerkrankten. In: Imago Hominis. Demenz als ethische Herausforderung i. Unter Mitarbeit von Johannes Bonelli und et al. Wien: IMABE • Institut für medizinische Anthopologie und Bioethik (Quartalsschrift für Medizinische Anthropologie und Bioethik, Heft 4), S. 267–276.

Höfler, Sabine; Bengough, Theresa; Winkler, Petra; Griebler, Robert (2015): Österreichischer Demenzbericht. 2014. Hg. v. Bundesministerium für Gesundheit und Sozialministerium. Wien. Online verfügbar unter https://www.sozialministerium.at/cms/site/attachments/2/7/0/CH3434/CMS1454578572018/oesterreichischer_demenzbericht_2014.pdf, zuletzt geprüft am 18.08.2016.

Juraszovich, Brigitte; Sax, Gabriele; Rappold, Elisabeth; Pfabigan, Doris; Stewig, Friederike (2015): Demenzstrategie. Gut leben mit Demenz. Abschlußbericht – Ergebnisse der Arbeitsgruppen. Hg. v. Gesundheit Österreich GmbH. Wien. Online verfügbar unter https://www.sozialministerium.at/cms/site/attachments/7/7/5/CH3434/CMS1456747615394/demenzstrategie.pdf, zuletzt geprüft am 05.08.2016.

Knoll, Bente; Hofleitner, Birgit; Kremer, Anja; Reitinger, Elisabeth; Pichler, Barbara; Egger, Barbara: Wenn die Orientierung versagt – unterwegs mit Menschen mit Demenz. Reviewed paper. In: Real Corp Proceedings, Bd. 2017. Online verfügbar unter http://programm.corp.at/cdrom2017/papers2017/CORP2017_47.pdf, zuletzt geprüft am 02.10.2017.

Reitinger, Elisabeth; Pichler, Barbara; Egger, Barbara; Knoll, Bente; Hofleitner, Birgit; Plunger, Petra; Dressel, Gert; Heimerl, Katharina: MIT Menschen mit Demenz forschen – ethische Reflexionen einer qualitativen Forschungspraxis zur Mobilität im öffentlichen Raum; Beitrag in FQS Forum: Qualitative Sozialforschung (im Erscheinen).

Rutenkröger, Anja (2014): Bewegung trotz(t) Demenz. Körperlich aktiv oder inaktiv sein - Was sind die Konsequenzen. In: Demenz Support Stuttgart gGmbH (Hg.): Let´s move II - Bewegung und Demenz. Unter Mitarbeit von Ulrike Fischer. Stuttgart (DeSSorientiert, Nr 2/14), S. 4–10. Online verfügbar unter http://www.demenz-support.de/Repository/dessorientiert_2014_02_sportbewegung.pdf.

Sepandj, Asita (2015): Krankheitsbild Demenz. In: Bundesministerium für Gesundheit und Sozialministerium (Hg.): Österreichischer Demenzbericht. 2014. Wien, S. 4–8.

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Mittelstädte als Stabilisatoren ländlich-peripherer Räume

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1 PROBLEMSTELLUNG

Der ländliche Raum enzieht sich heute mehr denn je einer einheitlichen, eindeutig definitorischen Abgrenzung. Ländliche Regionen kennzeichnet eine hohe Entwicklungsvielfalt, welche mitunter von deutlichen Divergenzen geprägt ist (BMVBS/BBSR 2009; S. 2). Attraktiven ländlichen Wohnstandorten im Umfeld von Agglomerationen stehen demnach schlecht erreichbare, ländlich, periphere Räume gegenüber. Insbesondere diese sind es, welche sich vor dem Hintergrund verfestigter sozioökonomischer Basistrends in einer zusehends problematischen Instabilität befinden. Damit einhergehend erleben diese Räume schlechtestenfalls eine Abwärtsspirale bezüglich Lebensqualität und Wettbewerbsfähigkeit (Liebmann/Bernt 2013; S. 11-12). Eine Verschärfung räumlicher Disparitäten, eine Abkopplung dieser Räume sowie weiter anhaltende Entleerungstendenzen sind damit verbundene Gefahren.

Vor dem Hintergrund der beschriebenen Entwicklungen ländlicher Räume stellt sich die Frage nach Ansätzen und Strategien zu deren Stabilisierung. Eine Antwort zur Stabilisierung dieser Räume kann die Förderung und Sicherung der Rolle von Mittelstädten und ihr Bedeutungsgrad als Motoren regionaler Entwicklung sein. Mittelstädte in ländlichen Räumen unterstützen in der Bundesrepublik Deutschland traditionell eine räumlich ausgewogene und nachhaltige Entwicklung sowie den Erhalt einer flächendeckenden Daseinsvorsorge und die Sicherung gleichwertiger Lebensverhältnisse. Weiterhin bieten diese Städte ein attraktives, urbanes Wohnumfeld mit einer überschaubaren Größe, bezahlbaren Wohnraum sowie vorhandenen Versorgungsstrukturen ohne infrastrukturelle Engpässe.

Gleichzeitig stehen Mittelstädte ländlich, peripherer Regionen in einer zunehmenden Diskrepanz hinsichtlich ihrer Funktionszuordnung sowie der an sie gestellten Herausforderungen. Einerseits wurden ihnen aus raumordnungspolitischer Sicht neben ihrer Rolle als regionale Arbeitsmarkt-/Wirtschaftszentren zugleich eine stabilisierende Funktion des Umlandes sowie eine Trägerfunktion der ländlichen Entwicklungsdynamik zugeschrieben (BBSR 2012; S. 6). Andererseits weisen sie gleichzeitig selbst eine Betroffenheit bezüglich des infrastrukturellen Anpassungsdrucks an sozioökonomische Veränderungsprozesse auf, den es zu bewältigen gilt.

Keywords: Sicherung und Stabilisierung ländlicher Regionen, sozioökonomische Veränderungsprozesse, leerstehender ländlicher Raum, Anpassungsdruck, Mittelstädte

2 HERAUSFORDERUNGEN SOZIOÖKONOMISCHER TRANSFORMATIONSPROZESSE IN LÄNDLICH, PERIPHEREN RÄUMEN

Im Zuge sozioökonomischer Veränderungsprozesse stehen nicht allein Regionen mit Peripherisierungsprozessen sondern auch stagnierende sowie prosperiende Räume in einem Anpassungsdruck von Daseinsvorsorgeangeboten. Allerdings verschärfen diese deutlich divergierenden Entwicklungsverläufe regionale Ungleichgewichte.

Prosperierende Regionen stehen vor der Herausforderung der Anpassung an den sich wandelnden Infrastrukturbedarf. Gebiete mit demografischen Schrumpfungs- und Alterungsprozessen sowie anhaltender wirtschaftlicher Schwäche sehen sich darüber hinaus der Problematik einer Sicherstellung der Daseinsvorsorge, dem Erhalt von Lebensqualität und Wettbewerbsfähigkeit und der Wahrung des sozialen Zusammenhalts ausgesetzt. Insbesondere das Zusammenspiel aus ungünstigen Standortfaktoren und negativen Entwicklungsdynamiken bedingt schlechtestenfalls ein „circulus vitiosus". Ausgehend von wirtschaftlicher Strukturschwäche, einem anhaltenden angespannten Arbeitsmarkt und einer damit einhergehenden Abwanderung insbesondere junger, qualifizierter Arbeitskräfte sowie einer zunehmenden Leerstandsproblematik von Wohn-, Gewerbe- und Einzelhandelsräumen ergeben sich eingeschränkte Handlungsspielräume für betroffene Regionen. (Liebmann / Bernt 2013; S. 11-12)

Hinsichtlich der Gestaltung einer ausgeglichenen Raumentwicklung sowie der Aufrechterhaltung von Chancengerechtigkeit und der Teilhabe an wirtschaftlicher und gesellschaftlicher Entwicklung in allen Teilräumen erfordert diese wachsende Diskrepanz zwischen Räumen einen wachsenden Handlungsbedarf im

Bereich der räumlichen Entwicklung, um das Postulat der gleichwertigen Lebensverhältnisse auch zukünftig gesichert zu wissen. In diesem Sinne geht es gegenwärtig um die Fragen, welche Lösungsformen einen erfolgreichen regionalwirtschaftlichen Prozess begleiten, welche Handlungsstrategien zu einer dauerhaften regionalen Stabilisierung von Regionen beitragen können und inwieweit in diesem Sinne Mittelstädte einen Stabilisierungsbeitrag für diese Räume leisten.

3 METHODIK ZUM THEMENFELD UM MITTELSTÄDTE IM KONTEXT LÄNDLICH, PERIPHERER STABILISIERUNGSSTRATEGIEN

Die Untersuchung des bisher noch wenig erforschten Themenfeldes um Mittelstädte im Kontext ländlich, peripherer Stabilisierungsstrategien basiert auf einem von der Deutschen Forschungsgemeinschaft (DFG) geförderten Projekt. Dessen Untersuchungsdesign untergliedert sich in drei zentrale Forschungskomponenten und umfasst hinsichtlich der Forschungsweise und Methodik wissenschaftliche, sekundärdatenanalytische sowie empirsiche, anwendungsorientierte Untersuchungsschritte.

In einem ersten Arbeitsschritt erfolgt eine definitorische Einordnung des Stabilisierungsbegriffs in den Regionalwissenschaften. Eng verknüpft ist damit einhergehend die Analyse landes- und regionalplanerischer sowie regionalökonomischer Ansätze unter dem Blickwinkel ihres Stabilisierungsgedankens sowie die Untersuchung von bestehenden Strategien zum Umgang mit regionalen Strukturwandelprozessen.

Der zweite Arbeitsschritt umfasst eine indikatorenbasierte beziehungsweise funktionale Typisierung des Stadttypus Mittelstadt im Kontext des ländlich, peripheren Raumtypus. Dabei sind umfassende sekundärstatistische Kennziffern zur Wirtschafts-, Arbeitsplatz-, Versorgungs- und Wohnzentralität berücksichtigt. Die Untersuchung ihrer Ankerfunktionen und Stabilisierungsmechanismen für das regionale Umfeld im Lichte sozioökonomischer Transformationsprozesse basiert auf wirkungs- und verflechtungsanalytischen Verfahren. Damit einhergehend wird fünf ausgewählten Fallstudien - Stadt Ansbach und Landkreis Ansbach, Stadt Freudenstadt und Landkreis Freudenstadt, Stadt Fulda und Landkreis Fulda, Stadt Lingen (Ems) und Emsland sowie Stadt Plauen und Vogtlandkreis - eine vertiefende Evaluation zugeführt. Für die ausgewählten Untersuchungsstädte sind zusätzlich Methoden der empirischen Sozialforschung (leitfadengestütze Experteninterviews sowie Befragungen) herangezogen. Hierdurch ergeben sich ergänzende Erkenntnisse insbesondere im Hinblick auf Verflechtungen zwischen Kreisregion und Mittelstadt, auf den Bedeutungsgrad der Mittelstadt bezüglich ihrer Wohn-, Arbeitsplatz- und Versorgungszentralität sowie insbesondere im Hinblick auf bestehende Handlungserfordernisse sowie Entwicklungsstrategien und Handlungsansätze zur Stärkung der Funktion und Rolle der Mittelstadt in und für ihr ländlich, peripheres Umfeld.

Im dritten Arbeitsschritt werden bestehende beziehungsweise erwartbare Handlungserfordernisse analyisiert sowie daran anschließend Handlungsansätze zur Sicherung der Ankerfunktion der Mittelstädte und somit letztlich auch zur Stabilisierung ihres ländlich, peripheren Umlandes abgeleitet.

4 DER STABILISIERUNGSANSATZ IM BEREICH DER REGIONALENTWICKLUNG UND RAUMORDNUNG

Im Wechselspiel von metropolitanen Räumen und ländlichen Regionen, von Persistenz beziehungsweise Peripherisierung und innovativen Entwicklungsdynamiken nimmt neben der Wachstums- und Innovationsförderung die Sicherung und Stabilisierung von Regionen eine zunehmend tragende Rolle in der Regionalentwicklung ein.

Aufgrund der wachsenden Zunahme räumlicher und sozioökonomischer Disparitäten steigt die Vielfalt und Intensität der Raumdynamiken an. „Die Folge ist eine spürbare Ökonomisierung des politisch-administrativen Handelns, die mit einer tendenziellen Schwächung normativer oder fiskalischer Steuerungsinstrumente einhergeht. Andererseits bieten sich neue Chancen für eine zukunftsorientierte regionale und lokale Standortpolitk, die auf die Nutzung vorhandener Stärken und Innovationspotenziale setzt.“ (Geschäftsstelle der Ministerkonferenz für Raumordnung 2006; S. 6)

„Nicht nur die erfolgreichen Regionen, die sich um den Erhalt ihres Wettbewerbs bemühen müssen, erscheinen in einem neuen Licht, sondern auch die sogenannten Problemregionen oder wirtschaftlich schwachen Regionen, denen sich verschiedene Entwicklungsoptionen öffnen, ihre periphere Lage durch eigene Anstrengungen zu überwinden.“ (Kujath 1998; S. 15) In der regionalwissenschaftlichen Diskussion sind im Hinblick auf die landes- und regionalplanerischen sowie regionalökonomischen Ansätze daher nicht nur ihr Beitrag für die Förderung dynamischer Entwicklungsprozesse abzuleiten sondern auch zunehmend die Chancen und Grenzen eines Stabilisierungsbeitrags für Regionen zu eruieren.

Der „Stabilisierungsbegriff“ findet seinen traditionellen wissenschaftlichen Ursprung in den physikalisch-technischen sowie chemisch-medizinischen Bereichen. Hinsichtlich des Apsekts der Sicherung bestehender gesellschaftspolitischer Zustände ist der Stabilisierungsbegriff vorrangig aus der Wirtschaftspolitik bekannt. Die wirtschaftspolitische Stabilisierungsfunktion beschreibt hierbei die Eingriffe des Staatssektors in den Wirtschaftsprozess. Das Stabilisierungsziel gilt demnach neben Wachstum, Ausgleich und Nachhaltigkeit auch als eines der derzeit wichtigsten Ziele in der regionalen Wirtschaftspolitik.

Zu stabilisierungsbedürftigen Regionen zählen insbesondere ländlich geprägte Räume in peripherer beziehungsweise grenznaher Lage oder frühindustrialisierte Räume mit schlechter Erreichbarkeit, unzureichenden Beschäftigungsmöglichkeiten und einer veralteten Industriekultur. In den Regionen herschen regionale Instabilitäten, wie unbefriedigende Auslastungen der Produktionsfaktoren, hohe regionale Arbeitslosenquoten, deutlich erhöhte Auspendlerüberschüsse und negative Wanderungssalden, vor. Dynamische Wachstums- und Entwicklungsprozesse sind in den betroffenen Regionen gering ausgeprägt, wohingegen eine erhöhte Gefahr einer Abwärtsspirale mit sich gegenseitig verstärkenden Entwicklungen besteht. (Geschäftsstelle der Ministerkonferenz für Raumordnung 2006; S. 16)

Stabilisierungsmechanismen sollen in erster Linie darauf abzielen, Möglichkeitsräume für eine Entwicklung zu schaffen, um den Abwärtstrend zu stoppen und die Daseinsvorsorge auf Status-quo-Niveau zu sichern. Das Ziel der Erreichung einer Trendumkehr, das Durchbrechen der negativen Abwärtsspirale und dem Erreichen eines „turn around“ der sozioökonomischen Entwicklung durch die Vertiefung und Steigerung der regionalen Wertschöpfung und Wettbewerbsfähigkeit, wird in dem Prozess nicht vorrangig angesehen. (Akademie für Raumforschung und Landesplanung ARL) (Hrsg.) 2005; S. 910)

In Hinblick auf die räumliche Dimension der Stabilisierung ist im Wesentlichen auf Regionsebene anzusetzen. Sozioökonomische Transformationsprozesse sind in der Regel nicht lokal begrenzt. Insbesondere Zentren erfüllen mit ihrer Punkt- und Bandinfrastruktur bei zufriedenstellender Erreichbarkeit die wesentlichen Funktionen der Daseinsvorsorge für das Umland und sind mit diesem aufgrund einer oftmals vergleichsweise höheren diversifizierten Wirtschaftsstruktur und einem größeren Arbeitsplatzangebot sehr eng vernetzt. Entsprechend sind die Herausforderungen und Auswirkungen von sozioökonomischen Transformationsprozessen weiträumiger zu fassen.

In funktionieller Hinsicht sind Stabilisierungsstrategien auf Bestandsentwicklung sowie Revitalisierung und qualitative Entwicklung im Sinne der Nutzung endogener Potenziale und exogener Ressourcen auszurichten, um eine weitere Schwächung eines Raumes zu verhindern und die Lebensqualität auch zukünftig zu sichern.

In der wissenschaftlichen Debatte um die Frage nach Stabilisierungsmechanismen beziehungsweise Handlungsstrategien, die zu einer dauerhaften Stabilisierung von Regionen beitragen können, geht es somit weniger um die Entwicklung neuer Ansätze als vielmehr um einen ableitbaren Stabilisierungsbeitrag des in der Raumentwicklungspraxis derzeit vorherrschenden Planungsinstrumentariums. In einer eingehenden Betrachtung konnten im Hinblick auf die verschiedenen Instrumente, Ansätze und Strategien eine Reihe stabilisierender Mechanismen unterschiedlicher Ausprägung identifiziert werden. Hieraus lässt sich nach aktuellem Forschungsstand folgender allgemeingültiger Stabilisierungsgedanke für die Raumordnung ableiten:

Stabilisierung in der Raumordnung und Regionalentwicklung meint jegliche Form der verstärkten Aktivierung, Nutzung und Weiterentwicklung regionsspezifischer Ressourcen und endogener Potenziale von Räumen in peripherer Lage oder mit besonders unterdurchschnittlichen sozioökonomischen Entwicklungsstand, um der raumordnerischen Leitvorstellung der Sicherung gleichwertiger Lebensbedingungen in allen Teilregionen auch unter den wachsenden Herausforderungen laufender sozioökonomischer Transformationsprozesse gerecht zu werden und um eine weitere Verschlechterung eines negativen Trendverlaufes zu verhindern.

5 MITTELSTÄDTE UND IHRE FUNKTION IN LÄNDLICH, PERIPHEREN RÄUMEN

5.1 Der Stadttypus Mittelstadt

Die kulturelle und baulich, räumliche Verschiedenartigkeit und Vielfalt europäischer Städte gilt als erhaltenswertes Spezifikum des vorrangig polyzentrisch ausgeprägten Systems der Stadtregionen Europas. Europäische Siedlungsstrukturen gelten „aufgrund ihres Wachstums und ihrer Entwicklungsstruktur als das ausgewogenste Städtesystem weltweit“ (Europäische Union, Generaldirektion Regionalpolitik 2011, S. 5).

Demgegenüber stehen die Ungleichheit der wirtschaftlichen Entwicklungspotenziale sowie die sozialen Problemdimensionen von Städten und Regionen, welche mit einer zukunftsfähigen europäischen Regionalentwicklung konstruktiv angegangen werden. Das Europäsiche Raumentwicklungskonzept (EUREK) forciert demnach auch zukünftig eine räumlich ausgewogene und nachhaltige Entwicklung der Europäischen Union über das Leitbild der Sicherung eines ausgeglichenen und polyzentrischen Städtesystems und eine neue Beziehung zwischen Stadt und Land. Die Bundesrepublik Deutschland ist aufgrund ihrer historischen Entwicklung sowie aufgrund ihrer föderalen Ausgestaltung von einem ausdifferenzierten polyzentralen Städtesystem und einer dezentralen Raum- und Siedlungsstruktur geprägt.

Bedingt durch ihre Vielfalt an Strukturen und Funktionen sowie durch die historischen und gegenwärtigen sozioökonomischen und politischen Entwicklungstendenzen liegt eine einheitlich manifestierte Begriffsdefinition von Stadttypen sowohl in der Forschung als auch in der Praxis allerdings nicht vor. „Das komplexe und dynamische System Stadt entzieht sich einem einheitlichen Stadtbegriff, der in allen Kulturen und geschichtlichen Epochen gelten könnte.“ (Akademie für Raumforschung und Landesplanung (Hrsg.) 2005; S. 1048)

Unterschiedliche administrativ-statistische Einwohnerschwellenwerte sowie vielfältige raumstrukturelle und naturräumliche Ausprägungen der einzelnen Nationen lassen ein weltweit einheitlich festgelegtes Städtesystem gegenwärtig nicht zu. So reichen Agglomerationen von 200 Einwohnern in den skandinavischen Ländern bereits als statistische Untergrenze für eine Stadt aus, während diese Untergrenze in Japan bei 50.000 Einwohnern angesetzt ist. Dennoch gilt der Indikator Einwohnergröße maßgeblich für die indikatorenbasierte Typisierung. In der Bundesrepublik Deutschland gilt zur Unterteilung der Agglomerationen als zentraler Anhaltspunkt dabei noch immer die Typisierung nach der deutschen Reichsstatistik von 1871. Demnach gelten nach der amtlichen Statistik der Bundesrepublik Deutschland Städte mit einer Einwohnergröße zwischen 20.000 und 100.000 als Mittelstadt. (Heineberg 2007; S. 306-308)

Stadttypus	Städteanzahl (prozentual)	Einwohneranzahl (prozentual zu Einwohner aller Städte)
Millionenstadt (≥ 1.000.000)	0,19%	13,01%
Großstadt (100.000 - ≤ 999.999)	3,64%	30,19%
Mittelstadt (20.000 - ≤ 99.999)	27,96%	35,13%
Kleinstadt (5.000 - ≤ 19.999)	49,37%	18,61%
Landstadt (2.000 - ≤ 4.999) und <	18,83%	2,06%
Städte gesamt (31.12.2015)	2.060 Städte gesamt	60.086.436 Einwohner gesamt

Table 1: Unterteilung der bundesdeutschen Städte nach Stadttypen

Neben der rein quantitativen Typisierung geht es im Hinblick auf eine umfassende Einordnung des Stadtbegriffes auch um die Betrachtung ihrer funktionalen Gesamtheit. Urbane Zentren sollen Konzentrationsräume von Konsumenten, Arbeitnehmern, Unternehmen sowie von formellen und informellen Einrichtungen sein und gelten als „Motoren der Wirtschaft, als Orte der Vernetzung, der Kreativität und Innovation und als Dienstleistungszentren für ihre umliegenden Gebiete“ (Schmidt-Lauber (Hrsg.) 2010; S. VI). Diese generelle „Verfügbarkeit und Vielfalt von Ressourcen an einem Standort mit einer hohen Dichte an verschiedenen Aktivitäten“ (Schmidt-Lauber (Hrsg.) 2010; S. 4) kennzeichnen die wesentlichen funktionalen Agglomerationsvorteile von Städten und deuten auf ihre (über)regionale Bedeutsamkeit hin. Ihr

Bedeutungsgrad ist dabei von ihrer Einwohnerghröße, ihrer räumlichen Lage sowie ihrer funktionalen Ausgestaltung beziehungsweise Spezifizierung abhängig.

Städte(agglomerationen) mit einer hohen Bewohneranzahl und -dichte, mit einer leistungsfähigen Infrastrukturausstattung, mit hochrangigen politischen Entscheidungsstrukturen, mit einem dichten Netz von produktionsorientierten Dienstleistungsunternehmen sowie mit dynamischen ökonomischen Entwicklungen weisen nicht nur auf nationaler Ebene sondern auch im europäischen und globalen Kontext eine außerordentliche Stellung auf. (BMVBS (Hrsg.) / BBR (Hrsg.) 2007; S. 2-3) Ihr Beitrag im Kontext der regionalen Entwicklung liegt auf der Sicherung und Förderung der Leistungs- und Konkurrenzfähigkeit eines Landes.

Aber auch Klein- und Mittelstädte fungieren als regionale Entwicklungskerne. „Sie sind sowohl Zentren für öffentliche und private Dienstleistungen als auch für lokale und regionale Wissensproduktion, Innovation und Infrastruktur.“ (Europäische Union, Generaldirektion Regionalpolitik 2011; S. 5) Entsprechend fungieren sie nicht nur für ihre Bewohner als Versorungs- und Dienstleistungszentren, sondern spielen „häufig eine Schlüsselrolle innerhalb der regionalen Wirtschaft“ (Europäische Union, Generaldirektion Regionalpolitik 2011; S. 5). Während diese Stadttypen in zentraler Lage im Wesentlichen Entlastungsfunktion einnehmen, liegt ihr Beitrag in dünn besiedelten Räumen „zur Förderung einer ausgewogenen regionalen Entwicklung“. (Europäische Union, Generaldirektion Regionalpolitik 2011; S. 5)

Raumstrukturtypus	Anzahl Mittelstadt (prozentual)
städtisch, sehr zentral	41,84%
städtisch, zentral	20,66%
städtisch, peripher	2,78%
städtisch, sehr peripher	-
ländlich, sehr zentral	-
ländlich, zentral	11,28%
ländlich, peripher	20,66%
ländlich, sehr peripher	2,78%
Mittelstädte gesamt (31.12.2015)	576 Mittelstädte gesamt

Table 2: Unterteilung der bundesdeutschen Mittelstädte nach Raumtypen

Die Typisierung des Raumes nach Raumtypen erfolgt in der Bundesrepublik Deutschland über ein kombiniertes Indikatorenkonezpt. Die Bestimmung von ländlich, peripheren Räumen ergibt sich letztlich aus der Überlagerung der Klassifizierung nach Siedlungsstruktur und Lage.

Mittelstädte verzeichnen gegenwärtig einen normativen Bedeutungsgewinn. Bereits aus dem historisch gewachsenen polyzentrischen Städtegefüge heraus begründet sich eine bedeutende Stellung im bundesdeutschen Städtesystem. Neben ihrer zahlenmäßigen Gewichtung trägt weiterhin ihre zentralörtliche Funktionszuweisung entscheidend zu ihrem Bedeutungsgrad bei. Aktuell gewinnen sie aber auch entsprechend der dargelegten Trendeinflüsse „unmittelbar als Forschungsgegenstand und mittelbar im Rahmen der aktuellen Städtebaupolitik“ (Adam 2005; S. I) wieder verstärkt an Aufmerksamkeit in der Stadt- und Regionalforschung sowie in der Raumordnung.

5.2 Mittelstädte und ihre Bedeutung in und für ländlich, periphere Räume

Mittelstädte stellen einen wesentlichen Beitrag in der Städtelandschaft der Bundesrepublik Deutschland dar. Aufgrund der vorhandenen regionalen Ausstrahlungskraft bei einer gleichzeitig noch fehlenden ausgeprägten Funktionsmischung stellt ein Spezifikum des Stadttypus Mittelstadt eine gewisse Vielfalt struktureller und funktionaler Ausprägungen dar. „Sie können nahezu autonom sein, in Agglomerationsräumen liegen oder in städtischen funktionalen Netzwerken miteinander agieren.“ (ESPON Homepage)

Die einzelnen und zum Teil sehr unterschiedlichen Spezialisierungsfunktionen zeichnen sich auch innerhalb der Gruppe der Mittelstädte ländlich, peripherer Räume ab. So finden sich Mittelstädte mit einem hohen Grad an spezialisierten Strukturen für die Regionalentwicklung und mehrdimensionaler Funktionsausstattung

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entsprechend Strukturen auf Großstadtebene vor. Derartige Spezialisierungen reichen von Konzentrationen von Freizeit- und Tourismuseinrichtungen, über Behördenstandorte, Bundeseinrichtungen bis hin zu Hochschulstandorten. Aber auch wirtschaftliche Innovationskerne sind mitunter in Mittelstädten ländlich, peripherer Räume, welche sich insbesondere über so genannte Cluster darstellen lassen, erkennbar.

Gerade abhängig ihrer Zentralität werden Mittelstädten jedoch seitens der Raumordnungspolitik gegensätzlichen Funktionsaufgaben konstatiert. Mittelstädten in Ballungsregionen wird vorrangig eine Entlastungsfunktion zugeordnet, wohingegen Mittelstädten in ländlich, peripheren Räumen eine Versorgungs- und Entwicklungsfunktion zugeschrieben wird. „Je zentraler Mittelstädte gelegen sind, desto höher ist ihre Wohnfunktion. Und je peripherer sie gelegen sind, desto größer ist ihre Bedeutung als Arbeitsplatz- und Versorgungszentrum.“ (BBSR 2012; S. 37) Insbesondere in ländlichen Räumen erfüllen sie dahingehend überörtliche Versorgungsfunktionen sowie wichtige Entwicklungsfunktionen als regionale Wirtschafts- und Arbeitsmarktzentren. Großstadtfernen Mittelstädten wird damit tendenziell mehrdimensionalere Funktionen als großstadtnahen Mittelstädten beigemessen und damit die wesentliche Rolle eines Impulsgebers für die Region“ zugeschrieben. (BBSR 2012; S. 6) „Diese Bedeutung von Städten steigt zudem weiter an, wenn es zugleich um Standorte von Behörden der unteren Verwaltungsebene und einer Hochschule handelt. Eine solche - bestenfalls synergetische - Mehrdimensionalität ist bei Mittelstädten außerhalb der Großstadtregionen wahrscheinlicher als bei Mittelstädten im Umland der Großstädte.“ (BBSR 2012; S. 49)

Im Zuge ablaufender sozioökonomischer Strukturwandelprozesse wird jedoch die Problematik nach zunehmenden Versorgungsdefiziten solcher zentraler Orte in der Forschung und Praxis erörtert. Die Entwicklungstendenzen von Mittelstädten im peripherisierten Raum werden zwischen Abkopplung und Innovation gesehen (Denkwerkstatt der Montag Stiftungen gAG (Hrsg.) / ILS (Hrsg.) / IRS (Hrsg.) 2012; S. S.2), wobei insbesondere für Städte mit anhaltender Strukturschwäche die Gestaltung einer nachhaltigen Stadtentwicklung als problematisch angesetzt wird.

Entsprechend ihrer sozioökonomischen Entwicklungsmuster ist die Gruppe der Mittelstädte in ländlich, peripheren Räumen folglich ebenfalls sehr heterogen ausgeprägt. Während einige Mittelstädte eine Kumulation wirtschaftlicher und sozialer Problemlagen aufweisen und von einer anhaltenden Strukturschwäche geprägt sind, verzeichnen wiederum andere Städte positive strukturelle Entwicklungsprozesse und entwickeln sich zu wirtschaftlichen Zentren mit innovativen Bereichen.

In Vergleichsanalysen der Mittelstädte mit ihrem jeweiligen regionalen Kontext wird ersichtlich, dass sich Mittelstädte in den ländlich, peripheren Räumen tendenziell gegen den jeweiligen regionalen Entwicklungstrend besser behaupten können. Mittelstädte in peripheren und nicht selten auch schrumpfenden Räumen stellen damit stabile Ankerpunkte dar. „Sie bilden daher ein wichtiges Grundgerüst zur Sicherung der Daseinsvorsorge in den peripheren, schrumpfenden Räumen, um der Negativspirale aus sinkender Nachfrage und sinkendem Angebot entgegenzuwirken.“ (BBSR 2012; S. 65)

Mittelstädte ländlich, peripherer Räume gelten somit als „Knotenpunkte“ für ihre Region. Anhand der umfassenden indikatorenbasierten Analyse aller bundesdeutschen Mittelstädte ländlich, peripherer Räume sowie anhand der vertiefenden Untersuchung der genannten fünf Fallstudien kann den Mittelstädten in den zentralen Bereichen Versorgung, Arbeiten und Wirtschaft sowie Wohnen eine Zentralitäts- und Ankerfunktion konstatiert werden. Insbesondere die Versorgungszentralität von Mittelstädten wird allen voran aufgrund ihrer zentralörtlichen Funktionszuweisung bestätigt. Die Wirtschafts- und damit einhergehend die Arbeitsplatzzentralität hängt demgegenüber mitunter auch von dynamischen Entwicklungsprozessen sowie von der Prägung des Umfeldes ab. Und nicht zuletzt zeichnet sich im Bereich Wohnen im Vergleich zu den weiteren Funktionen eine tendenziell geringere Zentralitätsfunktion ab.

Folgende ableitbare Determinanten begründen ihre Anker- beziehungsweise Stabilisierungsfunktion, deren jeweilige Ausprägung diese Rolle und Bedeutung zugleich fördern als auch abschwächen können:

- Größe der Mittelstadt selbst / Größe ihrer zugeordneten Kreisregion
- Entfernung zu den nächstgelegenen Klein- / Mittelstädten
- Erreichbarkeit zu den nächstgelegenen Ballungsräumen
- ihre zentralörtliche Funktionszuweisung

- bestehende infrastrukturelle Grundversorgung / Ausprägung im Einzelhandelsegment
- Ausprägung ihres Angebotes an Bildungs- und Forschungseinrichtungen
- Prägung des branchenstrukturellen und unternehmerischen Umfeldes
- wirtschaftsabhängige dynamische Entwicklungsprozesse

5.2.1 Versorgungszentralität

Bezogen auf die Erfüllung und Sicherung der infrastrukturellen Leistungserbringung der Daseinsvorsorge nehmen die Mittelstäde ländlich, peripherer Räume für ihr regionales Umfeld eine wichtige Zentralitätsfunktion ein. Der mehrheitliche Anteil der Städte umfasst neben einer zentralörtlichen Funktionszuweisung (überwiegend als Mittelzentrum) weiterhin die Kreisstadtfunktion des jeweiligen Landkreises. Und selbst die kreisfreien Mittelstädte stellen mitunter das politische Zentrum der jeweils zugeordneten Kreisregion dar. Entsprechend nehmen sie zudem in ihrer Grundgesamtheit weitere verwaltungsstrukturelle Zentralitäten in Form von Amtsgericht-, Finanzamt- und Arbeitsagentursitz wahr. Die Vergleichsanalyse der Gruppe der Mittelstädte mit ihrem regionalen Kontext bestätigt zudem die wesentliche infrastrukturelle regional bedeutsame Leistungserbringung der Städte im Hinblick auf verkehrsstrukturelle Anbindungsstrukturen, medizinische Versorgungseinrichtungen sowie regionale Bildungsstandorte. Die Mehrheit der Gruppe der Mittelstädte weisen Krankenhaus- beziehungsweise Klinikeinrichtungen auf. In rund ein Drittel der Städte sind zudem eine oder mehrere Vorsorge- beziehungsweise Rehabilitationseinrichtungen angesiedelt. Generell wird den Mittelstädten auch im Bereich Bildung eine Zentralitätsfunktion konstatiert. So decken diese in der Regel nicht nur ein breites Spektrum an Bildungseinrichtungen sondern darüber hinaus auch die unterschiedlichsten Bildungseinheiten ab.

Ein für Mittelstädte beachtliches Standortpotenzial stellt weiterhin der Faktor Hochschule dar, welcher regionale Effekte in Form regionaler Entwicklungsdynamiken, beispielsweise durch Ausgründungen, Start-Ups oder Technologiezentren, erzielt. „Hochschulen zählen zu den überregional und bundespolitisch bedeutsamen Einrichtungen des Wissentransfers.“ (BBSR 2012; S. 48) Sie können insbesondere im Hinblick auf unternehmerische Neuansiedlungen eine funktionale Spezialisierung fördern. Entsprechend wachsender politischer Tendenzen zu einer stärkeren Regionalisierung des Hochschulangebotes sind eine Reihe von neu errichteten Hochschulen auch in dünn besiedelten Räumen beziehungsweise einwohnergeringeren Städten entstanden.

5.2.2 Arbeits- und Wirtschaftszentralität

Entgegen dem Stadttypus Großstadt ist für Mittelstädte im Bereich Arbeiten und Wirtschaft eine deutlicher funktionale Spezialisierung sowie eine stärker mittelständisch orientierte Prägung charakteristisch. Großstädte weisen in der Regel eine überregionale Ausstrahlungskraft und einen überregionalen Bekanntheitsgrad auf und sind von einer hohen Funktionsmischung geprägt. Die regionale Ausstrahlungskraft und der Bekanntheitsgrad von Mittelstädten sind vorrangig von ihrer funktionalen Spezialisierung abhängig. Diese nimmt in der Regel auch einen wesentlichen Anteil an der wirtschaftlichen Bedeutung ein. Auffallend in der Gruppe der Mittelstädte zeigt sich allerdings, dass großstadtferne Mittelstädte in der Regel höher spezialisiert sind als großstadtnahe und darüber hinaus eine höhere Arbeitsmarktzentralität aufweisen.

Die Arbeitsmarktzentralität von Mittelstädten ländlich, peripherer Räume für ihr Umland kann mitunter anhand der Indikatoren Pendlersaldo und Arbeitsplatzzentralitätsfaktor verdeutlicht werden. Die Mehrheit der genannten Mittelstädte verbucht im Bezug zum Pendlersaldo deutliche Gewinne, wohingegen die Mehrheit der den Mittelstädten zugeordneten Kreisregion deutliche negative Pendlersalden aufweist. Zudem weist die Gruppe der Mittelstädte mehrheitlich einen Arbeitsplatzzentralitätsfaktor von über 1,0 auf.

5.2.3 Wohnzentralität

Die Wohn- und Lebenszufriedenheit von Mittelstädten in ländlich, peripheren Räumen wird generell als gut bewertet. Ein wichtiger Aspekt stellt hierbei die Tatsache dar, ob eine Person zur Miete oder im Eigentum wohnt. (BBSR 2012; S. 51) Eigentumsverhältnisse scheinen ein höheres Zufriedenheitsurteil zu ergeben als Mietverhältnisse. „Die Einwohnerzahl der Städte in Deutschland verhält sich umgekehrt proportional zum Anteil der Bevölkerung mit Immobilieneigentum. Nicht nur wohnen in Kleinstädten mehr Menschen im Wohneigentum als in Mittelstädten und dort wiederum mehr als in Großstädten, auch ist der Anteil der

Mieterinnen und Mieter in Wohnungen, die „kleinen“ Privateigentümern gehören, in Klein- und Mittelstädten höher als in Großstädten.“ (BBSR 2012; S. 54)

Allerdings wird im Bereich Wohnzentralität ein weiterer Aspekt deutlich: Während den Mittelstädten der fünf Fallstudien eine hohe Versorgungs-, Bildungs- sowie Arbeitsplatz- und Wirtschaftszentralität zugestanden wird, wird hierbei weiterhin die Wohnzentralität allenfalls mit Abstrichen beziehungsweise im Hinblick auf einen vorrangig niederschwelligen Bereich bestätigt. Als Gründe für die aus ihrer Sicht geringer einzustufende Wohnzentralität sind zwei Aspekte wesentlich. Starke Ansiedlungstendenzen zeichnen sich in den Regionen prioritär in Kommunen mit überregional bedeutsamen Verkehrs- und Bahnlinienachsen an, wodurch ein sogenannter Sogeffekt durch das Umland gegeben scheint. Demgegenüber ist in den Mittelstädten gegenwärtig teilweise die Flächenverfügbarkeit zur Schaffung von attraktivem Wohneigentum entsprechend dem Nachfragebedarf nur eingeschränkt gegeben. Dies lässt sich beispielhaft darin begründen, dass im innerstädtischen Kern Obergeschosse von Geschäftshäusern aufgrund der gegebenen Baustrukturen nicht bewohnt werden können. Weiterhin scheint es aber auch notwendig, die Bedarfsplanung an innerstädtischen Wohnflächen im Sinne einer perspektivischen Entwicklungsplanung stärker dem derzeit wachsenden Trend, beispielsweise über eine flexible Bodenpolitik, anzupassen.

5.2.4 Impulsgeberfunktion

Entsprechend ihrer bestätigten Zentralitätsfunktion in den jeweiligen Bereichen wird den Mittelstädten ländlich, peripherer Räume eine generelle Ankerfunktion für ihr Umland zugesprochen, welche stabilisierend für die Region wirkt. Ihr Bedeutungsgrad hinsichtlich einer Impulsgeberfunktion für Entwicklungsprozesse in den Regionen ist hingegen eingeschränkter zu bewerten. Insbesondere aus Expertensicht der fünf Fallstudien ist das Vorhandensein einer alleinigen Impulsgeberfunktion der Mittelstädte für die Region realistisch kritisch anzusehen. In der Regel ist für alle fünf Untersuchungsräume dahingehend vielmehr eine stärker verwobene Struktur von Stadt und Kreisregion mit arbeitsteiliger, sich gegenseitig stützender Wirkung beziehungsweise sich gegenseitig ergänzenden Impulsen und Synergieeffekten bestätigt. Insbesondere Umlandkommunen mit günstigen überregionalen Erreichbarkeiten beziehungsweise mit großen Unternehmenssitzen oder Produktionsstätten weisen zumeist ebenfalls positive beziehungsweise günstige Entwicklungseffekte auf. Ein gewisses Potenzialgehalt als Impulsgeber wird den Mittelstädten in der Regel für ihr Umland dennoch zugestanden. Ihr Attraktivitätsgehalt für das Umland liegt nicht nur in einem gewissen Vorhalten von Verwaltungs-, Versorgungs-, Kultur- und Freizeitinfrastrukturen bei einem gleichzeitigen Bestehen von kurzen Wegen. Sondern so kann beispielsweise der überregionale Bekanntheitsgrad der Mittelstädte imageprägend für die gesamte Region wirken.

6 ERGEBNISSE: HANDLUNGSERFORDERNISSE UND STRATEGIEN

Die statistische sozioökonomische Zusammenschau aller bundesdeutschen Mittelstädte in ländlich, peripher gelegenen Regionen einschließlich der Analyse ihrer jeweils zugehörigen Kreisregionen sowie die vertiefende Betrachtung anhand der fünf Fallstudien bestätigt diesen eine Anker- und Stabilisierungsfunktion für ländlich, periphere Räume. Damit einhergehend wurde aber auch deutlich, dass, bedingt durch die Herausforderungen sozioökonomischer Wandlungsprozesse, der Fokus einer zukünftigen Regionalentwicklung vermehrt auf einer Stärkung von Mittelstädten ländlich, peripheren Regionen und ihrem Umfeld zu legen ist.

Regionalen Akteuren „in schrumpfenden und wachsenden Kontexten steht ein gut gefüllter Werkzeugkasten zur Verfügung, um Transformation zu gestalten. Nicht alle Werkzeuge sind neu. Es kommt darauf an, sie klug und kreativ zu kombinieren: Sie müssen also lokal adaptierbar, skalierbar und flexibel zu- und abschaltbar sein“ (BBSR (Hrsg.) 2017; S. 67). Abgeleitet aus den untersuchten Mittelstädten und ihrer jeweils zugeordneten Kreisregion zeichnen sich in den einzelnen Strukturbereichen eine Reihe von Handlungsfeldern ab. Hierzu zählen mitunter Maßnahmen in den einzelnen Bereichen Daseinsvorsorge und Infrastruktur, Siedlungsstruktur und Wohnen sowie Arbeitsmarkt und Wirtschaft, gleichzeitig aber auch die Berücksichtigung seitens der einzelnen Planungsebenen. Insbesondere anhand der fünf Fallstudien können im Folgenden beispielhaft einige zentrale Handlungserfordernisse herausgestellt werden. Obgleich die fünf Fallstudien unterschiedliche funktionale und strukturelle Rahmenbedingungen sowie unterschiedliche Entwicklungsmuster aufweisen, zeichnen sich tendenziell gleichgerichtete Handlungsfelder ab.

6.1 Ebene Raumordnung/Landesplanung

Allen voran wird das Zentrale-Orte-Konzept auch für die Zukunft weiterhin als erhaltenswertes, zentrales Instrument für die rahmensetzende Planung der Landesplanungen angesehen. Mittelstädten sollen dabei nach Ansicht der befragten Experten insbesondere in ländlichen Regionen auch weiterhin als wirtschaftliche Zentren, Behördenstandorte und Versorgungskerne für das regionale Umland eingestuft, gesichert und gestärkt werden. Gleichzeitig steht bezogen auf die Zentrale-Orte-Funktion aus ihrer Sicht die Frage zur Diskussion, in welcher Weise diese Funktionszuweisung sowohl als Auftrag an die jeweilige Stadt als auch an das jeweilige Land zu sehen ist. Seitens der jeweiligen Länder sollen demnach vorrangig Maßnahmen vorgehalten werden, um insbesondere Städte mit negativen Strukturwandelprozessen oder Städte mit sich noch entwickelnden zentralörtlichen Funktionen hinsichtlich ihrer bedeutenden Zentralitätsfunktion zu sichern beziehungsweise zu stärken.

Im Hinblick auf EU-, Bundes- oder Landesfördermittel zeigt sich in allen Untersuchungsräumen einheitlich bestätigt, dass Fördermittel abhängig der durch ihre jeweiligen strukturpolitischen Rahmenbedingungen bestehenden Möglichkeiten regelmäßig beantragt und für eine nachhaltige Weiterentwicklung der Region genutzt werden. Eine generelle nachhaltige Förderpolitik ländlicher Regionen ist nach Ansicht der Experten dahingehend gegeben, wenn der Ansatz nicht vordergründig auf einer Minimierung der Schwächen strukturschwacher Regionen ausgerichtet ist. Stattdessen sind insbesondere finanzielle Instrumente schwerpunktmäßig darauf auszurichten, die Stärken der jeweiligen Regionen zu stärken und ihre jeweiligen Schwerpunkte zu fördern, um sich eigenständig weiterentwickeln zu können.

Als ein weiterer zentraler Gesichtspunkt wurde hierbei die Verstetigung der Mittel zur Planungssicherung benannt. Ihrer Ansicht nach sind insbesondere Sonderprogramme vornehmlich auf dynamische Prozesse ausgerichtet, wobei nachhaltige Unterstützung zur Fortführung bisher vielfach fehlt. Dies kann ebenso wie ein Auslauf wichtiger Förderperioden aus Sicht der befragten Experten zu ernsthaften Strukturproblemen in den Regionen führen. Eine Verstetigung der Mittel zur Planungssicherheit und damit vielfach zur Sicherung der Daseinsvorsorge ist nach Ansicht der Experten unabdingbar. Weiterhin scheinen eine Vereinfachung beziehungsweise Reduzierung der in gewisser Weise zu breit aufgestellten Förderlandschaft und ein Abbau der Regularien und damit des Aufwandes zugunsten der Antragsteller sinnvoll. Dieser Gesichtspunkt ist nach Expertensicht weiterhin eng verknüpft mit dem Aspekt, die jeweiligen Förderprogramme auf übergeordneter Ebene miteinander stärker zu koordinieren. Damit kann eine erhöhte Transparenz für die jeweiligen Akteure geschaffen und administrative Hemmnisse abgebaut werden.

Hinsichtlich der Frage nach landesplanerischen Strategien zur Förderung ländlicher Regionen wurde die so genannte Heimatstrategie des Freistaates Bayern vielfach herausgestellt, welche mittels dem Prinzip der Dezentralisierung auf eine Gleichwertigkeit der Lebens- und Arbeitsbedingungen in allen bayerischen Regionen abzielt.

6.2 Ebene Regionalplanung

Bezogen auf Ansätze und Projekte zur Förderung der regionalen Entwicklung bestehen innerhalb ländlich, peripherer Regionen bereits eine Reihe unterschiedlicher regionaler Entwicklungsstrategien beziehungsweise Modelle zur eigenständigen Entwicklung. Aber ihre Vielzahl, ihre vielfältigen projektbezogene Ausrichtung beziehungsweise Ausgestaltung, ihre Variabilität in ihrem Gebietszuschnitt, in ihrer Akteursstruktur oder in ihrer Förderkulisse macht einen gesamtumfassenden Überblick in gewissem Maße selbst für agierende Akteure vor Ort schwierig.

Ein in diesem Zusammenhang weiteres wichtiges Themenfeld stellt der Bereich interkommunale Zusammenarbeit in allen Bereichen dar. Trotz bereits vielfacher Bemühungen und bereits erster guter Praxisbeispiele stellt dies noch ein ausbaufähiges Handlungsfeld dar. Während die Vernetzung von Politik, Wirtschaft und Wissenschaft nach Expertensicht in den einzelnen Untersuchungsräumen bereits gut funktioniert, sind insbesondere die bereits vielfach seit Jahren im Blickpunkt stehenden interkommunalen Zusammenarbeiten weiterhin zu stärken beziehungsweise auszubauen. Und auch das oftmals diskussionsbehaftete Themenfeld Gebiets- beziehungsweise Kreisreform wurde zur Diskussion gestellt: Sollte ein stärkerer Zwang zur Kooperation erfolgen? Denn oftmals fehlt ein gemeinsames Verständnis. Können sich hieraus neue Möglichkeiten beziehungsweise Entwicklungstrends ergeben? Oder wird hierbei stattdessen ein Gestaltungsspielraum eingeengt?

Das Stichwort „Vernetzung“ wurde in allen Untersuchungsräumen auch mehrfach im Hinblick auf eine digitale Infrastrukturversorgung gesehen. Das Thema Digitalisierung stellt eine essentielle Thematik für eine dynamische Entwicklung ländlicher Regionen und ihrer Zentren dar. Obgleich eine flächendeckende Förderung des Breitbandausbaus von Bund und Ländern aktuell forciert wird, sind hierbei noch deutliche Defizite in den Räumen gegeben.

Im Bereich Arbeitsmarkt und Wirtschaft scheinen zwei Handlungsfelder für Mittelstädte und ihr ländlich, peripheres Umland essentiell. Zum einen sind angemessene Fachkräftesicherungsmaßnahmen insbesondere in ländlich, peripheren Räumen stärker zu forcieren, um zukünftig eine ausreichende Versorgung der angesiedelten Unternehmen mit Fachkräften zu gewährleisten und letztlich zur regionalen Resilienz beizutragen. Ein Mangel an Fachkräften kann ein ernstzunehmendes Risiko für Unternehmen darstellen. In konjunkturellen Hochphasen können betroffene Betriebe ihr Potenzial nicht ausschöpfen, wodurch sie insbesondere für konjunkturelle Schwächephasen keine Sicherheiten aufbauen können. Als einschlägiges Beispiel ist hier eine überregionale Anzeigesonderveröffentlichung des Vogtlandkreises zu bennen, mit der die Region darauf abzielte, insbesondere Bevölkerungsgruppen aus überteuerten Ballungsräumen die Vorzüge ihrer ländlichen Region aufzuzeigen und somit Fachkräfte anzuwerben.

Zum anderen fördert eine in die regionale Entwicklung integrierte Gewerbeentwicklungsstrategie eine nachhaltige Gewerbe- und Industrieflächenentwicklung und sichert damit die Zukunftsfähigkeit des regionalen Wirtschaftsstandortes. Über einen abgestimmten regionalen Prozess zur nachhaltigen Gewerbe- und Industrieflächenentwicklung kann für alle Kommunen eine ausgleichende Standortentwicklung geboten werden, welche gleichzeitig zu einer regionalen Standortqualität und letztlich überregionalen Wettbewerbsfähigkeit verhilft. Weiterhin kann eine im Gesamten möglichst flächeneffiziente und umweltverträgliche Entwicklung erzielt werden und fehlende Flächenverfügbarkeiten insbesondere in den Stadtgebieten kompensiert werden.

Im Bildungsbereich geht es um den Aspekt neuer Kooperationsmodelle zur Sicherung von Ausbildungsmöglichkeiten in den unterschiedlichen Berufsangeboten vor Ort. Insbesondere junge Auszubildende im ländlichen Raum haben ein Erreichbarkeitsproblem ihrer Lehrstellen. Um eine Sicherung der Berufsausbildungsbranchen in den Berufsschulen der Mittelzentren zu sichern, ist der Aufbau angepasster Modelle, unter anderem in Form von kleineren Klassengrößen oder von verschiedenen Kooperationsverbünden, zu prüfen.

6.3 Kommunale Ebene: Mittelstadt

Das Potenzial von Mittelstädten ländich, peripherer Räume liegt in ihren attraktiven Lebensbedingungen, die es gleichwohl noch zu stärken, vor allem aber verstärkt zu vermarkten gilt. Die Mischung aus urbanen Strukturen mit einer gewissen Versorgungsdichte, naturnaher Lage mit zum Teil umfassenden touristischen Angeboten, moderaten Wohn- und Mietpreisen sowie aus kurzen Wegen bieten den Städten dieser Größenordnung und Raumstruktur beachtliche Standortvorteile gegenüber Ballungsräumen. Weiterhin bestehen eine Reihe die Zukunftsfestigkeit fördernde Determinanten, allen voran das Vorhandensein eines Hochschulstandortes oder eine enge Vernetzung unterschiedlichster regionaler Akteure. Im Hinblick auf die seitens der Experten zugeschriebene zentrale Bedeutung der Hochschulen als regionaler Entwicklungsfaktor in allen fünf Untersuchungsräumen erachten sie diesbezüglich auch eine Sicherstellung eines perspektivischen Entwicklungsausbaus als wichtig an. Als einschlägiges Beispiel ist hierbei die derzeitige Regionalisierungsstrategie der Hochschule Ansbach zu nennen. Im Rahmen des Strategieprozesses 2020 liegt neben der Einrichtung neuer Studiengänge sowie der Neupositionierung bewährter Studienangebote und einem aktuell geplanten Ausbau des Zentralcampus Ansbach der Schwerpunkt auf dieser Regionalisierungsstrateige mit Außenstellen im Landkreis. Über diesen Ansatz soll die Hochschule als Hochschule in der Region und für die Region neu und stärker positioniert werden.

Eben diese Vorzüge der Mittelstädte und ihrem regionalen Umfeld sind über ein angepasstes Image sowie über geeignete Medien zu bewerben. Entsprechend sind die Entwicklungsprozesse dieser Städte darauf auszurichten, dass sie in ihrer Lebensqualität und als innovative Wirtschafts-, Bildungs- und Versorgungspunkte mit eigenem und nachhaltigem Profil gestärkt und weiterentwickelt werden. Dies ist insbesondere eng mit ihren zugewiesenen Zentralitätsfunktionen verknüpft. Seitens der Mittelstädte selbst sind über kommunale sowie regionale Strategien und Konzepte die Entwicklungen der Städte dahingehend auszurichten, dass diese die Infrastruktur- und Versorgungsleistungen für die Region entsprechend ihrer zentralörtlichen Funktionszuweisung sicherstellen. Und nicht zuletzt sind im Hinblick auf ihre vielfach konstatierte Ankerfunktion durch kommunale und regionale Strategien und Konzepte die Entwicklungen der Städte dahingehend auszurichten, dass diese ihre Infrastruktur- und Versorgungsleistungen für die Region entsprechend ihrer zentralörtlichen Funktionszuweisung auch zukünftig gesichert wissen. Beispielhaft ist hierfür ein abgestimmter regionaler Prozess zur nachhaltigen Gewerbe- und Industrieflächenentwicklung zu nennen.

7 REFERENCES

Adam, Brigitte: Klein- und Mittelstädte in Stadtregionen, in: Informationen zur Raumentwicklung, Heft 8.2005. Bonn, 2005.

Akademie für Raumforschung und Landesplanung (Hrsg.): Handwörterbuch der Raumordnung, Hannover, 2005.

BBSR (Hrsg.): Kreativ aus der Krise - Impulse für atädtische Transformation. Bonn, 2017.

BBSR (Hrsg.): Klein- und Mittelstädte in Deutschland - eine Bestandsaufnahme, in: Analysen Bau.Stadt.Raum, Band 10. Bonn, 2012.

BMVBS (Hrsg.) / BBSR (Hrsg.): Ländliche Räume im demografischen Wandel, in: BBSR-Online-Publikation, Nr. 34/2009. Bonn, 2009.

BMVBS (Hrsg.); BBR (Hrsg.): Initiativkreis Europäische Metropolregionen in Deutschland, in: Werkstatt: Praxis Heft 52. Bonn, 2007.

Denkwerkstatt der Montag Stiftungen gAG (Hrsg.); Institut für Landes- und Stadtentwicklungsforschung (ILS) (Hrsg.); Leibniz Institut für Regionalentwicklung und Strukturplanung (IRS) (Hrsg.): Mittelstädte im peripherisierten Raum zwischen Abkopplung und Innovation. Bonn, 2012.

Espon Homepage, aufgerufen unter: http://www.espontheroad.eu/dane/web_articles_files/1554/cee_im_towns_de.pdf.

Europäische Union, Generaldirektion Regionalpolitik: Städte von morgen - Herausforderungen, Visionen, Wege nach vorn. Brüssel, 2011.

Geschäftsstelle der Ministerkonferenz für Raumordnung im Bundesministerium für Verkehr, Bau und Stadtentwicklung (BMVBS): Leitbilder und Handlungsstrategien für die Raumentwicklung in Deutschland - verabschiedet von der Ministerkonferenz für Raumordnung am 30.06.2006. Berlin, 2006.

Heineberg, Heinz: Einführung in die Anthropogeographie / Humangeographie, Paderborn, 2007.

Kujath, Hans-Joachim: Regione nim globalen Kontext, in: Institut für Regionalentwicklung und Strukturplanung (Hrsg.): Strategien der regionalen Stbilisierung - Wirtschaftliche und politische Antworten auf die Internationalisierung des Raumes. Berlin, 1998.

Liebmann, Heike / Bernt, Matthias: Städte in peripherisierten Räumen - eine Einführung, in: Bernt, Matthias; Liebmann, Heike (Hrsg.) (2013): Peripherisierung, Stigmatisierung, Abhängigkeit? - Deutsche Mittelstädte und ihr Umgang mit Peripherisierungsprozessen. Wiesbaden, 2013.

Schmidt-Lauber, Brigitte (Hrsg.): Urbanes Leben in der Mittelstadt: Kulturwissenschaftliche Annäherungen an ein interdisziplinäres Forschungsfeld, in: Mittelstadt - Urbanes Leben jenseits der Metropole. Frankfurt am Main, 2010.

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New Enabling Technologies to Observe and Characterise Urban Environments with Big Data from Space – the Urban Thematic Exploitation Platform

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1 ABSTRACT

Modern Earth Observation (EO) satellite missions provide valuable opportunities to support sustainable urban planning and management by delivering dedicated information on the spatiotemporal development of the built environment and its key morphological and physical characteristics such as imperviousness, greenness, built-up density, building volume, albedo – from global down to local scale. However, the transformation of the raw EO imagery into ready-to-use thematic data and indicators for scientist or planners on the one hand and actionable information for decision makers on the other hand requires detailed technical expert knowledge. Moreover, the imagery collected by satellite missions such as the US Landsat program or the European fleet of Sentinel satellites, but also by airborne systems or drones, rapidly adds up to a multiple of the data volume that can effectively be handled with standard work stations and software solutions.

Hence, this contribution introduces the Urban Thematic Exploitation Platform (https://urban-tep.eo.esa.int) that utilizes modern information and communication technology to bridge the gap between the mass data collections of the technology-driven EO sector and the demand of science, planning, and policy for up-to-date information on the status, properties and dynamics of the urban system. Key components of the Urban Thematic Exploitation Platform (U-TEP) are an open, web-based portal that is connected to distributed high-level computing clusters and clouds and that also provides key functionalities for i) high-performance data access, analysis and visualization, ii) customized development and sharing of algorithms, products and services, and iii) networking, communication and exchange of data and information. The overarching objective here is to enable any interested (non-expert) user to easily generate actionable indicators and information for effective sustainable urban development based on a joint analysis of various data sources such as official survey data, EO mission data, socio-economic statistics, and data collected via social media or citizen science.

So far more than 3.5 PB of data have been processed and analyzed by means of the U-TEP to finally provide a broad spectrum of urban information products and related services for visualization and analytics that have yet successfully been used by more than 240 institutions (science, planning, NGOs, policy) from 41 countries (i.a. World Bank Group, United Nations, Organisation for Economic Cooperation and Development, World Food Programme, Bill and Melinda Gates Foundation, Group on Earth Observation, Global Platform for Sustainable Cities).

Keywords: information and knowledge sharing, enabling tools, urban monitoring, earth observation, urban thematic exploitation platform

2 INTRODUCTION

On the topic of global change, a large-scale transfomation is occurring on Earth where the proportion of people living in urban areas is exceeding that of people living in rural regions. Cities located in Asia and Africa are growing at a staggering pace; megacities are expanding every year and urban sprawls are emerging and spreading across extensive areas of landscapes, that until recently, had been untouched by development or used for agricultural production. This trend towards urbanization shows no sign of abating. Today, approximately 7.2 billion people inhabit Earth and this number is expected to rise up to 9 billion by the year 2050, when 70 percent of the population will be living in cities (UN, 2016).

Even when the urbanization process has regional roots, it also comes with common drivers that can be applied to describe urbanization at the global scale. It is here that Earth Observation (EO) can make a valuable contribution. Data from modern EO satellite missions such as US Landsat or the European Space Agency (ESA) Sentinel satellites support sustainable urban planning and management by delivering dedicated information on the spatiotemporal development of the built environment and its key morphological and physical characteristics such as imperviousness, greenness, built-up density, building volume, albedo – from global down to local scale. In other words, satellite-based geo-information delivers an up-to-date and comprehensive image of the built environment, while at the same time documents its changes over time (Seto, 2009; Esch et al., 2010; Gamba and Herold, 2009).

However, to effectively and efficiently access, process, analize and distribute the growing volume of data, the implementation of operational, modular and highly automated processing chains, embedded in powerful hard- and software environments and linked with effective distribution functionalities is of central importance. On this account, the ESA started the “EO Exploitation Platforms (EPs)” initiavite, aiming at the creation of an ecosystem of interconnected “Thematic Exploitation Platforms (TEPs)”. Basically, a TEP is a collaborative, virtual work environment with one coherent user interface that provides access to EO data and the tools, processors, and Information and Communication Technology (ICT) resources required to efficiently extract thematic geo-information from mass EO data sources (ESA, 2016). Starting in 2014 and with the first phase ending in 2017, TEPs have been implemented for Coastal, Forestry, Hydrology, Geohazards, Polar, Food Security and Urban applications.

3 THE URBAN-TEP PROJECT

The Urban-TEP project can be considered as an evolving framework platform which brings users and functionalities closer to big data inventories (primarily EO data, but also from other sources.), supports large-scale and complex data exploitation, and facilitates the sharing of data, technology, and knowledge. More information about the U-TEP project can be obtained from the project website via “https://urban-tep.eo.esa.int”

3.1 Consortium, Stakeholders and User Community

The U-TEP platform is developed by a consortium led by the German Aerospace Center (DLR) and integrated by Brockmann Consult GmbH (DE), Gisat s.r.o. (CZ), IT4Innovations (CZ), and Terradue Srl (IT). Terradue Srl contribute with their expertise in developing a web-portal; IT4Innovations, Brockmann Consult GmbH and DLR are responsible for the provision of high performance computing processing infraestructures, services and data storage, and in charged of the data processing and thematic analyses; and finally, Gisat s.r.o. provides with the necessary visualisation and WebGIS components.

The Urban TEP project is designed to serve a broad spectrum of stakeholders operating from global to local scale and including scientific communities, public authorities and governmental organizations, non-governmental and non-institutional communities, and the commercial sector. In the current project phase a dedicated community of “early adopters” is helping the Urban TEP consortium to set-up and optimize the basic system and service functions and therewith to guarantee a high applicability and benefit of the platform. The current main users include i.a. World Bank Group (WBG), United Nations (UN), Organisation for Economic Co-operation and Development (OECD), World Food Programme (WFP), Bill and Melinda Gates Foundation, Group on Earth Observation (GEO), Global Platform for Sustainable Cities (GPSC), WorldPop, Columbia University (CIESIN) - USA, and the Sultan Qaboos University -Oman.

3.2 Conceptual Design

The U-TEP is a web-based (Fig.1) and open platform that enables any interested user to exploit EO data easily and with no data download complications. The system allows the generation of thematic information, which combines not only different EO data, but data from other sources such as statistics, surveying and volunteered greographic information. Users involved in urban and environmental science can produce, for example, thematic information on growing cities, the impact of climate change on the built environment, or the erosion of biodiversity due to human disturbance.

In general terms, the main objective of the platform is to facilitate effective and efficient urban management by systematically exploring i) on-demand and up-to-date geo-information about the status and development of urban areas for any region and time of the users interest, ii) the massive processing power provided by modern ICT-infrastructures and technologies, and iii) the capabilities of participation and sharing of knowledge by using new media and ways of communication.

The U-TEP technical concept is based on a generic, modular, multi-purpose systems design, facilitating maximum flexibility with respect to the adaptation to various user requirements and application scenarios as well as to available data processing and analysis technologies and IT infrastructures. The main componets of the U-TEP are:

(1) Web-portal.

(2) High-level computing clusters,

(3) Unique portfolio of thematic data,

(4) State-of-the art pre-processing, analysis, and visualisation techniques,

(5) Customising functionalities for transfer of algorithms/products into services;

(6) Functionalities to disseminate data, functionalities, and information, and

(7) Support of networking and communication activities

Considering these basic components, the U-TEP can serve to various service models such Platform as a Service (PaaS), Infrastructure as a Serviced (IaaS), Information as a Service (InaaS), and Software as a Service (SaaS). The platform functionalities follow an Open Source strategy, which means, they are based on an Open Source components and models, with an online presence at "https://github.com/U-TEP". Moreover, the interfaces between the integrated software APIs are based on Open Standard specification (e.g., OCCI, OGC). The aim of an open strategy is to assure sustainable developments.

It is important to mention that the U-TEP platform is not designed to access EO data directly, and therefore, does not perform as a classical data distribution tool.

Fig. 1: U-TEP web-portal (https://urban-tep.eo.esa.int) serving as entry point to the system.

3.3 Supported Use-Scenarios

The conceptual design of the U-TEP primarily aims at supporting four general use scenarios.

(1) Explore existing thematic content

The user can select a broad spectrum of existing thematic content on urban themes provided on the U-TEP platform. Moreover, the user can upload own data and content (e.g., statistics) and jointly analyze and

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visualize the available thematic layers based on state-of-the-art tools of Geographic Information Systems. Any openly available thematic content or generated result can be exported.

(2) Task individual on-demand analyses

The user can conduct on-demand processing and production of thematic content based on multi-mission remote sensing imagery and additional data sources (e.g., cadastral data, statistics, and socio-economic data). The additional data might either be publically available on the platform or individually uploaded by the user.

(3) Develop, deploy and offer your own content or application

The U-TEP platform allows for the individual development and deployment of analysis techniques, thematic products and application-oriented services. Therefore, the platform offers interfaces to upload and run user-defined algorithms and processes and provides functionalities to develop own methods and products (e.g., by using the Sentinel tool boxes) directly on the platform. Developed applications or products can then be presented and shared at the U-TEP platform application and product store.

(4) Learn more about innovative data sets and methods

The U-TEP platform provides various opportunities to inform about innovative products, applications and initiatives and the latest state-of-the-art methods and solutions. These approaches and products might even be available for first testing on the platform by the interested user and the user can also contribute a rating of or feedback to the method or solution in order to support further optimization and/or operationalization.

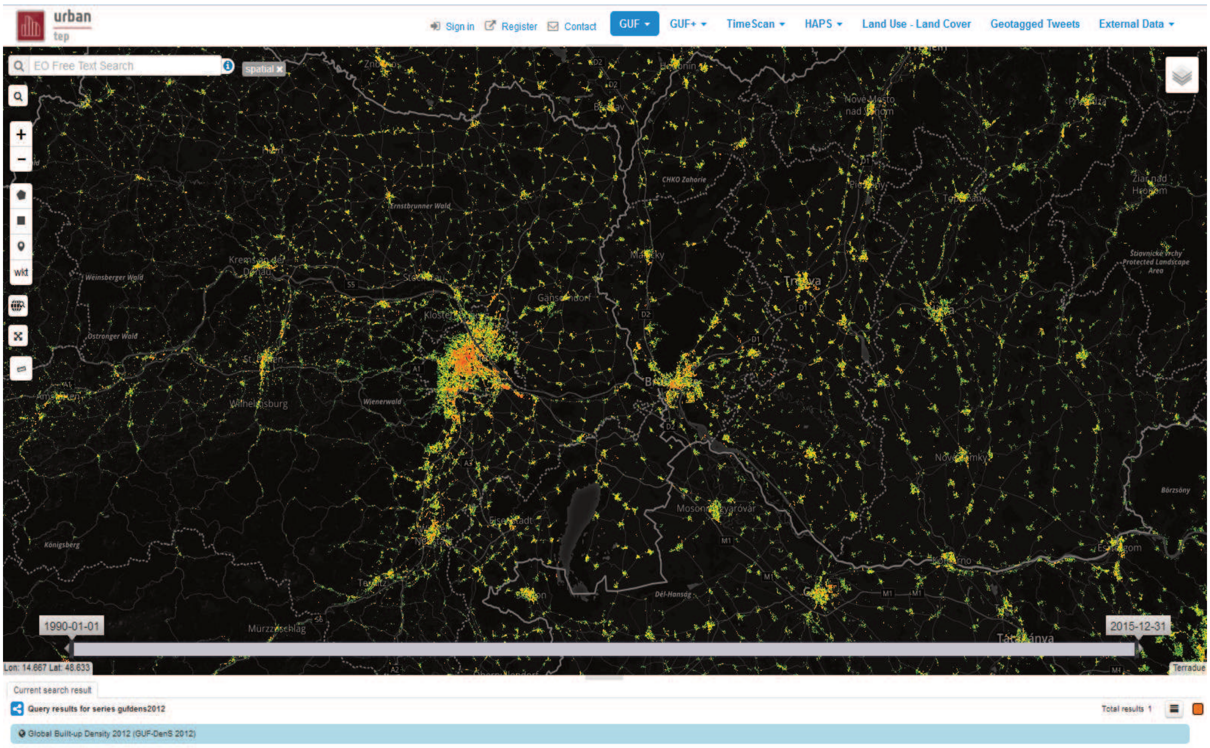

Fig. 2: U-TEP geobrowser showing current product portfolio and exemplary visualization of GUF-Density layer for region of Vienna, Austria.

3.4 U-TEP Products Portafolio and Services

Currently the U-TEP platform has successfully been used to process a vast amount of satellite data collections, including global coverages of multispectral Landsat scenes for the years 2015, 2010, 2000 and 1990 (948,894 images), a global dataset of 25,550 Envisat-ASAR radar images collected between 2010-2012, and Sentinel-1 and Sentinel-2 data collections covering several regions in central Europe and Africa. The results of this EO-based processing have been used to support the generation of several new global thematic layers, including the Global Urban Footprint (GUF 2012) binary human settlement mask (Esch et al., 2017) several collections of TimeScan products providing spectrally and temporally harmonized representations of the land surface (Esch et al., 2017) and the experimental GUF-DenS 2012 (Fig. 2) product derived from a combination of the binary GUF 2012 and TimeScan-Landsat 2015 data (Esch et al., 2017). A more detailed specification and visualization of all products and services already available is provided at the

Urban TEP website/portal. The currently available on-demand processing services include TimeScan on-demand (Sentinel, Landsat), Functional Area Definition (urban-rural), and Data Visualisation and Analytics (ESA, 2018).

Moreover, several (global) auxiliary data sets have been integrated in the Urban TEP, including demo data for High Altitude Pseudo Satellites (HAPS), WorldPop, Gridded Population World, Global Administrative Units, VIIRS Nighttime Lights, ESA CCI Land Cover, World Bank statistics, UN statistics or geotagged Tweets (ESA,2018).

4 CONCLUSIONS AND FURTHER DEVELOPMENTS

The main objective of the U-TEP is to initiate step changes regarding remote processing (bringing users-to-the-data), enabling technology (facilitating large-scale exploitation and timeliness of mass data analyses), distribution of expertise by sharing of data and methods (increase of assets, fostering of innovation, supporting benchmarking), and the establishment of open, integrative, participatory, collaborative concepts (community stimulation, increasing outreach). Currently, most services for thematic information can be considered non-generic and often just a short term solution, as they are mainly project funded and with a very specific focus and area of interest. For these reasons, the technological progress that the Urban TEP is expected to initiate in the near future will provide a number of advantages for the users, including, but not limited to:

(1) Free and open access to and use of state-of-the art infrastructures (computing, data management, storage), techniques (e.g., multi-source data fusion and analysis) and EO-derived information products.

(2) Efficient exploitation of full spectrum of available EO data streams and archives.

(3) Validated and benchmarked algorithms and products.

(4) Access to network of experts and stakeholders that share experiences and best practice applications.

(5) Market place of ideas and driver of innovation

(6) Seed point for the animation of new user communities outside EO/geo-sector.

(7) Gaining of better knowledge on urban system and increased efficiency, effectiveness and sustainability of functions and services in policy, planning, economy, and science.

In the current project phase, which covers the time span from March 2015 to March 2018, already more than 240 institutions from more than 40 countries have requested access to the U-TEP and products.

5 REFERENCES

ESA, 2016. European Space Agency, Website about Thematic Exploitation Platforms (TEP). https://tep.eo.esa.int (14. Apr. 2016).

ESA, 2018. Urban Thematic Exploitation Platform, “Urban TEP”, ESA website, available URL: https://urban-tep.eo.esa.int (03.01.2018).

Esch, T., Heldens, W., Hirner, A., Keil, M., Marconcini, M., Roth, A., Zeidler, J., Dech, S., Strano, E. (2017): Breaking new ground in mapping human settlements from space – The Global Urban Footprint. ISPRS Journal of Photogrammetry and Remote Sensing 134 (2017) 30-42. https://doi.org/10.1016/j.isprsjprs.2017.10.012

Esch, T., Marconcini,M., Uereyern, S., Zeidler, J., Himer,A., Asamer,H.,Rogge,D.,Metz, A., Tum, M.,Boettcher,M.,Kuchar,S. and Svaton, V. , „Exploiting Big Data from Earth Observation - The TimeScan Framework”, ISPRS Journal of Photogrammetry and Remote Sensing, submitted, 2017.

Esch, T., Taubenboeck, H., Heldens, W., Thiel, M., Wurm, M., & Dech, S. (2010). Urban remote sensing e how can earth observation support the sustainable development of urban environments?. In Proceedings of 46th ISOCARP Congress, 19-23 September 2010, Nairobi, Kenya.

Gamba, P., & Herold, M. (2009). Global mapping of human settlement e Experiences, datasets, and prospects. CRC Press.

Seto, K. C. (2009). Global urban issues e a primer. In P. Gamba, & M. Herold (Eds.), Global mapping of human settlements e Experiences, datasets, and prospects. Boca Raton: Taylor & Francis Group.

UN, 2016. 2014 Revision of World Urbanization Prospects of the Population Division of the Department of Economic and Social Affairs of the United Nations. http://esa.un.org/unpd/wup/ (14. Apr. 2016).

reviewed paper

Non-profit Housing: Current Trends in the European Context and its Specific Value for the Inward Urban Development in Switzerland

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1 ABSTRACT

The market share of social housing is around 6 % in Switzerland, while it amounts to an average of 11 % across the countries of the EU-28. Between the countries, big differences in market shares and support schemes for social housing exist. This paper investigates these characteristics of social housing in Europe as well as its trends in the recent years. The situation of social housing in Switzerland in the European context is highlighted – with a special focus to the aspect of inward urban development.

It is shown, that market shares of social housing are generally declining in Europe. Parallely, there has been a shift from bricks and mortar subsidies towards housing allowances and a focus on clearer targetting of the remaining social housing stock towards those most in need. While this can be seen as a necessity to reach a high effectiveness of social housing, it has led to an increased concentration of economically and socially disadvantaged people in the remaining housing stock, raising concerns about ghettoisation that contradict the housing paradigm of socially mixed neighbourhoods. In Switzerland, social housing is partly clearly targeted at certain population parts (continously subsidized housing), but partly also open for all people (mostly social cooperative housing). This raises questions about the fair distribution of public housing subsidies, but also reflects the large variety of different social housing providers in the country. Moreover – linking the subject of social housing and spatial planning – it is shown, that social housing providers play an important role in the national spatial strategy of inward urban development. Using the example of the city of Zurich, which has the biggest social housing market share (24 %) of any Swiss municipality, success factors in this regard are examined. It is detected, that a continous cooperation between the city authorities and social housing providers is a key factor for a succesful linkage of housing policies with urban development. The strategy builds upon a set of housing support measures from the city with clear requirements for compensatory measures by the social housing providers that further the quality and effectiveness of social housing projects.

Keywords: spatial planning, inward urban development, Switzerland, non-profit housing, social housing

2 NON-PROFIT HOUSING: DEFINITION AND OVERVIEW IN EUROPE

2.1 Definition of social housing

SCANLON ET AL. (2014: 3) state, that “it is impossible to provide entirely consistent comparative figures for the stock of social housing because different countries define the tenure in different ways and because of the limitations of the data.” Social housing can be defined based on rent levels (social rents as opposed to market rents), ownership (social dwellings are owned by particular types of landlords), or the existence of a government subsidy or allocation rules (social dwellings are distributed to households via an administrative procedure rather than the market). In this paper, social dwellings are qualified as such through the application of social rents – understood as rents that are either directly subsidized or operated on a cost basis without generating a profit (so-called cost rents[1]). In this sense, non-profit housing and social housing are treated as synonyms in this paper.

2.2 Housing challenges in Europe

The provision of sufficient affordable housing is a key issue in Europe. As a recent EU report (HOUSING EUROPE 2017: 11) states, house prices are growing faster than incomes in most European countries. This is reflected in the share of EU households’ budgets used for housing which has risen from around 22 % in 2000 to 25 % in 2016 – making housing the single highest expenditure item for Europeans (EUROSTAT 2017a). This development did not happen equally over the different income groups in the EU: While the average EU overburden rate – defined as the share of people who spend more than 40 % of their disposable income for

[1] The rent of a dwelling calculated on the cost of providing and maintaining the property without allowing for a profit (THE FREE DICTIONARY 2018).

housing – has slightly decreased for higher income groups, it has risen for the people in the lowest income quintile from around 34 to 36 %. In total, 11 % of the EU population was „overburdened“ by housing costs in 2016 (EUROSTAT 2017b). Furthermore, there are regional differences: Rising prices and rents can be observed particularly in large cities and metropolitan areas with a growing population, where housing shortages and conflicting interests between profit seeking investors in the housing markets and inhabitants come together. Therefore, finding adequate and affordable housing becomes increasingly difficult in central places, where job opportunities usually are the best (HOUSING EUROPE 2017: 11). People on the move as a result of, inter alia, armed conflicts, disaster, political instability or the effects of climate change can exacerbate this situation as migrants and locals oftentimes compete for the same low-price accommodations. This can be seen particularly in Germany, where in 2015 the so-called refugee crisis reached a peak with around 900’000 registered arrivals of asylum seekers (BAMF 2016) in the country.

2.3 The social housing sector in Europe – recent development, market shares and allocation criteria with a special focus on Switzerland

2.3.1 The social housing sector in Europe – recent development

Meanwhile, an important contributor for affordable housing – the social housing sector – has experienced profound changes lately. At first, its market share of the total housing sector, which currently (2017) amounts to around 11 % across the EU (HOUSING EUROPE 2017: 42), has been declining in most European countries in the last decades (SCANLON ET AL. 2014: 5). Oftentimes, this development went along with an increase in the share of owner-occupied home ownership (PRIEMUS, DIELEMANN 2002: 191). An important reason for this was the housing policy in some countries, which pushed forward the sale of social housing stock to its tenants (e.g. Great Britain, the Netherlands and especially the post socialist states in Central and Eastern Europe) (PRIEMUS, DIELEMANN 2002: 193; HEGEDÜS ET AL. 2014: 240). Furthermore, financial support of social housing by the public sector was reduced in numerous countries (e.g. in Germany), slowing down social housing production substantially without a respective compensation through an increase in home ownership (PRIEMUS, DIELEMANN 2002: 193). In many European countries, this reduction went along with a shift from supply to demand side financing measures: Providing housing allowances directly to clearly defined population groups (demand side) gained political support at the expense of so-called bricks and mortar subsidies for the building of new social housing (supply side). While public spending for housing allowances has risen from 55 to 81 billion Euro between 2009 and 2015, capital spending on building new homes across all EU countries has almost halved in the same timespan from 48 to 28 billion Euro (NATIONAL HOUSING FEDERATION 2017: 6). Exemplarily in this regard is the UK, where the drop of expenditure on housing development in the same period was even more pronounced from £11 billion to £5 billion. Housing allowances on the other hand mounted to around £25 billion in 2014/15, creating a ratio between supply and demand side housing subsidies of 1:5 (HOUSING EUROPE 2017: 22). In Switzerland, this ratio is even more one-sided: While more than 1 billion Swiss Francs were spent by the public for housing allowances in the year 2013, it is estimated that only about 50 million Swiss Francs were used to subsidize the construction of social housing, which corresponds to a ratio of more than 20:1 (GERBER 2015: 45). The narrowed focus of housing policies towards low-income people (targeting) – linked to more income related subsidies – has led to a residualization of social rented housing almost everywhere in Europe (POGGIO, WHITEHEAD 2017: 3). This is reflected in an increasing concentration of socially and economically disadvantaged households in the remaining social housing stock, which can be observed in numerous countries of the EU including the Netherlands, Denmark, Sweden, UK, Germany and France (PRIEMUS, DIELEMANN 2002: 195, HOUSING EUROPE 2017: 23). On one hand, this can be seen as a necessary development for an effective spending of state subsidies to those most in need. On the other hand, it raises concerns about the ghettoisation of areas with a strong concentration of low-income people and contradicts the paradigm of socially mixed neighbourhoods.

Alongside these developments, a decentralization of the responsibility for the provision of social housing from central state institutions to regional and local housing actors as well as from public to private providers of social housing (e.g. housing cooperatives, non-profit housing companies) could be determined (BRAGA, PALVARINI 2013: 10). This goes hand in hand with the determination of a (re)emergence of collaborative housing types, such as co-housing, cooperative housing and other forms of collective self-organzised housing with a usually high degree of residents involvement (CZISCHKE 2017: 1). Examples like Switzerland and

Denmark, where the provision of affordable housing through private not-for-profit organizations (mainly associations and cooperatives) have a long tradition, indicate the potential of these types of housing.

2.3.2 The social housing sector in Europe – market shares

Fig. 1 shows the current market shares of social housing in Europe. The shares vary greatly from near to zero percent in Greece and Latvia up until to over one fifth in Denmark (21 %), Austria (24 %) and the Netherlands (30 %) (HOUSING EUROPE 2017). Among all the states of the EU-28, the share of social housing lies at around 11 % of the total housing stock, while around 70 % of the population live in owner-occupied properties and around 20 % in properties rented on the private market (EUROSTAT 2015).

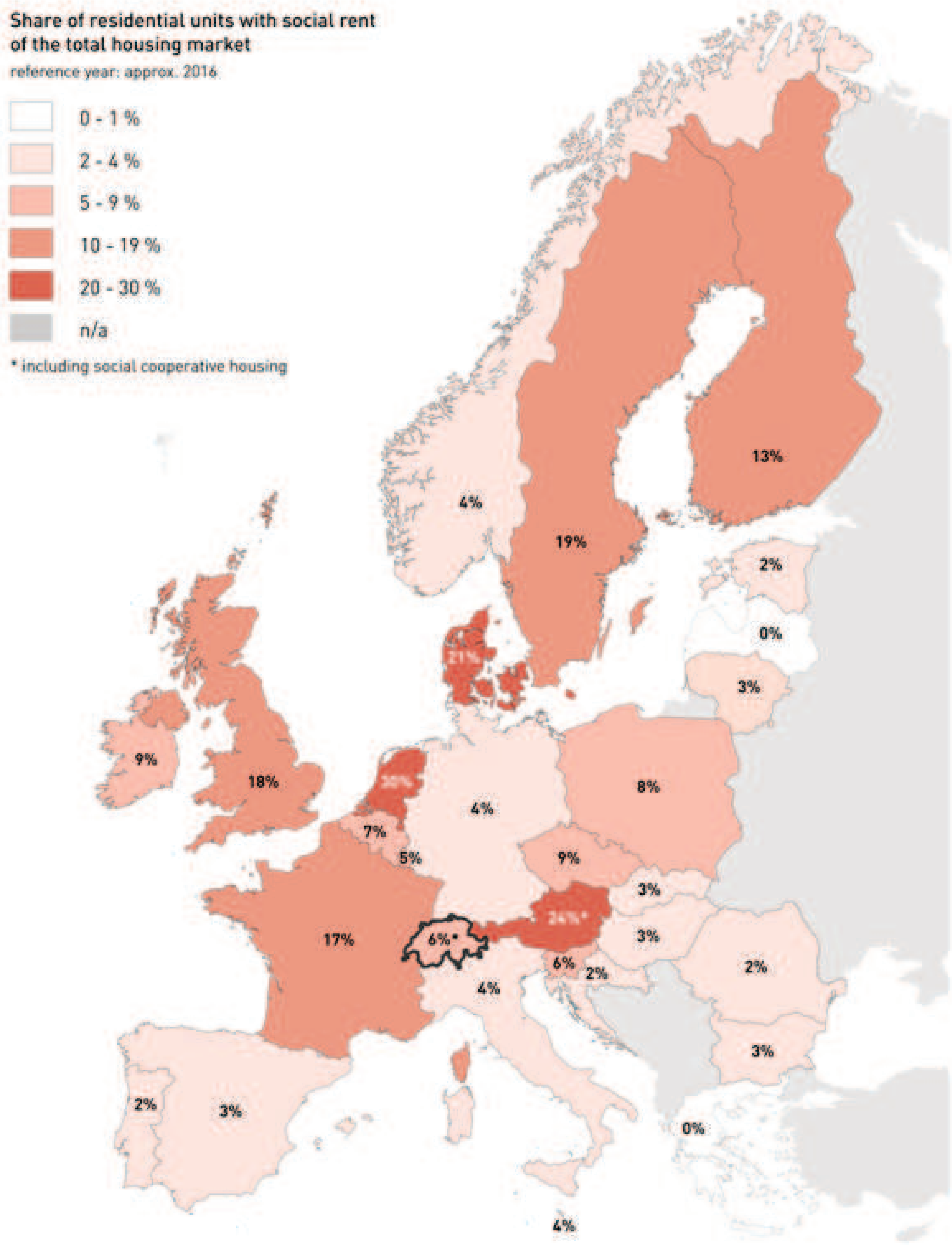

Fig. 1: Market shares of social housing in Europe (approx. 2016). Data source: HOUSING EUROPE (2017), WBG ZÜRICH (2015)

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In Switzerland, the share of social housing is significantly lower with around 6 % (WBG ZÜRICH 2015: 4). It must be stressed here, that a clear distinction of social housing within complex housing markets is sometimes difficult to make. Housing cooperatives, as an example, can be classified as social housing, when they provide housing strictly on a not-for-profit or limited-profit basis. This is the case with most of housing cooperatives in Switzerland and Austria, whereas their defining characteristics are determined in the legislation for housing subsidies in Switzerland (Wohnraumförderungsgesetz und -verordnung) and in the Non-profit Housing Act in Austria (Wohnungsgemeinnützigkeitsgesetz). In Germany, on the other hand, a similar law (Wohnungsgemeinnützigkeitsgesetz) was abolished in 1989, which was followed by the privatisation of large parts of former publicly owned buildings. As a result, the social housing stock in Germany decreased in the last two decades from around 2.6 to around 1.4 million units or a market share of 4 %. However, this covers only the stock still under legal restrictions with regard to rent and access. There are housing cooperatives and professional private housing companies that still account for a total stock of 6 million dwellings (around 14 % of the housing stock) and – apart from what is officially considered as social housing – often apply rents below the market level (HOUSING EUROPE 2017: 69). Nevertheless, because these dwellings are not clearly bound to the application of cost rents, they are not considered social housing in this paper. According to SCANLON ET AL. (2014: 4), the countries can be classified principally as followed: On the one hand, there are the countries with a medium or high share of social housing (> 10 %, mostly around 20 % or more), which in general can be assigned to the relatively wealthy European welfare states (The Netherlands, Austria, Denmark, Sweden, UK, France, Finland). These countries share in common a long-term commitment to significant social housing provision. Those countries with a rather low share (< 10%) have generally placed stronger emphasis on owner occupation (Portugal, Spain, Ireland, Italy, Greece, Malta, Luxemburg and Belgium) or they are former communist countries that privatised large parts of public (social) housing to sitting tenants after the fall of communism (SCANLON ET AL. 2014: 4, HEGEDÜS ET AL. 2014: 240). While most of the post-socialist countries have privatised almost all former public housing (Hungary, Bulgaria, Romania, Slovakia, Slovenia, Croatia, Estonia, Latvia, Lithuania), this development was less accentuated in Poland, Czech Republic and Slovenia, which still maintain social housing sectors with market shares of 6-9 % (HOUSING EUROPE 2017).

Two countries in the group with social market shares below 10 % stand out because of their low home ownership rates: In Germany (45 %) and Switzerland (below 40 %), less than have of the housing stock is owner-occupied. In combination with rather small social housing sectors, their market rent segments are particularly important, making up more than half of the total housing stock, which is the highest share throughout Europe (HOUSING EUROPE 2017: 68-69, BWO 2017a).

2.3.3 The social housing sector in Europe – allocation of apartments

Allocating housing with social rent to the „right“ people is a difficult task and there are different policies for it. CECODHAS (2007: 14-16) differentiates between universalistic and targeted allocation approaches. The universalistic approach is based on the conception of social welfare, that it is a public responsibility to provide the whole population with housing of a decent quality at an affordable price. Social housing providers are either municipal housing companies or private non-profit organisations. Social dwellings are allocated in this approach through waiting lists or without priority criteria and local authorities usually reserve a number of vacancies for those households with urgent housing needs. An important objective in this model is to foster socially mixed and cohesive neighbourhoods, e.g. by avoiding strong concentrations of lower income groups or ethnic minorities (CECODHAS 2007: 15). On the other hand, the targeted approach stems from the conception, that housing needs of the population are predominantly met by the market and only those households, for whom the market does not deliver an adequate housing supply, should benefit from social housing. Whithin the targeted approach, another distinction can be made between general and residual social housing policies (GHEKIÈRE 2007: 5). The former policies target households under certain income limits, while the latter correspond to a much more restricted category of beneficiaries, usually the so-called most vulnerable population groups (e.g. unemployed, disabled or elderly people, lone parents etc.).

Fig. 2 shows the countries of the EU-28 plus Norway and Switzerland classified according to the size and allocation scheme of their social housing sectors. It can be seen, that countries with universalistic conceptions of social housing usually have larger shares of social housing than those with targeted systems. However, there are also exeptions, such as the UK that has a rather large share of social housing (18 %)

which at the same time is clearly targeted at specfically vulnerable households (e.g. priority for homeless people, people who live in cramped conditions, people with medical problems) (UK GOVERNMENT 2018).

In general, countries with medium or low market shares of social housing tend to have more targeted social housing systems: Those with a market share of more than 5 % tending to target middle- and low-income people, while those with a lower market share rather target only the most vulnerable households.

market share of housing with social rents	*allocation criteria of housing with social rent*		
	universalistic	*targeted*	
	all population groups	*middle- and low-income people*	*most vulnerable*
>= 20 %	Denmark The Netherlands	Austria	
11 - 19 %	Sweden	France Finland	France UK
5 - 10 %	**Switzerland**	**Switzerland** Belgium Luxemburg Slovenia Poland Czech Republic	**Switzerland** Belgium Ireland
0 - 4 %		Germany Norway Greece Italy Croatia	Germany Norway Cyprus Portugal Malta Spain Slovakia Bulgaria Hungary Latvia Lithuania Estonia Romania

Fig. 2: Market shares and allocation criteria of social housing in Europe. Source: based on CECODHAS (2007: 16), updated and complemented for Norway (SANDLIE, GULBRANDSEN 2017: 55), Croatia (HOUSING EUROPE 2017: 54) and Switzerland (WBG ZÜRICH 2015: 4, BWO et al. 2013: 1, BWO 2012: 4)

The example of Switzerland is special in the way that its social housing sector has parts of the stock both with universalistic and with targeted allocation schemes. On the one hand it is declared by the Federal administration, that the provision of housing mainly happens through the private market (BWO 2018). This is reflected in the rather low market share of social housing of around 6 %. In the Law for housing subsidies (WFG 2018) it is furthermore stated, that the Federation particularly supports the housing provision for low-income households as well as the access to homeownership with a special regard to the interests of families, lone parents, people with disabilities, elderly people in need and people in education programmes. This corresponds to a targeted approach.

However, it is also stated in the Law, that the Federation supports the activity of non-profit housing providers. In order to be acknoledged as such, those have to operate with cost rents and provide housing at affordable prices agreeing with the so-called Charter of non-profit housing providers (BWO 2017b: 2). In this charter, it is stated, that non-profit housing providers offer housing for all sections of the population and strive for social mix with a special focus on the before-mentioned people in need – indicating a rather universalistic approach. This is reflected by the fact, that only around one fifth of all apartments with social rents are subject to mandatory income and wealth limits, even though most of their providers state, that they allocate their affordable apartments primarily to low income households. At the same time, more than two thirds of the social housing stock are subject to mandatory occupation rules that regulate the minimum number of persons, who have to live in an apartment (BWO 2012: 4). The occupation rules, in combination with the allocation priorities of social housing providers, have led to an overall situation, where people with low education levels as well as little financial resources are overrepresented in housing with social rent (BWO 2017c: 7). These findings support the argumentation of social housing providers, who emphasize that the sector is self-regulating – in the sense that "the right people" profit from affordable social housing, even without having strict income limits or similar rules. However, the question of the right amount of regulation for the allocation of social housing is still subject to a vivid political debate in Switzerland.

Lastly, it has to be noted, that the relatively liberal allocation policies of social housing only apply to the part of non-profit housing, which is indeed operated with cost rents, but not continuously dependent on state subsidies (there might have been subsidies used to build the dwellings, e.g. with reduced land prices, but after that, they are financially self-sustained). Apartments that are operated below cost rents and thus need to be continously subsidized, are subject to clear income and wealth limits, but they only comprise a small part of the social housing stock. In the city of Zurich, around a quarter (around 53'000 apartments) of the total housing stock is social housing, of which only around 13 % (6'700 apartments) is offered below cost rents (this part of the housing supply in Switzerland is usally referred to as subsidized housing or sometimes also social housing, showing the difficulties of this term in the comparison between countries) (STADT ZÜRICH 2018a). Within the clearly targeted social housing stock, there can be found examples that are aimed at middle- and low-income people as well as those which exclusively target certain vulnerable population parts. Examples for the latter are social-rent-projects for the elderly or those specifically for large families with limited income.

3 SWITZERLAND: SOCIAL HOUSING AND INWARD URBAN DEVELOPMENT

3.1 The housing market and the situation of social housing

Overall, the housing situation in Switzerland can be qualified as good and most people have access to housing with a sufficient quality. However, there are significant differences with regard to the location of the dwellings and the socioeconomic status of its demanders. As in most European countries, there is a strong reurbanisation trend observable in Switzerland, which led to a large overhang of housing demand over supply in larger cities and metropolitan areas. The consequences are rapidly rising prices in the residential market both for dwellings to buy and rent, especially in urban areas such as in Zurich, in central Switzerland and in the region of Lake Geneva. In the period between 2000 and 2015, rental prices of apartments[2] offered on the market have risen in the five largest cities between a third in the city of Berne (+ 35 %) and more than double in the city of Geneva (+ 140 %). In Zurich, the largest city of Switzerland, rents have gone up by around two thirds (+ 65 %) (WÜEST PARTNER 2015).

On the other hand, housing production was strong in Switzerland in recent years, leading to a situation, in which overall housing affordability has slightly improved. This is reflected in a slight decrease of the average share of household incomes that have to be used for housing (from around 20 to 19 % between 1998 and 2014). However, this is not the case for low-income people: When looking only at the fifth of population with the lowest incomes, this share has risen in the same timespan from around 27 % to 31 % (BFS 2017). Summarized, a slight ease of the housing market in Switzerland can be detected, but there is still a significant lack of new housing in central areas as well as at low prices. This leads us to the question, how the social housing sector is constituted in Switzerland.

Even though Switzerland has the largest share of rental housing in Europe (> 60 %), its social housing sector is rather small. It consists of around 6 % of total housing stock or 260'000 apartments. The most important providers in this sector are social housing cooperatives with around 160'000 units. It is estimated, that additional 100'000 apartments with social rents are offered by other providers such as municipalities, foundations and non-profit companies (WBG ZÜRICH 2015: 4). Most of the social housing providers are private nonstate entities with heterogenous structures, sizes and strategies. According to the two umbrella organisations of social housing providers, there are around 1'500 social cooperative housing providers in Switzerland (WBG SCHWEIZ, WOHNEN SCHWEIZ 2013: 3). This indicates a large organisational fragmentation of social housing providers in Switzerland. Their common characteristic is, that they operate with cost rents rather than market rents. As mentioned in 2.3.3, only a small part of their dwellings is continously subsidized so it can be let below cost rents.

Around three quarters of the social housing cooperatives are organised as member cooperatives (SCHMID 2004: 30) and as such, they primarily serve the needs of their members. Besides an increased housing security compared with the commercial rental market, this means, that members themselves decide in democratic processes, how the cooperative is further developed (e.g. if the financing of a new building is granted or not). BALMER and GERBER (2017: 1) suggest that while the reasons behind their success are complex, basing policies on private initiative rather than public property and targeting the middle class contributes to their popularity.

With its federalistic state system, Switzerland has different housing policy measures at the federal, cantonal and municipal level. Instruments to foster social housing include financing measures (e.g. low interest loans,

[2] measured with average 4-room apartments.

grants, guarantees, supplying social housing providers with affordable land), spatial planning measures (e.g. minimum shares or usage privileges for affordable housing in zoning regulations) and promotional measures for the social housing sector (e.g. consultation/sensitisation of municipalities and landowners, support for educational programmes and project work) (WBG SCHWEIZ 2017: 1).

Fig. 3 shows the spatial distribution of social housing in Switzerland. Remarkable is the clear concentration on the cities and agglomeration areas in the Swiss Central Plateau. The city of Zurich has – with its around 53’000 dwellings and a market share of around 25 % (STADT ZÜRICH 2018a) – both absolutely and relatively the largest social housing sector in any Swiss municipality. The next biggest social housing stocks are to find in Basel (around 10’000 dwellings), Berne (around 8’000) and Lucerne (around 6’000). Overall, the six largest cities of Switzerland (Zurich, Geneva, Basel, Bern, Lausanne and Winterthur) almost comprise half of the total social housing stock in Switzerland (BWO 2015). With regard to market shares, there are big differences between the cities. Besides Zurich, in Biel (15 %), Lucerne (13 %) and Winterthur (11 %) the social housing shares make up more than 10 % of the housing stock. By contrast, strikingly low market shares are identifiable in the western and southern part of Switzerland. Only about 5 % of the housing stock in Geneva and less than 1 % in Lugano are operated with cost rents (BFS 2014a).

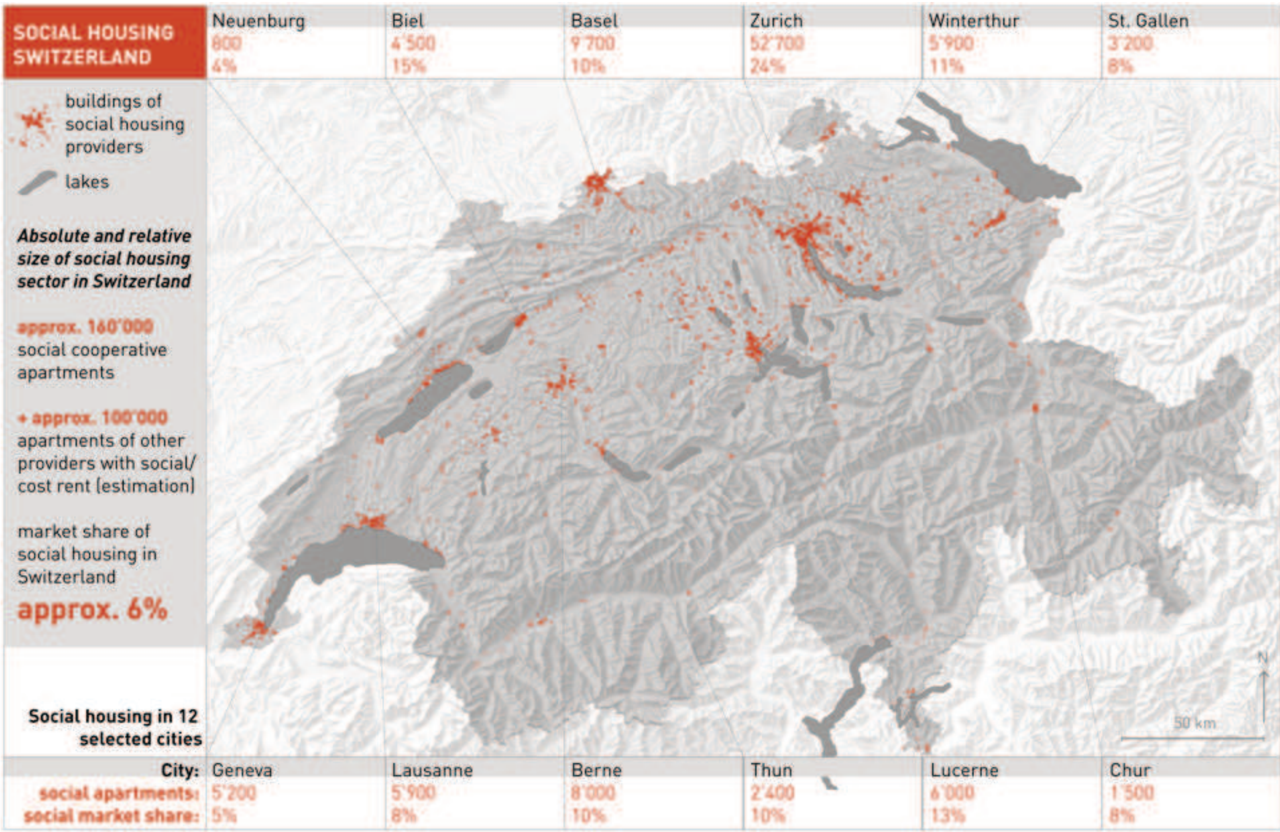

Fig. 3: Absolute and relative size of the social housing sector in Switzerland and selected cities. Data source: BWO (2015), STADT ZÜRICH (2018a) and LIECHTI (2015)

3.2 Relevant Aspects: Rental prices, living space per person, urban quality and ecology

Swiss Planning Law (RPG) aimes at an economic land use by directing the future settlement development “inwards” and creating more compact cities and villages (SCHWEIZERISCHE EIDGENOSSENSCHAFT 2018). With this inward urban development, population growth should be contained, in large parts, in the already built up areas. According to the Spatial Concept of Switzerland, particularly urban and suburban areas should cover the bulk of this growth (SCHWEIZERISCHER BUNDESRAT ET AL. 2012: 45).

For the inward urban development, the social housing sector can play an important role. Firstly, by providing affordable housing in central locations. As shown in fig. 4, rents in social housing are by average around 15 % below the Swiss average (BFS 2014b: 6). In the cities, rent differences are usually even higher – e.g. in the city of Zurich, where rents in the commercial housing sector are between a third and 50 % higher,

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depending on the number of rooms of the dwelling (STATISTIK STADT ZÜRICH 2006).[3] The lower rents enable it for lower-income people to live in Zurich. This not only furthers social mix, it also gives access to the city for people, who generally use less living space than others. Statistics show, that net floor area per person in social housing is with 35 m2 significantly lower than the Swiss average of 45 m2 (BWO 2015). Compact dwellings and minimum occupation rules[4] – which are applied in more than 70 % of all social apartments (BWO 2012: 4) – are important reasons for this.

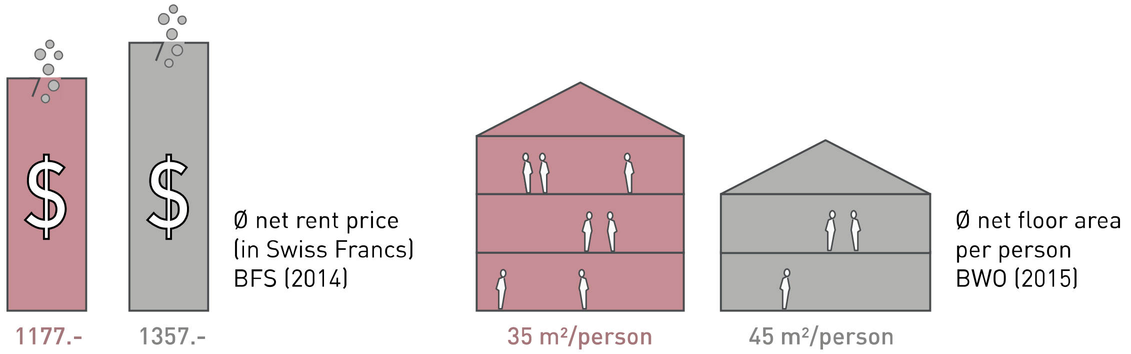

Fig. 4: Net rent price and net floor area used per person in buildings of social housing providers (red) and in all buildings (grey). Data source: BFS (2014b) and BWO (2015)

Interestingly, the area-saving effect of social housing is particularly strong in newly built projects. As shown in fig. 5, the net floor area per person is more or less constant in social apartment buildings over the different building periods. In the total housing stock, on the other hand, it rises from around 44 m2 to 49 m2 in apartment buildings built before 1919 and those built between 2011 and 2014 (BWO 2015). This indicates the importance of the integration of social housing in new construction in terms of an economic land use.

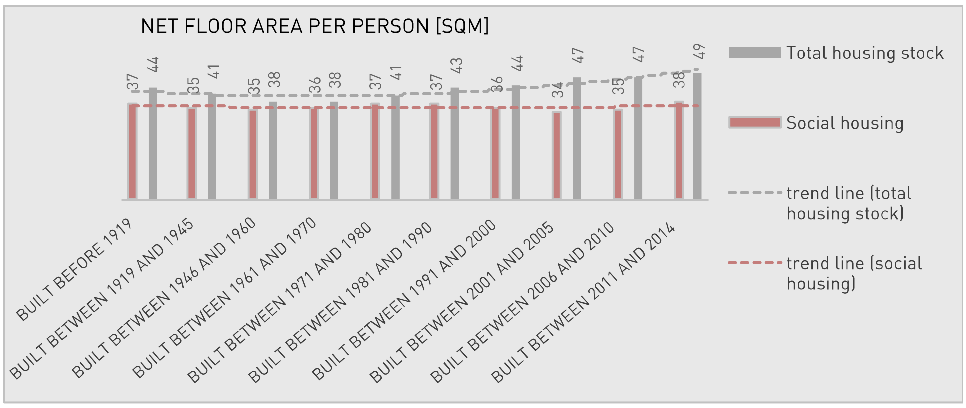

Fig. 5: Net floor area used per person in all apartment buildings and in apartment buildings of social housing providers. Data source: BWO (2015)

The example of Zurich illustrates the role of social housing in new construction. Here, social housing providers were particularly involved in the transformation of their existing building stock. As many social residential areas were built with a relatively low building density and partly in modest quality, many of them were torn down and replaced by new construction. When we compare these residential replacement projects between different providers in the years 2003 until 2016, it becomes evident, that the net floor area per person usually rose significantly with the new construction. However, in the social rental market, this increase was limited from 31 to 35 m2, while it rose in the commercial rental market from 42 to 47 m2 and in the owner-occupied condominium market from 47 to 53 m2 (STATISTIK STADT ZÜRICH 2018).

Furthermore, the relative affordability of new construction in the social housing sector is likely a reason for the usually high approval rates for residential replacement projects in democratic votes of member cooperatives. As shown in ARE ZÜRICH and STATISTISCHES AMT KANTON ZÜRICH (2014: 6), the

[3] The difference of 1-room-apartments was 33 % (819 Swiss Francs in the commercial market vs. 612 Swiss Francs in the social market) and of 5-room-apartments 51 % (2'484 Swiss Francs in the commercial market vs. 1'645 Swiss Francs in the social market).
[4] Usually, the number of persons in a dwelling has to equal the number of rooms minus 1 at least.

acceptance of urban densification is highly price-dependent, meaning that people are rather willing to live in a more densified environment, if this is not linked to an increase of their housing expenses.

The recent construction projects of social housing providers in the city of Zurich are generally of high quality, which is another important aim of the inward urban development. Many of the projects have exemplary character with regard to their variety of housing offers, solutions for densified living in an urban context and in noisy environments, architectural quality and sustainability (ESS 2009: 152). Social cooperative housing providers acted as innovators for new building and usage typologies (e.g. the combination of residential apartments, commercial and service rooms with a parking hall for trams in the project Kalkbreite) and floor plan types (e.g. large shared flats with so-called cluster apartments in the project Heizenholz, Kraftwerk 1).[5]

With regard to sustainability, social housing providers have acted as pioneers in energy-efficient construction by applying standards of low energy consumption such as Minergie significantly more often than commercial housing providers (STADTENTWICKLUNG, STATISTIK STADT ZÜRICH 2009: 34).

The reasons for the strong construction activity with high quality of social housing providers in Zurich in recent years are manifold. Within the large range of support measures for social housing by city authorities, especially the instrument of supplying social housing providers with land at a discount – whereby the land is not sold, but only leased for a long-term period (usually 60 up to a maximum of 100 years) – has to be pointed out. This instrument enables social housing providers to achieve affordable rents, because of significantly reduced land prices (which are determined by the city as a 10 to 20 % share of the overall building costs – independently of the market value of the land), but it is also linked to various conditions: Besides the rule, that no profit can be generated, there are requirements concerning the minimum occupancy and energy standards of buildings. Moreover, parts of the floor area have to be provided for subsidized housing, social services managed by the city authorities as well as for public use (e.g. a kindergarden). Not least, an architectural competition has to be carried out in close cooperation with the city (STADT ZÜRICH, 2018b, SCHMID 2016: 5-6, BWO 2017d: 21-22). According to ESS (2009: 151), this has prepared the ground for many innovative and forward-thinking projects.

Housing experts from the city authorities of Zurich[6] furthermore point out, that the success of social housing projects in the city can be traced to a combination of, inter alia, supportive housing policies (e.g. an active land policy), good prerequisites in terms of planning law and zoning (especially large existing reserves for densification), active and innovative social housing providers as well as a very close cooperation between those providers and the city authorities. It was stressed, that the trusting atmosphere between both sides in numerous planning processes (e.g. architectural competitions or test planning processes) was a key factor for the success of many newer projects.

Overall, the example of Zurich shows the potential of the social housing sector for inward urban development and the experiences gained there can help other municipalities in Switzerland, where the transformation and further development of the social housing stock is still in an early phase. Nevertheless, many open questions are remaining also in Zurich, namely how the market share can be further increased as it is politically required because of a public vote[7], how the housing offer for people with lowest incomes can be improved and how the interests of urban densification and the conservation of important urban heritage can be balanced. For these purposes, a further development of planning instruments and processes is needed.

4 DISCUSSION

In the former chapters, it was shown, how the social housing sector in Europe can be characterized and what trends there are observable. It has to be seen as critical, that housing affordability is generally getting worse in Europe, while market shares of social housing are shrinking in most countries. Furthermore, a stronger targeting of social dwellings to the households in need by tightening the eligibility criteria for their allocation and by increasing housing allowances at the expense of subsidies for social housing construction may increase transparency of the usage of public subsidies, but it also raises concerns about the segregation and

[5] See also BOUDET (2017) for exemplary projects of social housing cooperatives in Zurich.
[6] This finding is based on an interview with Sandra Nigsch from the Urban Planning Department and Alex Martinovits from the City Development Department of Zurich on 28th of June 2016.
[7] The share of social housing in the rental market should rise to a third until 2050 (STADT ZÜRICH 2018c).

residualization of the existing housing stock, which is already happening in many European countries. Moreover, housing allowances alone don't seem to be able to effectively soothe housing shortages in tense housing markets. The question of a right balance with the support of social housing construction will remain highly relevant. It has to be stated that besides the social housing providers, there are also other housing actors who are important for the provision of affordable housing. These can include private owners or also institutional investors who are able and willing to build or preserve housing at an affordable price and it would be interesting to examine, how they could be further included in affordable housing strategies.

With the example of Switzerland, it was highlighted, that the social housing sector offers advantages that go beyond the provision of affordable housing. Specifically, the benefits for inward urban development are highlighted, as social housing providers have proven to use space more economically than other housing actors. With the example of the city of Zurich it was furthermore pointed out, that the resulting social housing projects are oftentimes of a high quality. As the market share of social housing in Switzerland (around 6 %) is already relatively low and still decreasing, while the strategy of inward urban development as well as housing affordability are still of big political interest, the connections of social housing provision with spatial planning should be further emphasized.

The accomplishments of social housing providers for a more sustainable land use could also be used to justify increased public efforts to support bricks and mortar subsidies for social housing provides. An increase in housing allowances instead of subsidies for housing construction on the other hand does not help the aspect of inward urban development. Arguably, it is also the broad target group of large parts of social housing stock in Switzerland that helps fostering their building activity and quality, as many housing providers are highly dependent on the capabilities and efforts of their members for their further development. In order to find suitable persons with enough resources (time, expertise) to invest in this task, a too narrow focus on the most vulnerable could be problematic.

At the same time, it is especially the lowest income people in Switzerland, who are most affected by housing shortages and overburdening housing expenses. With regard to these aspects, the right balance of social mix and inclusion of those most in need should be further examined and tested. The combination of a certain percentage of continously subsidized apartments with strict allocation rules (e.g. income limits) with apartments that are distributed according to the own rules of the respective social housing provider – as it is already implemented in some projects in Switzerland – shows a possible approach in this regard.

5 CONCLUSION

The situation of social housing is very heterogenous across different European countries. Different starting points and problems in the housing supply ask for tailor-made approaches and no overall solution can be presented. Nevertheless, the decreasing share of social housing in most countries and a simultaneously growing housing shortage – especially in larger cities, where job opportunities are best – are alarming trends. New instruments and processes have to be found to increase the supply of affordable housing in central locations and social housing providers are important partners to help with this task.

So far, the increased focus on housing allowances instead of subsidies for social housing construction and a more targeted distribution of dwellings with social rent towards those most in need have not proven to solve the housing issue in tense markets. It seems like an increased state support for building more social housing could help the situation by increasing housing supply and at the same time helping to prevent social housing stocks to become more segregated and residualized, as it is the trend at the moment.

Switzerland is an example, where the commercially oriented rental market is particularly important for the housing provision. Concurrently, the stock of social housing helps mitigating shortages of affordable housing especially in the larger cities. Besides the price-damping effect, an increasing importance of social housing providers for inward urban development could be observed in recent years particularly in the city of Zurich.

High quality projects that helped densifying the urban fabric were made possible by a tight cooperation between the city and the social housing providers – mostly housing cooperatives. A consistent political support of social housing with different measures from financial aid to the provision of land at reduced prices fostered an increased production of affordable dwellings and a strengthened inward urban development at the same time. The support from the city authorities was bound to numerous conditions which helped the quality and social inclusiveness of the projects. Support and demand could be the summary of this strategy.

6 REFERENCES

AMT FÜR RAUMENTWICKLUNG KANTON ZÜRICH (ARE ZÜRICH), STATISTISCHES AMT KANTON ZÜRICH (2014): Akzeptanz der Dichte. Zürich, 2014.

BALMER, Ivo, GERBER, Jean-David (2017): Why are housing cooperatives successful? Insights from Swiss affordable housing policy. In: Housing studies, pp. 1-25. 2017.

BOUDET, Dominique (2017): Wohngenossenschaften in Zürich. Gartenstädte und neue Nachbarschaften. Zürich, 2017

BRAGA, Michela, PALVARINI, Pietro (2013): Social Housing in the EU. Directorate General for internal policies, policy department A: Economic and scientific policy, Brussels, 2013.

BUNDESAMT FÜR MIGRATION UND FLÜCHTLINGE (BAMF) (2016): Migrationsbericht 2015. https://www.bamf.de/SharedDocs/Anlagen/DE/Publikationen/Migrationsberichte/migrationsbericht-2015.html, date of access: 6.1.2018.

BUNDESAMT FÜR STATISTIK (BFS) (2014a): Gebäude und Wohnungsstatistik 2014, ergänzt mit Attribut zum gemeinnützigen Wohnungsbau. Neuchâtel, 2014.

BUNDESAMT FÜR STATISTIK (BFS) (2014b): Mietpreisstatistik aus Strukturerhebung 2014. https://www.bfs.admin.ch/bfs/de/home/statistiken/bau-wohnungswesen/wohnungen/mietpreis.html, date of access: 3.8.2017.

BUNDESAMT FÜR STATISTIK (BFS) (2017): MONET – Wohnkosten, https://www.bfs.admin.ch/bfs/de/home/statistiken/nachhaltige-entwicklung/monet/indikatoren/wohnkosten.html, date of access: 3.1.2018.

BUNDESAMT FÜR WOHNUNGSWESEN (BWO) (2012): Vermietungskriterien der gemeinnützigen Wohnbauträger in der Schweiz. Eine Studie zur Anwendung von Belegungsvorgaben und Einkommenslimiten bei 1000 gemeinnützigen Wohnbauträgern. Zusammenfassung. Grenchen, 2012.

BUNDESAMT FÜR WOHNUNGSWESEN (BWO), WOHNBAUGENOSSENSCHAFTEN SCHWEIZ (WBG SCHWEIZ), WOHNEN SCHWEIZ (2013): Charta der gemeinnützigen Wohnbauträger in der Schweiz. https://www.wbg-schweiz.ch/dienstleistungen/fachpublikationen/171/charta, date of access: 15.1.2017.

BUNDESAMT FÜR WOHNUNGSWESEN (BWO) (2015): Zahlen zum gemeinnützigen Wohnungsbau 2015, https://www.bwo.admin.ch/bwo/de/home/wohnraumfoerderung/zahlen-und-fakten/zahlen-zum-gemeinnuetzigen-wohnungsbau/zahlen-zum-gemeinnuetzigen-wohnungsbau-2015.html, date of access: 10.11.2017.

BUNDESAMT FÜR WOHNUNGSWESEN (BWO) (2017a): Wohneigentumsquote, https://www.bfs.admin.ch/bfs/de/home/statistiken/kataloge-datenbanken/karten.assetdetail.2240305.html, date of access: 16.1.2018.

BUNDESAMT FÜR WOHNUNGSWESEN (BWO) (2017b): Wohnraumförderungsgesetz WFG. Merkblatt 2: Bundeshilfe an die Dachorganisationen des gemeinnützigen Wohnungsbaus und ihre Einrichtungen. https://www.bwo.admin.ch/bwo/de/home/wohnraumfoerderung/wfg/indirekte-foerderung-des-gemeinnuetzigen-wohnungsbaus.html, date of access: 16.1.2018.

BUNDESAMT FÜR WOHNUNGSWESEN (BWO) (2017c): Gemeinnütziges Wohnen im Fokus. Ein Vergleich zu Miete und Eigentum. https://www.bwo.admin.ch/bwo/de/home/Wohnungsmarkt/studien-und-publikationen/gemeinnuetziges-wohnen.html, date of access: 5.1.2018.

BUNDESAMT FÜR WOHNUNGSWESEN (BWO) (2017d): Baurecht unter der Lupe. Schlussbericht. https://www.bwo.admin.ch/bwo/de/home/Wohnungsmarkt/studien-und-publikationen/baurecht.html, date of access: 5.1.2018.

BUNDESAMT FÜR WOHNUNGSWESEN (BWO) (2018): Marktwirtschaftliche Wohnraumversorgung. https://www.bwo.admin.ch/bwo/de/home/Wohnungsmarkt/marktwirtschaftliche-wohnungsversorgung.html, date of access: 16.1.2018.

CECODHAS (2007): Review of social, co-operative and public housing in the 27 EU member states. CECODHAS, European Social Housing Obervatory. Brussels, 2007.

CZISCHKE, Darinka (2017): Collaborative housing and housing providers: towards an analytical framework of multi-stakeholder collaboration in housing co-production. International Journal of Housing Policy, pp. 1-27, 2017.

ESS, Peter (2009): Neuorientierung der städtischen Wohnbaupolitik. In: Statistik Stadt Zürich (2009): 4 x 25. Günstig wohnen in Zürich. pp. 150-152. Zürich, 2009.

EUROSTAT (2015): Wohnstatistiken. http://ec.europa.eu/eurostat/statistics-explained/index.php/Housing_statistics/de#Wohnbesitzverh.C3.A4ltnisse, date of access: 8.1.2018.

EUROSTAT (2017a): Household consumption by purpose. http://ec.europa.eu/eurostat/statistics-explained/index.php/Household_consumption_by_purpose, date of access: 8.1.2018.

EUROSTAT (2017b): Housing cost overburden rate by income quintile - EU-SILC survey. http://ec.europa.eu/eurostat/en/web/products-datasets/-/TESSI162, date of access: 8.1.2018.

GERBER, Lea (2015): Staat profitiert von gemeinnützigem Wohnungsbau. In: Eidgenössisches Departement für Wirtschaft, Bildung und Forschung WBF, Staatssekretariat für Wirtschaft SECO (ed.): Die Volkswirtschaft, Issue 12/2015. Berne, 2015.

GHÈKIERE, Laurent (2007): Le développement du logement social dans l'Union Européenne. Quand l'intérêt général rencontre l'intérêt communautaire. L'essentiel de l'ouvrage. https://www.union-habitat.eu/IMG/pdf/logement-social-europe-resume.pdf, date of access: 15.1.2018.

HEGEDÜS, Jozsef, LUX, Martin, SUNEGA, Petr, TELLER, Nóra (2014): Social Housing in Post-Socialist Countries. In: Scanlon, Kathleen, Whitehead, Christine and Fernández Arrigoitia, Melissa (ed.): Social Housing in Europe, pp. 238-253. Chichester, 2014.

HOUSING EUROPE (2017): The state of housing in the EU 2017. Housing Europe, the European Federation of Public, Cooperative and Social Housing. Brussels, 2017.

LIECHTI, Richard (2015): Bürgerinnen und Bürger fordern mehr günstige Wohnungen. Eine wohnbaupolitische Tour de Suisse. In: WBG Schweiz (2015): Thema Städtebau, Wohnen, Issue 7/8 2015, pp. 19-25. Zürich, 2015.

NATIONAL HOUSING FEDERATION (2017): Public expenditure on housing: the shift from capital spend to housing allowances. A European trend? Research briefing. London, 2017.

POGGIO, Teresio, WHITEHEAD, Christine (2017): Social housing in Europe: legacies, new trends and the crisis. In: Critical Housing Analysis, Volume 4, Issue 1, pp. 1-10. Prague, 2017.

PRIEMUS, Hugo, DIELEMANN, Frans (2002): Social Housing Policy in the European Union: Past, Present and Perspectives. In: Urban Studies, Volume 39, Issue 2, pp.191-200. London, 2002.

SANDLIE, Hans Christian, GULBRANDSEN, Lars (2017): The Social Home Ownership Model – the Case of Norway. In: Critical Housing Analysis, Volume 4, Issue 1, pp. 52-60. Prague, 2017.

SCANLON, Kathleen, WHITEHEAD, Christine, FERNÁNDEZ ARRIGOITIA, Melissa (2014): Introduction, in: Scanlon, Kathleen, Whitehead, Christine and Fernández Arrigoitia, Melissa (ed.): Social Housing in Europe, pp. 1-20. Chichester, 2014.

SCHMID, Peter (2004): Die Wohnbaugenossenschaften der Schweiz. Masterarbeit an der Universtität Freiburg, Freiburg, 2004.

SCHMID, Peter (2016): Tagungsbericht ETH Forum Wohnungsbau (14.4.2016). https://www.wohnforum.arch.ethz.ch/de/eth-forum-wohnungsbau/eth-forum-wohnungsbau-2016, date of access: 12.12.2017.

SCHWEIZERISCHE EIDGENOSSENSCHAFT (2018): Bundesgesetz über die Raumplanung. https://www.admin.ch/opc/de/classified-compilation/19790171/index.html, date of access: 5.1.2018.

SCHWEIZERISCHER BUNDESRAT, KDK, BPUK, SSV, SGV (2012): Raumkonzept Schweiz. Überarbeitete Fassung. https://www.are.admin.ch/dam/are/de/dokumente/raumplanung/publikationen/raumkonzept_schweiz.pdf.download.pdf/raumkonzept_schweiz.pdf, Zugriff: 10.1.2018.

STADTENTWICKLUNG, STATISTIK STADT ZÜRICH (2009): Neubausiedlungen verjüngen die Stadt. Erhebung über die Auswirkungen von Neubausiedlungen in der Stadt Zürich, Zürich, 2009.

STADT ZÜRICH (2018a): Wohnbauförderung. https://www.stadt-zuerich.ch/fd/de/index/wohnbaupolitik/wohnbaufoerderung.html, date of access: 10.1.2018.

STADT ZÜRICH (2018b): Gemeinnützige Baurechte. https://www.stadt-zuerich.ch/fd/de/index/liegenschaftenverwaltung/immobiliengeschaefte/gemeinnuetzige-baurechte.html, date of access: 3.1.2018.

STADT ZÜRICH (2018c): Programm Wohnen. https://www.stadt-zuerich.ch/portal/de/index/politik_u_recht/stadtrat/weitere-politikfelder/wohnpolitik.html, date of access: 6.1.2018.

STATISTIK STADT ZÜRICH (2006): Mietpreise Stadt Zürich. Ergebnisse der Mietpreis-Strukturerhebung 2006. https://www.stadt-zuerich.ch/prd/de/index/statistik/publikationen-angebote/publikationen/Analysen/A_001_2008.html, date of access: 21.4.2017.

STATISTIK STADT ZÜRICH (2018): Zahlen zu der Innenentwicklung in der Stadt Zürich nach Eigentumsform. Spezifische Auswertung von Statistik Stadt Zürich für das Forschungsprojekt "Gemeinnütziger Wohnungsbau als Chance zur Innentwicklung" der ETH Zürich.

THE FREE DICTIONARY (2018): Cost rent. https://www.thefreedictionary.com/cost+rent, date of access: 3.1.2018.

UK GOVERNMENT (2018): Council Housing and Housing Association. https://www.gov.uk/browse/housing-local-services/council-housing-association, date of access: 5.1.2018.

VESTERGAARD, Hedvig, SCANLON, Kathleen: Social Housing in Denmark, in: Scanlon, Kathleen, Whitehead, Christine and Fernández Arrigoitia, Melissa (ed.): Social Housing in Europe, pp. 76-89. Chichester, 2014.

WOHNBAUGENOSSENSCHAFTEN SCHWEIZ (WBG SCHWEIZ), WOHNEN SCHWEIZ (2013): Der dritte Weg im Wohnungsbau. https://www.wbg-schweiz.ch/information, date of access: 8.1.2018.

WOHNBAUGENOSSENSCHAFTEN SCHWEIZ (WBG SCHWEIZ) (2017): Instrumente zur Förderung des gemeinnützigen Wohnungsbaus. https://www.wbg-schweiz.ch/data/wbg-infopool-forderinstrumente-7-2017_5536.pdf, date of access: 8.1.2018.

WOHNBAUGENOSSENSCHAFTEN SCHWEIZ, REGIONALVERBAND ZÜRICH (WBG ZÜRICH) (2015): Partner für nachhaltiges Wohnen. Gemeinden und Wohnbaugenossenschaften. https://www.wbg-schweiz.ch/data/Gemeinden_und_Wohnbaugenossenschaften_Neuausgabe_2015__9764.pdf, date of access: 1.1.2018.

WOHNRAUMFÖRDERUNGSGESETZ (WFG) (2018): https://www.admin.ch/opc/de/classified-compilation/20010522/index.html, date of access: 2.1.2018.

WÜEST PARTNER (2015): Monatsmiete in Franken für eine mittlere 4-Zimmer-Wohnung. https://blog.tagesanzeiger.ch/datenblog/index.php/9964/wo-mietpreis-berge-sich-erheben, date of access: 3.1.2018.

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On the Development of a Sustainable and Fit for the Future Transportation Network

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1 ABSTRACT

Population growth in cities and expanding city territory as well as population decline in rural areas pose a challenge for the existing transport network. As a consequence, we observe a rapid change in transport infrastructure and transportation technology within the last few years. The development of individually moving drones, for example, reached a new climax with novel applications such as the trial parcel distribution in rural areas in Great Britain and Germany or medicine distribution in Rwanda, Africa. At the same time, there are advancements with respect to land-borne transportation technology, among them the Hyperloop concept presented by SpaceX and Tesla founder Elon Musk with the first test of a prototype propulsion system in May 2016 and the first test on tracks in May 2017, both carried out by Hyperloop One.

Due to the novelty or differentness, it will initially be challenging to integrate them into the existing network and to identify suitable corridors leading to especially beneficial effects on the overall transport network. While TEN-T and the national guidelines already present plans for further development in the transport sector, these strategy papers only provide for existing technologies and therefore have a limited extend. The effects of new technologies and (high-performance) infrastructures are furthermore hardly examined at the moment, although the first test tracks are already being under discussion or even build (for the example of Hyperloop). At present, it remains unclear how these novel transportation technologies will change society, our understanding of spatial proximity, mobility and consequently the logistics sector.

In this work, we give an overview regarding first considerations and reflections on the impacts of the changes and developments in the field of freight transportation. The results presented in this work are based on the outcomes of the research project “inned” (innovative network design) funded by the Austrian federal ministry for transport, innovation and technology (bmvit). Established as an exploration study, the project mainly focusses on the estimation of the impacts of high-performance transportation technologies on the society, spatial proximity and the logistics sector in the course of extending the European transportation network accordingly. In our understanding, we refer to high-performance transportation technologies as mobility systems with either high throughput (fast and/or high utilization loads) or very flexible application. Concrete, we focus in our work on Hyperloop technologies, Cargo-Sous-Terrain, freight airships and drones. Although the mobility system is considered in its entirety, the main focus is on freight transportation.

We investigate the technological boundaries with respect to network design set by the above mentioned high-performance transportation technologies as a first step. Then, a societal assessment is carried out taking spatial, social, economic and environmental aspects into account. Constraints imposed by technology and society are considered when planning an exemplary future European transportation network based on actual (freight) transportation demand. Conclusions are drawn on additional research and development activities that have to be performed in order to reach a sustainable, reliable and fit for the future European

transportation network. Further, we report on expected effects of high-performance transportation technologies on geographical proximity and therefore the change in meaning of the term “region”. Finally we show preliminary results on the integration of high-performance transportation technologies into existing transportation networks for some exemplary corridors.

Keywords: network design, high-performance transport infrastructure, intermodality, spatial proximity, future transport networks

2 PROBLEM STATEMENT

Strongly contrasting developments regarding the population trends in cities and rural areas, meaning population growth in already dense areas and population decline in sparcely populated regions, require new approaches for passenger and freight transport. In addition to requirements on rapidity, efficiency, flexibility and safe transport, environmental aspects gain in importance. The transport sector is still accountable for a massive proportion of the greenhouse gas emission, in Austria it accounts for 28 percent in 2015 (umweltbundesamt 2017).

Ambitious targets for climate protection and energy, such as the Paris Agreement (United Nations 2015) on the international level and the 20-20-20 targets (European Commission 2010) on the European level, strongly influence the developments in the transport sector. Within the last few years, these policy papers set the ball rolling with energy efficient products or services, focus on behavioral aspects of usage as well as new or improved transportation infrastructure and transportation technology. Trial parcel distribution in rural areas in Great Britain (The Telegraph 2016) and Germany (Reuters 2014) as well as medicine distribution in Rwanda, Africa (CNN 2016) are just some examples of the developments in the field of individually moving drones. A recent development in the land-borne transportation technology is the Hyperloop concept. This concept presented by SpaceX and Tesla founder Elon Musk is currently carried out by the companies Hyperloop One and Hyperloop Transportation Technology. In May 2016, the first test of a prototype propulsion system (theguardian 2016) and one year later, the first test on tracks was performed (Forbes 2017), both by Hyperloop One.

The mentioned examples of technological developments underline that these new infrastructures in transport logistics are increasingly important. At the same time, it is obvious that the introduction of these technologies and infrastructures into the existing transport network is going to be a challenge due to the novelty and differentness. Another important aspect is the identification of corridors which benefit the overall transport network. Currently available strategy papers such as the TEN-T (European Commission 2011) and the national guidelines (bmvit 2012) are limited to existing technologies. Uncertainties associated with developments in the transport domain make forecasts especially challenging since the effects of new technologies and (high-perfomance) infrastructures on society, the concept of mobility and thus the logistics sector are practically unknown even though test tracks for some of the transport options (e.g. Hyperloop) are even already build.

Changes in emission and/or more specific CO2 emissions require a strategic implementation of measures, which can take place, inter alia, in the provision of sustainable infrastructures. On this account, a preliminary analysis of existing alternative technologies and infrastructures is necessary in order to assess how sustainable the use of high-performance infrastructures actually is. For example, Hyperloop is regarded as environmental friendly, although the knowledge on this technology is still very limited in this respect, and hardly any information on its effects on spatial, social or economic structures is available by now. It is for this reason that our research on intelligent network design (“inned”) explores the innovative and novel possibilities for environmental friendly transports in order to reduce CO2 emissions and negative environmental impacts that come along with growing global population and increasing urbanization.

The investigation of the potential of high-performance infrastructures is particularly important with regard to the aspect of mass performance. Although the mass performance is a major added value for rail and waterways, it is also being mitigated by problems in the area of compatibility (including air transport) and time factors (e.g. in the case of waterways). High-performance infrastructures can be even better suited for that purpose.

Efficiency is an important aspect in our society and is commonly associated with costs that have to be constantly optimized in order to remain competitive on the market. Substantial efficient technologies (high-performance infrastructures) are currently reaching market maturity and are expected to be systematically implemented in the existing transport network over future years. To be able to estimate the effects of such an implementation (positive as well as negative) and therefore to make decisions in favor of certain means of transport, a closer look at the network is necessary. The network design determines the efficiency of the transport, which is why it is necessary to look more closely at the circumstances in which technologies can be integrated. Particularly in Europe, where a well-developed transport network meets comparatively small distances and a high population density (compared to the USA), it is not only the effects on the flow of goods and people, but also on spatial, social and economic structures.

The results presented in this work are based on the outcomes of the research project "inned" (innovative network design) funded by the Austrian federal ministry for transport, innovation and technology (bmvit). Established as an exploration study, the project mainly focusses on the estimation of the impacts of high-performance transportation technologies on the society and the logistics sector in the course of extending the European transportation network accordingly. In our understanding, we refer to high-performance transportation technologies as mobility systems with either high throughput (fast and/or high utilization loads) or very flexible application. Concrete, we focus in our work on Hyperloop technologies, high-speed trains, freight airships and drones. Although the mobility system is considered in its entirety, the main focus is on freight transportation.

The work plan foresees the investigation of technological boundaries with respect to network design set by the above mentioned high-performance transportation technologies as a first step. Then, a societal assessment is carried out taking spatial, social, economic and environmental aspects into account. Both, technology and society are expected to impose constraints that have to be considered planning an exemplary future European transportation network based on actual (freight) transportation demand. Finally, conclusions are drawn on additional research and development activities that have to be performed in order to reach a sustainable, reliable and fit for the future European transportation network. The structure of this paper corresponds to this work plan in consideration of the current status of the project.

3 HIGH-PERFORMANCE TRANSPORT INFRASTRUCTURE

When talking about high-performance infrastructure, the first step is to define high-performance. We decided to define high-performance as either high quantities, high speeds and/or high flexibility. Both, high quantities and high speed finally result in high throughput. High flexibility results, however, in rather low cost results. We mainly focus, however, on novel transport technologies, i.e. technologies, which have not (or at least only limited) been applied in real-world settings.

3.1 Hyperloop

Elon Musk initially introduced the Hyperloop technology as an idea to shift passenger transport towards a new and sustainable technology. The main idea is hereby to develop a large-scale pneumatic post, i.e., a tube of dimensions such that a capsule with transport capacity for approx. 20 persons. The capsule reaches speeds of up to 1200km/h, which is possible due to reduced air pressure in the tube. The usage of the capsules, also called pods, is for either passenger or freight transport. There are also concepts for pods to be used for freight and passengers at the same time (Taylor 2016). Construction costs are estimated between EUR 9.5mio up to EUR 28.5mio per kilometer with an extra of EUR 27mio per kilometer in tunnels (HTT 2017 and SpaceX 2017).

Obvious advantages of Hyperloop technologies are the high speeds, which enable the (sustainable) connection of areas located further apart (e.g. the often mentioned example of Los Angeles and San Francisco). Due to the short travel times together with the ease of train travelling (compared to air travelling), one has to rethink the term of local proximity. We assume that the introduction of such a high speed connection results in noticeable changes in societal behaviors. E.g., daily commuting between cities located up to 1000km apart becomes not only possible but also physically relevant.

Disadvantages, on the other side, are the necessary construction of tubes, which means that, in addition to often already existing, rail tracks and highways a second transport infrastructure needs to be constructed. Investments are, however, rather high.

3.2 Freight Airships

The concepts of airships is rather old and well known to a broad mass of people due to dramatic historic incidents. Caused by these incidents, the concepts were not pursued over a long period. In the last years, however, the idea became more and more popular again resulting in the fact that currently novel airship concepts are developed and are already tested. The novel concept aims, however, at freight transport only. The main idea is to lift cargo into air with the clear advantage that it is not necessary to construct additional transport infrastructure except at the two ends of a connection. In addition, it would be possible to construct interim terminals for airships or, in extreme situations, to just guarantee that a large enough empty (and smooth) area is available. The construction companies plan different model types with a payload of up to 500t and up to 220km/h max speed (Aeros 2017). However, only smaller variants successfully performed test flights during the last few years.

Beside the advantage that airships are rather flexible with respect to origin and destination of transports, they also build a valuable addition with respect to special transports. Drawbacks are, surely, that the area needed for landing/take-off and cargo handling is rather large compared to the size of cargo transported. In addition, the price for one individual airship is approx. EUR 40mio (Airlander 2017).

3.3 Drones

The absolute opposite to airships are drones. They are rather small, fast and agile. The basic concepts are, however, quite similar. They allow for a flexible and easy to plan transport even in areas where no (or rather limited transportation infrastructure is available. Good examples are the parcel distribution trials in Great Britain (The Telegraph 2016) and Germany (Reuters 2014) or medicine distributions in Rwanda, Africa (CNN 2016).

While drones themselves are rather cheap and there is a wide range of possible application, drones suffer from the fact that they are relatively sensitive to windy weathers. Furthermore, depending on the actual manufacturer, the payload of drones is limited to at most 100kg with many of them being in the range of up to 20kg. Furthermore, the range of drones is limited – especially for the electric ones. At the same time, current laws forbid autonomous flights in some countries (incl. Austria). Even more, based on reports in local media one can expect that societal acceptance of (a high number of) drones in the air will be rather low.

3.4 Cargo-Sous-Terrain

Strictly speaking not a mode of transport, Cargo-Sous-Terrain is a further innovative freight transport concept. Cargo-Sous-Terrain as proposed by the research project and company with the same name combines different ideas and concepts for city logistics (Cargo-Sous-Terrain 2017). First, the main idea is to shift land transport from roads to underground. Second, Cargo-Sous-Terrain relies on a city hub concept, i.e. a logistics concept where a small depot is installed in the city center while at the outer rim of the city a large consolidation hub is established. City hub and consolidation hub are linked via an underground connection. The last mile (from the city hub) is realized by employing sustainable modes of transport like bikes or small e-vans.

Advantages are obvious like bundling of cargo as well as a shift of freight cargo to the underground. Disadvantages are the extra handling of cargo at the consolidation and city hub. Further, it is necessary that one (neutral) operator is in charge of all city distributions. In addition, construction costs are rather high, as additional infrastructure is needed.

4 IMPACTS OF HIGH-PERFOMANCE TRANSPORT TECHNOLOGIES

To assess the impact of (novel) transport technologies on the societal and economical parameters in regions, an impact assessment was performed. We assumed that an easy accessible high-speed connection between two cities, which is reducing the travel time below one hour, leads to increased commuting between these cities. However, this implies that these two cities close ranks with each other, i.e., in terms of labour and housing market. Thus, the meaning of a "region" is changing since the spatial limitations set by distance and connected travel time are softened.

To analyze the concrete impact, we chose the following approach: First, we decided on the transport technologies to be assessed (described in the previous section). Then, we estimated effects of these technologies on the elements of the transport system. Together with experts, we assessed these effects.

Finally, we performed a multidimensional impact analysis. Details on this procedure are given in Schodl et al. (2017). The result of this impact assessment is a benefit analysis for "typical" network links. These values are then a major input for the network-planning presented in the following section.

5 DESIGN OF FUTURE TRANSPORT NETWORKS

The main idea was to design a transportation network that is fit for future transport requests. This includes, but is not limited to, freight transport. Quite the contrary, it is essential that the transport network fulfills all requirements stated by passenger and freight.

Based on the results obtained via the impact assessment presented in the previous section, it is possible to apply basic service network optimization algorithms (Crainic 2000) with additional constraints, which are motivated by the technological constraints stated by the transport technologies (e.g. capacity and/or meaningful range). Obviously, the main objective is to maximize the benefit of the transport network. This includes that for some regions conventional, already existing transport modes will still be heavily used while the algorithms suggest to implement novel transport technologies for other connections.

To be more precise, we model the existing transport network on a multi-layered graph where nodes represent stations in major cities and the edges represent the connections between them. Each layer is assigned to one transport mode, e.g. road or rail as classical representatives, and Hyperloop or freight airships as high-performance representatives. Edges between stations of one city illustrate the work for transferring/handling goods from a station to another. We denote this graph as infrastructure network. Furthermore, we model the freight transportation on an abstract graph, the so-called service network, where each city is connected with a direct edge. Each edge shows the flow of goods between two cities without specifying the actual route and the transport mode(s). In our approach we have to synchronize the freight transport between these two networks: On the service network we search for future transport requests that should be fulfilled (e.g. because of high importance or high profit) and on the infrastructure network we optimize the actual realization with respect to specific key performance indicators (KPIs). The following KPIs are considered:

- Minimization of infrastructure costs (for the new connections)
- Minimization of transport costs for the transported goods
- Maximization of effectiveness for each transport mode where it is implemented. The effectiveness is a weighted cumulative rating consisting of speed, throughput, flexibility, reliability, noise and emission of the transport technology.
- Maximization of regional bonus effects. This is also a cumulative rating, applied only to the high-performance transportation technologies where social, spatial, economical, ecological, political and technological impacts are considered.

Based on this model, we implemented a mixed integer program that is able to solve small to medium sized scenarios. Fig. 1 shows a small scenario where we tested our approach. The infrastructure network contains six cities and six transport modes. Black connections represent the existing infrastructure network (road, rail and water). Orange, purple and red connections represent possible connections for cargo airship, Hyperloop and Cargo Sous Terrain (CST), respectively. In this scenario, while airship and CST are less restrictive with respect to the geographical conditions, Hyperloop cannot be built between Graz and Budapest due to mountain slopes. The green line is an example for a transport request between Budapest and Linz, realized as road transport between Linz and Vienna and Hyperloop between Vienna and Budapest. In Fig. 2 the same transport request is represented by a direct connection between Linz and Budapest in the service network.

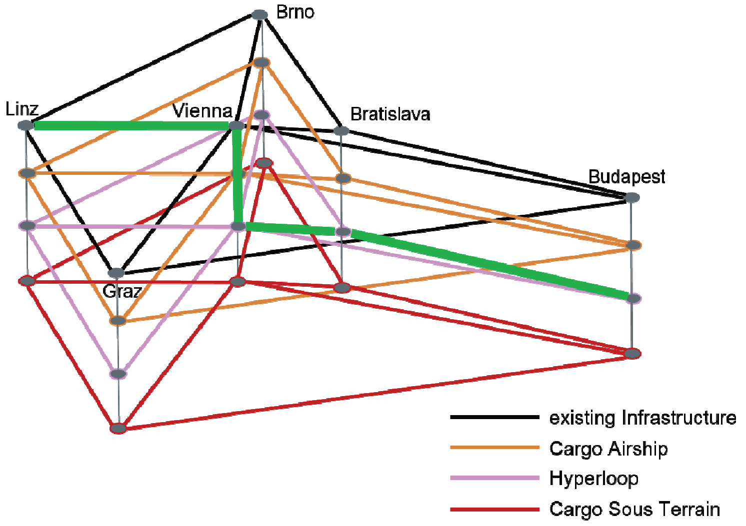

Fig. 1: Example for an infrastructure network.

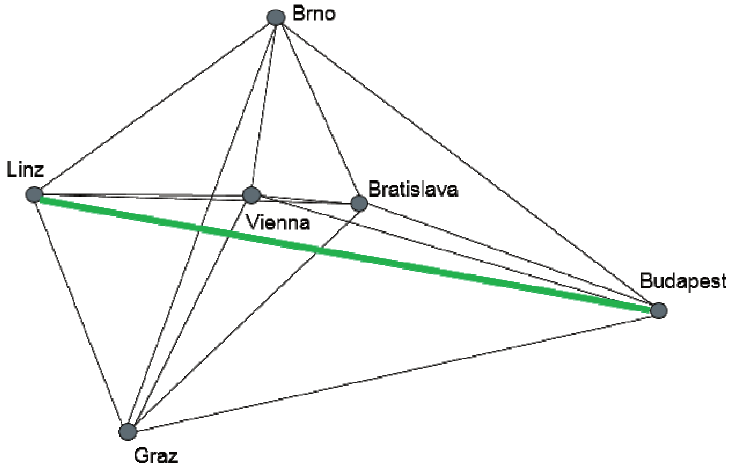

Fig. 2: Example for a service network.

In the experimental computation we considered the amount of food transported between the six cities based on Eurostat (2014). The effectiveness ratings were taken from Pfoser et al. (2017) and the regional effects ratings from Schodl et al. (2017). Costs for the high-performance transportation technologies were taken from preliminary information (Airlander 2017, HTT 2017, SpaceX 2017, Cargo-Sous-Terrain 2017) and summarized in Table 1. The costs for freight transportation via Hyperloop were reduced since the infrastructure is designed to be used for passenger and freight. We further set a capacity limit on the existing infrastructure since otherwise the high-performance transportation technologies will not be used due to high investment costs.

	Station costs	Track costs	Transport costs
Hyperloop	€ 200mio	€ 40mio per km	€ 0.05 per ton per km
Freight airships	€ 100mio	€ 1mio per km	€ 0.45 per ton per km
Cargo Sous Terrain	€ 150mio	€ 45mio per km	€ 0.10 per ton per km

Table 1: Costs for high-performance transportation technologies.

In Fig. 3 and Fig. 4 we present two example results of our model. Fig. 3 shows that the cargo airship infrastructure is nearly fully built since it has the cheapest infrastructure costs. It is mainly used for freight transport whenever the capacity of the existing infrastructure is exhausted. Graz is only connected via the existing infrastructure because the transport demand is relatively low compared to the other cities. CST is used on a relative short route between Vienna and Bratislava (~70km) where the construction cost is still bearable in relation to the efficiency of the technology. Hyperloop is not built at all due to its high costs.

In Fig. 4 we modified the scenario settings by neglecting the infrastructure costs. The biggest impact is that the cargo airship is not used anymore. Compared to the other technologies, it is less effective in the cumulative rating. While the CST operates on the triangle between Vienna, Brno and Bratislava, the Hyperloop network now reaches every city except Graz. We can see the main connection goes from Linz to Budapest and a branch from Bratislava to Brno. The reason why Bratislava is selected as branching point instead of Vienna is the much higher transport demand between Brno and Bratislava.

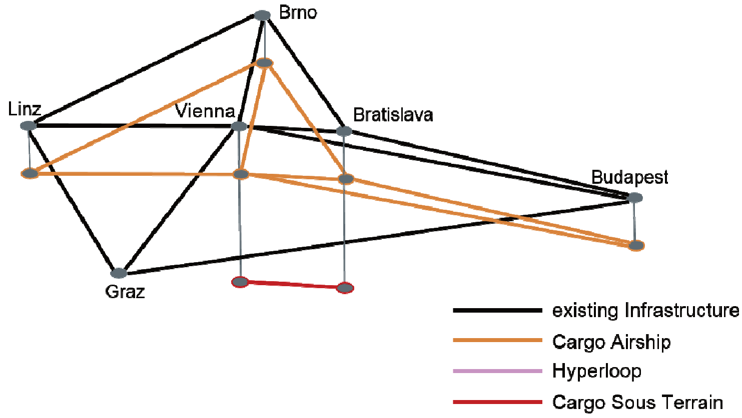

Fig. 3: Example result for the scenario in Fig. 1.

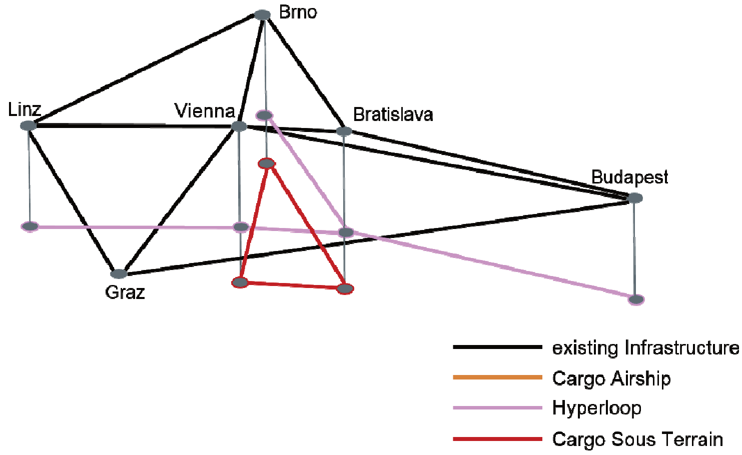

Fig. 4: Result for the scenario in Fig. 2 if infrastructure costs are neglected.

We want to highlight that the basic idea of the overall approach is to (re-)plan the transport network as a whole. I.e., we are not focusing only on a small region or one country but address the problem as a European one. Therefore, it is essential that the methods developed and employed during the assessment step allow a deduction from showcases towards a more general level. Nevertheless, we emphasize that the results obtained via this approach only represent a supporting tool which has to be thoroughly evaluated by the planners in a subsequent step.

6 CONCLUSIONS

We are facing, on the one hand, an increasing demand and high expectations for passenger and freight transportation as a result of population growth and urbanization. On the other hand, goals as the Paris Agreement force us to rethink our current transport system. This opens the door for the introduction of novel transport technologies, which have the potential to be more sustainable with respect to social, economic but also ecological aspects. We, therefore, dare to propose a novel holistic network planning approach, which aims at optimizing the whole (European) transport network in order to gain the most positive effects. As the planning (and building) of a transport network is a rather costly and time-consuming task, we emphasize the importance of such supra-regional planning approaches. Even if these cannot come up with an optimal final decision, they can support the planners in their decision-making.

7 ACKNOWLEDGEMENTS

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8 REFERENCES

AEROS: Fleet. Montebello, 2017. URL: http://aeroscraft.com/fleet-copy/4580475518, access 18/12/2017.

AIRLANDER: Airlander 50 Brochure. Gratefully provided by Andy Barton, Business Development Director (commercial markets). 2017.

BMVIT: Gesamtverkehrsplan für Österreich. Vienna. Vienna, 2012. URL: https://www.bmvit.gv.at/verkehr/gesamtverkehr/gvp/downloads/gvp_gesamt.pdf.

CARGO-SOUS-TERRAIN: Menschen oberirdisch – Güter unterirdisch. Basel, 2017. URL: http://www.cargosousterrain.ch/de/grundprinzip.html, access 18/12/2017.

CNN: Rwanda's hospitals will use drones to deliver medical supplies. Article from 14/10/2016. URL: http://money.cnn.com/2016/10/13/technology/rwanda-drone-hospital/index.html, access 18/12/2017.

CRAINIC, T. G.: Service network design in freight transportation. In: European Journal of Operational Research 122(2), pp: 272-288, 2000.

EUROPEAN COMMISSION: Communication from the commission. Europe 2020. A strategy for smart, sustainable and inclusive growth. Brussels, 2010. URL: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2010:2020:FIN:EN:PDF.

EUROPEAN COMMISSION: Trans-European Transport Network. Progress on priority axes, November 2011. Brussels, 2011. URL: https://ec.europa.eu/inea/sites/inea/files/download/maps/overview/progress_report_2011_ongoing_projects.pdf.

EUROSTAT: Statistical office of the European Union, 2014. URL: http://ec.europa.eu/eurostat, access 22/12/2017.

FORBES: Hyperloop One Claims First Successful Test, Pulls Two 'G's In Nevada Desert. Article from 12/07/2017. URL: https://www.forbes.com/sites/ericmack/2017/07/12/hyperloop-one-claims-first-successful-test-elon-musk/#7795b64615f8, access 18/12/2017.

HYPERLOOP TRANSPORTATION TECHNOLOGIES (HTT): Official Crowstorm Documentation. Culver City, 2014. URL: https://lintvkrqe.files.wordpress.com/2014/12/crowdstorm.pdf.

PFOSER, S., Putz, L.-M., Schauer, O., Hauger, G., Wanjek, M., Berkowitsch, C., Schodl, R., Eitler, S., Markvica, K., Prandtstetter, M.: Hyperloops: New transport mode enabled by the Physical Internet? 4th Physical Internet Conference, Graz, 2017.

REUTERS: Drone delivery: DHL 'parcelcopter' flies to German isle. Article from 24/09/2014. URL: http://www.reuters.com/article/us-deutsche-post-drones-idUSKCN0HJ1ED20140924, access 18/12/2017.

SCHODL, R., Eitler, S., Ennser, B., Breinbauer, A., Hu, B., Markvica, K., Prandtstetter, M., Zajicek, J., Berger, T., Pfoser, S., Putz, L.-M., Berkowitsch, C., Hauger, G.: Impact Analysis of Innovative Means of Cargo Transport. Unpublished manuscript to poster at HKSTS Conference Proceedings. Hong Kong, 2017.

SPACEX: Hyperloop Alpha. Hawthorne, 2017. URL: http://www.spacex.com/sites/spacex/files/hyperloop_alpha.pdf.

TAYLOR, C., Hyde, D., Barr, L.: Hyperloop Commercial Feasibility Analysis: High Level Overview. Cleveland, 2016. URL: https://ntl.bts.gov/lib/59000/59300/59393/Hyperloop_Commercial_Feasibility_Report.pdf, access 18/12/2017.

THEGUARDIAN: Hyperloop One tests supersonic transport propulsion system – video. Article from 12/05/2016. URL: https://www.theguardian.com/technology/video/2016/may/12/hyperloop-one-tests-supersonic-transport-propulsion-system-video, access 18/12/2017.

THE TELEGRAPH: Amazon to step up UK tests of delivery drones. Article from 26/07/2016. URL: http://www.telegraph.co.uk/technology/2016/07/26/amazon-to-step-up-uk-tests-of-delivery-drones/, access 18/12/2017.

UMWELTBUNDESAMT: Treibhausgase. URL: http://www.umweltbundesamt.at/umwelt/luft/treibhausgase/, access 18/12/2017.

UNITED NATIONS: Paris Agreement. Paris, 2015. URL: http://unfccc.int/files/essential_background/convention/application/pdf/english_paris_agreement.pdf.

🏆 *reviewed paper*

Proactive Spatial Planning in Regard to a new Regional Mobility Hub – the case of Ebreichsdorf

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1 ABSTRACT

The City of Ebreichsdorf is a fast growing municipality in the metropolitan region of Vienna, Lower Austria and Burgenland. Especially the southern suburbs of Vienna such as the region surrounding Ebreichsdorf are gaining from the growth of the Austrian Capital City Vienna. The expansion of the railroad track of „Pottendorfer Linie" to a double track railroad and the thereby even better connexion from Ebreichsdorf to Vienna will strengthen its growth process even more. A new regional mobility hub is planned to be built, located on a greenfield site, between the city districts Ebreichsdorf and Unterwaltersdorf. The existing railway track is going to be abandoned.

In spatial planning terms, its leading goal is to locate future growth in the area of the new train station. Unfortunately, Austrian planning practice tends to adopt reactive behaviour in the context of infrastructure and settlement development. Thus, simultaneous planning of high-level-infrastructure and surrounding station area is mostly missed. Especially small and medium-sized cities are often overwhelmed by this task. The results of this uncoordinated approach vary from non-development of suitable land to uncoordinated urban sprawl around the stations. Furthermore, only reactive actions can be taken to contain negative consequences and to enable an orderly, soil-saving settlement development.

Therefore, in February 2016 the Smart City Ebreichsdorf project (SMCE) started as an exploratory study funded by the Klima- und Energiefonds (KLIEN 'climate and energy fund') with a duration of one year. The research focus was on creating a proactive planning community together with citizens by acting on four thematic topics: planning and process; railway station; district; and energy and resources, to. As a result, four scenarios have been developed for Ebreichsdorf including necessary dimensions of action. Criteria for an innovative implementation were defined and necessary actors for the continuing project were involved at an early stage of the development process. The Smart City concept obtains incresasing importance in the course of urban and regional development. Thereby, new technologies are used to create a sustainable environment and economy in order to ensure quality of life for further generations. Particular measures are: minimizing soil sealing, adopting technologies for future mobility, preventing urban sprawl, de-densification, as well as creating cities of short distances. The participation and awareness of the citizens are of fundamental importance. Using the example of the test bed Ebreichsdorf, the main aim of the SMCE project is to demonstrate proactive city development with an overall systemic, interdisciplinary approach to an area, and involving the population and the relevant stakeholders of the political, administrative and private sectors.

This paper examines how this proactive planning-process of Smart City Ebreichsdorf is working. It shows the development process in the exploratory project and its results and explains the integrated dimensions of action. Building on this, it presents the current project and new planning approaches, e.g. to avoid soil sealing. With a focus on Ebreichsdorf, this paper demonstrates how such a proactive planning process can be used for a smart urban and regional development.

Keywords: mobility, smart city, Ebreichsdorf, urban sprawl, urban development

2 SPATIAL CHALLENGE

The project Smart City Ebreichsdorf (SMCE) is a research project concentrating on energy efficient and sustainable development of the municipality Ebreichsdorf with due regard to surrounding municipalities. Ebreichsdorf is a fast growing city in the area of the metropolitan region of Vienna, Lower Austria and Burgenland. The southern suburbs of Vienna such as the region surrounding Ebreichsdorf are gaining from the growth of the Austrian Capital City. Furthermore the Austrian Federal Railways (ÖBB) is currently expanding the southern route "Pottendorfer Linie" from the new Vienna central station "Wien Hauptbahnhof" across the newly build freight centre "Güterzentrum Wien Süd (Inzersdorf)", up to a new 27,3 km long tunnel "Semmering Basistunel" between Lower Austria and Styria (see Fig. 1). Especially the new freight centre in Inzersdorf as well as the growing suburban region in the south of Vienna and the faster connection to Styria making the expansion of the southern route into a four-track railroad between Wiener Neustadt and Vienna necessary (ÖBB Infra, n.d.).

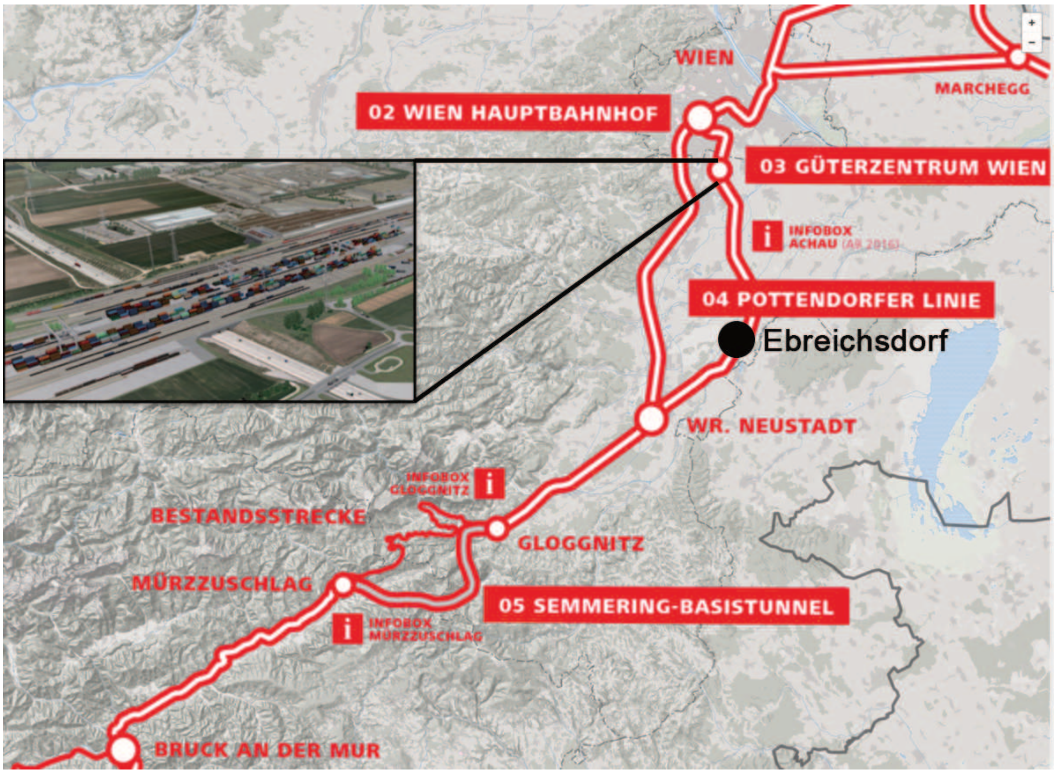

Fig. 1: The new southern route "Südstrecke" of the ÖBB (Source: (ÖBB Infra, 2016 b); own presentation)

A new impulse for the region will be the expansion of the “Pottendorfer Linie” to a double track railroad. This will reduce the traveling time from Ebreichsdorf to Vienna to less than 20 minutes and strengthen the growth process of the city and the region even more than now. As part of the expansion a new railway station is going to be built on “green field” land between the two city districts Ebreichsdorf and Unterwaltersdorf within a distance of about 500 meters to each urban centre (ÖBB Infra, 2016 a). The train station is expected to play an important role in the region of Ebreichsdorf. It was planned as a regional mobility hub with a Park+Ride parking lot for maximum 600 vehicles and a regional bus station with four parking spaces. It is also the last stop for express trains outside Vienna. However, there are no concepts of adequate transport links and the use of the station environment. Also, the existing railway is going to be abandoned (see Fig. 2), while the new railroad, as well as the new train station, should provide a full service by 2023.

This current development of Ebreichsdorf results in new challenges like the development of the existing and new train station as well as expected growth processes. Unfortunately, in Austrian planning practice, a reactive behaviour is usually observed in the context of infrastructure development and settlement. Simultaneous planning of high-level-infrastructure and the surrounding area of the station may well be missed. The state Lower Austria and the City Ebreichsdorf are well aware of the future challenges. Thus the idea of planning and implementing a „Smart City“ or a „Smart Urban Region“ at this specific area has moved in the focus of considerations. According to contemporary spatial planning approaches, it is goal leading to locate zones of future growth in the area of new railway stations. Possible options of action to form such an innovative growth process around the railway station have been developed in a first project.

As well as formulating the growth process the future use of the existing railway track should also be discussed at an early stage. The preliminary project answered the question, how this new railroad track and station can be used as an impulse for smart urban and regional development. The main aim was to initiate a process of awareness building and reflection, as well as to enhance a proactive planning approach. Hence, the focus in the first step was not on concrete solutions, but on the examination of potential actions and planning processes. The continuation of the project, on the other hand, aims to provide concrete plans for the future development of Ebreichsdorf through a proactive planning process.

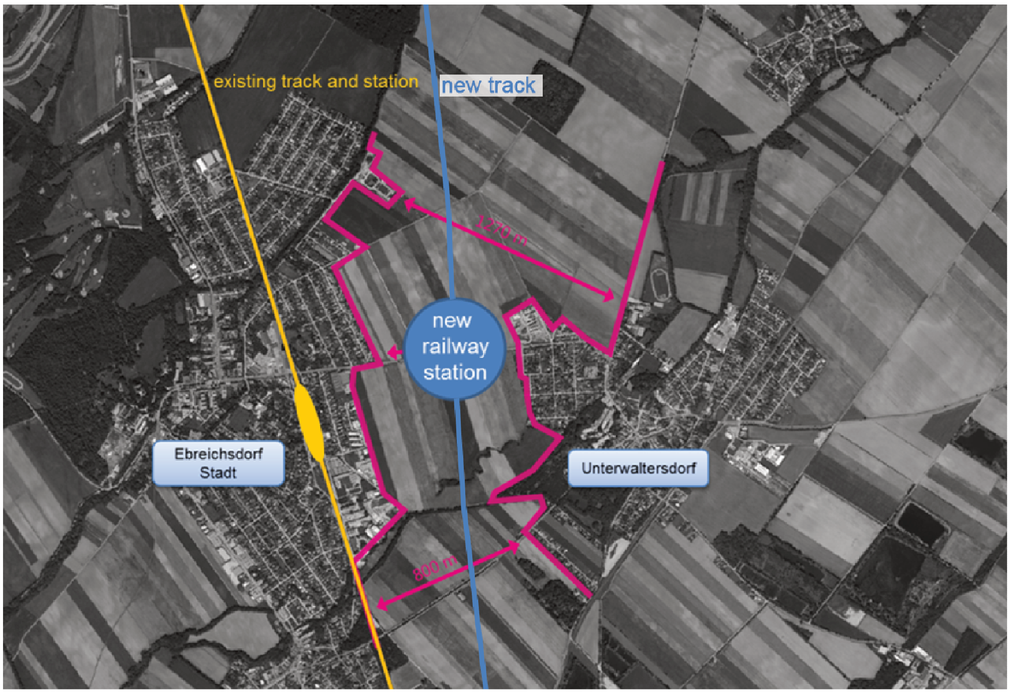

Fig.2: Location of the new railway station Ebreichsdorf (Source: map data (google maps, 2016), own presentation)

3 SETTLEMENT STRUCTURE AND THEIR EFFECTS ON MOBILITY BEHAVIOR

The spatial coordination between traffic stations and settlement structure makes it possible to reach a larger number of destinations and sources via short distances from train stations and stops. This shortens door-to-door travel times, improves accessibility and increases the demand potential, especially when a large proportion of passengers reach the stations by foot or by bicycle. Nevertheless, so far this aspect had only a minor significance in the discussions of plans for upgrading railway lines (Bahn.Ville, 2004; Rump, 2004; ILS/MASSKS, 1999). The consideration of catchment areas, which can deviate strongly from the frequently used spheres of influence depending on the settlement structure and the road network (Jermann, 2004), plays an important role in this.

The development of settlements in the catchment area represents an opportunity to increase the demand potential by increasing the sources and targets located in the surrounding area. This opens up the following possibilities:

- Reclassification of building land: in the immediate vicinity of numerous train stations and stations, there are still plots of land and areas which, despite their general suitability, are not designated as building land.
- If a traffic station is located within an existing housing estate, the demand potential can be expanded by using internal potential areas (Professur für Raumentwicklung, 2012):
  - undeveloped reserves: undeveloped land intended as building land (eg construction gaps),
  - floor space reserves, which result from the difference between the actually constructed areas and the planning permissible areas,
  - unused or under-used areas (eg brownfields).Railway use depends on a number of influencing factors.

Wulfhorst (2003) has classified these factors in terms of their relevance and modeled their interactions. In addition to the quality of the railway offer (travel time, clock, etc.) the location of stations which expresses the accessibility of residents was attributed a significant role. Settlement structural factors, such as settlement density, functional mixing, are also, directly and indirectly, effective in traffic behaviour (Matthes and Gertz, 2014). In addition, soft factors such as a successful urban integration of the station are also important. This has a positive effect on the quality of stay, subjective safety and cleanliness which, in turn, indirectly increases the use of railways by the population (Wulfhorst, 2003).

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4 THE "SMART CITY" CONCEPT IN THEORY

The term "Smart City" has come to be well known by a wide section of the population and often used by municipalities as well as in politics, although there is no shared definition about the concept of a "Smart City". Even in recent years, there have been different projects concerning this term (Dameri, 2013) (Hollands, 2008). This urban labeling has often been associated with new technical-based solutions to counteract the challenges of growing cities and urbanisation along with several technical, economic or social problems.

An aim of Smart City is to create a sustainable environment and economy in order to ensure the quality of life for the further generations. The city performance should primarily be improved by using Information and Communication Technologies (ICT) (Neirotti, et al., 2014). However, the term "Smart" is not only used as a positive description for urban-technological innovations and adjustments like ICTs but also as a synonym for cities with a special focus for e-governance, participation, communities and social learning in order to gain more public and social value (Hollands, 2008). In contrary to that, citizens are often ignored in the definition of Smart City, although they can be seen as a fundamental aspect of the concept (Dameri, 2013). As Caragliu et al. (2011) have shown social and human capital such as social skills are essential ingredients for smart city performances. Thus, considering only "hard" infrastructure as well as the exclusive focus on ICTs and technological improvements are not expedient. This means, that "smart" depicts a combination of technological and socioeconomic development (Nam & Pardo, 2011 b).

Due to the many possibilities to define Smart City, there are also different ways to describe the specific characteristics. Giffinger & Heindlmayer (2010) identify six smart capacities such as environment, mobility, people, governance, economy, and living, which rely on independence and awareness of citizens. To specify each characteristic several factors are mentioned. For example, a smart environment is defined as sustainable resource management and environmental protection in order to ease pollution. Linked to this topic smart mobility is defined by sustainable, innovative and safe transport systems as well as the local accessibility to transportation systems amongst others. Together these characteristics can make a major contribution to save energy and to use green energy. In order to implement a forward-looking development of the built environment smart living, as housing quality or social infrastructure, and smart economy in terms of competitiveness are primarily mentioned. Lastly, flexibility, creativity, open-mindedness, and participation in public life are examples of smart people. Possibilities of participation, transparent governance, as well as social and public services, can be mentioned as aspects of smart governance. Comparing these two characteristics, smart people and smart governance, highlights, that there is quite an overlap between them.

Due to a lack of only one valid definition of Smart City, also other characteristics like smart transportation, smart education or smart energy can be mentioned (Nam & Pardo, 2011 a), but they all have similar intentions by using ICTs and awareness of citizens to preserve or even improve the quality of life, as well as to protect the environment through resource-saving technologies.

5 DELIVERABLES OF THE PRELIMINARY EXPLORATORY PROJECT SMCE[1]

When planning the regional mobility hub, it was assumed that the existing settlement borders would remain and that the land surrounding the station would not be available for settlement development. The consequences, opportunities, and requirements that such a high-level infrastructure project brings with it for the community and region were not considered in advance (see section 3). It was not until the previous exploratory SMCE-project that new options for action in an iterative work process and with the active participation of the population and stakeholders were developed on the basis of four different scenarios. Furthermore, the exploratory project has already familiarised a broader public in the city region with the idea of "smart city", thereby starting a necessary social innovation process.

The main questions in the project were about the "conceivable" and "possibility". In the one-year SMCE project, possible development scenarios for the municipality of Ebreichsdorf were compiled considering all relevant, present and future development trends and discussed on a broad level in politics and with the public. The term Smart City in the project "Smart City Ebreichsdorf" stands for a future-oriented, sustainable and proactive planning practice, with strong involvement of the citizens. Awareness-raising measures and

[1] cp.: TU Wien, Stadtgemeinde Ebreichsdorf, Energiepark Bruck/Leitha, eNu, 2017. Publizierbarer Endbericht Smart City Ebreichsdorf (SMCE). Wien: TU Wien

specially designed participation formats were carried out in which all interested residents were able to contribute their suggestions, visions, but also fears and concerns about the development process. For example, 4 project newspapers were distributed to all households in Ebreichsdorf; there were information stands at community festivals and workshops in the town hall with the inhabitants. All results are incorporated into the research project. In addition, there were workshops with experts and stakeholders from politics, administration, and science on topics such as soil management and process control in order to clarify the possible implementation challenges as early as possible.

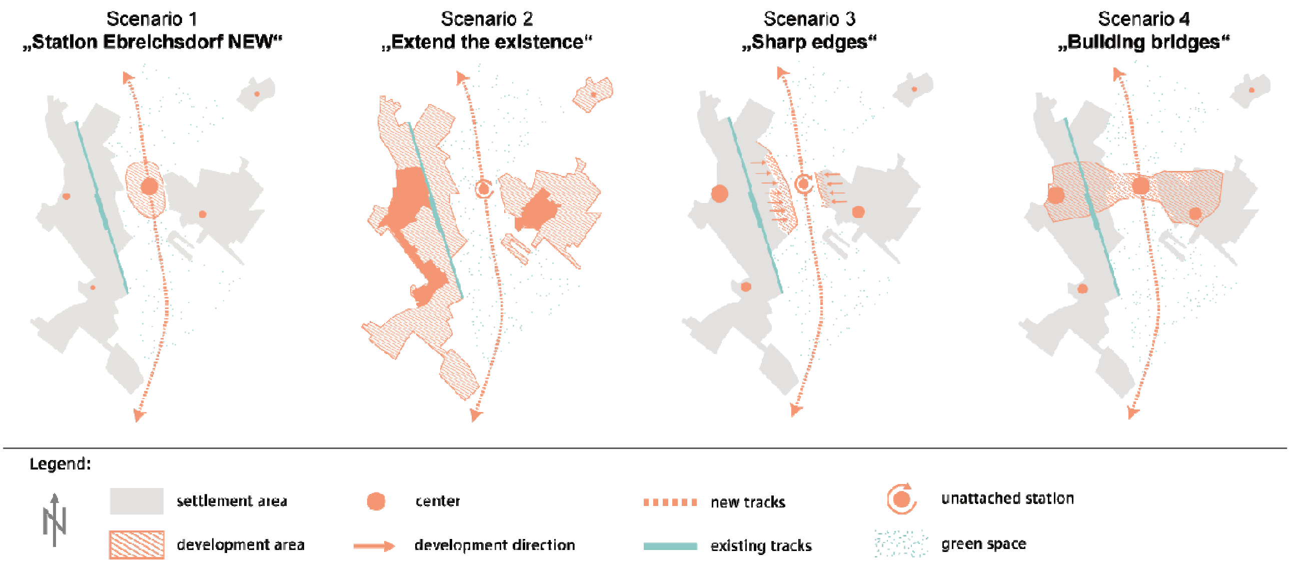

Fig. 3: Four scenarios for Ebreichsdorf (Source: (TU Wien, Stadtgemeinde Ebreichsdorf, Energiepark Bruck/Leitha, eNu, 2017), own presentation)

Using the scenario technique the future development of Ebreichsdorf and the area surrounding the new regional mobility hub was simulated. Four different scenarios were developed that bring different advantages and disadvantages for the city (see Fig. 3). At a workshop with all researchers, the four scenarios were discussed and challenges such as energy-efficient settlement development and the potential impact of the new station to the existing town centres were highlighted. Moreover, the scenarios were the basis for the “future-workshop” with the citizens. In addition, they served as a decision-making basis for the policy on the question of how the community should evolve.

- The first scenario “Station Ebreichsdorf NEW” concentrates the future development of the city around the new station. New settlements for living and work are to be built just around the station. Thereby, old town centres will be partly replaced by the new centre in their meaning and function.
- In contrast to this, in the second scenario “Extend the existence” there will be no development around the station and the impulse of the new station will be concentrated in the existing centres. Post-compaction and the reduction of vacancies will be the focus. The area around the station will function as a local recreation area which prevents the merging of Ebreichsdorf and Unterwaltersdorf.
- Similar to this, also the third scenario “Sharp edges” prevents new settlements around the station, but concentrates the expansion of Ebreichsdorf in the direction of the new station. Clear settlement boundaries and a recreation area around between Ebreichsdorf and Unterwaltersdorf are the consequences.
- The fourth and last scenario “Building bridges” concentrates development around the station, but also links the city districts. Thus, a new centre is being built without weakening the existing centres. The barrier effect of the railroad track will be minimized.

The results of the project have shown that the area between Ebreichsdorf and Unterwaltersdorf is significantly upgraded by the new station and has the potential of a centre that connects both spatially and socially-emotionally. The direct connection to the public transport promotes short distances and the change to train and bus. From a spatial planning point of view, it is therefore expedient to provide settlement and open space developments in the vicinity of the new station that exploits the potential and thus achieves site-appropriate use. This district is given high priority for the future development of the municipality of Ebreichsdorf. Hence, the municipal council decided on scenario 4 in a fundamental decision and is going to develop the area around the station. However, it is clear that such a planning task exceeds the technical, personnel and communicative capacities of the small township of Ebreichsdorf or is in no comparison to the intensity of planning and scientific reference to similar areas in large cities. The new framework conditions also raise new questions and challenges. Therefore, a sequel project was designed, concentrating on two topics, land management and urban planning competition for the area around the station to ensure orderly development.

6 FROM THEORY TO PRACTICE[2]

6.1 Need and setup of the project

A holistic concept of urban development for the establishment of a concept of short distances, with low floor and energy consumption, valuable green and recreational space as well as new mobility approaches could be pursued well in this new district. For a smart district with a high quality of life, the future-oriented connection and networking of the regional mobility hub with the district, the city, and the region is a central field of action. Added to this is that the station or the immediate station environment represents a new centre for the newly emerging district and thus must have new uses and functions. These are to be combined in cooperation with the district conception.

However, any planning will not help if the required land is not available. The areas around the new station are owned by 16 owners. The possible security and accessibility of these high-quality areas for site-appropriate use (urban development) and the protection against land speculation are a great challenge for an orderly growth of the municipality. Only the active involvement of the 16 property owners concerned as well as the local and supra-local decision-makers can ensure an orderly and resource-efficient spatial development. With Ebreichsdorf as a test bed, new forms of land policy can be developed and tested, which are also of great importance for other communities with similar problems.

Smart urban development will not meet the demands of integrated and site-appropriate use with conventional planning tools. In order to be able to solve this problem, it is necessary to further develop the planning instrument of the cooperative planning procedure, which has been applied in practice, to a dialogical planning process in the elaboration of a master plan for urban landscape planning. Another challenge for medium and long-term development projects is the provision of information and the associated participation of the wider public. Above all, interventions and actions on site are necessary in order to make the vision of the future tangible.

Therefore, Smart City Ebreichsdorf focuses on the smart development planning of areas located in the immediate vicinity of train stations. For the successful implementation of the project, the following aspects must be researched and applied under real conditions for the first time in Lower Austrian planning practice:

- Development of the immediate station area and station district
- Development of a soil management
- Public relations and participation procedures

6.2 Aims and methods of the project

The SMCE exploratory project already used the method of "visioneering" – a combination of visionary-creative and engineering-scientific technical thinking (see Fig. 4). With the participation of the population, four scenarios could be developed and finally, a vision for Ebreichsdorf emerged. Using the "visioneering" method, the results of the SMCE exploratory project can be directly transferred to the continuation project. Based on the vision, concrete steps are now taken in the future. The area around the new station should thus be converted to a location-appropriate use (see Fig. 5).

[2] cp.: TU Wien, Land NÖ, Stadtgemeinde Ebreichsdorf, Dialog Plus, Riegler Rechtsanwälte, 2017. Projektantrag Smart City Ebreichsdorf (SMCE). Wien: TU Wien

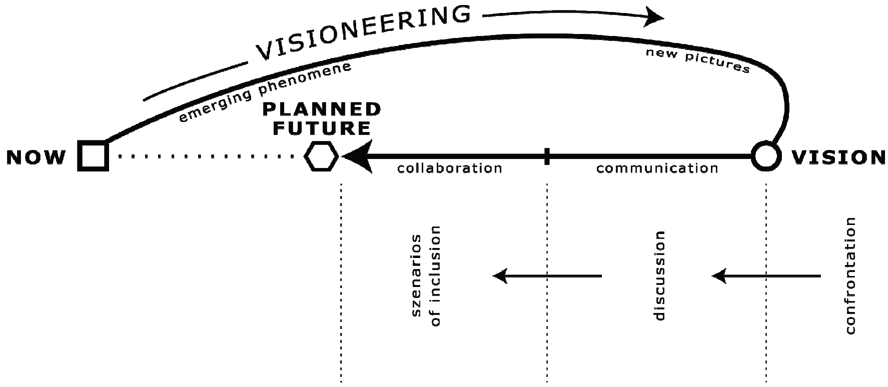

Fig. 4: Visioneering model (Source: (TU Wien, Stadtgemeinde Ebreichsdorf, Energiepark Bruck/Leitha, eNu, 2017), own presentation)

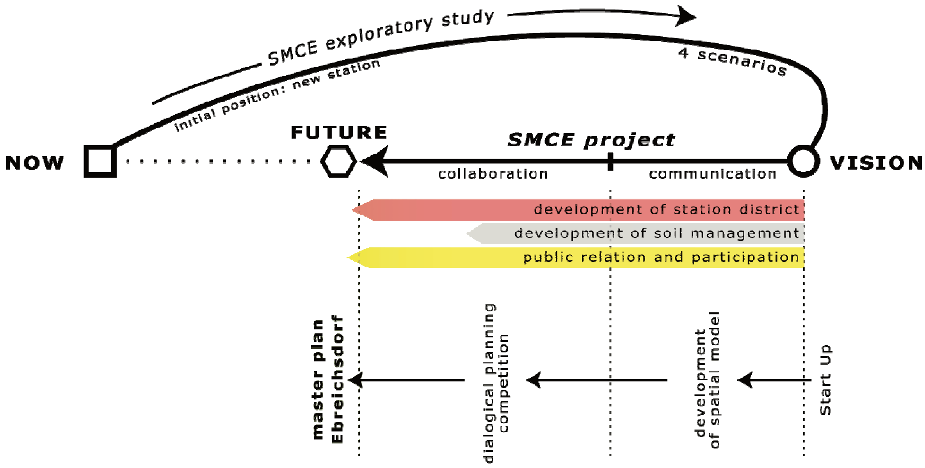

Fig. 5: Implementation of visioneering in the SMCE project (Source: (TU Wien, Land NÖ, Stadtgemeinde Ebreichsdorf, Dialog Plus, Riegler Rechtsanwälte, 2017), own presentation)

Specifically, the SMCE project uses a dialogical planning process to design an urban planning strategy for site-appropriate reuse. At the same time, in an active cooperation with the property owners, an innovative public-policy strategy is being drawn up, which creates the conditions for realisation. Parallel to this, both public relations and participation events take place. The results of these events (workshops, think tanks, etc.) flow directly into the master planning process and facilitate further social innovations. The research results are applied directly to the test bed Ebreichsdorf but also serve as a recommendation for comparable development sites in Austria and internationally. The insights gained are intended to trigger learning processes in politics, planning administration and the scientific community and to secure the concrete Smart City implementation in Ebreichsdorf. They pursue an integrative urban development approach.

Development of the immediate station area and station district

From the present development scenario 4 for the station district, an urban planning and landscape planning concept in the sense of a master plan is to be derived. Based on a mission statement, it should clarify a concrete spatial development, which is a solid and robust basis for concrete construction projects. On the one hand, a location is to be developed which is well connected to the railway station, and on the other hand, provides effective contributions to the further development of existing settlement areas. Important ecosystem services of the landscape area and climate-effective measures are to be considered. The dialogical planning process serves as an innovative and transparent method for urban development.

The development process is carried out in the sense of a dialogical competition procedure. 3-4 teams (composed of architecture / urban planning and landscape planning) are identified through a selection procedure in order to work on a spatial concept. The teams compete with each other in the competition for the best and most innovative solution. Due to the complexity of the question, the process is designed to be dialogue-oriented. In the context of a kick-off, intermediate and final colloquium, there is a close exchange between the teams, all development-relevant stakeholders, the citizens and the professional public (talks, forums, workshops, lectures and discussion events). Intermediate studio phases guarantee the planning teams a focused work on the respective concepts.

Development of a land management

With the development of a new land management concept, the implementation of the master plan should be secured. An in-depth analysis of the legal and institutional framework will help to implement an innovative land policy strategy to secure rights of the disposal and use of the land covered by the Master Plan. Risks and limitations of the application of different instruments of land policy are to be recorded and presented. These should be based on an evaluation of the public and private law instruments with regard to the subject of settlement development. Finally, a draft contract is to become designed, which can / should serve the municipality as well as the property owners concerned as a legal document (land management tool) with the future development of the objective real estate.

The work package uses various methods for processing the individual content chapters. The development interests of the owners, the community, and the country are raised in discussions. The preparation of the legal and theoretical foundations is carried out primarily by research activities with the consultation of experts. The various options for land policy and strategies are brought to the overall project in the form of workshops. Interim reports on the individual topic blocks will be prepared, submitted and introduced into the discussion. Among other things, the support and monitoring of the local political decision for a development scenario are accompanied by arrangements to secure the rights of disposal and use of the properties in question.

7 CONCLUSION

The future Smart City Ebreichsdorf (SMCE) is a fast-growing municipality in the city agglomeration Vienna, Lower Austria and Burgenland. The two-track extension of the Pottendorfer track and the cities better connection will create a new regional mobility hub and thereby reenforce the growth process.

From smart thinking to smart acting – Based on the results of the exploratory project, where the research focus was on the development of dimensions of acting along four themes, planning and process, railway station, district and energy and resources, the current project has the primary goal to develop a new city district along Smart City principles. The main questions in the exploratory projects were about what was "conceivable" and "possible". Now a concrete and integral implementation concept is in the forefront. With the decision of the city council to develop the target area the implementation process has begun. The province of Lower Austria, as the administrative authority in charge of controlling zoning issues, supports the city council's decision. Austrian planning practice tends to adopt reactive behaviour toward infrastructure and settlement development. This project is characterised by proactive actions based on changed conditions of spatial planning and development.

From smart goals to smart implementation - Social innovation in the implementation of an integrated and forward-looking interim and post-utilisation concept is the focus of the project. Through a new content and temporal interlacing of participatory, planning-technical and land policy elements, a future-oriented development process will be adopted. In the realisation phase of the railway project, the use of the future city district will be prepared. In a dialogical competition, an urban-planning and open-space planning master plan will be drawn up, whereby the station becomes the important mobility turntable in the context of local and regional mobility. An innovative land management model is used to ensure implementation in cooperation with the real estate owners.

From smart projects to smart society - The aim of the project is the demonstration of a city (regional) development using the example of the test bed Ebreichsdorf in terms of an overall, systemic, interdisciplinary approach of the area, involving the population and the relevant stakeholders of the political, administrative and private sectors. The results obtained can be used directly in university research and teaching and can be applied to comparable settlement development projects in the catchment area of railway development projects.

8 REFERENCES

Bahn.Ville – Konsortium, 2004. Ergebnisse und Hinweise für die Planungspraxis aus dem Projek Bahn.Ville, Aachen

Caragliu, A., Del Bo, C. & Nijkamp, P., 2011. Smart Cities in Europe. Journal of Urban Technology, Vol. 18(Issue 2), pp. 65-82.
Dameri, R. P., 2013. Searching for Smart City definition: a comprehensive proposal. International Journal of Computers & Technology, 11(5), pp. 2544 - 2551.
Giffinger, R. & Heindlmayer, G., 2010. Smart Cities Ranking: An effective instrument for the positioning of cities. ACE 12: Architecture, City and Environment, pp. 7-25.
google maps, 2016. google.maps. [Online]. Available at: www.google.at/maps/@47.9641112,16.4190001,4160m/data=!3m1!1e3 [Zugriff am 20 May 2017].
Hollands, R. G., 2008. Will the real smart city please stand up?. City, Vol. 12(No. 3), pp. 303-320.
ILS/MASSKS 1999. (ILS Institut für Landes- und Stadtentwicklungsforschung des Landes NRW / Ministerium für Arbeit, Soziales und Stadtentwicklung, Kultur und Sport /Hg.): Baulandentwicklung an der Schiene, NRW_notiert Nr. 13325. Düsseldorf: Ministerium für Arbeit, Soziales und Stadtentwicklung, Kultur und Sport des Landes Nordrhein-Westfalen.
Jermann, J., 2004. GIS-basiertes Konzept zur Modellierung von Einzugsbereichen auf Bahn-Haltestellen. Schriftenreihe des IVT Nr. 129, ETH Zürich.
Matthes, G. & Gertz, C., 2014. Raumtypen für Fragestellungen der handlungstheoretisch orientierten Personenverkehrsforschung. ECTL Working Paper. Hamburg: Technische Universität Hamburg-Harburg, Institut für Verkehrsplanung und Logistik
Nam, T. & Pardo, T. A., 2011 a. Conceptualizing Smart City with Dimensions of Technology, People, and Institutions. The Proceedings of the 12th Annual International Conference: Digital Government Research, pp. 282 - 291.
Nam, T. & Pardo, T. A., 2011 b. Smart City as Urban Innovation: Focusing on Management, Policy, and Context. ICEGOV '11 Proceedings of the 5th International Conference on Theory and Practice of Electronic Governance, pp. 185 - 194.
Neirotti, P. et al., 2014. Current trends in Smart City initiatives: Some stylised facts. Cities, Volume 38, pp. 25-36.
ÖBB Infra, 2016 a. ÖBB Infra: Südstrecke. [Online]. Available at: www.oebb.at/infrastruktur/de/5_0_fuer_Generationen/5_4_Wir_bauen_fuer_Generationen/5_4_1_Schieneninfrastruktur/Suedstrecke/Zweigleisiger_Ausbau_der_Pottendorfer_Linie/index.jsp [Accessed 18 Mai 2016].
ÖBB Infra, 2016 b. Südstrecke: Südstrecke online. [Online]. Available at: http://www.oebb.at/infrastruktur/de/5_0_fuer_Generationen/5_4_Wir_bauen_fuer_Generationen/5_4_1_Schieneninfrastruktur/Suedstrecke/suedstreckeonline/index.html [Accessed 20 May 2016].
ÖBB Infra, n.d.. Schieneninfrastrucktur: Südstrecke. [Online]. Available at: http://www.oebb.at/infrastruktur/de/5_0_fuer_Generationen/5_4_Wir_bauen_fuer_Generationen/5_4_1_Schieneninfrastruktur/Suedstrecke/index.jsp [Accessed 20 May 2016].
Professur für Raumentwicklung, ETH Zürich, 2012. Schweizweite Abschätzung der inneren Nutzungsreserven. Bern: Bundesamt für Raumentwicklung
Rump, D., 2004. Möglichkeiten und Grenzen siedlungsstrukturell abgestimmter Flächenbahnsysteme. Dissertation an der Fakultät für Raumplanung, Universität Dortmund.
TU Wien, Stadtgemeinde Ebreichsdorf, Energiepark Bruck/Leitha, eNu, 2017. Publizierbarer Endbericht Smart City Ebreichsdorf (SMCE). Wien: TU Wien
TU Wien, Land NÖ, Stadtgemeinde Ebreichsdorf, Dialog Plus, Riegler Rechtsanwälte , 2017. Projektantrag Smart City Ebreichsdorf (SMCE). Wien: TU Wien
Wulfhorst, G., 2003. Flächennutzung und Verkehrsverknüpfung an Personenbahnhöfen – Wirkungsabschätzung mit systemdynamischen Modellen. Stadt Land Region Bericht 49 des Instituts für Stadtbauwesen und Stadtverkehr der RWTH Aachen.

🏆 *reviewed paper*

Räumliche Differenzierung des ÖPNV-Modalsplits zur Integration in die Standortbetrachtung für Ladeinfrastrukturen

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1 EINLEITUNG

Eine Grundvoraussetzung für die Verbreitung der Elektromobilität ist der Zugang zu Ladeinfrastruktur (LIS). Neben der LIS im privaten Raum, wie sie derzeit 92 % der elektromobilen Verkehrsteilnehmer [Trommer et al. 2015] zur Verfügung haben, ist die im öffentlichen Raum positionierte LIS abgesehen von der öffentlichen Wahrnehmung vor allem für die Grundversorgung und als Lademöglichkeit für ungeplante Fälle von besonderer Bedeutung. Spätestens beim Eintritt in den Massenmarkt kann nicht mehr von dem derzeitig hohen Anteil an privater LIS ausgegangen werden. Während der Potentialbestimmung der zu erwartenden LIS Nutzung innerhalb der Modellierungsmethodik STELLA ist es entscheidend, die Abschätzung der durch Personen entstehenden Fahrten nach der Verkehrserzeugung und Verkehrsverteilung möglichst zutreffend auf die verschiedenen Fahrmodi zu verteilen. Diese modale Aufteilung der Fahrten kann je nach räumlicher Lage sowie weiteren Begleitumständen, wie zum Beispiel unterschiedlichen Verkehrsmittelangeboten variieren. Durch spezifische Analysen des ÖPNV-Angebots lassen sich auf der einen Seite räumlich differenzierte ÖPNV-Anteile in das Modell STELLA integrieren, auf der anderen Seite sind auf Basis dieser Daten ebenfalls Aussagen zur Versorgungsqualität durch den ÖPNV ableitbar.

Keywords: Ladeinfrastruktur, Standortsuche, Verkehrsmodellierung, öffentlicher Verkehr, Elektromobilität

2 MODELLMETHODIK STELLA

2.1 Modellierungsansatz

In der Literatur existieren verschiedene Ansätze, die sich mit der Positionierung von LIS für elektrische Fahrzeuge auseinandersetzen. Diese betrachten entweder räumliche Kriterien einer einzelnen Stadt bzw. Region oder konzentrieren sich auf die Mobilität der Nutzer. Eine gleichzeitige Berücksichtigung der Fragen nach der Positionierung sowie der Quantifizierung der LIS je Standort wird in der Literatur nur in begrenztem Maße innerhalb einer theoretischen Umgebung durchgeführt. Anders ist es bei dem entwickelten Standortfindungsmodell für elektrische Ladeinfrastruktur (STELLA), welches an die Methoden und Datenstrukturen der klassischen Verkehrsmodellieung angelehnt ist.

In dem Modellansatz werden verschiedene Indikatorgruppen einerseits zur Beschreibung und andererseits zur räumlichen Verortung der täglichen Mobilität der Bevölkerung in einem spezialisierten, deutschlandweiten Verkehrsmodell zusammengestellt. Das Nutzerverhalten, die Verteilung von Fahrzeugen, die bereits existierende Ladeinfrastruktur sowie Raumstrukturen und die vorhandenen verkehrlichen Infrastrukturen bilden dabei die Grundlage für die weiteren Berechnungsschritte. Ebenso gibt es durch den modularen Aufbau des Modells die Möglichkeit weitere Rahmenbedingungen wie zum Beispiel unterschiedliche Prognosejahre oder politische Zielsetzungen zu integrieren.

Eine der Grundlagen für den Modellansatz STELLA bildet die Ermittlung des erzeugten Verkehrsaufkommens je kleinteiligem Wohnquatier [DDS 2014]. Ein kleinteiliges Wohnquartier wird in Abhängigkeit von der 8-stelligen Postleitzahlebene (PLZ8) gebildet. Die PLZ8 teilt Deutschland in rund 82.000 Wohnquartiere auf und stellt eine differenziertere Unterteilung der 5-stelligen Postleitzahlen in homogene Gebietseinheiten von durchschnittlich jeweils ca. 500 Haushalten [DDS 2014] dar. Als Basis der Ermittlung des erzeugten Verkehrsaufkommens gilt die Methode der FGSV [2010], welche allerdings unter anderem im Bereich des Modalsplits für den Modellansatz STELLA modifiziert wird. Innerhalb der FGSV Methode wird das Verkehrsaufkommen in einem ersten Schritt in Abhängigkeit der Baugebietstypen (Wohn , Misch- und Gewerbegebiet) bestimmt. In einem weiteren Schritt wird dieses durch Berücksichtigung verschiedener Einflussfaktoren zwischen den verschiedenen Verkehrsmodi mittels unterschiedlicher Modalsplitanteile aufgeteilt. Eine Übertragbarkeit dieses, für einzelne Gebiete (<50 ha) [FGSV 2010] individuell auslegbaren, Ansatzes auf eine bundesweite Betrachtung (durchschnittliche bebaute Gebietsgröße 29,3 ha) erfordert die Entwicklung und Integration zusätzlicher aus Daten analysierbarer und nicht

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individuell interpretationsbedürftiger Indikatoren. Bei der Bestimmung des ÖPNV Anteils für jedes der rund 82.000 Wohnquartiere können unter Beachtung der großräumigen Raumstruktur zum Beispiel die Haltestellendichte und Charakteristika der ÖPNV-Angebotsqualität in Verbindung gesetzt zu örtlichen Verkehrsverflechtungen als Anhaltspunkte dienen. Die Ergebnisse des auf diese Weise modifizierten Verfahrens zur Ermittlung der Verkehrserzeugung inklusive der Verkehrsaufteilung auf die unterschiedlichen Modi fließen unmittelbar in das Modell STELLA ein.

2.2 Raumabgrenzung

Für die deutschlandweite räumliche Verortung des Potentials für elektrische LIS ist eine Abgrenzung und Charakterisierung des Raumes nötig, um unterschiedliche Voraussetzungen in der Raumstruktur zu berücksichtigen. Diese Raumabgrenzung ist auf unterschiedlichen Auflösungsebenen möglich, da je nach Ebene den einzelnen Gebieten verschiedene charakterisierende Attribute, zum Beispiel als Verknüpfung mit anderen Datenbanken, angefügt werden können. Die folgenden Abschnitte geben einen kurzen Überblick über die in STELLA verwendeten unterschiedlichen Raumabgrenzungen. Dabei wird auch die für die räumliche Differenzierung des ÖPNV-Anteils relevante Abgrenzung dargestellt.

Als eine großräumige Abgrenzung kann die administrative Gliederung in Deutschland anhand von beispielsweise Kreisen, Gemeindeverbänden, Gemeinden oder auch Postleitzahlen dienen [Destatis 2015]. Für die Untersuchung des Potentials für elektrische LIS ist die rein administrative Abgrenzung jedoch nicht ausreichend, da Attribute zur Struktur des Raumes fehlen. Daher wird eine Charakterisierung der Gemeinden anhand nichtadministrativer Merkmale wie Zentralität, Verdichtung oder Pendlerbeziehungen benötigt [Destatis 2015]. Das Bundesinstitut für Bau-, Stadt- und Raumforschung (BBSR) im Bundesamt für Bauwesen und Raumordnung (BBR) stellt entsprechende Gebietstypen, sogenannte „Stadt- und Gemeindetypen“ wie sie in Tabelle 1 dargestellt sind, zur Verfügung [BBSR 2018]. Diese differenzieren die Gemeinden anhand der Gemeindegröße bzw. Einwohnerzahl sowie der jeweiligen zentralörtlichen Funktion in Stadt- und Landgemeinde.

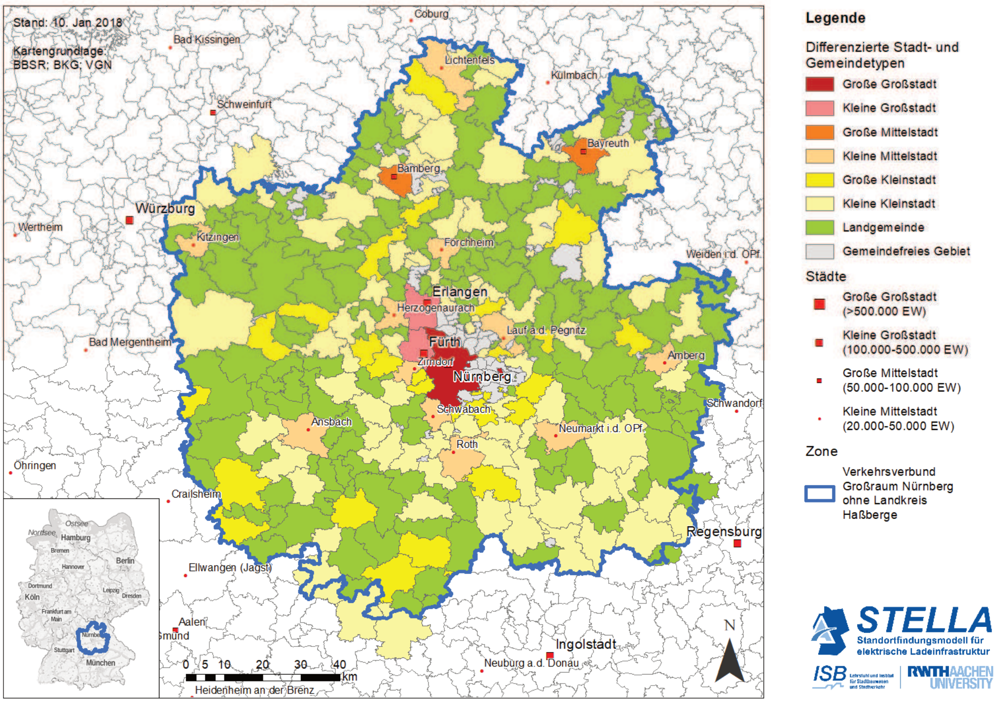

Abb. 1: Stadt- und Gemeindetypen im Gebiet des Verkehrsverbunds Großraum Nürnberg[1] (eigene Darstellung nach BBSR [2018], BKG [2018], VGN [2018])

Diese Einteilung liefert eine Grundlage für räumliche Analysen, kann jedoch nicht alle Eigenschaften abdecken [BBSR 2018]. Daher wird eine weitere Abgrenzung eingeführt, die die Charakterisierung der Gemeinden um die Typisierung in „Großstadtregionen“ auf Gemeindeverbandebene erweitert. Diese beinhaltet eine Unterscheidung zwischen dem Zentrum einer Großstadtregion, dem Ergänzungsgebiet sowie

[1] Stand Verbundgebiet 12/2017: Landkreis Haßberge aufgrund fehlender Daten nicht miteingeschlossen.

einem engeren und weiteren Pendlerverflechtungsraum, indem als Basis insbesondere Pendlerbewegungen von sozialversicherungspflichtigen Beschäftigten zwischen ihrem Wohn- und Arbeitsort verwendet werden. Die Großstadtregionen entsprechen dabei der Gebietstypisierung der „Stadt-Land-Regionen“ [BBSR 2018].

Bezeichnung		Einwohnerzahl	Zentralörtliche Funktion
Großstadt	groß	> 500.000	meist oberzentrale/ mindestens mittelzentrale Funktion
	klein	100.000 bis 500.000	
Mittelstadt	groß	50.000 bis 100.000	überwiegend mittelzentrale Funktion
	klein	20.000 bis 50.000	
Kleinstadt	groß	10.000 bis 20.000	mindestens grundzentrale Funktion
	klein	5.000 bis 10.000	
Landgemeinde		< 5.000	weniger als grundzentrale Funktion

Tab. 1: Differenzierte Stadt- und Gemeindtypen [BBSR 2018]

Insbesondere im Kontext der Bestimmung des ÖPNV-Modalsplits (siehe folgendes Kapitel 2.4) stellt das „Zentrale-Orte-Konzept“ (ZOK) [BBSR 2018] eine nächste, relevante Kategorisierung dar. Das ZOK ist ein normatives Konstrukt zur Zuordnung von Funktionen der Daseinsvorsorge an Städte und Gemeinden [Flex et al. 2016] und liefert somit Anhaltspunkte über die vorhandene oder geplante infrastrukturelle und institutionelle Ausstattung einer Region [BBSR 2018]. Im Allgemeinen werden dabei Oberzentren (Versorgung des spezialisierten höheren Bedarfs), Mittelzentren (Versorgung des gehobenen Bedarfs) sowie Unter-/Grund-/Kleinzentren (Versorgung des Grundbedarfs) unterschieden. Da die Zuordnung einzelner Regionen in die Kategorien Aufgabe der Landesplanung ist [BBSR 2018], existieren zwischen den Ländern Unterschiede in der definitorischen Auslegung und daher Unterschiede in der Zuordnung. Diese Einteilung wird unter anderem im weiteren Verlauf für die Abschätzung des ÖPNV-Modalsplits berücksichtigt, um die Verknüpfung zu anderen etablierten Betrachtungen und Analysemethoden herstellen zu können.

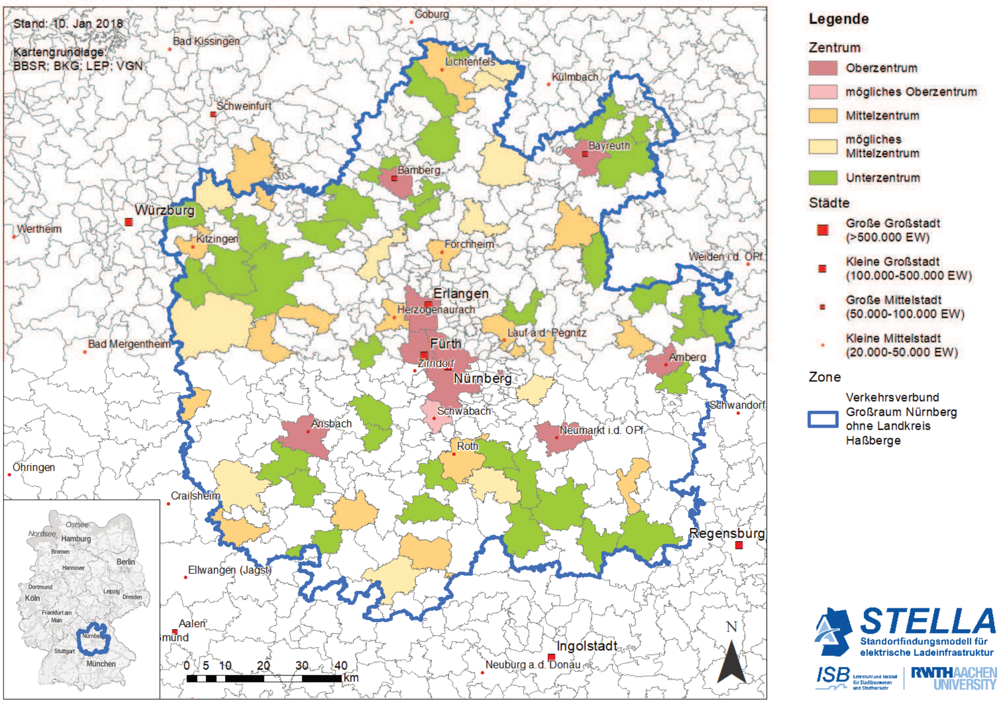

Abb. 2: Einteilung des Gebietes Verkehrsverbund Großraum Nürnberg[2] anhand des „Zentrale-Orte-Konzepts“ (eigene Darstellung nach BBSR [2018], BKG [2018], LEP [2018], VGN [2018])

Eine weitere räumlich detaillierte Abgrenzung stellt die Ebene der Wohnquartiere dar (siehe Kapitel 2.1), für die das Modell STELLA das Potential als LIS berechnet. Jedes dieser Wohnquartiere wird durch Verknüpfung der oben erläuterten großräumigeren Gebietstypisierungen mit den Siedlungs- und Gewerbeflächen, den Einwohner-, Haushalts- und Beschäftigtenanzahlen sowie der Gebäudeflächen in die

[2] Stand Verbundgebiet 12/2017: Landkreis Haßberge aufgrund fehlender Daten nicht miteingeschlossen.

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Baugebietstypen Wohn-, Misch- und Gewerbegebiet eingeordnet. Als Datengrundlage werden sowohl Open Data Inhalte als auch Daten kommerzieller Anbieter herangezogen [BKG, BBSR, DDS, HERE, OSM].

Für diese abgeleiteten Baugebietstypen kann eine weitere Differenzierung bedingt durch die vorherrschende Gebäudetypologie in verschiedene Stadtraumtypen (EST) [HEGGER et. al. 2015] vorgenommen werden. Dabei wird unterschieden zwischen kleinen, freistehenden Einzelbauten, Reihen-, Zeilen-, Blockbebauungen, großmaßstäblichen Wohnungsbebauungen und Baustrukturen mit einem dörflichen Charakter. Diese Kategorisierung dient als Basis zur differenzierten Bestimmung der räumlichen Lage eines Wohnquartieres innerhalb des ZOK, an die wiederum die Unterscheidung der Erreichbarkeitskategorien für ÖPNV Haltestellen gemäß Tabelle 2 anknüpft.

2.3 Verkehrserzeugung

Die Verkehrserzeugung hat als Ziel, für jede betrachtete Einheit (hier Wohnquartier), eine ungerichtete Verkehrsnachfrage zu generieren. Es wird die Gesamtheit der quellseitig startenden und zielseitig ankommenden Fahrten für das gesamte Planungsgebiet (PG) (im Modell STELLA wird ganz Deutschland abgebildet) betrachtet. Zur Berechnung der Quell- und Zielverkehre der einzelnen Zellen des PG wurde ein differenzierter Strukturklassenansatz verwendet, dessen zentrale Eingangsgrößen verschiedene Strukturdaten (z. B. Einwohner und Betriebe, differenziert nach Wirtschaftsgruppen und Mitarbeiterklassen) darstellen. Das Verfahren ist dabei stark angelehnt an die durch die FGSV [2010] veröffentlichten Hinweise zur Schätzung des Verkehrsaufkommens.

2.4 Methodik zur Konkretisierung der Bestimmung des ÖPNV-Modalsplits

Entsprechend der Methode der FGSV [2010] wird nach dem Schritt der Abschätzung des Verkehrsaufkommens die Differenzierung zwischen den Verkehrsmittelgruppen nicht motorisierter Individualverkehr (NMIV), motorisierter Individualverkehr (MIV) und Öffentlicher Personenverkehr (ÖPNV) vorgenommen. Für die Abschätzung ÖPNV-Anteils werden in dem Verfahren verschiedene Werte genannt, die unter anderem abhängig von den verkehrserzeugenden Gruppen (Bewohner-, Besucher-Beschäftigtenverkehr), den Stadt- und Gemeindetypen, der (nicht) integrierten Lage der Standorte, Merkmalen des Verkehrssystems oder der Erreichbarkeit der Zugangspunkte sind. Allerdings weisen diese Werte zum Teil große Spannweiten auf („5%-30%" [FGSV 2010, 3.3.8]), werden nicht differenziert vom NMIV betrachtet („ÖPNV/NMIV-Anteil 50%-90%" [FGSV 2010, 3.5.20]) oder benutzen vage Begriffe zur Beschreibung des ÖPNV-Angebotes („attraktive ÖPNV-Bedienung" [FGSV 2010, 3.5.20]), sodass die Abschätzung des ÖPNV-Anteils durch subjektive Einschätzungen beeinflusst werden kann. Durch die Analyse und Bestimmung verschiedener messbarer Indikatoren mit Einfluss auf den Anteil des ÖPNV-Aufkommens eines Wohnquartiers, kann die Abschätzung des ÖPNV-Anteils objektiviert und systematisiert werden. So ist es möglich bei der Betrachtung eines großen Untersuchungsraumes wie der Bundesrepublik Deutschland in der Methode STELLA einen Algorithmus zur Näherung an den räumlich differenzierten ÖPNV-Anteil zu entwicklen. Durch die Konkretisierung des ÖPNV-Anteils wird indirekt ebenfalls der IV-Anteil im Modell spezifiziert, welcher als Grundlage für die Ableitung der elektrischen Fahrten dient, die wiederum die Basis der Potentialermittlung für elektrische LIS darstellen.

Eine Literaturrecherche zeigt, dass sich bereits eine Vielzahl von Personen und Institutionen mit der Definition von Qualitätskriterien für den ÖPNV beschäftigen, die als Anhaltspunkte für die Auswahl und Definition von Indikatoren zur Entwicklung des Algorithmus herangezogen werden können. Nicht nur auf Nationaler, sondern auch auf europäischer Ebene wurde mit der DIN EN 13816 ein Instrument geschaffen, welches sich unter anderem mit der Beschreibung von Qualitätskriterien für den ÖPNV differenziert in acht Kategorien befasst. Allerdings werden dort lediglich mögliche Kriterien benannt, und keine Grenz- oder Richtwerte beigefügt. Dahingegen setzt sich zum Beispiel Schwarze [2005] in seiner Arbeit detailliert mit dem Begriff der Erreichbarkeit, verschiedenen Definitionen, Indikatoren und etwaigen Richtwerten für diese auseinander. So differenziert er, basierend auf einer Auswertung nordrhein-westfälischer Nahverkehrspläne, zum Beispiel zwischen planerischen Indikatoren und in der Praxis angwandten Erreichbarkeitsindikatoren.

Aus der Vielzahl von Qualitätskriterien für den ÖPNV, die sich in der Literaturrecherche gezeigt haben, wurde für die vorliegende Untersuchung der Fokus auf die Erreichbarkeit von Haltestellen im Raum gelegt. Die Bedeutung dieses Indikators im Kontext der Konkretisierung der Bestimmung des ÖPNV Modalsplits wird in den folgenden Abschnitten erläutert.

2.4.1 Qualitätskriterium Erreichbarkeit von Haltestellen

Der Indikator der Erreichbarbkeit bzw. des Einzugsbereichs von Haltestellen dient als ein Hinweis auf die Erschließungsqualität des ÖPNVs. Für ihn lassen sich verschiedene Empfehlungen in der Literatur finden. Der VÖV [1981] differenziert in seinen Empfehlungen für einen angemessenen Bedienungsstandard im ÖPNV zwischen den Verkehrsmittelgruppen U-Bahn/S-Bahn/SPNV und Bus/Straßenbahn. Abhängig von einer Unterteilung des zentralörtlichen Systems in Unterkategorien hinsichtlich der räumlichen Lage bezogen auf den Kernbereich, werden Entfernungen zwischen 300 m und 1200 m als angemessen angesehen. In seinen gut zwanzig Jahre später veröffentlichten Empfehlungen für die zumutbare luftlinienbezogenen Einzugsbereiche unterscheidet der VDV [2001] die gleichen Verkehrsmittelgruppen, allerdings werden hierbei Entfernungen zwischen 300 m und 1000 m, abhängig der Nutzungsdichte innerhalb des ZOK, empfohlen. Die geringere Maximaldistanz deutet auf einen, innerhalb der Jahre gewachsenen, höheren geforderten Erschließungsstandard hin. Neben Empfehlungen auf Bundesebene hat auch das Bayerische Staatsministerium für Wirtschaft, Infrastruktur, Verkehr und Technologie [STMWI 2018] in seinen Leitlinien zur Nahverkehrsplanung in Bayern Angaben zu Einzugsbereichen von Haltestellen angegeben. In diesem Fall wird zwischen Richtwerten (zwischen 300 m und 1500 m) und oberen Grenzwerten (zwischen 400 m und 1800 m) je Verkehrsmittelgruppe unterschieden. Die FGSV [1999] weist eine etwas abweichende Herangehensweise an die ÖPNV-Zugänglichkeit in ihren Planungshilfen für die kommunale Bauleitplanung aus, was darauf zurückzuführen ist, dass keine Empfehlung, sondern ein Bewertungsschema für einzelne Standorte aufgezeigt wird. Daher werden verschiedene qualitative Abstufungen hinsichtlich der Distanz zu Haltestellen aufgeführt. In diesem Ansatz werden die Verkehrsmittelgruppen in Busverkehr und den SchienengebundenenNahverkehr unterschieden.

In Anlehnung an diese vier Quellen wurden die in Tabelle 2 und 3 dargestellten Qualitätsstufen (QS) entwickelt. Die QS 1 oritentiert sich an den Empfehlungen des VÖVs, dem VDV sowie den Richtwerten des Bayerischen Staatsministeriums, die sich nur in einzelnen Kategorien unterscheiden. Die Grundlage für die QS 2 bilden die Grenzwerte der Bayerischen Nahverkehrsplanung, wobei gleichzeitig die Grenzwerte der oberen drei Bewertungskategorien der FGSV Berücksichtigung fanden. Eine weitere, von Winter [2005] durchgeführte, Untersuchung von elf hessischen Nahverkehrsplänen hat hinsichtlich der Beurteilungswerte für Haltestellenzugangsbreiche ähnliche Größenordnung aufgewiesen, wie die anderen Quellen. Abweichungen treten in den hessischen Nahverkehrsplänen insbesondere bei den Erreichbarkeiten für S-/U-Bahn und dem SPNV auf, wobei dafür bereits in der Analyse in sich große Spannweiten auftreten.

Bezeichnung		Bus/Straßenbahn			S-/U-Bahn/SPNV		
		QS 1	QS 2	QS 3	QS 1	QS 2	Q S3
Oberzentrum	Kernzone	≤ 300	≤ 400	> 400	≤ 400	≤ 600	> 600
	Gebiet mit hoher Nutzungsdichte	≤ 400	≤ 500	> 500	≤ 600	≤ 800	> 800
	Gebiet mit geringer Nutzungsdichte	≤ 600	≤ 800	> 800	≤ 1000	≤ 1200	> 1200
Mittelzentrum	Kernzone	≤ 300	≤ 500	> 500	≤400	≤ 600	> 600
	Gebiet mit hoher Nutzungsdichte	≤ 400	≤ 800	> 800	≤ 600	≤ 800	> 800
	Gebiet mit geringer Nutzungsdichte	≤ 600	≤ 800	> 800	≤ 1000	≤ 1200	> 1200
Unter-/ Kleinzentrum	Zentraler Bereich	≤ 400	≤ 500	> 500	≤ 600	≤ 800	> 800
	Übriges Gebiet	≤ 600	≤ 800	> 800	≤ 1000	≤ 1200	> 1200
Gemeinde		≤ 600	≤ 800	> 800	≤ 1000	≤ 1200	> 1200

Tab. 2: Qualitätsstufen Erreichbarkeiten (Luftlinie) ÖPNV Haltestellen (Einheit Meter) (eigene Darstellung in Anlehnung an FGSV [1999], STMWI [2018], VDV [2001], VÖV [1981])

Neben Empfehlungen für die Entfernungen zu Haltestellen, was sich meistens auf Luftliniendistanzen bezieht, gibt es in der Literatur auch Quellen, die ein Maximum für die Gehdistanz, also den tatsächlich zurückzulegenden Weg, festlegen. Sowohl H. Boesch [1989] als auch die UVEK [2011] nennen für die maximale Gehdistanz zu Bus- bzw. Straßenbahnhaltestellen 600 m und zu Bahnhaltestellen 1500 m. Da hierbei allerdings keine räumliche Differenzierung aufgeführt ist, kann die Annahme getroffen werden, dass ähnlich wie in den anderen Quellen gewisse Schwankungen der empfohlenen Distanzen zwischen Kern- und Randzonen möglich sind. Auch diese Grenzwerte wurden bei der Definition der Qualitätsstufen berücksichtigt. Von einer deutlichen Überschreitung von bis zu 500 % Prozent, wie sie bei dem Bewertungsschema der FGSV [1999] vorliegt, wurde für die Entwicklung der QS abgesehen, da die realisitsche Nutzung solcher Haltestellen in 3 km Entfernung bzw. einem fußläufigen Zeitaufwand von ca. 51 Minuten in Frage gestellt wird. Die Umrechnung von der räumlichen Distanz zum dafür benötigten Zeitaufwand wird in diesem Fall mit der sowohl in den Empfehlungen des VÖV [1981] als auch des VDV [2001] zugrunde gelegten Durchschnittsgeschwindigkeit von 1,17 m/s (70 m/min) berechnet. Zwar können in der Literatur eine Vielzahl von Quellen mit Angaben über die Fußgängergeschwindigkeit gefunden werden, wie U. Weidmann bereits 1992 aufzeigte, jedoch weisen diese zum Teil starke Streuungen auf. Die von den Empfehlungen benutzte Geschwindigkeit liegt geringfügig unter der von Weidmann [1992] entwickelten Durchschnittsgeschwindigkeit von 1,34 m/s. Allerdings kann die Geschwindigkeit von Eigenschaften des Fussgängers, Begleitumständen der Bewegung sowie Charakteristiken der Anlagen [Weidmann 1992] beeinflusst werden. Für den benötigten Umwegefaktor zur pauschalen Umrechnung der Luftliniendistanz wird ebenfalls der von dem VDV verwendete Faktor von 1,2 genutzt, auch wenn hier ebenfalls Unterschiede zum Beispiel fahrtzweckabhängig [UVEK 2011] möglich sind. Eine Umrechnung der der Qualitätsstufen in Fußwegedauer in Tabelle 3 zeigt, dass die in der Literatur empfohlenen 5 bis 10 Minuten zu Haltestellen unterschiedlicher Verkehrsmittel [Winter 2005] in der QS 1 überwiegend eingehalten wurden. Für die QS 2 ist dies ebenfalls teilweise für die Kernbereiche gültig. Ausnahmen bilden Randbereiche der Unterzentren sowie ländliche Gemeinden.

Bezeichnung		Bus/Straßenbahn			S-/U-Bahn/SPNV		
		QS 1	QS 2	QS 3	QS 1	QS 2	Q S3
Oberzentrum	Kernzone	≤ 5	≤ 7	> 7	≤ 7	≤ 10	> 10
	Gebiet mit hoher Nutzungsdichte	≤ 7	≤ 9	> 9	≤ 10	≤ 14	> 14
	Gebiet mit geringer Nutzungsdichte	≤ 10	≤ 14	> 14	≤ 17	≤ 21	> 21
Mittelzentrum	Kernzone	≤ 5	≤ 9	> 9	≤ 7	≤ 10	> 10
	Gebiet mit hoher Nutzungsdichte	≤ 7	≤ 14	> 14	≤ 10	≤ 14	> 14
	Gebiet mit geringer Nutzungsdichte	≤ 10	≤ 14	> 14	≤ 17	≤ 21	> 21
Unter-/ Kleinzentrum	Zentraler Bereich	≤ 7	≤ 9	> 9	≤10	≤ 14	> 14
	Übriges Gebiet	≤ 10	≤ 14	> 14	≤ 17	≤ 21	> 21
Gemeinde		≤ 10	≤ 14	> 14	≤ 17	≤ 21	> 21

Tab. 3: Qualitätsstufen Erreichbarkeiten (Fußwegedauer) ÖPNV Haltestellen (Einheit Minuten) (eigene Darstellung in Anlehnung an FGSV [1999], STMWI [o.J.] VDV [2001], VÖV [1981])

Basierend auf den definierten Qualitätsstufen der Erreichbarkeit von ÖPNV-Haltestellen kann eine räumliche Analyse durchgeführt werden. Abhängig von dem Anteil der abgedeckten Siedlungsfläche je Qualitätsstufe kann dann der Modalsplitanteil des ÖPNVs im FGSV Verfahren zur Abschätzung des Verkehrsaufkommen beeinflusst werden. Die Erreichbarkeit stellt jedoch nur einen von vielen Indikatoren zur Beeinflussung des ÖPNV-Anteils dar und wird in späteren Schritten mit dem Einfluss anderer Indikatoren kombinbiert.

2.4.2 Auswertung des Qualitätskriteriums der Erreichbarkeit für die Modellregion VGN

Als Modellregion für die ersten Analysen des ÖPNV-Angebots wurde das Verbundgebiet des Verkehrsverbundes Großraum Nürnberg (VGN)[3] gewählt. Einerseits ist dies in der räumlichen Struktur und dem vorhandenen ÖPNV-Angebot begründet, andererseits stehen alle Informationen über Haltestellen und Fahrpläne zur freien Nutzung online zur Verfügung [VGN 2018]. Das Verbundgebiet des VGN weist alle unterschiedlichen Gebietstypen der Stadt- und Gemeindetypen, des ZOKs und der EST auf (siehe Kapitel 2.2) sowie ebenfalls die verschiedenen Verkehrsmittel Bus, Tram, S-/U-Bahn und Regionalbahn.

[3] Stand Verbundgebiet 12/2017: Landkreis Haßberge aufgrund fehlender Daten nicht miteingeschlossen.

Der Indikator der Erreichbarkeit von ÖPNV-Haltestellen liegt in diesen Untersuchungen im Fokus. Die Qualität der Erreichbarkeit wird anhand des Anteils abgedeckter Siedlungsfläche an der Gesamtsiedlungsfläche je Stadtquatier bewertet. Entsprechend der in Tabelle 2 aufgeführten Kategorien wird dabei in einer vorgeschalteten Analyse jedem Wohnquartier eine Kategorie des ZOK zugeordnet, damit abhängig des Haltestellentypes (Bus/Straßenbahn bzw. S-/U-Bahn/SPNV) und der QS (1 & 2) die entsprechenden Erreichbarkeitsdistanzen zugeordnet werden können.

Die Analyse der Erreichbarkeit wird hinsichtlich zwei verschiedener methodischer Ansätze durchgeführt. Die erste Methode berücksichtigt die Distanzen als Erreichbarkeitsradien (Luftlinie), sodass um jede Haltestelle Kreise mit entsprechenden Radien gezogen werden. Anschließend werden für jedes Wohnquartier die auf den verschiedenen QS abgedeckten Siedlungsflächen in Relation zur gesamten Siedlungsfläche gesetzt. Diese Methode hat den Vorteil, dass sie einfach zu implementieren ist und ein homogenes Ergebnis liefert. Der Nachteil daran ist jedoch, dass die Radien Luftlinien abbilden und nicht zwangsläufig die durch Luftlinien abgedeckten Flächen auch entlang des vorhandenen Netzwerkes binnen der angesetzten Reichweiten zu erreichen sind. Auch die Berücksichtigung möglicher Umwegefaktoren kann nur pauschal angesetzt werden, allerdings weisen die örtlichen Straßen- und Wegenetzwerke deutliche Unterschiede hinsichtlich ihrer Direktheit auf. Aus diesem Grund wurde zusätzlich als zweite Methode eine Erreichbarkeitsanalyse auf dem für Fußgänger benutzbaren Straßen- und Wegenetz [HERE 2017] durchgeführt. Hierbei werden die Haltestellen zunächst auf die räumlich nächste Straßenverbindung projeziert bevor die Erreichbarkeitsdistanzen auf dem Straßen- und Wegenetz geroutet werden. Auf diese Weise ist es möglich die tatsächlich erreichbaren Gebiete und somit die tatsächlich abgedeckte Siedlungsfläche zu bestimmen. Eine schematische Darstellung in Abbildung 3 verdeutlich diese unterschiedlichen Ergebnisse der beiden Methoden.

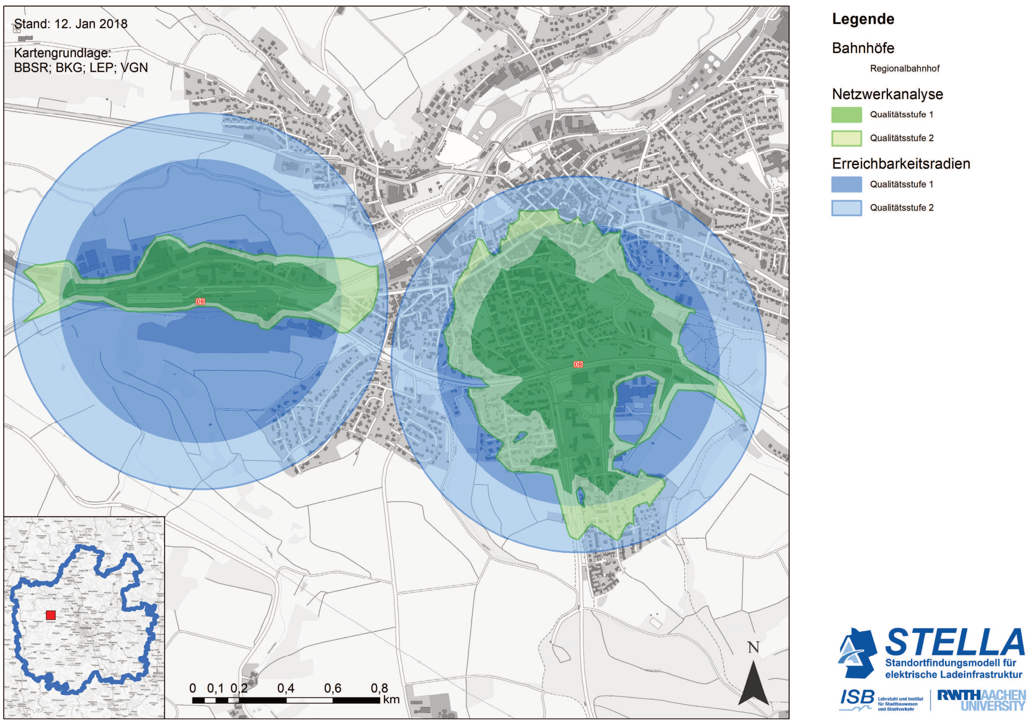

Abb. 3: Schematischer Vergleich der Erreichbarkeitsradien und Netzwerkanalyse [eigene Darstellung]

Die Auswertungen hinsichtlich der abgedeckten Siedlungsflächen je QS für beide Methoden werden in Tabelle 4 und 5 dargestellt. Entsprechend der Angaben des VDV [2001] sowie weiterer Quellen „[gilt] eine Fläche als erschlossen, wenn 80 % dieser Personen in den Einzugsbereichen von Haltestellen (…) wohnen oder dort arbeiten". Vereinfacht wurde vorerst die Annahme aufgestellt, dass sich die Einwohner gleichmäßig auf die Fläche verteilen und diese somit als erschlossen gilt, wenn 80% der Siedlungsfläche abgedeckt ist. Die Analyse wurde vorerst exklusive der Wohnquartierstypisierungen Geschäfts-, Büro-, Verwaltungs- und Gewerbegebiet durchgeführt. Diese Typisierung Bedarf einer detaillierteren Betrachtung, da eine qualitative Bewertung über die Fläche nicht in jedem Fall sinnvoll ist. Bei großflächigen

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Gewerbebetrieben muss nicht das gesamte Gebiet durch eine ÖV-Haltestelle erreichbar sein, sondern die relevanten Zugänge. Eine reine flächenbezogene Analyse würde die Ergebnisse daher negativ beeinflussen.

Bezeichnung		Anzahl Wohnquartiere*	Bus/Straßenbahn		S-/U-Bahn/SPNV	
			QS1	QS2	QS1	QS2
Oberzentrum	Kernzone	120	89 %	98 %	38 %	62 %
	Kernrandzone	425	93 %	98 %	47 %	62 %
	Außenzonen	370	96 %	99 %	30 %	41 %
Mittelzentrum	Kernzone	17	82 %	100 %	0 %	18 %
	Außenzone	25	92 %	100 %	28 %	44 %
	Ortsteile	344	91 %	94 %	15 %	24 %
Unter-/ Kleinzentrum	Zentraler Bereich	12	75 %	83 %	17 %	50 %
	Ortsteile	310	75 %	86 %	11 %	15 %
Ländliche Gemeinde		1052	81 %	89 %	14 %	18 %

* exklusive Geschäfts-, Büro-, Verwaltungs- und Gewerbegebieten

Tab. 4: Anteilige Abdeckung der Siedlungsfläche je Wohnquartier durch Erreichbarkeitsradien differenziert nach Qualitätsstufen und Verkehrsmittelgruppe im Bedienungsgebiet des VGN [eigene Darstellung]

Die Analyse der übrigen Wohnquartierstypen, exklusive der vorher genannten, mittels der Methode der Erreichbarkeitsradien zeigt deutlich, dass die Flächenabdeckung mit Haltestellen des Verkehrssystems Bus bzw. Straßenbahn innerhalb des VGN Bedienungsgebietes nahezu überall erfüllt ist. Die Erreichbarkeit von Haltestellen des schienengebundenen Nahverkehrs hingegen erfüllt in keiner der räumlichen Kategorien die vom VDV genannte Grenze zur Flächenabdeckung.

Bezeichnung		Anzahl Wohnquartiere*	Bus/Straßenbahn		S-/U-Bahn/SPNV	
			QS1	QS2	QS1	QS2
Oberzentrum	Kernzone	120	51 %	80 %	18 %	48 %
	Kernrandzone	425	69 %	84 %	30 %	48 %
	Außenzonen	370	70 %	86 %	16 %	24 %
Mittelzentrum	Kernzone	17	24 %	88 %	0 %	0 %
	Außenzone	25	64 %	92 %	20 %	28 %
	Ortsteile	344	58 %	81 %	6 %	13 %
Unter-/ Kleinzentrum	Zentraler Bereich	12	42 %	58 %	0 %	33 %
	Ortsteile	310	37 %	64 %	5 %	7 %
Ländliche Gemeinde		1052	37 %	69 %	7 %	12 %

* exklusive Geschäfts-, Büro-, Verwaltungs- und Gewerbegebieten

Tab. 5: Anteilige Abdeckung der Siedlungsfläche je Wohnquartier durch Netzwerkanalysen differenziert nach Qualitätsstufen und Verkehrsmittelgruppe im Bedienungsgebiet des VGN [eigene Darstellung]

Ein anderes Ergebnis zeigt sich dahingegen bei der Analyse der Wohnquartierstypen durch die zweite, netzwerkbezogene Methode. In diesem Fall ist auffällig, dass bezüglich der Erreichbarkeit von Bus- und Straßenbahnhaltestellen in keiner der räumlichen Kategorien die vollständige Flächenabdeckung nach VDV Definition in der QS 1 erreicht wird. Auch in der QS 2 wird der Grenzwert je ländlicher ein Gebiet wird weniger erreicht. Auch die Abdeckung der Siedlungsfläche durch Haltestellen des SPNV ist im Vergleich zur Analyse mit Erreichbarkeitsradien deutlich geringer bzw. zum Teil nicht mehr vorhanden.

Es bestätigt sich somit die im Vorfeld aufgestellte Hypothese, dass durch die Erreichbarkeitsradien eine größere Fläche abgedeckt wird als durch die Netzwerkanalyse. Die Differenz der Anteile der abgedeckten Fläche weist dabei Spannweiten zwischen 6 % bis hin zu knapp 60 % auf. Es fällt auf, dass die Differenz in der QS 2 jeweils kleiner ist als in der QS 1. Dies kann möglicherweise dadurch begründet werden, dass durch die höhere Distanz insgesamt ein größere Anteil der Siedlungsfläche abgedeckt wird. Ebenso ist es aber auch möglich, dass sich die erreichbaren Gebiete durch die größere Fußwegedistanz häufig flächiger und „runder“ ausbilden als bei geringen Distanzen, da zum Beispiel Querverbindungen zwischen zwei von der Haltestelle geradlinig wegführenden Achsen ebenfalls erreicht werden können und die Fläche somit abgedeckt wird. In der Abbildung 3 wird deutlich, dass die Zugänglichkeit der Gebiete von der Form der Straßen bzw. des Netzwerkes abhängt. Je nach Netzwerk bilden sich bei der Netzwerkanalyse die abgedeckten Flächen quasi „linear“ entlang einer Achse aus (Abbildung 3, linkes Beispiel) oder werden eher flächiger und „runder“ (Abbildung 3, rechtes Beispiel).und nähern sich so der Analyseergebnisse der Erreichbarkeitsradien an. Dieser Vergleich macht deutlich, dass die Wahl der Analysemethode für die Bewertung des ÖPNV-Angebotes von besonderer Bedeutung ist. Aufgrund des bundesweit zur Verfügung stehenden Netzwerkes inklusive der Berücksichtigung von besonderen Strecken für Fußgänger, werden die weiteren Analysen anhand von Netzwerkanalysen und somit mittels gerouteter Distanzen durchgeführt.

Diese Ergebnisse dienen als erste Indikatoren zur Beeinflussung des ÖPNV-Modasplit-Anteils. Ist eine Erreichbarkeit in den Flächen nicht gegeben, ist der ÖPNV als Alterantive zum Individualverkehr nur von untergeordneter Bedeutung. Ist die Flächenabdeckung jedoch gegeben, können weiterführende Analyse des Angebotes dazu führen, dass der ÖPNV eine höhere Bedeutung hat, was sich wiederum im Modalsplitanteil zeigt und somit in das FGSV Verfahren der Abschätzung des Verkehrsaufkommens einfliest. Weitere Indikatoren zur Beeinflussung des ÖPNV-Anteils befinden sich derzeit in Arbeit. Dazu zählen neben Kriterien der Verkehrserschließung und des Verkehrsangebots auch Eigenschaften der potentiellen Nutzergruppen, wie der soziodemographische oder sozioökonomische Status. Eine Überprüfung des erarbeiteten Einflusses auf den Modalsplit anhand von Erhebungen und Fahrgastzahlen bezüglich des tatsächlichen Fahrtenaufkommen im ÖPNV ist beabsichtigt.

3 MODELLERGEBNIS STELLA

Die dargestellten Analysen zur räumlichen Differenzierung des ÖPNV-Modalsplits fließen in die Berechnung des Verkehrsaufkommens des Modells STELLA ein. Das primäre gesamte Modellierungsergebnis dieses Ansatzes beschreibt für jedes Wohnquartier des gesamten Planungsgebietes „Deutschland“ das Potential der zu erwarteten Ladungen in Abhängigkeit von benötigter Ladeleistung und erwarteter Aufenthaltszeit. Dieses Ergebnis lässt sich auf einen modellintern-vergleichbaren Rang reduzieren und ordnen. Eine derzeit in Entwicklung befindliche iterative Berechnung kann die Reihenfolge und die benötigten Mengen an Ladeinfrastruktur im Planungsgebiet „Deutschland“ bestimmen. Die Iteration kann dabei durch variable Abbruchkriterien zur Flächendeckung und dem Bedarf beschränkt werden.

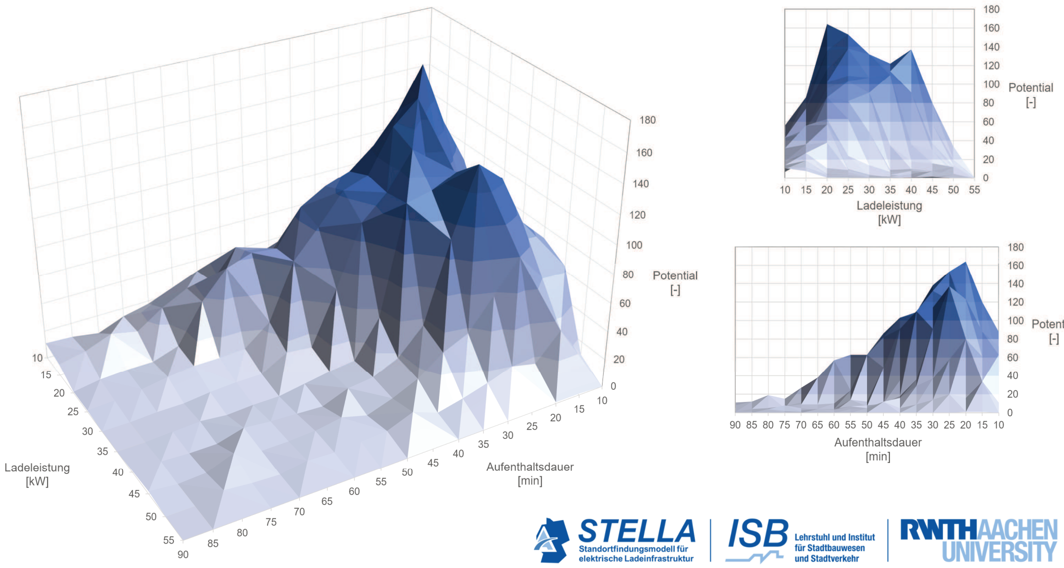

Abb. 4: Darstellung des Ladebedarfprofils eines Wohnquartiers [eigene Darstellung]

Das so geschaffene Standortfindungsmodell STELLA bildet ein Werkzeug mit breiter Anwendung bei den Planungsschritten der Verortung, Ausplanung und Bewertung einzelner zukünftiger oder bestehender Standorte oder Standortsystemen für Ladeinfrastruktur auf der Ebene der Wohnquartiere. Als Haupt-Zielgruppe für die Bedienung und Interpretation des Modellergebnisses sowie für eine gezielte Nutzung der breiten Palette an Indikatoren und deren Parametrisierung sind insbesondere Fachplaner im Fokus. Durch

Workshops und bei Bedarf noch zu erstellenden erweiterten Dokumentationen, ergänzt durch Interpretationsbeispiele, kann auch ein größerer Personenkreis das Werkzeug für die Planung anwenden.

4 LITERATURVERZEICHNIS

STMWI 2018: Leitlinie zur Nahverkehrsplanung in Bayern. Bayerisches Staatsministerium für Wirtschaft, Infrastruktur, Verkehr und Technologie (STMWI). Online verfügbar unter http://www.demografie-leitfaden-bayern.de/fileadmin/user_upload/demografie-leitfaden/dokumente/LEITLINIE98.pdf (abgerufen am 04.01.2018)

BBSR 2018: Raumabgrenzungen. Bundesinstitut für Bau-, Stadt- und Raumforschung (Hrsg.), online verfügbar unter http://www.bbsr.bund.de/BBSR/DE/Raumbeobachtung/Raumabgrenzungen/raumabgrenzungen_node.html (abgerufen am 02.01.2018).

BKG 2018: Open Data – Freie Daten und Dienste des BKG. Bundesamt für Kartographie und Geodäsie (BKG) (Hrsg.), online verfügbar unter http://www.geodatenzentrum.de/geodaten (abgerufen am 02.01.2018).

Boesch, H., 1989: Der Fussgänger als Passagier – Zugänge zu Haltestellen und Bahnhöfen. Institut für Orts-, Regional- und Landesplanung (ORL), ETH Zürich. ORL-Bericht 73/1989. Vdf-Verlag. Zürich.

DESTATIS 2015:. GV-ISys – Verzeichnis der Gebietseinheiten. Definitionen und Beschreibungen. Statistisches Bundesamt (Hrsg.).

DIN EN 13816: Transport-Logistik und Dienstleistungen. Öffentlicher Personenverkehr. Definition, Festlegung von Leistungszielen und Messung der Servicequalität. Deutsche Fassung EN 13816. 2002.

DDS 2014: Datenbeschreibung. PLZ8 Deutschland Grenzen, PLZ8 Deutschland XXL. Digital Services GmbH. Karlsruhe. 2014.

FGSV 1999: ÖPNV und Siedlungsentwicklung – Planungshilfe für die kommunale Bauleitplanung. Forschungsgesellschaft für Straßen- und Verkehrswesen e.V. (FGSV). Ausgabe 1999. Köln.

FGSV 2010: Hinweise zur Schätzung des Verkehrsaufkommens von Gebietstypen. Forschungsgesellschaft für Straßen- und Verkehrswesen e.V. (FGSV). Ausgabe 2006. Korrektur 2010. Köln. FGSV 147. ISBN 3-939715-06-9.

Flex, Florian; Greiving, Stefan; Milstein, Alexander; van Gemmeren, Christoph; David, Carl-Heinz, 2016: Steuerungswirkung und Handlungsfelder eines modernisierten Zentreale-Orte-Konzepts. Arbeitsberichte des ARL, Hannover.

Hegger, M., Dettmar, J., Meinberg, T., Drebes, C., Schulze, J., Sieber, S., Sylla, O., 2015: EnEff:Stadt – UrbanReNet Phase 2: Weiterführung und inhaltliche Vertiefung des Forschungsprojektes UrbanReNet – Vernetzte regenerative Energiekonzepte im Siedlungs- und Landschaftsraum. Schlussbericht. Fachgebiet Entwerfen und Energieeffizientes Bauen, FB Architektur, Fachgebiet Entwerfen und Freiraumplanung, FB Architektur, TU Darmstadt. Förderkennzeichen 0327832E. Gefördert durch Bundesministerium für Wirtschaft und Energie. Darmstadt

HERE 2017: Datensatz Deutschland, HERE International B.V. (HERE)

LEP o.J.: Anhang 2 – Zentrale Orte und Siedlungsschwerpunkte. Online verfügbar unter: https://www.landesentwicklung-bayern.de/fileadmin/user_upload/landesentwicklung/Dokumente_und_Cover/Instrumente/s067.pdf (abgerufen am 10.01.2018)

OSM 2017: Datensatz Openstreetmap. FOSSGIS e.V.

Trommer, S., Jarass, J., & Kolarova, V., 2015: Early adopters of electric vehicles in Germany unveiled. In Proceeding of the 18th International Electric Vehicle Symposium and Exhibition.

Schwarze, B., 2005: Erreichbarkeitsindikatoren in der Nahverkehrsplanung. Arbeitspapier 184. Institut für Raumplanung, Fakultät Raumplanung, Universität Dortmund. Dortmund.

UVEK 2011: Grundlagen für den Fussverkehr. Eidgenössisches Departement für Umwelt, Verkehr, Energie und Kommunikation (UVEK). Forschungsauftrag VSS 2000/368. Bundesamt für Strassen. Zürich.

VDV 2001: Verkehrserschließung und Verkehrsangebot im ÖPNV. Verband Deutscher Verkehrsunternehmen (VDV). VDV-Schrift 4. Ausgabe 06/2001. Köln.

VÖV 1981: Empfehlungen für einen Bedienungsstandard im öffentlichen Personenverkehr. Verband Öffentlicher Verkehr (VÖV). VÖV-Schriften 1.41.1. Verband Öffentlicher Verkehr, Köln.

VGN 2018: Verkehrsverbund Großraum Nürnberg (VGN). Internetpräsenz. Online verfügbar unter: http://www.vgn.de (abgerufen 04.01.2018)

Weidmann, U., 1992: Transporttechnik der Fussgänger – Transporttechnische Eigenschaft des Fußgängerverkehrs, Literaturauswertung. Institut für Verkehrsplanung, Transporttechnik, Strassen- und Eisenbahbau (IVT). ETH Zürich. Schriftenreihe des IVT Nr. 90. 1992. Zürich. https://doi.org/10.3929/ethz-a-000687810

Winter, O. M., 2005: Analyse und Evaluation von Nahverkehrsplänen und die Aufstellung von Kriterien zur Bewertung von Standardds im ÖPNV. Institut für Verkehrswesen Universität Kassel (Hrsg.). Schriftenreihe Verkehr. Heft 16. Juli 2005. Kassel. ISBN 3-89958-153-9.

reviewed paper

Regionalpark Murauen – ressourcenschonende, anrainergerechte Naherholung in wachsenden Stadtregionen

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1 ABSTRACT

Der globale Trend vom Zuzug in die Städte bzw. in das Stadtumland hält auch in der Stadtregion Graz an. Die Agglomerationszone um die Kernstadt Graz konzentriert sich aufgrund ihrer topographischen Beckenlage vor allem auf das südlich gelegene flache Grazer Feld und führt zu einer Verflechtung unterschiedlicher Nutzungsinteressen auf begrenztem Raum und somit zu einem ansteigenden Nutzungsdruck auf verbliebene Freiflächen. Speziell die Murauen stellen in der Stadtregion Graz ein attraktives Naherholungsziel für die Bevölkerung der angrenzenden Gemeinden dar. Der zunehmende Nutzungsdruck birgt jedoch zahlreiche Konflikte zwischen den Erholungssuchenden, den ansässigen Land- und Forstwirten, der Jägerschaft und dem Naturschutz. Diese wurden in den letzten Jahren durch die Errichtung von Wasserkraftwerken und die damit verbundene Verbesserung der Zugänglichkeit von vormals „abseits“ gelegenen Landschaftsräumen verstärkt. Am rechten Murufer wurden in den letzten Jahren als Ausgleich für den Kraftwerksbau zudem zahlreiche ökologische Maßnahmen gesetzt. Demzufolge ist in diesem Flußabschnitt Erholungsnutzung nicht erwünscht.

Im Rahmen des Projektes „Regionalpark Murauen“ (2013-2015) wurden die Akteure der Region in einen Kommunikationsprozess eingebunden, um die Potenziale der Freiräume zu erkennen und regionale Identitäten zu definieren. Gemeinsam wurden räumliche und thematische Handlungsschwerpunkte erarbeitet und Pilotprojekte für eine multifunktionale Entwicklung der städtisch geprägten Region initiiert.

Seither ist der Nutzungsdruck auf die erweiterte Stadtlandschaft weiter gestiegen und damit einhergehend die Notwendigkeit der Verdichtung von Besucherlenkungsmaßnahmen. Das aktuelle, vom Regionalmanagement Steirischer Zentralraum initiierte, Folgeprojekt „NaMUR Besucherlenkung Murauen“ soll daher in diesem Naherholungsgebiet vor den Türen von Graz eine sanfte Nutzung ermöglichen und die wachsenden sozioökonomischen und naturräumlichen Konflikte durch ein gezieltes interkommunales Kommunikations- und Konfliktmanagement abbauen. Am Projektende werden ein abgestimmtes Besucherlenkungskonzept, ein Maßnahmenplan sowie Vorbereitungen für dessen Umsetzung vorliegen.

Keywords: Besucherlenkung, Murauen, Konfliktmanagement, Regionalpark, Naherholung

2 REGIONALPARK MURAUEN

2.1 Ausgangslage und Zielsetzung

Auf die suburbanen Bereiche der Kernstadt und insbesondere das Grazer Feld und die Vorlandbereiche der Murauen lastet ein hoher Siedlungsdruck: immerhin wird für die Gemeinden des Grazer Feldes (südlich der Landeshauptstadt Graz) bis 2030 ein Bevölkerungszuwachs von ca. 30.000 EW prognostiziert und im Einzugsbereich des Projektgebiets (Standortgemeinden inkl. Stadt Graz) ein Anwachsen auf rd. 400.000 EW Gesamtbevölkerung erwartet. Im steirischen Zentralraum führt das anhaltend hohe Siedlungs- und Verkehrsflächenwachstum zu einem hohen Verbrauch an Freiflächen. Das (Nah-) Erholungspotenzial der vorhandenen Freiräume und Landschaften entlang der Mur im Süden von Graz - wie die Typuslandschaft Murauen (Landschaftsschutzgebiet 31) - und weiter hinaus in die Nachbargemeinden ist noch weitgehend ungenutzt. Hier liegen die Ansatzpunkte, um neue Qualitäten für diesen, durch hohen Nutzungsdruck gekennzeichneten Siedlungs-/Landschaftsraum, zu schaffen und in weiterer Folge attraktive Stadt-Landschafts-Räume zu entwickeln.

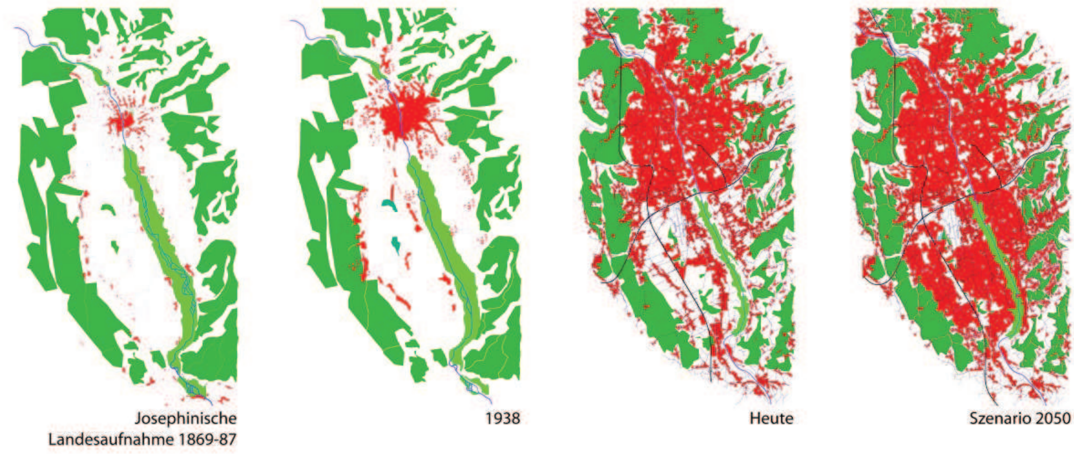

Abbildung 1: Entwicklungstrends im Grazer Feld, Quelle: eigene Bearbeitung

Ein „Regionalpark“ wird als ein Instrument der Regionalplanung für ein landschaftsbezogenes Regionalmanagement in Stadtregionen verstanden. Der Regionalpark Murauen fällt demnach nicht in die Kategorie naturräumlicher Schutzgebiete wie z.B. ein Naturpark oder Nationalpark (z.B. Donauauen), sondern ist in erster Linie ein regionales und interkommunales Kooperationsprojekt zur Schaffung einer landschafts- und freiraumbezogenen Erholungslandschaft, das auf hohen natur- und landschaftsräumlichen Qualitäten aufbaut.

Ein integrativer Entwicklungsansatz soll die klassischen Interessenkonflikte (Erholung, Naturschutz, Energie, Land- und Forstwirtschaft etc.) in Verdichtungsräumen ausgleichen. Vision und Anspruch eines Regionalparks liegen darin, den regionalpolitischen Stellenwert von Freiräumen und Landschaft durch die Betonung ihres Wertes als Erholungsraum der Bevölkerung und als weichen Standortfaktor für die Wirtschaft zu verbessern. Die Akteure der Region müssen zusammengeführt werden und gemeinsam die Notwendigkeit von Freiräumen und ihre Potenziale erkennen und entwickeln. Gemeinsam gilt es, die regionale Identität zu definieren.

Ein Regionalpark zielt daher darauf ab, den regionalen Freiräumen und Landschaften zwischen den Siedlungsräumen eine neue Qualität zu verleihen und dadurch die regionale Identität zu stärken. Dies soll nicht durch eine flächendeckende Gestaltung, sondern vielmehr durch eine strukturelle und punktuelle Anreicherung im Rahmen der gegebenen Nutzungen erreicht werden. So sollen die in diesem Raum bestehenden land- und forstwirtschaftlichen Nutzungen durch den Regionalpark weder verdrängt noch abgelöst werden. Mit kooperativ definierten, themenbezogenen Zielsetzungen soll eine multifunktionale Entwicklung der erweiterten Stadtlandschaft sowie eine Positionierung der Stadtregion im internationalen Vergleich (Stichwort „Stärkung weicher Standortfaktoren“) erfolgen.

Für den Regionalpark Murauen wurden im Rahmen eines Strategiekonzeptes Arbeitspakete und Maßnahmenbündel geschnürt. Folgende Aspekte standen dabei im Vordergrund:

- Definition von Zielsetzungen und Leitlinien für die Entwicklung der Landschaften und Freiräume
- Festlegen räumlicher und thematischer Handlungsschwerpunkte aus regionaler Sicht für einen definierten Umsetzungszeitraum (Funktionskonzept)
- Organisation des Regionalparks als Kooperationsplattform
- Aufbau eines Dialogforums (Kommunikations- und Konfliktmanagement) mit den regionalen Akteuren
- Impuls durch Pilotprojekte für ein nachhaltiges Management (Trägerschaft) der städtisch geprägten Region

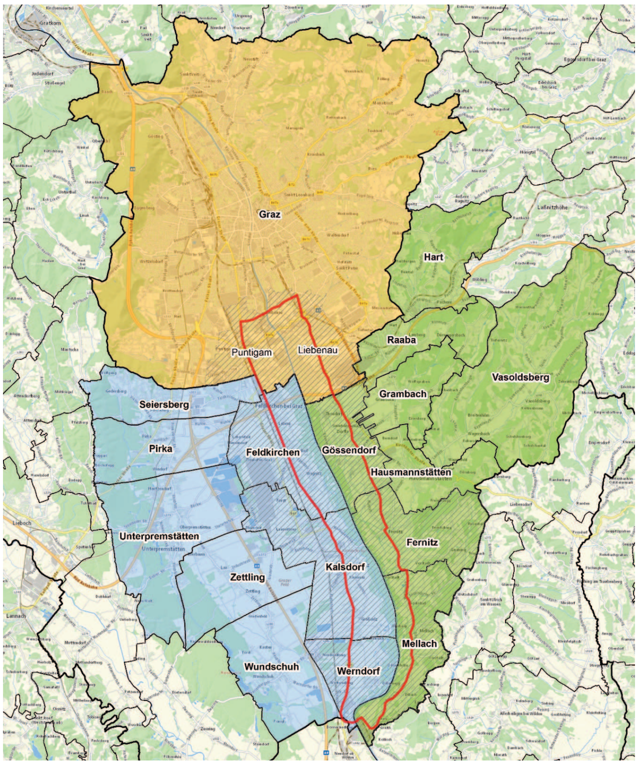

Abbildung 2: Regionalpark Murauen: Übersicht Standort- und Anrainergemeinden sowie engerer Untersuchungsraum, Quelle: eigene Bearbeitung

2.2 Projektstruktur

Die Regionale Projektgruppe stellte das Entscheidungsgremium für die strategische Umsetzung dar und war in die Struktur des Regionalvorstandes der Planungsregion Steirischer Zentralraum eingebettet (vgl. § 17a StROG).

Im Kernteam wurden maßgebliche inhaltliche Entscheidungen vorbereitet und diskutiert.

Die delegierten Vertreter der Standortgemeinden und die regionalen Stakeholder Naturschutz, Tourismus und Landwirtschaftskammer wurden zu Arbeitsgruppen zusammengefasst. In Workshops und Besprechungen wurden die relevanten räumlichen und thematischen Entwicklungspotenziale, Konflikte und Defizite diskutiert.

Die Einbindung der regionalen Stakeholder erfolgte durch Einzelinterviews anhand eines strukturierten Fragenkataloges und diente in erster Linie dazu, Nutzungsansprüche und -konflikte abzufragen. Die Inputs der jeweiligen Stakeholder wurden mittels Mindmap gebündelt und in einem Workshop diskutiert.

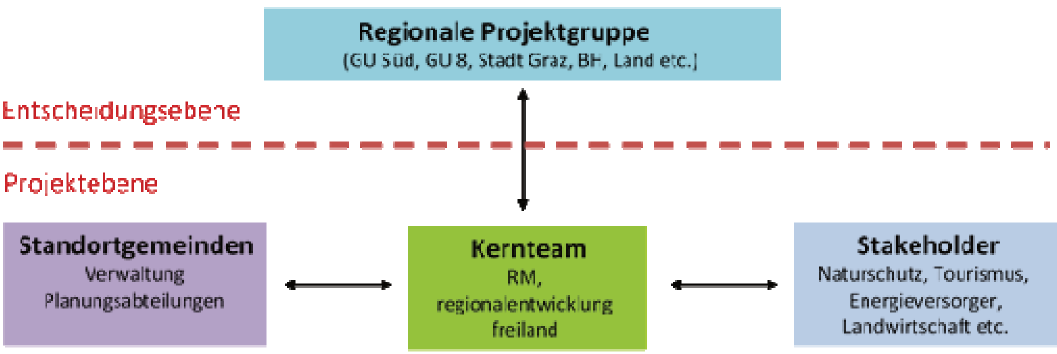

Abbildung 3: Projektstruktur Regionalpark Murauen, Quelle: eigene Bearbeitung

Durch diese Struktur wurde die folgenden Qualitätsziele erreicht:

- Optimierung der Problemlösungen durch Einbindung der Betroffenen und Ausgleich der Interessen
- Erweiterung der Handlungsspielräume und damit der Lösungsvielfalt
- Verbesserte Legitimation der Ergebnisse durch Transparenz der Entscheidungsprozesse

- Dauerhafte Verbesserung der Beziehungen zwischen den Beteiligten und Schaffung einer Vertrauensbasis für die Umsetzung der Ergebnisse

Mit der Einrichtung dieser Bearbeitungsstruktur wurde sowohl der Transfer des Wissens und der Ergebnisse in die Region sichergestellt als auch garantiert, dass Konflikte und einem Konsens entgegenlaufende Haltungen den Beteiligten offengelegt und behandelt wurden. Interessen, Wünsche und Ideen konnten frühzeitig in den Planungsprozess eingebracht und Konfliktpotenziale rechtzeitig erkannt werden. Durch Information und Diskussion sollte eine entsprechend hohe Akzeptanz bei allen Personen und Einrichtungen erreicht werden.

2.3 Projektziel: Regional Governance Kernstadt – Umland

Im Rahmen einer konstruktiven „Regional Governance“ bzw. im Rahmen des Koopertationsprozesses „Stadtregion 2014+“ zwischen der Kernstadt Graz und den – in Gemeindekooperationen vertretenen – Umlandgemeinden ergaben sich Chancen für eine neue Planungskultur.

Für den Regionalpark galten auf dieser Basis folgende Leitprinzipien:

- Regionale (Freiraum)Potenziale gemeindeübergreifend stärken und entwickeln;
- Lokale Stärken in den Gemeinden und Stadtteilen ausbauen und in einen regionalen Kontext bringen;
- Erreichbarkeiten und Zugänglichkeit (Erschließung / Besucherlenkung) steuern.

Die (Stadt)Landschaft und ihre Potenzialflächen sollten als Bindeglied zwischen Kernstadt und Umlandgemeinden dienen.

2.4 Strategiepapier „Regionalpark Murauen“

Der Planungsprozess „Regionalpark Murauen“ stellte sich in erster Linie als Kommunikationsprozess dar: alle wichtigen Voraussetzungen für einen Naherholungsraum waren bereits gegeben und der Landschaftsraum wird überdurchschnittlich gut von den Erholungssuchenden der Kernstadt und der Region angenommen. Was jedoch fehlte war eine entsprechende Bewusstseinsbildung und Wertschätzung in der Region – bei den Standortgemeinden, bei den Regionalen Akteuren / Grundbesitzern, bei den Nutzern (Land- und Forstwirtschaft, Jagd etc.) sowie insbesondere bei den Erholungssuchenden selbst.

2.4.1 Funktionskonzept

Die Murauen südlich von Graz gehören zu den Naherholungsgebieten des Grazer Zentralraumes. Im Gegensatz zu anderen Naherholungsgebieten, wie z.B. dem Leechwald oder Plabutsch / Buchkogel ist die extensive Freizeit- und Erholungsinfrastruktur (Wege und Plätze) hier jedoch gering. Die Vision Regionalpark Murauen möchte die Freizeit- und Erholungsmöglichkeiten steigern, um den hohen Besucherdruck landschafts- und anrainergerecht zu lenken; gleichzeitig jedoch die unterschiedlichen Nutzungsansprüche (Ökologie, Wirtschaft etc.) berücksichtigen und zu einem Wertausgleich zwischen unterschiedlichen Nutzungsgruppen beitragen. Die wirtschaftliche Komponente der Versorgung und Verpflegung der Gäste sollte zudem Anreize schaffen, unter der Dachmarke „Regionalpark Murauen“ zu agieren. Die regionsübergreifende Zusammenarbeit der Stadt und der fünf Gemeinden war Voraussetzung dafür, eine gemeinsame Identität das Ziel. Es galt, die Freiräume zur Freude der Bewohner und Gäste am Fluss aufzuwerten, um dem Wirtschaftsstandort Grazer Zentralraum ein „Grünes Rückgrat“ zu geben und sich dadurch im internationalen Wettbewerb als Region mit hoher Lebensqualität zu präsentieren.

Das Funktionskonzept definierte Leitlinien, unterstrich die Bedeutung von Grünverbindungen, zeigte landschaftsbezogene Aktivitäts- und Nutzungsintensitäten, skizzierte Entwicklungspotenziale und lieferte Vorschläge für Gestaltungsbereiche. Das Funktionskonzept diente den Beteiligten und handelnden Personen über räumliche Strategien zu diskutieren und in eine Interaktion mit der Bevölkerung zu treten.

2.4.2 Kommunikations- und Konfliktmanagement: Besucherlenkung als Konfliktlösung?

Man unterscheidet grundsätzlich zwei Ebenen bzw. Handlungsansätze zur Besucherlenkung:

- Die raum- und landschaftsplanerische Ebene, z.B. landschaftsräumliche Zonierung, Infrastrukturausbau, -angebote; sowie

- die Einzelmaßnahmen im Bereich der Umsetzung- bzw. Objektebene („sanfte“ Maßnahmen).

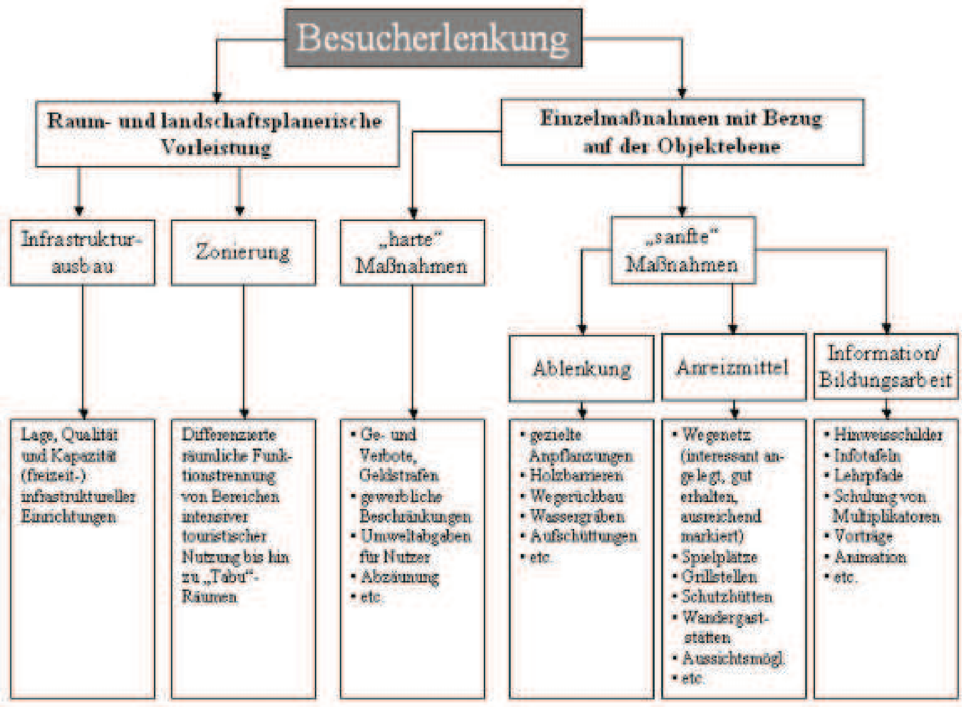

Abbildung 4: Konzept zur Besucherlenkung, Quelle: Scharpf 1998

Als wichtiger Baustein wird die Informations- und Bildungsarbeit genannt, diese stellt eine der größten Herausforderungen des künftigen Regionalparkbetriebes dar! Hinweisschilder und Infotafeln alleine werden nicht ausreichend sein. Naturpädagogische Angebote (Lehrpfade), Schulungen von Multiplikatoren, Patenschaften, Vorträge und Animationen müssen wesentliche Angebote einer Bewusstseinsbildung sein.

3 NAMUR – BESUCHERLENKUNG MURAUEN

Die Errichtung der Wasserkraftwerke an der Mur und der für deren Betrieb erforderlichen Begleitinfrastrukturen haben den ursprünglich wilden und unzugänglichen Naturraum weiter verändert. Gleichzeitig machen die Erlebbarkeit dieses Naturraums, die Vielfalt der Nutzungsmöglichkeiten, die gute Erreichbarkeit und die räumliche Nähe zur Landeshauptstadt Graz sowie zu den wachsenden Wohngebieten der Umlandgemeinden im Süden die Murauen zu einem attraktiven Ausflugs- und Naherholungsziel von regionaler Bedeutung.

Das vom Regionalmanagement Steirischer Zentralraum initiierte interkommunale Folgeprojekt „NaMUR“ soll zeitnah auf die aktuellen und zukünftigen Herausforderungen reagieren. Dazu wird ein Besucherlenkungskonzept partizipativ erstellt. Dabei werden die unterschiedlichen Nutzungsansprüche erörtert und entsprechende Lösungsmöglichkeiten erarbeitet. Ziel ist es, durch die gemeinsame Planung und den regelmäßigen Austausch die Qualität der Murauen-Landschaften hervorzuheben, ohne land- und forstwirtschaftliche Nutzungen zu verdrängen.

3.1 Abstimmungsprozess

Die Projektabwicklung erfolgt in regem Austausch mit dem Regionalmanagement Steirischer Zentralraum und den Standortgemeinden. Die assoziierten Partner des interkommunalen Entwicklungsvereines „GU-SÜD“, das sind die Energie Steiermark AG als Kraftwerksbetreiber und die Umweltanwaltschaft Steiermark wie auch Amtssachverständige aus dem UVP-Verfahren der Murkraftwerke Gössendorf und Kalsdorf beteiligten sich ebenfalls bereits im Planungs- und Abstimmungsprozess.

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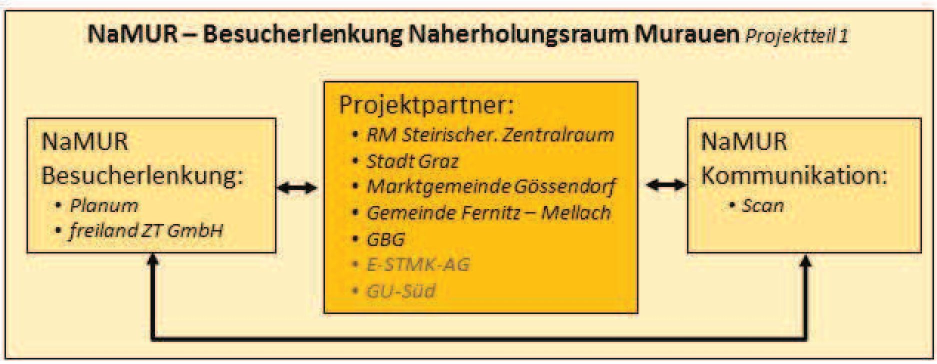

Abbildung 5: Projektbeteiligte NaMUR Projektteil 1, Quelle: eigene Bearbeitung

Im Projektgebiet der Murauen bzw. des Grazer Feldes manifestieren sich einige der „klassischen“ Herausfordungen an die Entwicklung von stadtregionalen Räumen:

- „große“ (Stadt Graz“) vs. „kleine“ (Umland) Gemeinden
- Einzel- (z.B. Grundbesitzer) vs. Gemeinschaftsinteressen (Öffentlichkeit)
- inhomogene Eigentumsverhältnisse (öffentlich / privat / große und kleine Strukturen)
- vielfältige thematische Nutzungsansprüche (Naherholung, Naturraum, Energie, Land- und Forstwirtschaft etc.) innerhalb eines Gesamtraumes
- teils fehlende Kompetenzen und Zuständigkeiten (über administrative und institutionelle Grenzen hinweg)

In Kernteamsitzungen, Einzelgeprächen, Arbeitssitzungen und Workshops wurde auf Basis einer umfassenden Bestandserhebung, durch Befragungen und Zählungen sowie durch Auswertung unterschiedlicher Datenressourcen ein einheitliches Bild des Gesamtraumes erarbeitet. Abgeleitet aus der Bestandserhebung wurden verschiedenen Maßnahmen zur Konfliktbereinigung und zur Weiterentwicklung sowie zum Management des Gesamtraumes erarbeitet und Umsetzungsprioritäten festgelegt.

3.2 Massnahmenempfehlungen

Die Massnahmenpakete umfassen Erholungs- und Erschließungsinfrastrukturen, Management und Regulierungsmaßnahmen sowie Beschilderungen und Leitsysteme. Dazu zählen beispielhaft:

- Fuß- und Radwegeausbau sowie -beschilderung
- Einbindung in das örtliche und regionale Fuß- und Radwegenetz
- Errichtung von Infopunkten und Rastplätzen an ausgewählten Standorten
- Freihaltung und Schaffung von Ruhezonen für ökologisch sensible Bereiche
- Verbesserung der Ver- und Entsorgungsinfrastruktur an „hot spots“ mit starken Besucherfrequenzen
- Liegenschaftsmanagement

Einzelne Maßnahmen sind gemeindeübergreifend, fallen in den Zuständigkeitsbereich des jeweiligen Grundbesitzers oder sind als Ausgleichsmaßnahmen im Zuge des Kraftwerkbaues durch den Betreiber umzusetzen.

3.3 Stadtregionales Commitment

Zur Realisierung des Regionalparks bzw. der derzeit in Erarbeitung befindlichen Folgeprojekte ist sowohl eine kommunalpolitische Verankerung und die Mitarbeit zahlreicher öffentlicher und privater Institutionen, wie auch die Unterstützung durch die Öffentlichkeit notwendig. Die politischen Vertreter der Standortgemeinden befürworten eine weitere gemeinsame und abgestimmte Vorgehensweise in Bezug auf die Evaluierung, Ausstattung und Entwicklung der Murauen als wertvollen Naherholungs-, Freizeit-, Natur- und Wirtschaftsraum.

Die Stadt Graz und die Grazer Umlandgemeinden bekennen sich mit einer kooperativen Vereinbarung zu einer gemeinsamen Weiterentwicklung dieses Raumes und begrüßen die wechselseitige Kooperationsbereitschaft.

Die Projektpartnerschaft mit den Zielen

- Aufbau einer regionalen Trägerschaft und Organisationsstruktur sowie
- Sicherung einer langfristigen Finanzierungsbasis

soll auf Augenhöhe erfolgen.

Das Stadtregionale Commitment „Murauen“ wird derzeit ausgearbeitet und soll dann im Sinne einer laufenden Stadt-Umland-Kooperation umgesetzt werden.

4 RESÜMEE UND AUSBLICK

Zusammenfassend kann für das Regionalparkprojekt festgehalten werden, dass die Herausforderungen weniger in der Neukonzeption und Neuerrichtung von Erholungs- und Erschließungsinfrastrukturen lagen, sondern primär in der Kommunikation des Nutzens („In-Wertsetzung“) als regionales Leitprojekt und in der Kommunikation des zunehmenden Handlungsbedarfes bei Konfliktmanagement und Besucherlenkung.

Um verschiedene Interessen vereinen und Nutzungskonflikte minimieren zu können, ist eine umfangreiche Bewusstseinsbildung notwendig. Besucher sollen ebenso auf die Bedürfnisse anderer Erholungssuchender, wie auch auf die der Grundbesitzer, Land- und Forstwirte sowie der Jägerschaft Rücksicht nehmen. Andererseits sollte den Bewohnern der Grazer Umlandgemeinden und der Kernstadt Graz, die oft in Umgebungen wohnen, in denen Frei- und Grünraum zusehends rarer wird, auch zugestanden werden, die Murauen für Erholung und Sport zu nutzen. Menschen haben das Bedürfnis nach Natur, nach Erholung und Entspannung. Kollektiv nutzbare Einrichtungen fördern die soziale Interaktion. Ein generelles Aussperren durch Verbote ist nicht das Ziel einer Besucherlenkung. Ein gezieltes Freigeben von Räumen und Wegen ist nicht nur sinnvoll, sondern auch notwendig.

Vision: Der Regionalpark Murauen im Jahr 2025…

…ist für die Kernstadt und Gemeinden des Grazer Feldes die Leitidee und Strategie einer gemeinsamen Freiraumentwicklung. Damit wird für künftige Generationen – und neu zugewanderte Bewohner – ein attraktives Naherholungsgebiet von regionaler Bedeutung mit vielfältigen Nutzungsmöglichkeiten für die Einwohner der Kernstadt Graz und den Umlandgemeinden gesichert;

…ist als Typuslandschaft Murauen durch die Vernetzung mit den Siedlungsräumen als „Grünes Band“ erlebbar: intensiver genutzte Erholungs- und Erlebnisbereiche (wie z.B. die Auwiese oder die Uferpromenade), sanft erlebbare Natur- und Landschaftsbereiche, landwirtschaftlich genutzte Flächen und Rückzugsräume wildlebender Pflanzen und Tiere bilden das Mosaik;

…zeigt die „Kontraste“ eines intensiv genutzten und vielfältigen Ballungsraumes: neben einer großteils intakten Aulandschaft existieren Infrastrukturanlagen (wie z.B. Kraftwerke, Wasserwerke, Kläranlagen, Verkehrsträger), Siedlungsräume und Agrarflächen (Ackerbau);

…ist räumlich gut vernetzt und auch ohne Auto erreichbar! Die Naherholungsschwerpunkte / -räume sind über ein gut ausgebautes Fuß- und Radwegenetz mit Quer- und Längsverbindungen auch für Familien sicher erreichbar;

…ist ein „Nichtkommerzielles Projekt“ d.h. die Erholungsflächen und Einrichtungen sind für alle Bevölkerungsgruppen ohne Benutzungsentgelte frei zugänglich;

…ist über Startschwierigkeiten hinausgewachsen - Nutzungskonflikte konnten durch spezifische Angebote minimiert sowie auf Basis einer Besucherlenkung und Aufsicht geregelt werden;

…ist ein Modellprojekt und trägt durch den permanenten Dialog mit den Gemeinden und den Stakeholdern (Grundbesitzer, NGO´s) wesentlich zu einer neuen regionalen Identität bei;

…ist auf Grundlage der Planung, Koordination und Projektbegleitung (Projektförderung) durch das Regionalmanagement Steirischer Zentralraum erfolgreich hervorgegangen;

…ist erfolgreich in Betrieb: Errichtung und Pflege, Pacht, Ankäufe etc. werden durch interkommunale Kooperationen finanziert; seine Existenz ist somit langfristig gesichert.

5 QUELLEN

AMT DER STEIERMÄRKISCHEN LANDESREGIERUNG, A16: Landesentwicklungsprogramm Steiermark - Verordnung und Erläuterung. Graz, 2009.

AMT DER STEIERMÄRKISCHEN LANDESREGIERUNG, A7: Regionales Entwicklungsprogramm der Planungsregion Graz/Graz-Umgebung. Graz, 2005.

AMT DER STEIERMÄRKISCHEN LANDESREGIERUNG, A7: Regionsprofil Steirischer Zentralraum. Graz, 2011.

AMT DER STEIERMÄRKISCHEN LANDESREGIERUNG, FA1C: Regionale Bevölkerungsprognose Steiermark 2009/2010. Graz, 2010.

ARGE IBV FALLAST & REGIONALENTWICKLUNG TISCHLER: Regionales Verkehrskonzept Graz/Graz-Umgebung. Graz, 2010.

BUNDESINSTITUT FÜR BAU-, STADT- UND REGIONALFORSCHUNG: Gartenstadt 21, Ein neues Leitbild für die Stadtentwicklung in verdichteten Ballungsräumen – Vision oder Utopie? Band 1 & 2. Bremen, 2017.

HESSE, Anja: Konzept zur Besucherlenkung im Distrikt Wahlerscheid des Nationalparks Eifel. Diplomarbeit. Bonn, 2004.

ÖSTERREICHISCHES INSTITUT FÜR RAUMPLANUNG (ÖIR): Raumtypisierung Steiermark. Wien, 2011.

SCHARPF, Helmut: Tourismus in Großschutzgebieten. in: Buchwald/Engelhardt (Hrsg.): Umweltschutz - Grundlagen und Praxis, Band 11, Freizeit, Tourismus und Umwelt, Economica Verlag, 1998.

SIEVERTS, Thomas: Zwischenstadt: zwischen Ort und Welt, Raum und Zeit, Stadt und Land. Bauwelt Fundamente 118, 1997.

Geodaten:

AMT DER STEIERMÄRKISCHEN LANDESREGIERUNG, GIS-STMK: Geodateninhalte für das Grazer Feld, 2013.

Rural Revival Financing in Serbia: Kikinda Municipality Case Study

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1 ABSTRACT

In Serbia, similar to other European countries, towns grow, while villages lose population and fertile land disappears. Identification of potential resources for rural revival financing represents a research challenge. The aim of this paper is to evaluate Kikinda municipal budget increase as potential financial resource for revival of villages around Kikinda. New communal company in Kikinda, formed recently by five old communal companies merging, not only provides good services, but also enlarges municipal budget.

In this paper, following Serbia rural features review, Kikinda Town and surrounding villages are briefly described. Prosperous village of Mokrin, once train station for the Orient Express, is presented in more detail. Then Kikinda Municipality budget is analyzed. Conclusion is that if the municipal budget surplus exists, small farming holdings can be financially supported to start modern food production. In Kikinda Municipality case, however, existing budget surplus is not sufficient for generous financial support yet.

Keywords: communal, revival, countryside, Kikinda, budget

2 INTRODUCTION

It is generally known that rural areas are losing population in Europe these days. People move from countryside into towns looking for better jobs, higher salaries, more infrastructure, comfortable housing, easier supply, developed social life. Many migrants try to retain links with their home villages in case they have to return. But empty villages around towns and abandoned houses in rural areas appear as evident proofs of excessive migration.

In all countries, villages produce goods for markets and agricultural industry. Since rural habitation frequent disadvantages are lack of infrastructure, chaotic building and poor sanitation, spatial and urban planning of the countryside becomes an imperative. Rural areas revival, very important both nationally and internationally, is difficult in recent days due to economic slowdown and resulting budget constraints.

3 SERBIA

3.1 Basic data

The Republic of Serbia (area 88,407. km2, population 7.12 millions) is a landlocked country situated at the crossroads of Central and Southeast Europe, covering the southern Pannonian Plain and the central Balkans (MRR, 2017). In relative proximity to the Mediterranean, Serbia is bordering eight countries (Hungary, Romania, Bulgaria, Macedonia, Albania, Montenegro, Bosnia, Croatia), four of them inside the EU.

Serbia is the United Nations (UN) member and military neutral state.Thanks to motorways (Corridors X and XI) and the Danube River (Corridor VII), Serbia is well connected with other countries (Deloitte, 2015). Belgrade, the capital of Serbia, ranks among the oldest and largest cities in Southeastern Europe.

Major sectors of Serbian economy are: agriculture, food, textile, automotive, construction, information and communication technology (ICT), tourism (Furundžić et al., 2017). Agricultural products (livestock, crop, and fruit) have good quality. The food industry is adequately developed. The textile industry has highly qualified workers and cooperates with the leading foreign garment brands. The Serbian automotive industry, with experienced workers, is in progress. Construction is focused on transport infrastructure and buildings in cities. Serbia is attractive spot for information and communication technology (ICT) industry. International tourism has important role in Serbia (SIEPA, 2017).

According to the World Bank (WB) and the International Monetary Fund (IMF), Serbia is an upper-middle income economy, with the service sector dominating, followed by the industrial sector and agriculture. The

Serbian state provides encouraging investment ambience offering Greenfield and Brownfield projects in all industries and favorable tax policy (MRR, 2017).

3.2 Rural Serbia

Serbia abounds in plains, hills and mountains. Each region of Serbia has specific geographical characteristics that determine favorable farming activity (Gulan, 2017). Serbia has diverse agricultural production due to its favorable land and climate. In agricultural production 70% is from the crop field production, and 30% is from the cattle production (VRS, 2010).

Modern Serbia is one of the largest providers of frozen fruit to the EU, especially to the French and German market (RAS, 2017). Serbia is world's second largest producer of plums (after China), second largest producer of raspberries (after Poland), and also significant producer of maize (ranked 32nd in the world), and wheat (ranked 35th in the world) (FAO, 2018). Agricultural production is exceptionally developed in Vojvodina, Northern part of Serbia, on the fertile Pannonian Plain.

In recent times, big hypermarkets control the price of food. Hypermarkets organize export and import of food, raw materials, machinery and equipment. Small farmers cannot compete with big hypermarkets. The goal is to find a way for sustainable development and to make active small farmers to operate locally.

3.3 Urbanization of Serbia

More than 80% of Serbian population lived in villages before the Second World War. After this war people moved towards towns, Serbia urbanizes rapidly and number of inhabitants living in urban settlements continually increases (Table 1).

Year	1953	1961	1971	1981	1991	2002	2011
Urban inhabitants [%]	22.5	29.8	40.6	46.6	51.2	56.4	59.4

Table 1: Percentage of inhabitants living in urban settlements in Serbia (Compiled by the authors, source: SORS, 2014)

According to the "2011 Census of Population" (SORS), in urban settlements – being 3.6% of all settlements in Serbia – live 59.4% of total population (Table 1). During period 2002-2011, countryside population decreased, from 43.6% to 40.6% of total population of Serbia (Table 1). These days, for the first time in the history of Serbia, countryside population has fallen to below 3 million (RSAPG, 2012).

Year	1961	1971	1981	1991	2002
Number of settlements	80	140	280	487	713

Table 2: Settlements in Serbia with less than 100 inhabitants (Compiled by the authors, source: SORS, 2014)

Population decline in Serbian villages is obvious (Table 2), particularly in small villages near the border. Only villages close to industrial towns, which enable employment, succeed to retain young people.

4 KIKINDA

4.1 Municipality of Kikinda

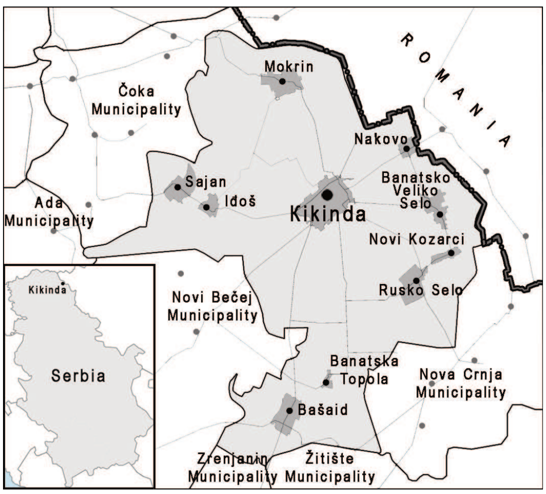

Figure 1: Kikinda Municipality map (Redrawn, source: JPKZS, 2015)

Kikinda is a town and a municipality (Figure 1) located in the Banat district, in Vojvodina - autonomous province of Serbia. Kikinda Town and 9 villages in its surrounding constitute Kikinda Municipality. The town of Kikinda, with circa 38000 population, is economic and social centre of North Banat (Table 3).

Total area	783 [km^2]
Agricultural area (2013)	70 538 [ha]
Population (2011)	59 453
Number of population per 1 km2 (2011)	76
Population average age (2011)	42.4
Natural increase per 1.000 inhabitants (2014)	– 6.8
Number of employees (2014)	13 679
Number of employees in agriculture (2011)	9 181

Table 3: Kikinda Municipality data (Compiled by the authors, source: SORS, 2014)

Kikinda is very close to Romanian border (only 10 km), Hungarian border (65 km), and located 130 km from Belgrade, the capital of Serbia. The town is connected by rail with the Romanian border, with Subotica, and with Belgrade via Zrenjanin. Also, a dock for waterway industrial transport by Danube – Tisa – Danube Canal is passing through Kikinda Municipality. Similarly to other Serbia regions these days, number of inhabitants declines in Kikinda Municipality (Table 4).

Year	1991	2002	2011
Number of inhabitants	69 709	67 002	59 453

Table 4: Number of inhabitants in Kikinda Municipality (Compiled by the authors, source: SORS, 2014)

4.2 Town of Kikinda

Kikinda, established as a modern settlement in the 18th century, is a well planned town (Ilijašev, 2002) with wide streets orthogonally laid, a central square, city hall, churches, public edifices, and market. Town urban infrastructure is adequately developed and allows flow of people, goods, water, energy, and information.

Banat's fertile farmland ensured successful agriculture and existence of natural raw materials provided the development of industry in the 1980s, before Yugoslavia broke down. Both agriculture and industry were devastated almost completely during the transition process which was long lasting (Furundžić et al., 2017).

4.3 Villages around Kikinda

Kikinda Town is surrounded by 9 villages (Figure 1). Among them, Mokrin is the largest village (Figure 2).

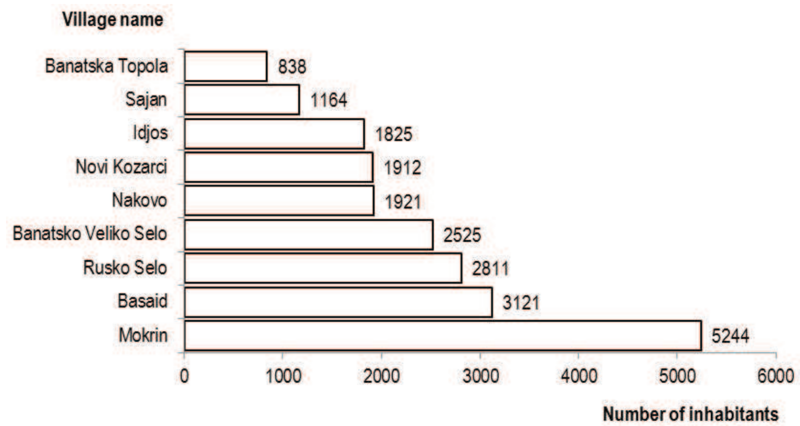

Figure 2: Number of inhabitants in villages of Kikinda Municipality (Compiled by the authors, source: KO, 2011)

Kikinda Municipality area has capacity for farming of wheat, sunflower seeds, soybean, fruit and vegetables. But villages of Kikinda Municipality are close to the border and faraway from large towns with developed industries and markets. Therefore countryside inhabitants, especially young people, leave villages and migrate towards towns.

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Years	1953-1960	1961-1970	1971-1980	1981-1990	1991-2001	2002-2011
VILLAGE	[%]					
Banatsko Veliko Selo	+0.10	-1.78	-0.78	-0.61	-0.29	-2.08
Banatska Topola	+0.86	+5.31	-2.24	-1.36	-1.11	-3.01
Basaid	-0.11	-1.06	-1.08	-0.32	-0.60	-1.27
Idjoš	-0.87	-1.17	-0.83	-0.33	-0.36	-1.94
Mokrin	-0.06	-0.78	-1.09	-0.41	-0.57	-1.28
Nakovo	-0.53	-1.74	-0.84	-0.31	-0.39	-2.55
Novi Kozarci	+0.12	-1.77	-1.39	-0.70	-0.80	-2.03
Rusko Selo	-0.58	-0.78	-0.46	-0.41	-0.48	-1.85
Šajan	-0.51	-1.62	-1.79	-0.62	-1.29	-1.56

Table 5: Villages of Kikinda Municipality - Change of population in percent [%] during time (Compiled by the authors, source: BS, 2011)

Figure 3: Abandoned houses in villages (Fig.3a: Šajan / Fig.3a: Idjoš / Fig.3a: Nakovo) (Source: ASRCC, 2017)

Number of inhabitants decreases in villages (Table 5), and subsequently in Kikinda Municipality (Table 4). Abandoned houses in villages (Figure 3) are visible result of contemporary village-to-town migration process. On the other side, village of Mokrin is flourishing and represents instructive example.

5 MOKRIN

5.1 Village of Mokrin

Figure 4: Mokrin village map (Redrawn, source: JPKZS, 2015)

Village of Mokrin (Figure 4) is connected by roads with Kikinda and neighboring villages. Old railway from Szeged to Timisoara passes Mokrin and Kikinda (Figure 4). Three airports (Belgrade, Timisoara, and Budapest) are not far from Mokrin.

Mokrin is the largest village in Kikinda Municipality (Figure 2), in the North Banat region of Serbia. Today Mokrin has over 5000 inhabitants and, because of that, it belongs to larger villages in Serbia (RIS, 2008).

In this paper, Mokrin is described in more detail as the most prosperous village in the municipality of Kikinda. Farming, rural life and everyday activities in Mokrin can be example for other villages in Serbia.

5.2 Past Mokrin

Figure 5: Old Mokrin (Fig.5a: Serbian church, 1898 / Fig.5b: Fiacre, 1927 / Fig.5c: Salash, 1930) (Source: Mokrin Museum, 2017)

Good location of Mokrin enables village increase and development in the 19th century. The Orient Express – luxury passenger train created in 1883 with terminals in Paris and Constantinople (Istanbul) – stopped in Mokrin to tank soft water (Lazić, 2002).

Old Mokrin is in Figure 5 presented by 3 photographs: Serbian church, fiacre, and salash. Serbian Ortodox Church (Fig.5a) in Mokrin is built in 1898.

Image of fiacre (Fig.5b) is taken at Mokrin's street in 1927. Fiacre is four-wheeled horse-drawn carriage. (Word "fiacre" is created in French after Hôtel de St. Fiacre, inn in Paris where such carriages were first for hire in 17th century. This French word is unchanged transferred into English.)

Image of salash (Fig.5c) of Grastića & Badrljica is taken about 1930. Salash (in Serbian: salaš, originated from Hungarian: szallas) is solitary farm with economic buildings, livestock and tools.

5.3 Modern Mokrin

Figure 6: Modern Mokrin (Fig.6a: Mokrin House (Terra Panonica) / Fig.6b: Shadoof - Ethno House Djeram / Fig.6c: Geese Fight) (Sources: NOVOSTI, 2017; EKD, 2017; MH, 2017)

Modern Mokrin is in Figure 6 presented by 3 photos: Mokrin House (Terra Panonica), Ethno House - Garden, and Geese Fight.

Mokrin House (Fig.6a) is a part of cultural and tourist complex named Terra Panonica (Land Pannonian). This complex in Mokrin is a space for work and living, planned for designers, freelancers, entrepreneurs, and digital nomads. Mokrin House is a modern and urban spot in the rural environment (MH, 2017). Terra Panonica complex supports tourism and helps local community to sale genuine Mokrin’s products (rolled leaf cheese, quince brandy, goat milk soap). It also helps local farmers to educate themselves on different subjects, such as organic food production, cooperation developing, state funds allocation, or EU funds applying (ALJ, 2013).

Ethno House Djeram with shadoof (Fig.6b) in garden is a country house built in rural style in 1925 (EKDj, 2017). The shadoof (in Serbian: djeram) is a device used for raising water, consisting of a long suspended rod with a bucket at one end and a weight at the other. Today Ethno House Djeram has tourist facilities (restaurants, accommodation rooms, and playground) established comprehensively for recreation and various cultural activities (art colonies, concerts, folk dances).

Mokrin today has two tournaments, active over 25 years (MH, 2017). The first tournament Geese Fight (Fig.6c) (in Serbian: gusanijada) is registered by UNESCO as the world competition of geese.

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The second tournament Striking Easter Eggs (in Serbian: tucanijada) is annual tournament on Easter Sunday by the Julian Calendar. One rival holds an Easter egg in his hand, while another rival hits it with his own Easter egg. The egg which remains whole wins and the cracked egg belongs to the winner.

5.4 Living standard in Mokrin

INCOME IN MOKRIN			
AGRICULTURAL	[%]	NON-AGRICULTURAL	[%]
Sale of fodder products	50	Pension for employment work	45
Sale of milk	30	Pension for agriculture work	15
Sale of fattened cattle	10	Salary for current work	30
Sale of fattened pigs	10	Social assistance	10
TOTAL	100	TOTAL	100

Table 6: Population income - expressed as percent [%] of the total [100%] (Compiled by the authors, source: RIS, 2008)

Income of population in Mokrin, expressed as percent [%] of total income [100%], is presented in Table 6. The income can be: agricultural, or non-agricultural. Mokrin agricultural income comes from production of fodder, milk, cattle, and pigs. On the other side, Mokrin non-agricultural income comes from pension, salary, and social assistance (i.e. government provision for unemployed, injured, or aged people).

LIVING STANDARD IN MOKRIN			
ABOVE AVERAGE HOUSEHOLD 20 %	- Salary or pension - Tractor (2 pieces) - Most of farm machinery - Cattle *over* 20 head - Arable land *over* 10 ha - Seasonal workers	*AVERAGE* HOUSEHOLD 40 %	- Salary or pension - Tractor - Some of farm machinery - Cattle *up to* 20 head - Arable land *up to* 10 ha - Seasonal workers
OLD-AGE HOUSEHOLD 30 %	- Pension - Cattle up to 5 head - Arable land renting - Workers shortage	*SINGLE* HOUSEHOLD 10 %	- Pension - Cattle 1 or 2 head - Arable land renting - Workers shortage

Table 7: Households living standard - expressed as percent [%] of the total [100%] (Compiled by the authors, source: RIS, 2008)

Living standard of households in Mokrin, expressed as percent [%] of the total [100%], is categorized in Table 7. Household denotes a house and its occupants regarded as one unit. Living standard of household can be: above average (20 %), average (40 %), old-age (30 %), and single (10 %). Division is made on the base of salary, pension, tractor, machinery, cattle, arable land (RIS, 2008). Here arable land is land capable of being ploughed and used to grow crops.

According to the categorization compiled (Table 7), living standard of 60 % of inhabitants in Mokrin is average or above. Countryside life and work tradition is preserved in Mokrin. Population mainly sells fodder products, fruit, milk and dairy products, fattened cattle and pigs. In contrast to other villages around Kikinda, young people do not leave Mokrin.

5.5 Opportunities in Mokrin

Village of Mokrin is the biggest and the most developed in the Kikinda Municipality. Agriculture has tradition, which young farmers continue. Mokrin's genuine products are easy to sell.

Rolled leafy cheese is distinguished as famous Mokrin brand and finds the buyers in Serbia and abroad. The art of making this cheese, using an old recipe, is kept by many women in Mokrin (ASN, 2016).

Non-farm activities in Mokrin include transport, construction, repairs, trade, household manufacturing, handicrafts, community and personal services in the village.

Dead and alive nature is wealthy in Mokrin. There are oil fields in village region (RTS, 2017). According to that fact, route of gas pipeline connecting Serbia and Romania is adopted not long ago.

Great Bustard (in Latin: Otis Tarda, in Serbian: velika droplja) is rare bird specie threatened with extinction. The remaining bastard population in Serbia is located in northern Banat, in open steppe named Pastures of Great Bustard (UZVD, 2017). Part of these pastures is in the vicinity of Mokrin.

Coming of visitors encourage the development of tourism. Many rural households are transformed into accommodation capacities, which favorably influence the development of ethno tourism.

Many spectators visit Mokrin during two annual tournaments – Geese Fight Striking and Striking Easter Eggs. Mokrin also has a polygon for competition of horses. Mokrin House is suitable for conferences and seminars. Ethno House Djeram offer accommodation to tourists, children, and bird-watchers (EKD, 2017).

Mokrin residents recognize importance of investing in agriculture, machinery modernization, farmers education, traditional skills maintenance, genuine products promotion, local identity affirmation, and strengthening of local community.

Communal infrastructure improvement and development in Mokrin, however, requires Kikinda Municipality financing. Lack of sewage is the biggest problem in Mokrin. Public Company "Kikinda" (Furundžić et al., 2016a), recently established, comprehends Mokrin demands and provides better water chlorination process.

6 RURAL REVIVAL MUNICIPAL FINANCING

6.1 Communal merging in Kikinda

On the base of Kikinda utilities substantial analysis, the first author of this paper designed novel organizational structure of single public company for communal services (Furundžić et al., 2016a). Activities of 5 Public Companies (5PC) are merged into the activity of compound Public Company Kikinda (PCK). Communal services, being split into 5 companies, merging into 1 company join together real estates, resources, equipment, staff, knowledge, management (Furundžić et al., 2016).

In addition to finances, the new PC Kikinda establishment through the merging process, managed with a systems approach, enables the layout of a modern company with a matrix structural organization (Furundžić et al., 2016a) and corporative management of utility services and other business.

6.2 Merging economic echo

Five communal public companies merging feasibility can be estimated by comparison costs of these five companies (5PC) and PC Kikinda (PCK). As a matter of fact, cost is one of the key economical factors for each company. The cost has a crucial impact on business success and company development.

Unfortunately, cost comparison of relevant companies (5PC and PCK) is not possible in reliable and trustful manner. This costs non comparability is because relevant company's financial statements are not done in a single way and meaningful comparison of costs is impossible.

OUTFLOW	BEFORE MERGING Five companies (5PC) 2014 (state)		AFTER MERGING PC Kikinda (PCK) 2016 (state)		DIFFERENCE (5PC–PCK)
	Cash [million €]	Share [%]	Cash [million €]	Share [%]	Cash [million €]
Operating activities	5.410	73	2.745	83	2.665
Investing activities	1.838	25	396	12	1.442
Financial activities	0.162	2	0.180	5	-0.018
TOTAL	7.410	100	3.321	100	4.089

Table 8: Cash outflow of Five companies (5PC) & PC Kikinda (PCK) (Compiled by the authors, sources: BSP, 2014; ITG, 2016)

In order to evaluate feasibility of communal companies merging, cash outflow before and after merging is scrutinized. In Table 8, the cash outflow of the Five companies (5PC) – in the time before merging and with available data for 2014 (BSP, 2014), is compared with the cash outflow of the compound company (PCK) – in the time after merging and with available data for 2016 (ITG, 2016).

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The compound company (PCK) planned cash outflow (€2.477×106 total) (Furundžić et al., 2016, p.168, Table 4) is smaller than PCK real cash outflow (€3.321×106 total) (Table 8). Consequently, between the Five companies (5PC) and the compound company (PCK) planned difference (5PC–PCK) (€4.933×106 total) is bigger than real difference (€4.089×106 total).

As it can be seen (Table 8), Five companies (5PC) realized total outflow (€7.410×106) is higher, for respectable difference (€4.089×106), than PC Kikinda (PCK) total outflow (€3.321×106). In other words, outflow difference (5PC–PCK = €4.089×106) presents remarkable 55% of outflow (5PC = €7.410×106) before merging. Operating activities outflow reduction produces that difference.

Five communal public companies (5PC) merging into one compound communal public company (PCK) is economically approved in Kikinda case. After merging, lower operating activities outflow provides fund for investing activities, such as revival of villages.

6.3 Municipal financing of rural revival

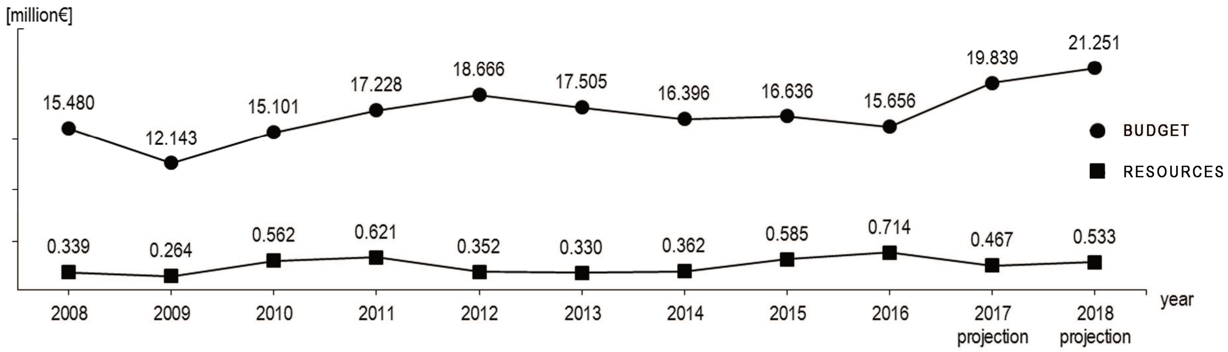

Figure 7: Kikinda Municipality budget expenses and resources from the budget (Compiled by the authors, sources: OZRBOK, 2008-2015; OZRBGK, 2016; OIDOBGK, 2017; OBGK, 2018)

Year		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017*	2018*
Share in budget	[%]	2	2	4	4	2	2	2	4	5	2	3

Table 9: Participation in the city budget (* denotes: projection) (Compiled by the authors, sources: OZRBOK, 2008-2015; OZRBGK, 2016; OIDOBGK, 2017; OBGK, 2017)

Current and investment costs of rural local community, such as Mokrin village, are provided both from local self-funding funds and from the Municipality Budget.

Municipality of Kikinda budget expenses and resources from the budget are shown in Figure 7, while appropriate share of resources in [%] are given in Table 9 (where, for example, in 2016 is: $0.714/15.656=0.0456 \approx 5$ %). Resources from the budget, created after communal merging process, can be used for future rural revival in Kikinda Municipality.

#	PROJECT	PERIOD [year]	VALUE [million €]
1	Roads in municipality – maintenance	2018-2020	1.288
2	Pedestrian trails in villages – maintenance	2018	0.145
3	Mokrin – technical design preparing	2017-2020	0.165
4	Mokrin and Idjoš – investment in building	2016-2019	0.037
5	Rural development – subsidies	2018	0.164
6	Agricultural policy – grants	2018	0.745
		TOTAL	2.544

Table 10: Kikinda Municipality investments plan for local communities projects (Compiled by the authors, sources: OBGK, 2017)

Investment plan of Kikinda Municipality for supporting project of local communities is presented in Table 10. In this table, six projects are concisely described and appropriate period of project realization and value of the project are given.

It can be concluded (Table 9) that from the budget for the operation of local communities Kikinda Municipality allocates an average of 3% (i.e. an average of €470,000.). If we compare this average (0.470 million €) with planned local comuinities demands (Table 10), it is obvious that resource from the budget is insufficient for rural revival of Kikinda villages and funds have to be increased both locally and municipally.

7 CONCLUSIONS

Serbia is a country of diverse rural potential. Each region has distinctive and various geographical characteristics and, for that reason, agricultural opportunities are also large and diverse. Agriculture in Serbia is at the heart of the economy and is an engine for development of rural areas. Also, agriculture is the most important export sector in Serbia. Urban planning and regional development in Serbia task is to protect rural natural features and to preserve long-lasting agricultural tradition of the Serbian peasant.

Global trend of migration from villages to towns did not bypass Serbia. Looking for better jobs, wages, infrastructure, housing, supplying, entertainment, and other important things, people leave countryside, and abandoned houses remain as monuments of the past.

Rural areas revival is very important, both nationally and internationally. Crucial mission is to stop migration of countryside inhabitants. Villages have to become attractive again to young people. Urban planning of infrastructure, houses and spaces in villages and intensive building is an imperative task. But this is difficult task in recent days due to economic slowdown and resulting financial constraints.

Agricultural potential of Serbia deserves protection. Regional and local action changes village's depopulation and degradation. Basic task is the municipal budget strengthening. When budget surplus exists, small farming holdings can be supported financially and encouraged to start modern organic food production. Introduction of new tools, fertilizers and harvesting techniques results in increased productivity and agricultural prosperity.

The subject of this paper is rural revival financing in Serbia. Following Serbia brief description, Kikinda surrounded with nine villages is presented. Flourishing Mokrin village, where fertile farmland of Banat ensures successful agriculture is described in more detail. Then economic echo of five communal companies merging into one compound communal company is analyzed. Budget surplus relocation to rural revival financing is encouraged.

Presented Kikinda Municipality case study shows that resources from the municipal budget are insufficient to revive rural life. Villages should acquire their own resources and add them to resources granted from the budget.

Prosperous Mokrin Village represents an instructive example how own resources can be achieved. Countryside life tradition is preserved in Mokrin. Population sells fodder products, fruit, milk and dairy products, fattened cattle and pigs. Mokrin's genuine products, such as famous rolled leafy cheese, are easy to sell in Serbia and abroad.

Non-farm activities in Mokrin include household manufacturing, handicrafts, and personal services in the village. Coming of visitors to Mokrin encourages the development of ethno tourism. Many rural homes are transformed into accommodation facilities.

Mokrin residents recognize importance of investing in agriculture, machinery modernization, education, traditional skills, genuine products, local identity affirmation, and ethno tourism developing. As a result of that, young people do not leave Mokrin.

8 REFERENCES

ALJ: Al Jazeera Balkans. Sarajevo, 2017. <http://balkans.aljazeera.net/blog/mokrin-novi-regionalni-kulturni-centar> (Dec. 10, 2017)

ASN: Agro Smart. Novi Sad, 2018. <http://www.agrosmart.net/selo/mokrinski-sir-stize-druge-kontinente.html> (Dec. 10, 2017)

ASRCC: Archive of Service - Records, Calculation and Debt Collection. PC Kikinda, Kikinda, 2017.

BS: Broj Stanovnika. [Number of Inhabitants.] Statistical Office of the Republic of Serbia. Belgrade, 2017. <http://www.brojstanovnika.cu.rs/opstina/kikinda> (Dec. 27, 2017).

DELOITTE: Guide for Investing in Serbia, 2015. <https://www2.deloitte.com/content/dam/Deloitte/rs/Documents/tax/Guide_for_investing_in_Serbia.pdf> (Dec. 27, 2017)

EKDj: Etno kuća Đeram. [Djeram Etno House.] Mokrin, 2017. <http://www.etnokucadjeram.com/o-nama.html> (Dec. 10, 2017)

FAO: Food and Agriculture Organization of the United Nations. Rome, 2017. <http://www.fao.org/countryprofiles/ index/ en/?iso3=SRB> (Dec. 10, 2017)

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FURUNDŽIĆ, D.S., IVANIŠ, D., FURUNDŽIĆ, B.S.: Primer organizacije objedinjenog komunalnog preduzeca. [Integrated Communal Company Organization Case.] 4th International Conference Contemporary Achievements in Civil Engineering, Conference Proceedings, Subotica: Faculty of Civil Engineering, 2016a, pp. 779-784.
FURUNDŽIĆ, D.S., JAKŠIĆ-KIURSKI, D., PETROVIĆ, I.: Communal Companies Merging as Smart Approach: Kikinda Town in Serbia Case Study". In: REAL CORP 2016 Proceedings, (Reviewed Paper), Schwechat: CORP, 2016, pp.161-170.
FURUNDŽIĆ, D.S., FURUNDŽIĆ, B.S., VUJOVIĆ, V., IVANIŠ, D.: Investment Opportunities in Serbia: Kikinda Case Study. In: Places and Technologies 2017 Proceedings, Sarajevo, 2017, pp. 57-67.
GULAN, B.: Država i selo. [State and Village.] Makroekonomija, Beograd, 2017 <http://www.makroekonomija.org/poljoprivreda/drzava-i-selo/> (Dec. 10, 2017)
ILIJAŠEV, B.: Kikinda, vekovi prolaze - grad ostaje. [Kikinda, Centuries Pass – Town Remain.] Istorijski arhiv, Kikinda, 2002.
ITG: Izveštaj o tokovima gotovine, 2016. [Cash Flow Statement,2016.] JP Kikinda, Kikinda, 2017.
JPKZS: Javno preduzeće Kikinda - Operativni plan rada zimske službe. [Public Company Kikinda – Winter Service Work Plan.] Kikinda, 2015, str.39. <http://www.jpkikinda.rs/images/ UserFiles/File/ delatnosti/ zimskasluzba/ Operativni%20plan%20rada%20Zimske%20sluzbe.pdf> (Dec. 10, 2017).
KO: Kikinda-Onilne. Official site of Kikinda Municipality, Kikinda, 2007. <http://www.kikinda.org.rs/index.php?language= cir> (Dec. 27, 2017).
LAZIĆ, V.: Pruge i vozovi u Vojvodini. [Rails and Trains in Vojvodina.] Kulturno-istorijsko društvo Pčesa, Novi Sad, 2002.
MH: Mokrin Hause. Mokrin, 2017. <http://www.mokrinhouse.com/about-us/> (Dec. 10, 2017)
MRR: Market Research Reports. USA, 2017. <https://www.marketresearchreports.com/countries/serbia> (Dec. 10, 2017)
NOVOSTI: Novosti, RS. Beograd, 2017. <http://www.novosti.rs/vesti/naslovna/reportaze/aktuelno.293.html:658727-Vojvodjanske-price-Megdan-belih-musketara> (Dec. 31, 2017).
OZRBOK: Odluka o završnom računu budžeta opštine Kikinda (2008-2015). [Decision on the Final Account of the Budget of the Municipality of Kikinda (2008-2015).] Kikinda, 2015. <http://www.kikinda.org.rs> (Feb. 25, 2016).
OZRBGK: Odluka o završnomi računu budžeta grada Kikinda (2016). [Decision on the Final Account of the Budget of the Town of Kikinda (2016).] Kikinda, 2016. <http://www.kikinda.org.rs> (Nov. 25, 2017).
OIDOBGK: Odluka o izmenam i dopunama Odluke o budžeta grada Kikinda (2017). [Decision on Amendments to the Decision on the Budget of the City of Kikinda (2017).] Kikinda, 2017. <http://www.kikinda.org.rs> (Dec. 25, 2017).
OBGK: Odluka o budžetu grada Kikinda (2018). Kikinda, 2017. [Decision on the budget of the city of Kikinda (2017). Kikinda, 2017.] <http://www.kikinda.org.rs> (Dec. 31, 2017).
RAS: Razvojna agencija Srbije. [Development Agency of Serbia.] Belgrade, 2017<http://ras.gov.rs/en> (Dec. 10, 2017)
RIS: Rural Info Serbia. [Mreža za podršku ruralnom razvoju.] ID karta sela Mokrina, 2008. Ministarstvo poljoprivrede, trgovine, šumarstva i vodoprivrede. Beograd, 2017. <http://www.ruralinfoserbia.rs/karte_sela/nk/mokrin.pdf> (Dec. 31, 2017).
RSAPG: Radna snaga i aktivnosti poljoprivrednih gazdinstava. [Labor Force and Activities of Agricultural Holdings.] Republički zavod za statistiku. Beograd, 2012.
RTS: "Kvadratura kruga – Mokrin" (Emisija). ["Circle Square - Mokrin" (Broadcast).] Radio televizija Srbije, 25.02.2017. <http://www.rts.rs/page/tv/sr/story/22/rts-satelit/2639883/kvadratura-kruga-mokrin.html>
RZS: Republički zavod za statistiku. [Statistical Office of the Republic of Serbia.] Beograd, 2017. <http://www.stat.gov.rs/WebSite/Default.aspx> (Nov. 05, 2017)
SIEPA: Invest in Serbia Info Pack. Serbia Investment and Export Agency (SIEPA). Belgrade, 2015.
SORS: 2011 Census of Population, Households and Dwellings in the Republic of Serbia. Statistical Office of the Republic of Serbia, Belgrade, 2014. < http://popis2011.stat.rs/?page_id=2134&lang=en > (Dec. 27, 2017).
SYBRS: Statistical Year Book of the Republic of Serbia 2011 - Agriculture. Vlada Republike Srbije, Beograd, 2010. <http://www.media.srbija.gov.rs/medsrp/dokumenti/stgs-poljoprivreda2010.pdf> (Dec. 10, 2017)
UZVD: Udruženje za zaštitu velike droplje. [Great Bustard (Otis Tarda) Protection Association.] Mokrin, 2017. <http://www.velikadroplja.rs/rs/rezervat/polozaj> (Dec. 10, 2017)
VRS: Vlada Republike Srbije. [Government of Republic of Serbia.] Beograd, 2010. <http://www.media.srbija.gov.rs/medsrp/dokumenti/stgs-poljoprivreda2010.pdf> (Dec. 10, 2017)

reviewed paper

Smartphone and Mobile Territories - Technical Knowledge Transformed into an Object Producing New Territorial Layers: An Experience in the City of Strasbourg

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1 ABSTRACT

The “smartphone” is one of the individualized technical objects of the 21st century. This object is like a tool for socio-spatial reading of the territories thanks to the Internet of Things. The integration of geolocalised information with the Internet of Things opens the way to apprehend actual heritage of the cities in different ways.

The relationship between digital and physical mobility in mapping physical territories in a sensitive way has been investigated only in a few studies and there is controversy about its predictors. Therefore we aimed to investigate the relationships between the invisible and non-visible elements of territories and users with their networks. We hypothesized that the circulations of 10 participants during 7 days in Strasbourg would enable us to trace a sample of images of the collective memory of the city relevant to its architecture and urbanity.

The study is done by sending screenshots of the applications in use in the public space for at least three times in a day during a period of 1 week in the city of Strasbourg. The participants recorded also their daily journeys during this week via applications "Open GPS Tracker" or "Open GPX Tracker" (two open source applications). At the end of each day, they sent us both screenshots and open tracker gpx files of their journey and a total of 70 journeys were analysed. Afterwards the paths of the participants with their digital activities have been correlated by superimposing cartographically physical places frequented and digital activities carried out on each journey. By digital activities we considered all activities related to the use of smartphones, these activities may be related to the internet or not but they are categorically achievable through smartphones (messaging, communications applications, entertainment, etc.).

We observed that the flow elements, such as public transport, constituted a good physical place where the diversity of digital activities was increased. Furthermore we saw that the nature of the subject's presence in the public space (rest, passage, movement via the different systems of transport, etc.) was associated with his/her digital movements. Moreover, some physical locations were more appropriate for digital activities than the others interestingly.

Our work with a modest sample offered clues of the emergence of these new layers by the use of technological devices. Global computer knowledge is transformed into a mobile technical object and shared worldwide via smartphones. These objects are not just mere results of global knowledge, but they also produce socio-territorial knowledge by revealing the relations between the invisible or non-visible elements of territories and users. In other words, the people’s digital and physical mobility with new individualized objects forms new layers of territories that we name Mobile Territories. We found and illustrated with many attractive examples, for the first time, that the nature of the digital activities of the participants is shaped according to their physical location and own speed. And vice-versa, the physical location appeared to be augmented according to digital activities. By establishing connections between the digital activities and physical location, we understood that the both are moving in accordance with their relationships.

Possible readings of the morphological and social characteristics of cities via layers of Mobile Territories, the consequences and the effects of these invisible layers would be remarkable for planners and architects.

Keywords: digital activities, Strasbourg, mobile territories, new territorial layers, smartphone

2 INTRODUCTION

The Smartphones entered into our lives as an object producing urban layers. At the base of its evolution, it is undeniable that the term Big Data has had a great importance. The Big Data is like the petrolium oil of the 21st century. The smartphone is a product which follows the interdisciplinary logic of the term and is a phenomenon that we call Big Data, at the same time (Diebold, 2012).

Pronounced by Weiss and Indurkhya (1998) in computer science and by Diebold (2000) in statistics/econometrics, this phenomenon of Big Data accompanies the evolution of the use of the smartphones and enriches it. The unpublished research note by Douglas Laney highlighted that we can rethink the concepts of the Big Data (volume, velocity and variety) through the smartphones (Laney, 2001). The smartphone is one of the individualized technical objects and builds a new urban relationship (Picon, 2014). It regulates the data of the hidden city information, creates computer data and gives meaning to all these while linking the lives of the individuals with the technical systems. But the digital activities of mobile territories created by the smartphones are not fully discovered.

Our goal was to explore some of these links created by the smartphones using the cartography of the city of Strasbourg and the principles of the Big Data phenomenon built the baseline of our research.

3 RELATED WORK/ STATE OF RESEARCH

The smartphone has been mainly worked as an individualized technical object that connects individuals like a social condition (Hatuka, 2014) via an environment of a digital technology. It has always been at the meeting point of the physical and digital environment while being integrated in both of them. However, these two environments are two worlds which are not the parts of the same system. Therefore they are not totally compatible with each other.The smartphone was determined by the human choice that has tried to achieve the best possible compromise between two worlds (Simondon, 1958, 2012; Mizuko, 2004; Beaude, 2012). The associated environment of smartphones was considered as a set of human relations traversing mostly two social environments (the physical and the digital environments).

Muziko introduced physical territories as an object to work with associated smartphone environments for the first time. She highlighted the need to have common ground where everyone can get out from their protected areas and communicate with each other. According to her, the relationship between the public and the private sector is still in the center of many stratification and classification systems. It is not sufficiently evaluated but the smartphones enabled this relationship in some way (Muziko 2004). The relationships established by smartphones between the public and the private sector have overlapping economic, social, cultural and political dimensions and a clearly visible physical manifestation, perhaps more than any other form of the structures of the city.

Besides, Hatuka continued to work on the public-private relations created by smartphones as a social condition and took up the Muziko's ideas without being linked to the formal dimension of structure of the city. She suggests that the smartphone is building a mostly portable territory. Its mobility depends on the physical mobility of the people who own this object (Hatuka 2014).

But the smartphone is not only portable/mobile but it builds the mobile territories while being at the same time one of the parts of these territories. It is not only a social but also an urban physical condition that has many consequences for the economic, social, political and cultural dimensions of the urban territories. These territories produced by smartphones are physical, real and belong to the real world as well as to the digital world. They travel from the concrete to the abstract world and then return to the concrete world to finish their journey. These journeys are framed by smartphones which are the technical objects being in a continual state of transformation (Simondon 2012) and directly affecting the architecture and urban practices of our territories.

The trajectories of the mobile territories can be detected through digital traces (Beaude 2012 and 2014). There are many studies investigating digital traces in a way related to the mapping of physical territories. Among these researches, we can mention the studies interested in the rhythms of the cities, and the emotions, the various multiple representations (thanks to the augmented reality), the modelings as well as the limits and the different spatial consequences of the models of these rhythms. The smartphone, as an individualized technological object, has always been used in these studies but it was not always at the center of the work as a part of the Internet of Things.

In regard to the city's rhythms, the work of Miranda et al. , in the Tandon School of Engineering's Center for Data Science, mainly proposed an analogy between the recurrent processes in a city and the heart rate of a human body. Their Project Urban Pulse studied the human activity through empirical measurements related to the daily lives of citizens in the Rockefeller Center (NYC) and Alcatraz Island (SF) by using the phone calls and letters. In this study, the digital traces of the citizens were a part of the measures established by the researchers. (Miranda et al., 2017).

The exploitation of digital traces was also used to work cartographically the emotions of the citizens in face of the rhythms of cities. The citizens were considered as sensors in various studies (Martino et al., 2010; Resch 2013; Zeile et al. 2016). Resch emphasized the model of innovative concept (called People as Sensors by him) in which measurements were taken by using the technical objects combined with individual measures such as subjective sensations, current perceptions or personal observations of citizens (Resch 2013). The smartphone was actually an instrument capable of creating new forms of collaboration and participation. Thus it may allow experiencing each individual as a node in a network of sensors (Martino et al. 2010). Moreover, the place of augmented reality must also be emphasized in graphic representations of the rhythms of the cities. Some authors gave a general overview of augmented reality techniques while showing the possible use cases in the fields of architecture and urbanism (Zeile and Bronchart 2014).

The Senseable City laboratory of The Massachusetts Institute of Technology (MIT) focused on modeling city beats by the uses of mobile phones that interacted with the urbanity and architecture. The cartographic modelings of the rhythms via the digital traces have been experimented. The experiences of "Mobile Landscape Graz in Real Time (Ratti et al., 2006)" and "Tweet Bursts: Quantifying mass excitement in social media (Ratti et al., 2014)" can be mentioned among different researches that have studied physical territories in connection with mobile phones. In both experiments, the goals were to understand the technologically oriented urban dynamics of the daily life and to open new ways to understand the contemporary city using mapping. On the other hand the experience of Mobile Landscape Graz in Real Time showed that even if the phone activities were put in connection with the city the distribution of different digital activities on the city is unclear. In the Tweet Bursts study, the aim was to understand people's reaction to a single event - which occurs in a specific place - being a part of a specific digital activity: he use of the Twitter. The limits of the cartographic modeling were reached in connection with the spatio-temporal patterns of the mobile phones (Ratti, Claudel, 2015, Kondor et al., 2017). The different consequences of these modelings were also explored in different disciplines such as medicine (Vanky et al., 2017) and computer science (Constantino et al., 2017). Eric Fischer modeled for the first time, the project "280 Million Tweets" revealing geographic usage of mobile phones using different operating systems (e.g. android, ios…), where he collected the tweets (by Twitter) during one week. Then he showed cartographically the data that he got from 130 cities of the world (Fischer 2010).

The works cited above let us realize that the cartographic modeling of the different digital activities is still not completely studied. That’s why we focused on the digital activities of mobile territories created by the smartphones in order to understand the modeling system of urban rhythms limited in the urban open spaces. Our purpose was to give an integrated image of mobile territories by geolocating and analyzing one or more digital traces.

4 STUDY SET-UP

The interactions between the virtual places and the territorial places sheltering traditional infrastructures are not well investigated. Therefore we focused on the relationships of the invisible elements (urban layers) of the virtual places and the non-visible elements (urban layers) of both the virtual and territorial places. Our aim was to understand the characteristics of these relationships and the urbanity produced by the emergence of mobile territories. The main questions that we wanted to answer is how the interaction of these territories with multiple characters could cause changes in the architecture of public spaces and the urban practices, and how virtual spaces could compete with the traditional infrastructures?

For the purpose of investigating the questions above, we were interested in matching the digital activities and the physical territory, and in having access to these systems. Our methodology was based on the research of their interactions with the smartphones by following the spatial logic of the Simondon’s philosophy (Simondon, 2012). The points of interaction of the activities of the smartphones with the city of Strasbourg have constituted the trunk of the research.

4.1 Methods

4.1.1 The cartographic analysis

To begin our cartographic work, we have scanned the experiences of representations of the previous data generated by the smartphones (Ratti et al. 2006, 2017; Yoshimura et al. 2014). Thereafter, we referred to the project "280 Million Tweets" (Eric Fischer 2010); we drew a time "t" of the possible location of the mobile territories created by the smartphones in the city of Strasbourg (Fig.1). We also showed the different operating systems (Android and iOS) used in the physical limits of the city (Fig.1a). We linked one of the flow elements of the territory to the new territories created by the smartphones (Fig 1b). In other words, we assembled the Strasbourg's public transport system with the new urban layer of the mobile territories.

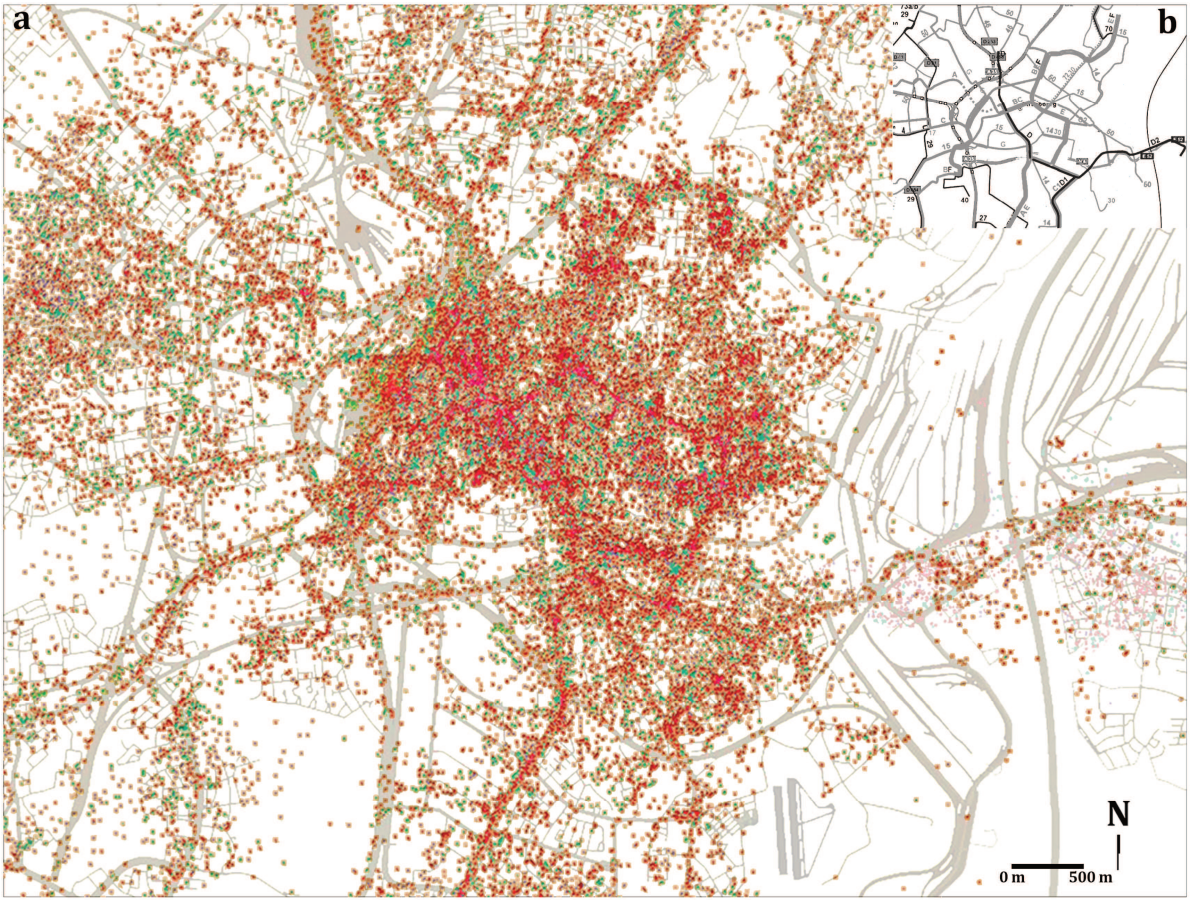

Fig. 1: Mobile territories and flow elements in the city of Strasbourg*.

*Mobile territories are based on the computer data retrieved from Eric Fischer's project and represented at the time t, t = $\sum_{i=1}^{7} a_1$, for a = day of the week.

The digital traces of smartphones are formally represented in the Figure 1. It gives us an idea of the configuration of the trajectories of the mobile territories on the physical territory of Strasbourg. This configuration seems to be consistent with the network of public transport in Strasbourg. This map giving a first view of the city of Strasbourg, is in accordance with the phenomenon of spatial transduction reported by Simondon (Simondon 2012). The digital activities of the smartphones and physical displacements on the territory come into resonance following this transduction which is representable by the invention of the cartographic dimension. The visuality in urbanism of Söderström (Söderström 2000) and the comprehension of the space via the images described by Lussault (Lussault 2003) inspired also our study design.

4.1.2 The collection and the interpretation of the data

A total of 10 citizens of Strasbourg agreed to participate in our study. Each participant recorded his/her daily journey via the Open GPX Tracker (Ios) or Open GPS Tracker (Android) applications executed by their smartphones, for a period of 7 days. This application did not only record the location (Von Landesberger et al., 2016) but also the speed of the participants and the duration of the journeys. While using the Open GPX / GPS Tracker application, participants took the screenshots of the other current applications at least three times a day when they were in a public area of the city of Strasbourg. The examples of screenshots are given in Figure 2.

The temporal data of the GPX/GPS Tracker application of an exemplary day were superimposed with the precise moment of taking the screenshots. These overlays provided us the places where the screenchots were taken. We explored cartographically the spatial transduction phenomenon specific to mobile territories: the digital activities and the courses of the participants, considering some recent studies (Wu et al. 2016, Sleipness et al. 2016). The mobile territories were assessible by using the superposition of these spaces. The reading of the data was done by the open source program "QGIS 2.18"(2004-2016 QGIS Development Team/General Public License).

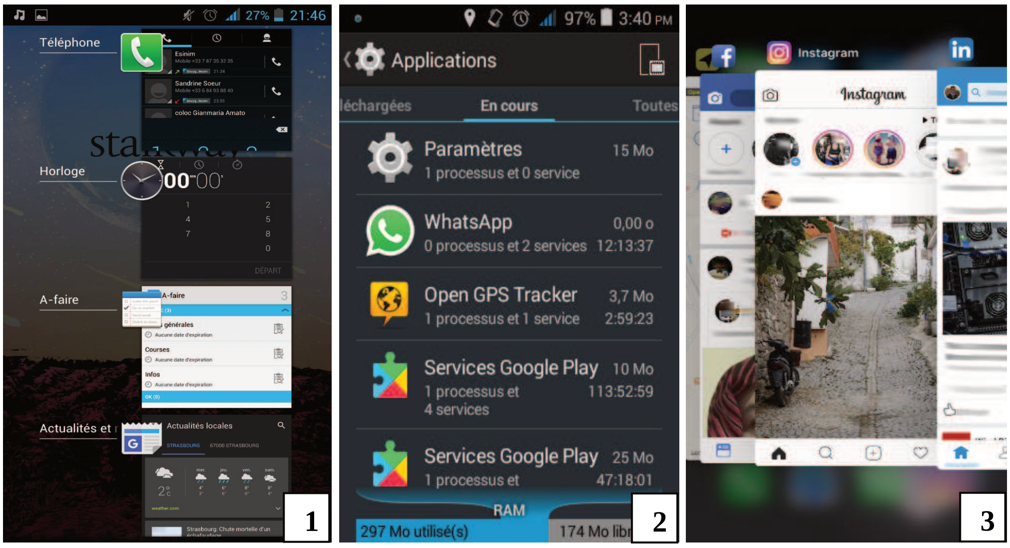

Fig. 2: The examples of screenshots: The first and the second belong to the smartphones having an Android operating system (less used than the third one); the third one from both operating systems (Android and IOS) is one of the mostly taken screenshots.

4.2 Findings

In this article we present the data of four representative journeys made by the 4 different participants. We want to reveal the results of a small scale (the scale of one journey per participant), then the results of the scale of Strasbourg. The journeys 2 and 3 (Fig.4, Fig. 5) of these four journeys were realized within the island ellipse of the city of Strasbourg. The first (Fig. 3) has touched the limits of the ellipse bounded by the Rhin. The fourth, the last journey which is chosen for this paper (Fig 6) has crossed remarkably the limits of the ellipse of the island.

4.2.1 The four representative journeys and Mobile Territories

In each journey, we found logic for the weekdays and also for the weekend. We saw that the week days were similar to each other for every participant which may be related to going to the work or to the school . It is undeniable that weekend days were more interesting. We realized a high flexibility in the journey of the participants during weekend; this flexibility nourished our work in order to better understand the logic of mobile territories within the limits of Strasbourg's physical territory.

The first journey (Fig.3) is a student's one and was recorded during a week day. During the whole journey the participant moved by walking. His/her has journey begun from his/her home to the library in the square of République. Digital data were communicated via a smartphone with an Android operating system. The screenshots were taken in the inside of the home, in the inside and the outside of the National University Library and finally in the square of Marché Gayot (Table 1). An application for the communication (The Whatsapp), for the navigation and research on the Internet (the Chrome), for the leisure and the work (the Youtube) and for e-mailing (the Gmail) built the main body of the various digital activities of this journey.

The second journey (Fig.4) was at the limits of the island ellipse of Strasbourg. It was made during a weekend day. We have understood that the participant took the tram (A or D) to go from his home to the place of the old synagogue and then he walked in the street Noyer. The screenshots have been taken from

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the outside of the home, on Street of Noyer and at Kléber Square by a smartphone with the Ios operating system. An application for the navigation and research on the Internet (The Chrome), for leisure (the Google Play Music) built the main body of the various digital activities of this journey.

Fig. 3- Fig. 4: The cartography of the journey 1 and 2. The physical paths are correlated with the digital activities in the city of Strasbourg.

The third journey (Fig. 5) is one of to young active people. He/she stayed in the inside of the island ellipse of Strasbourg during the days of the week (he/she was working). This exemplary journey was realized during a day of the week. The displacements of the whole journey were entirely made by bike. The screenshots were taken in a public space near to the home and near the Kléber Square This square was next to the work of the participant. We have understood, from the data in the Gpx file obtained through the Open Gpx Tracker application (Ios Operation System), that the screenshots were made at the breaks when the participant was immobile. An application for the leisure (The Instagram), for communication (the Whatsapp), for the leisure and work (the Youtube), for the research and navigation on the Internet (the Chrome) and for the leisure with actualities (the Google News app) built the main body of the various digital activities of this journey.

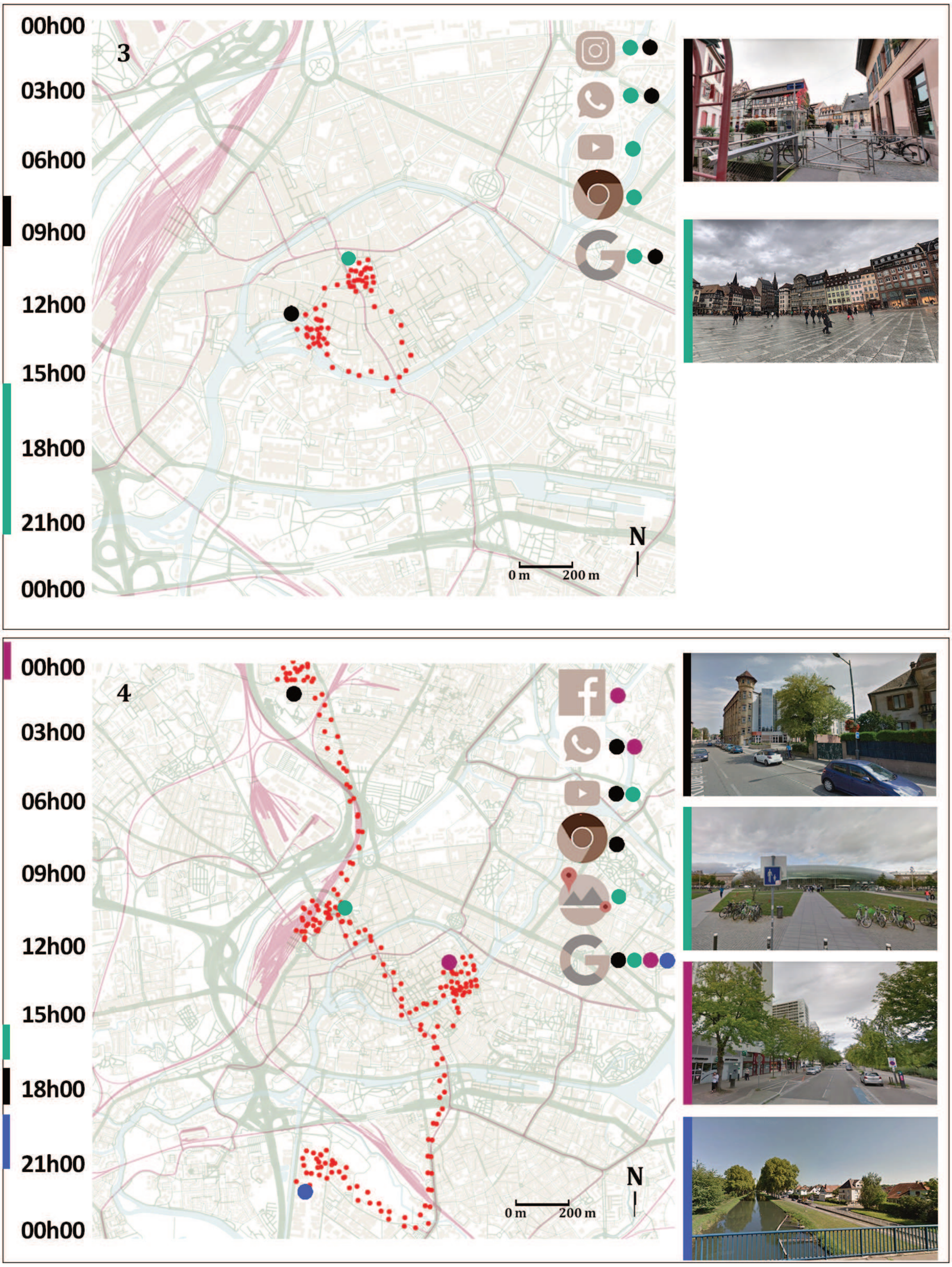

Fig. 5- Fig 6: The cartography of the journey 3 and 4. The physical paths are correlated with the digital activities in the city of Strasbourg.

The fourth journey (Fig. 6 is one of a young active person's. He/she passed through the ellipse island of Strasbourg during the days of the week. Digital data was communicated via a smartphone having an Ios

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operating system. The journey of the day was made by the tram (A or D) from the Esplanade District to the Central Station and from the Central Station with the bus line 71 to the Bischheim District. After a break in the Bischheim the participant went to the Meinau by taking the same bus line and then the tram (A or D). This day was one of the most marked days by travel. The screenshots showed that there was a significant diversity in the digital activities. An application for the leisure and the communication (The Facebook), for the communication (the Whatsapp),for the leisure and the work (the Youtube), for the research (Le Chrome) and for the leisure and navigation (Le Google Navigation app) built the main body of the various digital activities of this journey.

Number of Journey	Date	Distance (km)	Duration (h:s:ss)	Average (km/h)	Frequented places	Period of time
#1	25/07/2017 (UTC+02:00)	2.0	21.04.18	0.1	District of "Haras"(1), "République" Square(2), "Marché Gayot" Square (3)	00:00:00-13:34:13(1) 14:09:02-17:36:30(2) 17:42:05-19:03:26(3) 19:22:16-21:04:18(1)
#2	28/10/2017 (UTC+02:00)	1.5	19:22:53	0.2	"Corbeau"Square (1), Street of "Noyer"(2), "Kléber" Square(3), City center(4)	00:00:00-15:13:29(1) 15:29:14-16:34:42(2) 16:40:22-18:08:02(3) 18:16:19-19:22:53(4)
#3	02/11/2017 (UTC+02:00)	1.2	22:45:59	1.0	District of "Petite France" (1), "Kléber" Square (2)	00:00:00-08:55:10(1) 09:03:00-21:10:23(2) 21:32:28-22:45:59(1)
#4	13/10/2017 (UTC+02:00)	20.1	21:43:44	0.9	Esplanade(1), Neudorf(2), Esplanade(3), Station area(Gare de Strasbourg) (4), "Halles" Square(5), Bischheim(6), Meinau(7)	00:00:00-00:24:05(1) 00:29:44-12:36:48(2) 12:50:17-13:43:00(3) 13:52:03-15:17:39(2) 15:23:15-15:37:15(3) 15:59:05-16:03:04(4) 16:14:07-16:20:04(5) 16:36:11-18:11:09(6) 19:03:26-21:43:44(7)

Table 1: The details of the 4 journeys chosen for the paper. These data are retrieved from the GPX files sent by the participants at the end of each day.

By looking at these 4 examples of journey, we can estimate the spirit of the remaining journeys (66 journeys). And also we can identify two states conditioning the nature of mobile territories, created by smartphones.

The first state is the state of action. It is possible to be part of the physical networks of the territories via a walking journey. In this state we can interact directly with the existing physical territorial system. The second state is the state of inertia. It is directly linked to the possibility of being part of these territorial physical networks by using public transport, cycling or driving a car. In this second state the citizens follow the system established by the authorities of the city. The interaction with the city is conditioned by the presence of the physical limits.

During the state of action (a walk for example), our participants became a part of the networks of the city. Because they converted themselves into a network inside the city of Strasbourg. We saw a perfect match of the themes between the destinations of the physical places and the nature of the digital activity. The example of the first journey, seen in the Figure 3, was correlated with the logic of the state of action, where the participant browsed the internet to do specific research inside of the National Library. Furthermore in the second journey (Fig.4), we discovered that the physical activity of shopping from one of the famous stores of France was accompanied by the research of the products of this store on the smartphone, interestingly.. These findings showed us the correspondence of the nature of the physical place and the digital activity.

The pause of any action in the urban or landscape public space is also one of the elements of the state of action. The third and fourth journeys (fig.6) are the examples of this fact. The pause in the open public space means the leisure, the communication and relaxation for both of the digital activities and physical displacement.

During the state of inertia, the participants were in a network system. In other words they were inside the flow elements of the city of Strasbourg and their displacements were experienced as a pause in the Inside of these elements. Thus it was possible to see the digital activities of the recreation and the communication in the public transport. The fourth journey constitutes a good example where the participant was interacting with a leisure application during his/her tram trip from the Esplanade District to the Central Station. We also noted that cycling (second journey) and driving, being among the flow elements, were not very conductive to a possible interaction with digital activities; in the other words, for the birth of mobile territories.

4.2.2 The general appearance of the Mobile Territories and New Territorial Layers in the city of Strasbourg

In this study, we observed that the city's filled places (closed spaces), empty places with amenity qualities (open public spaces) and the interior spaces of the flow elements (public transport) were strategic locations for the birth of the mobile territories in the city of Strasbourg (Fig.7).

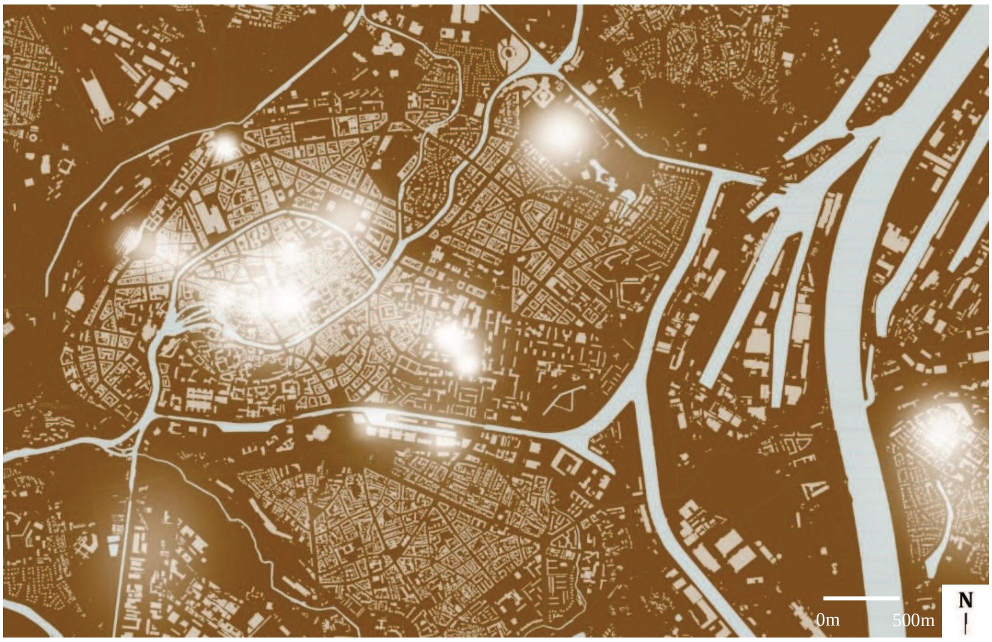

Fig. 7: The cartography of the directional layers of the Mobile Territories based on our results in the city of Strasbourg.

Finally we combined the cartography of the directional layers of the Mobile Territories and the physical places of the city of Strasbourg (Fig 7). These physical places hosted a wide variety of digital activities and by this way new layers of mobile territories were added to the existing urban layers (Fig.7). Moreover, the nature of the physical movements of citizens on the territory of Strasbourg might shape the directional layer of the mobile territories and create ephemeral intermediate layers related to the different temporalities of the digital activities.

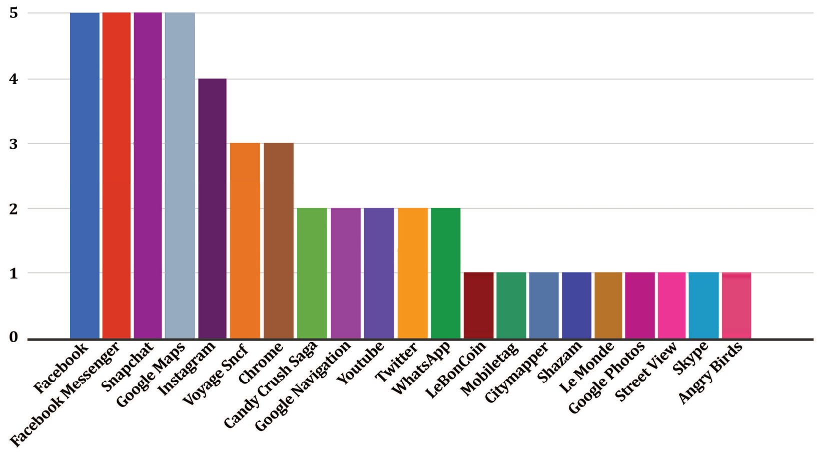

Fig. 8: The distribution of the applications used in the city of Strasbourg according to the participants. (The name of applications is given on the x axis and y axis represents the number of participants. The applications are divided into 3 subgroups according the frequency of use as A, B and C)

Furthermore we drew the map of the mobile territories using the series of ephemeral digital activities obtained through our findings of 70 journeys. In order to understand the intermediate layers of the mobile territories, we asked also our participants which applications they though they used in common spaces. These interview based reports gave us a distribution of the applications shown in the Figure 8. But according to the digital findings of this study, the mostly used applications in the physical public territory were those in the group B, instead of group A (Fig 8).

4.3 Problems and Questions

In this study, the participants being mostly students or young workers composed a more or less homogeneous group. Their common leisure was being interested in digital technologies. However the total of 70 journeys provided us a variety of digital data. According to our findings, we can say the possibility of the occurrence of a certain digital activity in a certain place, which was not previously noted to our knowledge. One of the week points of this study was that we could not assess all of the digital activities of the participants to respect their private life. Thus our findings were restricted to the willingness of the subjects.

Our experience gives also rise to many questions. One of the most important questions is: How we may adapt our experience to the study of different cities in the long term? Making our experience transferable to other cities may elucidate the relationships between mobile territories and architectures of these cities. Our study is like a pioneering first step in understanding how virtual technologies can compete with traditional infrastructures. The public spaces where there is a high probability of interaction between digital activities and traditional infrastructures were identified in this study. Moreover, the Smartphone, as an individualized technical object is an "integrative" object for different territories, the spatial, social cultural and economic practices of the citizens. This may permit us to identify various operations of the cities and encourage us to think about the malfunctions of them.

We think that his study may be a start point for an understanding of the interactions of physical and digital territories, which allows to trace point by point the physical paths and gives us the possibility of occurence and the features of the digital activities. Tracing all of the physical geolocations of a single digital activity may be investigated by the future studies.

5 CONCLUSION

The Mobile territories are a part of the big data phenomenon. They are composed and decoded frame by frame. In this study, we reached to a “sensible” cartography of the mobile territories after evaluating 70 journeys in the city of Strasbourg. This cartography was formed by the digital data of the citizens of that city according to the filled spaces, empty spaces and networks of the city's system. Our findings showed the first public places with possible interaction between the virtual spaces and traditional infrastructures of the city of Strasbourg.

In our research based on the reading of a physical path, we geolocated one specific image of a specific digital activity (communication, research, etc.) at one location of the physical territory. We had a point of interaction of the physical territory with a specific digital activity at a specific time. At this point each digital activity seemed to create a new urban layer invisible to the naked eye on the physical territory.

The technological knowledge becomes increasingly a means of change in the relationships between the people leading to social innovation; the use of the smartphones is an example. A permanent connective intelligence that represents a valuation of the forms of mobile territories will certainly lead to a territorial innovation, accompanied by changes in the relationships between people. It certainly deserves to be explored in the future experiences.

6 ACKNOWLEDMENTS

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7 REFERENCES

BROSCHART, Daniel; ZEILE, Peter: ARchitecture – Augmented Reality Techniques and Use Cases in Architecture and Urban Planning, Proceedings. REAL CORP 2014 Tagungsband, Vienna, 21-23 Mai 2014.

COSTANTINO, Gianpiero ; MAITI, Rajib ; MARTINELLI, Fabio ; SANTI, Paolo : Private mobility-cast for opportunistic networks Computer Networks, 120, Cambridge, MA, 2017, pages 28-42. http://www.iit.cnr.it/sites/default/files/ComNetCR.pdf.
DIEBOLD, Francis: A Personal Perspective on the Origin(s) and Development of "Big Data": The Phenomenon, the Term, and the Discipline, Second Version. In: PIER Working Paper No. 13-003. Available at SSRN: https://ssrn.com/abstract=2202843 or http://dx.doi.org/10.2139/ssrn.2202843, Pennsylvania, 2012.
FISCHER, Eric:Mobile Devices + Twitter Use. Exposition Talk to Me, New York City's Museum of Modern Art. New York. 2010. https://www.uchicago.edu/features/20111017_fischer/.https://www.mapbox.com/labs/twitter-gnip/brands/#4/34.85/-95.89
HATUKA, Tali: The emergence of portable private-personal territory: Smartphones, social conduct and public spaces. Urban Studies 1–17. Tel Aviv, 2014.
KONDOR, Dániel; GRAUWIN, Sebastian; KALLUS, Zsófia; GÓDOR, István; SOBOLEVSKY, Stanislav; Ratti, Carlo: Prediction limits of mobile phone activity modelling Royal Society Open Science, 4, 1-14, Cambridge, MA, 2017. http://dx.doi.org/10.1098/rsos.160900.
LANEY, Doug: 3-D Data Management: Controlling Data Volume, Velocity and Variety. META Group Research Note, Stamford, February 6. 2001. http://goo.gl/Bo3GS.
LUSSAULT, Michel: L'espace avec les images. In DEBARBIEUX, Bernard. And LARDON Sylvie (dir.), Les figures du projet territorial. La Tour d'Aigues, Editions de l'Aube – DATAR, 2003.
MARTINO, Mauro; Britter, Rex; Zacharias, Caitlin; Bidermann Assaf: Senseable city: digital urban and modelling. Boston.2010.
MIRANDA, Fabio; DORAISWAMY, Harish; LAGE, Marcos; ZHAO, Kai; GONC¸ALVES, Bruno; WILSON, Luc; HSIEH, Mondrian and SILVA, Claudio T: Project Urban Pulse: Capturing the Rhythm of Cities. New York, 2017.
MIZUKO, Ito : Personal Portable Pedestrian: Lessons from Japanese Mobile Phone Use. Mobile Communication and Social Change. The 2004 International Conference on Mobile Communication in Seoul, Korea, University of Southern California Keio University, Octobre 18-19, 2004.
PICON, Antoine : La ville intelligente est-elle une utopie? Interview on France Culture. December 3. Paris, 2014.
RATTI, Carlo. et al. : Mobile Landscape : Graz. SENSEable City Laboratory, MIT. Cambridge, MA, 1 Octobre 2006. http/senseable.mit.edu/graz.
RATTI, Carlo. et al.: Tweetbursts. Exploring digital collective responses to major events. 2014. http/senseable.mit.edu/tweetbursts/.
RESCH, B: People as sensors and collective sensing-contextual observations complementing geo-sensor network measurements. In J. M. Krisp (Ed.), Lecture Notes in Geoinformation and Cartography (pp. 391–406). Springer, Berlin, Heidelberg, 2013.
SIMONDON, Gilbert : Du mode d'existence des objets techniques. Broché. Aubier Philosophie. Paris, 2012, 1958.
SLEIPNESS, Ole R;, GEORGE, Benjamin H.; HUGHES, Amanda; RAMINENI, Sriram: Hidden Dimensions: Illuminating Landscape History through Mobile Apps: Journal of Digital Landscape Architecture, Istanbul, 2016.
SÖDERSTRÖM Ola : Des images pour agir. Le visuel en urbanisme. Lausanne, Payot, 2000.
VANKY, Anthony; VERMA, Santosh K.; COURTNEY, Theodore K.; SANTI, Paolo; RATTI, Carlo: Effect of weather on pedestrian trip count and duration: City-scale evaluations using mobile phone application data Preventive Medicine Reports. Cambridge, MA, 8, 30-37, 2017. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5555086/
VON LANDESBERGER, Tatiana; BRODKORB, Felix; ROSKOSCH, Philipp; ANDRIENKO, Natalia; ANDRIENKO, Gennady and KERREN, Andreas: Mobilitygraphs: Visual analysis of mass mobility dynamics via spatio-temporal graphs and clustering. IEEE TVCG, 22(1):11–20, 2016. http://cs.lnu.se/isovis/pubs/docs/kerren-vast15-postprint.pdf.
WEISS, Sholom M., INDURKHYA Nitin: Predictive Data Mining: A Practical Guide, Morgan Kaufmann Publishers, Inc. 1998.
WU, Wenchao; XU, Jiayi; ZENG, Haipeng; ZHENG, Yixian; QU, Huamin; NI, Bing; YUAN, Mingxuan and NI, Lionel M. : Telcovis: Visual exploration of co-occurrence in urban human mobility based on telco data. IEEE TVCG, 22(1):935–944, 2016.http://www.cse.ust.hk/~huamin/tvcg_wenchao_2016.pdf.
YOSHIMURA, Yuji and al.: An analysis of visitors' behavior in The Louvre Museum: a study using Bluetooth data. Environment and Planning B: Planning and Design, volume 41, Boston, 2014, pages 1113 – 1131.
ZEILE, Peter; RESCH, Bernd; LOIDL, Martin; PETUTSCHNIG, Andreas and DÖRRZAPF, Linda: Urban Emotions and Cycling Experience – Enriching Traffic Planning for Cyclists with Human Sensor. GI_Forum 2016, Journal for Geographic Information Science, Volume 1, Vienna, 2016. http://www.austriaca.at/0xc1aa5576_0x0033ffa1.pdf.

SmartUP: Entwicklung eines Zentrums für Nachhaltigkeit

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1 ABSTRACT

Industriegebiete wurden seit Mitte des 19. Jahrhunderts an Stellen errichtet, die heute mitten in den Städten sind. Im Laufe der letzten Jahrzehnte kam es zu einem starken Wandel in diesen Bereichen. Die umweltbelastenden Emissionen sowie bessere Anschlüsse an die Verkehrsinfrastruktur führten zu einer Verlagerung von Produktionsstätten in die Peripherie der Ballungsräume. Als Ergebnis dieses Wandels stehen heute in zentraler Lage viele Objekte leer bzw. sind nur teilweise genutzt.

Einer dieser ehemaligen Industriestandorte, das Areal der ÖKO-Service in der Puchstraße 41, 8020 Graz, soll in der Folge eines Smart City Sondierungsprojektes zu einem Nachhaltigkeits-Zentrum ausgebaut werden, das Menschen und Organisationen mit zukunftsfähigen Produkten und Dienstleistungen Platz bietet, Kompetenzen bündelt und diese nach außen sichtbar macht. Geplant ist in einem ersten Schritt der Ausbau zu einem Nachhaltigkeits-Zentrum, die Ansiedlung von neuen Nachhaltigkeits- und Reparaturbetrieben, Büros, Geschäften und Gastronomie. Die Entwicklung wird auch Impulse für das Umfeld geben, sich als energie- und ressourcenschonendes Stadtquartier im Sinne der Smart City Graz Strategie zu positionieren.

Im Rahmen des Projekts, welches mit Mitteln aus dem Förderprogramm „Smart Cities Demo“ des Klima- und Energiefonds gefördert wurde, soll in einem kooperativen Prozess auf Basis von Umfeld- und Stakeholderanalysen sowie unter Beteiligung von NachbarInnnen, nachhaltigkeitsorientierten Unternehmen, Kunst- und Kulturschaffenden, Vertreterinnen und Vertreter der Stadt Graz sowie Wissenschaft und Forschung eine gemeinsame Vision für das Quartier erstellt werden. Gleichzeitig wird ein umfassendes Energie- und Ressourcenkonzept für das Projektgebiet ausgearbeitet.

Mit dem Projekt Smart UP soll gezeigt werden, dass eine derzeit wenig attraktive Industriebrache durch einen innovativen Nutzungsmix aus Gewerbe, Büros und sozialer Infrastruktur zu einem energie- und ressourceneffizienten Stadtquartier umgewandelt werden kann.

Keywords: Open Innovation, Zentrum für Nachhaltigkeit, Industriegebiete, Beteiligung, Stadtteilentwicklung

2 HINTERGRUND

Industriegelände und –gebiete wurden seit Mitte des 19. Jahrhunderts an Stellen errichtet, die heute mitten in den Städten sind. Im Laufe der letzten Jahrzehnte kam es zu einem starken Wandel im Bereich von Industrie und Gewerbe. Die umweltbelastenden Emissionen sowie bessere Anschlüsse an die Verkehrsinfrastruktur führten zu einer Verlagerung von Produktionsstätten in die Peripherie der Ballungsräume. Als Ergebnis dieses Wandels stehen heute in zentraler Lage viele vormals industriell und gewerblich genutzte Objekte leer bzw. sind nur teilweise genutzt. Auf Grund heterogener Besitzerstrukturen und der dadurch bedingten Interessenkonflikte erweisen sich umfassende Konzepte, die hohe Ansprüche in Bezug auf Nachhaltigkeit und Innovation haben, als schwer umsetzbar. Die derzeitige städtebauliche und raumplanerische Praxis geht daher oft den Weg des geringsten Widerstandes und weist in den Peripherien der Städte neue Siedlungs-, Industrie- und Gewerbeflächen aus, obwohl aus raumplanerischer Sicht diese zentral gelegenen Industriebrachen zu bevorzugen wären. Gleichzeitig erwartet man von integrierten, smart Städten auch wieder wirtschaftliche Aktivitäten in den Zentren.

In der vom Umweltbundesamt beauftragten Studie „Industrielle Brachflächen in Österreich. Wiedernutzungspotenzial“[1] wurde das Potential industrieller Brachflächen aufgezeigt:

„In Österreich werden täglich 20 Hektar wertvolles Grün- und Ackerland durch Siedlungs- und Verkehrstätigkeit versiegelt, während gleichzeitig rund 3 Hektar an Industrie- und Gewerbeflächen brachfallen. Bei 3.000 bis 6.000 brachliegenden Industriestandorten in Österreich und Brachflächen im Ausmaß von 8.000-13.000 ha – somit einer Fläche in der Größenordnung der Stadt Linz – sowie einem jährlichen Anfall an Industriebrachen von ca. 1.100 ha könnte rund ein Viertel des jährlichen Flächenneubedarfs durch Revitalisierung von verlassenen Industriestandorten eingespart werden“.

International ist aktuell die Entstehung von sog. „Innovation Districts“, als Manifestation des Trends neuer örtlicher Präferenzen von Menschen und Unternehmen, zu beobachten: “In recent years, a rising number of innovative firms and talented workers are choosing to cogregate and colocate in compact, amenity-rich enclaves in the cores of central cities. Rather than building on greenfield sites, marquee companies in knowledge-intensive sectors are locating key facilities close to other firms, research labs, and universities so that they can share ideas and practice “open innovation.”[2]

Des Weiteren zeigt sich, dass bei der Sanierung, Modernisierung und Umnutzung von Industriehallen und Gewerbeobjekten bis dato wenig ambitionierte Realisierungen hinsichtlich Energie und Ressourceneffizienz vorliegen. Auf Grund der bestehenden Gebäudestruktur (große Spannweiten, der Bauweise, und rechtlicher Vorgaben wie z.B. Denkmalschutz) sind innovative Lösungen oft sehr kostspielig und daher kaum leistbar. Die kommunalen Verwaltungen sind daher zukünftig mehr denn je gefordert, solche sozialen, kulturellen und ökonomischen Aufgaben von Nach- bzw. Neunutzungskonzepten für Gebäude und Stadtteile zu lösen.

Smart-City-Graz-Strategie

Aktuelle Prognosen[3] gehen davon aus, dass die Bevölkerungszahl der Stadt Graz bis 2031 bezogen auf das Vergleichsjahr 2011 um 27.000 Personen bzw. 10% steigen wird. Dies bedeutet für 2031 eine Einwohnerzahl von 289.000 gegenüber 262.000 im Jahr 2011. Auf Grund des beschränkten Siedlungsraumes setzt die Stadt Graz verstärkt auf die Innenentwicklung mit Nachverdichtung, Umwidmung und Nachnutzung von bestehenden Gewerbe- und Industrieflächen. Das derzeit größte Areal, auf dem dieser Prozess bereits in Gange ist, befindet sich im Westen des Stadtzentrums auf den Reininghausgründen (ehemaliges Brauereiareal). Die Realisierung eines urbanen Nutzungs-Mixes, der neben Wohnen, auch Büro, Handel sowie gewerbliche und industrielle Nutzugnen umfasst, ist aufgrund vielfältiger Interessenskonflikten schwierig, muss aber ein strategisches Ziel sein, um die Standortqualität der Stadt Graz zu sichern und Arbeitsplätze für die Menschen in der Stadt zu schaffen.

Im Zuge des Strategieprojektes „I live Graz" (2012) wurde eine Vision für die Smart City Graz im Jahr 2050 entwickelt. In den sog. „7+1 Handlungsfeldern“ Ökonomie, Gesellschaft, Ökologie, Mobilität, Energie, Ver-/ Entsorgung, Gebäude sowie im Handlungsfeld Stadtplanung wurden sog. Teilvisionen sowie ein Roadmap mit Maßnahmen erarbeitet, um die übergeordnete Vision erreichen zu können. Der Grazer Gemeinderat hat 2013 die Verankerung dieser „Smart City“ Strategie im 4.0 Stadtentwicklungskonzept als Grundsatz der Stadtentwicklung verordnet. Als räumlich geeignet wurden 2 „Smart City Graz“-Zielgebiete definiert: GRAZ WEST und GRAZ SÜD. Für die Areale im Bereich von GRAZ WEST liegen bereits konkrete Umsetzungsstrategien bzw. erste Realisierungen vor. Für das Gebiet GRAZ SÜD fehlen größtenteils noch Konzepte.

Die Stadt Graz hat im Rahmen der Smart City Initiative folgende Vision für Graz 2050 definiert:

„Graz ist im Jahr 2050 eine dynamische und kompakte Stadt mit urbaner Mischnutzung, attraktivem öffentlichen Raum und höchster Lebensqualität. Durch die konsequente Verfolgung der Smart City-Strategien und breite Bewusstseinsbildung konnten der Ressourcen- und Energieverbrauch sowie der damit

[1] Brachflächenstudie: Egger Karin, Ganthaler Sylvia, Haider Stefan, Kordina Hans, Tragseil Franz, Schamann Martin: Industrielle Brachflächen in Österreich. Wiedernutzungspotenzial. Wien, 04/2004.

[2] Katz, B., Wagner, J. (2014) The rise of innovation districts. A new geography of Innovation in America. Metropolitan POliy Program, May 2014.

[3] Bevölkerungsprognose für die Landeshauptstadt 2012-2013: Herausgeber: Magistrat Graz – Präsidialabteilung Referat für Statistik. Juni 2012.

verbundene Schadstoffausstoß reduziert und deutliche Schritte in Richtung einer Zero Emission City getan werden. Die benötigte Energie wird zu 100 % in der Region und aus erneuerbaren Energiequellen erzeugt“.

Städtische Industrie- und Gewerbebetriebe/Flächen können als Chance für eine multifunktionale, durchmischte Stadt gesehen werden und können helfen, dem derzeitigen Trend der Verdrängung von innerstädtischen Industrie- und Gewerbeflächen an die städtische Peripherie entgegenzuwirken.

Im Folgenden werden auf Basis der Arbeiten zu „SmartUP“ Ergebnisse und Erfahrungen aus der einjährigen Sondierungsstudie beschrieben und zur Diskussion gestellt. Ziel des Projekts Smart UP ist es, das Industrieareal am Standort der ÖKO-Service Halle in der Puchstraße 41 in Graz zu einem lebendigen Nachhaltigkeits-Zentrum auszubauen und weiterzuentwickeln. Neben zahlreichen Betrieben aus dem Bereich der Abfallwirtschaft, befindet sich dort derzeit eine spannende Mischung an Unternehmen wie Künstlerateliers, Buchverlag, Tanzstudio, Cross-Fit-Arena, Boulderhalle und IT-Firmen. Das Areal befindet sich im Zielgebiet „Smart City Graz Süd“ für das von städtischer Seite bis dato noch keine konkreten Umsetzungsstrategien vorliegen. Die Entwicklung des Areals könnte unter Berücksichtigung der gesamtstädtischen Smart City Strategien und Ziele (u.a. Stadt der kurzen Wege, Energie aus erneuerbaren Quellen, sanfte Mobilität) ein wesentlicher Katalysator für die Entwicklung des gesamten Zielgebietes darstellen.

In einem ersten Schritt ist der Ausbau zu einem Nachhaltigkeits-Zentrum geplant, das die Ansiedlung von neuen Nachhaltigkeits- und Reparaturbetrieben, Büros, Geschäften und Gastronomie umfasst. Gleichzeitig wird ein Energie- und Ressourcenkonzept für das Projektgebiet ausgearbeitet. Die Entwicklung soll auch Impulse für das Umfeld geben, sich als energie- und ressourcenschonendes Stadtquartier im Sinne der Smart City Graz Strategie zu positionieren.

3 STAKEHOLDERPROZESS

3.1 Kooperative und integrative Stadt(teil)entwicklung

Die frühzeitige Einbindung relevanter Stakeholder in Stadt(teil)entwicklungen sowie Governance im Sinne offener, transparenter und partizipativer Entscheidungsfindungsprozesse werden in europäischen Strategiedokumenten mehrfach explizit gefordert.[4] Sie werden aber auch seitens der Entscheidungsträger in Kommunen zunehmend als erfolgsrelevantes und qualitätssteigerndes Kriterium erkannt. Internationale Vorreiter wie Jan Gehl (Dänemark) betonen in ihren Projekten die Bedeutung der „human dimension“ für eine qualitätsvolle Stadt(teil)entwicklung.[5]

Beteiligung kann je nach Zielsetzung auf den Stufen der Information, Konsultation oder Mitgestaltung erfolgen und zielt immer auch auf eine Stärkung der Innovationsfähigkeit und Selbstwirksamkeit der Menschen ab. Heruntergebrochen auf Stadtteilentwicklungen bedeutet dies, das Experten-, Erfahrungs- und Alltagswissen unterschiedlichster urbaner Akteursgruppen frühzeitig in die Planungen einzubinden. Die Öffnung der Entwicklungs- und Innovationsprozesse hin zu einem erweiterten Akteurskreis orientiert sich dabei an den Prinzipien von Living Labs und Open Innovation.

3.2 Beteiligungsprozess im Rahmen des Projektes Smart UP

Im Rahmen des Projekts SmartUP wurde in einem kooperativen Prozess gemeinsam eine Vision für das Quartier erstellt. Der Stakeholder Prozess verlief in drei Phasen (siehe Abbildung 1):

Im Zuge einer Stakeholder- und Umfeldanalyse wurden relevante Stakeholder, soziale Infrastruktur und sonstige Einrichtungen erhoben, um Chancen, Potentiale aber auch Herausforderungen in Bezug auf das Areal und seine zukünftige Entwicklung zu identifizieren. Diese Akteure wurden in folgende Kategorien unterteilt: nachhaltigkeitsorientierte Unternehmen, benachbarte Unternehmen, Expertinnen und Experten, Politik und Verwaltung. In bilateralen Vorgesprächen mit ausgewählten Schlüsselakteuren wurden im nächsten Schritt Erwartungen an das Projekt sowie Interessen und relevante Fragestellungen in Bezug auf das Areal erhoben. Die Kernphase des Stakeholder-Prozesses war ein Visions-Workshop bei dem ausgewählte Schlüsselakteure zu einem halbtägigen Workshop eingeladen wurden. Ziel war es, Ideen,

[4] siehe u.a. EU-Städteagenda, Leitfaden für die Mitgliedstaaten zu integrierten nachhaltigen Stadtentwicklung bzw. ältere Dokumente wie die Aalborgh-Charta und die Leipzig-Charta zur nachhaltigen europäischen Stadt

[5] siehe Gehl, J. Cities for People, 2010

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Vorschläge und Positionierungsoptionen für das Nachhaltigkeitszentrum und das umliegende Areal zu generieren und zu diskutieren. Im Rahmen eines World Café in drei Runden wurden drei inhaltliche Schwerpunkte bearbeitet:

Abbildung 1: Ablauf Beteiligungsprozess

Nachhaltigkeitszentrum

- Was macht ein Nachhaltigkeitszentrum aus? Welche Bilder/Visionen entstehen?
- Wer sind mögliche Zielgruppen eines Nachhaltigkeitszentrums?
- Welche Kundenbedürfnisse sollen angesprochen werden?
- Welche Produkte/Dienstleistungen sollen (für wen) angeboten werden?
- Wie könnte ein innovativer Nutzungs-Mix aussehen?
- Wodurch könnte ein Alleinstellungsmerkmal erzielt werden?

Nachhaltigkeitsdistrikt

- Was ist das besondere an einem Nachhaltigkeitsdistrikt?
- Wie kann das Nachhaltigkeitszentrum mit dem Umfeld zusammenwirken?
- Welche Potentiale, Synergien und Ressourcen aus der Nachbarschaft und dem Umfeld könnten genutzt werden (Stoff- und Energieströme, Menschen, Ideen, Flächen, Räume, Parkplätze, Autos)?
- Wer wären interessante Kooperationspartner?
- Wie können Kunst und Nachhaltigkeit zusammenwirken?

Anknüpfung an städtische Strategien

Welche Synergien mit städtischen Strategien sollten aktiv aufgegriffen werden?

- Smart City
- City of Design
- ÖKO-Profit
- Abfallvermeidungsstrategie
- Erlebniswelt Wirtschaft
- Digitale Agenda
- Mobilitätsstrategie
- Klimawandelanpassung

Der Teilnehmerkreis setzte sich aus dem Kernteam des Projektes SmartUP, erweitert um Vertreter der lokalen Kreativszene, der Nachhaltigkeitsszene und der lokalen Betrieben, Städtebau- und Energieexperten, sowie Architekten und anderen Interessenten zusammen. Es waren somit unterschiedlichste Fachexpertisen vertreten, wodurch gute Voraussetzungen für eine interdisziplinäre Zusammenarbeit geschaffen werden konnten. Hervorzuheben ist, dass der Workshop vor Ort in der Halle der Ökoservice stattfand und somit direkte Eindrücke vom Ort des Geschehens vermittelt werden konnten.

In mehreren Bearbeitungsschleifen wurde innerhalb des Kernteams wird im Anschluss an den Visions-Workshop ein innovatives und integratives Konzept für ein Zentrum für Nachhaltigkeit erarbeitet. Die wichtigsten Ergebnisse des Workshops werden in Kapitel 4 zusammengefasst.

4 VISION FÜR DAS ZENTRUM FÜR NACHHALTIGKEIT

4.1 Allgemeine Vision

Die Ergebnisse aus dem Workshop zeigen, dass das Zentrum für Nachhaltigkeit im Sinne einer übergeordneten Ressourcen- und Energieeffizienz integrativ entwickelt und umgesetzt werden soll. Nachhaltig Handeln, Reparieren, Upcyclen und ähnliche Ansätze sollen attraktiv, sichtbar und erlebbar gemacht werden und zur Nutzung einladen. Durch die Ansiedlung kleinstrukturiert produzierender Unternehmen im Bereich Nachhaltigkeit und sozialökonomischer Betriebe soll das Areal auf sozialer und ökologischer Ebene aufgewertet werden.

Abbildung 2: Stakeholderworkshop

Auf Grund ökonomischer Zwänge (die Industrie- und Gewerbeflächen befinden sich auf Grund ihrer zentralen Lage in Gebieten mit extrem hohen Grundstückspreisen) ist die Verdichtung (speziell die vertikale Nachverdichtung) von großer Bedeutung. In diesem Sinne steht die Umwandlung der derzeitigen Halle der Fa. Ökoservice zu einem „Smart-Up Tower“ (siehe Abbildung 3) im Zentrum der Überlegungen. Durch ein mehrstöckiges Gebäude innerhalb einer bestehenden, divers genutzten Industriehalle wird das Prinzip der Nachhaltigkeit und die Offenheit auch nach außen symbolisiert.

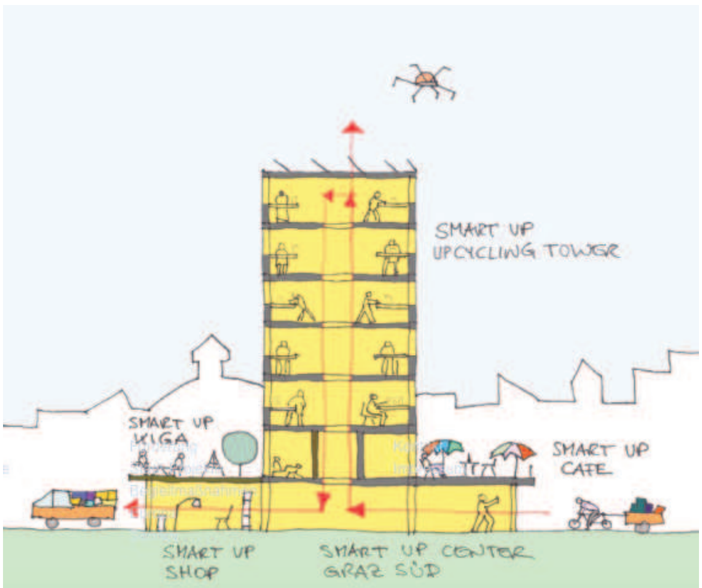

Abbildung 3: Smart-UP-Zentrum für Nachhaltigkeit

Um die vielfältigen Aspekte eines Zentrums für Nachhaltigkeit angemessen berücksichtigen zu können und die zukünftige Entwicklung dieses Areals zu ermöglichen, wurden folgende drei Themenfelder vertieft:

(1) Dienstleistungen und Produkte, (2) Energie und Mobilität, (3) Synergien mit dem Umfeld.

4.2 Produkte und Dienstleistungen

Das Areal soll nicht nur als Raum für Verkauf, sondern auch als Raum für Produktion, Co-Kreation, Lernen und Co-Working betrachtet werden. Daher soll das Quartier nicht nur für weitere Nachhaltigkeitsbetriebe einladend gestaltet werden, sondern auch Unternehmen und Siedlungsstrukturen in der Nachbarschaft aktiv in ihre Entwicklung miteinbinden. Es wird eine Erlebniswelt geschaffen, ein Ort an dem sich Menschen gerne aufhalten und in dem ökologische, ökonomische und soziale Nachhaltigkeit sichtbar und erlebbar gemacht wird. Die vorhandenen Grünflächen und öffentlichen Flächen sollen in der Planung mitberücksichtigt und entsprechend attraktiviert werden. Der Bekanntheitsgrad des Areals kann erhört werden, indem man wichtige Zielgruppen wie Kreativszene und junge Menschen einbindet. Folgende Ideen für neue Produkte, Dienstleistungen und Angebote für unterschiedliche Zielgruppen wurden bis dato gesammelt:

- Nachhaltige Projekte im Gebiet initiieren (z.B.: Projekt zum Thema Ernährungssouveränität / Essbare Stadt; Re-use und Upcycling Projekte)
- Räume für Veranstaltungen schaffen: wie Street Food-Markt, Workshops, Ausstellungen, Kochworkshops, Insider-Führungen; Künstlerinnen außer Haus; Konzerte
- Reparaturcafé und Re-Use-Shop: Bündelung unterschiedlicher Reparatur-Dienste auf einem Areal; Möglichkeit vor Ort zu arbeiten oder Werkzeug auszuleihen; Themenbezogene Reparatur- und Upcycling Workshops
- Shared Space/Co-Working Space: Anmietbare Räume schaffen (z.B. Räume für Meetings, Musik-Proberäume, Räume für handwerkliche Tätigkeiten)
- Beschäftigungsprojekte initiieren z.B. mit AMS oder St:WUK
- Initiativen für Kinder auf der Bewusstseinsbildungsebene initiieren, z.B. Garten mit Kindern verschiedener Altersgruppen

Bewegungsangebote für Mitarbeiterinnen und Mitarbeiter schaffen, z.B. nachhaltige Bewegung in der Natur, Trainings-Parcour, Betriebssport auf den Grünflächen

Hier ist vor allem das besondere Engagement der lokalen Unternehmen sowie die Einbindung von Kunst und Kultur bei der Entwicklung und Umsetzung der Projekte und Initiativen von großer Relevanz. Trotz starker Präsenz im Gebiet werden momentan die Kunstszene und umliegende Betriebe (Abfallwirtschaft) noch nicht als eine Einheit betrachtet.

4.3 Energie und Mobilität

Aufbauend auf den Ergebnissen aus der energetischen Potentialabschätzung, die im Rahmen des Projektes SmartUP durchgeführt wurde, werden Konzepte und Lösungen für eine energetische und ökologische Optimierung des Quartiers erarbeitet.

Die Nähe zum Stadtzentrum und die Lage an der Mur, die durch den Bau eines Wasserkraftwerkes als attraktiver Lebensraum aufgewertet werden soll, die bereits vorhandenen Gewerbebetriebe, deren Fokus im Bereich Ressourceneffizienz durch Reuse, Upcycling und Recycling von Abfall liegt, sowie die unmittelbare Nachbarschaft zum Fernwärmeheizwerk Puchstraße bieten hervorragende Voraussetzungen für die Entwicklung eines energie- und ressourcenschonenden Innovationszentrums („Innovation district“).

Auf Grund multifunktionaler Gebäude- und Prozessnutzungsprofile bietet dieses Areal neben den oben angeführten Vorteilen die Chance, hohe Einsparungspotentiale durch einen energetischen Verbund zu generieren. Zusammenfassend stehen folgende Aspekte im Mittelpunkt der Betrachtung:

- Energieverbünde für Strom, Wärme und Kälte: Leistbare und ökologische Lösungen am Standort für Privathaushalte und Betriebe (z.B. eigene Stromversorgung, PV-Beteiligungsanlagen)
- Erneuerbare Energien und deren Potentiale, inkl. Netzanbindung

- Intelligente Energieverteilungsnetze
- Ressourcenschonende Nachverdichtung
- Energie- und Stoffspeicher

Die Entwicklung eines Areals hin zu einem lebendigen Ort bringt auch spezifische Herausforderungen aus verkehrlicher Sicht mit sich. Zu wichtigen Maßnahmen im Bereich Mobilität gehören:

- Umsetzung eines umfassenden Mobilitätskonzepts für die Nutzer mit dem Ziel, den Bedarf an Stellplätzen durch attraktive Mobilitätsangebote zu minimieren (E-Mobilität, Quartiers-(Lasten)Räder, ÖV-Angebote, multimodaler Knoten tim…)
- Kooperationen mit umliegenden Unternehmen (Stellplätze)
- Entwicklung innovativer Nutzungs- und Finanzierungsmodelle, wie z.B. die Aufnahme der Ladestationen oder des Carsharing in die Betriebskosten der Büromieten
- Umsetzung der Anbindung an den Murradweg in Abstimmung mit der Stadt Graz

4.4 Synergien mit dem Umfeld

Die gemeinsame Betrachtung des Nachhaltigkeitszentrums und des Umfelds bringt hohe Synergien und Potentiale im Areal, und zwar in folgenden Bereichen:

Kooperationen mit ansässigen Betrieben und anderen Schlüsselakteuren

Seitens der Betriebe vor Ort besteht bereits Interesse, sich an der Transformation des Stadtteils aktiv zu beteiligen und mit konkreten Projekten zur Entwicklung des Zentrums für Nachhaltigkeit beizutragen. Neue Synergien zwischen Betrieben in der Nachbarschaft und lokalen Einrichtungen sollen durch die Umsetzung solcher kooperativen Pilotprojekte geschaffen werden. Beispielsweise können Recyclingbetriebe mit Kunstateliers (Kunstprojekte, Ausstellungen), Schulen, Stadtteilzentren und Vereinen zusammenarbeiten. Synergien mit interessiertem Publikum sollen ebenfalls genutzt werden (Studentinnen und Studenten für Vorträge und ehrenamtliche Unterstützung einbinden). Ein regelmäßiges Miteinander und Austausch sollen gefördert werden, lokale Unternehmen sollen zu Vorzeigebeispielen bezüglich Nachhaltigkeit werden. Dadurch soll eine langfristige Identifikation mit dem Areal, dem Umfeld und dem Thema geschaffen werden.

Öffentlicher Raum

Der öffentliche Raum soll auch einladend gestalten und interessanter machen werden. Die Dachflächen der Gebäude bieten verschiedene Nutzungsmöglichkeiten, u.a. für urbanes Grün. Derartige Nutzungen sind in Verbindung mit anderen Nutzungen (Gastronomie, Erholung, Urban Gardening, etc.) zu überlegen und zu optimieren. Durch Kooperationen mit ansässigen Künstlerinnen und Künstlern soll auch Kunst im öffentlichen Raum erlebbar gemacht werden. Wiederverwertung von Bauteilen und fremden Objekten (Eisenbahnbrücken, etc.) steht auch im Zentrum der Überlegungen.

Stoff- und Energieströme

Das Zero-Waste Prinzip, ein bewusster Umgang mit Ressourcen und ähnliche Konzepte sollen auf allen Ebenen sichtbar und erlebbar gemacht werden. Durch „Leuchtturmprojekte“, wie beispielsweise einen Showroom rund um das Thema Energie, können die Bewusstseinbildungsprozesse unterstützt werden. Sanfte Mobilität sowie einfache Zugänglichkeit (Fußgänger, Fahrrad) zählen ebenso zu den Grundprinzipien dieses nachhaltigen Distrikts.

5 AUSBLICK UND CONCLUSIO

Das einjährige Sondierungsprojekt versucht dem derzeitigen Trend der Verdrängung von innerstädtischen Industrie- und Gewerbeflächen an die städtische Peripherie entgegenzuwirken indem es energetische, ökonomische und soziale Konzepte für nachhaltige, stadtverträgliche Nutzungen entwickelt. Städtische Industrie- und Gewerbebetriebe/Flächen werden nicht als Problemzonen im städtischen Kontext, sondern als Chance für eine multifunktionale, durchmischte Stadt gesehen.

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Die Kombination aus vertikaler Nachverdichtung, der Optimierung sämtlicher Energie- und Ressourcenströme von Industriegebäuden und die gleichzeitige Etablierung eines attraktiven Stadtquartiers unter Einbeziehung aller Nutzer und Verantwortlichen, ist in dieser Form sicherlich Neuland.

Auf Grund der großen Zahl beteiligter bzw. betroffener Akteure kann eine spätere Umsetzung der Projektergebnisse mit Risiko behaftet sein, wenn unterschiedliche Interessen nicht transparent gemacht werden bzw. wenn kein entsprechend moderierter Interessensausgleich stattfindet. Die frühzeitige Einbindung relevanter Stakeholder in die Quartiersentwicklung soll somit eine hohe Umsetzungswahrscheinlichkeit gewährleisten. Einerseits werden dadurch, Nutzungskonflikte vermieden, andererseits aber auch viele Kriterien einer Smart City, wie kurze Wege, Energieverbund, innovative Verkehrslösungen oder Nahversorgungsstrategien durch gemeinsam erarbeitete sektorübergreifende Lösungsszenarien berücksichtigt und umgesetzt.

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6 REFERENCES

AEE-INTEC (Hsg): Bezug zur Nachhaltigkeit – Ein Katalog der 10 wichtigsten Maßnahmen im Energie- und Gebäudebereich für Steirische Gemeinden. Ein Projekt des Zukunftsfonds Steiermark

BARBER, Benjamin R.: If Mayors Ruled the World – Dysfunctional Nations, Rising Cities. New Haven & London, 2013.

CITIES ALLIANCE: Sustainable Development Goals and Habitat III: Opportunities for a successful New Urban Agenda. 2015.

EGGER, Karin, GANTHALER, Sylvia, HAIDER, Stefan, KORDINA, Hans, TRAGSEIL, Franz, SCHAMANN, Martin: Industrielle Brachflächen in Österreich. Wiedernutzungspotenzial. Wien, 04/2004.

GEHL, Jan: Cities for People. Copenhagen, 2010.

GRI, UN Global Compact, WBCSD: SDG Compass – Leitfaden für Unternehmensaktivitäten zu den SDGs.

KANURI, Chaitanya, REVI, Aromar, ESPEY, Jessica, KUHLE, HOLDER: Getting Started with the SDGs in Cities – A Guide for Stakeholders. Sustainable Development Solutions Network, 2016.

KATZ, Bruce, WAGNER, Julie: The rise of innovation districts. A new geography of Innovation in America. Washington D.C., 2014.

MAGISTRAT GRAZ, Präsidialabteilung Referat für Statistik (Hrsg.): Bevölkerungsprognose für die Landeshauptstadt 2012-2013. Graz, 2012.

PRAKASH, Mihir, TEKSOZ, Katerina, ESPEY, Jessica, SACHS, Jeffrey, SHANK, Michael: Achieving a Sustainable Urban America – The U.S. Cities Sustainable Development Goals Index. 2017.

SPEC, Werner: SDG 11 Sustainable Cities – Nachhaltige Städte und Gemeinden 13. Deutsches CSR-Forum. Ludwigsburg, 2017

reviewed paper

„Stadt-Raum-Strategien": Innovationsfelder für resiliente Stadtentwicklung

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1 ABSTRACT

Kern der vorliegenden Auseinandersetzung ist, nicht alte Debatten einer Stadtentwicklung aufzugreifen, sondern sich auf lösungsorientierte Wege zu begeben, das Eigene einer Stadt zu finden, zu betonen oder im Zweifelsfall eine disruptive Innovation einzuleiten. Die Frage ist dabei nicht, wie viele Einwohner eine Stadt im Verhältnis zu den letzten Jahren hat und wie stark deren Wachstum ist, vielmehr muss eine Stadt Attraktivität ausstrahlen und den Teilhabenden einer Stadt ein gesundes Lebensumfeld bieten.

Um diese wichtigsten Fragen zu klären erfüllt sich der Wunsch eines Erkenntnisfortschritts im zu bearbeitenden Themenbereich in einer innovativen Strategiefindung für Mittelstädte. Mit Beantwortung der Forschungsfrage, sowie den unten angeführten Unterfragen, sollen Stadtgemeinden in Randgebieten von Großstädten einen Orientierungsleitfaden erhalten, der zur weiteren Entwicklungsprozessen anregt.

Aus der Perspektive eines „Best Practice"-Beispiels der Stadtgemeinde Leonding wird in diesem Beitrag erörtert, wie geplante Stadtentwicklungsstrategien Bevölkerungswachstum steuern können und warum optimierte Lösungen für schnellwachsende Städte für gesteuerte Entwicklung sorgt.

Im Zuge dieser prozessoptimierten Herangehensweise wurde als Handlungsempfehlung ein Visionsprozess für die Stadtgemeinde Leonding eingeleitet. In diesem Prozess wurden nach Analyse der weichen und harten Standortfaktoren und einer Gesamtraumbetrachtung über das Instrument der SWOT-Analyse die strategischen Maßnahmen getroffen. Wirtschaft, Bildung und Politik sind in die Wirtschafts- und Regionalstrategien einbezogen, und die Standortagentur fühlt sich als Lenkerorgan für die Positionsausrichtung der Mittelstadt Leonding als Zukunftsstadt verantwortlich.

Keywords: Stadtentwicklung, Resilienz, Innovation, Stadtraumstrategien, Bevölkerungswachstum

2 EINLEITUNG

„Die Menschen, nicht die Häuser machen die Stadt." (Perikles, 493-429 v.Ch.)

Wie beim Philosophen muss eine gute Bürgermeisterin oder ein guter Bürgermeister sich in erster Linie mit dem Menschen und in zweiter Linie mit dem realen Tun befassen. So wie sich der Platz der Philosophen ursprünglich auf dem Marktplatz, wie beispielsweise die Agora in der griechischen Polis, sich inmitten der Unternehmer und Bürger befand, in gleicher Weise sollte der Auftrag an die Kommunalpolitik lauten, in direkter Verbindung zu den Bürgern zu stehen, um spürbar von den Menschen wahrgenommen zu werden und auf deren Bedürfnisse eingehen zu können.

3 STATE OF THE ART

3.1 Dorfleben

Periphere Kommunen in ländlichen Gebieten leiden an Landflucht und Dorfsterben. Der ländliche Raum wird scheinbar zum Ort des Rückzugs, zur morbiden Welt der Vereinsamung, des Leerstandes und gefolgt von Abwanderung der jungen Bevölkerung.

Doch neben dieser nebulosen Darstellung ländlicher Siedlungsstrukturen mit ihren typischen physiognomischen, sozialen Merkmalen weisen Raumwissenschaftler auf die konservativen Ansätze des „gesunden" Lebensraums hin. Aus dem Szenario der Ausdünnung des ländlichen Raumes stellt sich die Frage, wohin die vorwiegend junge Landgesellschaft wandert? Es findet ein weltweiter Trend der Verstädterung statt. Städte wachsen, Kleinstädte, Mittelstädte, Großstädte entwickeln sich dynamisch, statt. Diese Abwegigkeit zwischen Stadt und Land lässt unterschiedliche Interpretationen zu. „Die Verschiebung hin zur städtischen Bevölkerung bewirkt beträchtliche Veränderungen auf der ganzen Welt. Schätzungen zufolge wird die Zahl der Bewohner von Städten im Jahr 2050 ungefähr doppelt so groß sein wie heute und von 3,3 Milliarden (2007) auf 6,4 Milliarden ansteigen. Allerdings verteilt sich dieser Zuwachs in den einzelnen Weltregionen unregelmäßig."[1] Wie der Wissenschaftler Laurence Smith die Welt im Jahr 2050

[1] Smith L. S.57

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sieht und deren Auseinandersetzung in seinem Buch in dem er einen Teilaspekt des globalen Bevölkerungswachstums aufwirft. „Doch Bevölkerungswachstum, Handel und Kommerz sind natürlich nicht die einzigen Faktoren, die das wirtschaftliche Wachstum in den Städten antreiben.“.[2] Welche Triebkräfte begünstigen Wachstum in Kommunen und welche effizienten Denkansätze können gesteuerten Wachstum in urbanen Strukturen ermöglichen? „Für Smith sind Städte der Schlüssel zum Neuen Norden, weil die NORCs wie alle anderen Weltgegenden auch in einem radikalen Urbanisierungsprozess begriffen sind. Selbst in den entlegenen arktischen und subarktischen Regionen verabschieden sich Menschen von kleinen Dörfern oder von einem Leben in der Wildnis, um in Orte wie Fairbanks, Fort McMurray und Jakutsk zu ziehen.“[3]

3.2 Stadtleben

Der Soziologe und Stadtphilosoph Georg Simmel befand im Jahre 1903, dass der Stadtbewohner im 18. Jahrhundert als Individuum von vergewaltigenden, sinnlos gewordenen Bindungen politischer und agrarischer, zünftiger und religiöser Art hervorging – Dies seien Beengungen, die dem Menschen gleichsam eine unnatürliche Form und längst ungerechte Ungleichheiten aufzwangen. Simmel benennt den neuen Wert in der Weltgeschichte des Geistes. Erst im Ideal des Liberalismus wuchs im 19. Jahrhundert, durch Goethe und die Romantik einerseits, die wirtschaftliche Arbeitsteilung andererseits, das weitete auf: die von den historischen Bindungen befreiten Individuen wollen sich nun auch voneinander unterscheiden.[4] Simmel ging dabei von der These der Städte als eigenständige Entitäten aus. Simmels Schlussfolgerung, dass Stadtmenschen einer anderen Prägung entwachsen und die Entwicklung eines Städters einen anderen Verlauf nimmt als die eines dörflich Sozialisierten, führt zur Stadtentwicklung als eigene Größe.

Dieses Phänomen prägte sich im Industriezeitalter weiter aus und führte global zum Trend der Verstädterung. Dieser Zusammenfluss der Bevölkerung ist aufgrund unserer Zeitgeschichte nicht aufzuhalten, was zur Folge hat, dass es in Vorstädten, Klein- und Mittelstädten zu einem rapiden Bevölkerungswachstum gekommen ist, welches aufgrund demografischer Entwicklungen auch noch zunehmen wird. Damit einhergehend werden Städte als Folge des schnellen wirtschaftlichen Wachstums mit Identitätsverlust konfrontiert. Wie die Politik und deren ausführende Organe, die Verwaltung, mit diesen Paradoxien in ihrem kommunalpolitischen Handlungskatalog umgehen und wie damit Entgleisungen in der Stadtentwicklung gegengesteuert wird, soll in Form von Stadtforschung in eine hypothetische Betrachtung gestellt werden.

3.3 Resiliente wimmelnde Kommunen

Die weitere Fragestellung, die aufgrund dieser demografischen Gesellschaftsentwicklung von Interesse ist, lautet „Wie können Städte diese Dynamik für den eigenen Aufbruch, die der ganzen Bevölkerung zu Gute kommt, nutzen? „Ein schnelles Wachstum ging einher mit einem wachsenden Wohlstand“, so die Aussage Smith? Wobei in der Literatur von Smith der Vergleich von Singapur zu Lagos in Nigeria gezogen wird. Es gibt kein Naturgesetz, keinen linearen Zusammenhang, dass eine Großstadt eine gewisse Lebensqualität haben muss, um möglichst schnell ein Bevölkerungs- und Wirtschaftswachstum zu erzielen. Es kommt gelegentlich vor, dass Städte ein erstaunliches Wachstum aufweisen und dennoch die Hölle auf Erden sind. Während in Singapur eine vorbildliche Technopolis spiegelt, zeigt sich in Lagos ein anderes Bild. „Es ist ein übervölkertes Dystopia aus Verkehrsstaus, Verwahrlosung, Korruption, Mord und Krankheiten. Lagos ist eine Slumstadt, und es liefert – ähnlich wie andere Slumstädte ein eindrucksvolles Bild von einer städtischen Welt, wie wir sie nicht wollen. Offenbar gehört einiges mehr dazu, glitzernde Technopolen zu bauen, als Urbanisierung und wirtschaftliches Wachstum.“[5] Die Qualität einer Stadt die im rasanten Wachstum begriffen ist und deren Lebenswerte nachhaltig und leistbar zu halten ist eine Herausforderung für die Stadtverwalter, ebenso wie für die Stadtgestalter. Diese wandelnden Lebensbedingungen zwingen Städte in neue Entwicklungsmodelle. In Veränderungsprozessen stellt sich das altbekannte Phänomen des menschlichen Bedürfnisses nach Sicherheit und Stabilität ein. Der daraus entwickelte Begriff Resilienz soll zeigen mit welchen Methoden und Denkansätzen sich Stadtentwicklung gegen überraschende Dynamiken schützen kann und wie die Bürgerinnen und Bürger in Krisen hilfreich begleitet werden können. Die

[2] Bloom D.E., Canning und Fink. Science 319.Nr.5864
[3] Smith L. S.385
[4] Vgl. Simmel G. 1903
[5] Vgl. Smith L. S.62-69

Widerstandsfähigkeit ist eine Neigung sich in turbulenten Zeiten gegen unerwünschte Entwicklungen zu stellen und sich in Krisenzeiten auf neue Entwicklungsschritte einzulassen. Die Globalisierung fordert das Stadtmanagement sich mit dem Umgang einer Sicherheitskultur auseinanderzusetzen. Diese Form des Risikomanagements soll eintretende Entwicklungsstörungen gezielt steuern können. Diese können beispielsweise nach Peter Jakubowski sein:

- Sehr starke Einkommensdisparitäten
- Chronische fiskalische Ungleichgewichte
- Überalterung von Gesellschaften.

In der heutigen Beschleunigungsgesellschaft und dem einhergehenden Wettbewerbsdruck bedarf es klarer Strategiemuster für Kommunen. In dieser Auseinandersetzung muss in erster Linie die Unterscheidung von Stadt und Land definiert werden. Aufgrund des Urbanisierungsprozesses und deren Bevölkerungsverdichtung in Städten entstehen neue Raumkategorien, diese Typologien zuordnen und zu kategorisieren soll ein Schwerpunkt der weiteren Auseinandersetzung sein.

3.4 Stadt. Land. Zwischenraum

„Das Umland, das auch als Vorgürtel bezeichnet wird, gehört aufgrund räumlich-funktionaler Beziehungen zur Stadt. Die Stadtregion ist eine neue Siedlungsform der hoch entwickelten Industrieländer des 20. Jahrhunderts. Sie ist geprägt durch die Ballung städtischer Funktionen (Wohn- und Arbeitsstätten, Handel- und Dienstleistungseinrichtungen oder Verkehrsanlagen) zu einem Verdichtungsraum, was ein enormes Flächenwachstum in den zuvor ländlichen Raum des stadtnahen Umlandes zur Folge hat.“ Daraus entsteht ein Faktum, dass ausgehend von den Städten sich die mitteleuropäische Gesellschaft durch städtischindustrielle Lebens-, Wirtschafts- und Wohnformen häufiger auf die Randgebiete ausweitet und dadurch eine Verflechtung des Stadt-Land-Kontinuums entsteht. Die sich daraus ergebende Übergangsform lässt sich gleichlautend Verflechtung von Stadt und Land bezeichnen. „Das Stadt-Land-Kontinuum wird insbesondere in der Bevölkerungs- und Wirtschaftsstruktur und in den raumrelevanten Verhaltensweisen der Bevölkerung deutlich, aber auch bezüglich der Funktionen und Physiognomie lassen sich städtische und ländliche Siedlungen aufgrund vieler Übergangstypen kaum noch eindeutig voneinander unterscheiden.“ Aus dieser Betrachtung heraus entstehen für Städte, die von hoher Bevölkerungszuwanderung betroffen sind, neue Handlungsfelder die mittel- und langfristige Strategiepläne brauchen. Diese Annahme gilt letztlich für alle Stadtgrößen, die in einem bemerkenswerten Konkurrenzdruck stehen.

Dieser vorliegende Beitrag hat das Anliegen, sich mit einer interdisziplinären Herangehensweise zu befassen, welche für eine kritische Forschungspraxis geeignet sind. Dazu werden Fragen entlang der vorgenannten Hypothese durchgeführt, welche eine theoretisch-methodische Erarbeitung innerhalb der Stadtforschung zulassen. Im Folgenden wird versucht zu analysieren wie die historische Stadtforschung dualistisch aus sozialwissenschaftlichen Grundlagen, sowie dem Fachbereich Innovationsmanagement eine Methodengeschichte erzählen kann. Diese beiden Entitäten erlauben eine Auseinandersetzung mit der qualitativen Forschungsmethode aus sozialwissenschaftlicher Sicht die immer lauter werdende Kritik an der Verstädterung, um den darin lebenden Menschen die auf die drängenden gesellschaftspolitischen Fragen in den rasant wachsenden Städten eine Antwort auf ihre Identität geben. Damit in Exkurs zu treten, wie starkes Bevölkerungswachstum auf dichtem versiegelten Raum neben Einschränkung der Lebensqualität auch zu Imageproblemen führen kann, soll neue Denkprozess stimulieren und Städte in ihrer Entwicklung anregen und neue Szenarien andenken.

3.5 Vom Dorf zur Stadt – Mittelstädte im Wandel

Einleitend zum besseren Verständnis und um den Rahmen von Entwicklungstypologien ländlicher Gemeinden aufzuzeigen, welche vor dem Hintergrund demografischer Entwicklung die Entwicklungsperspektiven aus anderen Aspekten betrachten als dies Klein-, oder Mittelstädte tun, unterscheidet das Landesraumordnungsprogramm des oberösterreichischen Landesgesetzes in Typologien. Darin wird die räumliche Gliederung des Landesgebietes in seiner sozioökonomischen und landschaftlichen Struktur nach Raumtypen gegliedert:

„Als Raumtyp 1 werden Statutarstädte bezeichnet. Beim Typ 2 handelt es sich um städtische Umlandbereiche. Gemeinden im Einzugsgebiet von Ballungszentren, auch „Speckgürtel“ genannt. Diese

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Gemeinden bilden einen Anziehungspunkt durch Zuzug und hohe Wohnqualität. Gut entwickelte ländliche Gemeinden im Umfeld von Mittelstädten bzw. an überregionalen Verkehrsachsen bilden strukturell den Typ 3 ab. Die Wohnbedingungen sind meist relativ günstig, die Grundstückspreise moderat. Neben einer guten Nahversorgung gibt es eine gute öffentliche Verkehrsanbindung. Im Falle von Typ 4 kann man von schwach entwickelten ländlichen Gebieten mit Tourismusfunktion ausgehen, die sich in zentrumsfernen Lagen befinden. In diesen Gemeinden herrscht eine ausgeprägte Abwanderungstendenz von jüngeren und besser ausgebildeten Arbeitskräften. Kennzeichen sind ebenso die auffällige Überalterung der Bevölkerung und schwindende Nahversorgung. Typ 5 und Typ 6 sind Verdichtungsgebiete im ländlichen Raum mit unterschiedlichen Raumtypen.“[6]

Auf Basis dieser Typologien ergeben sich für die Gemeinden des Typus 2 erhöhte Zukunftschancen durch Zuzug von Personen, welche an die Randzone von Großstädten ziehen. Daraus ergibt sich für diese Zuzugsgemeinden eine soziale „Zweiteilung“, zwischen den sogenannten Einheimischen und den neu Zugezogenen. Im Zuge der demografischen Entwicklung und des damit raschen Bevölkerungswachstums in diesen Städten resultiert daraus die Eingrenzung des Forschungsfeldes auf die dringende Frage,

„Verlieren Städte des Typus 1 und 2 im allgemeinen ihre Identität oder gibt es einen direkten Zusammenhang mit Identitätsverlust nur bei starkem unkontrollierten Wachstum?

Welche Auswirkung hat Identitätsverlust auf die darin lebende Bevölkerung?“

Der deutsche Sozialgeograph Steinbrink erklärt in seinem Werk „Leben zwischen Stadt und Land“ die kommunalpolitischen Handlungsfelder der Mittelstädte in der Stadtkulturentwicklung. „Mittelstädte müssen für ihre Stadtkultur eine eigene, spezifische Urbanität entwickeln. Der inflationär und undifferenziert gebrauchte Begriff der Urbanität ist für Mittelstädte im Hinblick auf Lebensqualität zu definieren und nicht mit urbaner Dichte gleichzusetzen. Die Verdichtungsdiskussion ist zu relativieren – die Mittelstädte wollen künftig nicht mehr die schwarzen Schafe mit umweltzerstörendem Flächenfraß für Einfamilienhäuser als Wohnwunschbild sein – auch hier ist eine neue Wohnkultur in der Innenstadt als Chance zu sehen, aber die Wohnformen müssen den Traum nach Freiraum und „Individualabstand“ beachten.“[7]

Die Gegenhypothese zu Steinbrinks Überlegungen, dass Mittelstädte eine eigene spezifische Urbanität entwickeln müssen, lässt folgende hypothetische Frage zu: Haben Mittelstädte ihren Identitätsverlust nicht dem starken Wirtschafts- und Bevölkerungswachstum zu verdanken? Dieser signifikante Wachstumskurs der Mittelstädte hob zwar im Zeitalter der wachsenden Industriegesellschaft den prosperierenden Status der Speckgürtelgemeinden, ließ aber neben dem Segen des florierenden Gemeindehaushaltes auch den Fluch des Bindungsverlusts der Bürger entstehen. Trotz der hohen Kommunalsteuereinnahmen der angesiedelten Wirtschaftsbetriebe und den daher teilweise hohen Gemeindebudgets von sogenannten „Speckgürtelgemeinden“ leiden diese blühenden Randkommunen zunehmend am Schlafstätten-Phänomen. Das schnelle Wachstum von Klein- und Mittelstädten bringt nach wie vor viele Binnenwanderer in benachbarte Kommunen von Großstädten, die jedoch nicht am aktiven Stadtleben teilnehmen und sich im Vereinsleben nur schwer integrieren. Schlafgemeinden erfahren diese Unpässlichkeit vornehmlich an der Nicht-Teilnahme an Kulturaktivitäten, sowie der fehlenden Opferbereitschaft für karitativen Tätigkeiten von Non-Profit Organisationen wie beispielsweise bei den örtlichen Feuerwehren oder den ansässigen Rettungszentralen. Binnenwanderer verwurzeln langsam bis kaum an lang bestehende Stadttraditionen der Urbevölkerung.

Neben dem Bevölkerungswachstum ist das wirtschaftliche Wachstum einer Kommune von Bedeutung. Deshalb wird der derzeitige begünstigte Online-Handel zu einer massiven Bedrohung für Städte mit einer hohen Kaufkraft und einer dementsprechend hohen Handelsstrukturdichte.

3.6 Handelsstrukturveränderungen – Entwichlungen, Auswirkungen für Städte

Österreich versteht sich gleich hinter Deutschland als Zweitplatzierter in der Europäischen Handelsstrukturdichte. Unter Berücksichtigung der derzeitigen Veränderungen im Handel, die stark durch den Digitalisierungstrend verursacht werden, steigt zunehmend der Marktbegleiterdruck. E-Commerce verändert das Kaufverhalten nachhaltig und global.

[6] Vgl. https://www.ris.bka.gv.at/GeltendeFassung.wxe?Abfrage=LrOO&Gesetzesnummer=10000614, 11.12.16
[7] Vgl. Steinbrink M. S.151-153

Hollbach-Gröming vom Deutschen Institut für Urbanistik sieht die Dynamik des Handels als eine Gefahr für Städte. Die großen Verlierer durch die Handelsverlagerung durch den Online-Handel, sind Klein- und Mittelstädte. Der Online-Shop, der zur „Commodity“ geworden ist, verändert mittel- und langfristig das Stadtbild. Nicht jedes Zentrum einer Stadt wird diesen Trend überleben, und ungesteuert kann es in Kommunen zu Handelsflächenleerstand kommen. Neben geografischen Gunstfaktoren wird auch die Intensität und Qualität der lokalen Aktivitäten einer Stadtentwicklung entscheiden über den atmosphärischen Charakter einer Stadt.

Nicht nur die regionale Entwicklung, sondern auch kleinstrukturierte Kommunen müssen sich aufgrund des transformierenden Handelsstrategien und neue Geschäftsfelder zurechtlegen. Diese Überlegungen sind für Verwaltungsorganisationen und politische Gemeindevertreter, die durch den operativen Einsatz nicht in der Lage sind eigenständig sich dieser Herausforderung zu stellen eine nicht greifbare Utopie.

Klein- und Mittelstädte sind deshalb umso mehr gefragt sich organisationsentwicklerische Prozessleistungen von externer Beratung zu holen.

Neben dem exorbitanten Urbanisierungstrend und der oben angesprochenen Handelsstrukturveränderung ergeben sich zwei Problemstellungen, die zusammengeführt eine Neue Denkweise für Städte und Kommunen bedürfen. Daraus entsteht ein neues Bild für Stadtentwicklung die eine gezielte strategische Ausrichtung benötigt. Um den zukünftigen Anforderungen eines modernen gesteuerten Wachstums einer Stadt eine positive Konnotation zu vermitteln, müssen Städte loslassen von Bestehendem und neue Denkweisen trainieren, um anknüpfend Innovationsprozesse zu durchlaufen.

4 FRAGESTELLUNG/HYPOTHESE

Aufgrund der oben skizzierten Entwicklungen lässt sich folgende Fragestellung formulieren:

„Welche Maßnahmen können von kommunalpolitischer Seite getroffen werden, um Klein- und Mittelstädte bei massiven Strukturveränderungen bei steigendem Bevölkerungs- und Wirtschaftswachstum gesteuert zu begleiten?

Von der Hauptfragestellung ausgehend, sollen folgende Unterfragen beantwortet werden:

- Welche Resilienzmethoden werden in städtischen Einzugsgebieten relevant, um den Standort situationsbedingt zu sichern?
- Mit welchem demographischen Bevölkerungswachstum haben sich Städte im mitteleuropäischen Raum in den nächsten 20 Jahren auseinanderzusetzen und wie kann damit qualitätsvoll umgegangen werden?

5 HANDELSEMPFEHLUNGEN

Erfahrung am Beispiel Leonding

Ausgehend von den oben stehenden Fragestellungen setzte das Standortmarketing der Stadtgemeinde Leonding durch einen gezielten Strategieplan neben der Visionsentwicklung 2030 einen Markenstrategieprozess für die Stadt mit folgendem Ziel auf:

(a) Die Identität der Stadtgemeinde zu klären und in weiterer Folge die Marke daraus zu entwickeln und diese in eine Form zu gießen, um die Stadt in einer einheitlichen Markenstärke in Erscheinung zu bringen. Im Sinne einer schlüssigen Gesamtkonzeption wurde das Markenimage definiert, die sich auf Grund der von der Bevölkerung subjektiv wahrgenommenen Attribute, das Nutzen und Persönlichkeit einer Marke bildet.

(b) Eine Visionsstrategie zu erarbeiten um der Stadt ihre Einzigartigkeit aufzuzeigen und die Stadt aus der Mittelmäßigkeit herauszuheben. In diesem Prozess hat sich die Stadtgemeinde Leonding mit ihrem Istzustand beschäftigt, an Denkschritten angeknüpft und daraus Handlungsanleitungen abgeleitet. Nach einstimmigen Beschluss der Stadtregierung wurde nun ein Maßnahmenkatalog für die Umsetzung der einzelnen Projektierungen festgelegt.

5.1 Eine Stadt im Wandel „Leonding 2030”

Die Stadt Leonding ist neben den drei Statutarstädten Linz, Wels und Steyr die viertgrößte Stadt in Oberösterreich. Eine klassische Mittelstadt mit über 30.000 Einwohnern, die mit der Nähe zur Landeshauptstadt Linz vorteilig mit gut ausgebauter Infrastruktur besticht. Neben den Spill-Over-Effekten zur angrenzenden Stadt Linz in Bezug auf Kultur-, Tourismus und Handelsangeboten ist Leonding ein attraktiver Standort für Wirtschaft, Wohnen und Leben. Die Bevölkerungsdichte wird mit 1.121 Einw. / km² gemessen. Der Bevölkerungswachstum liegt mit 17,2 % weit über dem österreichischen Durchschnitt. Die Bevölkerung weist einen geringen Anteil von 10,4 % an ausländischen Staatsangehörigen auf. Leonding hat neben Wilhering den zweithöchsten Akademikeranteil bei Bürgerinnen und Bürgern in Oberösterreich. Zentraler Punkt ist zudem, dass die Unternehmensdichte von Klein- und Mittelbetrieben ausgeprägt hoch ist und einige investitionsträchtige Leitbetriebe eine erhöhte Kommunalsteuerdichte ergeben, was sich positiv auf das Stadtbudget auswirkt.

Trotz dieser prosperierenden Betrachtungen wird von den umliegenden Kommunen ein starker Einfluss ausgeübt. Die Bevölkerung folgt dem Überalterungstrend, während sich die Umlandgemeinden weiterentwickeln. Die Großstadt Linz wächst und positioniert sich. Diese Marktbegleitungserscheinungen zwingen eine angrenzende Mittelstadt zu gesteuerten Handlungen.

5.2 Stadtentwicklung neu gedacht

Die Stadtgemeinde Leonding geht einen innovativen Weg in der strategischen Stadtentwicklung. Gemeinsam mit regionalen Vertretern aus Wirtschaft, Bildung und Politik ist es gelungen einen dynamischen Visionsprozess zu entwickeln.

Die Stadt vereint Menschen mit gemeinsamen Werthaltungen und schafft ein Umfeld, in dem sich jeder in die Weiterentwicklung des Lebensraumes einbringen und somit die Zukunft mitgestalten kann. In der strategischen Positionierung zeigt die Stadt Leonding viel Initiative, Mut und Willen zu Bewegung und Weiterentwicklung. Die Stadt beweist in ihrer Markenposition den Charakter der Abenteurerin und setzt damit seinen Schwerpunkt in die Zukunftsorientierung.

Die festgelegte Dynamik der neuen Identität wird genutzt um die Stadt mittel- und langfristig dem Wunsch des menschlichen Bedürfnisses nach Sicherheit und Stabilität nachzukommen.

Gleichzeitig muss Veränderung schrittweise und gesteuert passieren, um eine Standortsicherung für die Wirtschaft, Bildung und Gesellschaft zu gewährleisten. Die Stadtentwicklung ist angehalten, alle Stakeholder auf die Zukunftsausrichtung der Stadtgemeinde mitzunehmen.

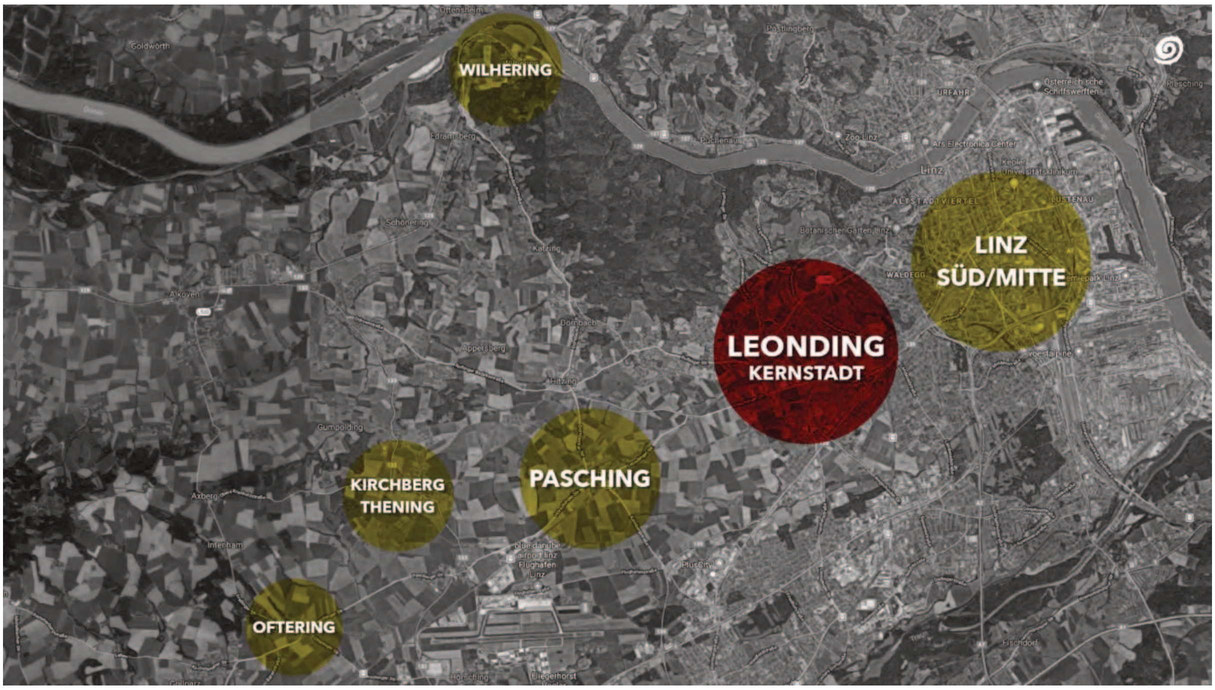
Doch die Frage, die wesentlich die Standortentwicklung in der Stadt Leonding beschäftigt ist die, welche Identifikationsmerkmale die Stadt Leonding zu etwas Besonderem macht? Wie geht die Stadtpolitik mit dem signifikanten Bevölkerungswachstum um? Welche Bedeutung kommt dem Standortmerkmal Bildung im gesellschaftspolitischen- und städtebaulichen Entwicklungskonzept zu? Um diese Frage beantworten zu können beschäftigte sich die Stadtgemeinde Leonding mit den Leitfragen und entwickelte daraus gemeinsam mit dem Gründer des IT-Fachhochschulcampus in Hagenberg bei Linz, Univ. Prof. Dr. Bruno Buchberger ein Zukunftskonzept. Neben diesen Erkenntnissen und einer interkommunalen Raumstrategie wurde ein Maßnahmenkatalog mit Handlungsmaßnahmen zur Umsetzung verabschiedet.

Die unter Pkt. 5.3. dargestellten Handlungsempfehlungen liefern für die Bevölkerung der Stadtgemeinde Leonding eine Weiterentwicklung des Lebens-, Wohn- und Arbeitsraums.

5.3 Handlungsempfehlung für Stadtentwicklung als Fallbeispiel

(a) Überregionale Kommunalarbeit als Strategie

Bisher gab es zwischen den Kommunen wenig niederschwellige Zusammenarbeit zu den benachbarten Gemeinden. Eine praxisorientierte Anleitung zur Schaffung von Synergien zwischen den Umlandgemeinden wird als Chance für eine fruchtbare Entwicklung gesehen. Die resultierende Empfehlung, dass überkommunale Vernetzungen gewinnbringend sind, sollte für Randstädte eine Zusammenarbeit auf Basis gemeinsamer Anliegen ermöglichen. Eine bessere Verhandlungsbasis mit den Vertretern der Großstädte spricht für überregionale und kommunale Zusammenschlüsse. So können sich Umlandgemeinden aufrüsten und große Infrastrukurprobleme gemeinsam lösen. Mit einem regionalen Konglomerat von mehreren Orten zwischen den Statutarstädten werden die Orte zu einer größeren kommunalen Einheit zusammenwachsen und ein bedeutsameres Sprachrohr darstellen, welches kreative Projekte, Stadtentwicklung und produktive Eigenschaften herausbildet.



- Abbildung 1: Stadtregionales Forum; Kernstadt Leonding; 2018

(b) Drei Säulen für erfolgreiche Wirtschafts- und Stadtentwicklung

In Leonding wurden die Stärken- und Chancenfelder definiert, aus denen die Zukunftskraft für die nächsten 15 Jahre geschöpft wird: Bildung, Mobilität und Konferenztourismus. Aus diesen Bereichen wurden konkrete Maßnahmen entwickelt und erste Umsetzungen im Stadtrat beschlossen.

- Bildung als entscheidender Standortfaktor

Bildung treibt eine Stadt an, sie eröffnet Möglichkeiten und neue Horizonte und sie ist ein entscheidender Standortfaktor für die regionale Wirtschaft. Die Stadtgemeinde Leonding setzt auf einen Bildungscampus – einen Raum für integrative Bildung. Von der Krabbelstube bis zum internationalen Studium. Bildung als gemeinsamer Kern. Es wird eine zentrale Zone für die Jugend geschaffen, ein entscheidender Raum für eine zukunftsweisende Entwicklung.

- Teststrecken für moderne Mobilität

Im Bereich der Mobilität geht es vor allem darum, Alternativen zur Straße zu schaffen. Moderne Mobilitätskonzepte haben in Leonding eine Chance den Verkehr der Stadt zu revolutionieren. Neben der Stärkung des öffentlichen Verkehrs, beispielsweise durch die Entwicklung einer lückenlosen Circle Line, die alle Stadtteile verbindet, wird in Richtung E-Mobilität und Sharing Modelle gedacht.

- Veranstaltungsort als Landmark

Die dritte Säule der Zukunftsvision nimmt sich dem Thema Event-Infrastruktur an. Das altgediente Veranstaltungszentrum wird in Leonding in einer neuen Dimension gedacht. Konferenztourismus wir mit einem erweiterten Konzept angestrebt, das sich durch einen multifunktionalen Modulaufbau mit einem dynamischen Angebot auszeichnen soll.

6 AUSBLICK/FAZIT

Der Stadtentwicklungsprozess wurde von der Standortagentur Leonding Mitte 2016 gestartet und befindet sich derzeit in der Umsetzung des Maßnahmenkataloges. Die Bevölkerung wurde in dieser Phase eingebunden ihre Ideen für die Weiterentwicklung der Stadt einzubringen. Leonding vereint in diesem Entwicklungsprozess Menschen mit gemeinsamen Wertehaltungen und schafft ein Umfeld, in dem sich jeder in die Weiterentwicklung des Lebensraumes einbringen und somit die Zukunft mitgestalten kann. Die Triebfeder in diesem Prozess ist die Initiative und der Mut zur Bewegung seitens der Stadtregierung. Eine Umsetzung der Ziele ist nur durch konsensorientierte überparteiliche Zusammenarbeit von Politik, Bevölkerung und Wirtschaft möglich.

7 BIBLIOGRAPHIE

BLOOM, D.E., CANNING und FINK G. Urbanization and the Wealth of Nations; Science 319. Nr. 5864. 2008
HABERMANN-NIESSE Klaus. HENTSCHEL Armin. LOMMER Hubert. PREIS Reinhard. SPIEGEL Dietmar. Alternativen in der Wohnungspolitik. 1983. Sonderheft Nr. 2. AJZ Druck+Verlag, Bielefeld.
SMITH Laurence. C. Die Welt im Jahr 2050. Die Zukunft unserer Zivilisation. Deutsche Verlagsanstalt. 2010. München.
STEINBRINK Malte. Leben zwischen Land und Stadt. Migration, Translokalität und Verwundbarkeit. 2008. Osnabrück.
DEUTSCHES INSTITUT FÜR URBANISTIK. Strukturwandel im Handel. Beate Hollbach-Grömig
(https://difu.de/institut. ; 20.2.17)
BUNDESKANZLERAMT. Landesrecht OÖ. https://www.ris.bka.gv.at/GeltendeFassung.wxe?Abfrage=LrOO&Gesetzesnummer=10000614; 11.12.2016)
JAKUBOWSKI Peter. Resilienz – eine zusätzliche Denkfigur für gute Stadtentwicklung. Information zur Raumentwicklung. Heft.4.2013 (http://www.bbsr.bund.de/BBSR/DE/Veroeffentlichungen/IzR/2013/4/Inhalt/DL_Jakubowski.pdf?__blob=publicationFile&v=2; 12.12.2016)
SIMMEL Georg. Die Großstädte und das Geistesleben. Aus: Die Großstadt.Vorträge und Aufsätze zur Städteausstellung. (Jahrbuch der Gehe-Stiftung Dresden. hrsg. von Th. Petermann. Band 9. 1903. S.185-206). Dresden (http://gutenberg.spiegel.de/buch/die-grossstadte-und-das-geistesleben-7738/2; 9.12.11.30)
STATISTIK Austria. Schnellbericht 8.2. Bevölkerungsprognose für Österreich 2010 bis 2030 mit Ausblick auf 2050 (ÖROK Regionalprognosen). (http://www.statistik.at/web_de/statistiken/menschen_und_gesellschaft/bevoelkerung/demographische_prognosen/bevoelkerungsprognosen/index.html; 1.12.1016)
STATISTIK Austria. Zahlen, Daten, Fakten. Wien. 2013 (http://www.statistik.at/web_de/services/index.html; 3.12.2016)
WIFO. Demografischer Wandel als Herausforderung für Österreichs Regionen. Teilbericht 1. November 2010 a (http://www.forschungsnetzwerk.at/downloadpub/2010_wifo_5555.pdf; 3.12.2016)

reviewed paper

State Space Analysis a Tool for Solid Waste Management

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1 ABSTRACT

Concentration of intense economic processes and high level of consumption in urban areas increase total waste generation and more space is required for waste disposal. Ministry of Finance (BAU: 2009) has estimated by 2041 it would be 1400 sq. km which will be equal to the total area of Mumbai, Chennai and Hyderabad city. Present solid waste management practices are shadowed by institutional lacuna, lack of proper funding, lack of management and operational systems, public apathy, lack of municipal will lead day by day increasing practice of dump to dump yard.

The most pressing problem faced by any urban centre in India today is Municipal Solid Waste Management (MSW). Rapid urbanization and changing lifestyles have led to the generation of huge amounts of garbage and waste in the urban areas. Over the past few years, the handling this MSWM has become a major organizational, financial and environmental challenge. (Ramachandra T. V. & Bachmanda, S. 2007). During the last century urban population of India increased ten folds from 27 million to 270 million. India produces 48.0 MT of MSW annually at present. Central Pollution Control Board, India (2009) said that by the year 2021, the urban population is expected to represent 41% of the overall population and subsequently MSW is expected to increase to 300 MT per year, by the year 2047 (490 g to 945 g per capita). A number of technologies are being proposed for management and disposal of garbage but so far no technology has been shortlisted as the one which would be viable not only from the environment angle but also in terms of the cost involved for unanimously in Indian context. (Davidson, 2000) .

Waste dumping is the only favorable method to urban local body without any further action. Day by day increasing trend practice of dump to dump yard won't sustain the function. So there is a requirement of taking integrated policy and technology to use less land as land is precious.

A number of technologies are being proposed for reduction of waste quantity through process and disposal of solid waste in general for different city or towns, but so far no technology has been shortlisted as the one which would be viable not only from the environment angle but also in terms of the cost involved for unanimously in urban local body in India.

A holistic approach is being therefore, derived through State-Space Model to manage waste by combining and applying a range of suitable techniques, technologies and management programs to achieve less requirement of land near urban areas by accounting area specific number of variables over period of time.

Keywords: tool, system, state space analysis, SWM, carbon footprint

2 INTRODUCTION

The most pressing problem faced by any urban centre in India today is Municipal Solid Waste Management (MSW). Rapid urbanization and changing lifestyles have led to the generation of huge amounts of garbage and waste in the urban areas. Over the past few years, the handling this MSWM has become a major organizational, financial and environmental challenge. (Ramachandra T. V. & Bachmanda, S. 2007). During the last century urban population of India increased ten folds from 27 million to 270 million. India produces 48.0 MT of MSW annually at present. Central Pollution Control Board, India (2009) said that by the year 2021, the urban population is expected to represent 41% of the overall population and subsequently MSW is expected to increase to 300 MT per year, by the year 2047 (490 g to 945 g per capita). A number of technologies are being proposed for management and disposal of garbage but so far no technology has been shortlisted as the one which would be viable not only from the environment angle but also in terms of the cost involved for unanimously in Indian context. (Davidson, 2000)

Waste dumping is the only favorable method to urban local body without any further action. Day by day increasing trend practice of dump to dump yard won't sustain the function. So there is a requirement of taking integrated policy and technology to use less land as land is precious.

Concentration of intense economic processes and high level of consumption in urban areas increase total waste generation and more space is required for waste disposal. Ever increasing population with end lasting waste production can be sustained with adopting an integrated approach for accounting solid waste management. This requirement may vary on the basis of different state vector.

Day by day increasing trend practice of dump to dump yard won't sustain the function for any urban area. Ministry of Finance (BAU:2009) has estimated that Country would occupies landfill area by 2001 237.4 sq.km which is equal to Mumbai; by 2011 at 379.6 sq.km or more i.e 90% of Chennai, by 2021 i.e 590.1 sq.km which is larger than Hyderabad town (583 sq.km) and by 2041 it would be 1400 sq km which will be equal to Mumbai+Chennai+Hyderabad city area. So, there is a requirement of taking integrated policy and technology to use less land as land is precious.

Draft SWM Manual by Central Public Health and Environmental Engineering Organisation (India) (CPHEEO), 2014 and Ministry of Environment & Forest (MoEF) Rule, 2013 have emphasized by 3R principle-Reduce, Recycle and Reuse in SWM. Both the manual has first time stated about Space requirement for different cities. The most important concern currently is reduction of land requirement for disposal by maximize appropriate treatment of different waste streams.

3 SWM SCENARIO IN INDIAN CITY

3.1 Per Capita Waste Generation

City size and per capita waste generation is positively correlated. Subsequently bigger city occupies big landfill area so > population > waste generation > landfill area. 366 towns' data has been collected and tabulated as under.

Original Classification	**Classification for this Study**	**Population Range (2001 and 2011 Census)**		**No. of Cities Studied**	**Total No. of Cities**	**Per Capita kg/day average**	**Landfill Area to City area %**
Class I	Metropolitan	5,000,000	Above	6	6	0.605	Upto 5
	Class A	1,000,000	4,999,999	32	462	0.518	Upto 3
	Class B	700,000	999,999	20		0.487	Upto 2
	Class C	500,000	699,999	19		0.464	
	Class D	400,000	499,999	19		0.459	
	Class E	300,000	399,999	31		0.448	Upto 1
	Class F	200,000	299,999	58		0.445	
	Class G	150,000	199,999	59		0.436	
	Class H	100,000	149,999	111		0.434	
Class II		50,000	99,999	6	345	0.427	Upto 0.5
Class III		20,000	49,999	4	947	0.425	Crude Dumping
Class IV		10,000	19,999	1	1,167	0.342	
	TOTAL			366			

Table 1: Per Capita Waste Generation in Different Class of Town in India. Source: Census of India, CPCB Report, Municipal Document

3.2 Waste Composition

Materials in MSW can be broadly categorized into three groups,

Compostables: Compostables or organic fraction comprises of food waste, vegetable market wastes and yard waste.

Recyclables: Recyclables are comprised of paper, plastic, metal and glass

Inerts The fraction of MSW which can neither be composted nor recycled into secondary raw materials is called Inerts. Inerts comprise stones, ash and silt which enter the collection system due to littering on streets and at public places.

366 towns data has analyzed to assess the waste composition in different region of country as under.

Region/City	MSW (TPD)	Compostables (%)	Recyclables (%)	Inerts (%)	Moisture (%)	Cal. Value MJ/kg	Cal. Value kcal/kg
Metros	51,402	50.89	16.28	32.82	46	6.4	1,523
Other Cities	2,723	51.91	19.23	28.86	49	8.7	2,084
East India	380	50.41	21.44	28.15	46	9.8	2,341
North India	6,835	52.38	16.78	30.85	49	6.8	1,623
South India	2,343	53.41	17.02	29.57	51	7.6	1,827
West India	380	50.41	21.44	28.15	46	9.8	2,341
Overall Urban India	130,000	51.3	17.48	31.21	47	7.3	1,751

Table 2: Composition of MSW in India and Regional Variation. Source: Census of India, CPCB Report, Municipal Document

A major fraction of urban MSW in India is organic matter (51%). Recyclables are 17.5 % of the MSW and the rest 31% is inert waste as shown in above table. The average calorific value of urban MSW is 7.3 MJ/kg (1,751 Kcal/kg) and the average moisture content is 47%. It has to be understood that this composition is at the dump and not the composition of the waste generated. The actual percentage of recyclables discarded as waste in India is unknown due to informal picking of waste which is generally not accounted.

3.3 Technological Viability

Waste composition categories include organic material (biodegradable) and inorganic material (non-biodegradable). Inorganic portion is mostly occupied by inert material but also include paper, plastics, glass, paper, rubber, etc. Despite the best efforts to reduce, reuse and recycle, there will always be residual waste requiring disposal. The alternative treatment and disposal technologies are:

- Recycle/Reuse/Material Recovery
- Energy recovery
- Aerobic digestion
- Anaerobic digestion / Biomethanation
- Pelletisation / Refuse Derived Fuel (RDF)
- Pyrolysis and Gasification
- Incineration
- Composting
- Landfills - Sanitary Landfill / Bioreactor landfill / Secured landfill (for inert waste)`

Recycling and composting efficiency are greatly reduced due to the general absence of source separation in India. Absence of source separation also strikes centralized aerobic or anaerobic digestion processes off the list. Anaerobic digestion is highly sensitive to feed quality and any impurity can upset the entire plant. Aerobic digestion leads to heavy metals leaching into the final compost due to presence of impurities and makes it unfit for use on agricultural soils. In such a situation the role of waste to energy technologies and sanitary landfilling increases significantly in India. This is due to the flexibility of waste-to-energy technologies in handling mixed wastes. Cost and space requirement for different time the comparative assessment of different process are as under:

Item	Composting/ aerobic Digestion	Sanitary/Bioreactor Landfill	Bio-Methanation /Anerobic Digestion	Incineration	Pelletisation	Pyrolysis
Retention Period	*5 Year*	*25-30 Years*	*6days*	*30 minutes*	*20-30 minutes*	*1 hour*
Space Requirement	High : (50-70% reduction of waste to	Moderate : 10-20% reduction of	Low to Moderate 70 % reduction and produce	Low 90% reduction	Low 7-10% waste inert	Moderate 30%

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Item	Composting/ aerobic Digestion	Sanitary/Bioreactor Landfill	Bio-Methanation /Anerobic Digestion	Incineration	Pelletisation	Pyrolysis
	manure)	waste Quantum	electricity			
Area Calculation (based on usual practice)	*1 MT for 20 sq mt area*	*1 MT for 10 sq mt*	*1 Mt for 15 sq mt area*	*1 Mt 5 sq mt*	*1 Mt for 5 sq mt area*	*1 MT for 15 sq mt*
Concern for Atmospheric Pollution	Moderate	Low	Low	High	Moderate	Moderate
Capital Investment	*High (INR 200,000 per tom)*	*High*	*High (INR 350,000) per ton*	*High (INR 1000,000 per ton)*	*Moderate (INR 5310 per ton)*	*High ((INR 1000,000 per ton)*

Table 3: Technological Viability with Space and Time in India. Source: CPHEOO Manual

3.4 Management Approach

In India, in most of the cities, residents collect waste in plastic buckets and deposit it regularly in community bins located near the house. In some areas, the waste is collected from individual houses by corporate staff. Street sweepings are also collected in community bins. There are no separate bins exclusively for collec¬tion of waste paper, plastic, etc.(S. Kumar et al. in Waste Management 29 (2009) 883-895). Several types of waste receptacles are used in the urban area. These are (i) large masonry bins, locally called "Dhalao" , a community storage of solid waste (ii) metallic bins of covered and open types (iii) 4-wheeled plastics and FRP (Fibreglass Reinforced Plastics) bins with large covers (iv) dumping in open area low lying or road side. For effective solid waste management in a city, the desired strength of workers is 2-3 workers per thousand, which has been indicated as adequate and can be considered to be 200-250 kg/worker/8 h shifts. But very few cities is following the MSW Rule, 2000. The following table gives the idea of management status of municipality and state capital of India.

S N.	Name of City	Waste Qty. (TPD)	MSW Management Scenario			Collection of MSW			Transportation of MSW			
			Organization in charge	Penalty clause	Manual handling	Community bin system	House to house collection	Segregation by rag pickers at community	Municipal vehicles	Private vehicles	Provision of tarpaulin/ good quality cover	Transfer station facility
	Meerut	490	HO	X	✓	✓	No	✓	✓	X	X	X
	Nashik	200	HO	X	✓	X	Fully	✓	✓	✓	✓	X
	Jabalpur	216	HO	X	✓	✓	Partially	X	✓	✓	X	X
	Jamshedpur	338	PP	X	✓	✓	No	X	X	✓	X	X
	Asansol	207	ME	X	✓	✓	Partially	X	X	✓	X	X
	Dhanbad	77	SO	X	✓	✓	No	X	✓	X	X	X
	Faridabad	448	HO	X	✓	✓	Partially	X	✓	X	X	X
	Allahabad	509	AHO	X	✓	✓	No	X	✓	X	✓	X
	Amritsar	438	MHO	X	✓	✓	Partially	X	✓	X	✓	X
	Vijaywada	374	MC	X	✓	✓	Partially	X	✓	X	X	X
	Rajkot	207	DMC	X	✓	✓	No	✓	✓	X	✓	✓
	Port Blair	76	SO	X	✓	✓	No	X	✓	X	X	X
	Guwahati	166	MC	✓	X	✓	No	X	X	✓	✓	X
	Chandigarh	326	MOH	X	✓	X	Fully	X	✓	X	✓	X
	Raipur	184	HO	X	✓	✓	Partially	X	✓	X	X	X
	Panjim	32	AO/TO	X	X	X	Fully	X	✓	X	✓	X
	Gandhinagar	44	DC	X	✓	✓	No	✓	✓	X	✓	X
	Simla	39	HO	X	✓	✓	Partially	✓	✓	X	X	X
	Srinagar	428	HO	X	✓	✓	Partially	X	✓	X	X	X
	Ranchi	208	HO	X	✓	✓	Partially	X	✓	X	X	X

S N.	Name of City	Waste Qty. (TPD)	MSW Management Scenario			Collection of MSW			Transportation of MSW			
			Organization in charge	Penalty clause	Manual handling	Community bin system	House to house collection	Segregation by rag pickers at community	Municipal vehicles	Private vehicles	Provision of tarpaulin/ good quality cover	Transfer station facility
	Thiruvanamthapuram	171	HO	X	✓	✓	Partially	X	✓	X	✓	X
	Imphal	43	HO	X	✓	✓	Partially	X	✓	X	X	X
	Shillong	45	CEO	X	✓	✓	Partially	X	✓	X	✓	X
	Aizawal	57	SO	X	✓	✓	No	X	✓	X	X	X
	Kohima	13	AO	X	✓	✓	No	X	✓	X	X	X
	Bhuveneshwar	234	HO	X	✓	✓	Partially	X	✓	✓	X	X
	Agartala	77	CEO	X	✓	✓	Partially	X	✓	X	X	X
	Dehradun	131	SHO	X	✓	✓	Partially	✓	✓	X	X	X
	Pondicherry	130	HO	X	✓	✓	Partially	✓	✓	X	✓	X
	Itanagar	12	DC	X	✓	✓	No	X	✓	X	X	X
	Gangtok	13	JS	✓	X	X	Fully	X	✓	X	✓	X
	Kavaratti	3	CP	X	✓	✓	Partially	X	X	✓	X	X
	Daman	15	ME	X	✓	✓	No	X	✓	X	X	X
	Jammu	215	HO	X	✓	✓	Partially	X	✓	X	X	X
	Silvassa	16	CMO	X	✓	✓	No	X	✓	X	X	X

Table 4: Status of State Capital Cities in implementation of MSW (Management and Handling) Rules, 2000. Source: CPCB 2006-07. Note: Note; CEO: Chief Executive Officer, DC: District Collector, MOH: Municipal Officer (Health), AO/TO: Accounts Officer/Tax Officer, DC: Dy. Commissioner, JS: Joint Secretary, CP: Chairperson (Village Panchayat), CMO: Chief Medical Officer, SHO: Senior Health Officer PP: Private Party, ME: Municipal Engineer, SO: Special Officer, AHO: Asst. Health Officer, MHO: Municipal Health Officer, MC: Municipal Commissioner

3.5 Cost

To account the cost of solid waste management process in city the following cost to be accounted:

For accounting Transportation cost

(1) from individual node to transfer stations or processing unit or disposal sites.

(2) from transfer station to R.D.F. plant , compost plant, recycling plant and landfill

(3) from transfer station to incinerator, vermicular compost plant and landfill

For accounting revenue cost

(4) revenue respectively per unit of waste from RDF plant mechanical compost plant, recycling plant, incinerator, vermicular compost plant, bio-medical treatment plant .

(5) cost of buying dumpers and special vehicle for bio medical waste.

(6) total amount of waste at transfer from different stations

(7) fixed cost incurred in opening a RDF plant, mechanical compost plant, recycling plant , an incinerator , vermicular compost plant , bio-medical treatment plant and landfills

(8) respectively variable cost incurred in handling of plants and landfill site

There are several methods or technologies exist in market. Every technology has some positive and negative point. Each every technology requires Land i.e. pace, Capital investment i.e. cost, Selection criteria i.e. waste generation (accounting accumulation of per capita waste), Atmospheric pollution load and management practices (Shareholder’s capacity to mitigate factor), The comparative assessment of all technology have been framed in one table and find out that every process has inert or reject which requires Space for disposal of waste.

4 STATE SPACE MODEL

To account the best technology for environmental angle, cost befit for urban local body and management practice ‘State-Space’ model has been chosen to anlayse. In control engineering, ‘state space’ representation is a mathematical model of a physical system as a set of input, output and state variables related by first-

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order differential equations known as the "time-domain approach" of Laplace Theorem with linear components.

'State-Space' refers to the space whose axes are the state variables (variables/parameters). State space representation is a mathematical model of a physical system as a set of input, output and state variables related by first-order differential equations : flow dynamic . It has one constant i.e time and output will be space when input variables are different then equation will be

This is simple linear progression method following laplace theorem where time is constant i.e. for 20 years and variable will change in different city and then space requirement will differ.

5 STATE SPACE MODEL ACCOUNTING SWM

Different process for individual study area have been calculated and Space requirement have been calculated basis of state space model. Further Terra Tech model has been chosen for testing the model. Cost Benefit analysis have been drawn to finalize the best option of SWM for individual town. At last Proposal for Space requirement in planning practice have been framed. To account the State-space model variables have been chosen basis of existing use of model in SWM practices and literature review as well as factor and computation formula have been drawn as under:

$$\sum_{i=1}^{5}\alpha X_{it1}+\sum_{j=1}^{4}\alpha X_{jt2}\geq \Psi_{t1}+\Psi_{t2}$$

$$\dot{\mathbf{x}}(t)=\mathbf{A}(t)\mathbf{x}(t)+\mathbf{B}(t)\mathbf{u}(t)$$
$$\mathbf{y}(t)=\mathbf{C}(t)\mathbf{x}(t)+\mathbf{D}(t)\mathbf{u}(t)$$

∑X2 = Total Projected ward Population i-n

where i to n are wards

∑Y1= Collected total waste i to n

∑Y2 = Estimated total waste

i to n

Z1= ∑Y1/∑X1 (per capita waste at present year)

Z2= ∑Y2/∑X2 (per capita waste in projected year)

This is simple linear progression method following laplace theorem where time is constant i.e. for 20 years and variable will change in different city and then space requirement will differ.

Sl No	State Variables	Factors influence variables	Equation of State variables for Space Requirement
	Per Capita Waste Generation	*Population* Sector wise / ward wise present population (Initial Year) Population projection in different years (block year) *Socio-Economic Condition* *Social* Family size Education Life style Practice *Economic* Gross Income of family No person employed Type of job	Based on Linear Equation $\sum X_1$ = Total Population of wards i-n Where i to n are wards $\sum X_2$ = Total Projected ward Population i-n where i to n are wards $\sum Y_1$ = Collected total waste i to n $\sum Y_2$ = Estimated total waste i to n Z1= ∑Y1/∑X1 (per capita waste at present year) Z2= ∑Y2/∑X2 (per capita waste in projected year)

Sl No	State Variables	Factors influence variables	Equation of State variables for Space Requirement
2	Waste Composition	*Types of Waste* *Biodegradable* *compostable* *non compostable* *Non Bio Degradable* *recyclable* *debris* *Quantity of each typology waste* *Source* *Segregation* *Waste Reduction* *Quality of waste* *Physical Characteristics* *Chemical Characteristics*	Based on Linear Equation ∑a i-n +∑b i-n +∑c i-n +…….∑Z i-n = ∑Y2 where: ∑a i-n= Composting Waste ∑b i-n= Recycle Waste ∑c i-n= Construction Debris Waste ∑d i-n= WTE Waste ∑Y2= Estimated total waste
3	Technological Option	*Composting* *Sanitary landfill* *Bio Methanation* *Incineration* *RDF* *Pyrolysis*	Based on Linear Equation ∑a i-n= Composting Waste= compost plant ∑b i-n= Recycle Waste= Pyrolysis ∑c i-n= Construction Debris Waste= incineration ∑d i-n= WTE Waste (RDF) ∑ Y2- (∑a i-n +∑b i-n +∑c i-n +…….∑Z i-n) = Sanitary Landfill / Inert Calculation
4	Management Approaches	*Collection* *Source Segregation* *Methods* *Residential Collection* *Open Residential Collection* *Municipal Residential Collection* *Municipal Contracted Residential Collection* *Zoned Residential Collection* *Commercial Collection* *Recyclables Collection* *Residential Curbside Collection* *Commercial On-Site Collection* *Transportation* *Direct Haul* *Transfer Station* *Drop-off Recycling Centers* *Recyclables Commodities / Material Processing (MRF: Material recycling facility) :* *Newspaper/papers (Office Paper , Phone Books, Magazines, Mixed Paper)* *Corrugated Cardboard* *Aluminum Cans /Misc. Aluminum* *Bi-Metal (Tin) Cans* *Ferrous* *Non-Ferrous* *Glass Containers* *Plastic Film /Plastic Containers* *Yard Waste* *Food Waste* *Wood* *Textiles* *Rubber* *Yard Waste Composting*	Based on Linear Equation ∑aX it1+ ∑a Xyt2 ≥ T1 + T2 Total waste moved from each waste collection points i=1,…5 and j=1,…4 should at least be equal to the total amount of waste at that point or net density waste. t1, t2 : transfer station If only direct Haul exist then Transfer station is equal to zero
5	Costs	*Capital Cost* *Collection Costs* *Transportation Costs* *Operating Costs* *Total Facility Costs (Equipment Cost)* *Debt Service* *Gross Costs* *Net Costs* *Revenue cost* *Tipping Fees* *RDF Sales* *Electricity Sales* *MSW Compost Sales /Yard Waste Compost Sales* *Recyclables/Commodities Sales* *Other Fees if any*	Based on Linear Equation Net cost ≤ Revenue Cost ∑F1Xi-z= Sum of Every HH/Nodes collection cost ∑F2Ti-z-= Sum of Every node to transfer station cost ∑F3Oi-z= sum of Operating cost of different processing plant per unit ∑F4Ei-z= Sum of equipment cost ∑F5Si-z= Sum of salary cost Net Cost= ∑F1Xi-z+ ∑F2Ti-z+∑F3Oi-z+∑F4Ei-z+∑F5Si-z ∑f1X1=Sum of revenue collection from HHs ∑f2R= Sum of RDF sales cost(yearly) ∑f3 E=Sum of electricity sale ∑f4A= Sum of Compost plant sale ∑f5B= sum of recyclablewaste Net revenue= ∑f1X1+∑f2R+∑f3 E+∑f4A+∑f5B

Table 6: Identified Variables and Factor for Computing State-Space Model for SWM. Source: Analyses

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6 ANALYSIS

The existing SWM scenarios of three identified urban areas of Gurugram (Class I), Durgapur (Class II) and Solan (Class III) are different. Three classes of towns have been selected i.e. large, medium and small towns in terms of population and climatic location. Waste generation has been differed basis of economic characteristics of towns and compositions which are also varied on the basis of climatic location To account the state space model for individual town SWM for 20 years perspective c following table no. 7 has illustrated for study areas Gurugram, Durgapur and Solan.

Title	Unit	Gurugram	Durgapur	Solan
Base year population (2011)	Number	886,159	566,517	39,256
Projected year population (2031)	Number	4,250,000	793,124	58,746
Per Capita MSW Genration in 2011	gm	565	370	350
Per Capita MSW Genration in 2031	gm	600	400	550
Total Waste Generation by 2011	TPD	551	227	14
Total Waste Generation by 2031	TPD	2550	398	34
Total compostable waste by 2031	%	33%	45%	60%
Total recyclable waste by 2031	%	10%+20%RDF	12%	12%
Total Inert by 2031	%	37%	35%	20%
Total disposable RDF & Leachate by 2031	%	20% +2%	8%	8%
Total Area required for composting	Ha	6	1.79	7
Total area required for recycle	Ha	2	4.289	0
Total area required for Inert disposable	Ha	8	8.13	5.59
Total area required for Plant (Waste to Energy)	Ha	1	0	0
Total area Required for Haul Areas	Ha	2.07	1.9	0.01
Total area required for collection bins	Ha	1.003	1.0428	0.015
Total expenditure	Rs.in lakh	675.3	76.7	66.0
Ultimate Total Revenue	Rs.in lakh	1002.6	101.8	65.7
Net Revenue	Rs.in lakh	32.7	25.1	-.03
State-Space Model Accounting				
Selection of Best option	Technology	WTE+Compost+SLF	RDF+ Compost+SLF	RDF+ Aerpbic Compost+SLF
Total estimated area	Ha	17	11.59	12.51
Local Body report				
Technological Option	Technology	Incineration +compost+SLF	SLF	Compost+ SLF (regional SLF)
Estimated area	Ha	19.904	21	21

Table 7: Comparative assessment of State Space Model of Three Selected Study Areas. Source: Author, 2015

From above table it is clearly vivid that 'State Space' model is illustrating the space requirement for Solid waste disposal for three towns by accounting best suitable methods for individual town for disposal waste and further space requirement for landfill site for 20 years. This model also accounts major factors like socio-economic condition where food habits accounts waste generation, economic condition has helped to analyse capacity of residents for taxation, climatic condition helps to choose best method for processing waste. Further terra tech model helps to validate the calculation.

Mega city Gurugram has exponential population growth has indicated the huge amount of waste generation over period where as Solan, a hilly town is restricted to growth in terms of spatial expansion as well as only incremental population growth has been noticed. Industrial town Durgapur is back logging with economic issue and growth dynamic is also very nominal. Migration from rural to urban area has influx population and less purchasing power has shown the less capability to share the burden of cost for SWM. The population and economic growth has impacted the per capita generation of solid waste on this case study area. Where, Gurugram has marked the highest per income, but Durgapur city stands the lowest rank in income generation whereby population category city is placed at second position. The comparative statement of these two towns has extensively shown the economic influence in waste generation and management scenario. Percentage of composting waste also varies in these cities. The maximum potentially has been found in Solan town. Hilly town is humid climate with heavy rainfall has maximum potentiality for composting technology followed by Durgapur and minimum at Gurugram. Although, inert i.e. residue is maximum in big city comparative to small town among case study areas and so disposable quantity of waste is huge in mega city Gurugram, followed by Durgapur and comparatively less in Solan town. This is helping to predict space requirement for particular technological use for waste process in city on specific basis of its state variable factors. By using state space analysis model total estimated area requirement for individual case study area are 17 ha for

Gurugram City, 12 ha for Durgapur City and 12.5 ha for Solan town whereas, municipality of individual town has estimated area i.e. 19 ha for Gurugram, 21 ha for Durgapur and Solan town each.

Based on the analysis of the selected cities, their different contexts and approaches, it is seen that there is not a single technology is suitable. It can be sustained with adopting a suitable technique for processing waste for further landfilling the inert an integrated approach for accounting several variables should be adopted for solid waste management in city planning. The State Space Model is a problem solution method for particular town with dynamic variables. Mainly three areas of concerned have been approached in this 'State-Space' analysis model for Solid Waste Management as described below.

(a) Technological design: Basis of less space requirement of output value X on t time and less cost use with local body's management capacity suitable technology shall be chosen

(b) Space Design: estimated area requirement have been calculated for individual case study area. This model has also been tested for three towns through computer aided Terra-model tool Pack.

(c) Time Design This State Space model can be calculated by two methods

- First order differential equation i.e. Linear Method where time is invariant,
- Second order differential equation method i.e. Standard Deviation Method where time is variant.

7 CONCLUSION

The 'State-Space' model for Solid Waste Management analysis for town is a good starting point upon which future variation can be built. So for net cost determine the selection of processing technology for town and on that account net inert or net residue can be accounted. After calculating the net residue generation net inert area requirement for waste disposal will be identified on different time perspective.

Positive aspects of State-Space model provide an important body of techniques for analyzing time-series data but their use requires estimating unobserved states variables. This Laplace-Gaussian Filter (LGF) gives fast, recursive, deterministic 'state' or parameter estimates.

Whereas Negative Aspect of Model is the central statistical problem in applying state-space models is that of filtering, i.e., estimating the unobserved state from the observations. There are several factors which are unobserved for computing may change the output.

8 REFERENCES

Central Pollution Control Board, (2013) "India. Plastics Waste Management: Environmental Issues and Challenges". Central Pollution Control Board.

[Online].http?www.cpcb.nic.in/divisionsofheadoffice/pcp/mamnagement_plasicwaste.pdf

Central Public Health and Environmental Engineering Orgainsation, (2000) "Manual for Solid Waste Management, MSW Rule, 2000", Publication of CPheeo, Ministry of Urban Development.

Central Public Health and Environmental Engineering Orgainsation (2014), 'Manual on Municipal Solid Waste Management', Draft, Ministry of Urban Development, Government of India.

Ramachandra T. V., & Bachmanda, S. (2007), "Environmental Audit of Municipal Solid Waste Management": Technical Paper, ENVIS Int. J. Environmental Technology and Management, Vol. 7, Nos. 3/4, 2007 (p 369-390).

Poulsen, Tjalfe Moldrup , G. & Sørensen, Per Kirsten (2006), "Linking landfill hydrology and leachate chemical composition at a controlled municipal landfill (Kåstrup, Denmark) using state-space analysis" Sage Publication.

Steuerung der Siedlungsflächenentwicklung auf dem Prüfstand – kompakte, umweltverträgliche Siedlungsstrukturen im regionalen Kontext: Traum oder Wirklichkeit?

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1 EINFÜHRUNG

Angesichts des steigenden Siedlungsdrucks können viele deutsche Städte der Nachfrage nach Flächen für den Wohnungs- und Gewerbebau immer öfter nicht mehr allein bzw. allein auf ihren Gemarkungen gerecht werden, sondern sind auf regionale Lösungen angewiesen. Gleichzeitig sehen sich die Planer und Politiker in Deutschland mit dem sogenannten 30 ha-Ziel, seit neuerem sogar mit der „Netto-Null" konfrontiert, um einer der zentralen negativen Umweltauswirkungen der Siedlungsentwicklung zu begegnen.

Seit der zweiten Hälfte des 20. Jahrhunderts steigt die Flächeninanspruchnahme für Siedlungs- und Verkehrsfläche stetig und entkoppelt vom Bevölkerungswachstum an. In den 1980er Jahren erfolgte eine räumliche Schwerpunktverschiebung von den verdichteten in eher ländliche Regionen, insbesondere in Agglomerationsräumen, wobei der engere suburbane Raum absolut die größten Zuwächse verzeichnete. Mit der gestiegenen umweltpolitischen Relevanz seit dem Jahr 2000 sank die tägliche Flächeninanspruchnahme von im Jahr 2002 noch 129 ha bis auf 61 ha pro Tag im Jahr 2015 (BBR 2005; S. 54ff.; BBSR 2012; S. 123). Gleichwohl erscheint im Jahr 2017 das in der Nationalen Nachhaltigkeitsstrategie auf das Zieljahr 2020 ausgerichtete 30 Hektar-Ziel nicht mehr realistisch erreichbar. In der Neuauflage der Deutschen Nachhaltigkeitsstrategie 2016 wurde der Zielhorizont daher auf 2030 hinausgeschoben und das Ziel in „unter 30 Hektar" geändert (Bundesregierung 2017; S. 159).

Im Gegensatz zu anderen Umweltproblemen verursacht die Flächeninanspruchnahme keine unmittelbare Bedrohung für Menschen. Trotz vielfältiger Folgewirkungen ist sie aufgrund der kaum sinnlich wahrnehmbaren Umweltfolgen und eines schleichenden Belastungsprozesses im gesellschaftlichen Problembewusstsein wenig verankert (Rink/Banzhaf 2011; S. 453). Durch die Flächeninanspruchnahme kommt es in erster Linie zum Verlust von Boden für andere Nutzungen. Insbesondere die Landwirtschaft ist davon betroffen. Damit einher geht die Beeinträchtigung der natürlichen Bodenfunktionen. Gleichzeitig bedingt die Umwandlung in Siedlungs- und Verkehrsfläche den Rückgang von Freiräumen. Dies hat negative Auswirkungen auf den Naturhaushalt und seine Funktionen, den Biotop- und Artenschutz sowie die Biodiversität, aber auch auf die Erholungsfunktion des Freiraums für den Menschen (UBA 2003; S. 93).

Die primären Triebkräfte der Flächeninanspruchnahme sind nicht allein mit nachfragebezogenen Variablen zu erklären; das bedeutet neben der demografischen Entwicklung, der Beschäftigungsentwicklung, Veränderungen der Haushaltseinkommen sowie einem gestiegenen Motorisierungsgrad sind weitere, angebotsbezogene Faktoren zu berücksichtigen. Angebotsplanungen durch Kommunen und Projektentwickler stellen Anreize für die Flächeninanspruchnahme durch private Haushalte und Unternehmen dar (BMVBS/BBSR 2009; S. 1).

Vor diesem Hintergrund kann die Schaffung kompakter, umweltverträglicher Siedlungsstrukturen im regionalen Kontext wesentlich dazu beitragen, die Flächeninanspruchnahme und ihre Folgen zu reduzieren. Auf Grundlage von Zwischenergebnissen aus einem laufenden Forschungsvorhaben „Kompakte, umweltverträgliche Siedlungsstrukturen im regionalen Kontext – Potenziale, Hemmnisse und Handlungsansätze einer integrierten Siedlungs- und Verkehrsplanung im Zusammenhang von Stadt und Region (KuSirK)" des Umweltbundesamtes werden, durch einen Vergleich der Definition dieser mit Festlegungen im Regionalplan, Entwicklungsbedarfe im regionalplanerischen Instrumentarium zum Erreichen kompakter, umweltverträglicher Siedlungsstrukturen im regionalen Kontext aufgezeigt, um dem zukünftigen Städtewachstum über kommunale Grenzen auf regionaler Ebene zu begegnen und Freiräume zwischen den Siedlungen zu erhalten. Dabei wird vor allem auf zwei Untersuchungsregionen aus dem Forschungsvorhaben Bezug genommen: die Region Münsterland sowie die Region Hannover. Neben der Auswertung der Plandokumente kann auf intensive Expertengespräche mit den regionalen Akteuren zurückgegriffen werden, um erste Ergebnisse und Lösungsvorschläge zu präsentieren und zur Diskussion zu stellen.

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2 DEFINITION KOMPAKTER, UMWELTVERTRÄGLICHER SIEDLUNGSSTRUKTUREN IM REGIONALEN KONTEXT

Die Begriffe „kompakt“ und „umweltverträglich“ im Kontext regionaler Siedlungsstrukturen müssen als zwei Bedingungen gesehen werden, die zwar eigenständig zu verstehen, aber auch im engen Zusammenhang zu diskutieren sind. Im städtischen Kontext oft im Sinne hoher Siedlungsdichten und einer geschlossenen Siedlungsform betrachtet und somit gesunden Lebens- und Arbeitsbedingungen entgegenstehend, spart eine bauliche Verdichtung die Inanspruchnahme von Freiflächen für die Siedlungsentwicklung. Insbesondere im regionalen Kontext wird dieser Zusammenhang sehr deutlich, da eine Konzentration von Siedlungstätigkeiten das (Nachhaltigkeits-)Ziel des „Flächensparens“ unterstützt und somit auch auf eine Umweltverträglichkeit der Siedlungsstrukturen hinwirkt. Kompakte, umweltverträgliche Siedlungsstrukturen sind daher als Optimierungsaufgabe zu betrachten und werden im Folgenden anhand qualitativer Kriterien beschrieben und abgegrenzt (vgl. Tabelle 1).

Die Siedlungsentwicklung in einem stadt-regionalen Kontext soll sich am Prinzip der „dezentralen Konzentration“ orientieren und gleichzeitig großräumig zusammenhängende Freiräume mit verschiedenen, schützenswerten Freiraumfunktionen von Besiedlung freihalten. Im regionalen Bezugsrahmen kommt es darauf an, im Sinne der Kompaktheit eine räumliche Steuerung der Siedlungsentwicklung auf solche Standorte anzustreben, die über eine regional bedeutsame Ausstattung von Infrastrukturen und Versorgungseinrichtungen verfügen. Dies sind vor allem Zentrale Orte.

Gemäß dem Leitbild der „Region der kurzen Wege“ (UBA 2011; S. 64) ist eine räumliche Steuerung der Siedlungsentwicklung auf die Standorte, die über Erreichbarkeitsvorteile insbesondere durch den Öffentlichen Personennahverkehr (ÖV)-Anschlüsse verfügen, notwendig. Dies gilt sowohl für Wachstums-, aber auch insbesondere für schrumpfende Regionen. Hierdurch sollen vor allem der Individualverkehr (IV) vermieden oder zumindest die Standorte mit leistungsfähigem ÖV für die zukünftige Siedlungsentwicklung präferiert werden.

Somit ist auch das Vorhandensein eines leistungsfähigen ÖV-Systems, am besten schienengebunden, das eine echte Alternative zum IV bietet, ein wichtiges Kriterium zur Bestimmung und Abgrenzung von „kompakten, umweltverträglichen Siedlungsstrukturen im regionalen Kontext“. Zum einen wird ein enger räumlicher Anschluss an bestehende Siedlungseinheiten unterstützt, wodurch der Zersiedlung vorgebeugt wird, und zum anderen wird der verkehrliche Erschließungsaufwand reduziert und führt somit zu geringeren verkehrlichen Emissionen.

Wesentlich ist außerdem das Prinzip „Innenentwicklung vor Außenentwicklung“. Dieses wird ergänzt durch den planerischen Ansatz der „Doppelten Innenentwicklung“ (Böhm et al. 2016; S. 15f.). Als ein wesentlicher Indikator kann die Umwandlung von Freiflächen in Siedlungs- und Verkehrsfläche („Flächenneuinanspruchnahme“) angesehen werden.

Des Weiteren sind gesunde Lebens- und Arbeitsbedingungen innerhalb der Siedlungen ein wesentliches Kennzeichen für umweltverträgliche Siedlungsstrukturen. Diese werden u.a. durch weitgehend emissionsfreie oder zumindest emissionsreduzierte Wohnquartiere und gut erreichbare Naherholungsgebiete erreicht. Dabei sind für eine innenentwicklungs- bzw. bestandsbezogenen Siedlungsstruktur regional adäquate Dichtewerte zielführend.

Eine Definition bzw. Ausgestaltung von kompakten, umweltverträglichen Siedlungsstrukturen im regionalen Kontext ist dabei immer im engen Bezug zu den realen Raumstrukturen zu sehen, sodass es auch zu differenzierten Zielvorstellungen in unterschiedlichen Raumtypen kommen kann. Eine Festlegung von konkreten Schwellenwerten oder bundesweit geltenden Indikatoren lässt sich aber hieraus nicht ableiten.

3 RAUMPLANERISCHE STEUERUNG DER SIEDLUNGSENTWICKLUNG IN DEN REGIONEN HANNOVER UND MÜNSTERLAND

Zur Identifizierung von Potenzialen und Hemmnissen bei der Herstellung kompakter, umweltverträglicher Siedlungsstrukturen im regionalen Kontext werden die Regionen Hannover und Münsterland als Fallstudien herangezogen. Eine Strukturanalyse in den Bereichen Demografie, Wirtschaft, Verkehr und

Siedlungsentwicklung dient der Einschätzung von Handlungsbedarfen mit dem Ziel, kompakte, umweltverträgliche Siedlungsstrukturen herzustellen. Als weitere Rahmenbedingungen werden die Vorgaben der Landesplanung untersucht und anschließend die Inhalte der Regionalen Raumordnungspläne dargestellt, um den regionalplanerischen Steuerungsansatz zu bestimmen. Dabei soll abgeglichen werden, ob kompakte, umweltverträgliche Siedlungsstrukturen im regionalen Kontext als Ziel in diesen verankert sind und welche Handlungsbedarfe in dieser Hinsicht gesehen werden.

3.1 Raumplanerische Steuerung der Siedlungsentwicklung in der Region Hannover

3.1.1 Strukturelle Herausforderungen im Hinblick auf kompakte, umweltverträgliche Siedlungsstrukturen im regionalen Kontext

Die strukturelle Ausgangslage in der Region Hannover stellt sich räumlich differenziert dar und bietet sowohl Potenziale als auch Hemmnisse für die Ausbildung kompakter, umweltverträglicher Siedlungsstrukturen im regionalen Kontext.

Es ist erforderlich, das prognostizierte, vor allem durch Zuwanderung bedingte Bevölkerungswachstum im Herzen der Region (Region Hannover/ Landeshauptstadt Hannover 2014; S. 16ff.) an den Zentralen Orten aufzufangen, da diese über eine regional bedeutsame Ausstattung von Infrastrukturen und Versorgungseinrichtungen verfügen. Die dortige Siedlungsstruktur ist unter Berücksichtigung einer effizienten Flächennutzung und dem Prinzip der Innen- vor Außenentwicklung zu entwickeln, um die aus dem Wachstum resultierende Flächenneuinanspruchnahme gering zu halten. Des Weiteren kann eine Umlenkung der Bevölkerungsströme in die schrumpfenden Zentralen Orte der Entlastung des bereits sehr verdichteten Regionskerns dienen. Dabei gilt es, die Siedlungsstruktur an den Haltepunkten des Öffentlichen Personennahverkehrs (ÖPNV), insbesondere des Schienengebundenen Personennahverkehrs (SPNV), zu konzentrieren, sodass eine Zersiedlung und die Entstehung von mehr Motorisiertem Individualverkehr (MIV) verhindert werden. Gleichzeitig werden kurze Wege in der Region gefördert.

Steuerungserfordernisse ergeben sich im Hinblick auf die Konzentration der ökonomischen Entwicklung auf die Landeshauptstadt Hannover (LHH) und ihr direktes Umland (Region Hannover 2016c; S. 36; IHK Hannover 2017) sowohl für die Ansiedlung neuer Gewerbe- und Industriebetriebe als auch für die verkehrliche Erreichbarkeit der Arbeits- und Produktionsstätten. Auch hier ist der Anschluss an bestehende Siedlungsstrukturen und die Konzentration auf wenige geeignete Standorte anzustreben, um eine Zersiedlung zu vermeiden. Überdies bietet die Ansiedlung an Standorten im Umland mit Erreichbarkeitsvorteilen durch den SPNV-/ÖPNV einerseits eine Entlastung in der LHH und andererseits eine gute verkehrliche Anbindung für den Personen- und Güterverkehr. Die Erhaltung und Verbesserung des SPNV-/ÖPNV-Angebots in der gesamten Region ist von Bedeutung, um eine Verlagerung des Pendelverkehrs vom MIV zum ÖPNV, vor allem zum SPNV, zu erreichen und so verkehrliche Emissionen zu verringern.

Die Region Hannover verfügt über ein gut ausgebautes ÖPNV-System, welches insbesondere die LHH aus den Umlandkommunen gut erreichbar macht. Die Trägerschaft durch die Region Hannover bietet darüber hinaus weitere organisatorische Vorteile (Region Hannover 2017). Dennoch stellt sich die Herausforderung, die ÖPNV-Anbindung im Umland – vor allem die SPNV-Anbindung in den Kommunen an den Grenzen der Region – zu verbessern, aber auch angesichts der künftigen Bevölkerungsentwicklung die Leistungsfähigkeit dieses im Zentrum der Region zu erhalten und insgesamt den Umweltverbund zu stärken.

Angesichts einer differenzierten Flächenentwicklung, die in einigen Kommunen nicht allein mit der Bevölkerungsentwicklung zu erklären ist, und dem Ziel der Schaffung kompakter, umweltverträglicher Siedlungsstrukturen im regionalen Kontext gilt es, vor allem im Norden der Region eine Zersiedlung der Landschaft zu vermeiden. Dort befinden sich die Entwicklungsschwerpunkte im Bereich Gewerbe und Industrie direkt angrenzend an die LHH, im Bereich Wohnen in den Kommunen an der Grenze (LSN 2017). Besonders in den Bereichen mit einem hohen Anteil der Siedlungs- und Verkehrsfläche sollte die Flächenneuinanspruchnahme minimiert und möglichst auf die Zentralen Orte – auch im Süden der Region – gelenkt werden. Insbesondere in den Kommunen mit hoher Flächendynamik sollte die Siedlungsentwicklung nur im Anschluss an bestehende Siedlungsstrukturen und unter dem Vorrang der Innenentwicklung erfolgen. Darüber hinaus sollten neue Siedlungsflächen bestehende Verkehrsinfrastrukturen nutzen, um eine weitere Flächenneuinanspruchnahme für Verkehrsflächen zu vermeiden.

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3.1.2 Vorgaben der Landesplanung zur Siedlungsentwicklung

Landesrechtliche Grundlagen für das Regionale Raumordnungsprogramm (RROP) Region Hannover 2016 sind das Niedersächsische Raumordnungsgesetz (NROG) und das Landes-Raumordnungsprogramm Niedersachsen 2008/2012 (LROP). Das NROG gibt in § 2 Nr. 5 S. 2 und 3 vor, die Entwicklung, Sicherung und Verbesserung der Arbeitsplatz-, Bildungs- und Versorgungsstruktur in der Regel auf die zentralen Siedlungsgebiete in den Gemeinden auszurichten und dadurch leistungsfähige Zentrale Orte zu sichern und zu entwickeln. Damit sind bereits auf landesrechtlicher Ebene Grundprinzipien einer kompakten, umweltverträglichen Siedlungsstruktur im regionalen Kontext verankert. Der ebenfalls unter Nr. 5 aufgeführte Grundsatz der räumlich zweckmäßigen Zuordnung von Versorgung, Wohnen, Arbeiten und Freizeit (S. 5) begünstigt eine „Region der kurzen Wege“ und damit die Umweltverträglichkeit der Siedlungsstrukturen.

Das LROP strebt eine umweltverträgliche und klimagerechte Siedlungsentwicklung an (LROP 2012; S. 1f.). Leitlinien wie die Entwicklung von Siedlungsstrukturen, in denen die Ausstattung mit und die Erreichbarkeit von Einrichtungen der Daseinsvorsorge für alle Bevölkerungsgruppen gewährleistet wird und die in das öffentliche Personennahverkehrsnetz eingebunden sind, oder die Erhaltung siedlungsnaher Freiräume kommen einer kompakten, umweltverträglichen Siedlungsstruktur zugute. Außerdem werden die in den Regionalplänen einzusetzenden Instrumente zur Siedlungssteuerung benannt (ebenda; S. 9ff.). Verstärkt wird die Relevanz kompakter, umweltverträglicher Siedlungsstrukturen im neuen LROP 2017, indem die Innen- vor Außenentwicklung als Grundsatz der Raumordnung festgelegt wird und die Entwicklung von Wohn- und Arbeitsstätten vorrangig auf die Zentralen Orte und vorhandene Siedlungsgebiete mit ausreichender Infrastruktur konzentriert werden soll (LROP-VO 2017).

Durch weitere Festlegungen wird der Freiraum im Sinne umweltverträglicher Siedlungsstrukturen vor einer weiteren Inanspruchnahme von Freiräumen für die Siedlungsentwicklung, den Ausbau von Verkehrswegen und sonstigen Infrastruktureinrichtungen sowie Zerschneidung geschützt. Die Erhaltung der Freiräume erfolgt über einen landesweiten Freiraumverbund sowie weitere flächenhafte Festlegungen zum Schutz des Freiraums und seiner Funktionen, welche zum Teil in den Regionalplänen konkretisiert werden (ebenda; S. 16ff.).

Außerdem enthält der LROP mehrere Festlegungen zur Stärkung des ÖPNV und hebt in diesem Zusammenhang insbesondere die Bedeutung des SPNV hervor (ebenda; S. 29ff.), durch welchen MIV-bedingte Emissionen verringert werden können.

3.1.3 Regionalplanerischer Steuerungsansatz zur Siedlungs-, Freiraum- und Verkehrsentwicklung

Das RROP Region Hannover 2016 wurde am 27. September 2016 beschlossen (Region Hannover 2017i). Darin werden kompakte, umweltverträgliche Siedlungsstrukturen im regionalen Kontext angestrebt, indem die Entwicklung der Raum-, Siedlungs- und Infrastruktur an dem dreistufigen zentralörtlichen System (Ober-, Mittel- und Grundzentren) ausgerichtet wird sowie dem Leitbild der dezentralen Konzentration und dem Leitbild der Einheit von Siedlung, Verkehr und Infrastruktur folgt (Region Hannover 2016a; S. 5).

Die Vorstellung zur Entwicklung der räumlichen Struktur der Region Hannover beinhaltet einige Komponenten der Definition kompakter, umweltverträglicher Siedlungsstrukturen. Diese spiegeln sich auch in den einzelnen Festlegungen zur Siedlungs-, Freiraum- und Verkehrsstruktur wider (vgl. Tabelle 1).

Maßgeblich für die Steuerung der Siedlungsentwicklung in der Region Hannover sind die „zentralen Siedlungsgebiete“ der Zentralen Orte. Diese dienen als Grundlage für den Einsatz folgender regionalplanerischer Instrumente zur Festlegung von Siedlungsschwerpunkten (ebenda; S. 8f.):

- Die „Standorte Schwerpunktaufgabe Sicherung und Entwicklung von Wohnstätten“ sind die „zentralen Siedlungsgebiete“ des Oberzentrums Hannover, der Mittel- und Grundzentren. Aufgrund ihrer besonderen siedlungsstrukturelle Lagegunst sowie einer ihrem zentralörtlichen Versorgungsauftrag entsprechenden ÖPNV-Anbindung und Infrastrukturausstattung besitzen sie eine Konzentrationswirkung und Bündelungsfunktion für die Siedlungsentwicklung (Region Hannover 2016b; S. 31).

- Die „Vorranggebiete Siedlungsentwicklung“ werden in sieben Städten und Gemeinden der Region Hannover ausgewiesen, um mittel- bis langfristig regionalbedeutsame Flächen für die Siedlungsentwicklung zu sichern (ebenda; S. 32).

Des Weiteren dienen die Festlegungen zu ländlich strukturierten Siedlungen dazu, die Siedlungsentwicklung auch unterhalb der zentralörtlichen Gliederung auf Stadt- und Ortsteile langfristig tragbarer Infrastruktur-ausstattung zu lenken (ebenda; S. 37):

- „Ländlich strukturierte Siedlungen mit Ergänzungsfunktion Wohnen“ dürfen in ihrer Siedlungsentwicklung über das Maß der Eigenentwicklung hinausgehen, soweit diese mit der Tragfähigkeit der örtlichen infrastrukturellen Grundversorgungseinrichtungen abgeglichen ist und die Siedlungsschwerpunkte nicht beeinträchtigt. Es wird damit der Flächenneuinanspruchnahme und verkehrsintensiven Siedlungsstrukturen vorgebeugt.
- In „Ländlich strukturierte Siedlungen mit der Funktion Eigenentwicklung“ beschränkt sich der Spielraum zur Siedlungserweiterung auf 5% Zuwachs der bestehenden Siedlungsfläche. In Ausnahmefällen wird ein Ermessenszuschlag von zusätzlich bis zu 2% gewährt (Region Hannover 2016a; S. 9f.). „Die festgelegte Eigenentwicklungsquote dient dazu, Fehlentwicklungen (sog. „Ausreißern“) an siedlungsstrukturell ungünstigen Standorten entgegenzuwirken“ (Region Hannover 2016b; S. 40).

Komponenten der Definition KuSirK	RROP Region Hannover 2016	Regionalplan Münsterland
Anschluss neuer Siedlungsentwicklung an bestehende Siedlungsstrukturen	-	X
Begrenzung der Zersiedlung/ Geringer Zersiedlungsgrad	X	X
Freihalten großräumig zusammenhängender Freiräume von Besiedelung	X	X
Konzentration der Siedlungsentwicklung auf wenige geeignete Standorte (Zentrale Orte, Dezentrale Konzentration)	X	X
Siedlungsschwerpunkte mit Erreichbarkeitsvorteilen, insbesondere ÖV-Anschluss	X	-
Erhalt bzw. Stärkung des leistungsfähigen regionalen ÖV-Systems	X	X
ÖV-System als punkt-axiale Grundstruktur regionaler Siedlungsentwicklung	X	X
Minimierung der Flächenneuinanspruchnahme	X	X
Schutz der Freiraumfunktionen in (siedlungsnahen) Freiräumen	X	X
Geringer Versiegelungsgrad	-	X
Effiziente Flächennutzung für Siedlungszwecke (Innen- vor Außenentwicklung)	X	X
Minimierung der verkehrlichen Erschließung und Emissionen	X	X
Förderung gesunder Arbeits- und Lebensbedingungen	X	-

Tabelle 1: Elemente von KuSirK im RROP Region Hannover 2016 und Regionalplan Münsterland

Analog zu den Wohnstätten werden für die gewerbliche Nutzung in den „zentralen Siedlungsgebieten“ des Oberzentrums Hannover und der Mittelzentren sowie an weiteren geeigneten Entwicklungsstandorten „Standorte Schwerpunktaufgabe Sicherung und Entwicklung von Arbeitsstätten“ festgelegt. In drei dieser sind außerdem vier „Vorranggebiete industrielle Anlagen und Gewerbe“ ausgewiesen, durch welche die Ansiedlung von Industrie- und Gewerbeunternehmen mit erhöhtem Flächenbedarf gesteuert wird. In den Grundzentren sind vorrangig Arbeitsstätten für den örtlichen Bedarf zu entwickeln (Region Hannover 2016a; S. 36f.).

Der Erhalt und die Entwicklung des Freiraums wird in der Region Hannover grundsätzlich gleichrangig zur Siedlungs- und Infrastrukturentwicklung betrachtet. Der Schutz des Freiraums wird neben Grundsätzen zur Verringerung der Flächenneuinanspruchnahme und Vermeidung der Zersiedlung durch diverse Vorrang- und Vorbehaltsgebiete, beispielsweise „Vorranggebiet Freiraumfunktion“ verfolgt (ebenda; S. 15ff.).

In der Region Hannover gilt die „Ausrichtung der Siedlungsentwicklung auf eine Verkehrsvermeidung bzw. minimierung durch eine kleinräumige Organisation der Funktionen Wohnen, Arbeiten und Versorgen“ (Region Hannover 2016b; S. 197), welche wesentliche Voraussetzung für kompakte, umweltverträgliche Siedlungsstrukturen im regionalen Kontext ist. Es wird ausdrücklich eine „Region der kurzen Wege“

angestrebt. Die Förderung des Umweltverbundes zur Verringerung von Verkehrsemissionen erfolgt durch eine Vielzahl von Festlegungen zur Verbesserung des ÖPNV- und insbesondere des SPNV-Angebots, aber auch des Radwegenetzes (Region Hannover 2016a; S. 25ff.). Es werden solide Ansätze einer integrierten Siedlungs- und Verkehrsentwicklung deutlich.

3.2 Raumplanerische Steuerung der Siedlungsentwicklung in der Region Münsterland

3.2.1 Strukturelle Herausforderungen im Hinblick auf kompakte, umweltverträgliche Siedlungsstrukturen im regionalen Kontext

Auch in der Region Münsterland treten räumlich differenziert sowohl Hemmnisse als auch auch Potenziale auf, welche verschiedene Anforderungen an die Steuerung der Siedlungs- und Verkehrsentwicklung stellen.

Angesichts der bereits bestehenden und zukünftig zunehmenden Konzentration der Bevölkerung in und rund um Münster sowie in den Grundzentren des Nordwestens (IT.NRW 2017) sollte im Hinblick auf kompakte, umweltverträgliche Siedlungsstrukturen im regionalen Kontext eine Konzentration der Siedlungstätigkeit auf die Mittelzentren der Region erfolgen, da dort bereits eine regional bedeutsame Ausstattung von Infrastrukturen und Versorgungseinrichtungen besteht. In den schrumpfenden Kommunen im Südwesten und -osten ist die Entwicklung auf den Innenbereich und insbesondere im Umfeld von ÖPNV/SPNV-Haltestellen zu konzentrieren. Solche verkehrsgünstig gelegenen Standorte können als Entlastungsbereiche für die unter Siedlungsdruck stehenden Kommunen dienen, da sie sowohl für Pendler als auch für Ältere und Jugendliche, deren Anteile an der Bevölkerung im Münsterland zukünftig zunehmen werden (ebenda), attraktiv sind.

Die durch den produzierenden Sektor geprägte Wirtschaftsstruktur (NRW.BANK 2017; S. 15) erfordert eine verträgliche Zuordnung der Gewerbe- und Industrieansiedlungen. Aufgrund der hohen (meist negativen) Pendlerströme ist es gleichzeitig von Bedeutung, die Gewerbeentwicklung im Einklang mit dem Bus- und Bahnnetz voranzutreiben, um umweltverträgliche Pendelverkehre zu ermöglichen. Vor dem Hintergrund der Beschäftigtenentwicklung gilt dies insbesondere in der kreisfreien Stadt Münster und ihrem Umland.

Das ÖPNV-Angebot in differenzierter Intensität sowie mit unterschiedlichen Trägerschaften (Bezirksregierung Münster 2014b; S. 9f.) sollte optimiert werden, um einen Anstieg des MIV-Anteils am Modal Split zu verhindern. Der Anschluss weiterer Kommunen im Osten und Westen der Region an das SPNV-Netz kann deutlich dazu beitragen. Weiterhin kann der Anschluss von Gewerbegebieten bzw. die Ansiedlung dieser in der Nähe von Schienen-Haltepunkten zu einer Reduktion des Lkw-Verkehrs führen. Damit wird zur Verringerung der Luft- und Lärmbelastung durch Verkehr in der Region beigetragen. Durch die verstärkte Zusammenarbeit der Träger des ÖPNV soll die Abstimmung zwischen Straße und Schiene verbessert und die Nutzung dieses erhöht werden. Die guten Bedingungen für den Fahrradverkehr sollen erhalten und ausgebaut werden, sodass der Umweltverbund insbesondere in der kreisfreien Stadt Münster und dem näheren Umland gestärkt wird.

Trotz bisher moderater Anteile der Siedlungs- und Verkehrsfläche an der Bodenfläche in der Region Münsterland setzt sich die Flächenneuinanspruchnahme weiter fort. Die Flächenentwicklung – vor allem für Wohn- und Verkehrsflächen – sowie die Bautätigkeit spielen sich dabei vor allem in Münster und an der westlichen Regionsgrenze ab (IT.NRW 2017). Eine Steuerung der Siedlungsentwicklung ist insofern notwendig, dass die Flächenneuinanspruchnahme in den schrumpfenden Kommunen im Südwesten möglichst auf null reduziert sowie eine Zersiedlung vermieden wird, indem Innenentwicklungspotenziale genutzt werden. Der Vorrang der Innenentwicklung gilt allerdings auch für die dynamischen Bereiche. Hier ist vor allem darauf zu achten, neue Baugebiete an die bestehende Siedlungs- und Infrastruktur anzuschließen. Eine Entlastung der kreisfreien Stadt Münster kann durch die Konzentration der Siedlungsentwicklung an geeigneten Standorten an den SPNV-Achsen erfolgen.

3.2.2 Vorgaben der Landesplanung zur Siedlungsentwicklung

Inhaltliche Vorgaben hinsichtlich kompakter, umweltverträglicher Siedlungsstrukturen im regionalen Kontext in der Region Münsterland enthalten das Landesplanungsgesetz Nordrhein-Westfalen und seine Durchführungsverordnung nicht. Maßgebliche Aussagen machen allerdings der Landesentwicklungsplan Nordrhein-Westfalen (LEP NRW) 1995 bzw. der LEP NRW 2017.

Orientiert am System Zentraler Orte soll die Siedlungsentwicklung an den „Entwicklungsschwerpunkten“, den Mittel- und Oberzentren, erfolgen, da diese über eine regional bedeutsame Ausstattung von

Infrastrukturen verfügen. Für die innergemeindliche Entwicklung werden „Siedlungsschwerpunkte“ definiert (LEP NRW 1995; S. 4f.). Zur Flächenvorsorge sind Bereiche für die Wohn- und Gewerbeansiedlung in den Regionalplänen auszuweisen, sodass es ebenfalls zu einer Konzentration der Siedlungsstrukturen kommt. Weitere Vorgaben zur Siedlungsentwicklung zielen vor allem auf den Vorrang der Innenentwicklung, Brachflächennutzung, Flächentausche und Nachverdichtung ab, welche zur Herstellung kompakter, umweltverträglicher Siedlungsstrukturen beitragen (ebenda; S. 17ff.). Im LEP NRW 2017 wird das Instrumentarium konkretisiert, indem beispielsweise das Berechnungsverfahren für die Bedarfe der Wohn- und Gewerbebauflächen dargestellt wird. Auch werden weitere Leitbilder der Siedlungsentwicklung wie die „dezentrale Konzentration“ oder die „nachhaltige europäische Stadt“ aufgenommen und so kompakte, umweltverträgliche Siedlungsstrukturen im regionalen Kontext gestärkt (LEP NRW 2017; S. 26ff.).

Auch der Freiraumschutz wird im Hinblick auf umweltverträgliche Siedlungsstrukturen durch Festlegungen aufgegriffen und erfolgt weiterhin durch diverse Schutzgebietsausweisungen (LEP NRW 1995; S. 10ff.). Gemeinden unter 2.000 Einwohnern werden zum Freiraum gezählt und dürfen nur im Rahmen der Arrondierung oder Nachverdichtung entwickelt werden (ebenda; S. 18).

Eine abgestimmte Siedlungs- und Verkehrsentwicklung wird durch die Zielvorgabe der Ausrichtung der Raum- und Siedlungsstruktur auf die Entwicklungsachsen, an welchen sich die regional besonders wichtige Infrastruktur bündelt, aufgegriffen (ebenda; S. 25). Dies wird im LEP NRW 2017 zur Vermeidung bandartiger Entwicklung allerdings nicht mehr verfolgt (LEP NRW 2017; S. 26). Auch wird die Förderung des ÖPNV- und SPNV-Systems im LEP NRW 1995, weniger stark im LEP NRW 2017, angestrebt (LEP NRW 1995; S. 25; LEP NRW 2017; S. 84ff.).

3.2.3 Regionalplanerischer Steuerungsansatz zur Siedlungs-, Freiraum- und Verkehrsentwicklung

Der aktuelle Regionalplan für das Münsterland trat am 27. Juni 2014 in Kraft. Bisher erfolgten sieben Änderungen dieses; sechs weitere befinden sich zum Ende 2017 noch im Verfahren (Bezirksregierung Münster 2017).

Im Hinblick auf kompakte, umweltverträgliche Siedlungsstrukturen im regionalen Kontext steht bei den übergreifenden Planungsvorstellungen der Region Münsterland die freiraumverträgliche Siedlungsentwicklung im Vordergrund, welche eine möglichst geringe Inanspruchnahme des Freiraums verfolgt. Kompakte Siedlungsstrukturen werden eher im kommunalen Kontext betrachtet (Bezirksregierung Münster 2014a; S. 13; 27). Dennoch werden einzelne Komponenten der Definition aufgegriffen und spiegeln sich auch in den Festlegungen zu den verschiedenen Strukturbereichen wider (vgl. Tabelle 1).

Unter Berücksichtigung der Vorgaben des neuen LEP NRW 2017 wird in der zeichnerischen Darstellung des Regionalplans Münsterland zwischen Siedlungs- und Freiraum unterschieden. Dies ist maßgeblich für die Entwicklungsmöglichkeiten der Gemeinden, die im Bereich Wohn- sowie Gewerbe- und Industrieansiedlung im Wesentlichen durch folgende Instrumente gesteuert werden:

- Die Siedlungsentwicklung ist in den „Allgemeinen Siedlungsbereichen“ (ASB) zu vollziehen, sodass Flächen für Wohnen, wohnverträgliches Gewerbe, Wohnfolgeeinrichtungen, zentralörtliche Einrichtungen und sonstige Dienstleistungen sowie wohnungsnahe Freiflächen unmittelbar und möglichst verkehrsarm untereinander erreichbar sind. Allerdings darf die Inanspruchnahme nur im Rahmen des nachweisbaren Bedarfs erfolgen, der anhand der künftigen Einwohner- und Haushaltsentwicklung sowie des Wohnungsbestandes als Wohnungsbedarf ermittelt und über planerisch anzustrebende Siedlungsdichten in Flächenbedarfe umgesetzt wird. So werden kompakte Siedlungsstrukturen im regionalen Kontext erhalten, die Flächenneuinanspruchnahme im Freiraum begrenzt und kurze Wege geschaffen. Noch nicht räumlich benannte Flächenbedarfe einiger Kommunen werden in einem „Flächenbedarfskonto“ aufgeführt und sollen, wenn erforderlich, verortet werden (ebenda; S. 25ff.).
- „Gewerbe- und Industrieansiedlungsbereiche“ (GIB) dienen der Neuansiedlung und Entwicklung von emittierenden Gewerbe- und Industriebetrieben sowie ihnen zuzuordnenden Anlagen. Dies trägt zur Wahrung gesunder Lebens- und Arbeitsbedingungen bei. Die Entwicklung hat sich im Rahmen der im Regionalplan dargestellten Bedarfe zu bewegen, um eine Zersiedlung zu vermeiden (ebenda; S. 48). Diese werden nach einem landesweit verwendeten Modell berechnet, „bei dem eine Beziehung zwischen den "Gewerbeflächen beanspruchenden" Beschäftigten und der

Flächennachfrage in Form des Verlagerungs- und Neuansiedlungsbedarfs unterstellt“(ebenda; S. 49) wird.

- Für die „im Freiraum gelegenen, zeichnerisch nicht dargestellten Ortsteile unter 2.000 Einwohnern“ gilt die Eigenentwicklung, welche sich am Bedarf der ortsansässigen Bevölkerung und Betriebe orientiert. Eine sinnvolle Abrundung oder Ergänzung der Siedlungen aufgrund der örtlich vorhandenen Infrastrukturausstattung ist im Einzelfall möglich. Die Begrenzung der Entwicklung in diesen Bereichen beugt der Zersiedlung des Freiraums vor (ebenda; S. 25).

Prinzipien wie die Innen- vor Außenentwicklung, die Rückführung nicht mehr benötigter Flächenreserven in den Freiraum sowie die Nutzung von Brachflächen sind dabei Leitvorstellungen. Weitere Vorgaben zur konkreten Ausgestaltung der Siedlungsstruktur gibt es allerdings nicht. Auch eine weitergehende Konzentration auf wenige geeignete Standorte, wie beispielsweise die im LEP NRW 2017 verankerten „zentralörtlich bedeutsamen ASB“, wird vom derzeit gültigen Regionalplan noch nicht verfolgt.

Umweltverträgliche Siedlungsstrukturen bedeuten Freiraumschutz. In diesem Sinne ist in der Region Münsterland eine Zerschneidung noch vorhandener großer zusammenhängender Freiräume möglichst zu verhindern sowie die Inanspruchnahme des Freiraums auf das unumgängliche Maß zu begrenzen. Neben seinen ökologischen Funktionen, die durch verschiedene Vorrang- und Vorbehaltsgebiete geschützt werden, soll mitunter auch seine Funktion als gliedernder Raum für Siedlungsbereiche und gebiete berücksichtigt werden (ebenda; S. 57ff.).

Zwar wird auch im Regionalplan Münsterland eine umweltverträgliche, flächensparende Entwicklung des Verkehrs z.B. durch die Erhaltung und Förderung des SPNV angestrebt, konkrete Ansätze einer integrierten Siedlungs- und Verkehrsentwicklung zur Reduzierung der Flächeninanspruchnahme sowie Verkehrsemissionen sind in diesem aber nicht enthalten (ebenda; S.119ff.).

4 POTENZIALE UND HEMMNISSE BEI DER ENTWICKLUNG KOMPAKTER, UMWELTVERTRÄGLICHER SIEDLUNGSSTRUKTUREN IM REGIONALEN KONTEXT

In der Untersuchung wurde deutlich, dass sich das Verständnis für kompakte, umweltverträgliche Siedlungsstrukturen im regionalen Kontext in den beiden Fallstudienregionen sehr ähnlich darstellt und weitestgehend mit der erarbeiteten Definition (vgl. Kapitel 2) deckt. Allerdings wird die Herstellung dieser auf struktureller, planerischer und politischer Ebene beeinflusst.

Dabei erschwert vor allem die räumlich differenzierte demografische, wirtschaftliche und flächenbezogene Entwicklung innerhalb einer Region die Herstellung dieser, da bereits regional unterschiedliche Handlungsstrategien erforderlich werden. Insbesondere das inkongruente Verhältnis zwischen abnehmender Bevölkerungszahl und steigender Flächenneuinanspruchnahme in einigen Teilräumen der Regionen steht kompakten, umweltverträglichen Siedlungsstrukturen im regionalen Kontext entgegen und macht deutlich, dass nicht alleine nachfragebezogene Faktoren zu Flächeninanspruchnahme führen. Ergänzend müssen planerisch und politisch auch die angebotsbezogenen Faktoren mitbedacht werden, die zu wettbewerbsorientierten fiskalisch motivierten Flächenbereitstellungen durch die Kommunen führen.

Gleichzeitig bieten strukturelle Gegebenheiten wie beispielsweise das bestehende ÖPNV-Netz in der Region Hannover enorme Potenziale, eine flächensparende und verkehrsreduzierte Siedlungsentwicklung zu betreiben.

Positiv zu bewerten ist die zunehmende Bedeutung kompakter, umweltverträglicher Siedlungsstrukturen im regionalen Kontext in der Landesplanung. Diese Sensibilisierung auf Landesseite zeigt sich durch eine steigende Anzahl an Festlegungen, insbesondere in den neueren landesweiten Raumordnungsplänen. So wird die Thematik bereits auf dieser Ebene verankert, wodurch die Beschäftigung mit dieser auch auf regionaler Ebene gefördert wird. Jedoch werden einige Festlegungen, wie beispielsweise die räumliche Verortung der ASB im Regionalplan, mitunter kritisch gesehen. Eine Ausweisung anhand textlicher Kriterien mit anschließender Verortung in den Flächennutzungsplänen wird als praktikabler eingeschätzt. Auch das Berechnungsverfahren zur Bestimmung der gewerblichen Flächenebedarfe erweist sich als schwierig umsetzbar. Zu prüfen ist im Folgenden, ob dadurch eine Sensibilisierung auf der kommunalen Ebene erfolgt.

In den untersuchten Regionalplänen werden fast alle Aspekte kompakter, umweltverträglicher Siedlungsstrukturen im regionalen Kontext durch Festlegungen im Sinne der Definition aufgegriffen. Das

Bewusstsein über diese stellt ein grundlegendes Potenzial dar. Das Steuerungsinstrumentarium ist ausgerichtet an:

- Nachfrageindikatoren wie der Bevölkerungs- oder Beschäftigtenentwicklung,
- dem Zentrale-Orte-System und somit der Bündelung von Einrichtungen und Verkehren zur Vermeidung zusätzlicher Flächen in Anspruch nehmenden Infrastruktur sowie
- der Begrenzung von Flächenneuinanspruchnahme in Gemeinden ohne Ausstattung.

Die letztgenannte „Eigenentwicklung" wird dabei als wirksames Instrument eingeschätzt. Es zeigt sich aber, dass die einzelnen Komponenten unterschiedlich stark berücksichtigt werden. Das Instrumentarium zur Entwicklung kompakter, umweltverträglicher Siedlungsstrukturen in der Region Hannover stellt sich differenzierter dar als das im Münsterland. Insgesamt ist es in den Regionen eher auf die Standortwahl und indirekt auf eine kompakte, flächensparende Siedlungsentwicklung ausgerichtet. Direkte Festlegungen diesbezüglich gibt es nur wenige. Die Regionalplanung hat daher einen dämpfenden Einfluss auf kommunale Planungen und Flächenneuinanspruchnahmen.

Als eine Chance ist der Ansatz in der Region Münsterland zu sehen, die Flächenbedarfe auf Grundlage von Prognosen der zukünftigen Bevölkerungsentwicklung zu bestimmen. Hierdurch erfolgt eine bessere Annäherung an die tatsächlichen Bedarfe als auf Grundlage der vergangenen Flächenneuinanspruchnahme, welche unter Umständen nicht unter dem Leitbild kompakter, umweltverträglicher Siedlungsstrukturen im regionalen Kontext stattfand. Dabei ist allerdings zu beachten, dass die Prognosen selbst auch ein Hemmnis darstellen können, da unterschiedliche Stellen zu unterschiedlichen Ergebnissen kommen bzw. diese nicht nachvollziehbar sein können. Eigene regionale Prognosen werden in der Regel als belastbarer angesehen. Als Kontrollinstrument wird außerdem das Siedlungsflächenmonitoring hervorgehoben, wobei eine jährliche Aktualisierung wünschenswert ist.

Ein klares Potenzial sind weiterhin die deutlichen Ansätze einer integrierten Siedlungs- und Verkehrsentwicklung im Regionalplan der Region Hannover. Die Zuständigkeit der Region für beide Fachbereiche ist dabei förderlich. Dagegen wird im Regionalplan Münsterland kaum ein Bezug zwischen diesen hergestellt, wodurch die Entwicklung kompakter, umweltverträglicher Siedlungsstrukturen im regionalen Kontext gehemmt wird.

Ein weiterer wichtiger Faktor ist die kommunale Politik. Die Akzeptanz der politischen Vertreter für die Notwendigkeit kompakter, umweltverträglicher Siedlungsstrukturen im regionalen Kontext und der damit einhergehenden reduzierten Flächenneuinanspruchnahme bzw. der Verortung von Gebieten zur Siedlungsentwicklung spielt eine erheblich Rolle bei der Herstellung dieser. Eine erforderliche regionale Lösung der Siedlungsentwicklung wird nicht zuletzt häufig durch ein Konkurrenzdenken der dominierenden Oberzentren und der umliegenden Kommunen behindert.

5 EMPFEHLUNGEN UND AUSBLICK

Die Schaffung kompakter, umweltverträglicher Siedlungsstrukturen im regionalen Kontext kann wesentlich dazu beitragen, die Flächeninanspruchnahme und ihre Folgen zu reduzieren sowie Freiräume zu schützen. Die Regionalplanung ist dabei in der Lage auf eine derartige Entwicklung hinzuwirken. In den untersuchten Regionen sind in diesem Hinblick bereits vielversprechende Steuerungsansätze vorhanden. Dennoch stehen sie weiterhin so wie andere Regionen vor differenzierten strukturellen, planerischen und politischen Herausforderungen, welche die Siedlungs- und Verkehrsentwicklung hemmen.

Basierend auf der Untersuchung der Fallregionen sowie mehrerer Expertengespräche wurden folgende Chancen für die regionale Ebene zur Entwicklung kompakter, umweltverträglicher Siedlungsstrukturen im regionalen Kontext identifiziert:

- Strikte Anwendung des regionalplanerischen Instrumentariums, um die angestrebte Steuerungswirkung zu gewährleisten.
- Flächenbedarfsberechnung auf Grundlage von Prognosen, wodurch eine bessere Annäherung an die zukünftige Entwicklung sowie daraus resultierende Bedarfe erreicht wird.
- Stärkung der regionalplanerischen Mengensteuerung (ASB, Flächenzertifikate, Nachweispflicht für Bedarfe bei Kommunen im Genehmigungsverfahren) zur Nachvollziehbarkeit von kommunalen

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Bedarfen. Denkbar wären beispielsweise standardisierte Verfahren oder auch die Einführung einer Nachweispflicht, dass Folgekosten einer Baulandausweisung durch potenzielle Einnahmen gedeckt werden können (fiskalische Folgekostenrechnung) (BMVBS/BBSR 2009; S. 104).

- Einsatz adaptiver Instrumente im Regionalplan, die eine Entwicklung an die Erfüllung bestimmter Bedingungen knüpfen. Ziel ist es dabei, Planinhalte zeitlich gestaffelt zu realisieren; beispielsweise die Entwicklung zusätzlicher Wohnflächen, wenn prioritär zu entwickelnde Gebiete ausgeschöpft wurden und weiterhin eine positive Bevölkerungsentwicklung besteht (BMVBS 2013; S. 23).
- Förderung interkommunaler Kooperationen in der Region zur Auslastung von Einrichtungen, um z.B. Baulandausweisungen rein zur Sicherung einer grundzentralen Funktion zu vermeiden. Dabei spielt die Berücksichtigung des ÖPNV zur Stützung dieser Kooperationen eine wesentliche Rolle.
- Implementation informeller (Beteiligungs)Prozesse zur Erhöhung der Akzeptanz kompakter, umweltverträglicher Siedlungsstrukturen im regionalen Kontext, beispielsweise in Form eines Leitbildprozesses (Region Hannover 2018). Dies kann dazu dienen, kommunale Akteure (Politik, Projektentwickler und nicht zuletzt Bürger) für das Thema Flächenneuinanspruchnahme zu sensibilisieren und sie im besten Fall dazu zu bringen, ihre Wertevorstellungen kritisch zu reflektieren.
- Kontinuierliches Siedlungsflächenmonitoring und Datenbanken zu Siedlungspotenzialen zur Überprüfung und Kontrolle der Entwicklung (beispielsweise RAUM+Monitor Rlp) (MDI RLP 2018).

Um nachzuvollziehen, ob die Instrumente der Landes- und Regionalplanung wirken und ob ein Bewusstsein für kompakte, umweltverträgliche Siedlungsstrukturen im regionalen Kontext bei kommunalen Akteuren besteht, werden im Rahmen des Projektes im Folgenden für eine tiefergehende Analyse in den Fallstudienregionen teilräumliche Untersuchungen durchgeführt. Dabei ist es ebenso Ziel, Beispiele erfolgreicher Kommunikation zwischen Regionalplanung und Bauleitplanung zu identifizieren.

6 QUELLENVERZEICHNIS

BBR: Raumordnungsbericht 2005. Bonn, 2005.

BBSR: Raumordnungsbericht 2011. Bonn, 2012.

BEZIRKSREGIERUNG MÜNSTER: Regionalplan Münsterland. Münster, 2014a. https://www.bezreg-muenster.de/zentralablage/dokumente/regionalplanung/regionalplan_muensterland/regionalplan_umweltbericht/regionalplan_muensterland.pdf. aufgerufen am 05.10.2017.

BEZIRKSREGIERUNG MÜNSTER: Mobilität im ländlichen Raum – Zukunftsperspektiven. Münster, 2014b.

BEZIRKSREGIERUNG MÜNSTER: Regionalplanänderungen. http://www.bezreg-muenster.nrw.de/de/regionalplanung/regionalplan/regionalplanaenderungen/index.html. aufgerufen am 07.12.2017.

BMVBS: Flexibilisierung der Planung für eine klimawandelgerechte Stadtentwicklung. Verfahren, Instrumente und Methoden für anpassungsflexible Raum- und Siedlungsstrukturen. BMVBS-Online-Publikation, Nr. 16/2013. Berlin, 2013. http://www.bbsr.bund.de/BBSR/DE/Veroeffentlichungen/BMVBS/Online/2013/DL_ON162013.pdf?__blob=publicationFile&v=2. Aufgerufen am 05.01.2018.

BMVBS/BBSR: Einflussfaktoren der Neuinanspruchnahme von Flächen. Forschungen Heft 139. Bonn, 2009.

BÖHM, Jutta; Böhme, Christa; Bunzel, Arno; Kühnau, Christina; Landua, Detlef; Reinke, Markus: Urbanes Grün in der doppelten Innenentwicklung. Freising, Berlin, 2016.

DIE BUNDESREGIERUNG: Deutsche Nachhaltigkeitsstrategie – Neuauflage 2016. Kabinettbeschluss vom 11. Januar 2017. Berlin, 2017. https://www.bundesregierung.de/Content/DE/_Anlagen/Nachhaltigkeit-wiederhergestellt/2017-01-11-nachhaltigkeitsstrategie.pdf?. aufgerufen am 19.06.2017.

IHK HANNOVER: Pendler 2016. https://www.hannover.ihk.de/fileadmin/data/Dokumente/Themen/Konjunktur_Statistik/SVB_Deutschland_Gemeinden_Pendler_30-6-2016.pdf. aufgerufen am 25.07.2017.

IT.NRW: LDB – Landesdatenbank NRW. https://www.landesdatenbank.nrw.de/ldbnrw/online. aufgerufen am 05.10.2017.

LROP 2008/2012 – Verordnung über das Landes-Raumordnungsprogramm Niedersachsen (LROP) in der Fassung der Bekanntmachung vom 8. Mai 2008 (Nds. GVBl. S. 132), zuletzt geändert durch Verordnung vom 24. September 2012 (Nds. GVBl. S. 350).

LROP-VO 2017 – Verordnung über das Landes-Raumordnungsprogramm Niedersachsen (LROP-VO) in der Fassung vom 8. Mai 2008 (Nds. GVBl. S. 132), zuletzt geändert durch die Verordnung vom 06.07.2017 (Nds. GVBl. S. 232).

LSN: LSN Online – Regionaldatenbank. http://www1.nls.niedersachsen.de/statistik/html/default.asp. aufgerufen am 24.07.2017.

NROG (Niedersächsisches Raumordnungsgesetz) vom 18. Juli 2012 (Nds. GVBl. S. 252), zuletzt geändert durch Artikel 4 des Gesetzes vom 2. März 2017 (Nds. GVBl. S. 53).

MDI RLP: RAUM+Monitor. 2018. https://mdi.rlp.de/de/unsere-themen/landesplanung/raum-monitor/. aufgerufen am 03.01.2018.

NRW.BANK: Regionalwirtschaftliche Profile Nordrhein-Westfalen 2017 – Wirtschaftsregion Münsterland. Düsseldorf, 2017. https://www.nrwbank.de/export/sites/nrwbank/de/corporate/downloads/presse/publikationen/regionalwirtschaftliche-profile-nrw/NRW.BANK_Wirtschaftsregion_Muensterland_2017.pdf. aufgerufen am 10.10.2017.

REGION HANNOVER/LANDESHAUPTSTADT HANNOVER: Bevölkerungsprognose für die Region Hannover, die Landeshauptstadt Hannover und die Städte und Gemeinden des Umlands 2014 bis 2025/2030. Hannover, 2014.
REGION HANNOVER: Regionales Raumordnungsprogramm Region Hannover 2016 – Beschreibende Darstellung. Stand: 30.08.2016. Hannover, 2016a. https://www.hannover.de/content/download/544444/12437608/file/RROP2016_BeschreibendeDarstellung.pdf. aufgerufen am 02.05.2017.
REGION HANNOVER: Regionales Raumordnungsprogramm Region Hannover 2016 – Begründung/Erläuterung zur beschreibenden Darstellung. Stand: 30.08.2016. Hannover, 2016b. https://www.hannover.de/content/download/600742/13710684/file/RROP2016_Begr%C3%BCndung.pdf. aufgerufen am 02.05.2017.
REGION HANNOVER: Kommunale Strukturdaten 2016. Beiträge zur regionalen Entwicklung Nr. 146. Hannover, 2016c.
REGION HANNOVER: NAHVERKEHR – Aufgabenträger Region Hannover. Hannover, 2017. https://www.hannover.de/Leben-in-der-Region-Hannover/Mobilit%C3%A4t/Bus-Bahn/Aufgabentr%C3%A4ger-Region-Hannover. aufgerufen am 27.09.2017.
REGION HANNOVER: Ein Zukunftsbild für die Region Hannover. 2018. https://www.hannover.de/Leben-in-der-Region-Hannover/Planen,-Bauen,-Wohnen/Raumordnung-Regionalentwicklung/Regionalplanung-in-der-Region-Hannover2/Zukunftsbild-Region-Hannover/Ein-Zukunftsbild-f%C3%BCr-die-Region-Hannover. aufgerufen am 03.01.2018.
RINK, Dieter; Banzhaf, Ellen: Flächeninanspruchnahme als Umweltproblem. In: GROSS, Matthiss: Umweltsoziologie. Wiesbaden, 2011.
UBA: Reduzierung der Flächeninanspruchnahme durch Siedlung und Verkehr – Materialband –. Texte 90/03. Berlin, 2003.
UBA: Leitkonzept – Stadt und Region der kurzen Wege – Gutachten im Kontext der Biodiversitätsstrategie. Texte 48/2011. Berlin, 2011.

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Sustainable Land Management: Challenges, Opportunities Trade Off

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1 ABSTRACT

Land is the integrating component of all livelihoods depending on surface of the earth like: agricultural activity, forest land and water bodies (rivers, lakes, coastal marine) habitats. Due to varying political, social, and economic factors, the heavy use of natural resources to supply a rapidly growing global population and economy has resulted in the unintended mismanagement and degradation of land and ecosystems.

In the twenty-first century, the utmost need is to meet three major requirements: (a) adequately supplying safe, nutritious food for the growing population, (b) significantly reducing rural poverty by providing rural household incomes, and (c) reducing and reversing natural resource degradation, especially that of land. India is a developing country and it requires fast space quality infrastructure development, which is the need of current times. For any development, land is required. Accounting land parcel procedure is cumbersome. The assessment of land details are recorded in a system which is more than two hundred years old. The upcoming technologies such as Geographical Information System (GIS), data warehousing and web based information dissemination should be very helpful in land record management for decision making, strategy planning and predictive modelling.

The modern web integrates various kinds of advanced, dynamic, multi-layered, time series data and graphical information which transform the tedious data analysis job to a faster, dynamic and realistic exercise. Regular updating of information makes monitoring and management of land parcel in records a more transparent and realistic approach towards any development. This information system can be used as a tool to disseminate information and valuation of land on an open platform. It can also be a useful support system to conserve ecological fragile area.

Sustainable Land Management: challenges, opportunities, and trade-offs provides a strategic focus to the implementation of sustainable land management (SLM) components. SLM is a knowledge based procedure that integrates land, water, biodiversity, and environmental management to meet rising food and fiber demands while sustaining livelihoods and the environment. This paper, aimed at policy makers, project managers, and development organisations, articulates priorities for investment in SLM and natural resource management and identifies the policy, institutional and incentive reform options that will accelerate the adoption of SLM productivity improvements and pro-poor growth.

Keywords: data, trade off, opportunities, challenges, SLM

2 INTRODUCTION

In the twenty-first century, the utmost need is to meet three major requirements: (a) adequately supplying safe, nutritious food for the growing population, (b) significantly reducing rural poverty by providing rural household incomes and (c) reducing and reversing natural resource degradation, especially that of land. India is a developing country and it requires fast space quality infrastructure development, which is the need of current times. Land is required for any development. Government is acquiring land for public purpose. Acquisition of land for public purpose displaces people, forcing them to give up their home, assets and means of livelihood. The Government of India (GoI) recognises the need to minimise large scale displacement as much as possible, except where displacement is inevitable. Accounting land parcel procedure is cumbersome.

In India, details for the assessment of land are recorded in a system which is more than two hundred years old. This conventional system is not fulfilling the changing demands of time and adequate recording of space. The upcoming technologies such as Geographical Information System (GIS), data warehousing and web based information dissemination could be very helpful in land record management for decision making, strategic planning and predictive modelling. The use of these technological leverages can make land record management efficiently.

Since time immemorial, it has been a constant endeavour of human beings to pursue various aspects of life with ease. In the present era of high-end computing, this endeavour of simplifying things is achieved by an effective tool like GIS, when applied to as complicated a process as land acquisition. Unlike the conventional procedure of simultaneous handling of various maps, such as village maps, engineering drawings and layout plans etc., which are of different scale, GIS helps to prepare the maps and peruse the maps of multiple types at the same instance through registration of geographic coordinates. The concept of layer mechanism and subsequent superimposition of one above the other is used to store both non-spatial and spatial data in different thematic layers. For the planners this entire process is made available at the fingertips of Personal Computers (PCs) without unfolding the age old cloth maps.

3 WHAT IS SLM?

Sustainable Land Management (SLM) is defined as a knowledge-based procedure that helps integrate land, water, biodiversity, and environmental management (including input and output externalities) to meet rising food demands while sustaining ecosystem services and livelihoods. SLM is necessary to meet the requirements of a growing population. Improper land management can lead to land degradation and a significant reduction in the productive and service (biodiversity niches, hydrology, carbon sequestration) functions of watersheds and landscapes. In layman's terms, SLM involves:

- Preserving and enhancing the productive capabilities of land in cropped and grazed areas-that is, upland areas, down-slope areas, and flat and bottom lands; sustaining productive forest areas and potentially commercial and non-commercial forest reserves; and maintaining the integrity of watersheds for water supply and hydropower generation needs and water conservation zones and the capability of aquifers to serve farm and other productive activities.
- Actions to stop and reverse degradation or at least to mitigate the adverse effects of earlier misuse which is increasingly important in the uplands and watersheds, especially those where pressure from the resident populations is severe and where the destructive consequences of upland degradation are being felt in far more densely populated areas "downstream."
- Land parcels for infrastructure development are impetus to growth. Development unproductive land can be identified to facilitate balanced growth by proposing infrastructure need.

Sustainable land management combines technologies, policies, and activities aimed at integrating socio-economic principles with environmental concerns so as to simultaneously maintain or enhance production, reduce the level of production risk, protect the potential of natural resources and prevent (buffer against) soil and water degradation, be economically viable, and be socially acceptable (Smyth and Dumanski, 1993).

These concepts span the scales of detail, application, and levels of integration with socio-economic data. Soil quality is the most restrictive component, followed by land quality and sustainable land management. Soil quality is effectively a condition of a site, and it can be studied using soil data alone. Land quality requires integration of soil data with other biophysical information, such as climate, geology and land use. Land quality is a condition of the landscape, i.e. it is a biophysical property, but includes the impacts of human interventions (land use) on the landscape. Sustainable land management requires the integration of these biophysical conditions, i.e. land quality, with economic and social demands. It is an assessment of the impacts of human habitation, and a condition of sustainable development.

These are more than simple differences in semantics; the concepts differ in the kinds and scale of the processes being described, the data used for input, and the amount and kinds of integration with other disciplines (Dumanski, et al., 1997). However, the concepts form a continuum over the landscape, and they must be applied to different types and scales of land use.

In general and particularly in developing countries, it is essential that scarce resources devoted to land management be used more cost-efficiently and that policy-makers have at least rough indicators of whether environmental conditions and land quality are getting better or worse. Land quality indicators, such as nutrient balance, loss of organic matter, land use intensity and diversity, and land cover are useful to managers and decision makers in monitoring and improving the performance of projects with respect to their socio-economic and environmental impacts, and to assess the trend towards or away from land use sustainability. While routine project performance indicators based on cost-benefit analyses (input-output factors, risk and economic performance indicators), are necessary to monitor the activities and components of a project, LQIs are required to evaluate the environmental impact(s). The quantitative assessment of physical impacts, such as depletion of soil nutrients, loss of organic matter, soil erosion, water contamination etc. may appear to be costly and cumbersome during project implementation, but the long-term negative impact of reduced land quality, such as decreased efficiency of fertilisers, increased erosion, increased fuel consumption, increased pest infestation (nematodes, etc.), often result in rehabilitation costs that are much higher.

The LQI approach focuses on preventive maintenance rather than rehabilitation, and provides the methodology and the approach to integrate the socio-economic and biophysical information that are required for better informed sustainable land management strategies.

Core LQIs for managed ecosystems (agriculture and forestry) in the major agro-ecological zones (AEZs) of tropical, sub-tropical and temperate environments, and recommended for development in the short term include:

- Nutrient balance describes nutrient stocks and flows as related to different land management systems used by farmers in specific AEZs and specific countries
- Yield trends and yield gaps describe current yields, yield trends, and actual: potential, farm level yields for the major food crops in different countries
- Land use intensity describes the impacts of agricultural intensification on land quality; intensification may involve increased cropping, more value-added production, and increased amounts and frequency of inputs; emphasis is on the management practices adopted by farmers in the transition to intensification.
- Land use diversity (agro-diversity) describes the degree of diversification of production systems over the landscape, including livestock and agro-forestry systems; it reflects the degree of flexibility (and resilience) of regional farming systems, and their capacity to absorb shocks and respond to opportunities.
- Land cover describes the extent, duration and timing of vegetative cover on the land during major erosive periods of the year. It is a surrogate for erosion, and along with land use intensity and diversity, it will give increased understanding on the issues of desertification.

A second set of core LQIs were recommended for longer-term research. These are indicators which require further development of their theoretical base, or lack adequate data for immediate development. They include:

- Soil quality. likely to be based on soil organic matter turn-over, particularly the dynamic (microbiological) carbon pool most affected by environmental conditions and land use change.
- Land degradation (erosion, salinisation, compaction, organic matter loss): these processes have been much researched and have a strong scientific base, but reliable data on extent and impacts are often lacking.
- Agro-biodiversity. involves objectives of managing natural habitats and the co-existence of native species in agricultural areas, maintaining natural soil micro and meso biodiversity, and managing the gene pools utilized in crop and animal production.

Four additional sets of core LQIs were identified, but these were recommended to be developed through collaboration with the respective authoritative disciplines:

- Water quality
- Forest land quality
- Rangeland quality
- Land contamination/pollution.

The above are the biophysical components of sustainable land management. Although useful in their own right, they must still be complemented by indicators of the other pillars of sustainable land management, economic viability, system resilience, and social equity and acceptability. Considerable additional work is required to develop these pillars to the same level of detail as the land quality (biophysical) indicators.

4 SLM PROGRAMME IN INDIA

The Sustainable land and Ecosystem Management (SLEM) Programme is a joint initiative of the Government of India and the Global Environmental Facility (GEF) under the latter's Country partnership Programme (CPP).

The objective of the SLEM Programmatic Approach is to promote sustainable land management and use of biodiversity as well as maintain the capacity of ecosystems to deliver goods and services while taking into account climate change.

The GEF programmatic approach can be defined as a long-term and strategic arrangement of individual yet interlinked projects aimed at achieving large-scale impacts on the global environment. It seeks to achieve these impacts by providing recipient countries, the GEF, and other GEF stakeholders synergies across the Focal Areas of the GEF within the framework of national and regional sustainable development; by catalysing action and replicating successes and innovations; by maximising and scaling up global environmental benefits; and by enabling donors and other partners to invest in additional and focused funding based on the scope of the programme.

In the 11th Plan document, the Government of India has placed a high priority on raising agricultural productivity to achieve annual growth of more than 4.1 %. The plan acknowledges that this target cannot be achieved in the face of ongoing shrinking and degradation of the country's natural resources; it therefore commits to conservation and to harnessing and developing the natural resource base.

The plan further acknowledges that in order to be effective, sustainable land and ecosystem management must contribute directly to poverty reduction at household and community levels, in addition to maintaining land quality and ecosystem integrity.

The Sustainable Land and Ecosystem Management Country Partnership Program (SLEM CPP) was developed to contribute to the implementation of the 11th Plan. The overall objective of the SLEM partnership is to contribute to poverty alleviation in India by promoting enhanced efficiency of natural resource use, improved land and ecosystem productivity, and reduced vulnerability to extreme weather events, including the effects of climate change. Specifically, the partnership will support:

(1) Prevention and/or control of land degradation by restoration of degraded (agricultural and forested) land and biomass cover to produce, harvest, and utilise biomass in ways that maximise productivity, as well as by carbon sequestration, biodiversity conservation, and sustainable use of natural resources;

(2) Enhancement of local capacity and institution building to strengthen land and ecosystem management;

(3) Facilitation of knowledge dissemination and application of national and international good practices in SLEM within and across states; and,

(4) Replication and scaling up of successful land and ecosystem management practices and technologies to maximise synergies across the UN Conventions on Biological Diversity (CBD), Climate Change (UNFCCC), and Combating Desertification (UNCCD) conventions.

The Desertification Cell, MoEF is the national executing agency for the SLEM programmatic approach. ICFRE, Dehradun has been designated as the Technical Facilitation organisation for the SLEM programme. All the 7 sub projects have a full fledged Project Management Unit with a Project Manager, Project Director (a senior government officer) and Project Steering Committee (chaired by a senior government officer). However, the responsibility of coordinating the SLEM programmatic approach as a whole and, to ensure SLEM principles are appropriately integrated into our national/ state level policies and programmes lies with MoEF.

SLEM NSC was constituted on 31st March 2009 with specific responsibilities and is chaired by additional Secretary, MoEF to ensure effective participation not only from the 7 sub projects but also by the concerned line Ministries of GoI and other institutions working in SLEM sector.

SLEM is a multiagency initiative supported by the World Bank, UNDP, and FAO, and is designed to engage national and state-level agencies. Through a combination of capital investments, policy and regulatory incentives, and public participation, the SLEM CPP aims to provide a critical mass of financial resources and technical knowledge to mainstream integrated and strategic approaches into investments in sustainable land and ecosystem management.

As a leading implementing agency, the World Bank brings to the partnership substantial IDA/IBRD resources under its ongoing lending programme for rural and agricultural development in India. The Government of India/ State Government's contribution to the programme is substantial, in the form of co-financing of all programme activities. As partnering agencies, UNDP and FAO will contribute with initiatives focusing on capacity building, knowledge dissemination, and promotion of best conservation practices that will be further scaled up through the partnership.

As mentioned above, to generate the maximum benefits from such a multi-sectoral and multi-partner approach, the SLEM CPP has established a dedicated, programme-level management and coordination function in the form of a medium-size project (MSP) entitled Policy and Institutional Reform for Mainstreaming and Up-scaling Sustainable Land and Ecosystem Management in India. The sharing of lessons learned and emerging results tracked by an M&E mechanism will be an integral part of each component project included in the programme, as well as of the programme as a whole. The M&E functions will form the basis for the outreach, knowledge base, mainstreaming, and scaling up of successful policy initiatives. If the SLEM partnership meets its objectives, a follow-up grant from the GEF will be requested. Future plans also include expanding the partnership to include other international financial institutions and donor contributions, and eventually leveraging additional donor financing.

5 CHALLENGES

The Process of Land Records Management in India is very old. The Arthsastra is supposed to be the first Indian work to mention of the village officers known as "gopa" maintained records on village fields, transfers, due taxes, etc. but that was at a very rudimentary level. Attempt to reform the system was first made by Sher-Shah-Soori (Ruled from 1534-1545) whereby land was categorised, measured and a schedule of crop rates fixed. The system was reformed during Mughal King Akbar regime (Ruled from 1556-1605) by adviser Todar Mal. The subsequent colonial rule by the British implemented the system on scientific lines, whereby large scale cadastral surveys were conducted to demarcate the boundaries and extent of each individual landholding, and soil fertility to levy revenue from landholders of each and every village. A "Patwari or Revenue Officer" was responsible for collecting agricultural revenue, reporting the transfer or transition information, maintaining pedigree database and managing land records of the area of his jurisdiction that is known as a Patwar circle. After about 200 years the system retains the same character and only minor changes have been made according to the needs of the time.

The land record system is at a transition stage from a 200 year old land record system to more advanced computerisation systems now. The Computerisation of Land Records (CLR) was started in 1988-89 with the intention to remove the inherent flaws in the manual system of maintaining and updatiing Land Records. In 1997-98, the scheme was extended to 'tehsils' to start distribution of Records of Rights (ROR) to landowners on demand. So far the scheme has been extended to 582 districts and 3286 tehsils. Computerised copies of ROR are being issued to landowners from 1976 tehsil/taluks across the country. This project can safely claim to be the first successful initiative of e-Governance in India, at the grass-root level. The focus of the entire operation has always been to employ state of the art information technology (IT) to galvanise and transform the existing land records system of the country.

The Government of India has decided to implement the centrally-sponsored scheme in the shape of the National Land Records Modernisation Programme (NLRMP) by merging two existing Centrally-Sponsored Schemes of Computerisation of Land Records (CLR) and Strengthening of Revenue Administration and Updating of Land Records (SRA&ULR) in the Department of Land Resources (DoLR), Ministry of Rural Development. The integrated programme would modernise management of land records, minimise the scope of land/property disputes, enhance transparency in the land records maintenance system, and facilitate moving eventually towards guaranteed conclusive titles to immovable properties in the country. The major components of the programme are computerisation of all land records including mutations, digitisation of maps and integration of textual and spatial data, survey/re-survey and updating of all survey and settlement records including the creation of original cadastral records wherever necessary, computersation of registration and its integration with the land records maintenance system, development of core Geospatial Information System (GIS) and capacity building. The following is an outline of the components and activities to be taken up under the NLRMP.

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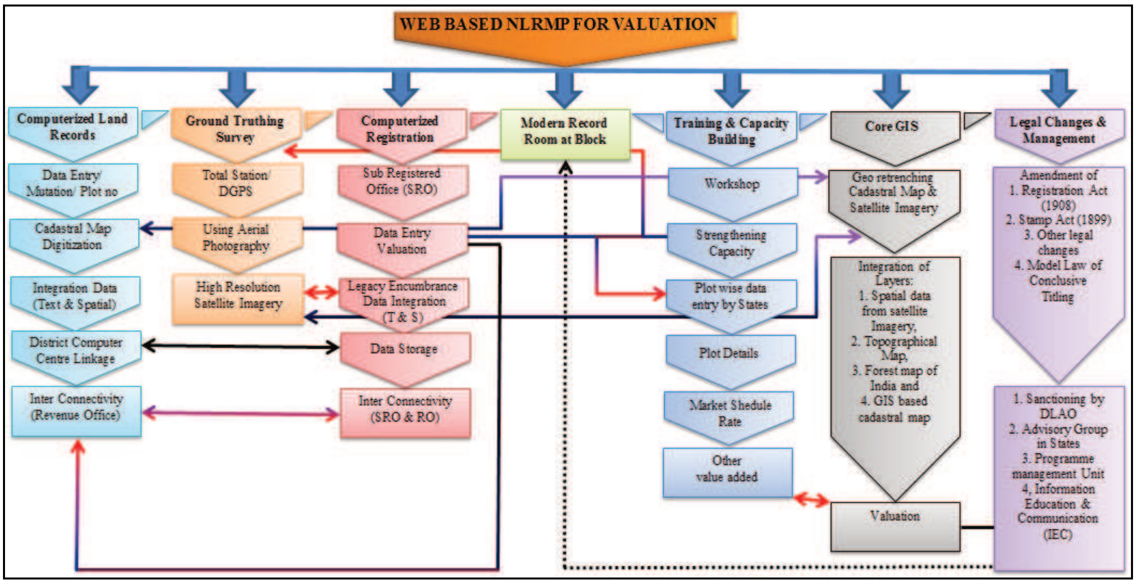

Fig 1: Basic System Architecture towards NLRMP

6 OPPORTUNITIES

The above NLRMP land and resource management programmes have been successful; the following contributing factors have often been present:

(a) Improvement and maintenance of infrastructure;

(b) Sound macroeconomic management that does not discriminate against agriculture and natural resources;

(c) Local community participation in all aspects of the programme;

(d) Public support for private investment in soil and water conservation;

(e) Robust local capacity building by non-governmental organisations and other cooperative-type projects; and

(f) Consistent efforts over at least a decade by concerned governments to increase not only land productivity but also awareness of environmental problems and possible solutions at local levels.

Investing in research on how to better adapt current land management systems to cope with increasing climate variability and climate change and the associated shocks and stresses, such as drought, flood, pests, and soil salinity, will also result in improved adaptation to climate change. Geographic information systems (GIS), geo-spatial mapping, and remote sensing technologies are central to achieving a successful transition from traditional environmental and resource management practices to sustainable development because of their integrative quality (linking social, economic, and environmental data) and their place-based quality.

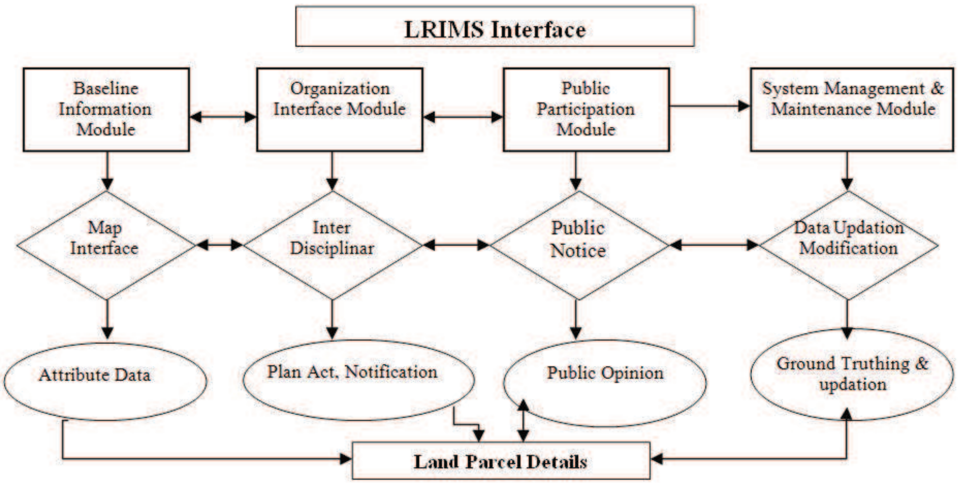

Figure 2: Land Records Information Management System

In a conventional system, query of land records is laborious, time consuming and revolves around a single person (Patwari). That is why integration of geographic data and their pertinent alphanumeric data is indispensable to develop and maintain a comprehensive Land Records Information Management System (LRIMS). The proposed system will not only be useful for the revenue department regarding information updating, query, reporting, customisation, leakage detection and predictive modelling but will also be beneficial for other system stakeholders regarding the identification of the legal precinct of their respective land. For the land acquisition plan for infrastructure development a man-machine interface model makes data capturing, ground truthing, plot details, land parcel details and acquisition plans more accurate and less time consuming. At present NRLMP is only used for land records and revenue collection, but through interface of different stakeholders it may play a pivotal role for decision making.

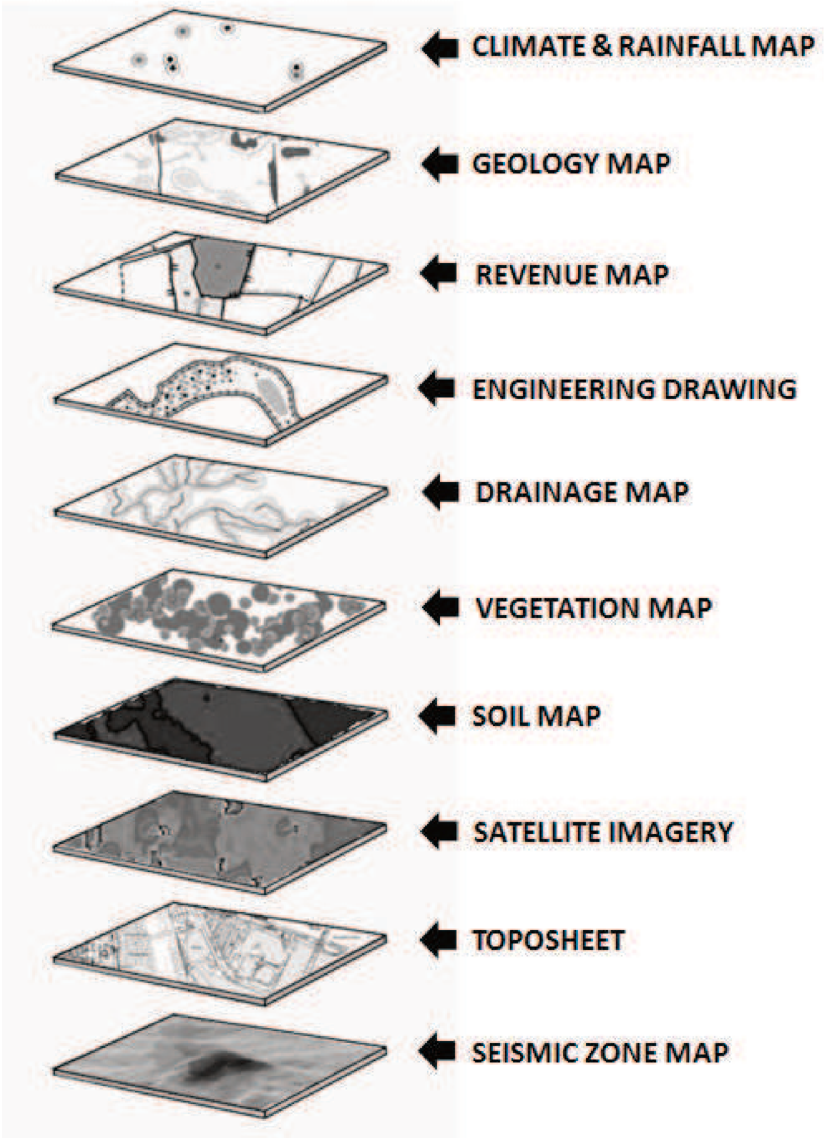

Figure 3: Baseline Information Mapping

Base Line information Module: The base line information module basically comprises a map, graphic, raster image, base line information, attribute data related to spatial information in one platform i.e. Geographic Information system (GIS). The module will have the capability of querying building, and presentation of the result of the query in both graphical and tabular presentation through overlay analysis. The information system will have zooming facilities starting from 1:1or 2 million scale and zooming up to 1: 500 scale depending on the resolution imagery and the level of study (Figure:3). The information content of this module will be a cadastral map showing details of each land parcel with physiography, demography, landuse, physical and social infrastructure, sensitive location, housing, open areas, transportation (road, rail, waterways), utilities (water supply, electricity), hot spots, location of monuments, polluted stretches, problem areas, tourist spots, pilgrim areas, tribal settlements, earth quack prone areas, their environmental status and their details etc.

Organisational Interface Module: Broadly speaking in the Indian scenario the development, management and decision making bodies are government organisations, development agencies, private developers, engineering firms and NGOs. But these bodies are separate. This module will have three sub modules focusing on highways, state roads and others roads. This module will contain alphanumeric data like Jamabandi, Khasra Girdawari, Pedigree Sheet. The basic booklet to be incorporated in this module will be government notifications, norms, infrastructure development standards various gazetteer, guidelines and directions published by government.

Public Participation Module: Public participation is one of the major tasks of the land acquisition process. The module will act as a platform for sharing the plan and progress of land acquisition in this computerised interface. This module will contain land parcel details, status of acquisition process, disbursement of compensation and public grievances.

The system management and maintenance module: This module deals with the maintenance and management of the LRIMS in the land acquisition system itself. It is basically a user management module. It deals with the various authorisations for access, viewing, updation, modification of data, information etc. The user management function may add and delete users of the system and the module-wise authorisation will also vary. The data, graphic and map updating may be authorised to different users to update the baseline and other information. The system management will be at block level, district level and state level. The average users will only be able to use data, analyse and compare the data but are not able to revise, add, delete or modify it.

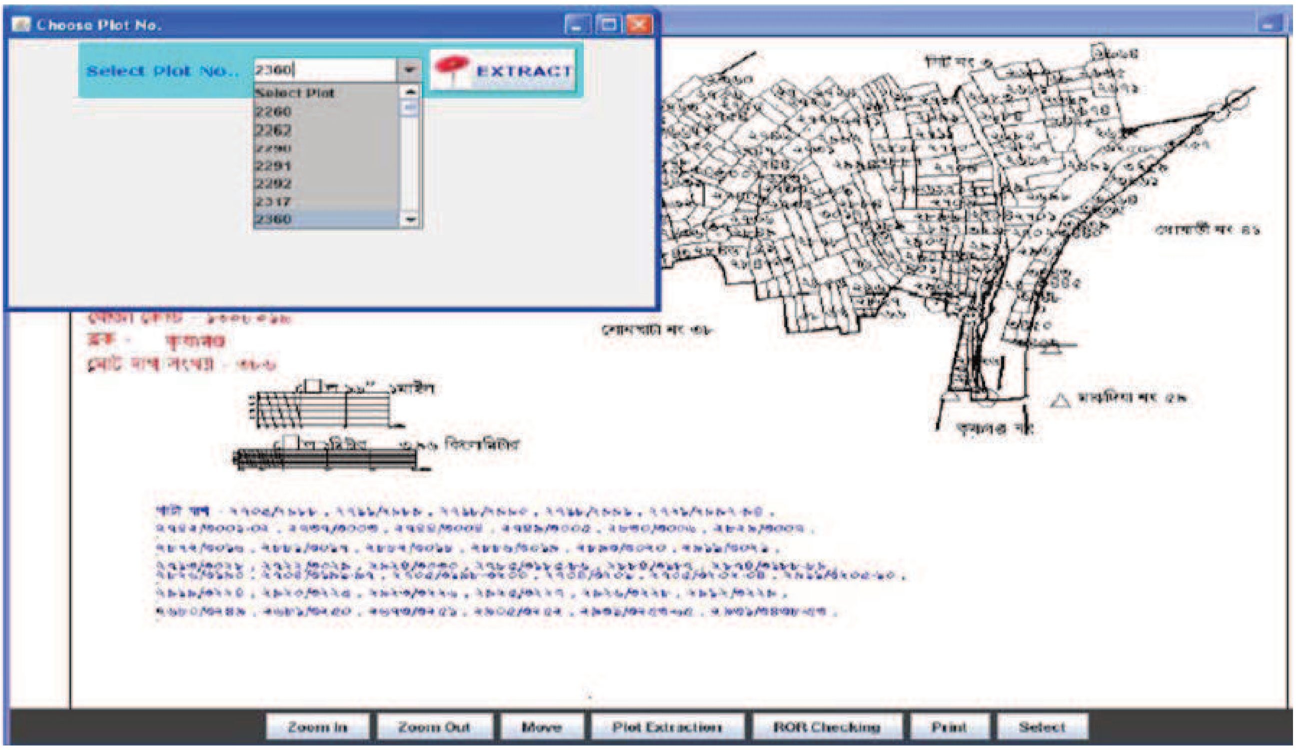

Fig 4: Public participation Module

7 TRADE-OFFS AND ITS OPTIONS

Though the specifics will vary from country to country and region to region, a comprehensive strategy for facilitating sustainable land and natural resource management contains four main components. They are:

- Policy and Sector Work: Further empirical work is necessary to clarify the private and social costs and benefits of alternative land use systems. Tradeoffs and synergies need to be identified and quantified where possible. Policy makers need such information when deciding on the relative priorities for the alignment of producer and consumer price incentives, fiscal and financial subsidies, licensing fees and taxation, and the structure of protection in the context of a country's environmental and social policy objectives.

- Research and Technology: Rrevitalisation of investment in infrastructure will be needed to undertake SLM strategies and programmes at the country and ecological zone levels. Emphasis must be given to the adaptation and improvement of technologies associated with agricultural intensification, the management and rehabilitation of forest cover in sensitive watersheds, and more effective water management (to avert salinisation and mitigate flooding) on irrigated and bottom land.
- Information Management System and Its Implementation: Integration of Field Measurement Books (FMB) and alphanumeric data are indispensable to have a fully-fledged LRIMS. The technologies like GIS, spatial data warehousing and the web are very helpful to generate a complete LRIMS. All Block offices will have the right to update information as well as to keep track of ownership, crop yield and revenue, as well as land acquisition status on it. With the aid of these recent technologies all land record information will be under a fingertip (click of mouse). The implementation of this interface will help:
- A gateway to dynamic planning: A developing country like India which is in the transition stage of office automation this information system will act as a platform of integration of the traditional data and information system with the modern and dynamic GIS based information system.
- Efficient data management: Land acquisition needs a wide range of data and information. In the GIS platform data and information are stored at different coverage levels. This assists integration and differentiation of graphic and data base information with the data table and text.
- Tools for data analysis: This information system has the capability of performing user - based data queries. The types of data analyses used by infrastructure planners, developers, decision makers, land owners will be different from the that of academics and the general public. All users will retrieve, plot, and analyse the data according to their requirements.
- Transparent planning: With the dynamic nature of the information flow planning, monitoring and management will be more transparent.
- Active public participation in planning: The proposed information system will be web based, not software biased so that information technology can be opened with any operating system. As all the information is easily available people will be able to take active part in the land acquisition and developmental activity.

For instance, there is growing recognition by decision makers that problems at the intersection of agriculture and environmental management, climate-change, and land vegetative cover change, with their related social and economic consequences, will be at the forefront in the new century. Technological advances in GIS fostering the integration of satellite imagery with other data (such as socio-economic or health data) are opening new ways to synthesise complex and diverse geographic data sets, thus creating new opportunities for collaboration among natural and social scientists and decision makers at all levels.

- Knowledge Sharing and Extension: For improved land management practices, it will be important to build innovation into national extension programmes under natural resource management initiatives. A major advantage of these innovations is that they are site-specific and often are readily acceptable to locals. The incorporation of an innovative within a systematic approach can significantly improve the performance of natural resource conservation.
- Incentive Priorities and Financing: SLM practices are likely to be adopted where agriculture is important for rural livelihoods, where agricultural land is in short supply, and/or where SLM has the potential to increase yields of high-value crops or to identify environmental fragile areas. Policies to facilitate SLM are more likely to be successful if they provide tangible benefits to individual households or communities by emphasising enhanced agricultural productivity, food security, and income, rather than by controlling land degradation. In this context, a policy framework which provides for market access and attractive producer prices is essential to SLM. In addition to offering policy incentives, normally operating at price and cost margins sufficient to redirect the private sector's utilisation of resources in directions deemed socially desirable, achieving SLM will require

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additional investment in research and technology generation, knowledge dissemination, and the integration of knowledge and policies at appropriate spatial and temporal levels.

The costs of these investments can be considerable in areas where severe degradation has already taken place, often over decades and even centuries, as well as in those areas that will be hard hit by increasing climate variability and eventual climate change. Thus governments will need to (a) realistically assess the availability of resources; then (b) prioritise investments to rehabilitate the most egregiously damaged lands and soils (as measured, primarily, by the opportunity costs of taking no action); (c) develop a realistic phasing of investments; (d) set forth financing plans; and (e) seek agreements with likely beneficiaries in the private sector and civil society, for them to participate in programme implementation and to share a portion of the costs in accordance with agreed mechanisms.

8 CONCLUSIONS

A large area of formerly productive land has been rendered unproductive due to natural or man- made activities or government policies. Caution is required in interpreting the extent of land degradation. However, there is a general consensus that it is far less expensive to prevent land degradation via the application of good management, based on both cultural and scientific knowledge than to rehabilitate degraded land, and that where land is truly degraded, significant production and ecosystem service benefits can result from the rehabilitation of degraded lands. Given the scale of potential benefits and negative effects, it is essential for problem diagnosis, assessments of resource use alternatives, and cost-benefit analyses to be conducted at appropriate spatial and temporal levels. More emphasis needs to be placed on planning and implementation. Given the transboundary effects of land, water, and other resource management costs and benefits, equitable regional arrangements and treaties will need to be considered and revised as necessary. Property rights to resources such as land, water, and trees have been found to play a fundamental role at the nexus of poverty reduction, resource management, and environmental management. The property rights held by poor people represent key household and community assets that may provide income opportunities, ensure access to essential household subsistence needs (water, food, fuel, and medicines), and insure against livelihood risk. Poorer groups tend to rely more heavily on customary or informal rights. It is unlikely that SLM can be achieved in the absence of explicit attention to property rights.To stimulate the involvement of local to private investors in land-friendly commercial activities would relieve pressures on the budget for adequate programme finance while bringing to bear some of the flexibility and responsiveness needed to address the physical and financial contingencies associated with the kinds of investments required. The use of risk reduction or guarantee funds or the provision of insurance, partially underwritten by government, might prove sufficient to induce a strong private sector response. Overall SLM will act as a tool for decision making.

9 REFERENCES

Dumanski, J. 1994. International Workshop on Sustainable Land Management for the 21st Century: Summary. Workshop Proceedings. Agricultural Institute of Canada, Ottawa, ON. 50 pp.

Pieri, C., Dumanski, J., Hamblin, A., and Young, A. 1995. Land Quality Indicators. World Bank Discussion Paper No.315. World Bank, Washington, DC. 51 pages.

Smyth, A.J. and Dumanski, J. 1993. FESLM: An international framework for evaluating sustainable land management. A discussion paper. World Soil Resources Report 73. Food & Agriculture Organization, Rome, Italy. 74 pp.

World Bank. 1997. Rural Development. From Vision to Action. ESSD Studies and Monographs Series 12. World Bank, Washington, DC. pp 157.

TDR Approach Employment in Dealing with Metropolitan Area's Sprawl; Isfahan Metropolitan Area, District 9

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1 ABSTRACT

Transfer of Development Rights (TDR), as a market-led mechanism, attempts to managing the urban growth and facing urban sprawl, with reference to the valuable lands, through balancing between public and private interests. This approach has been raised following the master plans inefficiencies in protecting valuable natural lands and zones. Due to the master plans failure in facing urban sprawl and managing the cities' growth in a smart way in Iran this concept has been put forward in academics and professional arenas in recent decades. But, due to the lack of institutional context and necessary soft perquisites, it has not been realized and moved beyond theoretical fields.

Similar to most of the Iran's' city districts, district no 9 in Isfahan Metropolitan Area- which is famous because of its orchards and landscaped lush and productive agriculture-has been exposed to the commercialization and mass unplanned constructions. As a result its valuable environmental assets, which act as a respiratory lung of the city, exposed to destruction. This is while many lands are abandoned within the city. These issues raised the necessity of TDR approaches employment for the aim of growth management. In this regard, the main question is that what the main institutional perquisites are and by which means a reliable institutional context would be provided for realization of this mechanism in the selected district as the research case study.

The following research, with the intention of answering this question, is up to identify those theoretical perquisites through literature reviews methods such as meta-synthesis and field research methods. Afterwards, due to the extracted conceptual frameworks, 4 main institutions' vision about TDR's soft perquisites, including citizens, developer, landowners and urban experts, would be analyzed by means of statistical methods such as Friedman and T tests, Multivariate regressions and SWOT analysis. Based on the results, this approach employment requires long term smart plans to achieve successful outputs, since variety of institutional barriers such as low regional consciousness, unwillingness to participate and not providing the necessary legal grounds.

Key words: Transfer of Developmental Rights (TDR), Urban Development Institutional Capacity, 9th District of Isfahan Municipality, urban sprawl, smart growth

2 INTRODUCTION: THE RESEARCH QUESTION AND CONCEPTUALIZATION OF THE TRANSFER OF DEVELOPMENTAL RIGHTS (TDR)

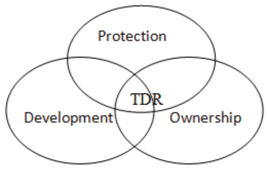
The increasing urban population in recent decades has caused an unplanned expansion of the cities, with the highest pressure on the agricultural land inside and outside the cities. However, the protection of agricultural lands and gardens in 1950s and later, in particular with the discussion of sustainable development issues, has been specifically addressed and turned into operational agendas. Nevertheless, the experiences during the past decades have shown that urban development plans and current regulations to protect valuable natural assets have not been effective. In seeking operational and enforcement strategies for protection, new perspectives on urban and regional development planning have been presented which are market-oriented. Among these are the approaches presented in 1990s in the world leading to the production and delivery of efficient tools for market's capacity utilization in policymaking and planning for urban development. One of the most successful approaches among these is TDR. The concept of "transfer of the development rights" emerged for the first time in the 1960s as a tool for historical protection (Linkous, 2016: 162). In the 1980s and 1990s, followers of the society protection reported the dramatic environmental and economic potential of TDR programs, believing that these programs would provide permanent protection of land with an environmental or historical value. Following this claim, many TDR programs were developed in the United States (Messer, 2007: 47). The TDR by striking a balance between the public and private sector interests is trying to manage the city's growth and development. Depending on the circumstances and purpose of the application, related approaches have emerged: Transfer of Development Credit (TDC), Purchase of

Development Rights (PDR), Residential Density Transfer (RDT), Development Fee, Density Transfer Change or Density Transfer Fee (DTC or DTF), and Development Rights Certificate (DRC) among all. The main idea of the approach outlined above is to protect against development, yet they are different in details as summarized in Table 1 in a nutshell.

Table 1: Theoretical TDR Approaches to Protecting Natural Property and Historical Heritage

Definition	Approach	Definition	Approach
All construction is required to pay the development fee, and the proceeds belong to the owners who are volunteers to permanently protect their valuable assets (Pruetz, 2003: 83)	**Development Fee**	This program first emerged in the United Kingdom in 1990s to preserve agricultural lands. By purchasing development credits from public lands and transferring to postal areas, this mechanism provides permanent land protection using a public / private hybrid model (with direct state intervention) (Greenaway & Good, 2008: 10).	**Transfer of Development Cost**
Part of the surplus value obtained is absorbed through increased development potential and used to compensate for the loss of decreasing development potential elsewhere (in cash) (Fulton, 2004: 31)	**Density Transfer Fee**	This program was first introduced in 1980s in order to protect the agricultural lands. In this mechanism, development rights are purchased and permanently abandoned requiring funds from government and nonprofit organizations (Nelson, 2013: 22)	**Purchase of Development Rights**
A tool for government officials to access the lands needed for public use without requiring cash (CFSD, 2015: 14)	**Development Rights Certificate**	Part of the TDR program is aimed at transferring residential density (Otto, 2010: 4)	**Residential Density Transfer**

In general, the TDR is a legal mechanism that allows developers who have purchased the development rights from landowners in other areas, allowing development beyond the project's permitted density in the designated areas (Cowan, 2005: 404). In other words, the TDR is a law for the use of land, in which the rights related to development can be taken from the size and extent of the land and sold in the market (Taintor, 2001: 8) This approach is considered as a modern way of monitoring the development of the land, which has been used in developed and (in recent decades) some developing countries along with other methods of controlling and monitoring urban development. Regardless of its role in urban development, TDR is important in reducing the inequality and ensuring fair rights for individual owners (Azizi and Shahab, 2012: 3), so that Chan and Hu (2015) consider the TDR as a balance between protection, property rights and development.



Chan & Hou, 2015: 36

Chart 1: TDR – Balance between protection, development and property rights

In all societies, government actions have an inevitable impact on the value of land. Most planners, in accordance with the constitutional considerations, refrain from government actions that cause devaluation, unless the cost of damages to the people is determined and provided because compensation payment is a huge expense. TDR is a mechanism that convinces the landlords to voluntarily accept high-value rights that reduce their value of ownership (Ardestani, 2008: 21) because it provides conditions to compensate the owner with the property for the loss of their development rights. (Tavares, 2005: 4). In Iran, in spite of the laws (the law of preserving the use of agricultural lands and gardens and its amendment, the implementing regulations on the amendment of the law on the maintenance of agricultural lands and gardens, along with the related amendments), plans and projects, administrative authorities, and numerous commissions on protecting the natural surroundings inside and outside the cities, conservation objectives have not been properly implemented so far. Especially in metropolises or large cities, landowners tend to change the use of agricultural lands and gardens due to their added value.

Also, the policies applied to preserve the greenness of the cities and their regionalization have had adverse physical and economic consequences. As a result of the decrease in land prices due to the restrictions for the construction on agricultural lands and gardens, unauthorized industrial activities, workshops and warehousing in the agricultural lands and gardens have been developed as well as illegal construction (sustainable development plan of Isfahan, 2009: 22). The growth in the price and value of land in these areas is not equal to other parts of the city which has contributed to the limitation of the decent development. The 9th district of Isfahan municipality, which has been formed from joining villages to the city, includes agricultural and horticultural lands along with natural assets such as valuable natural landscapes of Najvan (natural and urban tourism axis). However, despite many efforts to protect them, these assets are still in danger of being destroyed. According to the management of district 9 of the Isfahan municipality, "changing the land use is one of the main demands of citizens in the area from the municipality"(Beautiful Esfahan, 2017). On the other hand, the urban management approach and that of the institutions responsible for protecting the valuable land of Najvan (land acquisition by the municipality started in the 1980s, with the motive of creating an impassable recreational axis) has led to the implementation of disruptive tourism plans that are not in harmony with the principles of sustainable development and have doubled the air pollution of Isfahan while damaging the natural ecosystem in this area. In addition, horticulture and maintenance costs of gardens are not cost-effective for gardeners in Najvan area, and these lands are gradually become dry and deserted, while construction is stepping into this area (detailed overview plan, 2003: 115).

Accordingly, in order to protect the agricultural and horticultural lands of the region, it is felt that there is a need for effective plans, which can both help to protect agricultural and horticultural lands, as well as the rights of citizens. Considering the issues raised, the TDR approach is important in terms of its instrumental capabilities in reducing inequalities and ensuring the fairness of individual property rights of the landowners in the possibility of land development in order to create equilibrium and equity in the interests and losses caused by different situations which is due to the implementation of urban planning rules for various lands.

3 CONCEPTS AND VIEWS, THEORETICAL AND EMPIRICAL BACKGROUND OF THE TDR APPROACH

TDR programs can be divided into three periods in their evolution. The concept of TDR was first introduced by Gerald Lloyd (1961). After its introduction, the TDR implementation plans soon were offered and scientists tried to examine the effectiveness of the "first generation" TDR programs. Some of these first programs were performed in places like New York City, Collier (Florida) and Calvert (Maryland). The programs focused on the practical aspects of TDR programming while providing suggestions for the "second generation" of the programs. The second wave of the TDR program began in the 1980s. These programs include Montgomery (Maryland), Pinelands in New Jersey, Boulder (Colorado), Tahoe Regional Planning Agency (CA), etc., focusing on the importance of stakeholders and their involvement in design and implementation of programs. In the "third generation" TDR programs like the Triston program (Washington), which still continuing, has been a simultaneous emphasis on participation in programs and incentives (Kaplowitz et al., 2008: 379-380).

The key to the realization of any TDR program is the concept of "sending area" and "receiving area". The sending areas are those introduces through the zoning with environmental or historical values (sensitive sites) that send their developmental rights to the areas that are suitable for development (Triedman et all, 2014: 6-7).

TDR mechanism (Transaction Mechanisms): TDR is an innovative land use tool that can help communities implement growth management policies and plans and, as a voluntary and market-based mechanism, exceeds the regular zoning process (Bratton, 2008: 1). In the TDR approach, it is assumed that the development right of a piece of land as part of the transferable rights can be sold and used in other pieces (Tavares, 2005: 3). As a result, the right to develop the land is separated from the property without changing the ownership, the owner can then continue to use the land based on the contract (Bratton, 2008: 3). A Transfer Development Certificate is transferable in the market, and when the right market is a competitive one, development rights can be redeemed, which causes the price of the protected land to be updated while earning more profit. (Tavares, 2005: 5). The TDR exchange mechanisms are widely variable, which are used depending on the circumstances and the context of each system and country. Some of these include private market exchanges, including buyer-seller exchanges, private sector exchanges with public sector support, intermediary exchanges, TDR banks and private funding firms (Bratton, 2008: 3).

TDR Actors; Bratton (2008) believes that there must be at least three separate actors in order to complete a transfer of development right. These actors include: the development rights vendors (property owner), development rights buyers (builder or developer), and supporting public community that ensures the rules and regulations of the program and guarantees fair play. Triedman et al. (2014) also refer to the effective role of the community and the local government in addition to the mentioned actors, so TDR actors can be considered as four groups: development rights vendors, development rights buyers, trade support (Bratton, 2008: 3 -4) and the general public (Triedman et al, 2014: 19).

The Institutional Ground and Capacity: Institutions are the rules of the game in society, or in other words, they are more scrupulous constrains by humanity that forms the interactions of human beings with each

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other. As a result, institutions organize the hidden motives for human exchanges (Farajirad and Kazemian, 2012: 139). In other words, institutions make the world simpler and make people more logical and social. The rules only develop if the community recognizes its ultimate goals. However, determining the goals depends on how the society thinks in interpreting the world. Therefore, institutions develop only in an institutional context. In this institutional framework, people are turning to their daily routine, and they can regulate their behavior if their experiences go well beyond what they expect. Keizer, 2008: 13).

An institutional context includes a set of policies, legal frameworks, resources, incentives and mechanisms governing relations (IFAD: 1). In other words, an institutional context is a set of institutions. Institutions are the rules of the game in a society, and the institutional framework points to how the rules of the game are combined and arranged (Zamanzadeh and Al-Husseini, 2016). Without a full understanding of the context and institutional framework, many factors that are likely to have a great impact on how changes occur, are considered as "axioms" or hazards that are unchangeable, and actors are unable to change them (IFAD: 1). For this reason, the recognition and comprehension of the institutional framework is of the necessities for any change in a society. For example, the institutional context of the developed countries is completely different from developing countries, and obviously institutional capacity must be different accordingly (Robin & Stephen, 2004: 18-19).

Institutional capacity is one of the main concepts, but also the major concept in institutional approach (Farajirad and Kazemian, 2012: 103). Evans and colleagues considered capital or institutional capacity as a key element of local government and referred to three main dimensions as organizational resources, knowledge and leadership of local governments. They pointed out that having this capacity can be a trigger for change (Mohammadi, 2014: 45). Institutional capacity, due to its broad concept and its high importance, has been studied and evaluated by various individuals and institutions in recent years in various fields of study. It has also been presented while the dimensions and indicators for its evaluation have been presented depending on the conditions of the field of analysis. In the table below, the views of some experts are observed (Table 2).

Table 2: Components and Indicators of Institutional Capacity from Different Perspectives

Components and indicators	Perspective on institutional capacity	Writer
The ability of institutions (human capital, resource availability, purposefulness, incentive system, inter-institutional relationships, and flexibility), the integrity of institutions (inter-sectoral relationships of institutions, collective capacity of institutions), knowledge of institutions (formal knowledge and indigenous knowledge), learning the institutions (interactive learning, experiential learning, continuous learning) and appropriate legal arrangements (legibility, legal ground)	Regional institutional capacity	Farajirad & Kazemian (2012) Kazemian et al. (2013)
Inter-sectoral integration (integration between policies, laws, regulations, organizations and methods), balance bottom-up and up-bottom approaches (corporation of the two levels, utilizing low level participation of people for better understanding of needs and solutions to problems, high level participation of managers taking into account the national needs and interests), the credibility or legitimacy of policies	Development institutional capacity	Michel(1994)
Flexible structures, Incentive system, Assistance mechanisms, Coordination, Leadership, Internal relations quality, Networking, Objectives, Clear missions	Institutional Capacity in the Form of Organizational Capacity	European Commission(2005)
Committed employees, political will, education, common practice and creating networks for taking measures	Sustainable institutional capacity	Evans et al.(2005)
Human capital (knowledge, skill, experience), social capital (mutual trust, values, attitudes and behaviors, commitment, motivation, sense of belonging, networks, relationships), institutional capital (governing arrangements), economic capital (infrastructure, Financial resources)	Institutional Capacity Measurement and Capacity Building Measures	Ruins(2008)
Individual capacity (technical skill and knowledge of individuals), internal and organizational capacity (organizational strengthening including policy development, methodology, structure, network and participation, including formal and informal relationships, constructive interaction with other stakeholders, open and transparent inter-organizational relations, Regular and continuous information exchange, Support for organizational learning, Organizational paths and perspectives, Periodic evaluation of resources), External rules and incentive arrangements (support for regulations, transparency of regulations and responsibilities, community support for participation in decision making, access to technical and financial resources required)	Institutional Capacity in Organizational Content and Public Management	Dimen(2008)

Source: Writers, Adopted from the sources mentioned

Theoretical and empirical background to the research on TDR: According to the studies, the United States has been a pioneer in the use of TDR programs and has so far gained much success in protecting the TDR mechanism. For example, in Pinelands (New Jersey), an ecologically valuable area in southern New Jersey, in 1980, with the purpose of land management, the Pinelands Commission formed and decided to use the TDR program to protect the lands.

The commission managed to protect at least 16,000 acres of land by 2014 and achieve a high level of success (Triedman et al, 2014: 22). On the path to success in this program, the institutional indicators of "knowledge, commitment, professional staff, internal and inter-organizational integration, a prominent organizational vision, flexible structures, regular exchange of information, mutual trust among all stakeholders, participation, the existence of financial resources, economic incentives, the existence of infrastructures, the legal framework and the transparency of laws" had a significant impact in this program (Bratton, 2008: 11-12; Triedman et al, 2014: 21-24).

The TDR in Montgomery (Maryland) developed with the aim of protecting agricultural lands and natural resources between cities as well as increasing the density of residential development by increasing the commercial base of existing centers. This one has been another successful program in the United States that has so far been able to result in the protection of 49,000 acres of agricultural lands (Otto, 2010: 35). In this program, in order to achieve maximum protection, both TDR and PDR mechanisms are used simultaneously (Bratton, 2008: 14-15). Owners who want to preserve their natural resources and agricultural lands are attracted to the PDR program, and landlords who are willing to reduce the density of residential development in their property will tend to the TDR program (Otto, 2010: 3). The success of the program depends on institutional contexts such as knowledge, specialized staff, internal and inter-organizational integration, specific organizational vision, regular exchange of information, mutual trust among all stakeholders, networks, financial resources, economic incentives, legal and regulatory contexts" (Walls & McConnell, 2007: 38-45; Bratton, 2008: 14-15; Otto, 2010: 3-35).

King County (Washington) approved the TDR program in an effort to limit the urban dispersion. The state legislature passed the Growth Management Act in 1990. Then, in 1999, the King County Council allocated $ 1.5 million to create the TDR Bank in order to purchase development rights from rural and natural areas (SGA, 2008: 3). The focus of the program has been on the preservation of rural lands and the separation of urban lands in order to prevent the invasion of Seattle's suburbs (Huang, 2011: 40). Based on the studies, "knowledge, commitment, interconnectivity, interagency, specific organizational vision, trust, partnership, financial resources, economic incentives" are indicators of the institutional capacity to achieve success in this program.

China sought to find a way to deal with urbanization problems, including the destruction of historic areas, agricultural areas and urban dispersal until it started getting information about the TDr in 1990s and, despite the different social, cultural and land ownership systems, has so far been able to implement this mechanism in several provinces (Huang, 2011: 9). In the socialist system of China, development rights are considered as individual rights, which are valid as much as land ownership. In China, these rights are relocated as the person relocates, that is they are not transferred individually. The majority of TDR programs in China have been implemented in rural areas aimed at transferring the development of agricultural land to residential areas. One of China's successful plans is the Zheijiang Province Trial Program, which was implemented in 2000 and succeeded in protecting 50% of the natural and agricultural lands of 13 villages and towns (Ibid: 49-55). To achieve success in this program, indicators of "inner and inter-organizational integration, specific organizational vision, trust, partnership, availability of financial resources, economic incentives, legal ground and transparency of laws" have been considered.

The Indian state of Karnataka in the 200s saw the rapid growth of immigration and, as a result, the demand for basic facilities such as housing, water resources, health, transportation, schools and hospitals, which resulted in massive pressure on the state regarding the land and the financial resources needed. In 2005, Karnataka introduced the TDR tool to explore new infrastructure facilitators. In this system, offering the DRC instead of cash led to the possibility of providing the required infrastructure by the authorities. Based on this, 2186 DRC certificates were issued (CFSD, 2015: 14). This TDR program aimed at providing a win-win situation for the city as well as the owners along with the access to urban land for public use without conflict. Although information indicates that, given the development rights granted, land owners are resisting DRC admission, and the program has failed to achieve all its goals (Ibid: 24-32). An evaluation of the implementation of the program demonstrates shortcomings in the implementation of the TDR; the lack of transparency of the program (the lack of transparency of construction projects), the lack of information for the buyers and owners of the TDR, the incompleteness of the information and documents related to the transactions and their non-digitization, being influenced by TDR incentives of planning policies and administrative processes for economic benefits (Ibid: 40-45).

In Iran, several studies have also been carried out on the mechanism for the TDR to protect valuable lands and the possibility of its implementation in the context of Iran and in various dimensions. Mohsenzadeh (2010) concluded in his research that the TDR program aimed to protect the agricultural lands of Babolsar and other northern cities of the country was appropriate because, if successful and correct, they would lead to

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more profit to farmers, urban clever development and the improvement of agricultural land degradation. Also, Mohebbi and Zakir Haghighi (2015) in their study in 2015 found that the TDR program, due to its more profitability for farmers in case of monitoring its proper implementation, has the ability to be executed in Tonekabon and protect the agricultural lands. In the research carried out by Rafiyan et al. (2011), the use of the TDR mechanism is appropriate to protect Qazvin gardens. In this regard, the Arezou Zare (2015) in her research entitled "The capacity measurement of the TDR method in the realization of urban development plans, Ghasr al-Dasht gardens, Shiraz" concluded that the use of the TDR mechanism for the protection of Shiraz gardens is appropriate because of the balance it maintains between the public and private interests and, thus, the willingness of the owners to participate in the protection.

From another perspective, Azizi and Shahab (2012) studied the use of the TDR mechanism as complementary to urban development plans, and found that using this mechanism contributes to the implementation of the plans helping the interaction between properties and planning rights. Mozafaripour and Soltani, in their study in 2014, stated that in general, the success of TDR's mechanism, apart from the purpose of its application, is dependent on the supervision of local governments. Also, they stated that in order for the landowners to welcome the program, transactions must be mediated by a general institution (Mozaffaripour and Soltani, 2014).

Tousi and Bagheri in summarizing their research on explaining the sprawl phenomenon in the metropolitan city of Shiraz (Tousi & Bagheri, 2017) introduced the TDR along with policies and approaches such as smart growth, as an effective approach for confronting the sprawl phenomenon in metropolises. In a study in 2017 titled "Feasibility of the TDR Implementation in Providing Urban Services in Shiraz", this mechanism was considered necessary for the provision of needed land for proper urban services (Farsi Farashbandi et al., 2017). In the studies conducted by Zare in 2015, the use of the TDR mechanism for sustainable urban renewal was addressed while it was pointed out that in pursuit of the desired goals, this approach should take the process of localization according to Iran's conditions (Mohammad Zare, 2015). In the end, Mohammadi et al. (2017), regarding the evaluation of the TDR implementation in the 9th district of Isfahan in legal, social, economic and physical dimensions, found that the area enjoys the capacities for the implementation of this mechanism such as the tendency of the urban management towards the protection of agricultural and horticultural lands as well as the existence of suitable sending and receiving areas.

Apart from the academic fields, many research projects have been conducted or currently under conduct regarding TDR implementation. Among them are Isfahan regional study aiming to guide the development and conservation of the agricultural and horticultural lands along with the emphasis of the master plan of Tehran, Mashhad and Shiraz on the protection of the Qasr al-Dasht gardens. However, despite the fact that this approach has been considered as a proper protecting approach in Iran, due to the lack of adequate institutional framework, no plans have been put in place yet and the TDR mechanism has failed to take action. Also, most studies have less focused on the need to provide institutional frameworks, and addressing this issue has often been briefly discussed during other topics. Assessing the existing institutional conditions for implementation is one of the most important prerequisites for entering the implementation phase of the TDR mechanism in Iran, which is the focus of this research.

4 INFERENCE OF CONCEPTUAL FRAMEWORK AND METHODOLOGY OF RESEARCH

Reviewing the theoretical foundations, domestic and foreign experiences and research, the theoretical / conceptual model of the research is deduced presented as the following figure. Achieving this model is possible through step-by-step actions; (1) reviewing research and projects related to the institutional capacity of urban development and extracting indicators of institutional capacity assessment from different sources; (2) evaluating the validity and reliability of the indicators based on their frequency of use in different texts through meta-synthesis, selecting more reliable theoretical indicators and categorizing them into five groups: individual capacity, organizational capacity, social capacity, economic capacity and legal arrangements according to the purpose of the research; (3) evaluation of the indicators for measuring institutional capacity, in domestic and foreign projects and research to achieve the most important indicators of institutional capacity which are effective on the TDR implementation (based on the frequency of use and reference to indicators in the experiences and research); and finally (4) the presentation of the conceptual framework of the research is described in Fig. 2. Theoretical model of research has tried to illustrate effective actors in realizing the TDR policies and the capacities needed to successfully implement TDR programs in terms of theoretical relationships and indicators.

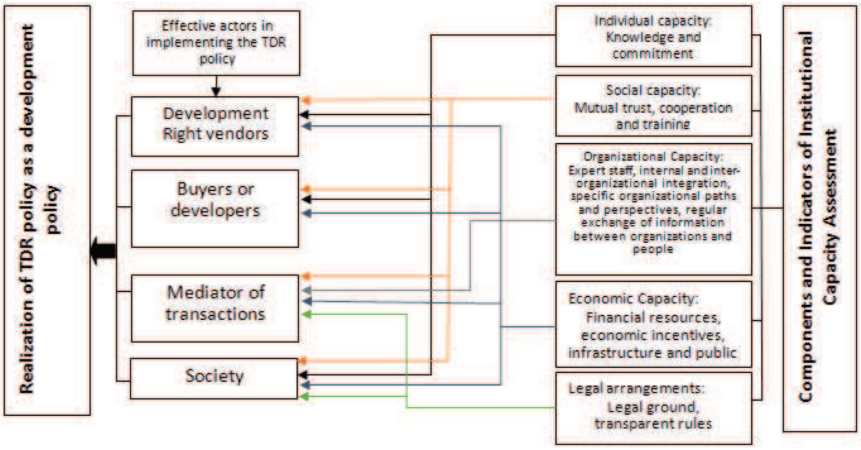

Chart 2: The conceptual/theoretical framework of the research

The present research is based on the purpose of applied research type as well as the nature of the descriptive-analytic type. Based on the methodology of research which is a combination of qualitative and quantitative methods, several basic steps have been taken: First, based on documental studies, theoretical components of the research are extracted and indexed through meta-synthesis and then, using a social survey method, structured and semi-structured questionnaires (in order to determine the main categories and design of the final and structural questionnaire), the 9th district of Isfahan has been evaluated from regarding these components. The completed questionnaires included information on the effective components of TDR implementation, which was developed in four groups (1) people, (2) owners, (3) developers, and (4) experts and specialists. Then it was distributed among groups of respondents with different sample sizes.

The sample size of the group of owners and people was determined using Cochran's formula with a 90% confidence index because the size of the population was relatively obvious. The sample size in these two groups was 89 and 96, respectively. In order to determine the sample size of the developers and specialists, a targeted sampling method was used based on the researcher's judgment and the sample size was 50 and 30, respectively. Finally, the results of the questionnaire were summarized and analyzed using descriptive and inferential statistical methods (such as regression, Friedman test, T-test, etc.) in Excel software and SPSS. In the final step, using the SWOT matrix and the Quantitative Strategic Planning Matrix (QSPM) analytical methodology, appropriate strategies have been formulated and prioritized. In the following, after the introduction of the selected research, the results of the methodology will be explained.

5 THE SCOPE OF RESEARCH

The 9th district of Isfahan municipality with an area of 2025 hectares is located on the western border of Isfahan and north of Zayandehrud River (Statistics of Isfahan, 2011: 20). As shown in the picture below, this peripheral area formed by the joining of several villages is rich in plentiful land, as well as fertile agricultural lands and extensive gardens (detailed review plan, 2002: 11).

The poor supervision of the urban development planners on these lands and the high level of greenery has led to a tendency towards construction in this area, and on the other hand, the profitability resulted from the conversion of agricultural and horticultural lands to other inappropriate uses as well as the policies to maintain greenery (the reduction of land prices due to the restrictions on the construction in agricultural and horticultural lands and, consequently, the establishment of illegal industrial activities, workshops and storage) has led to the destruction of more and more valuable natural areas of the region (Sustainable Development Plan Isfahan, 1388: 22).

In addition to the agricultural and horticultural lands, in this area the valuable lands of Najvan natural park are located in the north of Zayandehrud River which due to the western winds and most pollutant industries in western Isfahan has led to the urban management taking actions for protecting these lands. One of the most prominent of these measures is aquiring the ownership of horticultural and agricultural lands and the implementation of tourism projects, although this policy has caused more destruction of these lands due to the presence of tourists (and in the absence of proper protection planning) (Same: 115).

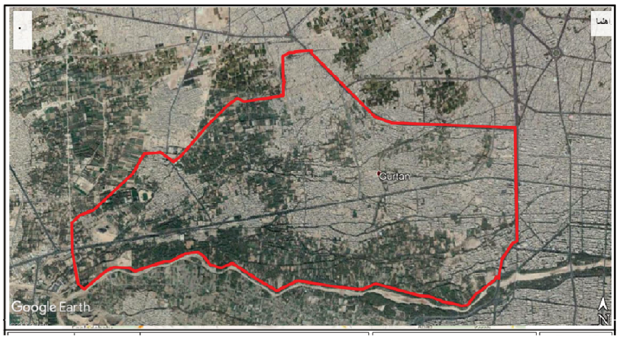

Figure 1: District 9 of Isfahan

To date, many plans and projects have been put in place to protect the horticultural and agricultural lands, yet they have not been able to achieve their conservation goals due to the lack of executive solutions. There are also several laws on the protection of agricultural and horticultural lands: Article 19 of the Land Reform Act adopted in1961, Article 12 of the Law on Agricultural Extensions in Agricultural Regions adopted in 1975, the Bill on Agricultural and Livestock Damage adopted in 1979, Article 10 of the Executive Code The Law of Utilized and Arid Land (which after the Revolution has been provided to farmers as temporary cultivation) adopted in 1986, Article 1 of the Executive Order on Amendments to the Law on the Conservation and Development of Green Space in the Cities, 2009, Article 1 of the Law on the Maintenance of Agricultural and Horticultural Land Use and its amendment adopted in 1995, etc. Some law, with a positive attitude and encouragement of gardeners and farmers to protect the land, permits for the construction of compatible uses, limited construction and wall-mounted to 80 cm height for productive gardens. However, economic interest, neglect of laws and regulations, lack of enforcement of guarantees, etc. in the country resulted in the ineffectiveness of the said laws.

Based on surveys and interviews conducted in district 9, it was noted that gardens and landslides of Najvan are considered as part of the green belt of Isfahan. It should be noted that the green belt of Isfahan with a total of 1700 hectares has not been approved (there is no legal basis), but the municipality of the district 9 taking into account the Najvan as a green belt, enforces laws that raise owners' dissatisfaction who own the horticultural and agricultural lands which has led to their reluctance towards the land protection.

In the following, the chosen methodology of research in this area and the description of its results and findings are discussed.

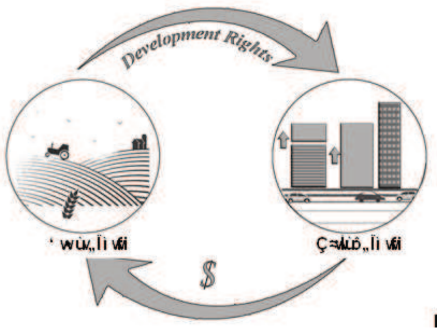

Figure 2: Sending and receiving area in TDR approach

6 APPLICATION OF SELECTED METHODOLOGY FOR RESEARCH IN ISFAHAN, DISTRICT 9 AND PRESENTATION OF FINDINGS

Based on the above methodology, first, based on documental studies, the conceptual model of research, as it was discussed earlier, was developed in the form of influential actors and institutional capacities required. Then the sending areas (including two categories of agricultural land and horticultural land within the area and the Najvan area which were determined based on the theoretical foundations and urban plans) and receiving areas (including areas with development capabilities, including urban areas worn out which were determined based on the theoretical foundations and urban plans) were identified (Figure 2) and the questionnaire was developed based on theoretical model of research. Then it was distributed among the members of the target community.

In this study, the owners included the owners of horticultural and agricultural lands in district 9, the people included a group of residents of the district 9, who were not included in one of the three categories of owners, developers and intermediaries; experts and specialists included the experts of the municipality of the region, the Agricultural Jihad Organization and the Organization for the Environmental Protection. Finally, the developers, who have not been specifically identified, have been chosen from the residents in the receiving area and the buyers in the region.

Table 3: Results from T-test

Developers' Questionnaire

90% confidence interval		Difference of average	Level of significance	Degree of freedom	t-statistics	Item
High degree	Low degree					
1.97	1.75	1.860	0.000	49	29.08	Significance of horticultural protection
-1.71	-1.97	-1.840	0.000	49	-23.73	Familiarization with the legal remedies for protecting horticultural lands
1.01	0.51	0.760	0.000	49	5.161	The tendency to protect the horticultural and agricultural land
-0.71	-1.25	-0.980	0.000	49	-6.11	The tendency to buy the agricultural and agricultural land in order to change their use
-0.77	-1.19	-0.980	0.000	49	-7.76	The tendency to participate in workshops
-0.34	-0.78	-0.560	0.000	49	-4.36	The tendency to cooperate with the municipality
-0.40	-0.92	-0.660	0.000	49	-4.31	tendency to cooperate with the agencies
1.59	1.17	1.380	0.000	49	11.13	Tendency to cooperate with banks
1.19	0.73	0.960	0.000	49	6.86	Participation in the conservation plan in case of tax exemption
1.62	1.14	1.380	0.000	49	49.+	Participation in the conservation plan in case of receiving over-accumulation points
1.54	1.10	1.320	0.000	49	9.97	Participation in the conservation plan in case of gaining a higher level of occupancy

People's Questionnaire

90% confidence interval		Difference of average	Level of significance	Degree of freedom	t-statistics	Item
High degree	Low degree					
1.91	1.99	1.948	0.000	95	85.44	Significance of horticultural protection
0.63	0.98	0.802	0.000	95	7.613	Mutual trust
1.25 -	0.85 -	1.052 -	0.000	95	-8.656	Financial contribution
1.06 -	0.67 -	0.865 -	0.000	95	-7.263	Contributing to the cost of water
0.91 -	0.52 -	0.719 -	0.000	95	-6.129	Physical contribution
0.76 -	0.30 -	0.531 -	0.000	95	-3.782	Participation in workshops
0.13	0.64	0.385	0.000	95	2.489	Agreement with the TDR mechanism
1.51 -	1.24 -	1.375 -	0.000	95	16.61 -0	Trusting the municipality
0.37	0.82	0.594	0.000	95	4.360	Trusting the owners of the gardens
1.50 -	1.16 -	1.333 -	0.000	95	12.90 -6	Trusting the regulations
0.72	1.18	0.948	0.000	95	6.771	Agree to increase the density in case of providing the infrastructures

Owners' questionnaire

90% reliability interval		Difference of average	Level of significance	Degree of freedom	t-statistics	Item
High degree	Low degree					
2.01	1.97	1.989	0.000	88	177.000	Significance of horticultural protection
-1.64	-1.84	-1.742	0.000	88	-28.593	Familiarization with legal and official strategies
0.66	0.24	0.449	0.001	88	3.488	Tendency to protect the agricultural and horticultural lands
0.17	-0.26	-0.045	0.724	88	-0.355	tendency to attend workshops
1.51	1.14	1.326	0.000	88	12.131	tendency to protect in case of having a solution and cost recovery
0.26	-0.15	0.056	0.644	88	0.464	ability to protect the horticultural and agricultural land in the present situation
-1.16	-1.47	-1.315	0.000	88	-14.193	Trusting the municipality for protection
1.23	0.88	1.056	0.000	88	9.924	Trusting the banks for protection
-1.65	-1.85	-1.753	0.000	88	-29.025	Trusting the agencies for protection
1.03	0.68	0.854	0.000	88	8.006	tendency to protect in the absence of the construction by others
0.59	0.17	0.382	0.004	88	3.000	Financial ability to protect
2.01	1.90	1.955	0.000	88	61.871	tendency to protect in case of gaining a reasonable profit
1.69	1.39	1.539	0.000	88	17.014	tendency to protect in case of over-accumulation
0.82	0.37	0.596	0.000	88	4.400	tendency to protect in case of tax exemption
0.13	-0.26	-0.067	0.570	88	-0.570	tendency to protect in case of receiving loans
-0.92	-1.32	-1.124	0.000	88	-9.328	tendency to protect in case of receiving money from government
0.88	0.40	0.640	0.000	88	4.474	tendency to protect in case of receiving a permission to convert to other uses
0.41	-0.10	0.157	0.310	88	1.021	tendency to protect in case of obtaining permission to convert to livestock and greenhouse
1.96	1.82	1.888	0.000	88	43.312	tendency to protect in case of providing the needed amount of water
0.82	0.58	0.697	0.000	88	9.651	tendency to protect in case of receiving support from the Agricultural Jihad Organization and the Municipality

Experts' questionnaire

90% reliability interval		Difference of average	Level of significance	Degree of freedom	t-statistics	Item
High degree	Low degree					
2.02	1.91	1.967	0.000	29	59.000	Significance of horticultural protection
-0.91	-1.43	-1.167	0.000	29	-7.663	Familiarization with TDR
-0.30	-0.70	-0.500	0.000	29	-4.349	ability of the municipality to educate and inform
0.93	0.40	0.667	0.000	29	4.325	tendency to attend workshops to get acquainted
1.06	0.67	0.867	0.000	29	7.549	Tendency to participate in workshops in case of gaining a higher level of occupancy
0.96	0.37	0.667	0.001	29	3.808	Tendency of the municipality to protect the agricultural and horticultural lands
-0.29	-0.91	-0.600	0.003	29	-3.275	Tendency of the municipality to implement TDR approach
-0.99	-1.61	-1.300	0.000	29	-7.208	Presence of expert staff
-0.82	-1.31	-1.067	0.000	29	-7.443	Proper relationship of the municipality with other organization
-0.44	-0.96	-0.700	0.000	29	-4.583	Inter-organizational integrity in the municipality
0.90	0.37	0.633	0.000	29	4.080	Ability to provide quick and easy access to information
2.02	1.91	-0.133	0.502	29	-0.680	Access to sufficient funds
-0.91	-1.43	-0.567	0.001	29	-3.798	Having legal authority
-0.30	-0.70	1.000	0.000	29	8.515	The ability to provide infrastructure and public services

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The next step was to identify the barriers and institutional requirements for the realization of TDR in district 9 and prioritize them. First, using the T-test, the institutional barriers to the realization of TDR were investigated in District 9 of Isfahan Municipality. Based on the results obtained (as seen in the tables showing the results of the T-test below), the institutional barriers in each of the four groups of institutions involved in the realization of TDR were obtained from the following table.

Table 4: The institutional barriers to the realization of TDR policy in Isfahan, district 9

Indicators	Institutional barriers (items)	Effective actors in the realization of TDR
Economic incentives	Unwillingness to protect in case of receiving money from government	Owners
	Unwillingness to protect in case of receiving loans	
Mutual trust	lack of trust in agencies to conduct transactions	
	lack of trust in municipality to conduct transactions	
knowledge	Non-familiarization with TDR	
Contribution	Unwillingness to attend the TDR workshops	
Mutual trust	lack of trust in agencies to conduct transactions	Developers
	lack of trust in municipality to conduct transactions	
Knowledge	Non-familiarization with TDR	
Contribution	Unwillingness to attend the TDR workshops	
Legal grounds	not-having the required authority	Intermediaries for transactions (municipality)
Internal and inter-organizational integrity	Lack of internal integrity	
	Lack of proper relationships between the municipality and other organizations	
Expert staff	Lack of sufficient expert staff	
Specific path and vision	Unwillingness of the municipality to implement TDR	
Education	Inability of the municipality to educate	
Knowledge	Non-familiarization with TDR mechanism	
Mutual trust	Lack of trust in municipality to protect	People
Contribution	Unwillingness to attend the TDR workshops	
	Unwillingness to contribute financially	
	Unwillingness to contribute in providing water	
	Unwillingness to contribute physically	
Transparent laws	Non-transparent laws	

Source: researchers

In the next step, using a multivariable regression method, we measured the relationship between variables and determining institutional requirements in each of the actors involved in the realization of TDR. First, in order to assess the regression significance, the coefficient of correlation between variables was measured in each group. Based on the results of the statistical summary of the regression model of each questionnaire (as described in the table below), there is a strong correlation between independent and dependent variables in the questionnaire of each of the actors and as a result, the use of regression is significant.

Table 5: of Factors Affecting TDR in the Questionnaire of the Four Groups as the Institutions Involved in the Realization of TDR

Developers	Owners	Experts and specialists	People	Questionnaire for each of the groups of actors
0.889	0.901	0.792	0.969	Correlation Coefficient

The results of the multivariate linear regression test are shown in the following tables. Based on the results, the requirements for the realization of TDR in each group of actors in District 9 of Isfahan are represented in Table 6. One of the main objectives of this research is to prioritize and determine the most effective dimensions identified in the concept of TDR in a sample of studies so that it could be possible to compare the severity of the impact caused by these dimensions with respect to the standard regression coefficients (Beta). Regarding the Beta coefficients, providing the social context in district 9 is the most important factor in the realization of TDR in the region. Then stands the economic capacity (which here is merely the infrastructure capacity assessed in the questionnaire) as the TDR pre-requisites in this region.

According to the experts and specialists of District 9, the existence of a legal framework is one of the most important requirements for the realization of the TDR mechanism, and in the present circumstances, due to the lack of legal authority, the municipality has no ability to take any protective measures. Also, with regard to Beta, individual capacity is the most important in realizing the TDR among owners. According to interviews and statements by owners of the horticultural and agricultural lands, the most important reason for protection is their personal motivation and commitment, while they have stated that although economic motivation is important to them, but more important is their personal desire.

Table 6: Multivariate linear regression test results

Experts' questionnaire

t-statistics	Level of significance	Standard coefficients	Non-standard coefficients		Model	
		Beta	Standard error	B		
0.807	-0.247		0.814	-0.201	Constant value	1
0.148	1.906	0.258	0.087	0.130	Individual capacity	
0.108	1.671	0.228	0.092	0.154	Social capacity	
0.051	2.055	0.283	0.086	0.177	Organizational capacity	
0.027	2.362	0.409	0.094	0.221	Legal capacity	
0.069	1.906	0.273	0.194	0.370	Economic capacity	

People's questionnaire

t-statistics	Level of significance	Standard coefficients	Non-standard coefficients		Model	
		Beta	Standard error	B		
0.005	2.871		0.552	1.585	Constant value	1
0.567	-0.575	-0.018	0.119	-0.068	Individual capacity	
0.000	0.000	0.721	0.067	0.522	Social capacity	
0.459	0.459	-0.043	0.049	-0.036	Legal capacity	
0.000	0.000	0.323	0.041	0.203	Economic capacity	

Developers' questionnaire

t-statistics	Level of significance	Standard coefficients	Non-standard coefficients		Model	
		Beta	Standard error	B		
0.000	-5.446		0.814	-4.435	Constant value	1
0.000	5.309	0.387	0.134	0.712	Individual capacity	
0.000	4.896	0.334	0.173	0.849	Social capacity	
0.000	12.748	0.933	0.057	0.726	Economic capacity	

Owners' questionnaire

t-statistics	Level of significance	Standard coefficients	Non-standard coefficients		Model	
		Beta	Standard error	B		
0.387	-0.870		0.258	-0.225	Constant value	1
0.000	13.766	0.739	0.053	0.731	Individual capacity	
0.000	4.348	0.233	0.048	0.210	Social capacity	
0.025	2.279	0.109	0.060	0.138	Economic capacity	

Table 7: effective factors on the realization of TDR in each group of actors

Factors	Effective actors in realization of TDR
social capacity, economic capacity	People
legal capacity, organizational capacity, economic capacity	Experts and specialists
personal capacity, social capacity, economic capacity	Owners
Personal capacity, social capacity, economic capacity	Developers

Source: researchers

In the final step, using the Friedman test, indicators and the items for institutional capacities that have been effective in implementing the TDR mechanism in the region (based on the multivariate linear regression test) were ranked aiming to prioritize the strategies through the QSPM analysis based on which it will be possible to take the steps required to provide an appropriate institutional framework for the implementation of the TDR approach in Isfahan, district 9.

In the final step, based on the reviewed theoretical and empirical functions, interviews with the authorities and the results of the questionnaires (see Chart 3), along with the use of SWOT analytical matrix, the optimal strategies for removing institutional barriers and providing a solid institutional framework for realizing TDR policy in district 9 were identified. Then, using Quantitative Planning of Strategic Matrix (QPSM), these strategies were prioritized.

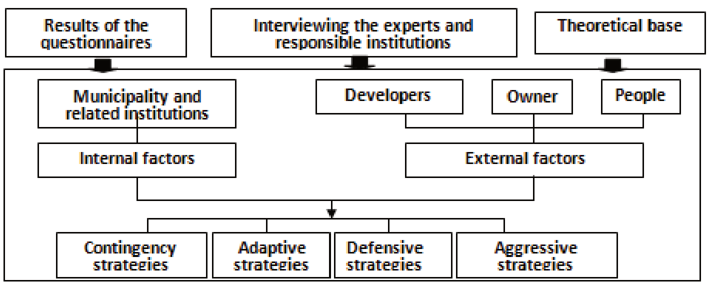

Figure 3: The process of compilation the strategies

Finally, the collected and prioritized strategies were categorized based on each group of actors in order to provide an appropriate institutional framework for the implementation of TDR policy in Isfahan, district 9 as proposed in Table 9. In formulating strategies, urban management is considered as the intermediary of transactions and the internal factor responsible for leading the actions, while other involved entities (people, owners and developers) are considered as external factors.

7 CONCLUSION

According to the studies carried out on theoretical foundations, domestic and foreign experiences and researches, the implementation of TDR policy in any region requires the some institutional bases and capacities in order to achieve its goals. As shown in Chart 2 (conceptual framework of research), some capacities such as individual, social, organizational, economic and legal capacities are among the

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prerequisites for the success of the TDR policy. Therefore, due to capacity gaps (institutional barriers) and efforts to eliminate them on the one hand, and strengthening the existing capacities, especially those that have the greatest impact on the realization of the TDR mechanism in the studied area, on the other hand, provided a solid institutional foundation in the region.

Table 9: SWOT Analysis Strategies for Implementation of TDR Policy in Isfahan, district 9

prioritization	Strategy
Proritization of strategies (external factor: owners)	
1	Creating added value for the gardens through the granting of permits for conversion to compatible uses such as livestock and greenhouses, or the garden of catering and teahouse (with temporary structures) for the profitability of the garden for conservation
2	Cooperating with Agricultural Jihad Organization and Environmental Protection Organizations to carry out land reform and assist in setting up irrigation methods .
3	Using the Planning Team to introduce and teach the TDR mechanism
4	Forming the Ownership Leading Committee to Build Trust and Motivation between Owners
5	Holding workshops for staff members of the TDR implementation group (planners, bank staff, executives, etc.) in coherence as well as the transparency of workshops for other stakeholders in order to win trust.
6	Creating an Internet website to inform about actions and build trust among beneficiary organizations
7	Allocating part of the people's development expense (renovation costs, construction costs, etc.) to the establishment and launch of the TDR Bank
8	Establishing TDR bank affiliated with the Shahr Bank for conducting transactions
9	Gaining taxes from tourism and recreational uses created in gardens after TDR (sustainable source of revenue for the municipality)
Prioritization of strategies (external factor: developers)	
1	Prohibition of accumulated sales outside the TDR plan
2	Creating a Leadership Committee for the developers in order to Build Trust and Motivation Between Developers and the Municipality
3	Establishing TDR bank affiliated with the Shahr Bank for conducting transactions
4	Allocating part of the people's development expense (renovation costs, construction costs, etc.) to the establishment and launch of the TDR Bank
5	Creating incentives for investors through the creation of specific uses in receiving areas
6	Increasing the cost of providing services and urban infrastructure in areas other than receiving areas
7	Involvement of urban management in the construction and operation of residential and commercial projects in the receiving areas while monetizing for the municipality
8	Using the Planning Team to introduce and teach the TDR mechanism and its functions
9	Creating an Internet website to inform about actions and build trust among beneficiary organizations
Prioritization of strategies (external factor: people)	
1	Formaing NGOs focusing on the protection of horticultural lands
2	Providing required infrastructure as well as the transparency of measures and work processes through the municipality's website and holding meetings
3	Utilizing the intellectual participation of people and other stakeholders (the TDR planning Committee, consisting of representatives of owners, developers, people and environmental organizations) in selecting scenarios developed by the planning group
4	Allocating part of the people's development expense (renovation costs, construction costs, etc.) to the establishment and launch of the TDR Bank
5	Making sustainable urban revenues by paying tax on clean air for residents of the horticultural area

Based on the studies carried out, the measures taken so far along with the conducted plans and projects have not been able to protect the horticultural and agricultural lands of the region; hence, in order to achieve this, a new approach has to be taken. Studies have shown that the TDR mechanism, based on the market and the balance between the interests of all groups, could be effective for protecting the horticultural and agricultural lands in the region. Based on the remarks made by the four groups involved in the TDR implementation and the collected questionnaires, all stakeholders are aware of the importance of protecting horticultural and agricultural lands, and each one, if interested, would like to protect these valuable properties. However, despite the acknowledged tendency of the municipality to protect these lands, due to the lack of sustainable income, familiarity with this approach as well as the knowledge about its advantages, it considers the implementation of this mechanism as an obstacle to the achievement of its interests damping its willingness to implement this mechanism.

Studies also suggest that no capacity building has been done to implement this approach in district 9, and its implementation, given the existence of institutional barriers, requires a long-term and targeted program while its success depends on the establishment and provision of institutional infrastructures prior to the implementation of TDR programs. In order to achieve this, the need for education is felt among all stakeholders. The municipality as well as the implementer of this policy should take responsibility for the establishment and take the necessary measures based on the developed strategies.

8 REFERENCES

Ardestani, Zahra Sadat (2008). Investigating Mechanisms for Improving the Improvement and Modernization Processes of Urban Context Using the TDR Approach (Case Study: Sirous District). Master's Thesis. Tarbiat Modares University. Tehran.

Rafiyan, Mojtaba. Saeidi Rezvani, Naveed. Mohsian, Zohreh (2001). Feasibility of Measuring Environmental Conservation of Traditional Gardens in Qazvin using TDR. First Conference on Urban Economics of Iran.

Zare, Arezou (2014). Capacitance Measurement of the TDR Method in Realization of Urban Development Plans (Case Study: Qasr-Al-Dasht Gardens of Shiraz). Master's Thesis. Shahid Beheshti University. Tehran.

Zare, Mohammad, 2005, Use of the TDR for Sustainable Urban Regeneration, National Symposium on Architecture and Urban Development of Iran, Yazd, Architectural and Urban Design Institute of Safiran Mehrazi, Yazd University of Science and Technology.

Detailed Review Plan of Isfahan, Districts 2, 9 and 11. (2003). Consulting Engineers and Architects of Saravand.

The Sustainable Development Plan of the City of Isfahan (2009) Jahan Pars Consulting Engineers

Azizi, Mohammad Mehdi. Shahab, Sina. (2012) Application of the TDR as an Implementation Mechanism for Urban Development Plans (Case Study: Kashan City). Quarterly Journal of Urban Studies. 41-54.

Farsi Farashandi, Hamid Reza. Azadeh, Seyed Reza, Malekian Behabadi, Mojtaba (2017). Feasibility Study on the TDR Implementation to Provide Lands for Urban Services in Shiraz. Quarterly Journal of Urban Studies. 3-14.

Faraji Rad, Khedr. Kazemian, Gholamreza (2012). Local and Regional Development Through Institutional Approach. Jahad University Press. First Edition.

Mohebbi, Mahyar, Zaker Haghighi, Kianoush (2015). The Application of the TDR Program in Order to Protect the Agricultural Lands in Tonekabon. Quarterly Journal of Regional Planning, 139-202.

Mohsenzadeh, Sina. (2010). The Feasibility of Using the TDR Model in Order to Protect the Agricultural Lands and Farms in the Urban District of Babolsar. Tarbiat Modares University. Tehran.

Mohammadi Balini, Zahra (2014). Planning of Sari Urban Area Based on Regional Institutionalization. Master's Thesis. Shahid Beheshti University. Tehran.

Mohammadi, Mahmoud. Shahiwandi, Ahmad. Moradi, Dariush. Moinpour, Samaneh (2017). Evaluation of the Implementation of the TDR Mechanism in Various Dimensions. Third Annual International Civil, Architectural and Urban Development Conference. 49-55.

Mozaffaripour, Najmeh. Soltani, Samaneh (2014). Efficient Management of Urban Lands with a Systemic Attitude Towards TDR Relying on Global Experiences. Quarterly Journal of Urban Management Studies. 16-33

Nedaee Tousi, Sahar. Bagheri, Bagher (2017). Explaining the Dispersion Phenomenon in Metropolitan Regions (Case Study: Shiraz Metropolitan Area). Geography and Development Quarterly. 185-212.

Beautiful Isfahan, 2017. Land Use Change as the Most Important Demand of Citizens. No. 2938.

Bratton, N., Eckert, J., Fox, N., & Conservancy, C. L.(2008). Alternative Transfer of Development Rights(TDR) Transaction Mechanisms.

Center For Sustainable Development(CFSD).(2015). Evaluation of Transfer of Development Rights(TDR) Scheme in BBMP. Study Conducted for Karnataka Evaluation Authority and Bruhat Bangalore Mahanagara Palike(BBMP) and Urban Development Ministry, Government of Karnataka.

Chan, E. H., & Hou, J.(2015). Developing a framework to appraise the critical success factors of transfer development rights(TDRs) for built heritage conservation. Habitat International, 46, 35-43

Cowan, R.(2005). The dictionary of urbanism. Streetwise press.

European Commission.(2005). institutional Assessment and Capacity Development Why, What and How?. Reference document No 1.

Evans, B., Joas, M., Sundback, S., & Theobald, K.(2013). Governing sustainable cities. Taylor & Francis.

Fulton, W., Mazurek, J., Pruetz, R., & Williamson, C.(2004). TDRs and other market-based land mechanisms: How they work and their role in shaping metropolitan growth. Washington, DC: The Brookings Institution.

Greenaway, G., & Good, K.(2008). Transfer of Development Credits in Alberta: A Feasibility Review.

https://www.ifad.org/documents/10180/fbeb4aad-a617-4de8-9f7f-502ca9ca9fc5.

https://www.smartgrowthamerica.org/app/legacy/documents/transfer-development-rightspolicy toolkit.pdf.

Huang, T.(2011). Research on Sinicized Transferrable Development Right(TDR) Inspired by TDR Programs in the United States(Doctoral dissertation, University of Florida).

IFAD(The International Fund for Agricultural Development). Understanding the institutional context.

Kaplowitz, M. D., Machemer, P., & Pruetz, R.(2008). Planners’ experiences in managing growth using transferable development rights(TDR) in the United States. Land Use Policy, 25(3), 378-387.

Keizer, P.(2008). The concept of institution: Context and meaning(No. 08-22).

Linkous, E. R.(2016). Transfer of development rights in theory and practice: The restructuring of TDR to incentivize development. Land Use Policy, 51, 162-171.

Messer, K. D.(2007). Transferable development rights programs: An economic framework for success. Journal of Conservation Planning, 3(47), 47-56.

Mitchell, B.(1995). Institutional obstacles to sustainable development in Bali, Indonesia. Singapore Journal of Tropical Geography, 15(2), 145-156.

Nelson, A. C., Pruetz, R., & Woodruff, D.(2013). The TDR handbook: Designing and implementing transfer of development rights programs. Island Press.

Otto, Katharine.(2010). Smart Growth through the Transfer of Development Rights(A selection of TDR case studies with relevance for the preservation of farmland, open space and other natural resources in New Jersey.

Pruetz, R.(2003). Beyond Takings and Givings: Saving Natural Areas, Farmland and Historic Landmarks with Transfer of Development Rights and Density Transfer Charges(Arjepress, Burbank, CA).

Robin, C., & Stephen, D.(2004). Institutional Change for Sustainable Development. Journal of Environmental Law, 17(3), 458-460.

Robins, L.(2008). Perspectives on capacity building to guide policy and program development and delivery. environmental science & policy, 11(8), 687-701.

Smart Growth American(SGA).Transfer of development Right.

Taintor, R.(2001). Transfer of Development Rights: South County Watersheds Technical Planning Assistance Project.

Tavares, A. F.(2005). Can the market be used to preserve land? the case for transfer of development rights.

Triedman, L., Caldwell, C., Sangree, E., & McCauley, M.(2014). A Study of the Feasibility of a Transfer of Development Rights Program in Lewiston, Maine.

van de Meene, S.(2008). Institutional capacity attributes of sustainable urban water management: the case of Sydney, Australia. In 11th International Conference on Urban Drainage, Edinburgh, Scotland.

Walls, M., & McConnell, V.(2007). Transfer of development rights in US communities. Washington DC, Resources for the Future.

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The Challenging Path to a Redistribution of Space – Renegotiating Urban Mobility

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1 ABSTRACT

The (rapid) growth of cities and city populations in many regions of the world puts a focus on the question of accessibility (use and distribution) of urban space. In consequence, the long-prevailing hegemony of the principle of car-friendly cities is being challenged, and political as well as societal mindsets towards individually possessed cars seem to be changing. Nonetheless, more sustainable forms of mobility will need different legal and economic frameworks, and will need to be more demand-orientated and smarter in order to become a real alternative.

From a technological perspective, new regulations on the reduction of (CO_2), NO_x and particulate matter have been passed by the European Parliament in 2015, while smart forms of mobility such as carsharing, e-mobility, and automated driving are being supported and subsidized by local and national governments. Both, regulations and incentives from the market are pushing companies to innovate.

From a socio-political perspective, the (re-)distribution of the increasingly scarce resource urban space and the manner of its utilization is a challenge which affects all population groups, but in different ways. Questions arising in this context are: How to actually initiate a process of transformation towards a more sustainable urban mobility? What future quality(s) of life will we have in demographically changing societies and which forms of mobility are more adequate to future needs than individual possession of cars?

This is exactly where our transdisciplinary project in Berlin/Germany takes off: place-based approaches promoting more sustainable forms of local mobility are being combined with iterative bottom-up approaches of discussion, information and playful testing of new forms of mobility for civil society, stakeholders, administrators and politicians. One and a half year into the project, it becomes obvious that urban mobility is a highly contested and emotionalized topic where fear of loss (of the individually possessed car and its parking space) clashes with misinformation, non-reflection of individual mobility behavior and demand, and different esthetic preferences on how public space should be designed.

This contribution presents intermediary results from a research project in Berlin/ Germany (http://neue-mobilitaet.berlin/) where local actors together with administrators, politicians, mobility providers and researchers are about to develop and test adequate strategies towards more sustainable local mobility. These intermediary results can be summarized as follows: 1) In order to develop a truly different, and less emotional approach to (sustainable) mobility, intensive communication with different groups and across these groups is necessary. 2) Smartness in the mobility sector is not merely the introduction of innovative technology-based solutions but needs to be understood as a process of multilateral information, discussion, and exchange.

Keywords: communication, urban space, quality of life, mobility, sustainability

2 INTRODUCTION

Cities are growing in many regions of the world. Such urbanization processes affect infrastructures and city populations in many ways (WBGU 2016) and sometimes even provoke protests. Similar in Germany - where urban mobility and transportation is one contested topic among many. But the long-prevailing hegemony of the principle of car-friendly cities has been challenged recently. Discussions on health effects, air quality, traffic jams and last not least the quality of life in a city support the idea of more sustainable forms of mobility. In addition, political as well as societal mindsets towards individually possessed cars seem to be changing.

Nonetheless, more sustainable forms of mobility will need different legal and economic frameworks, and will need to be more demand-orientated and smarter in order to become a real alternative. Although especially the younger urban generation attributes less positional value to car-ownership, the numbers of individually possessed cars in Germany is growing (UBA 2017).

This puts a focus on the question of accessibility (use and distribution) of urban space. Moreover, public life, space and mobility need to be organized differently to manifest a more equitable city for all participants. And planning standards need to be redefined to keep up with future needs.

Our contribution presents intermediary results from a research project in Berlin/ Germany (http://neue-mobilitaet.berlin/) where local actors together with administrators, politicians, mobility providers and researchers are about to develop and test adequate strategies towards more sustainable local mobility.

3 URBAN SPACE IN TRANSFORMATION

Modern Cities in the Western World were designed as "automotive cities" (Gilbert and Perl 2008) where (further) development of transport infrastructure focussed on motorized individual traffic while neglecting non-motorized transport and public transportation (Gössling 2016). In addition, the individually possessed car had been considered a status symbol (Müggenburg 2016) and became an almost self-evident part of people's lives since the 1950s. While individually possessed cars may often be a necessary feature in rural areas, in cities, and even more so in growing cities and neighborhoods, the increase in (individual, motorized) traffic causes a multitude of problems. For one, there are risks for health and quality of life: Accidents risks, distress, noise, smell– and CO2 emissions as well as particulate matter (Gössling 2016). For another, the hegemony of modernism had major spatial consequences. Urban space had been designed in many cities for moving and parking cars and for individual motorized transport (Gehl 2011; Rammler 2008).

But the need for transformation towards more sustainable mobility is becoming more urgent; it already provoked some changes in political and societal mindsets as many projects on local sustainable mobility are to be found all over the world.[1] Beyond necessary changes in mindsets, more sustainable forms of mobility will need different and adequate legal and economic frameworks, and will need to be more demand-orientated and smarter in order to become a real alternative.

The transformation of a whole mobility system is difficult to achieve though as it is a complex, long-term and resourceful process (Krellenberg 2016). Furthermore, a complete re-thinking of objectives, processes and structures will be required as incremental changes within an established socio-technical system, such as the mobility system, are obviously not sufficient in order to cope with exisiting and future challenges (Markard et al. 2012). What is needed are radical, large-scale and integrated approaches, which go well beyond traditional policy approaches (van den Bergh et al. 2011).

In a growing city as well as in districts with growing population changing demands for urban space as well as increasing demands for mobility can be identified. Both are challenging existing patterns of space consumption and can only be dealt with adequately if basic conditions are questioned.

4 THE PROJECT

Although one might agree that radical changes in urban mobility frameworks are overdue, there is not sufficient knowledge yet in order to come up with integrated, feasible strategies. According to literature on planning and sustainability, the local level is the most promising level to start with as political and economic actors tend to be more open towards experiments, individual engagement can more easily be related to local problems, experiences and solutions (self-efficacy), and (intermediary) results and progress can be perceived more easily (Kemmerzell 2017). This is even more important as a profound transformation towards more sustainable mobility needs to be embedded in and related to civil society.

In consequence, the project "New Mobility Berlin"[2] implements an experimental, demand-oriented and bottom up approach, working with different local actors. The project started in May 2016 with the idea to start discussions on future uses of urban space, and to consequently develop different feasible ideas for local sustainable mobility. The team decided to start with this approach in two neighborhoods where existing local mobility networks could be considered as a promising basis to get into contact with citizens in the district.

In order to facilitate a transformation process towards more sustainable mobility, place-based approaches promoting more sustainable forms of local and smart mobility are being combined with iterative bottom-up

[1] The German Federal Ministry for Education and Research as well as the European Union support such approaches, and, for example, Chinese state policies seem to be developing in this direction, too.

[2] http://neue-mobilitaet.berlin/?lang=en

approaches of public information and discussion, of personal communication, of playful testing and networking for civil society, stakeholders, administrators and politicians. The idea is to change behavior not with radical changes of the framework, but demand-orientated, raising consciousness for and provision of alternatives. At the same time, the question arose on how to use public space in the future if people actually will change their mindsets, abolish their car, and vacate parking lots in order to increase individual or collective quality of life.

To follow these aims, the project's core team was assembled of stakeholders from each neighborhood, science, private business, and local administration. And it combines knowledge from different perspectives: local expertise and networks, scientific competences, expertise with participatory processes, political experience, and administrative knowledge.

4.1 The neighborhood

One of the two neighborhoods where the project started is Mierendorff-INSEL.[3] It is located in Charlottenburg-Wilmersdorf district, in the northwestern center of Berlin. Roughly two thirds of the neighborhood consist of residential area, with only few retail business, cultural institutions and restaurants. The other third is occupied by allotment gardens and a wholesale market. ain parts of the neighborhood were built one century ago when Berlin already experienced a period of fast growth. Their traditional block perimeter development with its typical Berlin backyards allowed for a high population density. Some smaller parts were rebuilt during the 1950s and 1960s with linear structures alongside the streets and less density. One major, heavily used thoroughfare (airport resp. motorway towards the inner city) produces a large part of local emissions (particulate matter (PM) and nitrogen oxide (NO_2) as well as noise which exceeds existing reference points significantly (Grobcheck zum Stadtumbau Mierendorff-INSEL 2017: 19). This problem is already being targeted in the 2008 noise reduction plan (Lärmminderungsplan).

4.2 Pressure on urban space in a growing neighborhood

While population in Berlin has been growing with a total of approximately 10 percent within the last six years (Amt für Statistik Berlin Brandenburg 2018), Mierendorff-INSEL neighborhood only recently became more popular and additional housing, educational and recreational infrastructure, public space and playgrounds are needed (Grobcheck zum Stadtumbau Mierendorff-INSEL 2017). In consequence, it became more populated and the number of cars grew too. This increases the pressure on urban space in general as well as on parking space.

As part of the project, a study on individual mobility patterns and satisfaction with the parking situation, public spaces etc. was carried out in 2016by Karlsruhe Institute of Technology (KIT). Figure 1 shows the number of respondents and their degree of satisfaction with car parking (not satisfied on the left, very satisfied on the right) depending on how often they use a car (daily, 3-4 times a week, … , never). The second figure shows the satisfaction of cyclist (not satisfied on the left, very satisfied on the right) depending on how often they use a bike (daily, 3-4 times a week, … , never).

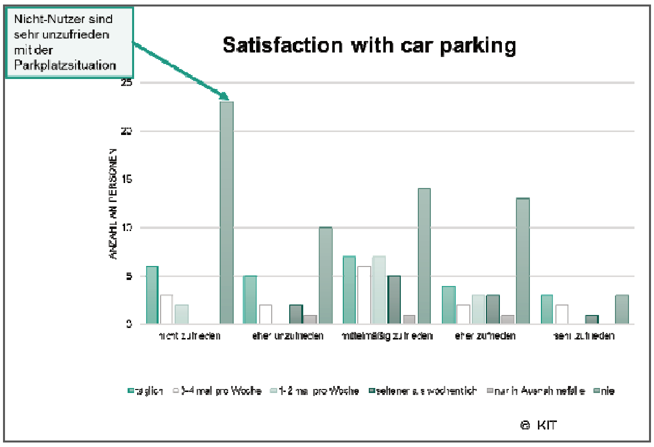

Fig. 1: Satisfaction with car parking in Mierendorff-Insel neighborhood (n = 150).

[3] The second neighborhood, Klausenerplatz Kiez, will not be dealt with in this article.

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Results show that both car owners and especially people who never use cars are considerably unsatisfied with the car parking situation (out of 25 car owners 6 are not satisfied and 5 are rather dissatisfied while out of 63 people never using a car 23 are not satisfied and 10 are rather dissatisfied.

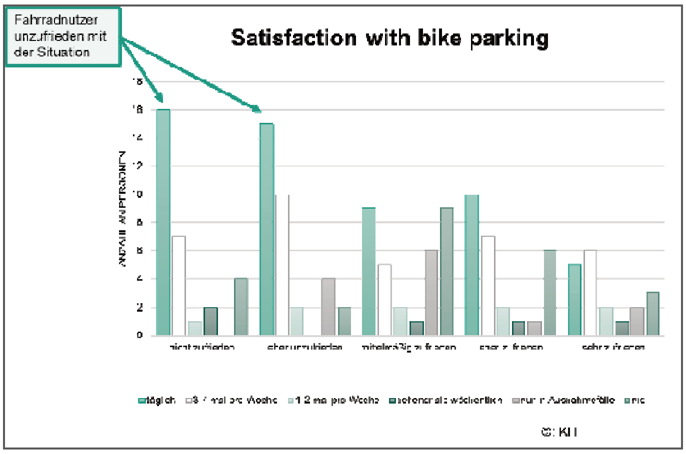

Fig. 2: Satisfaction with bike parking in Mierendorff-Insel neighborhood (n = 150).

Similarly, people riding their bikes every day are mostly not satisfied with the parking options for bikes (figure 2).

Satisfaction with public space in the neighborhood was also part of the interview. In figure 3 the bars show the percentage or respondents not satisfied (left) and very satisfied (right). Obviously, most residents consider their satisfaction with public space as average with room for improvement (figure 3).

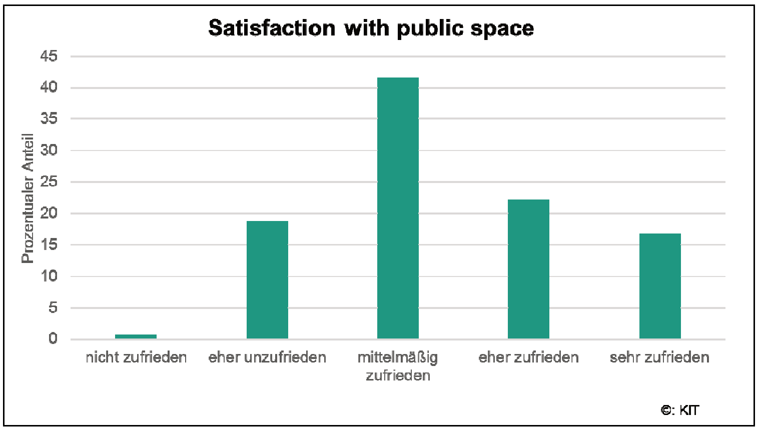

Fig. 3: Satisfaction with public space in Mierendorff-Insel neighborhood (n = 150).

4.3 Approach

These results were the basis to start public discussions on future uses of urban space and local quality of life. The vision of the project team is to improve quality of life through the demand-oriented advancement of jointly developed local sustainable mobility solutions. This results in several objectives: 1) Holistic approach to transformation to sustainability, 2) Systematic inclusion of locals & local initiatives from the start, and 3) Keeping and improving quality of life from a demand orientated perspective, considering the needs of local citizens. This will be implemented with a variety of measures such as:

(1) Reduction of urban space needed for driving and parking as well as reduction of mobility related emissions by changing the modal split and reduction of individual car ownership

(2) Conversion of parking space into public space which can be used in different ways and increases local quality of life in the neighborhood

(3) Facilitating sustainable mobility in the neighborhood by raising the visibility of available options and expanding mobility opportunities, such as car and bike sharing, renting out cargobikes etc.

4.4 First steps

First insights into local mobility demands were – as mentioned – collected through a survey on individual mobility behavior and preferences. When browsing the answers, the idea emerged to give people the opportunity to experience living without their car for two weeks. In addition, different activities focussing on the topic of mobility (information and discussions, offering e-scooters, bike and car sharing) were offered (this approach has been nick-named 'mobility days' in the project team): An agreement with the local authorities allowed us to use six parking lots for such activities – with the precondition that the project team is able to convince six car owners to not use their cars for two weeks.[4] Which happened. In consequence, we started a discussion process with locals on how to use this 'free' urban space in a different way. As a result, a 'Bring-your-own-Cushion' lounge was built from pallets by a local artist. This form of parklet was used to rise the awareness of how much space is needed for parking and how it could be used alternatively.

Fig. 4: Activities in the 'Bring-your-own-Cushion'-lounge during the 'Mobility Weeks'.

During all the testing and discussing, it became obvious that a large part of the population was either unaware of more sustainable alternatives to driving a car or was reluctant to switch to more innovative solutions such as car and bike sharing and different forms of e-mobility. This observation has been reinforced after the 'mobility days' when we organized three workshops with participants of the survey. The aim of these workshops was to find out under which conditions people would be willing to give up their car for a certain period of time or permanently. This information, in the following, should help to create an attractive mix of different mobility options within the neighborhood to convince people (not only those in the workshops) to decide against their individual car. In order to identify local challenges of sustainable mobility, a district-wide conference was organized. By now, there seems to be a growing network of individuals, public and private organizations supporting the idea of different future uses of urban space and more demand-orientated sustainable mobility. In addition, our activities were accompanied by two filmteams to present local 'car-abolishers' on their journey towards a car-free future and to show potential effects of our approach to a broader public (https://www.youtube.com/watch?v=FCJrFpnnK3g&feature=youtu.be & https://www.youtube.com/channel/UC6wECBORM0ifAeEoo1uCCCg). Local, and quite recently, national press and television, seems to become interested too.

5 DISCUSSION

One and a half year into the project, it becomes obvious that urban mobility is a highly contested and emotionalized topic where fear of loss (of the individually possessed car and it's parking space) clashes with misinformation, non-reflection of individual mobility behaviour and demand, as well as different esthetic preferences on how public space should be designed.

The first suggestion regarding a successful transformation towards more sustainable mobility and use of urban spaces therefore, would be to establish multilateral communication: Such communication helps to better understand each others demands as seemingly only few people do actively reflect their everyday mobility, and even less individual mobility demands of their fellow citizens. It also helped to initiate and facilitate interaction across actor groups, resulting in this case in a growing local network and activities of

[4] The cars were safely parked in a different Berlin district during this period.

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different kinds. In addition, intensive, personal communication is necessary and fruitful too - as the team experienced some strong opposition against the project in public discussions and individual dialogues over various topics (e.g. local quality of life, everyday mobility, alternative uses of urban space). After several hour-long exchanges with both residents and politicians, common grounds could in many cases be identified. It certainly helped when trying to de-emotionalize discourses on mobility that the project team consisted of science, mobility provider, local initiative and local administration. In order to develop a truly different, and less emotional, approach to (sustainable) mobility, intensive communication with different groups and across these groups is necessary.

A second early observation made is that most people are not familiar with alternative, innovative or smart forms of mobility. With our visible activities in urban space we provoked fears that the main aim of the project was to reduce parking space and to cut personal freedom (which in some cases was very closely linked to the possession of a car). In consequence, providing opportunities for information on recent technological developments in the mobility sector proved successful – even with critics of the project. And this even more so if it was combined with testing of new products and business models. This approach opened additional ways for discussions on individual prejudices against alternative forms of mobility or intermodality. The second suggestion therefore would be to conceptualize & test new forms of intermodality in order to reduce the number of individually possessed cars. The topic of intermodality, though, is quite challenging in the Berlin context as there is a tangible concurrence between different mobility providers and that intermodality is being seen/ prejudiced to be stressful andawkward oder laborious oder complicated. In consequence, if the plan is to identify people who are willing to get rid of their cars, it seems necessary to provide this. Smartness in the mobility sector is not merely the introduction of innovative technical solutions (like divices for detecting free parking lots) but needs to be understood as a process of multilateral information, discussion, and exchange.

6 CONCLUSION

Initiating transformation processes regarding sustainable mobility and future uses of urban space is very interesting, resourceful and fruitful, but at the same time challenging because of the redistribution of space to new purposes. Multilateral communication in combination with individual experimentation with alternative solutions is successful and appeals to different levels. It is essential to find ways to relate local administration and politicians, mobility providers and civil society. In a wider perspective, this approach also aims at contributing to Berlin's climate protection and sustainable mobility targets, providing examples on how transformation towards more sustainable uses of urban space might happen.

7 REFERENCES

AMT FÜR STATISTIK BERLIN BRANDENBURG, press release no. 6, 11th January, 2018.

BANISTER, D., Button, K. [Eds.]: Transport, the Environment and Sustainable Development. Spon, London, 1993.

BERECHMAN, J.: The Evaluation and Transportation Investment Projects. Routledge, New York, 2009.

BEZIRKSAMT CHARLOTTENBURG-WILMERSDORF VON BERLIN: Grobcheck Stadtumbau Mierendorff-INSEL Charlottenburg-Wilmersdorf, Berlin, April 2017.

GEHL, Jan. Life between buildings: using public space. Island Press, Washington D.C., 2011.

GILBERT, R., Perl, A.: Transport Revolutions: Moving People and Fright Without Oil. Earthscan, London, 2008.

GÖSSLING, S.: Urban transport justice. In: Journal of Transport Geography, 54, 2016: 1–9.

GREENE, D.L., Wegener, M.: Sustainable transport. Journal of Transport Geography, 5, pp. 177–190, 1997.

HANANEL, R., Berechman, J.: Justice and transportation decision-making: The capabilities approach. In: Transport Policy, 49, pp. 78–85. Ort, 2016.

KEMMERZELL Jörg: Überlokales Handeln in der lokalen Klimapolitik. Eine Brücke zwischen globalem Anspruch und lokaler Implementation, in: M. Barbehön, S. Münch (Hrsg.), Variationen des Städtischen – Variationen lokaler Politik, Stadtforschung aktuell, Wiesbaden, 2017: 245-271, DOI 10.1007/978-3-658-13394-8_10

KRELLENBERG Kerstin. Florian Koch.Sigrun Kabisch: Urban Sustainability Transformations (UST) in lights of resource efficiency and resilient city concepts, 2016.

KOCH Florian, Kerstin Krellenberg, Sigrun Kabisch,: How to achieve Urban Sustainability Transformations (UST) in real life politics? 2016.

MARKARD, Jochen, Rob Raven, and Bernhard Truffer. Sustainability transitions: An emerging field of research and its prospects. Research policy 41.6, 2012: 955-967.

MÜGGENBURG, Hannah. Lebensereignisse und Mobilität: eine generationsübergreifende Untersuchung von Mobilitätsbiographien. Springer-Verlag, Wiesbaden, 2016.

PLEHWE, D.: Güterverkehr und Logistik: Zielkonflikte nachhaltigen Wachstums im Straßen- und Schienenverkehr. In: Schwedes, O., Canzler, W., Knie, A. [Eds.]: Handbuch Verkehrspolitik, 2nd Edition, Springer, Wiesbaden, pp. 323–350. Ort, 2016

RAMMLER, Stephan. "The Wahlverwandtschaft of modernity and mobility." Tracing Mobilities. Towards a Cosmopolitan Perspectiven, 2008: 57-76.
VAN DEN BERGH, Jeroen CJM, Bernhard Truffer, and Giorgos Kallis. Environmental innovation and societal transitions: Introduction and overview. Environmental innovation and societal transitions 1.1 (2011): 1-23.
WBGU Wissenschaftlicher Beirat der Bundesregierung, Globale Umweltveränderungen. Der Umzug der Menschheit: Die transformative Kraft der Städte. Hauptgutachten. Berlin, 2016.
UBA (Umweltbundesamt): Mobilität privater Haushalte, Dessau, 2017, in: https://www.umweltbundesamt.de/daten/verkehr/verkehrsinfrastruktur-fahrzeugbestand.

The Inclusive Role of Ekistics Elements in Earmarking Innovation Zones through a Balanced Distribution of Smart Development and Local Expression: Case of Kolkata Metropolitan Area (KMA)

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1 ABSTRACT

Today there is a need for more accessible, habitable, economically, and socially sustainable urban areas. Despite rapid urbanization and globalization, the metropolitan areas have exploded and become heterogeneous in such a manner that it has become challenging to comprehend a holistic and homogenous solution. Currently, metropolitan areas are under tremendous pressure for smart development on the one hand, and on the other hand, basic development needs dealing with population and environment more seriously is a high priority for enhancing the basic livelihood of marginalized areas and their dwellers. Therefore, it is essential to take both the aspects together. Hence, an inclusive methodology can be suggested in the form of a balanced development policy on innovation zones. To best conceptualize the inclusive approach, the concept of Ekistics i.e., the study of human settlements and its elements, has been incorporated, an idea formulated by C. A. Doxiadis. The concept explains the examination of both local expression and specific smart or higher development prerequisites, in the form of Ekistics elements which are nature, human, society, shell, and network. Initially, the paper forwards a summary of extensive theoretical research to position the Ekistics prerequisites for developing the inclusive methodology. The paper subsequently highlights how the smart development can be perceived in parallel with the expansion and networking along with a focus on nature, human, society, shell, and network in local areas. This needs for an induction of a metropolitan approach with the distribution of innovation zones to balance both sides of the opportunities and potentials. The case of Kolkata Metropolitan Area has been taken. Finally, the paper assesses the elements and their constituent indicators and attempts to analyze the potential clusters of possible innovation zones through cluster analysis. Thus, the paper provides a basis for the study of prerequisites of development of urban innovation zones (IZ) in context of the metropolitan area.

Keywords: Ekistics elements, globalisation, innovation zones, metropolitan area, smart development

2 INTRODUCTION

2.1 Research motivation

"Progress is more plausibly judged by the reduction of deprivation than by the further enrichment of the opulent."-Amartya Sen

A new global paradigm has emerged over the last decade focusing on smart, sustainable, resilient, innovative and inclusive development. These development concepts and processes deal with number of present as well as future expansion requirements looking into physical, social and economic issues. Moreover, several research shows that even these concepts and processes itself are evolving continuously according to the dynamism of the global and local needs. It is also observed that policymakers, stakeholders, and other actors are aligning their conception about a development being smart in a way that the whole idea of inclusive growth and improvement of the quality of life does not get lost while planning for the future expansion and welfare. Often it has been reflected in many research that social welfare can be achieved by the economic upliftment of the society and its people. Thus, rapid urbanization and its development demand for infrastructure and economic development have become one of the prime focus, especially in metropolitan areas.[1] The UN predicts that by 2050 the world's urban population will be as vast as the world's total population in 2002. The urban population of India has increased from 222 million (i.e., 26% of the population) in 1990 to 410 million (32%) in 2014 and is predicted to reach 814 million (50%) by 2050, however, India ranks second in the world in terms of urban population size. Present urbanization rate of India is lower in comparison to China (54%), Indonesia (53%), Mexico (79%), Brazil (85%) and Russia (74%)

[1] Metropolitan area: it is an area comprising of a densely populated urban core and its less-populated surrounding territories, sharing industry, infrastructure, and housing. (Source: https://en.wikipedia.org/wiki/Metropolitan_area)

(Randhawa & Kumar, 2017). In a study, it is discussed that urbanization in India has a dual character - it is decelerating at the macro level on hand and on the other hand it is growing in class I cities, with the metropolitan area having the highest growth rates (Kundu, 2001). The metropolitan areas of India have emerged as economic growth engines and a pull factor for various new developments. Through several research based on economic clusters, special economic zones, innovation zones, innovation districts, innovation hubs[2] innovation ecosystem, and other similar concepts, it has been observed that these zones potentially deliver a concrete and significant concept to examine complex urban dynamics and an instrument to improve planning support for economic development of any area through networking of different actors (Dedehayir, Mäkinen, & Roland Ortt, 2016; Yang, Ottens, Cai, & Sliuzas, 2010). At metropolitan level, the infrastructural and economic demands have different requirements at different stages of development for knowing the innovation capability. In order to achieve these demands, there is an emerging consensus among the policymakers, stakeholders and other actors, to adopt a holistic approach. Hence, to plan and manage the complexity and multidimensional frameworks of metropolitan development, this paper has adopted the concept of Ekistics[3] introduced by C.A. Doxiadis.

2.2 Interpretation of smart development globally and acknowledging it as per local expression

In current planning practices and discussions, the concepts based on the terms-smart, sustainable, liveable or inclusive has made its identity so strong in the planning process that every other approach or concept introduced today is associated with these. For example, are the concepts like Smart Growth, Smart Cities, Sustainable development, Smart development, etc. As the definition of these concepts has a different dimension to the researchers, it becomes difficult to comprehend it to a singular definition or understanding. For instance, in context of Smart development, some concepts suggest it as the coherence of infrastructure, the significance of learning, innovation, and networks (Allwinkle & Cruickshank, 2011), while some regard it as the incorporation of Information and Communication Technology (ICT) into day to day life and state function (Komninos, 2011).

However, these concepts and approaches provide the policymakers, stakeholders, and most importantly the dwellers, an assurance that the issues faced by the cities in day to day life will be somehow addressed smartly and more effeciently. Therefore, what is important here to realize is that where we are demanding modern facilities and services in global context, but in reality, there is a huge disconnect while tackling the local or territorial demands of the society. Thus, even so, the approach is promising to be a good fit of the model by being smart and sustainable, but sometimes it remains to be a poor fit in practice while dealing with the urban local issues. By local expression, Doxiadis' meant particularity of the context, i.e., specific development needs of each nation-state, emphasizing on the spatial logic of practice in developing areas (Khan Mahsud, 2010). Hence, the integration of local expression in the global conception as suggested by Doxiadis' will provide the solution in terms of inclusiveness of the context-specific development needs making it more sustainable.

Generally, in urban areas, the development gets driven by a number of elements, considering the multifaceted needs of its people, infrastructure, and environment. There is a growing responsiveness among policymakers that innovative movement is one of the key drivers of economic development and well-being in meeting global challenges. While dealing the people, infrastructure, and its environment, the idea of development based on the concept of innovation has both scientific and practical significance for the socio-economic and physical growth of an urban area. It is commonly adopted and practiced in modern discourses on urban economic development policies in many developed nations. In this research, the concept of innovation zones has been taken, which is one of the leading theory as well as a practice among other concepts.

[2] Example: 'Arabianranta' in Helsinki/Finland, 'One-North' in Singapore and 'The Digital Hub' in Dublin/Ireland. 'There is a growing consensus among both academics and politicians that the innovation processes have a pronounced regional dimension and that the relevance of region-specific features for innovation processes is indeed increasing'.

[3] Ekistics: concerns the science of human settlements, including regional, city, community planning and dwelling design; Ekistics elements: Nature; human; society; shell; network.

2.3 Understanding the concept of Innovation Zones

There are number of definitions and conceptual basis provided in the wide array of literature. To best contemplate the idea of innovation, first, the definition of innovation has been specified. And then, the objective and elements of Innovation Zones have been discussed further.

2.3.1 Defining innovation

The term 'innovation' serves different definition to Innovation Zone concept. The definition selected in the study is explained as, "It is a ubiquitous phenomenon in the modern economy. In practicality all parts of the economy, and at all times, it is expected to find on-going processes of learning, searching and exploring, which results in new products, new techniques, new forms of organization and new markets" (Mikroglou & Khan, 2009). The paper provides a number of contribution to the literature on the development based on innovation applications. Generally, the application of innovation zones in economic and spatial policies worldwide is unusual. However, Innovation zones potentially provide a concrete and important concept to analyze complex urban dynamics and an instrument to improve planning support for economic development of any area (Yang et al., 2010). Hence, there is a need for more research on innovation-driven economic zones and its underlying elements in regard to the growing urbanization and population. The UN predicts that by 2050 the world's urban population will be as big as the world's total population in 2002. In the global economy, cities and metropolitan regions are the main fields for organizing economic activities and for managing with exogenous developments.

The key objective of Innovation Zones is to foster business creation and innovations, and thus making innovative use of knowledge, legislatures, and available resources. The concept of IZ came from the development of clusters (Mikroglou & Khan, 2009). It is observed that these clusters or common knowledge groups are formed by a structured and geographical mixture of firms having resemblance in highly harmonizing competences for common research and development (Maskell & Lorenzen, 2003). Furthermore, research suggests that the collective nature of the learning processes inside these special places is characterized by concentrated local associations and interpersonal interactions among the industrial districts or milieus and the cities, where the learning process embeds into a close system of small and medium enterprises (SMEs) as well as into the local labor market (Camagni & Capello, 2013; Keeble & Wilkinson, 1999). It is stressed that innovation is stimulated and influenced by many actors[4] and factors, both internal and external to the firm. Research shows that the social aspect of innovation refers to the collective learning process between several departments[5] of a company as well as to external collaborations with other firms, knowledge providers, financing, training, etc (Doloreux & Parto, 2005). It is argued that from regional science and socio-institutional environment point of view, innovation is localized and a locally embedded, not placeless, process.

Number of elements have been studied in several research giving an idea on which the assessment for potential innovation can be done. To name a few from studies, elements like- availability of workforce, local interaction and cooperation in order to achieve reduction of uncertainty (especially relating to the behaviour of contenders and partners) and of information irregularities (thus reducing mutual suspicion among partners); trust, sense of belonging, place-loyalty, and social sanctioning in order to reduce opportunistic behaviour are all territorial elements typical of the innovative milieus that increase the capacity of a region to speed up innovation and take full advantage of collective learning processes, as confirmed by many regional economics schools (Camagni & Capello, 2013). Recently in India NITI[6] Aayog has launched Indian Innovation Index in 2017, in regard to the success of GII since 2007 which works on a set of indicators to assess a nation's capacity for innovation and its global ranking. But prior to the analysis of the capacity of innovation, one must go through the existing indicators with holistic model and elements to envisage the potentials and strength of areas to become innovative further.

[4] Several researches deliver the set of actors as: government; universities; industry; supporting institutions; entrepreneurs; financial investors; customers; civil society and many others. (Rabelo & Bernus, 2015)

[5] For example, R&D, production, marketing, commercialization, etc.

[6] NITI Aayog- National Institution for Transforming India: where 'NITI' means 'policy' and 'Aayog' means 'commission', it is the premier policy 'Think Tank' of the Government of India, providing both directional and policy inputs.

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2.3.2 Learning from Innovation Zones and similar case studies

The concept of innovation recently has become a center of discussion globally that has captured the attention of several public officials and policy-makers around the world as an unconventional tool for taking decisions. However, the definition of innovation includes a wide range of issues that are underlined by a common set of guiding principles such as involvement of public and private entities, resource availability, and job creations, all of which can define innovation at many different levels.

	Study area	Objective/focus	Findings/results	Source
London Case Study	London	A set of control variables for other characteristics potentially predictive of London's specialization in the activity is concerned.	• Factors significantly associated with a concentration of employment in London included: market areas; supply areas; market type; establishment size; product innovation; establishment function; product cycle	(Cooke, Uranga, & Etxebarria, 1997)
Newark Innovation zone	Newark	Growth rate of employment in all the sectors of the region.	• Higher employment growth rate. • Newark's rate is equal to, or even higher than the growth of the rest of the region	(Mikroglou & Khan, 2009)
European Regional Innovation Survey	Vienna, Stockholm, Barcelona, Alsace, Baden, Lower Saxony, Gironde, S. Holland, Saxony, Slovenia, S. Wales	Innovation survey and results based on qualitative and quantitative determinants for innovation potential of any region and their linkages and network	• The activities based on innovation and business innovation process can be observed as a network process. • Interaction with other stakeholders and partners, and business played a vital role.	(Sternberg, 2000)
Nordic SMEs and regional innovation systems	13 Nordic regions (Oslo, Stockholm, Malmo /Lund, Aalborg, Jyvaskyla, Helsinki, Gothenburg, Linkoping, Stavanger, Horten, Jaeren, Salling, Icelandic regions	To explore the existence of similarities and differences between regional clusters of SMEs in different regions in the Nordic Countries	• Social networking arrangements proven to be successful for boosting & securing social capital and trust. • SMEs that draw on an analytical knowledge base and innovate through science-driven R&D tends to interact with global partners.	(Asheim & Coenen, 2005)
Regional innovative clusters	10 European regional clusters: ICT regional clusters in Finland, Ireland, Denmark, Spain, Flanders, and Netherlands; mature regional clusters: agro-food cluster (Norway) and construction clusters (Denmark. Netherland, Switzerland).	To seek the significance of regional clusters in innovation policy.	• Regional clusters in every country/region have unique cluster blends; • Regional clusters are in variation and have selection environments that are inherently different; • Regional clusters may go beyond geographical levels.	(Doloreux & Parto, 2005)

Table 1: Case studies with similar concepts like innovation zones

A study suggests innovation as a partly territorial phenomenon, which to a great extent, is based on the successes of specialized industrial agglomerations or regionally concentrated networks of SMEs and industrial clusters. This concept emphasizes region as a locus of innovation (Doloreux & Parto, 2005). To have a conceptual and application understanding of innovation based development, several case studies through literature are sorted in Table.1, giving examples of innovation related case studies with the key points on its focus, findings and the study area.

2.4 Understanding the concept of Ekistics

In search of a holistic concept, Ekistics have been considered as one of the inclusive approaches. It is the science of human settlements, and is concerned with social, economic, cultural, technical, administrative, and other problems of human communities of all sizes and types (Khera, 1973). The basis of the Ekistics elements is explained initially, then later the inclusive nature of the Ekistics concept has been discussed.

2.4.1 Foundation of Ekistics Elements

The study focuses on the five elements of Ekistics, shown in Fig. 1, given by C. A. Doxiadis. First element is Nature, it provides a foundation for the development of settlements. It is the framework within which settlement functions and flourishes. It explains the aspects related to geological and topographical resources, soil and water resources, plant and animal life, and the climate. Second element is Human, initially this element was termed as Anthropos. It is the major demand seeker among other elements. Directed by moral values, and influences the environment in an attempt to fulfil his biological and emotional needs and his senses. Third element is Society, it is formed by the second element human. It consists of indicators such as population composition and density, social stratification, cultural patterns, education, health and welfare, economic development, law, and administration. Fourth element is Shells, it is structures created by human. The purpose is to provide housing, community services, shopping, recreation, civic and business needs, industry, and transportation. And fifth element is Networks, it is mainl the natural and man-made links. Facilitating the functioning of the settlements and developments. It comprises of water and power supply systems, sewage and drainage, and communication and transportation systems.

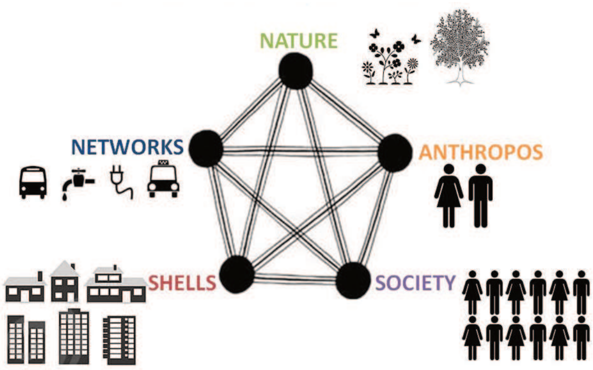

Fig.1 Five elements of Ekistics as designed initially by C.A. Doxiadis in 1947, (Fookes, 2008)

The concept works on the five principles which are: maximization of human potentials; minimization of efforts (in terms of time, energy, resource, routes); optimization of human's protective space; optimization of human's relation with his environment; and optimization in the synthesis of previous principles (Pertsemlidis, 2007). In the study of human settlement (Papaioannou, 2013; Zhang, 2017), it is suggested that the main objective of ekistics is to develop insights into the physical distribution, form, and structure of settlements, taking into account the variety of functions that they provide (John Peponis, 1968). According to Doxiadis, in order to comprehend settlements focused at their apparent spatial morphology, the underlying spatial patterns and indicators associated with human activities and behavior, as well as the functional and organizational structure have been suggested.

2.4.2 Inclusive nature of Ekistics in smart development

Discussion on benefits of adoption of the five Ekistics elements as the preliminary base for the development of generic framework for the urban sustainability, Fookes, 2008, describes that in context of 'sustainable communities and development', reviewing the steps of Doxiadis' efforts to develop an integral science of human settlement has considerable positive impact. In addition to the study of Ekistics, its relation with business and government study has shown the need of a universal application to major plans and action of industry and government (Khera, 1973). Studies suggest that planners can adapt the ekistics framework to

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society's needs, as well as the global view for the urban development (Gottmann, 1976). Some concepts of ekistics have already been successfully employed in several major European cities (A. Doxiadis, 1969; C. a Doxiadis, 1970). In a study done by Pertsemlidis, 2007, a more organised explaination of the Ekistics concept has been discussed (shown in Fig. 2), where a system of two sets was proposed. In which one set comprised of nature and human (that time known as anthropos) which is naturally formed, and other set comprising of shells, networks, and society modified as institutions, which is culturally formed interconnected through natural function i.e., ecological aspect, and cultural function i.e., economic, social and political.

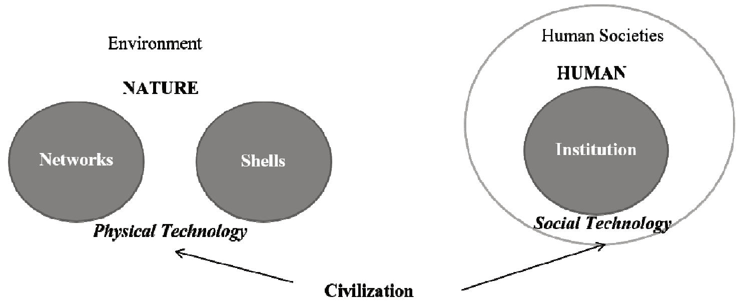

Fig. 2 Ekistics elements revisited

Thus, through different research it is clear that the objective of ekistics is to achieve a balance among these elements in the dimensions of time, space, and scale. The disbalance, among other elements, seems to have been caused by the exceptional increase in population; the tremendous rate of urbanization; the great increase in the average per capita income; the unexpected technological progress; and the social and political influences that these forces have had on the life of human (Kunzmann & Wegener, 1991; J. Peponis, Hadjinikolaou, Livieratos, & Fatouros, 1989).

2.5 Induction of metropolitan approach

In order to enhance the present study, the need of an induction of a metropolitan approach with a distribution of innovation zones to balance both sides of opportunities and potentials needs to be established. Several type of research have been conducted to analyze the innovation zones on a different scale from strong to weak so as to better understand a region's possibilities and productivity for economic development. There is a debate on the appropriate scale for studying regional innovation. Cities increasingly realize that in order to thrive they must expand beyond merely providing exceptional basic services, by also placing a strong focus on resource efficiency and start-up (American Institute of Architects, 2014). Urban areas that are best able to attract these types of businesses create more opportunity for the people already living there and draw new people in search of jobs. Similar arguments are made for metropolitan regions as sites of innovation systems (Doloreux & Parto, 2005). Studies on metropolitan innovation systems has concluded that metropolitan areas are the most important location for innovation (Feldman & Audretsch, 1999) and may possess high innovation potential (Brouwer, Budil-Nadvornikova, & Kleinknecht, 1999) because they offer firms spatial, technological, and institutional proximity and specific resources. In the present study, the case of Kolkata Metropolitan Area have been taken up, to look at the possibility of innovation zoning based on the assessment of potential indicators.

2.5.1 Case of Kolkata Metropolitan Area (KMA)

The third largest metropolitan area, in state of West Bengal, India, after Delhi and Mumbai, is a continuous linear urban agglomeration of areas along both sides of river Hooghly. KMA as shown in Fig. 3, (Paul & Sen, 2017)) comprises of areas taken from the six districts, namely, South and North 24 Paraganas, Nadia, Hooghly, Howrah, and Kolkata. The economic base of KMA contributes substantially to the total revenue collection of both the central and state governments. Kolkata city alone shares about 82 percent of annual sales tax collection and about 98 percent of annual income tax collection of West Bengal (Uttam & Roy, 2005). The history of Kolkata's foundation can be traced back to 1690 when British East India Company selected Kolkata (then Calcutta) for establishing a trade and business zone in the Eastern-India (Kundu, 2001).

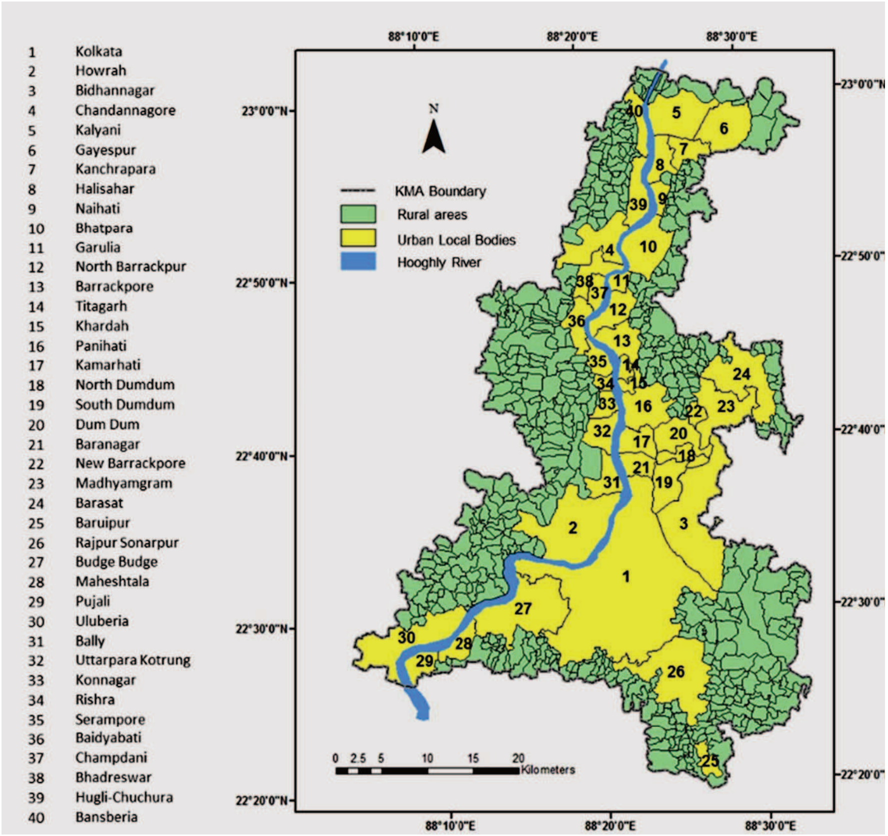

Fig. 3 Constititution of KMA

3 APPROACH FOR ASSESSING THE ELEMENTS AND ITS UNDERLYING INDICATORS

In order to understand and examine the current preparedness of an area, firstly there is a need to study the existing condition based on the list of indicators selected under the Ekistics elements.

Likert-type scale	
1	Least important
2	Somewhat important
3	Moderately Important
4	Very Important
5	Extremely Important

Nature	Human	Society	Shell	Network
Water resources	Temperature	Population density	School	Road
Natural Heritage	Workforce	Population composition	Hospital	Power Supply
Open Spaces	Creativity and inherited skill Knowledge	No. of literates	Recreational facility	Water Supply
		Economic equality	Market & shopping Centre	Communication System
		Technological acceptance	Commercial & business Centre	
			Transportation Centre	
			Warehouse	
			Industry	
			Skill Development Centre	

Table.2 List of selected indicators

The set of siginificant indicators will work as a basis for further earmarking potential clusters of innovation zones. Initial study was done on extracting the elements and its potential indicators through extensive literature review giving a pool of data which have been examined through a pilot and expert opinion survey[7], the output is shown in Table.2. For identifying significant indicators, a questionnair based on Likert-type scale of five on importance level have been developed. The experts were asked to select the indicators which they consider to have impact on the development of innovation zones in a metropolitan area. The indicators with median values 3 or above were selected based on pool of indicators extracted through literature review. Based on this selected list of indicators, the experts ranked three indicators to be most important for the study of potential clusters, they are population density, workforce, and number of literates available in each ULBs. Further, to demonstrate the analysis for potential clusters these indicators were selected. To observe the existing variation and status of the ULBs of the metropolitan area into clusters of high, medium, and low grouping based on each indicator's values, there is a methodology to assess potential clusters.

4 RESULTS AND DISCUSSION

4.1 Assessment of potential clusters

To assess the clusters, first the k-mean for the cluster analysis was carried out. The number of clusters were given three for the k-mean cluster analysis. As the output was focused on three range of high, medium, and low groupings. In Table. 3 the Initial and Final Cluster Centers represent the Euclidean distances between the cluster centers. Greater distances between two cluster centers indicate more dissimilarities within the algorithm. In this analysis, the groups are formed purposely in according to the distances between them. The data were standardized before undergoing the analysis by calculating their Z- scores.

	Initial Clusters			Final Clusters		
	1	2	3	1	2	3
Population_density	1.26528	2.68526	-1.45453	1.26528	2.00455	-.33200
Workforce	5.91470	-.28325	-.33931	5.91470	.21563	-.20567
No._of_literates	5.86374	-.30096	-.36225	5.86374	.25942	-.21061

Table. 3 Initial and Final Cluster Centers

The grouping of ULBs into clusters of high, medium, and low, shows the variation among the clusters based on the indicators.

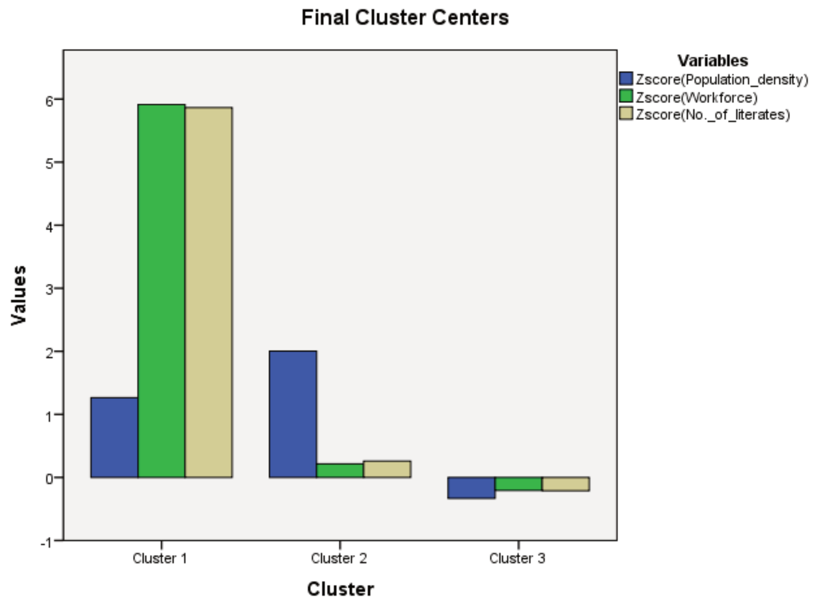

Fig.4 Cluster wise distribution of selected indicators

[7] Taking 15 experts from different relevant fields, a survey based on questionnaire on Likert-type scale of one to five points describing importance level. The experts comprised of different stakeholders, decision makers and academicians, like mayor of ULBs, chairperson of municipalities, professors, and etc.

The significant difference in cluster one from the other two clusters is visibly as shown in Fig. 4, high due to the high population size of Kolkata city. Since Kolkata is the core city on the west bank of the river Hooghly, with range of physical and social infrastructure as well as economic opportunities. Most of the ULBs with huge gap in meeting these physical, social, and economic infrastructure and opportunities fall in Clusters 2 and 3. This shows clearly the disbalance in the opportunities among the urban areas through out KMA. Howrah-Bally, Baranagar, Titagarh, South Dum Dum, and Kamarhati falls in Custer 2. And rest of the ULBs fall in Cluster 3.

As shown in Table. 4, the selected indicators have an impact in cluster formation and the population density has the least impact in it. In Table 4, the positive and large F values of the selected indicators denote the higher impact of indicators to the separation and in classifying the clusters.

	Cluster		Error		F	Sig.
	Mean Square	df	Mean Square	df		
Population_density	12.720	2	.366	37	34.707	.000
Workforce	18.327	2	.063	37	289.107	.000
No._of_literates	18.114	2	.075	37	241.790	.000

Table. 4 ANOVA[8]

The F tests are normally used only for descriptive purposes because the clusters have been chosen to maximize the differences among cases in different clusters. The observed significance levels are not corrected for this and thus cannot be interpreted as tests of the hypothesis that the cluster means are equal.

5 CONCLUSION

In the age of dynamic urban needs for smart development and global demands, somewhere the loophole still remains to meet the basic needs of an urban area. In order to address the needs on the grassroots level, first, there should be the realization that without taking bottom needs hand in hand in development programs and policies, it is hard to achieve smart development for urban areas. Where the population is connected with high-tech informatic society, there is still a huge disconnection in meeting the infrastructure needs, economic welfare and basic quality of life. The research shows that in developing country like India, approach to smart development needs more attention on solutions based on the local expression i.e., the indicators considered to be responsible to best understand the potential of an urban area like availability of workforce, no. of literates showing the knowledge groups and the gap. In this case, three indicators i.e., poulation density, workforce, and number of literates, were analyzed, since it gives a initial picture of the area how potential or weak it is in terms of the preparedness for potentcial clusters of innovation zones. The physical and socio-economic development will be more effective and sustainable if an inclusive approach is taken into account. Therefore, the purpose of the paper was to address and emphasize on the need for considering an inclusive concept like Ekistics, to envisage the development and augmentation of innovation zones in metropolitan areas. The paper argues that the need of modification based on the context and scale of cases should also be taken in to account while preparing for the innovation zone development. In addition, it also suggested through literature reviews that the indicators varies from context to context, thus the local expression of an area must be taken into account, as some area may be potential in terms of Nature element, or Shell. And thus, the indicators underlying to it must be taken into consideration for the study.

5.1 Limitation and scope

The study was limited with the demonstration of the selected indicators as governed by Ekistics elements, extracted for initial conceptualization. This research is not an attempt to replace any of the more commonly known indicators but instead present alternative holistic approach. In this paper, we have selected three indicators under Ekistics elements for the analysis, i.e., population density, workforce, and no. of literates based on expert's opinion. This is one of the limitations of the research. And initial clusters were identified, and with the help of these clusters further scope of analysis to identify level of augmentation and

[8] Analysis of Variance: used to analyze the differences among group means.

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development prerequisites for innovation zones can be assessed. The paper has scope and implications for a array of stakeholders, including researchers, policymakers, industries, and government and private bodies, which are in the long run, concerned with the development of innovation zones to augment economic prosperity and social welfare with a inclusive approach for the identification of indicators based on local context.

6 REFERENCES

AMERICAN INSTITUTE OF ARCHITECTS: Cities as a Lab: Designing the Innovation Economy. 2014

BROUWER, E., BUDIL-NADVORNIKOVA, H., & KLEINKNECHT, A.: Are Urban Agglomerations a Better Breeding Place for Product Innovation? An Analysis of New Product Announcements. Regional Studies, Vol. 33, Issue 6, pp. 541–549. 1999

CAMAGNI, R., & CAPELLO, R: Regional innovation patterns and the eu regional policy reform: Toward smart innovation policies. Growth and Change, Vol. 44, Issue 2, pp. 355–389. 2013

DEDEHAYIR, O., MÄKINEN, S. J., & ROLAND ORTT, J: Roles during innovation ecosystem genesis: A literature review. Technological Forecasting and Social Change. 2016

DOLOREUX, D., & PARTO, S: Regional innovation systems: Current discourse and unresolved issues. Technology in Society, Vol. 27, Issue 2, pp. 133–153. 2005

DOXIADIS, A: Books 373, pp. 373–374. 1969

DOXIADIS, C. A: Ekistics, the Science of Human Settlements. Science, Vol. 170, Issue 3956, pp. 393–404. 1970

FELDMAN, M. P., & AUDRETSCH, D. B: Innovation in cities:: Science-based diversity, specialization and localized competition. European Economic Review, Vol. 43, Issue 2, pp. 409–429. 1999

FOOKES, T. W: A Generic Policy Framework For Urban Sustainability. Shaping the Sustainable Millennium, CA, vol. 1, Issue 22. 2008

GOTTMANN, J: Megalopolitan systems around the world. Ekistics. Athens Center of Ekistics. 1976

KEEBLE, D., & WILKINSON, F: Collective Learning and Knowledge Development in the Evolution of Regional Clusters of High Technology SMEs in Europe. Regional Studies, Vol. 33, Issue 4, pp. 295–303. 1999

KHAN MAHSUD, A. Z: Rethinking Doxiadis: Ekistical Urbanism. University of Minnesota Press. 2010

KHERA, P: Business , Government , And The Science Of Human Settlements The application of ekistic criteria. 1973

KOMNINOS, N: Intelligent cities: Variable geometries of spatial intelligence. Intelligent Buildings International, Vol. 3, Issue 3, pp. 172–188. 2011

KUNDU, N: Understanding Slums Reports: The case of Kolkata India. Understanding Slums: Case Studies for the Global Report on Human Settlements. 2001

KUNZMANN, K. R., & WEGENER, M: The pattern of urbanization in Western Europe. Ekistics. Athens Center of Ekistics. 1991

MASKELL, P., & LORENZEN, M: The Cluster-and other current forms of Market Organization. 2003

MIKROGLOU, E., & KHAN, T. H: The Role of Innovation Zones in Regional Development. 2009

PAPAIOANNOU, J. G: Environment and the Role of Ekistics, Vol. 2. 2013

PAUL, A., & SEN, J: Livability assessment within a metropolis based on the impact of integrated urban geographic factors (IUGFs) on clustering urban centers of Kolkata. Cities. 2017

PEPONIS, J: EKISTICS - An introduction to the science of Human Settlements / C.A.DOXIADIS. Ekistics The Problems And Science Of Human Settlements, pp. 1–6. 1968

PEPONIS, J., HADJINIKOLAOU, E., LIVIERATOS, C., & FATOUROS, D. A: The spatial core of urban culture. Ekistics. Athens Center of Ekistics. 1989

PERTSEMLIDIS, C. R: The foundations of ekistics An attempt to test the validity of Anthropocosmos model in the context of modern evolutionary theory Purpose : The Anthropocosmos, pp. 1–15. 2007

RABELO, R. J., & BERNUS, P: A Holistic Model of Building Innovation Ecosystems. IFAC-PapersOnLine, Vol. 48, Issue 3, pp. 2250–2257. 2015

RANDHAWA, A., & KUMAR, A: Exploring sustainability of smart development initiatives in India. 2017

UTTAM, A., & ROY, K: Development of New Townships: A Catalyst in the growth of rural fringes of Kolkata Metropolitan Area (KMA). In In Annual Conference of HUDCO. 2005

YANG, Z., OTTENS, H. F. L., CAI, J., & SLIUZAS, R. V: Role of economic clusters in improving urban planning support. ITC Dissertation, Vol. 170. 2010

ZHANG, J. : Sustainable Degrowth and Relocalizing our Economies. 2017

Towards a more Liveable and Accessible Cycle Path Network in Padova: a Participatory Mapping Process

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1 ABSTRACT

With the advent of climate-related issues and low-carbon economy, networks of cycle paths and tracks are becoming a more and more relevant mobility infrastructure for cities. However, mapping their critical points in order to fix them to improve liveability and accessibility can be difficult. One solution may be to combine digital technologies and users' knowledge, using the methods of participatory mapping.

The first experiences in participatory GIS, in which geo-information technologies are used in support of collection, creation and sharing of spatial information by non-skilled social actors, date back to the nineteen-eighties. This bottom-up approach saw a strong evolution in recent years, even in the European urban context, thanks to the constant development of digital technologies and to the increasing opportunities for citizens to access the web. Free and open geographic data, by means of Public Participatory GIS (PPGIS) and Volunteered Geographic Information (VGI), facilitate the citizens' involvement and participation in urban planning and management.

This is the framework behind PISTE riCICLABILI, an innovative project by the University of Padova started in autumn 2016 and aiming at the following goals: a participatory mapping of critical issues of the urban cycle path network and the implementation of an open source geo-portal for collecting and sharing geo-referenced reports.

Within the workflow developed for this project, spatial information has been collected in two different ways: on the one hand, using printed city maps during public events, where involved citizens marked the cycle paths issues with pins; on the other hand, through a mobile geo-app.

In the second case, Open Data Kit (ODK) was used. It is a combination of free and open source tools enabling everyone to create a form to be filled in with a smartphone in the field, and to send geo-referenced reports to a server. Mobile data were collected using the GeoODK Collect Android app, then aggregated and periodically exported, reprocessed and released through the open source webGIS platform Lizmap.

First results of the process, which experienced a growing participation by citizens, consist of over 300 collected critical points. Through the analysis of these data it is possible to have a first overview on the main problems of bicycle mobility in Padova, their spatial implications and citizens' suggestions to improve human-oriented places.

This contribution presents the mapping and data spreading workflow, together with results achieved and possible future development, with the aim to share a promising tool to improve urban sustainable mobility.

Keywords: open source, cycle mobility, volunteered geographic information, public participatory GIS, georeferencing

2 INTRODUCTION

In many European cities, different "bottom-up" projects are being experimented with the involvement of students and citizens, enabling them to create and share geographical information, with a view to increase their participation in sustainable urban planning and management.

The first experiences of participatory GIS (Public Geographic Information System, PGIS) date back to the 1980s in the developing countries, where the population is involved and supports the production, use, share and communication of spatial information and knowledge (Rambaldi et al., 2006). This PGIS approach is taking place since the second half of the 1990s also in developed countries, with the spread of several approaches, techniques, and methodologies that can fall under the definitions of Public Participatory GIS (PPGIS) and Volunteered Geographic Information (VGI) (Brown, Kytta, 2014). This process is made possible by the diffusion and increasing availability of technologies (smartphones with GPS, internet and web-mapping) and open source and low-cost spatial data (such as OpenStreetMap). In the PPGIS, public decision-makers try to involve stakeholders in a given decision-making process concerning a territory, like in urban management plans or natural park management plans (Brown, 2012; Sieber, 2006), while the VGIis characterised by its voluntary nature has become known more recently than others through diffusion. In this case it is the individual citizen who more or less voluntarily decides to produce new geographical information within areas not strictly related to decision-making processes: for example daily activities (traffic information, cycle paths, etc.) or social activities, such as environmental monitoring and mapping of places of interest (Capineri et al., 2016).

Both in the scientific literature and in the mass media a growing interest can be noticed in the dissemination of projects for the production of participatory spatial information, with the use of different tools (printed maps, web-mapping, smartphone apps, etc.) and methodologies (participatory mapping during focus groups, crowd mapping, etc.); such spatial data can be analysed with the use of GIS software in several ways, producing output such as maps and statistics useful for the most diverse aims, and can be eventually disseminated and shared via WebGIS, on a blog, or inserted in a paper report (Brown, 2004; Brown, Kytta, 2014; Pacino, 2017).

This is the framework behind the project called "PISTE riCICLABILI", a participatory mapping project created in 2016 and still underway, funded by the University of Padova and led by the Department of Civil, Environmental and Architectural Engineering (ICEA), with the collaboration of the professional master in "GIScience and Unmanned System for the integrated management of territory and natural resources". The project aims at the following goals: participatory mapping of critical issues and attributes of the urban cycle path network of the city of Padova and implementation of an open source geo-portal for collecting and sharing geo-referenced reports.

The participatory collection of spatial data and their spatial analysis can be a valid support to the management of mobility, especially for a city like Padova that is top in Italy for number of bike trips (Padova24ore, 2017). Moreover, with the advent of climate-related issues and low-carbon economy, networks of cycle paths and tracks are becoming an increasingly relevant mobility infrastructure for cities. This analysis could become the first basis for prioritising critical parts in the cycle path system and where to identify the most suitable actions in order to solve the highlighted problems. At the same time, it could help make the public decision-making process more effective and incisive regarding the improvement of the existing and planned network of cycle paths. In particular, the project aims to involve the university students who, despite being the main bicycle users in th city of Padova, are often stakeholders with no voice in the decision-making processes related to mobility.

3 MATERIALS AND METHODS

In the project “PISTE riCICLABILI”, the ability to include different actors in the mapping process is considered as one of the key factors in the choice of methods and tools to utilise. Considering that the subject matter is of great interest and is addressed to all citizens of Padova without distinction of category, it was necessary to adopt two different mapping methodologies to reach the maximum possible participation: a) paper mapping assisted by trained persons, and b) voluntary mapping via smartphone app and web. The two methods are in many aspects complementary, allowing to reach different segments of the population. The critical issues or attributes mapped were selected and validated with the support of local environmental associations (the list of attributes used is shown in figure 1 at the top right corner).

The paper mapping work assisted by trained persons was carried out both during some organised public events (such as sustainability festivals organised by the municipality or university festivals), and intercepting important flows of people in strategic points (e.g. near university canteens). Citizens were asked to apply place marks on the city map showing the municipal cycle path network. The place marks were categorised with colours, each of which corresponded to certain types of issues or attributes (in figure 1 in the lower right corner is an example of paper mapping work during a festival).

Attributes mapped

- Mobile obstacle on the cycle path
- Fixed obstacle on/close to the cycle path
- Discontinued cycle path
- Dismal cycle path
- Dangerous cycle path
- Missing cycle path
- Missing or not enough bike racks
- Lack of adequate indications
- A bike sharing station would be needed
- It would be needed the possibility to go in the wrong direction
- Good or ideal cycle path

Fig. 1: The list of the attributes to be mapped (on the left). An example of paper mapping work during a festival (on the right).

The voluntary mapping work via smartphone app and web took place through an app for Android devices (GeoODK Collect) that allows users to report critical issues directly on the road with the use of their GPS or by posting a form on their smartphone, associating its position (in figure 1 at the top some screenshots of GeoODK Collect interface). For actors (compilers) without a suitable device or who prefer to use their PC, an online form has been made available through the jotform platform (https://form.jotform.co/, in fig. 1 in the lower left corner a screenshot of jotform interface). All compilers were asked, on a voluntary basis, to fill in a profiling form, in order to be able to cross the information regarding individual habits, with the type and distribution of points mapped.

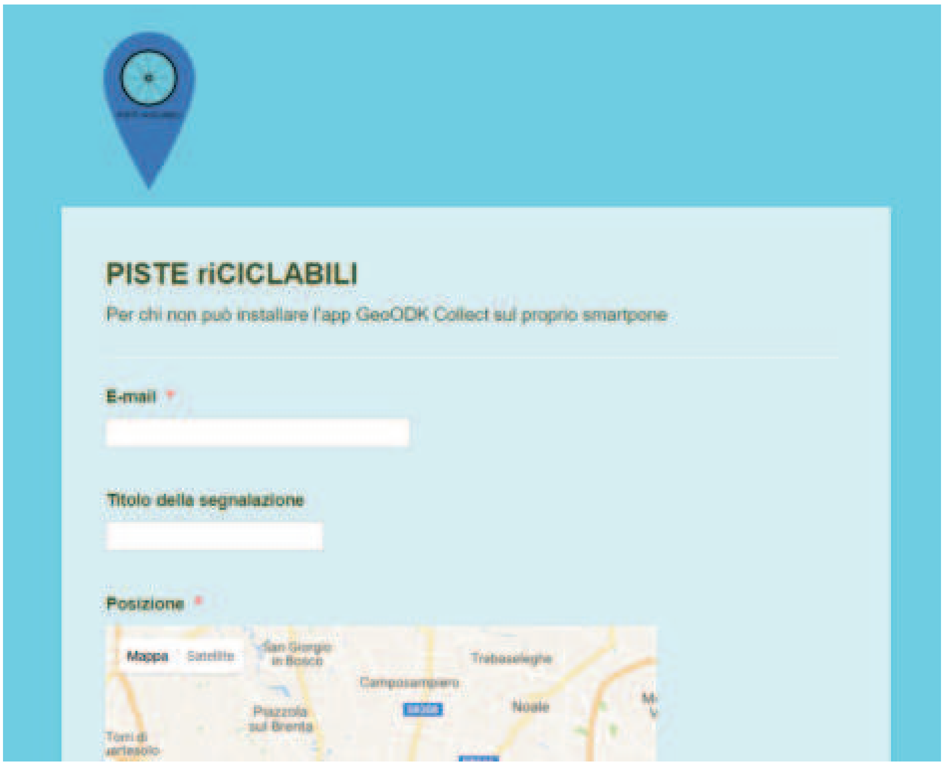

Fig. 2: A screenshot of the jotform interface.

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Fig. 3: Some screenshots of the GeoODK Collect interface.

Regarding the mapping via smartphone app, besides choosing one or more of the 11 available categories and associating the position, through the GeoODK Collect app a user can add a number of additional information, including photos, comments and the level of discomfort perceived in a scale from 1 to 5 (see Figure 1). The whole process is based on Open Data Kit (ODK), a set of free and open source tools that enable anyone to create fillable forms on Android devices and to collect reports in a server (https://opendatakit.org/). In this case, ODK Build was used to create the forms, ODK Aggregate for the management of the forms on the server and GeoODK Collect to perform the mapping work via smartphone. ODK Aggregate is the central element of this process: it permits to manage the database, user permissions, form settings, aggregation of collected data and their exportation in different formats (CSV, KML, JSON). All collected data are periodically exported in CSV format and reprocessed with QGIS software to obtain a spatial representation of the critical issues reported and to perform spatial analysis.

The last stage of this participatory mapping process is the re-sharing of the collected data. Since this is a project that makes use of substantially free tools, it was decided to use the QGIS plugin Lizmap for the publication of the results in a WebGIS, producing an interactive map which can be enquired and printed.

4 RESULTS AND DISCUSSION

During the processes of paper mapping and voluntary mapping via smartphone app and via web carried out in 2016 and 2017 (data updated in November 2017) a total of 616 points were collected (798 reports considering the points with multiple attributes). They were divided into 11 attributes, as shown in table 1, while the spatial distribution of all points mapped is shown in figure 3. In the 2016 collection campaign, the categories chosen during the planning phase had been reduced in order to simplify the collection made through paper mapping.

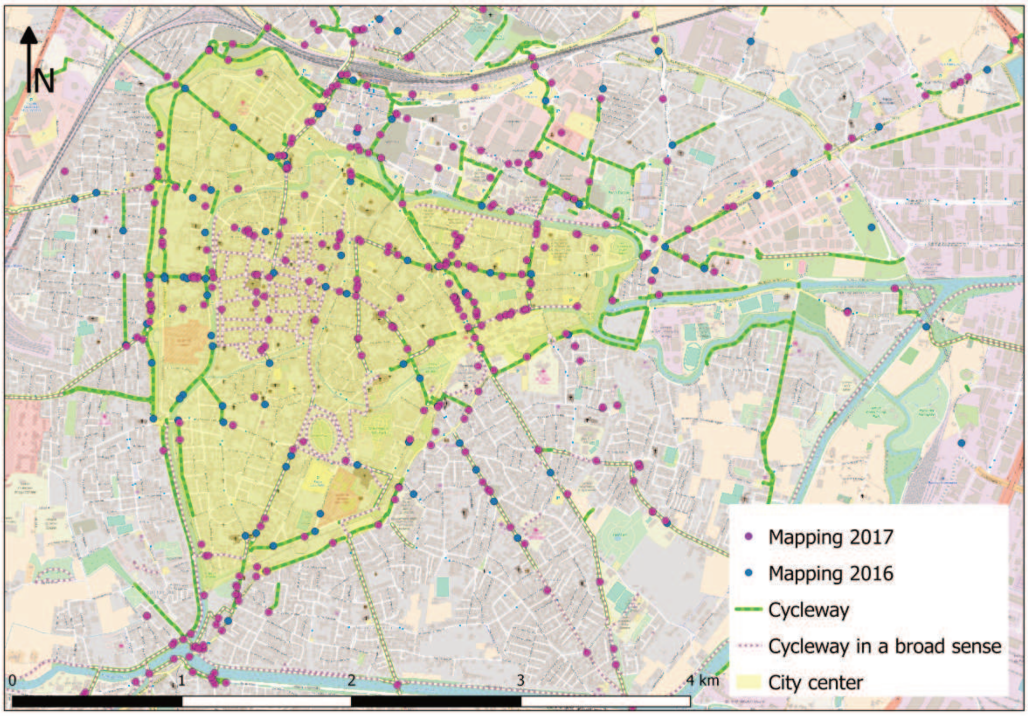

Fig. 4: Spatial distribution of all points mapped in 2016 and 2017

Thanks to the subsequent implementation of the mapping in digital format via app and via the web it was possible to map the entire range of attributes selected, as shown in table 1, also including a positive attribute, that is "good or ideal cycle path".

Attributes	Points mapped 2017	Points mapped 2016
Mobile obstacle on the cycle path	71	50
Fixed obstacle on/close to the cycle path	57	
Discontinued cycle path	63	
Dismal cycle path	71	15
Dangerous cycle path	138	20
Missing cycle path	125	31
Missing or not enough bike racks	41	
Lack of adequate indications	35	
A bike sharing station would be needed	19	
It would be needed the possibility to go in the wrong direction	47	
Good or ideal cycle path	15	
Total	682	116

Table 1: Number of points divided by attribute categories collected during 2016 and 2017.

Regarding the points marked via app and via web carried out till November 2017, figure 2 shows the corresponding attributes divided into reports within the historical centre and those outside the historical city walls. Most points fall outside the historical centre but two categories are more represented inside it, that is “possibility to go in the wrong direction” and “mobile obstacle”. These are indeed two very common problems because of the high density of narrow one-way streets in the centre and the parked cars on or close to a cycle path. The reports regarding bike sharing stations need is almost completely localised outside the centre, meaning that this service is well distributed in the centre but needs an expansion to some peripheral zones (like Forcellini, Guizza and Arcella quarters). In addition, the main south access road to the city (Guizza-3 ponti zone in yellow in figure 2) has been reported many times with critical issues concerning various aspects, so it could represent a “hot point” for planning interventions by the municipal administration.

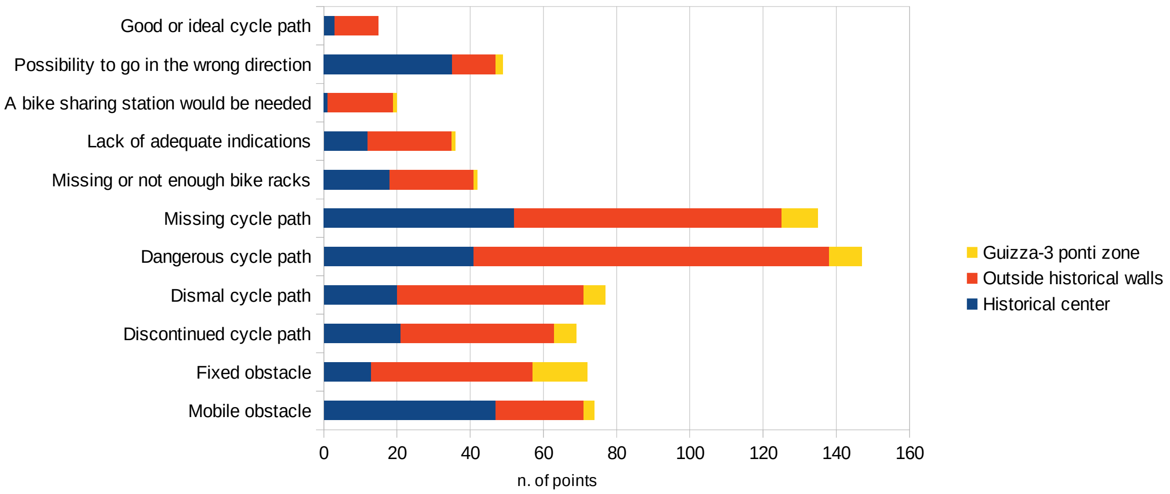

Fig. 5: Distribution of the mapped points (in x-axis the number of points, in y-axis the different attribute categories) inside (blue) or outside (red) of the historical centre of Padova, collected during 2017. In yellow are indicated the points marked along the south access to the city.

All the points related to the different types of critical issues collected till November 2017 have been analysed in GIS environment. A first product concerns density maps related to the concentration of the different mapped attributes, a simple form of analysis that is able to give an initial indication of the areas to be prioritised in support of interventions be the municipal administration An example is shown in figure 4. It highlights in lighter to darker shades of red the main sections of roads where citizens have reported the attribute "the possibility to go in the wrong direction would need to be included". Other density maps have shown that the major obstacles reported relate to the railway station, access to the south of the city and in the confluence section of the car and bicycle traffic coming from the west.

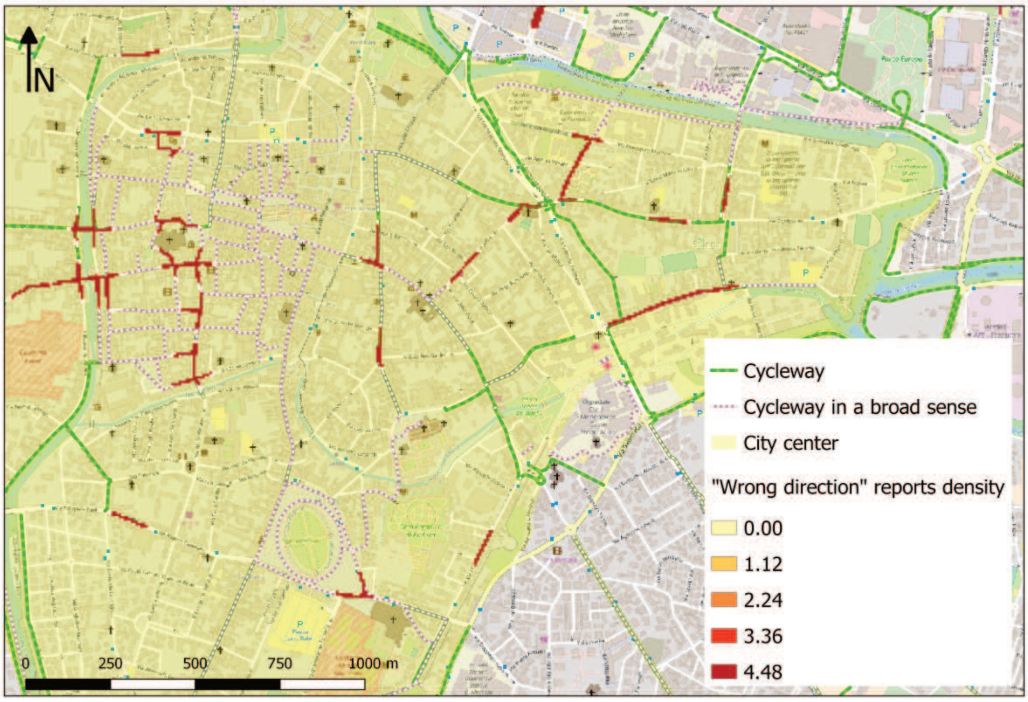

Fig. 6: Density map of points related to the attribute “It would be needed the possibility to go in the wrong direction”.

In addition to the mapping work, an important component of the project has been the dissemination of results, through the website and articles in the local press, but especially during public events and presentations, where the space left to debate made it possible to enrich the spatial information mapped. For example, on several occasions, the distribution of parking spaces for bike sharing in Padova has been mentioned: it is concentrated within the historical city walls, while there have been different requests for obtaining new bike parking spots, together with the need for new bike racks outside the walls, in the inner peripheral zones. Another key aspect, revealed also by several descriptions linked to the points marked, is that the bike path is well divided by the road network.

All the information produced, the WebGIS and these results can be freely consulted on the website of the project created ad hoc and periodically updated (https://pistericiclabilipd.wordpress.com).

5 CONCLUSION

In conclusion the project has showed a good participation by students and citizens and the data collected allowed the creation of a precious database. Over 600 georeferenced reports represent a good base to perform spatial analysis with the aim to localize the priority intervention areas. On this point, also the public administration have showed an interest to undertake a collaboration. Indeed, there have been several moments of collaboration with the municipality, and in particular with the bicycle office, for the promotion of the project. The whole data collected have been shared with the contributors, the institutions and any other interested party through a webgis based on the Lizmap platform, available from the project webpage.

Together with these results, this first year of project brought out some fundamental questions from both a conceptual and a methodological point of view.

A first methodological question concerns the effectiveness of the use of paper maps during particular events or the use of smartphone apps and/or web-mapping. If, on the one hand, the paper map has proved more effective from the point of view of participation and collection of points, it limits the number of mappable attributes and is definitely time-consuming, especially the process of digitization and georeferencing.

Special attention should be given to the question of which actors take part in the participatory process and thus the analysis and evaluation of the results obtained, since the information collected may be biased by the exclusion of some stakeholders in favour of others, or by a lack of representation of the population involved in the process. When planning a participatory process, using statistical tools to choose the sample or including stakeholders in a focus group one must avoid the phenomenon of participation inequality: that is when a small percentage of participants contributes to a significant portion of information production compared to the total involved (Haklay, 2016; Brown, Kytta, 2014). Finally, to assess the quality and effectiveness of the participatory process in decision making cases, Beierle (1999) indicates some guidelines to be taken into consideration: whether the process has educated and informed the public, included public values, increased confidence in institutions, reduced conflict and improved decision-making quality (Brown, 2012).

6 REFERENCES

BEIERLE, T.: Using social goals to evaluate public participation in environmental decisions. In: Policy Studies Review, 16, 3-4, pp. 75-103. 1999.

BROWN, G.: Mapping Spatial Attributes in Survey Research for Natural Resource Management: Methods and Applications. In: Society & Natural Resources, 18, 1, pp. 17-39. 2004.

BROWN, G.: Public Participation GIS (PPGIS) for Regional and Environmental Planning : Reflections on a Decade of Empirical Research. In: URISA Journal, 25, 2, pp. 7-18. 2012.

BROWN, G. and Kyttä, M.: Key issues and research priorities for public participation GIS (PPGIS): A synthesis based on empirical research. In: Applied Geography, 46, pp. 122-136. 2014.

CAPINERI, C., HAKLAY, M., HUANG, H., ANTONIOU, V., KETTUNEN, J., OSTERMANN, F. and PURVES, R.: Introduction. In: Capineri, C., Haklay, M., Huang, H., Antoniou, V., Kettunen, J., Ostermann, F., Purves, R. (eds.) European Handbook of Crowdsourced Geographic Information, Ubiquity Press, London, 1–11. 2016.

HAKLAY, M.: Why is participation inequality important?. In: Capineri, C., Haklay, M., Huang, H., Antoniou, V., Kettunen, J., Ostermann, F., Purves, R. (eds.) European Handbook of Crowdsourced Geographic Information, Ubiquity Press, London, pp. 35–44. 2016.

PACINO, G.: Dai beni confiscati alla street art, tutti pazzi per il crowd mapping. In: http://www.repubblica.it/cronaca/2017/09/27/news/dai_beni_confiscati_alla_street_art_tutti_pazzi_per_crowd_mapping-176618750/?ref=RHRS-BH-I0-C6-P2-S1.6-T1 (consulted 16/12/2017)

PADOVA24ORE: Padova si conferma amica della bicicletta, terza al giretto d'Italia. In: https://www.padova24ore.it/padova-si-conferma-citta-amica-della-bicicletta-terza-al-giretto-ditalia/ (consulted 16/12/2017)

RAMBALDI, G., KWAKU, KYEM, P. A., MCALL, P. and WINER, D.: Participatory spatial information management and communication in developing countries. In: The Electronic Journal of Information System in Developing Countries, 25, 1, pp. 1-9. 2006.

SIEBER, R.: Public participation geographic information systems: A literature review and framework. In: Annals of the American Association of Geography, 96, 3, pp. 491-507. 2006.

reviewed paper

Typologisierung der Headquarters in Wien im Hinblick auf die Nachhaltigkeit

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1 ABSTRACT

Bei der Entscheidung für die Headquarteransiedlung in einer bestimmten Stadt/Region spielen neben Kostenvorteilen sowie der volkswirtschaftlichen Leistungsfähigkeit und dem Vertrauen in die Zukunftsfähigkeit eines Landes Standortfaktoren wie Wissen, Know-how, die Verfügbarkeit von F&E-Ergebnissen sowie politische, raumordnerische und ökologische Faktoren eine große Rolle. Diese gelten auch als Entscheidungsfaktoren für die Erhaltung bzw. Stärkung von Wirtschaftsstandorten. Ob neu angesiedelte Headquarter nachhaltig agieren und im Sinne eines längeren Bestehens für den Wirtschaftsstandort Österreich nachhaltig sind, ist jedoch bislang wenig erforscht. Der vorliegende Beitrag[1] schließt die bestehende Forschungslücke durch die Analyse der in Wien angesiedelten (regionalen) Headquarter hinsichtlich ausgewählter Nachhaltigkeitskriterien.

Von den insgesamt 380 regionalen Unternehmenszentralen ausländischer Unternehmen (Stand 1.12.2016) sind 221 in Wien (dies entspricht 58%) angesiedelt (Vgl. Headquarters Austria, 2017). Diese bilden die Grundgesamtheit der vorliegenden Untersuchung. Die Merkmale dieser Unternehmen wurden mittels Primär- und Sekundäranalyse erhoben und ausgewertet. Sekundärdaten hierfür waren die Websites der jeweiligen Unternehmen, Unternehmensdatenbanken sowie Zeitschriften- und Zeitungsartikel. Die Primärdatenerhebung erfolgte mittels schriftlicher Befragung. Der vorliegende Beitrag typologisiert die (regionalen) Headquarters in Wien hinsichtlich (1) Branchen, Herkunftsländern/-regionen und nach Anzahl der Mitarbeiterinenn und Mitarbeiter, (2) UNGC Mitgliedschaft, (3) Nachhaltigkeitsberichterstattung, (4) Vorhandensein von Nachhaltigkeitsbeauftragten, (5) Verpflichtung zu Nachhaltigkeitsstandards/Zertifizierungen und schließt mit (6) einer Inhaltsanalyse der Websites der (regionalen) Headquarters in Wien hinsichtlich Aktivitäten und Maßnahmen zur Umsetzung von ökologischer, ökonomischer und sozialer Nachhaltigkeit.

Keywords: Headquarters, Wien, Nachhaltigkeit, Wirtschaftsstandort, Typologisierung

2 EINLEITUNG

In einer aktuellen Metastudie zur Attraktivität des Wirtschaftsstandorts Österreich über die sieben Standortfaktoren 1. Politisches und makroökonomisches Umfeld, 2. Unternehmensinfrastruktur und Umfeld, 3. Regulatorisches Umfeld, 4. Kosten, 5. Digitalisierung, Innovation, Forschung und Technologie, 6. Verfügbarkeit von Arbeitskräften und 7. Lebensqualität zeigt sich im Vergleich zu den letzten Jahren ein Aufwärtstrend Österreichs (Vgl. Deloitte, 2017). Der Standortwettbewerb zwischen Staaten bestand lange Zeit darin, dass die immobilen Produktionsfaktoren eines Landes (z.B. sesshafte Arbeitskräfte, Lage, Flächenverfügbarkeit, Infrastrukturangebot) mobile Produktionsfaktoren (z.B. qualifizierte Arbeitskräfte, innovative Unternehmen, Kapital) nicht nur anziehen, sondern auch im Land halten, um den Wohlstand und die Weiterentwicklung eines Landes zu gewährleisten (Vgl. Siebert, 2000). Diese Faktoren beeinflussen aber nicht nur die Ansiedelungsentscheidungen und Bleibeentscheidungen von Unternehmen, sondern auch den wirtschaftlichen Erfolg aller Unternehmen vor Ort. Das Interesse der politischen Einflussträger an der Attraktivität des Standortes und damit an der wirtschaftlichen Leistungsfähigkeit der örtlichen Unternehmen liegt einerseits an den lokalen Einnahmen, die mit der örtlichen Wirtschaftskraft verbunden sind, sowie am Interesse der Wähler und Wählerinnen an gut bezahlten Arbeitsplätzen (Vgl. Mäding, 2012).

Durch technischen Fortschritt und damit eingehend dem Strukturwandel von der Industriegesellschaft zur Dienstleistungsgesellschaft ist es nun allerdings möglich, immobile Produktionsfaktoren durch mobile

[1] Der vorliegende Beitrag entstand im Zuge des Projekts „Nachhaltige sozioökonomische Handlungs- und Entwicklungsperspektiven im Hinblick auf den Headquarterstandort Wien", gefördert im Rahmen der Fachhochschul-Ausschreibung Call Nr. 15: Ausbildungsbezogene Forschung und Entwicklung durch die Stadt Wien /MA 23 Arbeit, Wirtschaft und Statistik. Innovation und Technologie). Alle in dieser Arbeit dargestellten Meinungen, Erkenntnisse oder Empfehlungen sind die der Autorinnen und Autoren und spiegeln nicht unbedingt die der Kooperationspartner wider. Die Autorinnen und Autoren danken Bernhard Svoboda, Marija Tosic und Christoph Zeillinger für die Unterstützung bei der Primärdatenerhebung.

Produktionsfaktoren zu substituieren und ursprünglich immobile Produktionsfaktoren zu mobilisieren. Somit wird die Bindung von Unternehmen an Standorte zunehmend aufgehoben (Vgl. Deuster, 2013). Es ändert sich nicht nur die Bedeutung einzelner Standortfaktoren, die Produktion insgesamt wird standortunabhängiger (Vgl. Mäding, 2012).

Aktuelle Herausforderungen wie Digitalisierung, digitale Investments und digitale Ökonomien sind im Bereich Foreign Direct Investments (FDI) noch kaum ein Thema, erst recht nicht im Kontext der Headquarterpolitik. Es ist aber klar, dass die Digitalisierung einen wesentlichen Einfluss auf die Investitionsmuster hat und haben wird (Vgl. UNCTAD, 2017). Ein Teilaspekt sind digitale Unternehmen der Sharing Economy, die mit geringem Asset-Aufwand, einer starken Netz-, Software- und Kundenorientierung einen erheblichen disruptiven Wandel in den Bereichen Reisen, Carsharing, Finance, Musik-/Videostreams und Personalbeschaffung aber auch Logistik eingeleitet haben. Weiters haben sich die Entwicklungs- und Schwellenländer als wichtige Entscheidungsträger bei internationalen Investitionen etabliert und sind heute für mehr als ein Drittel der ausländischen Direktinvestitionen weltweit verantwortlich. Hier wiederum nehmen staatlich gelenkte Unternehmen, insbesondere aus den Schwellenländern, v.a. aus China, eine deutliche akzentuiertere Rolle ein als noch vor einigen Jahren. Auf globaler Ebene wurde die Verankerung der Nachhaltigkeit bei Investitionsentscheidungen zwar formal vorangetrieben (etwa durch die UNCTAD), allerdings bleibt die Umsetzung auf nationaler und regionaler Ebene noch die Ausnahme. Des Weiteren kann eine Rückkehr nationalstaatlich fokussierter Politik, nicht nur in den USA, sondern auch in Europa und dem Rest der Welt beobachtet werden.

Analysiert man Standortkriterien zur nachhaltigen Ansiedlung von (regionalen) Headquartern wird bemerkbar, dass sich die Gründe für eine Headquarteransiedlung in einer bestimmten Stadt gegenüber Anreizen von ausländischen Direktinvestitionen unterscheiden. Die Passung zum Zweck der Ansiedlung spielt bei der Headquarteransiedelung eine wesentlichere Rolle als generelle Standortvorteile. Unternehmen, die in einem Land wie Österreich (bzw. einer Stadt wie Wien) nach einem neuen Standort suchen, benötigen vor allem spezifische strategische Vermögenswerten wie Wissen, Forschungs- und Entwicklungsergebnisse, spezifische Marktkenntnisse oder Produktions-Know-how. (Vgl. Nachbagauer/Waldhauser, 2017). Multinationale Unternehmen stehen vor der Herausforderung, die richtige Balance zwischen der Befriedigung lokaler Bedürfnisse und der Nutzung globaler Synergien zu finden (Vgl. Ambos/Schlegelmilch, 2010). Grundsätzlich gilt daher, unternehmensbezogene Sichtweisen und politikökonomische Perspektiven (lokal, regional, national, multinational und letzten Endes globale) zu verflechten, um ein realitätsnahes Verständnis für das Thema entwickeln zu können (Vgl. Jäger/Springler, 2015). Aber auch Politisches Risk Management nimmt bei Standortentwicklungen an Bedeutung zu, nicht zuletzt im Kontext von nachhaltigen Investitionsentscheidungen und Betriebsansiedelungen (Vgl. Klopf/Nell/Leitner, 2017). Darüber hinaus gilt es zu berücksichtigen, dass die Auswirkungen von multinationalen Unternehmen auf Empfängerländer disaggregiert zu betrachten sind, da es einen Unterschied macht, ob es sich um Industrieländer oder Schwellenländer bzw. Entwicklungsländer handelt (Vgl. Jäger/Springler, 2015). Investitionen aus den sogenannten BRICS-Staaten – Brasilien, Russland, Indien, China und Südafrika – werden zunehmend bedeutender, auch wenn die Öffentlichkeit bzw. betroffene Unternehmen diesen oft skeptisch begegnen (Vgl. Franz/Henn, 2017). Dahinter steht u.a. die Befürchtung, dass das Ziel einer Investition sei, das Wissen aus den ansässigen Unternehmen abzuziehen. Studien für Deutschland zeigen aber, dass der hohe Know-how-Stand zwar ein wichtiger Investitionsgrund ist, die Angst vor einem schnellen Wissenstransfer trotzdem zumeist unbegründet ist (Vgl. Weingarten et al., 2015).

Der vorliegende Beitrag behandelt die Fragen, ob neu angesiedelte Headquarters nachhaltig agieren und im Sinne eines längeren Bestehens für den Wirtschaftsstandort Österreich nachhaltig sind, und schließt damit die bestehende Forschungslücke durch die Analyse der in Wien angesiedelten (regionalen) Headquarter hinsichtlich ausgewählten Nachhaltigkeitskriterien. Darüber hinaus erfordert die Berücksichtigung langfristiger Effekte einen genaueren Blick auf die interne Seite des Unternehmens, ebenfalls ein in der Standortdiskussion wenig berücksichtigter Faktor. Es wird in Nachbagauer/Waldhauser 2017 die Hypothese vertreten, dass eine Niederlassung bzw. ein regionaler Headquarter umso stabiler sein wird, je strategisch unabhängiger, mächtiger und selbstbewusster sie ist. Diese Charakteristika ermöglichen es einer lokalen Einheit auch, eine eigene Nachhaltigkeitsagenda zu verfolgen (Vgl. Nachbagauer/Waldhauser, 2017). Im Rahmen des vorliegenden Beitrags wird ein integrierter Nachhaltigkeitsbegriff, der auf dem Nachhaltigkeitsdreieck (Vgl. Kleine, 2009) beruht, vertreten, der einerseits eine gleichbedeutende

Aufmerksamkeit für die Bereiche Ökonomie, Ökologie und Soziales im Sinne des Brundtland-Reports und andererseits eine besondere Beachtung von positiven wie negativen Interaktionseffekten zwischen den Bereichen berücksichtigt (Vgl. Nachbagauer, 2015).

3 METHODISCHE VORGEHENSWEISE

Von den insgesamt 380 regionalen Unternehmenszentralen ausländischer Unternehmen (Stand 1.12.2016) sind 221 in Wien (dies entspricht 58%) angesiedelt (Vgl. Headquarters Austria, 2017). Diese bilden die Grundgesamtheit der nachfolgenden Untersuchung. Die Merkmale dieser Unternehmen wurden mittels Primär- und Sekundäranalyse erhoben und ausgewertet. Sekundärdaten hierfür waren die Websites der jeweiligen Unternehmen, Unternehmensdatenbanken sowie Zeitschriften- und Zeitungsartikel. Die Primärdatenerhebung erfolgte mittels schriftlicher Befragung. Ein Fragebogen zu ausgewählten Unternehmensmerkmalen wurde an die vorab kontaktierten Unternehmen ausgesandt. Nach der Erhebung wurden die Daten aufbereitet und ausgewertet. Der vorliegende Beitrag typologisiert die (regionalen) Headquarter in Wien hinsichtlich (1) Branchen, Herkunftsländern/-regionen und nach Anzahl der Mitarbeiterinnen und Mitarbeiter, (2) UNGC Mitgliedschaft, (3) Nachhaltigkeitsberichterstattung, (4) Vorhandensein von Nachhaltigkeitsbeauftragten, (5) Verpflichtung zu Nachhaltigkeitsstandards/Zertifizierungen und schließt mit (6) einer Inhaltsanalyse der Websites der (regionalen) Headquarters in Wien hinsichtlich Aktivitäten und Maßnahmen zur Umsetzung von ökologischer, ökonomischer und sozialer Nachhaltigkeit. Die vorliegende Untersuchung ist eine deskriptiv-analytische. Sie ermittelt existierende Sachverhalte sowie Beziehungen, die zwischen Sachverhalten bestehen, Ursache-Wirkungs-Zusammenhänge werden dabei nicht expliziert. Die Ergebnisse werden im Folgenden vorgestellt.

4 TYPOLOGISIERUNG DER HEADQUARTERSTANDORTE IN WIEN

4.1 Headquarters in Wien nach Branchen, Herkunftsländern/-regionen und nach Anzahl der Mitarbeiterinnen und Mitarbeiter

Branche	**%**	**absolut**
Herstellung von Waren	43,4%	96
Information und Kommunikation	12,7%	28
Erbringung von Finanz- und Versicherungsdienstleistungen	10,4%	23
Erbringung von freiberuflichen, wissenschaftlichen und technischen Dienstleistungen	7,2%	16
Verkehr und Lagerei	5,9%	13
Handel, Instandhaltung und Reparatur von Kraftfahrzeugen	5,4%	12
Erbringung von sonstigen wirtschaftlichen Dienstleistungen	4,1%	9
Bau	2,3%	5
Bergbau und Gewinnung von Steinen und Erden	1,8%	4
Energieversorgung	1,8%	4
Gesundheits- und Sozialwesen	1,4%	3
Wasserversorgung, Abwasser- und Abfallentsorgung und Beseitigung von Umweltverschmutzungen	0,9%	2
Erbringung von sonstigen Dienstleistungen	0,9%	2
Land- und Forstwirtschaft, Fischerei	0,5%	1
Beherbergung und Gastronomie	0,5%	1
Grundstücks- und Wohnungswesen	0,5%	1
Kunst, Unterhaltung und Erholung	0,5%	1

Tabelle 1: Headquarter in Wien nach Branche (% und absolute Werte)

Zwei Drittel (66,5%) aller in Wien ansässigen Headquarters beschäftigen sich mit der Herstellung von Waren, Information und Kommunikation oder der Erbringung von Finanz- und Versicherungsdienstleistungen.

Mehr als die Hälfte (57%) stammt aus der EU, der überwiegende Anteil davon aus Deutschland. Rund 17% der Unternehmen stammt aus den USA, aus Asien nur rund 8%.

Herkunftsland/-region	**absolut**	**%**
EU	126	57,0%
USA	38	17,2%
Rest-Europa	20	9,0%
Asien	18	8,1%
Russland	6	2,7%
Kanada	4	1,8%
Südamerika	4	1,8%
Afrika	3	1,4%
Australien/Neuseeland	2	0,9%

Tabelle 2: Headquarters in Wien nach Herkunftsland/-region

Die Klassifikation der Headquarters in Wien nach Anzahl der Mitarbeiterinnen und Mitarbeiter folgt der Empfehlung der EU-Kommission betreffend die Definition der Kleinstunternehmen sowie der kleinen und mittleren Unternehmen (Vgl. Kommission der Europäischen Gemeinschaften, 2003). Rund 12% sind demnach Kleinstunternehmen (bis 9 Personen), ca. 30% kleine Unternehmen (10-49 Personen), 32% mittlere Unternehmen (50-249 Personen) sowie rund 17% Großunternehmen (ab 250 Personen).

4.2 Headquarters in Wien & UNGC Mitgliedschaft

Global Compact bzw. United Nations Global Compact (UNGC) ist eine weltweite Übereinkunft, geschlossen zwischen Unternehmen und der UNO, um die Globalisierung sozialer und ökologischer zu gestalten (siehe dazu: https://www.unglobalcompact.org/). Als zentrales Element des UN Global Compact gelten die 10 universellen Prinzipien und die Unterstützung der 17 Sustainable Development Goals der Vereinten Nationen. Die 10 Prinzipien beinhalten die Themen Arbeitsnormen, Menschenrechte, Umweltschutz und Korruptionsbekämpfung. Organisationen, die am UN Global Compact teilnehmen möchten, bekennen sich zur Durchsetzung dieser universellen Prinzipien und zur Unterstützung der Sustainable Development Goals. Unternehmen geben einmal jährlich einen Bericht ab, den sogenannten COP („Communication on Progress“), in dem sie darlegen, welche Maßnahmen sie dazu umsetzen. Andere Organisationen berichten alle zwei Jahre, wie sie die Initiative vorantreiben (Vgl. Global Compact, 2017). Für die Gestaltung jenes Berichts werden den Mitgliedern kaum Vorgaben vorgeschrieben. Wesentlich ist auf jeden Fall die Beachtung der Mindesterfordernisse, die jede Veröffentlichung zwingend beinhalten muss. Dazu zählen eine Erklärung des Vorstandsvorsitzenden, sowie eine Beschreibung von praktischen Handlungen, die in den Bereichen Menschenrechte, Arbeit, Umwelt und Anti-Korruption geplant sind, oder schon umgesetzt wurden. Da sich die vielen Mitglieder auf unterschiedlichen Niveaus befinden, werden die COPs in drei verschiedene Levels kategorisiert. Jene reichen von einem Einsteiger- bis zu einem Experten-Level. Außerdem werden geltende Standards (z.B. GRI) berücksichtigt, um einheitliche Rahmen zu erfüllen (Vgl. Global Compact, 2013).

Die UNGC-Mitgliedschaft wurde anhand der Mitgliederliste unter https://www.unglobalcompact.org/what-is-gc/participants überprüft (Vgl. UN Global Compact, 2017).

Rund ein Viertel aller in Wien ansässigen Headquarters sind UNGC-Mitglied. Betrachtet man die Ergebnisse nach der Branche (die Klassifizierung erfolgt anhand der ÖNACE-2008-Klassifikation (Vgl. Statistik Austria, 2017)), so zeigt sich, dass Unternehmen der Branchen H: Verkehr und Lagerei, G: Handel, Instandhaltung und Reparatur von Kraftfahrzeugen, N: Erbringung von sonstigen wirtschaftlichen Dienstleistungen, C: Herstellung von Waren und J: Information und Kommunikation UNGC-Mitglieder. überdurchschnittlich häufig UNGC Mitglieder sind. Unternehmen der Branchen K: Erbringung von Finanzund Versicherungsdienstleistungen sowie M: Erbringung von freiberuflichen, wissenschaftlichen und technischen Dienstleistungen weisen am wenigsten oft eine UNGC-Mitgliedschaft auf.

Beachtenswert sind auch die Unterschiede in der UNGC-Mitgliedschaft nach Herkunftsländern/-regionen. Während 27% aller Headquarters in Wien, welche ihren Ursprung bzw. Hauptsitz in der EU haben, UNGC-Mitglied sind, liegt die Mitgliedschaft bei aus den USA stammenden Unternehmen bei nur 15,8%.

Herkunft	**Anzahl Unter-nehmen**	**Nachh. Bericht**	**kein Nachh. Bericht**	**keine Angabe**	**Nachh. Bericht (%)**	**kein Nachh. Bericht (%)**	**keine Angabe (%)**
Afrika	3	2	1		66,7%	33,3%	0,0%
Asien	18	13	2	3	72,2%	11,1%	16,7%
Australien/ Neuseeland	2		2		0,0%	100,0%	0,0%
EU	126	43	77	6	34,1%	61,1%	4,8%
Kanada	4	1	2	1	25,0%	50,0%	25,0%
Rest-Europa	20	6	12	2	30,0%	60,0%	10,0%
Russland	6	4	2		66,7%	33,3%	0,0%
Südamerika	4	3	1		75,0%	25,0%	0,0%
USA	38	20	14	4	52,6%	36,8%	10,5%
Summe	221	92	113	16	41,6%	51,1%	7,2%

Tabelle 3: Nachhaltigkeitsberichterstattung nach Herkunftsländern/-regionen

Betrachtet man nun die Teilgruppe jener Unternehmen, die ihren Sitz in den BRICS-Staaten haben (dies sind in der vorliegenden Untersuchung 14 Unternehmen), so sind 8 davon UNGC Mitglied.

4.3 Headquarters in Wien & Nachhaltigkeitsberichterstattung

Neben der Erhebung, ob die untersuchten Headquarters in Wien Nachhaltigkeitsberichte veröffentlichen, wurde geprüft, ob diese Berichterstattungsstandards (GRI-G3, G4) folgen. Dies erfolgte durch Abfrage der Global Reporting Initiative (GRI)-Datenbank: http://database.globalreporting.org/search/.

42% aller untersuchten Headquarters in Wien veröffentlichen einen Nachhaltigkeitsbericht. Welchen Berichterstattungsstandards sie folgen, kann aus der folgenden Tabelle entnommen werden.

BERICHTERSTATTUNGSSTANDARDS	**Anzahl Unternehmen absolut**	**Anzahl Unternehmen %**
Citing - GRI	2	2,2%
GRI	20	21,7%
GRI - Standards	2	2,2%
GRI-G3	7	7,6%
GRI-G4	56	60,9%
Non - GRI	5	5,4%
	92	100,0%

Tabelle 4: Nachhaltigkeitsberichterstattung

Untersucht man die Unterschiede in der Nachhaltigkeitsberichterstattung nach Branche bzw. nach Herkunftsländern/-regionen zeigt sich, dass es zwar Unterschiede nach Branchen gibt, jene nach Herkunftsländern aber deutlicher sind. So werden von Unternehmen, deren Herkunftsland in Asien oder in den USA liegt, häufiger Nachhaltigkeitsberichte gelegt als von Unternehmen, die Ihren Stammsitz innerhalb der EU haben. Von jenen 14 Unternehmen aus den BRICS-Staaten legen 10 einen Nachhaltigkeitsbericht.

4.4 Headquarters in Wien & Nachhaltigkeitsbeauftragte

In 21 der untersuchten 221 Unternehmen ist aufgrund einer Homepageanalyse der untersuchten Unternehmen ein/e für das österreichische Headquarter zuständige Nachhaltigkeitsbeauftragte/-r vorzufinden. Dies entspricht knapp 10% der Unternehmen. Dieser Anteil ist auch in der Gruppe der Unternehmen aus den BRICS-Staaten beobachtbar.

4.5 Headquarters in Wien & Nachhaltigkeitsstandards/Zertifizierungen

Ob die untersuchten Unternehmen relevante Zertifizierungen aufweisen oder sich gewissen Nachhaltigkeitsstandards verpflichtet haben, wurde ebenfalls mittels Homepageanalyse untersucht. 130 der untersuchten Unternehmen, das sind nahezu drei Fünftel, weisen zumindest eine relevante Zertifizierung (z.B. ISO 9001, ISO 14001, OHSAS 18001) auf oder folgen Nachhaltigkeitsstandards. Auch hier ergeben sich in der Teilgruppe der BRICS-Staaten keine Unterschiede.

Kleinstunternehmen verfügen weniger häufig über Zertifizierungen, ab einer Mitarbeiterinnen- und Mitarbeiteranzahl von über 10 Personen sind durchschnittlich rund zwei Drittel der Unternehmen zertifiziert.

Kategorie	**Anzahl Unternehmen**	**Zertifizierung**	**keine Zertifizierung**	**Zertifizierung (%)**	**keine Zertifizierung (%)**
Kleinst-unternehmen	27	9	18	33,3%	66,7%
Kleines Unternehmen	65	44	21	67,7%	32,3%
Mittleres Unternehmen	71	45	26	63,4%	36,6%
Großunternehmen	37	24	13	64,9%	35,1%
keine Angabe	21	8	13	38,1%	61,9%
Summe	221	130	91	58,8%	41,2%

Tabelle 5: Zertifizierungen/Nachhaltigkeitsstandards nach Unternehmensgröße

4.6 Headquarters in Wien & Nachhaltigkeit in der Unternehmensdarstellung

Hinweise auf Nachhaltigkeit von Unternehmen finden sich häufig auch implizit in den Unternehmensdarstellungen und geben ferner ein Bild, was unter Nachhaltigkeit aus Unternehmenssicht verstanden werden kann. Daher wurde eine Inhaltsanalyse der Websites der (regionalen) Headquarters in Wien hinsichtlich Aktivitäten und Maßnahmen zur Umsetzung von ökologischer, ökonomischer und sozialer Nachhaltigkeit durchgeführt.

Aktivitäten und Maßnahmen, welche unter ökologischer Nachhaltigkeit subsumiert werden können, umfassen (gereiht nach der Häufigkeit des Vorkommens):

- CO_2-Emissionen senken/CO_2-neutral agieren
- Einsatz „grünen Stroms“
- Ressourceneinsatz senken bzw. optimieren/Ressourcen schonen/Einsatz nachhaltiger Ressourcen/energieeffiziente Produktion
- Abfälle reduzieren/Abfallmanagement/Recycling
- Reduktion des Wasserverbrauchs
- Nachhaltiges Bauen/Wärmeeffizientes Bauen
- Einhaltung der Umweltschutzgesetze

Aktivitäten und Maßnahmen, welche unter ökonomischer Nachhaltigkeit subsumiert werden können, finden sich weniger häufig auf den untersuchten Websites der Unternehmen. Am häufigsten werden genannt:

- Treffen von nachhaltigen Entscheidungen
- Investition in nachhaltige Technologien/nachhaltige Investitionen

- Fokus auf Qualitätssicherung/ständige Qualitätssicherung/umfassendes Qualitätsverständnis
- Nachhaltiges wirtschaftliches Wachstum
- Nachhaltige Finanzprodukte und Anlagestrategien
- Langfristige Lieferantenbeziehungen/Kooperationen mit Lieferanten
- Nachhaltiges SCM/nachhaltige Lieferketten

Soziale Nachhaltigkeit stellt auf ein menschenwürdiges Leben ab, bei dem materielle und immaterielle Grundbedürfnisse gedeckt werden. „Arbeit“ spielt dabei eine zentrale Rolle. Im Zusammenhang mit Unternehmen und CSR wird soziale Nachhaltigkeit meist auf die Arbeitsbedingungen der Mitarbeiterinnen und Mitarbeiter bezogen. Dies zeigt sich auch in der vorliegenden Untersuchung. Am häufigsten werden folgende Aktivitäten und Maßnahmen von den untersuchten Unternehmen angeführt:

- Laufende Aus- und Weiterbildung der Mitarbeiterinnen und Mitarbeiter/Talenteförderung
- Sichere/angepasste Arbeitsplatzgestaltung/gute Arbeitsplatzbedingungen
- Fairer Lohn
- Flexible Arbeitszeitmodelle
- Arbeitsschutz/Arbeitsplatzsicherheit
- Gesundheitsmanagement/Fitnessangebote
- Freundliche Arbeitsumgebung/gutes Arbeitsklima/verantwortungsvoller Umgang mit Mitarbeiterinnen und Mitarbeitern
- Unterstützung Familie & Beruf/Betriebskindergarten
- Lehrlingsausbildung
- Mitarbeiterkantine
- Soziales Engagengement/lokale soziale Programme
- Achtung der Menschenrechte

5 LIMITATIONEN

In der vorliegenden Unterschung wurde eine Typologisierung der Headquarteransiedelungen im Hinblick auf die Nachhaltigkeit deskriptiv nach UNGC Mitgliedschaft, der Nachhaltigkeitsberichterstattung, Vorhandensein von Nachhaltigkeitsbeauftragten, Verpflichtung zu Nachhaltigkeitsstandards bzw. Zertifizierungen sowie einer inhaltlichen Analyse der Aktivitäten und Maßnahmen zur Umsetzung von ökologischer, ökonomischer und sozialer Nachhaltigkeit vorgenommen. Sie stützt sich somit im Wesentlichen auf formelle Bekenntnisse, Eigenauskünfte bzw. Sekundärdaten, wie die Websites der jeweiligen Unternehmen, Unternehmensdatenbanken sowie Zeitschriften- und Zeitungsartikel und durch Agenturen bestätigte Bekenntnisse der Unternehmen zur Nachhaltigkeit.

Dabei wurde davon ausgegangen, dass die zur Verfügung gestellten Informationen den Anforderungen der Vollständigkeit, Angemessenheit und Richtigkeit entsprechen. Eine zusätzliche inhaltliche Überprüfung der Daten oder eine Prüfung auf Differenzen zwischen Unternehmensangaben und widersprüchlichem tatsächlichen Handeln der Unternehmen wurde nicht vorgenommen.

6 CONCLUSION

Der vorliegende Beitrag behandelt die Fragen, ob in Wien angesiedelte Headquarters nachhaltig agieren und im Sinne eines längeren Bestehens für den Wirtschaftsstandort Österreich nachhaltig sind, und schließt damit die bestehende Forschungslücke durch die Analyse der in Wien angesiedelten (regionalen) Headquarter hinsichtlich ausgewählten Nachhaltigkeitskriterien.

Der Global Compact der Vereinten Nationen ist die weltweit größte Initiative zu CSR und nachhaltiger Entwicklung. Als zentrales Element des UN Global Compact gelten die 10 universellen Prinzipien, welche die Themen Arbeitsnormen, Menschenrechte, Umweltschutz und Korruptionsbekämpfung beinhalten, und

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die Unterstützung der 17 Sustainable Development Goals (SDGs)[2] der Vereinten Nationen. Am UN Global Contact teilnehmende Organisationen bekennen sich zur Durchsetzung der 10 universellen Prinzipien und zur Unterstützung der 17 SDGs. Rund ein Viertel aller in Wien ansässigen Headquarters sind UNGC-Mitglied. Dies spielt im Zusammenhang mit den SDGs, also jenen global gültigen Zielen für nachhaltige Entwicklung, welche auch in Österreich für Bund, Länder und Gemeinden handlungsleitend sind (Vgl. Umweltbundesamt, 2017), eine bedeutende Rolle. Von heute bis zum Jahr 2030 sollen Maßnahmen und Initiativen für ein nachhaltiges, inklusives und dauerhaftes Wirtschaftswachstum, für nachhaltige Konsum- und Produktionsmuster, geteilten Wohlstand sowie für den Schutz unseres Planeten und seiner natürlichen Ressourcen gemeinsam getroffen werden. In Österreich wurde im September 2017 ein erster Fortschrittsbericht zu den SDGs vom Bundesministerium für Land- und Forstwirtschaft, Umwelt und Wasserwirtschaft veröffentlicht. Dieser hat aber nicht nur die Grundlage für die Erarbeitung der kurzfristigen nächsten Schritte zur Umsetzung der SDGs geschaffen, sondern er macht auch deutlich, dass nachhaltige Entwicklung nur durch eine breite Partnerschaft mit anderen Bundesstellen, den Ländern, den Interessensvertretungen, der Wirtschaft und einer breiten Einbindung der Zivilgesellschaft erreicht werden kann. (Vgl. BMLFUW, 2017).

Die Nachhaltigkeitsberichterstattung unterstützt Unternehmen, Ziele zu setzen, Leistung zu messen und Veränderungen umzusetzen, um ihre Geschäftstätigkeit nachhaltiger zu gestalten. Internationale Standards gewährleisten, dass in Nachhaltigkeitsberichten enthaltene Daten zugänglich und vergleichbar sind und bieten Stakeholdern dadurch aussagekräftige Informationen für Entscheidungen (Vgl. Global Reporting Initiative, 2017). Neben der Erhebung, ob die untersuchten Headquarters in Wien Nachhaltigkeitsberichte veröffentlichen, wurde daher geprüft, ob diese Berichterstattungsstandards folgen. Etwas mehr als zwei Fünftel aller untersuchten Headquarters in Wien veröffentlichen einen Nachhaltigkeitsbericht. Die überwiegende Mehrheit berichtet nach dem GRI-G4 Standard. Dies ergibt insgesamt ein sehr positives Bild hinsichtlich Nachhaltigkeitsberichterstattung durch die in Wien ansässigen Headquarter.

Grundsätzlich belegen Zertifikate Leistungen und dienen als Handlungsanleitung nach innen und als Reputation nach außen. Nahezu drei Fünftel weisen zumindest eine hinsichtlich Nachhaltigkeit relevante Zertifizierung (z.B. ISO 9001, ISO 14001, OHSAS 18001) auf oder folgen Nachhaltigkeitsstandards. Kleinstunternehmen verfügen weniger häufig über Zertifizierungen, ab einer Mitarbeiteranzahl von über 10 Personen sind durchschnittlich rund zwei Drittel der Unternehmen zertifiziert. Dies stellt ein wichtiges Zeichen für CSR-Engagement der Headquarters in Wien dar und liefert unter anderem einen deutlichen Hinweis auf nachhaltiges Agieren der untersuchten Unternehmen.

Denselben Schluss lässt die Inhaltsanalyse der Websites der (regionalen) Headquarters in Wien hinsichtlich Aktivitäten und Maßnahmen zur Umsetzung von ökologischer, ökonomischer und sozialer Nachhaltigkeit zu. Auf nahezu allen Unternehmenswebsites sind Hinweise auf ökologische und/oder ökonomische und/oder soziale Nachhaltigkeit zu finden.

Aufbauend auf diese erste Kategorisierung der Headquarters in Wien hinsichtlich Nachhaltigkeitskriterien kann in Folge eine Potenzialanalyse für die zukünftige Entwicklung des Headquarter Standortes Wien entwickelt werden. Dadurch würden beispielsweise Fragen, welche Unternehmenstypen aus welchen Regionen im Sinne einer nachhaltigen Standortentwicklung für Wien relevant sein könnten, beantwortet werden.

7 REFERENCES

Ambos, B./Schlegelmilch, B.: The New Role of Regional Management. Basingstoke u.a., 2010.

BMLFUW (2017): 1. Fortschrittsbericht des BMLFUW zu den Sustainable Development Goals. In: https://www.bmlfuw.gv.at/umwelt/nachhaltigkeit/nachh_strategien_programme/sdgs_fortschrittsbericht2017.html, 2017 (4.12.2017).

Deloitte: Deloitte Radar 2017 - Attraktivität des Wirtschaftsstandortes Österreich. In: https://www2.deloitte.com/at/de/seiten/press-release/deloitte-radar-2017.html (02.12.2017), 2017.

[2] 1. Keine Armut, 2. Kein Hunger, 3. Gesundheit und Wohlergehen, 4. Hochwertige Bildung, 5. Geschlechtergleichheit, 6. Sauberes Wasser und Sanitäreinrichtungen, 7. Bezahlbare und saubere Energie, 8. Menschenwürdige Arbeit und Wirtschaftswachstum, 9. Industrie, Innovation und Infrastruktur, 10. Weniger Ungleichheiten, 11. Nachhaltige Städte und Gemeinden, 12. Nachhaltige/r Konsum und Produktion, 13. Maßnahmen zum Klimaschutz, 14. Leben unter Wasser, 15. Leben an Land, 16. Frieden, Gerechtigkeit und starke Institutionen, 17. Partnerschaften zur Erreichung der Ziele (Vgl. Umweltbundesamt, 2017).

Deuster, J.: Internationale Standortverlagerungen deutscher Unternehmen: Systematisierung — Bestimmungsfaktoren — Auswirkungen, Heidelberg: Springer-Verlag, 2013.
Franz, M./Henn, S.: Investitionen aus den BRIC-Staaten: Grund zur Sorge für Unternehmen, Beschäftigte und Kommunen?. In: Standort, Vol. 41, 1, S. 3-8, 2017.
Global Compact: Richtlinien des Global Compacts der Vereinten Nationen zu Fortschrittsberichten. In: https://www.unglobalcompact.org/docs/communication_on_progress/translations/COP_Policy_DE.pdf (17.06.2017), 2013.
Global Compact: Das Netzwerk. In: https://globalcompact.at/ (19.7.2017), 2017.
Global Reporting Initiative: G4 – Leitlinien zur Nachhaltigkeitsberichterstattung. In: https://www.globalreporting.org/resourcelibrary/German-G4-Part-One.pdf (19.12.2017), 2017.
Headquarters Austria: 221 Headquarters in Wien. In: http://www.headquarters-austria.at/2016/221-headquarters-in-wien/ (18.7.2017), 2017.
Jäger, J./Springler, E.: Eigentumsstrukturen, grenzüberschreitende Investitionen und Entwicklungsdynamiken, Number 87/ 2015, Working Paper Series by the University of Applied Sciences BFI Vienna. In: http://www.fh-vie.ac.at/var/em_plain_site/storage/original/application/6b384db6bec32f058ceb501a9619d97d.pdf, 2015.
Kleine, A.: Operationalisierung einer Nachhaltigkeitsstrategie. Ökologie, Ökonomie und Soziales integrieren. Wiesbaden: Gabler, 2009.
Klopf, P./Nell, P./Leitner, J.: It's the Politics, Stupid! Politik als Risikofaktor für Betriebe. In: https://diepresse.com/home/meinung/gastkommentar/5289178/Its-the-Politics-Stupid-Politik-als-Risikofaktor-fuer-Betriebe, 2017 (21.12.2017).
Kommission der Europäischen Gemeinschaften (2003): Empfehlung der Kommission vom 6. Mai 2003 betreffend die Definition der Kleinstunternehmen sowie der kleinen und mittleren Unternehmen. In: Amtsblatt der Europäischen Union L 124/36, 20.5.2003.
Mäding, H.: Strategische Regionsbildung: Ein neuer Ansatz zur Positionierung der Kommunen im Standortwettbewerb. In: Kauffmann, A. (2012): Städte und Regionen Im Standortwettbewerb: Neue Tendenzen, Auswirkungen und Folgerungen Für Die Politik, Band 238 von Forschungs- und Sitzungsberichte der ARL.: Akademie für Raumforschung und Landesplanung, 2012.
Nachbagauer, A.: Charakterisierung eines Begriffes der sozioökonomischen Nachhaltigkeit für Headquarterstandorte, Number 85/ 2015, Working Paper Series by the University of Applied Sciences BFI Vienna. In: http://www.fh-vie.ac.at/var/em_plain_site/storage/original/application/ba034dcecf71bc9e7217607482918c38.pdf (4.12.2017), 2015.
Nachbagauer, A./Waldhauser, B.: Standortkriterien zur nachhaltigen Ansiedlung von regionalen Headquartern, Number 93/ 2017, Working Paper Series by the University of Applied Sciences BFI Vienna. In: http://www.fh-vie.ac.at/var/em_plain_site/storage/original/application/cfea6ae95b3576b9f2d1032c7adef82d.pdf (2.12.2017), 2017.
Siebert, H.: Zum Paradigma des Standortwettbewerbs, Band 165 von Beiträge zur Ordnungstheorie und Ordnungspolitik, Tübingen: Mohr Siebeck, 2000.
Statistik Austria: Klassifikationen. In: https://www.statistik.at/web_de/klassifikationen/index.html (18.7.2017), 2017.
Umweltbundesamt: Die AGENDA 2030 für nachhaltige Entwicklung. In: http://www.umweltbundesamt.at/umweltsituation/nachhaltigkeit/nachhaltig/17_sdg/), 2017 (4.12.2017).
UNCTAD: World Investement Report 2017: Investment and the digital economy. In: http://unctad.org/en/PublicationsLibrary/wir2017_en.pdf (21.12.2017).
Weingarten, J./Franz, M./Henn, S.: BRICINVEST -Investoren aus den BRIC-Staaten und Arbeitnehmerinteressen in Deutschland, in: https://www.boeckler.de/pdf_fof/91240.pdf, 2015 (11.01.2018).

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Urban Relations – über die Bedeutung der Beziehungsebene in der Stadt(teil)entwicklung

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1 ABSTRACT

Das Wachstum urbaner Ballungsräume setzt sich fort. Damit intensivieren sich zunehmend auch die potenziellen ökologischen, ökonomischen, infrastrukturellen und (sozial-, migrations-, raum- wie auch informations-) politischen Herausforderungen. Technologische Einzellösungen adressieren abgrenzbare Probleme oder Ziele, vermögen komplexe und wechselseitig in Beziehung stehendende Herausforderungen jedoch nicht zu lösen. Die großen Herausforderungen für die Stadt(teil)entwicklung umfassen Aus- und Umbau urbaner Infrastrukturen, leistbare Wohnversorgung, ökonomische Resilienz und nachhaltigen Umgang mit Ressourcen ebenso wie urbane Identitätsbildung, sozialen Zusammenhalt und die Integration heterogener Individuen, Gruppen und Nachbarschaften. Nur unter ganzheitlicher Betrachtung der Städte und Stadtteile als dynamische aktive Organismen „der Vielen" kann es gelingen diese als lebenswerte, inklusive und menschenorientierte Orte zu erhalten bzw. zu entwickeln. Europäische und nationale Strategien und Ausschreibungen (beispielsweise JPI URBAN EUROPE oder SMART CITIES DEMO) fordern zunehmend sektoren-übergreifende und interdisziplinäre Forschungs- und Umsetzungsprojekte nachhaltiger Stadtentwicklung, auch unter Öffentlichkeitsbeteiligung. In lokalen Entwicklungskonzepten wird Bürgerbeteiligung strategisch verankert (beispielsweise im STEK 4.0 Graz). Viel zu oft bleiben Partizipation und Öffentlichkeitsbeteiligung jedoch Worthülsen und Lippenbekenntnissen oder beschränken sich darauf Instrumente eines Governancediskurses zu sein, der effizienteres und effektiveres Regieren in den Mittelpunkt stellt (vgl. FEINDT, Peter; NEWIG, Jens 2008). Viel zu oft bleibt es jedoch bei Worthülsen und Lippenbekenntnissen.

Wir verstehen Partizipation und Öffentlichkeitsbeteiligung weit über Bürgerbeteiligung hinaus umfassender im Sinne kooperativer Stadt(teil)entwicklung. Nehmen wir diesen Begriff ernst, so bedarf es neben einer bejahenden Grundhaltung aller Beteiligten konkreter Schritte, sorgfältig entwickelter Methoden und klarer Rahmenbedingungen, um etwa hoheitliche Strategien und Planungsverfahren mit informellen Prozessen zu verschränken oder divergierende private und öffentliche Interessen diskursiv (vgl. PFENNING, Uwe; BENIGHAUS, Christina, 2008) zu verhandeln. Damit können Vertrauen und Verbindlichkeit zwischen Projektpartnerinnen, Projektpartner, Stakeholderinnen und Stakeholder aufgebaut und in langfristigen Planungs- und Entwicklungsprozessen erhalten werden.

Kooperative Stadt(teil)entwicklung gestaltet und reflektiert die Beziehungen urbaner Akteure und Akteursgruppen, Netzwerke und Systeme. Sie adressiert ihre unterschiedlichen Ausgangsbedingungen, Interessen, Bedürfnisse, Rechte, Problemlagen, und Potenziale als Chance für die Entwicklung lebenswerter, resilienter und nachhaltiger Stadtteile. Kooperative Stadt(teil)entwicklung bringt somit notwendigerweise Menschen frühzeitig, persönlich und auf Augenhöhe in BEZIEHUNG und schafft damit die Voraussetzungen für den notwendigen Interessensausgleich zwischen den urbanen Akteurs- und Anspruchsgruppen. Methoden, Settings und Räume sind entsprechend zu entwickeln. Asymetrien aufgrund unterschiedlichen Zugangs zu Wissen, Definitions- und Entscheidungsmacht gilt es bewusst zu machen, zu reflektieren und auszugleichen (vgl. GOHL, Christopher; WÜST, Jürgen, 2008).

In mehreren Projekten in verschiedenen Stadtteilen in Graz und Umgebung konnte das StadtLABOR diesen Ansatz praktisch entwickeln bzw. erproben. Die Umsetzung in die tägliche Projekt-, Planungs- und Beteiligungspraxis wirft über die Theorie hinaus viele Fragen und Herausforderungen auf. Was haben wir aus kooperativen Prozessen bis dato gelernt? Was hat sich bewährt und was sind die konkreten Stolpersteine? Für wen und womit sind kooperative Stadt(teil)entwicklungsprozesse relevant und mit welchen (un)intendierten Auswirkungen? Welcher Ressourcen, Bedingungen und Wirksamkeitsanalyse bedürfen diese? Was können Akteure unterschiedlicher Sektoren, Institutionen oder Unternehmen zum Gelingen kooperativer Beziehungen zwischen Menschen in der Planungs- und Entwicklungspraxis von Städten und Stadtteilen beitragen, damit wir die großen Herausforderungen erfolgreich bewältigen?

Das Paper spannt den Bogen von theoretischen und stategisch-politischen Betrachtungen kooperativer und integrativer Stadtentwicklung über die Beschreibung deren Grundsätze und Haltungen bis zu Casestudies aus

der praktischen Arbeit im StadtLABOR. Lessons learnt und Handlungsempfehlungen für die Zukunft schließen den Beitrag ab.

Keywords: kooperative Planung, Partizipation, Stadtentwicklung, Urbanität, Transformation

2 EINLEITUNG - THEORETISCHE UND STRATEGISCHE GRUNDLAGEN KOOPERATIVER STADTTEILENTWICKLUNG

Die Herausforderungen für Europas Städte sind komplex und mannigfaltig. Der Urbanisierungsgrad, also der Anteil der Stadtbewohner an der Gesamtbevölkerung, lag im Jahr 2016 im EU-Schnitt bei 75% (vgl. DE.STATISTA.COM), in Österreich bei knapp 66%. Die meisten Prognosen gehen davon aus, dass die Urbanisierung weiter anhalten wird. Erste spürbare Auswirkungen sind steigende Immobilienpreise, Verkehrsüberlastung, Luftverschmutzung, die Verknappung von Grünflächen und attraktivem öffentlichen Raum und - damit verbunden - das Problem der städtischen Überhitzung in dicht verbauten Gebieten („urban heat islands“).

Angesichts der Dringlichkeit und Komplexität urbaner Herausforderungen muss klar sein, dass „business as usual“ und Silo-Denken diese Probleme nicht lösen werden. Um die Lebensqualität in Europas Städten nachhaltig zu sichern, braucht es neue gesellschaftliche Praktiken und Governance-Systeme sowie neben der inhaltlich/fachlichen Ebene eine noch stärkere Berücksichtigung der Prozess-/Verfahrensebene. Beteiligung sowie kooperative und integrative Planungsansätze gewinnen zunehmend an Bedeutung.

Der Begriff Stadtentwicklung wird hier als aktiver Planungs- und Veränderungsprozess verstanden, bei dem es um die Steuerung der Gesamtentwicklung einer Stadt bzw. eines Stadtteils geht. Dies beinhaltet immer auch die gesellschaftliche, wirtschaftliche, kulturelle und ökologische Entwicklung, sodass Stadtentwicklung eine interdisziplinäre, integrierte und zukunftsgerichtete Herangehensweise verlangt (vgl. WIKIPEDIA, 2018).

„Erkunden, Informieren, Präsentieren, Diskutieren, Moderieren, Motivieren, Koordinieren, Akzeptanz fördern, Beteiligen, um Konsens streiten, gemeinsam nach Lösungen suchen, zum Handeln anregen…all dies sind Kommunikationsaufgaben, denen sich diejenigen stellen müssen, die eine Bauaufgabe bewältigen, ein Projekt entwickeln, ein Quartier erneuern, einen Flächennutzungs-, Landschafts- oder Stadtentwicklungsplan aufstellen und umsetzen wollen. Keine Planungsaufgabe kann allein als Sachfrage begriffen werden. Sie ist immer auch, und zwar von Beginn an, eine Verfahrensfrage.“ (SELLE Klaus, 1996).

Gesellschaftliche Teilhabe und Beteiligung sind ein demokratisches Grundprinzip und wesentliches Element der Urbanisierung. Beteiligung (Partizipation) meint allgemein gesprochen die Teilnahme von Menschen und Organisationen an gesellschaftlichen und politischen Meinungsbildungs- und Entscheidungsprozessen. Beteiligung kann auf den Stufen der Information, Konsultation oder Mitbestimmung erfolgen (vgl. BUNDESKANZLERAMT 2008), wobei der Zugang zu Information natürlich die Voraussetzung aller weiteren Formen von Kommunikation und Beteiligung ist. Auf höheren Stufen zielt Beteiligung immer auch auf eine Stärkung der Entwicklungsmöglichkeiten und Selbstwirksamkeit der Menschen ab (Empowerment).

Die frühzeitige Einbindung relevanter Personen und Gruppen (Stakeholder) in Stadt(teil)entwicklungen sowie Governance im Sinne offener, transparenter und partizipativer Entscheidungsfindungsprozesse werden in europäischen und internationalen Strategiedokumenten mehrfach explizit gefordert:

- Die Leipzig-Charta zur nachhaltigen europäischen Stadt (2007) beschreibt gemeinsame Grundsätze und Strategien für die Stadtentwicklungspolitik und fordert u.a. die Einbeziehung der wirtschaftlichen Akteure, Interessensgruppen und der Öffentlichkeit in integrierte Stadtentwicklungsprogramme. Dabei sollen auf lokaler und stadtregionaler Ebene Bürgerinnen und Bürger und andere Beteiligte einbezogen werden, die maßgeblich zur Gestaltung der zukünftigen wirtschaftlichen sozialen, kulturellen und ökologischen Qualität der Gebiete beitragen können.
- Die Städteagenda für die EU (Pakt von Amsterdam 2016) anerkennt die Schlüsselrolle von Städten in der Bewältigung der drängendsten Herausforderungen (Klimawandel, Flüchtlings- und Integrationsfragen) und fordert eine stärkere Einbindung städtischer Behörden in die Verwirklichung der Unionsziele und Erarbeitung von EU-Rechtsvorschriften. Das Wissen darüber, wie sich städtische Gebiete entwickeln, sowie Erfahrungen und Erfolgsmodelle sollen besser verbreitet, verwertet und umgesetzt werden. Es werden 12 urbane Schwerpunktthemen genannt (u.a.

Wohnungswesen, Klimawandelanpassung, Energiewende, städtische Mobilität, digitaler Wandel) und verschiedene Querschnittsmaterien, die für alle Themen relevant sind. Zu erwähnen sind die Themen „integrativer und partizipativer Ansatz“ sowie „effektives Stadtmanagement, einschließlich Bürgerbeteiligung und neue Stadtmanagementmodelle“.

- Die Neue Urbane Agenda (2016) der Vereinten Nationen (UN) ist ein auf 20 Jahre ausgelegtes globales nicht rechtsverbindliches Rahmenabkommen zur Stadtentwicklung. Sie zielt darauf ab, nachhaltige Entwicklung und Stadtentwicklung miteinander zu verbinden und Städte zu zentralen Akteuren der Nachhaltigkeitspolitik zu machen. Auch hier werden Partizipation in Planungs- und Umsetzungsprozessen sowie Mitsprache auf Augenhöhe gefordert.

Die theoretischen Arbeiten des französischen Philosophen und Soziologen Henri Lefebvre sind auch in Bezug auf die aktuellen gesellschaftlichen Herausforderungen von Städten relevant und Quelle für einen zukunftsfähigen kooperativen Urbanismus. Nach seinen Überlegungen ermöglichen Stadt und Raum, die urbane Situation, Begegnungen zwischen unterschiedlichsten Personen und Gruppen und somit wechselseitige Inspiration und kollektives Agieren. Die Stadt als Œuvre darf nicht im Detail rationalistisch geplant oder standardisiert werden, sondern muss kollektiv entstehen. Urbanisierung ist mehr als die bloße Konzentration von Menschen in städtischen Gebieten, Urbanisierung ist auch als Prozess des umfassenden sozialen Wandels zu verstehen, der nur mit unterschiedlichen Gruppen gemeinsam und durch die alltägliche Praxis realisiert werden kann (vgl. VOGELPOHL Anne, 2015).

Die Praxis der Partizipation in der Stadtentwicklung in Österreich zeigt einerseits ein stärker werdendes Bemühen, Beteiligung frühzeitig und strategisch verankert zu ermöglichen. Auf der anderen Seite gibt es jedoch auch eine Reihe von Schwierigkeiten, diesem Anspruch nach umfassender gesellschaftlicher Teilhabe wirklich gerecht zu werden - insbesondere hinsichtlich der Ergebnisoffenheit, des Gestaltungsspielraumes, der Inklusion (u.a. von schwer erreichbaren Gruppen), der Schnittstelle von Beteiligungsprozessen zu hoheitlichen Planungsverfahren, der Kooperationsmöglichkeiten mit „großen Playern“ oder der Impactmessung.

3 GRUNDSÄTZE EINER KOOPERATIVEN STADT(TEIL)ENTWICKLUNG

3.1 Stadt gemeinsam denken und gestalten

Wir stehen vor der großen Aufgabe wachsende Städte mit häufig sinkenden Budgets zu erhalten, zu entwickeln und bestenfalls im Sinne übergeordneter Ziele und Strategien nachhaltig zu transformieren. Wie also diese (un)mögliche Aufgabe bewältigen?

Voraussetzung ist, Stadt im umfassenden Sinne zu betrachten! Stadt umfasst private wie öffentliche Gebäude, Grün- und Freiräume ebenso wie die sprichwörtliche Luft dazwischen (bspw. deren Geruch, Qualität und Temperatur), Infrastruktur- und Mobilitätsangebote ebenso wie das respektive Anwendungs- und Nutzungsverhalten, Arbeiten, Wirtschaften, Konsumieren aber auch das Alltagsleben, die Kommunikation und Beziehungen zwischen Menschen, Systemen und Umgebungen – einschließlich sozialräumlicher wie soziokultureller Diversität und Integration.

Die vielfältigen Aspekte von Stadt stehen miteinander in unzähligen Wechselwirkungen. Dies erhöht die Komplexität des Nachdenkens und Gestaltens von Stadt enorm, birgt aber ebenso großes Potenzial. Wird Stadtentwicklung zur Agenda der Vielen, zum gemeinsamen und geteilten Anliegen, werden Synergien möglich. Lokales Wissen verknüpft mit Fachexpertisen erhöhen die Treffsicherheit und Akzeptanz besserer Lösungen. Höhere Qualität kann mit geringeren Lebenszykluskosten einhergehen. (Vgl. BUNDESKANZLERAMT 2008)

Wie nun aber kooperative Stadtentwicklung realisieren? Wie Verantwortung teilen und Stadt gemeinsam denken und gestalten ohne beliebig Schlagwörter aneinanderzureihen und willkürlich Einzelaspekte zu kombinieren oder rein Kosten abzuwälzen?

Die Grundvoraussentzungen sind gleichwohl banal wie unabdinglich: eine Haltung der Bescheidenheit (ein singulärer Akteur schafft keine Urbanität!), der Offenheit (Neues, „Anderes“ zu erfahren und darauf einzugehen) und des Respektes (gegenüber divergierenden gleichwohl authentischen Erfahrungen und legitimen Interessen bzw. Bedürfnissen) sowie der Kontinuität (langfristige Verbindlichkeit).

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Wird Stadtentwicklung so zum kooperativen Transformationsprozess, so kann eine professionelle Prozesssteuerung und –begleitung wesentlich zum Gelingen des Unterfanges und zur Zufriedenheit der Beteiligten beitragen.

3.2 Komplexe Prozesse professionell steuern

Um Verfahrensfragen komplexer Prozesse zu beantworten können folgende Schritte/Phasen und Fragen sowie Methoden einer professionellen Prozesssteuerung hilfreich sein.

- Auftrag klären und regelmäßig evaluieren

Wer ist bzw. sind Auftraggeber? Was ist der Auftrag? Welche sind Ziele und welche sind Nicht-Ziele? Welche sind die zentralen Ziel- oder Anspruchsgruppen und deren Erwartungen und Interessen? Wie verändert sich der Auftrag?

Insbesondere bei Projekten der Auftragsforschung haben wir die Erfahrung gemacht, dass es sinnvoll ist, im Sinne der „Politik der kleinen Schritte" zunächst auch Teilaufgaben zu bearbeiten, um Auftraggeberinnen und Auftraggeber, die sich erstmals auf kooperative Stadt(teil)entwicklung einlassen, nicht von der Komplexität des großen Ganzen „abzuschrecken".

Bsp. Brauquartier Puntigam - „Branding vs. integratives Entwicklungskonzept": galt es zu Beginn einen eingeschränkten Auftrag eines Brandingkonzeptes zu bearbeiten, so konnten im Laufe dessen weitere Themen besprochen, Interesse geweckt, zunehmende Offenheit erwirkt und damit ein weit umfassenderes integratives Entwicklungskonzept realisiert werden (multimodale Mobilität, Quartiersmanagement, Energiesystem).

Art und Umfang von Aufträgen bzw. Kooperationen können sich also wesentlich verändern. Dies gilt es im Verlauf des Prozesses immer wieder anzusprechen, gemeinsam zu reflektieren und die Ziele, Erwartungen und (finanziellen) Ressourcen anzupassen.

- Ist-Zustand erheben

Zu Beginn gilt es, aktuelle Gegebenheiten zu erfassen und darzustellen. Dazu können unterschiedlichste Methoden dienen. Um ein räumliches Zielgebiet zu erfassen bieten sich Vor-Ort-Begehungen, Luftbildanalysen, raumplanerische oder historische Recherchen an. Um sozialräumliche Zusammenhänge darzustellen bieten sich Stakeholdermapping, Akteurslandkarten bzw. im übergeordneten Sinne Umfeldanalysen an (räumlich, sozial, Stadtstruktur) – die zentrale Frage ist: was ist schon da? Wesentlich ist zu verstehen, dass immer etwas da ist! Selbst postindustrielle Brachflächen oder urbane Baulücken sind praktisch immer genutzt, haben für verschiedene Betroffene unterschiedliche Bedeutungen und verfügen jedenfalls über eine Historie. Selbst die innovativsten Projekte bauen auf bestehende Diskurse und Referenzen auf und (re)agieren im Sinne von Reaktivierung und Reproduktion oder Abwehr des Vergangenen und Gegenwärtigen.

- Relevante Themen identifizieren und lokale Potenziale einbinden

Wesentliche Fragen sind: wo liegen Stärken/Potenziale/Synergien/Chancen aber auch Schwächen/Herausforderungen/Risiken und für wen? Hier gilt es die unter 3.1 beschriebene umfassende Sicht auf Stadt bzw. Stadtquartiere einzunehmen und die vielfältigen Facetten und Wechselwirkungen des gegenständlichen Stadtquartiers zu beschreiben und erste Analysen, Hypothesen und Ideen festzuhalten. Es lohnt sich hier Notizen genau zu verfassen, insbesondere um eigene von denen unterschiedlicher Stakeholder zu unterscheiden und damit den Anspruch von Allparteilichkeit zu wahren, statt die dein eigenen ähnlichen unbewusst zu verstärken.

Durch das Erheben unterschiedlicher Perspektiven der (lokalen) Schlüsselakteure zu den Herausforderungen und Chancen einer Transformation können lokale Potenziale in die Entwicklung integrativer Konzepte für neue Quartiere und Stadtteile eingebunden und Stolpersteine frühzeitig erkannt werden.

- Beteiligungsdesign festlegen

Je nach spezifischem Projekt, Rahmenbedingungen, Ausgangssituation sowie Zielsetzung gilt es nun, ein Beteiligungsdesign zu entwickeln. Dabei kommen dementsprechend unterschiedliche Beteiligungsmethoden und Settings zur Anwendung: Informationsveranstaltungen, Workshops, Ideenwerkstatt, Ideenbüro, Living Lab, interdisziplinäre Feldforschung in Kooperation mit den unterschiedlichen Stakeholdern, Lernreisen mit den Auftraggebern und Partnern oder Zielgruppen, Spaziergänge, Begehungen, Innovationsformate (z.B. Design Thinking), kooperative Planungswerkstatt vor Ort, Prototyping, diskursive Ergebnisausstellung, Einzugsbegleitung,…

Folgende methodischen Hinweise sind aus unserer Sicht dabei entscheidend:

Raus aus den Konferenz- und Seminarräumen und am Ort des Geschehens arbeiten!

Orte, Räume und Settings wohl überlegen, sie können den Inhalt entscheidend bestimmen!

Machtasymmetrien der Akteursgruppen und deren Vertreterinnen und Vertreter thematisieren und reflektieren sowie in der Wahl der Settings berücksichtigen!

Art of Hosting – die sorgfältige Vorbereitung einer einladenden Umgebung lohnt sich – sie vermittelt Wertschätzung und Wohlgefühl und erleichtert den anwesenden Personen mögliche inhaltlichen Differenzen und Konflikte auszuhalten!

Ergebnisoffen und dennoch konkret in den Ergebnissen (möglichst etwas konkret Sichtbares, Angreifbares bzw. Teilziele umsetzen – oder zumindest verbindlich festlegen wer, wann welche nächsten Schritte tun wird)!

Keine endlosen Diskussionen (mitunter entstehen gerade unter dem Zeitdruck eines straffen Workshopprogramms neue gute Ergebnisse)!

Das Visualisieren, Dokumentieren und diskursive Bewerten bzw. Evaluieren von Ergebnissen vorab planen und sodann konsequent durchführen!

- Beteiligungsprozess evaluieren

Die Ziele und gewünschten Ergebnisse vom Beginn mit dem fortlaufenden Prozess und den tatsächlich erreichten Ergebnissen vergleichen und diskursiv bewerten. Dazu können Ausstellungen, Konferenzen, gemeinsam diskursiv verfasste Berichte etc. öffentlich bzw. unter Beteiligung der wesentlichen Akteursgruppen dienen.

Transparenz über Erreichtes und Unerreichtes und den jeweiligen Prozess schaffen. was ist (nichts) geworden und warum? Dies ermöglicht, gemeinsam aus den Prozessen zu lernen und für mögliche Folgeprojekte die richtigen Schlüsse zu ziehen. Gelungenes, begreifbare Ergebnisse und engagierte Stakeholder hervorstreichen und damit weitere motivieren! Zeigen, dass es wert ist sich zu beteiligen, auch wenn nicht alle Ziele erreicht werden können.

Unsere Rolle im Prozessverlauf ist sehr vielfältig und umfasst Impulse zu geben, zu inspirieren, Ideen aus der Welt in ein konkretes Projekt, einen konkreten Auftrag hineinzubringen bzw. vorhandene Ideen und Akteure miteinander zu verknüpfen, den Prozess gemeinsam mit den Auftraggebern aufzusetzen, den Prozess zu steuern und zu moderieren bzw. gegebenenfalls zu mediieren, die Stakeholder zu vernetzen, im Sinne der Allparteilichkeit die unterschiedlichen Interessen, Bedürfnisse und Entscheidungen zu vermitteln, den Prozess zu reflektieren und mitunter auch strategischer Sparringspartner zu sein.

In mehreren Projekten in verschiedenen Stadtteilen in Graz und Umgebung konnte das StadtLABOR den Ansatz kooperativer Stadtentwicklung verfolgen, praktisch weiterentwickeln und erproben.

3.3 Permanent lernen und Transformation verwirklichen am Beispiel Stadtteilmanagent

Unterschiedlichste Akteure werden Teil des Prozesses und bringen in diesen ihre jeweiligen Expertisen ein. Ein gemeinsames Projekt vor Augen, verschiedene Interessenslagen und facettenreiche Blickwinkel reichern diese Entwicklung an und ein Lernen voneinander wird zum integralen Bestandteil des Weges. (Vgl. STOLTENBERG Ute, 2007)

Durch die Lernerfahrung voneinander stellt sich zunehmend auch ein Öffnen für Neues (Blickwinkel, Themen, Methoden) ein und Transformation beginnt - zuerst in den Köpfen, dann in den gebauten und gelebten Alltagswelten.

Städtische Abteilungen sind ebenso wie Investoren und verschiedene Interessensgruppen einer Stadt / eines Stadtteils Beteiligte und somit verantwortungsvolle und bereichernde Träger einer Entwicklung. Durch den Mut, das Vertrauen in die Entwicklung und durch ein klares Rollenverständnis kann eine Öffnung

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(Transparenz, Informations- und Meinungsaustausch) stattfinden und Ergebnisse aus einzelnen Prozessebenen gesichert in die Entwicklung eingebracht werden.

Die Bevölkerung (Nachbarinnen und Nachbarn eines Projektgebietes und in Folge auch Bewohnerinnen und Bewohner eines neu entwickelten Stadtteils) werden dann ebenfalls zu Trägern der Entwicklung, wenn sie frühzeitig in den Aushandlungs- und Lernprozess einbezogen werden und ein Vertrauensaufbau stattfinden kann. Erreichen kann man Privatpersonen, wie auch lokale Initiativen, Vereine und Unternehmen durch qualitative Interviews und Analysen von relevanten Alltagsthemen. Nur dann kann eine Aktivierung gelingen. Was bewegt die Menschen vor Ort? Welche Themen mobilisieren sie? Welche Ziele wollen (auch langfristig) von ihnen verfolgt werden?

Dann begleitet ein Stadtteilmanagement, das vor Ort präsent wirkt, eine Vertiefung dieser Themen. Einzelne Personen werden nach und nach zu Multiplikatoren und mobilisieren in ihren Netzwerken weitere Akteure bzw. gewinnen sie durch die Pflege des persönlichen Kontaktes für den Prozess. Ein Netzwerk an Beziehungen entsteht und die gemeinsame Beteiligung am Prozess macht eine Wirksamkeit im unmittelbaren Lebens- und Alltagumfelds (des Kollektivs aber auch des Einzelnen) sichtbar. Diese Wirksamkeit schafft Zufriedenheit und eine hohe Identifikation mit dem Ort und der Entwicklung an sich. Zufriedenheit schafft auch Gesundheit und ein Gefühl von Sicherheit und gemeinsam mit dem Beziehungsnetzwerk der Menschen und dem reziproken Vertrauen können die Grundbedingungen eines sozial nachhaltigen Stadtteils gelegt werden.

Inhaltlich können, im Aufbau eines Netzwerkes bzw. im Stärken eines solchen, weitere Themen einer nachhaltigen, zukunftsfähigen Stadt eingebracht werden, die mittel- bis langfristig zu Verhaltensänderungen der Menschen führen bzw. diese unterstützen können: ökologische Nachhaltigkeit (Reduktion der CO2-Emmisionen (Mobilität, Energie, Wohnen…), die ökonomische Nachhaltigkeit (Konsumverhalten, Leistbarkeit) und die soziale Nachhaltigkeit (Lebensstil, Alltagsentscheidungen, Suffizienz). In einem Beziehungsgeflecht kann leichter eine Verhaltensänderung in Gang gebracht werden als in losen Nachbarschaftsstrukturen. Durch Impulse (von Einzelnen oder einem Stadtteilmanagement) oder durch relevante Alltagsthemen (zu wenig Parkplätze, Kostenersparnisse (Reparaturen, Energieverbrauch…) wird der Grundstein für Verhaltensänderung gelegt. Ein nachhaltiger Stadtteil kann nur durch Menschen in Beziehung zueinander entwickelt und durch den entsprechenden Lebensstil und einer ausgeprägten Alltagskultur getragen werden.

4 CASESTUDIES

4.1 Beispiel “Living Green City” Beteiligungsdesign und Methoden:

Um die Vielfalt von Beteiligungsmethoden und Settings darzustellen kann folgendes einjähriges Sondierungsprojekt, gefördert aus Mitteln des Klima- und Energiefonds im Rahmen des Programmes „Smart Cities Demo“ von März 2016 bis Februar 2017 beispielhaft dienen. Ansprechpartnerin oder Ansprechpartner für wieterführende Informationen: Mag. (FH) Nana Pötsch

„Living Green City – 3D Grün und 3D Beteiligung“ im Grazer Stadtteil Waagner Biro

Übergeordnetes Ziel der Sondierung war es, die Machbarkeit einer integrierten mehrdimensionalen Entwicklung lebendiger Grüner Infrastruktur im Stadtteil Graz Waagner-Biro zu untersuchen. Die Entwicklung eines lebendigen Grünen Stadtteils als interdisziplinärer offener Prozess der Koproduktion unter Berücksichtigung (jahres)zeitlicher, räumlicher, technischer, wirtschaftlicher, prozessualer, sozial-gesellschaftlicher und philosophischer Gesichtspunkte. Es wurden sowohl Bestandsflächen und –gebäude als auch zukünftig geplante Bauvorhaben/-flächen im Stadtteil untersucht.

4.1.1 Projektteam

Im Sinne der Zielsetzung mehrdimensionalen Grüns durch mehrdimensionale Beteiligung haben wir uns entschieden bereits für die Antragstellung des Projektes das Team interdisziplinär um nicht zu sagen komplementär zusammenzusetzen (Vegetationstechnikerinnen und Vegetationstechniker; Gestalter von Grün, Raum und Interaktion; Angewandte Philosophin; Sozial- und Quartiersmanagerinnen; gemeinnütziger Beschäftigungsbetrieb Grünraumpflege). Dadurch konnten in weiterer Folge die Stakeholder auf verschiedenen Ebenen professionell angesprochen und ins Boot geholt werden, sowie integrative Potenziale identifiziert, Synergien entwickelt und schließlich Umsetzungsvorhaben vorbereitet werden.

Es gilt gewissermaßen sorgfältig jene relevanten Akteurinnen, Akteuire, Expertinnen und Experten auszuwählen, welche stellvertretend Expertisen und Interessen der unzähligen weiteren einzelnen Stakeholderinnen und Stakeholder in Bezug auf ein Thema bzw. ein Vorhaben sowohl glaubwürdig vertreten können als auch bereit sind sich außerhalb ihrer disziplinären bzw. institutionellen Komfortzone zu begeben und auf ein gemeinsames Unterfangen einzulassen.

Sorgfältige Projektplanung bei gleichzeitiger Flexibilität und einem notwendigen Maß an Ergebnisoffenheit sowie ausreichend Zeit und Raum für Findungsprozesse, Austausch und Abstimmung müssen vorausgesetzt werden. Geschützte geschlossene Räume und Zeiten interner Besprechungen des Projektkonsortiums sind ebenso vorzusehen, wie Zeitpunkte und Gelegenheiten der Überschneidung mit bzw. Öffnung zu weiteren Stakeholderinnen und Stakeholdern bzw. der betroffenen Öffentlichkeit, um die projekt-internen Hypothesen, Annahmen und Ergebnisse zu überprüfen.

4.1.2 Ist-Zustand & relevante Themen und Potenziale erheben

Mittels Begehungen, Beobachtungen und Befragungen wurden vorhandene Qualitäten und Themen erhoben und dokumentiert. Mittels Recherche, Umfeld- und Stakeholderanalyse wurden Entscheidungsträger bzw. Schlüsselstakeholder identifiziert und persönliche Gespräche geführt. Diese dienten sowohl der inhaltlichen Erweiterung und Ausdifferenzierung, als auch dem Vertrauensaufbau und dem „Contracting“. Weitere ausführliche telefonische Gespräche wurden mit unterschiedlichen Fachexpertinnen und Fachexperten geführt. Alle Gespräche wurden strukturiert dokumentiert und mit den Partnerinnen und Partnern geteilt.

4.1.3 Beteiligungsserie

In weiterer Folge wurde eine Serie von 10+2 Workshops vor Ort konzipiert, organisiert, durchgeführt und dokumentiert. In Diesem Rahmen wurde

(1) ein „Green Living Lab“, also ein realer Ort der Kommunikation, Beziehung, des gemeinsamen Tuns und Denkens – Forschens, Entwickelns und Bewertens installiert. Dieser diente auch dazu Inhalte und Prozesse sprichwörtlich „begreifbar“, „spürbar“ und damit „nachvollziehbar“ zu machen - sowohl Hardware/Technologien als auch Software/Prozesse. Durch die fortlaufende Dokumentation vor Ort und die jeweiligen Reaktionen der nachfolgenden Gäste auf das vorangegangene wurde eine fortlaufende Feedbackschleife eingezogen.

Damit ein solches Vorhaben gelingt bedarf es neben des Prozessdesigns unbedingt eines gestalterischen Konzeptes, wozu wir mit ausgewiesenen Expertinnen und Experten kooperieren.

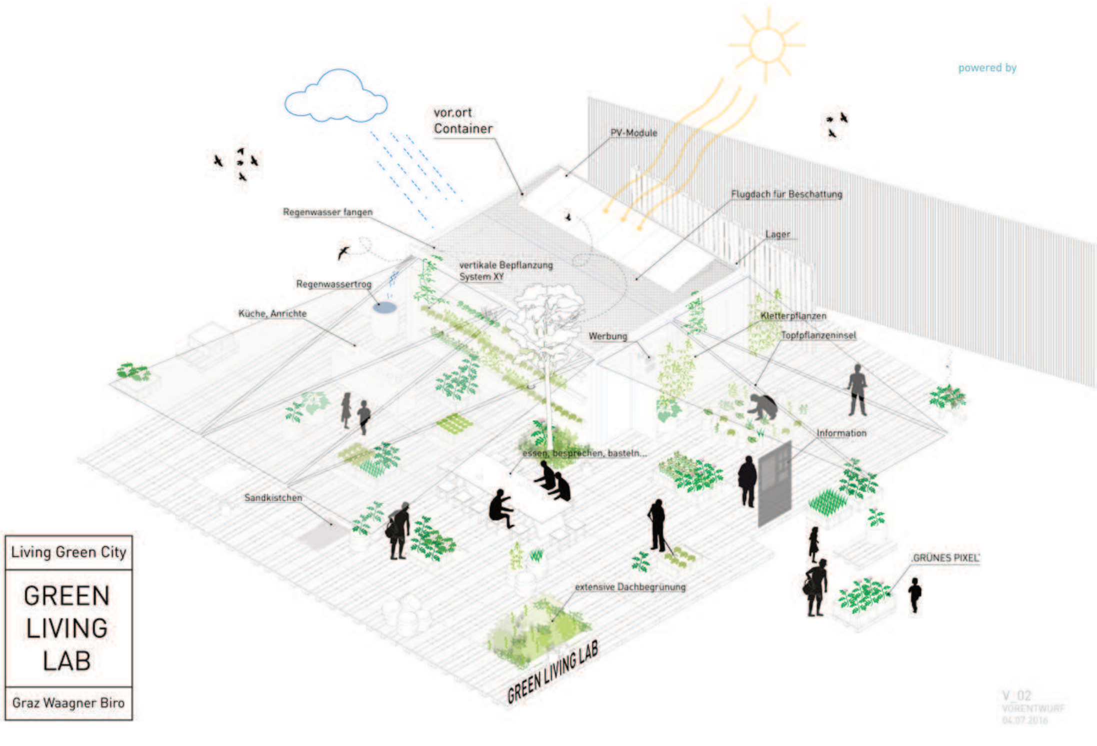

Bild 1: gestalterisches Konzept Green Living Lab vor Ort im Stadtteil von Andreas Goritschnig, © Andreas Goritschnig, Living Green City

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(2) wurden konkretes Wissen und Fertigkeiten entlang jahreszeitlicher Zusammenhänge (des „Gartenjahres“) an die Bürgerinnen und Bürger des Stadtteils vermittelt sowie zu spezifischen Themen sensibilisiert.

Bild 2: Wildkräuterlehrpfad statt Abstandsgrün, Intervention im Rahmen eines Spaziergangs © Nana Pötsch, Living Green City

(3) wurden parallel mittels offener Einzel- und Gruppengespräche die Interessen, Bedürfnisse, Einstellungen, Potenziale und Ideen der der Bewohnerinnen und Bewohner erhoben und dokumentiert.

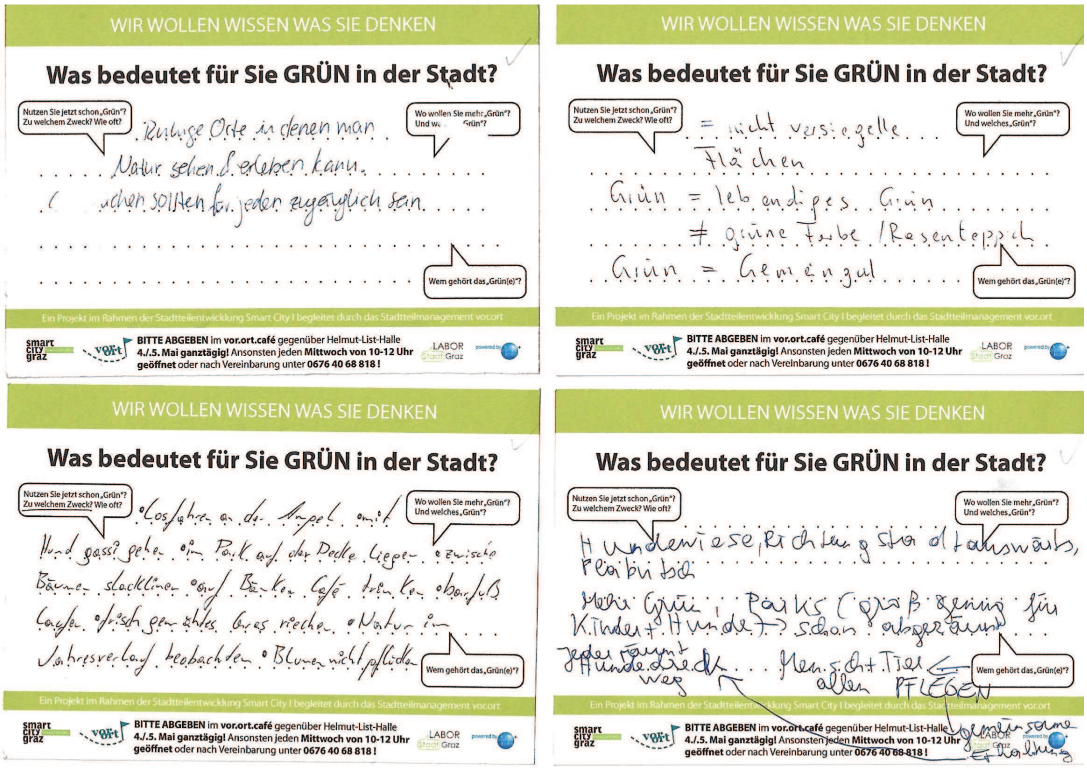

Bild 3: Beispiel Postkartenbefragung © StadtLABOR, Living Green City

(4) Darauf folgte eine einwöchige interdisziplinäre Open Summerschool.

Zu deren Beginn stand ein ganztägiger interdisziplinärer und Sektoren-übergreifender Stakeholderworkshop um die identifizierten Problemstellungen und Potenziale kooperativ zu bearbeiten und mögliche neue Ideen und Lösungen zu entwickeln.

Nach einem gemeinsamen Start im Festsaal des lokalen Oberstufengymnasium, erfolgte die Bearbeitung konkreter Fragestellungen vor Ort im Feld!

Bild 4: interdisziplinärer Stakeholderworkshop im Feld © Daniel Derndorfer, Living Green City

Die Workshopteams wurden im Vorfeld sorgfältig zusammengestellt, um jeweils relevante Expertinnen und Experten aus allen Sektoren (öffentliche Verwaltung, Bezirkspolitik, Bildung, Soziales, Unternehmen, Vereine, Nachbarinnen und Nachbarn) bzw. Professionen und Alltagsexpertisen (Landschaftsplanung, Architektur, Sozialarbeit, Stadtteilmanagement, Philosophie, Vegetationstechnik, Urbanistik, Anrainerinnen und Anrainer/Nutzerinnen und Nutzer) an den Workshoptischen im Feld zusammenzubringen. Die „kooperativen Feldforscher" wurden kulinarisch per Lastenfahhrad mit einem Mittagessen, zubereitet aus vorwiegend im Green Living Lab kultivierten und geernteten Feldfrüchten versorgt, wodurch die intensive inhaltliche Auseinandersetzung durch informelle Tischgespräche ergänzt wurden. Die Ergebnisse der Workshops im Feld wurden im Plenum, welches im Freien auf der Terrasse des Green Living Labs stattfand geteilt.

Die Ideen wurden während der folgenden Tage von den Teilnehmenden der Open Summerschool vertiefend ausgearbeitet und am Ende der Woche wiederum öffentlich präsentiert und diskutiert.

4.2 Beispiel "Living Green City" Ergebnisse und Evaluierung:

Formale Ergebnisse des Projektes waren eine Roadmap und eine Isometrie in welchen die entwickelten möglichen Maßnahmen zeitlich und räumlich gegliedert dargestellt sind. Die einzelnen Maßnahmen wurden in einem Maßnahmenkatalog beschrieben.

Einige der entwickelten Maßnahmen wurden noch im laufenden Sondierungsprojekt als Projektskizzen gemeinsam mit den relevanten Stakeholdern konkretisiert und schließlich zu Konzepten bzw. Anträgen für Folge- bzw. Umsetzungsprojekte ausformuliert. Zwei davon konnten bis heute verwirklicht bzw. aquiriert werden:

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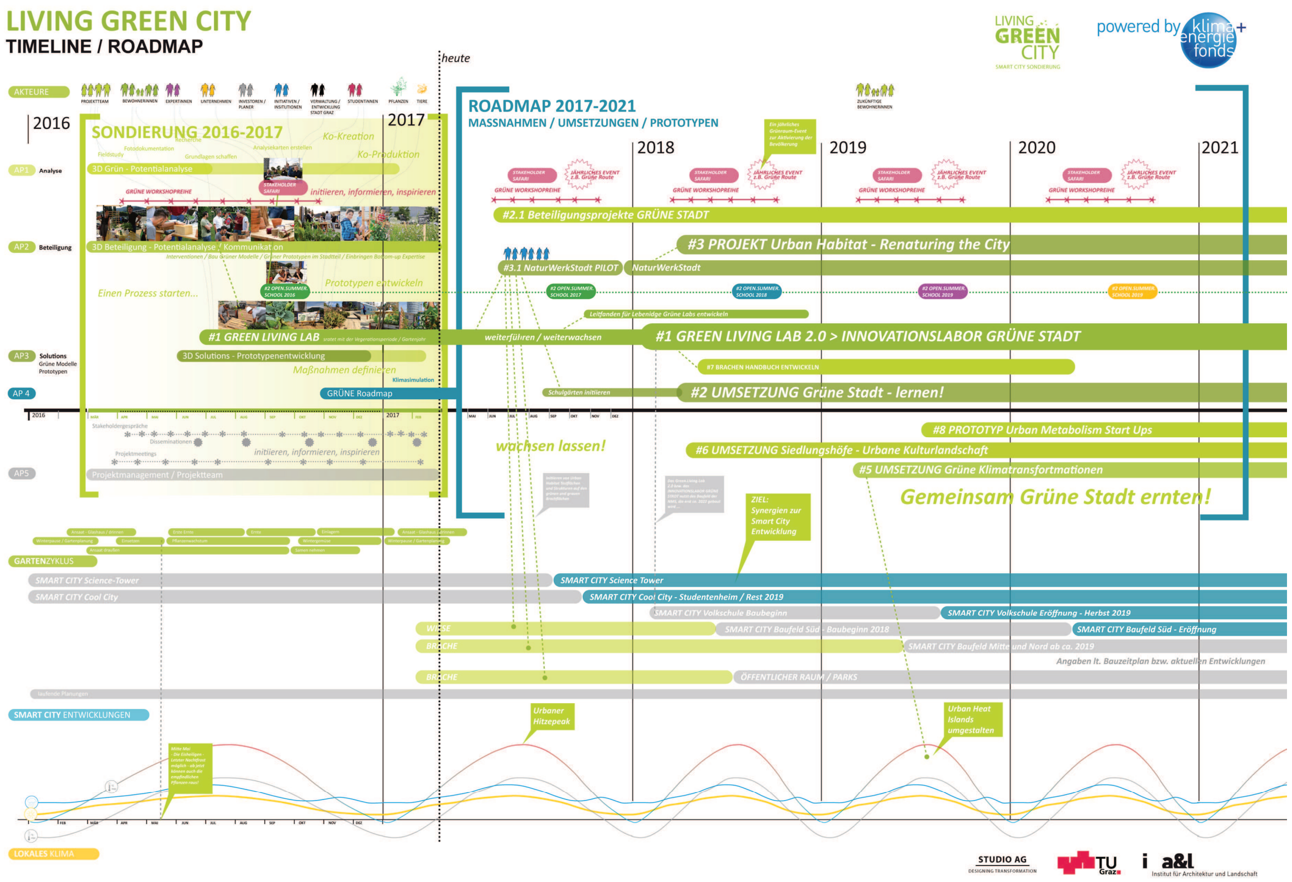

Bild 5 Roadmap Living Green City © Andreas Goritschnig, Living Green City

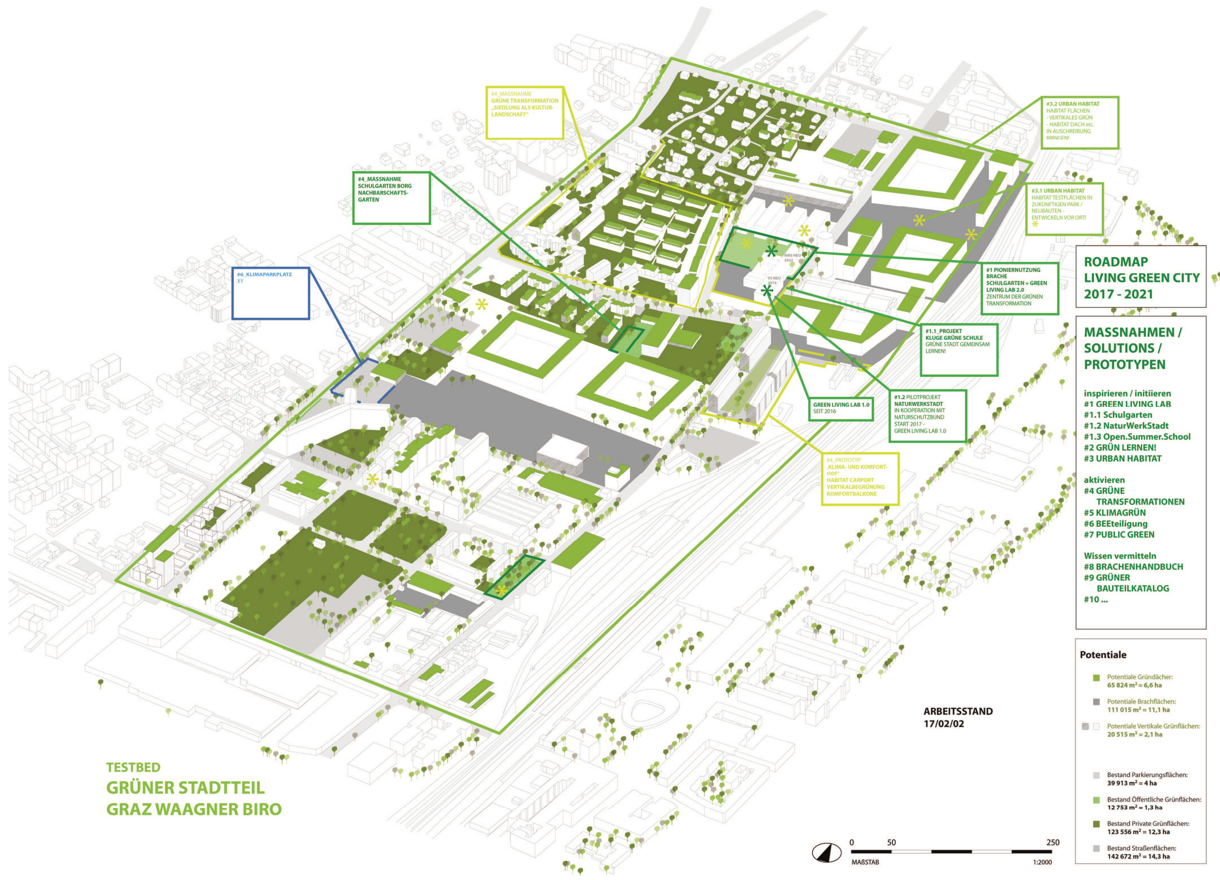

Bild 6 Isometrie Living Green City © Andreas Goritschnig, Living Green City

4.2.1 Natur.Werk.Stadt

Initiiert von Andreas Goritschnig und Daniela Zeschko konnte die „Natur.Werk.Stadt“ erstmals unmittelbar anschließend an das Sondierungsprojekt in der Gartensaison Frühling bis Herbst 2017 als Pilotprojekt umgesetzt werden.

Die „Natur.Werk.Stadt“ wird im Rahmen des gemeinnützigen Beschäftigungsprojektes Naturschutzbund Steiermark, finanziert aus Mitteln des AMS umgesetzt und ab Frühling 2018bereits regulären Projektstatus im Rahmen der gemeinnützigen Beschäftigung erhalten.

Die „Natur.Werk.Stadt“ setzt Ideen und Innovationen Urbanen Grüns und Ökologie schnell und in kleinem Maßstab um, pflegt und dokumentiert diese und schafft damit nachvollziehbare Erfahrungen für größere Umsetzungen. Sie fungiert darüberhinaus als Multiplikatorin und Übersetzerin in der Nachbarschaft und zur „Fach-fernen“ Öffentlichkeit, nicht zuletzt aufgrunddessen die Mitarbeiterinnen und Mitarbeiter selbst zumeist erstmals mit Stadtentwicklungs- und Innovationsdiskursen zu tun haben. Mithilfe der Natur.Werk.Stadt kann gezeigt werden, dass Ideen funktionieren bzw. was sie brauchen, damit sie funktionieren - in einem Mikro-Maßstab der für städtische Akteure (städtische Grünraumverwaltung und -erhaltung) nicht machbar wäre.

Mithilfe der Natur.Werk.Stadt können so sukzessive weitere vorgeschlagene Maßnahmen aus dem Sondierungsprojekt, beispielsweise „Habitat- statt Abstandsgrün – soziale und ökologische Aufwertung siedlungseigener Grünflächen“ oder „urbane ökologische Mikrohabitate – mikroklimatisch und ökologische Aufwertung von öffentlichen Straßenbegleitflächen“ umgesetzt werden. Damit setzten sich auch die im Sondierungsprojekt geknüpften Netzwerke in konkreten Kooperationen, beispielsweise mit dem Stadtteilmanagement, der Grünraumabteilung der Stadt Graz, der Holding Graz, lokalen Gemeinnützigen Siedlungsverwaltungen sowie Bewohnerinnen, Bewohner, Schülerinnen, Schülern und Vereinen fort.

4.2.2 „Green Living Lab“

Das „Green Living Lab“ konnte aufgrund der intrinsischen Synergie des Sondierungsprojektes „Living green City“ mit dem kontinuierlichen „vor.ort Stadtteilmanagement Graz Waagner-Biro“ sowie mithilfe der Unterstützung in der Pflege, Betreuung, Bespielung/Programmierung und Disseminaton durch das Team der „Natur.Werk.Stadt“ weit über den Zeitraum des Sondierungsprojektes (Abschluss im Februar 2016) bis heute fortgesetzt werden. Nachbarinnen und Nachbarn nutzen den Ort tatsächlich als ersten Vorboten des zukünftigen öffentlichen Raums und Parks, Spiel- und Aufenthaltsort, Kräutergarten und Inspirationsquelle für ihr eigene „Urban Gardening“.

4.2.3 green.LAB

Der Start des dreijährigen Demonstrationsprojektes „green.LAB“ im Frühling 2018, ebenfalls gefördert aus Mitteln des Klima und Energiefonds im Rahmen des Programmes Smart Cities Demo bedeutet im zweiten Anlauf die Realisierung einer weiteren Maßnahme aus der Roadmap des Sondierungsprojektes „Living Green City“. Damit sind außerdem der Ausbau und die Kontinuität des „Green Living Labs“ bis zumindest 2021 gesichert sowie aufgrund der als Projektziel genannten Klärung der Nachnutzung auf weiteren urbanen Brachflächen auch darüber hinaus wahrscheinlich. Auch das Projekt green.LAB baut auf den Ergebnissen, Netzwerken und Kooperationen, welche im Rahmen des Sondierungsprojektes erarbeitet wurden auf. Neben dem Hauptziel, einen vorgefertigten kompakten Holzbau mit Urbaner Grüner Infrastruktur zu verschränken und damit Aussagen über Themen wie Vorfertigungsgrade, Verhalten von Holz mit Gebäudebegrünung etc. zu treffen, werden idealerweise weitere Umsetzungsprojekte mehrdimensionalen urbanen Grüns unter mehrdimensionaler Beteiligung im Sinne einer „Living Green City“ initiiert und vorbereitet.

Ansprechperson für weiterführende Informationen zum oben beschriebenen Case ist die Projektleitung Mag. (FH) Nana Pötsch unter nana.poetsch@stadtlaborgraz.at oder 0676 4068817.

4.3 Beispiel “Smart City Graz“, Schwerpunkt: Mobilität - Beteiligungsdesign und Methoden:

Im Rahmen der Stadtteilentwicklung Smart City Graz wurden der Aufbau und die Aktivitäten eines Stadtteilmanagements, betrieben durch das StadtLABOR, vom Klima- und Energiefonds gefördert. Ein Informationscontainer wurde noch weit vor Baubeginn im Stadtteil installiert und bot den Nachbarinnen und Nachbarn, lokalen Unternehmen, Initiativen und Vereinen Möglichkeiten sich in den Planungsprozess einzubringen.

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Mehr Informationen zum Projekt: www.smartcitygraz.at

Mehr Informationen zum StadtLABOR: www.stadtlaborgraz.at

Das Thema Mobilität war seit der Eröffnung des Stadtteilmanagements eines der relevantesten Themen für die Menschen im nahen Umfeld und für Interessierte am Entwicklungsprozess. Diese Relevanz für das Alltagsleben bot ausreichend Kraft für einen längeren Beteiligungsprozess und den Aufbau eines Beziehungsnetzwerkes.

4.3.1 Erhebung der spezifischen Mobilitätsthemen im Stadtteil

Im Stadtteil wurden Postkarten an rund 500 Haushalte verteilt und auch via Newsletter wurden dieselben Fragestellungen ausgesandt. Interessierte konnten per Post, per Mail oder persönlich die Antworten an das Stadtteilmanagement zurücksenden oder in einem Postkasten beim Infocontainer einwerfen. Durch spezifische Fragestellungen wurden Themen gesammelt und einzelne Situationen konnten sehr konkret abgebildet werden. Beispielsweise: Parkverhalten während Veranstaltungen einer Mehrzweckhalle in den Seitenstraßen der unmittelbaren Nachbarschaft, Geschwindigkeitsbegrenzungen in Parallelstraßen oder Verbindungen und Taktung von Linien des öffentlichen Verkehrs.

4.3.2 Informationsabend und Workshop

Die gesammelten Fragen und Anregungen wurden vorab an die zuständigen Abteilungen der Stadt Graz geschickt und intern und abteilungsübergreifend besprochen. Die Antworten wurden in Folge für einen Informationsabend in einem bekannten Gasthaus inmitten des Stadtteils ausgearbeitet. Wichtig war es in diesem Beteiligungsschritt die Antworten tiefgehend zu bearbeiten und Zusammenhänge sichtbar zu machen. Ergänzend zu den Bearbeitungen von städtischer Seite wurden auch weitere Impulsgeber und Mobilitätsexperten eingeladen und gemeinsam widmete man sich den einzelnen Fragestellungen im Detail, im Kontext zur Gesamtstadtsituation und im Hinblick auf weltweite Trends in Punkto Mobilität und Mobilitätsverhalten. Der Prozess konnte folgende Ergebnisse erzielen: (1) es wurde individuell und gleichzeitig auf einer übergeordneten Ebene über Mobilität diskutiert (2) das Format bot ein Diskussionssetting auf gleicher Aufhöhe (3) Vertrauen und Zufriedenheit, da die Fragen nicht oberflächlich bearbeitet wurden und die Anregungen weitergetragen werden in die nächsten Planungsphasen (4) ein Durchbrechen der individuellen Schleife „immer wird vor meiner Türe geparkt“ und ein Öffnen für neue Wege und Denkmuster werden möglich

4.3.3 Knowhow für hoheitliche Planungsprozesse nutzbar machen

Die Anregungen und Bedenken wurden aufgenommen und in Gespräche innerhalb der städtischen Abteilungen, mit den Investoren und Entwicklern eingebracht. Auch in den Auslobungsunterlagen wurden und werden diese Ergebnisse eingewoben und den Teilnehmerinnen und Teilnehmern zugänglich gemacht.

Natürlich wird es nicht immer möglich sein alle Ergebnisse umzusetzen, aber es muss Ziel einer kooperativen Planung sein, die Ergebnisse anhand der Zwischenschritte entweder vorzufinden oder wenn nicht umsetzbar die Gründe dafür transparent darstellen zu können.

Ansprechperson für weiterführende Informationen zum oben beschriebenen Case ist die Projektleitung DI Elisabeth Oswald unter elisabeth.oswald@stadtlaborgraz.at oder 0676 4068818.

5 CONCLUSION

Interdisziplinäre kooperative und integrative Stadtteilentwicklung beginnt konsequenterweise beim Projektteam und der internen Zusammenarbeit. Wir möchten ermutigen noch viel öfter und früher Projekte hin zu kooperativen Entwicklungs- und Planungsprozessen zu öffnen um Projekte innovativer, resilienter und smarter – also klüger zu entwickeln.

Die Realisierung kooperativer Stadt(teil)entwicklung in der täglichen Projekt-, Planungs- und Beteiligungspraxis wirft über die Theorie hinaus beständig wieder neue Fragen auf und bringt neue Herausforderungen mit sich.

So ist es mitunter frustrierend, wenn selbst bei sorgfältiger Prozesssteuerung und guter Beteiligungsdesigns die Resonanz manchmal gering ausfallen kann, da vor Ort zu arbeiten auch eine erhöhte Vulnerabilität gegenüber externen Faktoren mit sich bringt – wie beispielsweise Hitzewellen oder Schlechtwetterperioden.

Auch sind Menschen, selbst in professionellen Rollen nicht vorhersehbar und bedeutet Kommunikation und vielmehr noch Kooperation ein sich aufeinander einlassen. Abhängig von den konkreten Menschen in den jeweiligen beteiligten Institutionen bzw. Systemen und ihren Haltungen und Bereitschaften, können Prozesse schleppend oder frustrierend sein, oder regelrecht ermutigend und bestätigend. Gerade deshalb oder dennoch möchten wir ermutigen in (kleinen) Schritten beständig weiter zu gehen und an einer Kultur der Kooperation zu arbeiten. Der kontinuierliche Aufbau von Beziehungen, Vertrauen und Mut lohnt sich, um in neuen Konstellationen an den ambitionierten Zielen nachhaltiger kooperativer Stadt(teil)entwicklung zu arbeiten. Es lohnt sich mit dem zu arbeiten, was gerade möglich ist.

Grundsätzlich sollten Agenden der Stadt(teil)entwicklung wesentlich langfristiger gedacht werden und die unzähligen Einzelprojekte in langfristigen Prozessen miteinander kommunizieren, um die großen Informationsverluste zwischen zusammenhanglos aneinandergereihten oder nebeneinander stehenden Einzelprojekten zu vermeiden und vielmehr aufbauend zu arbeiten.

Prozessbegleitung muss langfristig gedacht und gemacht werden und benötigt Ressourcen - diese sind im Vergleich zu den Investitionsvolumina immer noch sehr klein bringen aber großen Nutzen: Akzeptanz und Zufriedenheit (der am Prozess Beteiligten bzw. der Nutzerinnen und Nutzer), Planungssicherheit (schnellere Behördenverfahren durch weniger Einnwendungen), höhere inhaltliche Qualität, etc. mit sich.

Ohne Vertrauen, das heißt ohne BEZIEHUNG können keine Inhalte/Themen transportiert werden und kann daher auch keine Transformation gelingen.

6 REFERENCES

JPI URBAN EUROPE, beispielsweise Seiten 10-14 Call Text of European-China Joint Call for Sustainable and Liveable Cities and Urban Areas, abrufbar unter https://jpi-urbaneurope.eu/app/uploads/2018/02/NSFC-JPI-UE-Joint-Call-31-January-2018-0201.pdf, zuletzt aufgerufen am 27.02.2018

SMART CITIES DEMO, beispielsweise Seite 6 und 7 Leitfaden Smart Cities Demo 9. Ausschreibung, Klima- und Energiefonds, Wien 2017 - online abruf- oder bestellbar unter https://www.klimafonds.gv.at/foerderungen/aktuelle-foerderungen/2017/smart-cities-demo-9-as/

STEK 4.0 Vertiefende Betrachtungen, Abschnitt Bürgerbeteiligung, online abrufbar unter https://www.graz.at/cms/beitrag/10165681/7758015

FEINDT, Peter H.; NEWIG Jens (Hrsg.): Partizipation, Öffentlichkeitsbeteiligung, Nachhaltigkeit, Seite 9, Metropolis-Verlag, Marburg 2005

PFENNING, Uwe; BENIGHAUS, Christina: Partizipativer Wandel – methodischer Wandel, Seiten 199ff in VETTER, Angelika (Hrsg.): Erfolgsbedingungen lokaler Bürgerbeteiligung, Springer VS Verlag, Wiesbaden 2008

GOHL, Christopher; WÜST, Jürgen: Beteiligung braucht Wissen – Beteiligung schafft Wissen, Seiten 260 ff in VETTER, Angelika (Hrsg.): Erfolgsbedingungen lokaler Bürgerbeteiligung, Springer VS Verlag, Wiesbaden 2008

STATISTA das Statistikportal https://de.statista.com/statistik/daten/studie/249028/umfrage/urbanisierung-in-der-europaeischen-union-eu/ zuletzt aufgerufen am 10.01.2018

WIKIPEDIA https://de.wikipedia.org/wiki/Stadtentwicklung abgerufen am 9.1.2018

SELLE, Klaus (Hrsg.): Planung und Kommunikation. Gestaltung von Planungsprozessen in Quartier, Stadt und Landschaft. Grundlagen, Methoden, Praxiserfahrungen, 1996.

BUNDESKANZLERAMT ÖSTERREICH, SEKTION III UND V: Standards der Öffentlichkeitsbeteiligung, Wien 2008

VOGELPOHL, Anne: Die Begriffe Stadt und Urbanisierung bei Henri Lefebvre in: dérive - Zeitschrift für Stadtforschung, Ausgabe Nr. 60, Wien Juli 2015

STOLTENBERG, Ute: Gesellschaftliches Lernen und Partizipation, Seiten 96ff in: JONUSCHAT, Helga; BARANEK, Elke; BEHRENDT, Maria; DIETZ, Kristina; SCHLUßMEIER, Bianca; WALK, Heike; ZEHM, Andreas (Hrsg.): Partizipation und Nachhaltigkeit Vom Leitbild zur Umsetzung, Oekom Verlag, München 2007

reviewed paper

Verstärken Liberalisierung und Deregulierung die räumlichen Disparitäten zwischen Stadt und Land? Eine Fallstudie zum Südtiroler Einzelhandel im Kontext der Liberalisierungsgesetze ab 2012

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1 ABSTRACT

Bis 2012 war der Einzelhandel in der norditalienischen Provinz Südtirol durch eine umfassende sektorale Regulierung und eine strikte Raumordnungspolitik beeinflusst. Hiermit wurde die aus anderen Ländern bekannte enorme Flächenexpansion von Handelsbetrieben, v.a. auf der so genannten „Grünen Wiese“, stark eingedämmt. Im Zuge der Euro-Krise ab 2010 wurde von der damaligen italienischen Regierung unter Mario Monti ein großes Reformpaket zur Liberalisierung und Deregulierung vieler wirtschaftlicher Bereiche, darunter auch der Einzelhandel, verabschiedet. Im Jahr 2012 hat die Provinz Südtirol die staatlichen Vorgaben in Form eines Liberalisierungsgesetzes umgesetzt, in dem zahlreiche Vorgaben, u.a. im Hinblick auf Verkaufsflächenbeschränkungen in Wohn- und Gewerbegebieten, aufgehoben wurden. Einige frühere Bestimmungen wurden 2016 zwar wieder eingeführt, jedoch stellt sich die Frage, wie sich diese Erosion der wettbewerbs- und raumordnungspolitischen Kompetenzen der Provinz Südtirol auf den Einzelhandel und seine Standorte ausgewirkt hat. In dieser Untersuchung wurde daher zunächst geprüft, wie sich der gesamte Einzelhandel in Südtirol vor und nach der Reform entwickelt hat. Im zweiten Schritt wurde auf der kleinräumigen Ebene der 116 Gemeinden analysiert, ob vorher bzw. nachher eine regionale Konvergenz oder Divergenz (d.h. Angleichung oder Verstärkung räumlicher Disparitäten) im Hinblick auf die Ausstattung mit Einzelhandel stattgefunden hat. Tatsächlich ist ab 2012 ein deutliches Verkaufsflächenwachstum in der Provinz nachweisbar. Auf der Gemeindeebene zeigt sich, dass zwar im Zeitraum von 2002 bis 2011 eine Angleichung der Unterschiede in der Angebotsausstattung stattfand, dieser Trend jedoch ab 2012 umgekehrt wurde: Seit der Liberalisierung des Einzelhandels sind die Ausstattungsniveaus der Gemeinden umso stärker gewachsen, je besser sie vorher schon versorgt waren. Die räumlichen Disparitäten der Ausstattungsgrade im Einzelhandel haben zugenommen. Die Ergebnisse stützen die wesentlichen Aussagen der Standorttheorien des Einzelhandels, die zunehmende Disparitäten in Systemen von Angebotsstandorten voraussagen.

Keywords: sektorale Regulierung, Raumordnung, räumliche Disparitäten, Einzelhandel, Konvergenz

2 HINTERGRUND UND MOTIVATION DER UNTERSUCHUNG

2.1 Die sektorale Regulierung und planerische Steuerung des Einzelhandels in Südtirol bis 2012

Über lange Zeit war der italienische Einzelhandel im Vergleich mit den meisten anderen EU-Staaten als bedeutend kleinteiliger (d.h. geringere durchschnittliche Betriebs- und Verkaufsflächengrößen) sowie in weit geringerem Maße vertikalisiert (d.h. weniger Betriebe in Filialsystemen) und internationalisiert (d.h. geringere Präsenz international agierender Handelsunternehmen) zu charakterisieren (Kulke, 1997; Potz, 2002). Abgesehen von landesspezifischen Unternehmenskulturen und Konsumstilen spielt(e) hierbei auch die komplexe Regulierung des Handels in Italien eine Rolle, die einerseits aus einer sektoralen Regulierung (d.h. staatliche Marktregulierung der Handelstätigkeit) und andererseits einer planerischen Steuerung (d.h. raumordnungspolitische Steuerung der Standortentwicklung) besteht (Potz, 2002). Anders als z.B. in Deutschland oder Österreich beeinflusste gerade auch die sektorale Regulierung die räumliche Struktur des Handels enorm, z.B. durch Lizenzvergaben der Gemeinden für Einzelhandelsbetriebe in Abhängigkeit ihrer Verkaufsflächengröße und ihrer Sortimente. Auch deshalb galt die Regulierung des italienischen Handels über lange Zeit als eine der restriktivsten in Europa (Potz, 2002; OECD, 2009; Zanderighi, 2003).

Die nördlichste Provinz Italiens, Südtirol (amtlich: Autonome Provinz Bozen-Südtirol), stellt einen Sonderfall im Gefüge der sektoralen und planerischen Eingriffe in den Einzelhandel dar: Die nach Ende des ersten Weltkriegs Italien zugesprochene und überwiegend deutschsprachige Provinz (2016: 524.256 Einwohner) verfügt über eine umfassende politische Autonomie (Autonomiestatut von 1972), die sich auch darin zeigt, dass sowohl die sektorale Regulierung des Handels als auch die Raumordnung in den Kompetenzbereich der Provinz fallen. Faktisch besteht in Südtirol die Kombination aus einer sektoralen Regulierung nach italienischem Vorbild mit vielen raumwirksamen Elementen und einer (z.B. verglichen mit Deutschland) sehr restriktiven Landesraumordnung (Küpper/Scheibe, 2015). Die sektorale Regulierung

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erfolgt durch die Neue Handelsordnung (Landesgesetz 7/2000) und die zugehörige Durchführungsverordnung (Dekret des Landeshauptmanns 39/2000), die räumliche Steuerung auf der Grundlage des Landesraumordnungsgesetzes (Landesgesetz 13/1997) und des Landesentwicklungs- und Raumordnungsplanes (Südtirol – Leitbild 2000).

Die sektorale Regulierung durch die Südtiroler Handelsordnung umfasste zum Zeitpunkt ihres Inkrafttretens (d.h. vor den Reformen im Jahr 2012) u.a. folgende raum- bzw. standortwirksame Elemente:

- Mitteilungs- und Genehmigungsvorschriften für Neueröffnungen, Standortverlagerungen oder Erweiterungen von Handelsbetrieben in Abhängigkeit ihrer Verkaufsflächengröße (Art. 4-8 Neue Handelsordnung und Art. 7-8 Durchführungsverordnung):
- Kleine Handelsbetriebe (bis 100 qm in Gemeinden mit max. 10.000 Einwohnern bzw. bis 150 qm in Gemeinden über 10.000 Einwohner): Erforderlichkeit einer Mitteilung an die Gemeinde
- Mittlere Handelsbetriebe (bis 500 qm): Erforderlichkeit einer Genehmigung der Gemeinde
- Großverteilungsbetriebe (ab 500 qm): Erforderlichkeit einer Genehmigung des Landes, was ebenso für Einkaufszentren gilt, sobald diese die Grenze von 500 qm überschreiten
- Festlegung der maximalen Zahl an großen Handelsbetrieben und Einkaufszentren auf der Landes- bzw. Regionalebene durch die Landesplanung (Art. 5 Abs. 2 Durchführungsverordnung)
- Für Gemeinden ab 1.000 Einwohnern: Verpflichtende Ausarbeitung eines Gemeindehandelsplans für die Steuerung von Neuansiedlungen in Abhängigkeit des Bestandes und der zu erwartenden Nachfrage (Art. 5 Abs. 3 Durchführungsverordnung; Beispiel siehe Gemeinde Deutschnofen, 2009)[1]

Die genannten Grundlagen der Raumordnung umfass(t)en weitere wichtige Regelungen zum Einzelhandel:

- Verbot von Einzelhandelsansiedlungen außerhalb der bebauten Siedlungsbereiche und der Gewerbegebiete (Südtirol – Leitbild 2000, III. Ziele und Maßnahmen, Abschnitt 4.5)
- Beschränkung von Flächen für den Einzelhandel in verbauten Ortskernen und Wohnbauzonen in Abhängigkeit der Gemeindegröße (Art. 15 Abs. 4 Landesraumordnungsgesetz)
- Verbot der meisten Einzelhandelsnutzungen in Gewerbegebieten mit Ausnahmen für wenige explizit definierte Angebotsformen, die aufgrund ihrer „Sperrigkeit“ nicht im innerörtlichen Bereich einzurichten sind (z.B. Möbel) oder die vor Ort hergestellt werden; für diese Betriebe wurden zugleich Verkaufsflächenobergrenzen definiert (Art. 44/ter Landesraumordnungsgesetz)

Die genannten Regelungen sind deutlich restriktiver als z.B. in Deutschland: Beispielsweise wird in der Raumordnung nicht nur der „großflächige“ Einzelhandel behandelt, sondern jedweder Einzelhandel abhängig vom jeweiligen Baugebietstyp. Zudem existiert mit der Handelsordnung ein separates Regelwerk mit hoher Raumwirksamkeit (Küpper/Scheibe, 2015). Aufgrund dieser Instrumente wurden die enormen Flächenauswüchse von Einzelhandelsbetrieben, insb. außerhalb der Ortskerne bzw. auf der so genannten „Grünen Wiese“, bisher wesentlich stärker eingedämmt als dies z.B. in Deutschland der Fall ist. Der Südtiroler Einzelhandel war zumindest bis in die frühen 2010er Jahre hinein immer noch als relativ kleinteilig zu charakterisieren, was sich auch an einem relativ engmaschigen Verkaufsstellenetz des Lebensmitteleinzelhandels gezeigt hat (Altieri et al., 2011; Küpper/Scheibe, 2015; Wieland, 2012).

2.2 Das Gesetz zur Liberalisierung der Handelstätigkeit 2012

Im Zuge der Euro-Krise ab dem Jahr 2010 setzte in den besonders stark betroffenen Volkswirtschaften Südeuropas und insbesondere im von hohen Staatsschulden und geringem Wirtschaftswachstum betroffenen Italien eine Phase der Krisenpolitik ein: Um staatliche Ausgaben einzusparen und gleichzeitig – gemäß des wirtschaftspolitischen Axioms „Mehr Markt = Mehr Wachstum“ – die wirtschaftliche Entwicklung zu fördern, verabschiedete die damalige Staatsregierung unter Ministerpräsident Mario Monti im Jahr 2011 ein großes Reformpaket zur „Liberalisierung“ bzw. „Deregulierung“ vieler ökonomischer und sozialer Bereiche. Im Sinne angebotsorientierter Wirtschaftspolitik erfolgten in diesem Zusammenhang u.a. Deregulierungen

[1] Solche raumwirksamen Regulierungen durch die Gemeinden existierten in Südtirol auch für andere Sektoren, z.B. hinsichtlich der Zulässigkeit von Friseur- und Schönheitspflegebetrieben: Hierbei wurde z.B. eine Mindestentfernung neuer zu bestehenden Betriebsstandorten definiert (Beispiel siehe Marktgemeinde St. Lorenzen, 1998).

des Arbeitsmarktes und Liberalisierungen in diversen Dienstleistungsbereichen, u.a. Telekommunikation, Elektrizitätsversorgung und Einzelhandel (Arcidiacono, 2014; Matthes, 2015). Die Liberalisierungen des nationalen Wettbewerbsrechtes mit Bezug auf den Einzelhandel verpflichteten auch die Provinz Südtirol, ihre Regulierung und Steuerung des Einzelhandels dementsprechend anzupassen (Küpper/Scheibe, 2015).

Im Zuge dessen verabschiedete die Provinz Südtirol im Jahr 2012 das *Gesetz zur Liberalisierung der Handelstätigkeit* (Landesgesetz 7/2012), das wesentliche Bestimmungen sowohl der Handelsordnung als auch des Landesraumordnungsgesetzes aufhob bzw. modifizierte, hierbei jedoch nicht sämtliche nationalstaatlichen Liberalisierungsforderungen umsetzte. Die wichtigsten Änderungen umfassten:

- Abschaffung der Handelsplanung (Art. 1, Abs. 2, b)
- Aufhebung der im Landesraumordnungsgesetz verfestigten Einschränkung der Verkaufsfläche des Einzelhandels in Wohnbauzonen (Art. 3, Abs. 1)
- Aufhebung der im Landesraumordnungsgesetz definierten Verkaufsflächenbegrenzungen für die erlaubten Einzelhandelsnutzungen in Gewerbegebieten; die Beschränkung der Einzelhandelsnutzung auf diese Sortimentsbereiche blieb aber erhalten (Art. 5, Abs. 2)
- Aufhebung der in der Handelsordnung festgelegten Melde- bzw. Genehmigungspflichten von Handelsbetrieben (Art. 8, Abs. 1, a)

Die Liberalisierung wurde sowohl vom Südtiroler Handels- und Dienstleistungsverband (hds) als auch von anderen Organisationen kritisiert, u.a. aufgrund einer zu erwartenden Flächenexpansion und einer damit verbundenen Intensivierung des Wettbewerbs für kleine Betriebe. Thematisiert wurden ebenso mögliche negative Effekte (stärkere räumliche Disparitäten) in der Nahversorgung (Der Vinschger, 14.03.2012; Der Vinschger Wind, 04.04.2012). Auch wurde das Gesetz vor dem italienischen Verfassungsgericht durch die Staatsregierung angefochten, die die Liberalisierung nicht konsequent genug umgesetzt sah (Neue Südtiroler Tageszeitung, 13.01.2015). Nach juristischen Auseinandersetzungen konnte die Südtiroler Landesregierung in Verhandlung mit der Staatsregierung im Jahr 2016 eine Wiedereinführung bestimmter provinzspezifischer Regelungen der Raumordnung erwirken: Insbesondere die Liberalisierung des Handels in Gewerbegebieten wurde wieder rückgängig gemacht (Neue Südtiroler Tageszeitung, 27.10.2016).

Der Zeitraum von 2012 bis 2016 stellt in Südtirol faktisch einen Systemwechsel von einer der striktesten Regulierungs- und Steuerungsformen der (räumlichen) Einzelhandelsentwicklung hin zu einer minimalen Rahmengebung dar. **Wie hat sich der Südtiroler Einzelhandel seit der Liberalisierung entwickelt? Gab es ein Wachstum an Verkaufsflächen?** Und, vor allem: **Welchen Einfluss hatte die Liberalisierung auf die räumliche Struktur des Südtiroler Einzelhandels? Haben die räumlichen Disparitäten in der Ausstattung mit Einzelhandel zugenommen?** Diese Fragen sollen im Folgenden anhand empirischer Daten zum Südtiroler Einzelhandel (WIFO, 2017) zu beantworten versucht werden. Vorher müssen allerdings noch notwendige theoretische Vorüberlegungen zur Entwicklung räumlicher Disparitäten in Systemen von Einzelhandelsstandorten formuliert werden, von denen die zweite – Regionale Konvergenz – zugleich auch die Grundlage für das empirische Analysekonzept darstellt.

3 THEORETISCHE UND METHODOLOGISCHE VORÜBERLEGUNGEN

3.1 Regionale Disparitäten in Systemen von Angebotsstandorten des Einzelhandels

Die *Standorttheorien des Einzelhandels* behandeln sowohl die Standortwahl einzelner Betriebe als auch die Entstehung und Entwicklung ganzer Systeme von *Angebotsstandorten* des Einzelhandels. Allen gemein ist, dass Angebotsstandorte sowohl einzelne Verkaufsstellen als auch Agglomerationen (z.B. Einkaufszentren) oder ganze Standortbereiche (z.B. Innenstädte, Gewerbegebiete) sein können. Diese haben *Marktgebiete*, in denen ihre (tatsächlichen oder potenziellen) Kunden wohnen, wobei der Kundenzufluss mit steigender Entfernung abnimmt, da die Kunden den Reiseaufwand (*Transportkosten*) tragen müssen (*Distanzabhängige Nachfrage*). Die Angebotsstandorte konkurrieren untereinander, sofern sich ihre Marktgebiete überschneiden (*Räumlicher Wettbewerb*). Weiterhin sind diese (zumeist mikroökonomisch fundierten) Theorien dadurch gekennzeichnet, dass sie planerische bzw. politische Eingriffe unberücksichtigt lassen (Wieland, 2015).

Die Grundlage der meisten Überlegungen ist die *Theorie der zentralen Orte* von Christaller (1933). In deren Basismodell wird vereinfachend davon ausgegangen, dass Konsumenten – für die das Menschenbild des

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homo oeconomicus angenommen wird (*Vollständige Markttransparenz*, *nutzenmaximierendes Verhalten*) – bei einem Einkauf immer nur ein Gut erwerben und hierbei den nächstgelegenen Angebotsstandort aufsuchen. Die Marktgebiete von Angebotsstandorten ergeben sich hierbei zunächst allein aus den kundenseitigen Transportkosten, wobei sich im „Idealfall" ein System von Zentren herausbildet, deren Marktgebiete hexagonal angeordnet sind und sich nicht überschneiden. Allerdings geht auch Christaller davon aus, dass *Kopplungskäufe* vollzogen werden, d.h. aufgrund von Zeiteinsparung mehrere Güter im Zuge eines Einkaufs besorgt werden; kleine, nahe gelegene, Standorte werden daher u.U. umfahren zu Gunsten größerer Standorte, die ein höheres Kopplungspotenzial bieten. Daraus resultiert, dass sich die Marktgebiete größerer Standorte zu Lasten kleinerer Standorte ausdehnen und die Standortentscheidungen der Betriebe – aufgrund der größeren Nachfrage – ebenso zu Gunsten dieser Standorte fallen; es bestehen demnach *Agglomerationsvorteile* in Bezug auf Anbieter *unterschiedlicher* Branchen, deren Angebote gekoppelt werden. Gleichzeitig können die Unternehmen in ihren Verkaufsstellen an diesen Standorten aufgrund der größeren Nachfrage von sinkenden Durchschnittskosten (*Steigende Skalenerträge*) profitieren. Der dynamische Teil von Christallers Theorie behandelt Fälle, in denen einzelne Aspekte der räumlichen Standortkonfiguration im Zeitverlauf verändert werden: Insbesondere ist entsprechend der o.g. Prämissen davon auszugehen, dass „starke" Standorte aufgrund der Agglomerationsvorteile schneller und zu Lasten der bereits schwach ausgestatteten Standorte wachsen. Diese Entwicklungen führen zu einer „[…] Bevorzugung der großen Städte auf Kosten der kleinen, aus streng wirtschaftlichen Erwägungen heraus" (Christaller, 1933, S. 107), d.h. zu einer Zunahme von räumlichen Disparitäten in einem System von Angebotsstandorten, sofern keine planerische Regulierung erfolgt. Zu einem ähnlichen Ergebnis kommt Lange (1973) in seiner *Wachstumstheorie zentralörtlicher Systeme*, die eine Erweiterung der Zentrale-Orte-Theorie darstellt.

Diese Zusammenhänge gelten verstärkt, wenn den Konsumenten zugleich *unvollständige Markttransparenz* unterstellt wird: Aufgrund der beschränkten Information der Kunden werden jene Angebotsstandorte bevorzugt, die *Vergleichskäufe* ermöglichen, d.h. der Vergleich verschiedener Ausführungen derselben Produktklasse hinsichtlich z.B. Preis und Qualität vor Ort. Angebotsstandorte mit mehreren Verkaufsstellen derselben Branche – d.h. Konkurrenten mit nur *beschränkt substituierbarem* Angebot – wirken daher für die Kunden attraktiver. Hier besteht also ein betriebswirtschaftlicher Anreiz zur Ballung kompetitiver Anbieter, d.h. Agglomerationsvorteile in Bezug auf Betriebe, die eigentlich im Wettbewerb zueinander stehen. Die Folge ist die räumliche Konzentration auch von Mitbewerbern in einigen Angebotsstandorten (Lange, 1973; Nelson, 1970; Wolinsky, 1983). Die genannten Aspekte der Bildung von Agglomerationen im Einzelhandel und die damit verbundene Stärkung großer und Schwächung kleiner Standorte ist ebenso Gegenstand der stadtökonomischen Modelle aus der neuen Generation raumökonomischer Theorien der *New Economic Geography* (z.B. Fujita/Thisse, 2002; Takahashi, 2013).

Ausgehend von den Standortstrukturtheorien des Einzelhandels ist also eine Verstärkung räumlicher Disparitäten in der Einzelhandelsausstattung zu erwarten, die aus positiven Agglomerationseffekten resultiert (Wieland, 2015). Dies gilt insbesondere dann, wenn kein raumordnungspolitisches Korrektiv vorhanden ist (was ja eine Grundannahme besagter Theorien ist). Ein weiterer wichtiger Aspekt hierzu wird von Lange (1973) behandelt, nämlich dass neu in den Markt eintretende Unternehmen und/oder neue Betriebsformenkonzepte zunächst nur an den ertragreichsten Standorten mit den größten Marktgebieten (z.B. Innenstadtbereiche von Großstädten) eröffnet werden; sofern diese einmal etabliert sind, erfolgt eine Übertragung der Konzepte auf kleinere Standorte (*Räumliche Diffusion*), die allerdings auch *ausbleiben* kann. In jedem Fall findet auch hier eine Bevorzugung bereits gut ausgestatteter Angebotsstandorte statt.

3.2 Regionales Wachstum und Konvergenz

Das Wachstum von Volkswirtschaften wird in der Ökonomie im Rahmen des Forschungszweigs der *Wachstumstheorie* erklärt, die u.a. auf Solow (1956) zurückgeht (ausführlicher Überblick bei Barro/Sala-i-Martin, 2004). Der Zusammenhang zwischen dem (Wirtschafts-)Wachstum in *Regionen* (d.h. Teilgebieten eines größeren Wirtschaftsraums, z.B. einer ganzen Volkswirtschaft) und der Entwicklung der räumlichen Disparitäten zwischen diesen Regionen ist Gegenstand der *regionalen Wachstumstheorie*, die aus der Wachstumstheorie abgeleitet wurde bzw. diese auf Regionen anwendet. Der Abbau der Disparitäten wird hierbei als *Konvergenz*, ihre Zunahme als *Divergenz* bezeichnet (Capello/Nijkamp, 2007; Eltges, 2013).

Ausgangspunkt dieses Theoriegebäudes ist, dass der Output einer Region (z.B. BIP [=Bruttoinlandsprodukt] bzw. BIP pro Einwohner) vom Einsatz des Inputs, d.h. von der Höhe des Einsatzes der volkswirtschaftlichen

Produktionsfaktoren (Arbeit, Kapital, ggf. Boden), abhängt (z.B. je höher der Einsatz von Kapital, desto größer ist auch der Output). Allerdings gelten für die Produktionsfaktoren *abnehmende Grenzerträge*, d.h. bei steigendem Input wächst der Output unterproportional (z.B. bei einer Erhöhung eines Faktors um 10 % steigt der Output nur um 6 %). Daraus resultiert, dass Regionen mit hohem Ausgangsniveau (d.h. hoher Input) über die Zeit *geringere Wachstumsraten* aufweisen als Regionen mit niedrigem Ausgangsniveau. Mit der Zeit erfolgt daher – als Marktergebnis, d.h. ohne Staatseingriffe in Form von z.B. Regionalpolitik oder Raumordnung – ein Abbau regionaler Disparitäten, d.h. Konvergenz (Allington/McCombie, 2007). Es werden zwei Typen von Konvergenz unterschieden, die sich nicht notwendigerweise gegenseitig bedingen: Wachsen „arme" Regionen tatsächlich schneller als „reiche" Regionen, liegt *Beta-Konvergenz* vor. Die tatsächliche Abnahme regionaler Disparitäten zwischen den Regionen über die Zeit wird dagegen als *Sigma-Konvergenz* bezeichnet (Allington/McCombie, 2007; Capello/Nijkamp, 2009; Furceri, 2005).

Konvergenz ist aber nicht nur ein theoretisches Konzept, sondern auch ein empirisches Analysekonzept. Mit Bezug auf den Vergleich von zwei Zeitabschnitten kann mit folgendem Regressionsmodell ermittelt werden, ob Beta-Konvergenz vorliegt (Allington/McCombie, 2007; Dapena et al., 2016):

$$Ln\left(\frac{Y_{i,t2}}{Y_{i,t1}}\right) = \alpha + \beta Ln\left(Y_{i,t1}\right) + \varepsilon \qquad (1)$$

wobei: $Y_{i,t1}$ = Initialer Wert eines Indikators pro Einwohner (z.B. Bruttoinlandsprodukt pro Kopf) in Region i zum Zeitpunkt $t1$, $Y_{i,t2}$ = Wert desselben Indikators in Region i zum Zeitpunkt $t2$, α = Regressionskoeffizient (Konstante), β = Regressionskoeffizient (Steigung) und ε = Residuen.

Alternativ kann auch, anstelle des logarithmierten Wachstums zwischen zwei Zeitabschnitten, das logarithmierte durchschnittliche jährliche Wachstum innerhalb mehrerer Jahre verwendet werden (z.B. Goecke/Hüther, 2016). Beta-Konvergenz (genauer: *Absolute* Beta-Konvergenz[2]) – deren Name sich aus dem Modellkoeffizienten in der gezeigten Formel herleitet – besteht, wenn die Steigung 1.) statistisch signifikant (t-Test für Regressionskoeffizienten) und 2.) negativ ist ($\beta < 0$), d.h. wenn das regionale Wachstum innerhalb des betrachteten Zeitraums negativ vom initialen Wert abhängt (Allington/McCombie, 2007).

Hiermit sind zwei weitere Parameter verbunden, die, sofern Beta-Konvergenz besteht, eine Aussage darüber treffen, wie schnell diese vorangeht: Die *Konvergenzgeschwindigkeit* (λ) misst die prozentuale Angleichung je Zeiteinheit (z.B. pro Jahr), während der *half-life*-Wert (H) anzeigt, nach wie vielen Zeiteinheiten (z.B. Jahren) die Disparitäten zur Hälfte reduziert sind (Allington/McCombie, 2007; Dapena et al., 2016):

$$\lambda = \frac{-Ln(1+\beta)}{T} \qquad (2)$$

$$H = \frac{Ln(2)}{\lambda} \qquad (3)$$

wobei: λ = Konvergenzgeschwindigkeit (in %), H = Half-Life (in Zeiteinheiten), β = Regressionskoeffizient (Steigung) aus Formel (1) und T = Anzahl der Zeiteinheiten (z.B. Jahre) zwischen $t1$ und $t2$.

Auch die Sigma-Konvergenz ist nach dem statistischen Parameter zu ihrem Ausdruck (Standardabweichung σ) benannt. Im Fall des Vergleichs von zwei Zeitabschnitten ($t1$ und $t2$) wird die Standardabweichung (oder ein anderes Streuungsmaß, z.B. Varianz oder Variationskoeffizient) des betrachteten Indikators berechnet und die Ergebnisse miteinander verglichen (Furceri, 2005):

$$\sigma_{t1} = \sqrt{\frac{1}{N}\sum_{i=1}^{N}\left(y_{i,t1} - \bar{y}_{t1}\right)^2} \text{ bzw. } \sigma_{t2} = \sqrt{\frac{1}{N}\sum_{i=1}^{N}\left(y_{i,t2} - \bar{y}_{t2}\right)^2} \qquad (4)$$

wobei: σ_{t1} = Standardabweichung zum initialen Zeitpunkt $t1$, σ_{t2} = Standardabweichung zum Zeitpunkt $t2$, $y_{i,t1}$ bzw. $y_{i,t2}$ = (Logarithmierter) Indikator (z.B. BIP pro Kopf) in Region i zum Zeitpunkt $t1$ ($Ln\ (Y_{i,t1})$) bzw. zum Zeitpunkt $t2$ ($Ln\ (Y_{i,t2})$), $\bar{y}_{t1}$ und $\bar{y}_{t2}$ = Arithmetische Mittelwerte des (logarithmierten) Indikators über alle Regionen zu den Zeitpunkten $t1$ bzw. $t2$ und N = Anzahl Regionen.

[2] Werden weitere Variablen in das Modell integriert, um regionsspezifische Eigenschaften als Bedingungen des Wachstums darzustellen, wird von *bedingter* Beta-Konvergenz gesprochen (Allington/McCombie, 2007).

Sigma-Konvergenz besteht, wenn der Quotient aus beiden Standardabweichungen 1.) statistisch signifikant (F-Test für Varianzgleichheit) und 2) größer eins ist ($\sigma_{t1}/\sigma_{t2} > 1$), d.h. wenn die regionalen Disparitäten zum initialen Zeitpunkt *t1* größer sind als zum Zeitpunkt *t2*, was eine Abnahme der Disparitäten über die Zeit bedeutet (Furceri, 2005). Werden mehr als zwei Jahre betrachtet, kann die Entwicklung des Streuungsmaßes auf einen steigenden oder fallenden Trend hin untersucht werden (z.B. Goecke/Hüther, 2016).

Die Bestimmung der Beta- und Sigma-Konvergenz wird häufig als empirisches Konzept zur Analyse von Konvergenzprozessen der regionalen Wirtschaftsleistung in größeren Wirtschaftsräumen (z.B. EU, USA) angewendet (z.B. Dapena et al., 2016; Goecke/Hüther, 2016; Young et al., 2008). Prinzipiell ist das Konzept aber vielseitig anwendbar, wie z.B. Analysen zur regionalen Angleichung der Morbidität (Janssen et al., 2016) oder von Nachfrage- und Umsatzdaten im Lebensmitteleinzelhandel (Regmi et al., 2008) zeigen.

Das Konzept lässt sich auch auf die *Ausstattung* (bzw. *Versorgung*) *von Teilgebieten* (z.B. Gemeinden) mit Einzelhandel bzw. deren Entwicklung über die Zeit übertragen. Da der zentrale Standortfaktor für Einzelhandelsbetriebe die lokale Nachfrage ist, muss diese Ausstattung aber – wie im Konvergenzmodell das BIP pro Kopf – in Form eines Dichtewertes auf die Bevölkerung bezogen werden (z.B. Verkaufsfläche pro 1.000 Einwohner). **Ausgehend von der Konvergenzhypothese müssten bereits gut ausgestattete Teilgebiete in ihrem Ausstattungsgrad des Einzelhandels langsamer wachsen als schwächer versorgte Teilgebiete und sich die Ausstattungsgrade der Teilgebiete im Zeitverlauf anpassen, d.h. sich die räumlichen Disparitäten verringern**. Dies wäre demnach die gegenteilige Hypothese zur Grundaussage der o.g. Standortstrukturtheorien, wonach ein Anstieg räumlicher Disparitäten im Einzelhandel zu erwarten wäre. Welche der beiden Hypothesen zutrifft, lässt sich anhand des dargestellten empirischen Analysekonzeptes der Beta- bzw. Sigma-Konvergenz beantworten.

4 DARSTELLUNG DER ERGEBNISSE

4.1 Entwicklung des Südtiroler Einzelhandels vor und nach der Liberalisierung

Um die Gesamtentwicklung des Südtiroler Einzelhandels darzustellen, wurden die verfügbaren Daten zu den Verkaufsstellen des Einzelhandels (d.h. einzelne Einkaufsstätten) auf der Provinz- bzw. Gemeindeebene (WIFO, 2017) und die auf denselben Raumgliederungen verfügbaren Bevölkerungsdaten (ASTAT, 2017) ausgewertet. Hierbei wurden nur Unternehmen des stationären Einzelhandels (Amtliche Bezeichnung: Einzelhandel mit festem Standort) und Einzelhandel als Haupttätigkeit (bzw. als Umsatzschwerpunkt) berücksichtigt, da nur bei diesen davon auszugehen ist, dass sie effektiv durch ihre Verkaufstätigkeit an die Endverbraucher (private Haushalte) wirtschaftlich existieren, während Nebentätigkeitsbetriebe ihren Umsatz vorrangig anderweitig (z.B. Großhandel, Herstellung) generieren (Altieri et al., 2011). Ausgehend von den vorliegenden Daten existierten in der Provinz Südtirol im Jahr 2016 7.563 Verkaufsstellen des Einzelhandels, hiervon 4.846 (64,1 %) mit Haupttätigkeit bzw. 2.717 (35,9 %) mit Nebentätigkeit.

Die Daten lagen für den Zeitraum von 2000 bis 2016 vor, wobei die Bevölkerungsdaten erst ab 2001 und die Verkaufsflächenangaben für die Handelsbetriebe erst ab 2002 verfügbar waren. Im Kern steht demnach die Betrachtung der Zeiträume von 2002 (ab hier sind Verkaufsflächendaten verfügbar) bis 2011 (letztes Jahr *vor* der Liberalisierung) und von 2011 bis 2015 (da teilweise *Rücknahme* der Liberalisierung im Jahr 2016).

Betrachtet man die *absolute* Entwicklung der Südtiroler Einkaufsstätten und ihrer Verkaufsflächen (Abb. 1), zeigt sich eine leichte Zunahme der Zahl an Verkaufsstellen sowohl von 2002 bis 2011 als auch zwischen 2011 und 2015: Die Zahl der Verkaufsstellen ist von 2002 bis 2011 jährlich durchschnittlich um 0,63 % gewachsen, im Zeitraum von 2011 bis 2015 durchschnittlich um nur noch 0,50 %. Deutlich stärker fällt bereits im Zeitraum vor der Handelsliberalisierung das Wachstum der gesamten Verkaufsfläche aus (2002: 452.772 qm, 2011: 571.854 qm; Jährliches Wachstum im Durchschnitt: +2,64 %), wobei die Steigerung ab 2011 mit 3,83 % auf 680.274 qm im Jahr 2015 wesentlich höher ist. Das Verkaufsflächenwachstum ab 2011 ist also deutlich stärker als das der Verkaufsstellen. Dies zeigt sich auch anhand der durchschnittlichen Verkaufsflächengröße der Einkaufsstätten, die von 101,4 qm im Jahr 2002 auf 142,3 qm im Jahr 2015 angewachsen ist; im Zeitraum von 2002 bis 2011 entspricht das einem durchschnittlichen jährlichen Wachstum von 2,10 % und von 2011 bis 2015 von 3,32 %. Die Gesamtentwicklung der Einkaufsstätten zeigt also bereits eine *Maßstabsvergrößerung* auf, die im zeitlichen Zusammenhang mit der Liberalisierung steht.

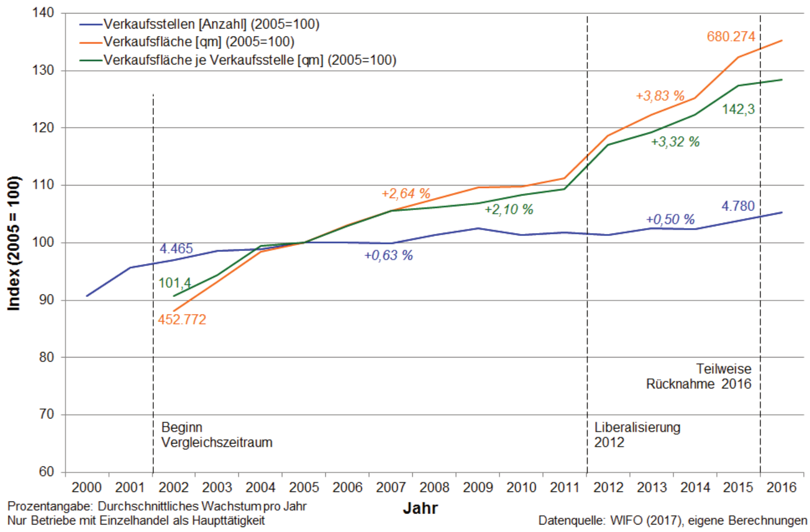

Abb. 1: Entwicklung der Verkaufsstellen und der Verkaufsfläche im Südtiroler Einzelhandel 2000-2016.

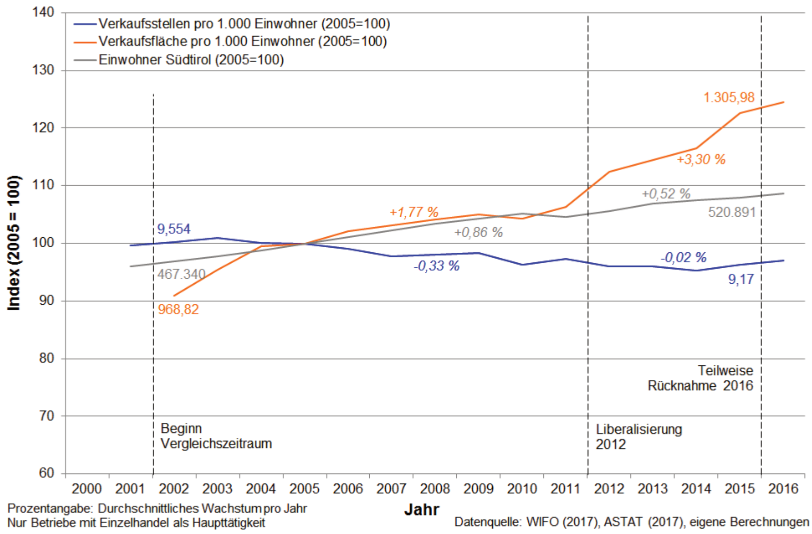

Abb. 2: Entwicklung der Ausstattungsgrade (Verkaufsstellen und Verkaufsfläche) im Südtiroler Einzelhandel 2001-2016.

Dieses Bild verstärkt sich, wenn die *relative* Situation in Form von Ausstattungsgraden betrachtet wird (Abb. 2): Der Ausstattungsgrad mit Einkaufsstätten (Verkaufsstellen je 1.000 Einwohner) ist sowohl von 2002 bis 2011 als auch von 2011 bis 2015 gesunken (-0,33 % bzw. -0,02 %), d.h. die Entwicklung der Zahl der Einkaufsstätten verlief in den genannten Zeiträumen unterhalb der (positiven) Bevölkerungsentwicklung Südtirols. Die Verkaufsflächendichte ist demgegenüber gestiegen, ab 2012 mit einem durchschnittlichen jährlichen Wachstum von 3,30 % deutlich höher als bis 2011 (+1,77 %). Sowohl die Verkaufsstellen- als auch die Verkaufsflächenentwicklung haben sich also tendenziell von der Entwicklung der Bevölkerung abgekoppelt; im ersten Fall nach unten, im zweiten Fall (deutlich) nach oben. Ob allerdings alle Teilgebiete Südtirols gleichermaßen daran teilhaben, lässt sich aus dieser Gesamtbetrachtung noch nicht schließen.

4.2 Kleinräumige Entwicklung der Einzelhandelsausstattung: Konvergenz oder Divergenz?

Zur Analyse der Entwicklung auf der Ebene der 116 Südtiroler Gemeinden im Zeitverlauf wurden die relevanten Indikatoren (Verkaufsstellen bzw. Verkaufsfläche je 1.000 Einwohner) auf der Gemeindeebene für die relevanten Jahre berechnet. Für die Prüfung auf Beta-Konvergenz wurde das Wachstum auf Gemeindeebene entsprechend Formel (1) als Quotient aus dem Indikatorenwert des zweiten und des ersten Jahres gebildet (siehe auch Abb. 3). Die Vergleichszeitpunkte *t1* und *t2* bilden die Jahre 2002 und 2011 (*vor* der Handelsliberalisierung) bzw. 2011 und 2015 (*nach* der Liberalisierung). Die Sigma-Konvergenz wurde gemäß Formel (4) auf die Abnahme der Standardabweichung zwischen den beiden Jahren jeweils vor und nach der Reform hin geprüft. Die Berechnung erfolgte in *R* (R Core Team, 2016) mit Hilfe des Pakets *REAT* (Wieland, 2017). Die grafische Darstellung der Regressionsmodelle zur Prüfung auf Beta-Konvergenz zeigt Abb. 4. Eine Zusammenfassung der ermittelten Parameter der Konvergenzanalysen wird in Tab. 1 gezeigt.

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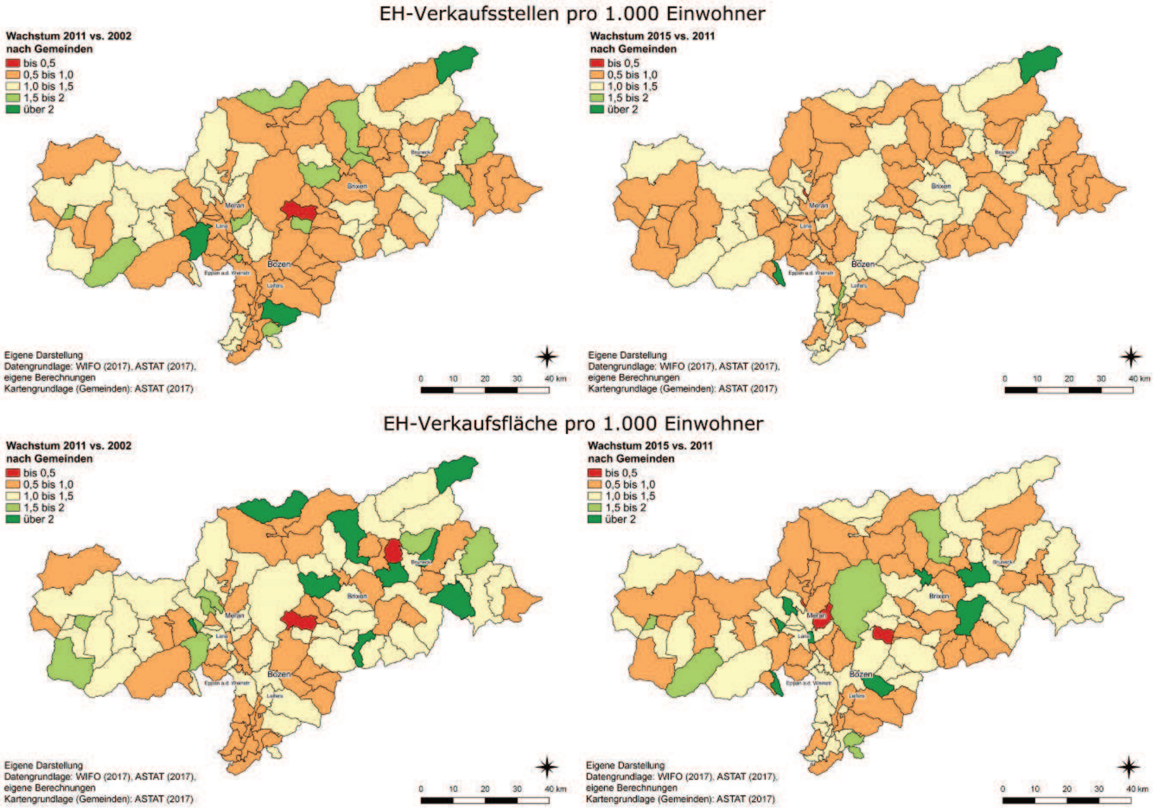

Abb. 3: Verkaufsstellen und Verkaufsfläche je 1.000 Einwohner – Wachstum nach Gemeinden 2011/2002 und 2015/2011.

Im Hinblick auf die Ausstattung der Gemeinden mit Verkaufsstellen des Einzelhandels (Abb. 4, links oben und Tab. 1, 3. Spalte) lässt sich für den Zeitraum von 2002 bis 2011 eine Beta-Konvergenz feststellen: Das Regressionsmodell ist als Ganzes statistisch signifikant (Bestimmtheitsmaß R^2 = 0,327), ebenso ist der Parameter β = -0,317 statistisch signifikant (jeweils 99,9-%-Niveau) und negativ, was anzeigt, dass im Hinblick auf diesen Ausstattungsgrad (Verkaufsstellendichte) tatsächlich in diesem Zeitraum schwächer ausgestattete Gemeinden stärker gewachsen sind als jene, die bereits über hohe Ausstattungsgrade verfügten (auch zu erkennen an der fallenden Ausgleichsgrade im Streudiagramm in Abb. 4). Ausgedrückt in Form des half-life-Wertes würde eine Halbierung der räumlichen Disparitäten unter dieser Voraussetzung noch 16,3 Jahre benötigen. Die Streuung der Versorgungsgrade, ausgedrückt durch die Standardabweichung, ist in diesem Zeitraum von 1,090 auf 0,894 gesunken; der Unterschied beider Streuungsmaße (Quotient) ist statistisch signifikant (95-%-Niveau) und größer eins, d.h. es liegt ebenso Sigma-Konvergenz vor. Im genannten Zeitraum hat ein also Abbau räumlicher Disparitäten der Versorgung mit Einkaufsstätten stattgefunden. Für den Zeitraum von 2011 bis 2015 ist dies nicht nachzuweisen: Das Regressionsmodell zur Prüfung auf Beta-Konvergenz (Abb. 4, rechts oben und Tab. 1, 4. Spalte) ist nicht signifikant, ebenso wenig der β-Wert, der nur leicht *oberhalb* von null liegt (auch zu erkennen an der nur minimalen Steigung der Ausgleichsgrade im Streudiagramm in Abb. 4). Die Berechnung von λ und dem half-life-Wert ist für den Fall positiver Beta-Werte nicht möglich (und inhaltlich nicht sinnvoll, da keine Beta-Konvergenz stattfindet). Der Quotient der Standardabweichungen von 2011 und 2015 ist statistisch signifikant (90-%-Niveau) und kleiner eins, was nach der Definition des Konvergenzmodells bedeutet, dass keine Sigma-Konvergenz, sondern vielmehr eine Verstärkung der räumlichen Disparitäten (d.h. Divergenz) stattgefunden hat.

Die Ergebnisse der Konvergenzanalyse für die Verkaufsflächendichte (Verkaufsfläche in qm pro 1.000 Einwohner) von 2002 bis 2011 (Abb. 4, links unten und Tab. 1, 5. Spalte) sind ähnlich: Auch hier ist in einem statistisch signifikanten Regressionsmodell (R^2 = 0,316 signifikant auf 99,9-%-Niveau) Beta-Konvergenz festzustellen (β = -0,317 signifikant auf 99,9-%-Niveau), ebenso eine signifikante Sigma-Konvergenz. Das Regressionsmodell für den Zeitraum von 2011 bis 2015 (Abb. 4, rechts unten und Tab. 1, 6. Spalte) ist, anders im Fall der Verkaufsstellen, statistisch signifikant (R^2 = 0,029 signifikant auf 90-%-Niveau), wobei der β-Wert signifikant *größer* als null ist (β = 0,102 signifikant auf 90-%-Niveau). Für den Fall der Verkaufsflächendichte ist also nicht nur keine Beta-Konvergenz (wie bei den Verkaufsstellen), sondern eine statistisch signifikante *Beta-Divergenz* festzustellen: Das Wachstum der Verkaufsflächendichte auf Gemeindeebene bis 2015 ist also umso größer, je höher der Ausstattungsgrad im Jahr 2011 war. Wie im Fall der Verkaufsstellen ist auch Sigma-Divergenz nachzuweisen, da die Streuung der Ausstattungsgrade von 2011 bis 2015 signifikant zugenommen hat. Parallel zu einem deutlichen Verkaufsflächenwachstum in ganz Südtirol (siehe Kap. 4.1) haben sich also die regionalen Unterschiede der Pro-Kopf-Ausstattung der 116 Gemeinden mit Verkaufsfläche erhöht.

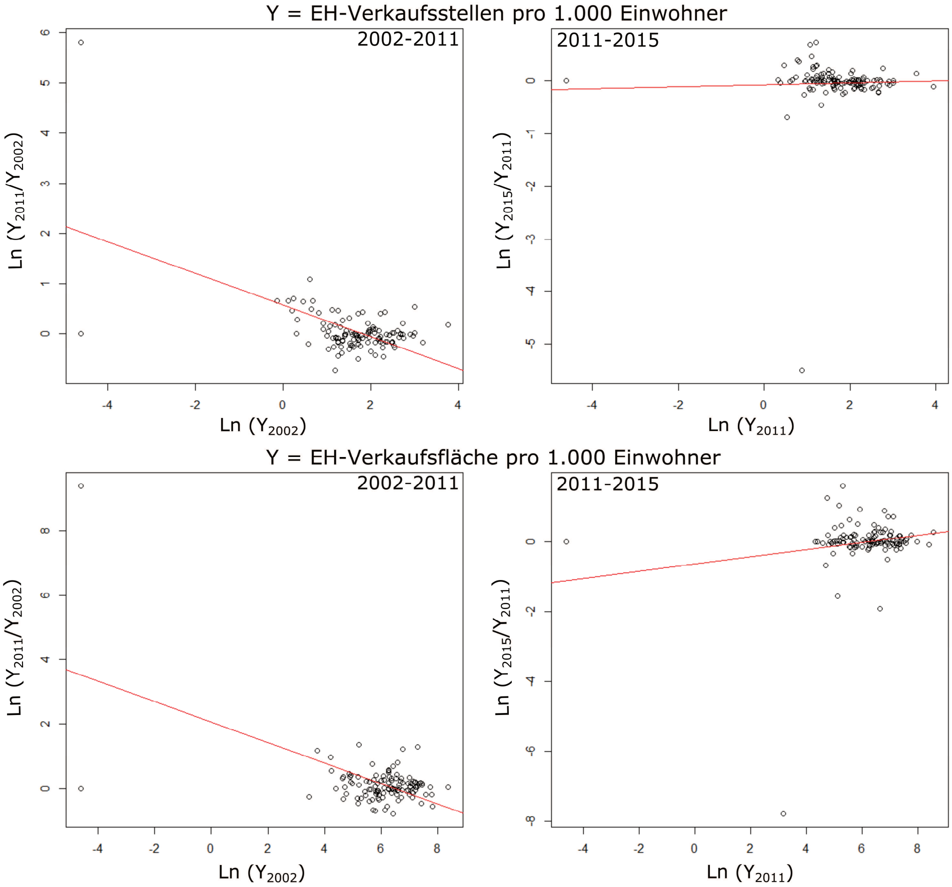

Abb. 4: Verkaufsstellen und Verkaufsfläche je 1.000 Einwohner – Beta-Konvergenz auf Gemeindeebene.

Konvergenz-Typ	**Parameter**	**Verkaufsstellen pro 1.000 Einwohner (Ebene: 116 Gemeinden)**		**Verkaufsfläche pro 1.000 Einwohner (Ebene: 116 Gemeinden)**	
		2002-2011	**2011-2015**	**2002-2011**	**2011-2015**
Beta-Konvergenz	α	0,573***	-0,069	2,053***	-0,630^{+}
	β	-0,317***	0,018	-0,317***	0,102^{+}
	λ	0,042	--	0,042	--
	H	16,333	--	16,364	--
	R^2	0,327***	0,001	0,316***	0,029^{+}
Sigma-Konvergenz	σ_{t1}	1,090	0,894	1,674	1,384
	σ_{t2}	0,894	1,058	1,384	1,728
	σ_{t1}/σ_{t2}	1,219*	0,845^{+}	1,209*	0,801*
Signifikanzniveaus (nur relevant für α, β, R^2 und $\sigma_{i,t1}/\sigma_{i,t2}$): *** = 0,1%, ** = 1%, * = 5 %, $^{+}$ = 10 %					

Tab. 1: Verkaufsstellen und Verkaufsfläche pro 1.000 Einwohner – Beta- und Sigma-Konvergenz auf Gemeindeebene (Parameter).

5 SCHLUSSFOLGERUNGEN

Ziel der Untersuchung war es, den Einfluss der Liberalisierung der sektoralen Regulierung und der raumordnerischen Steuerung des Einzelhandels in Südtirol ab 2012 herauszuarbeiten. Schließlich fand hier – aus dem Blickpunkt einer empirischen Wirkungsuntersuchung nahezu unter „Laborbedingungen" – der (nicht freiwillig vollzogene) Wechsel von einer beinahe einmalig strikten Interventions- hin zu einer „laissez-faire"-Politik statt. In einer Gesamtbetrachtung des Südtiroler Einzelhandels zeigt sich im zeitlichen

Zusammenhang mit der Erosion der wettbewerbs- und raumordnungspolitischen Kompetenzen der Provinz eine Zunahme der Verkaufsfläche des Einzelhandels, die deutlich über der Entwicklung der Verkaufsstellen und der Einwohner liegt. Die durchschnittliche Größe der Einkaufsstätten ist ebenso gestiegen wie der Ausstattungsgrad der Bevölkerung, insbesondere im Vergleich mit der Entwicklung vor der Liberalisierung. **Es zeigt sich also eine Maßstabsvergrößerung des Südtiroler Einzelhandels, die durch die Liberalisierung kaum vollständig induziert, aber zumindest deutlich beschleunigt wurde**. Demnach hat die Reform unbestreitbar **Investitionen im Einzelhandelssektor angeregt, nur dass diese vorrangig auf größere Verkaufsflächen und nicht auf Betriebe abzielten**.

Was diese Resultate bereits andeuten, wird durch die kleinräumige Betrachtung der Ausstattungsgrade im Zeitverlauf auf Gemeindeebene bestätigt: Im Zeitraum vor der Liberalisierung der Handelstätigkeit fand tatsächlich sowohl eine Beta- als auch eine Sigma-Konvergenz statt, die allerdings in erheblichem Maße der Regulierung bzw. Steuerung der räumlichen Einzelhandelsentwicklung geschuldet sein dürfte. Ab 2012 kehrt sich dieser Trend um: Entgegen der Konvergenzhypothese ist, je besser eine Gemeinde bereits mit Einzelhandel versorgt war, ihr Ausstattungsgrad umso stärker gewachsen. Gleichzeitig hat die Streuung der Ausstattungsgrade zugenommen. **In zeitlichem Zusammenhang mit der Liberalisierung haben sich also die räumlichen Disparitäten der Ausstattungsgrade verstärkt, d.h. es hat eine Divergenz im Südtiroler Einzelhandelssektor stattgefunden**. Dieses Ergebnis bestätigt im Wesentlichen die Kernaussagen der Standortstrukturtheorien des Einzelhandels zur Entwicklung räumlicher Disparitäten in Systemen von Angebotsstandorten des Einzelhandels. Gleichzeitig zeigt sich hier der Effekt des Abbaus planerischer Steuerungsmechanismen, deren ursprüngliches Ziel es ja war, eben diese Unterschiede einzudämmen.

Die Ergebnisse können allerdings über einige andere interessante Aspekte keine (direkte) Aussage treffen: In Ermangelung verfügbarer Daten konnte z.B. nicht analysiert werden, wo und in welchem Grad tatsächlich Schließungen, Verlagerungen oder Erweiterungen *einzelner* Verkaufsstellen stattgefunden haben und/oder ob es eine Verdrängung kleiner Verkaufsstellen gab. Hierzu wären georeferenzierte Mikrodaten (d.h. auf der Ebene einzelner Betriebe bzw. Verkaufsstellen) über den gesamten Zeitraum notwendig, die in dieser Form aus Datenschutzgründen nicht (öffentlich) verfügbar sind. Ebenso wäre in Anbetracht der steigenden regionalen Disparitäten und der simultan ablaufenden Maßstabsvergrößerung zu erwarten, dass auch die Leerstände in den Ortskernen insb. kleiner Gemeinden zunehmen; dies würde sich jedoch nur anhand von regelmäßigen Geschäftsflächenkartierungen nachweisen lassen, die schlichtweg nicht existieren.

Darüber hinaus bestehen noch drei weitere Einschränkungen des Aussagekraft, die vor allem statistischer Natur sind: Im Südtiroler Lebensmitteleinzelhandel ist in den letzten Jahren der Effekt zu beobachten gewesen, dass Anbieter des Lebensmittelhandwerks (Bäcker, Metzger) ihr Sortiment auf weitere Nahrungs- und Genussmittel ausweiten und sich somit ihr Umsatzschwerpunkt verlagert; die Folge ist, dass nun v.a. kleine Verkaufsstellen wirtschaftsstatistisch zum Einzelhandel (als sog. „Minimärkte") gerechnet werden, die vorher als Handwerksbetriebe erfasst wurden. Hierdurch erklärt sich eine rein statistische Zunahme an Lebensmittelmärkten, die eigentlich keine ist (Wieland, 2012). Natürlich besteht hier eine potenzielle Verzerrung, wenn Entwicklungen über mehrere Jahre analysiert werden. Zudem wurde in der hiesigen Untersuchung das Angebot der Nachfrage in Form von Einwohnerzahlen gegenübergestellt. Eine nicht unbedeutende Rolle spielt aber auch die touristische Kundschaft in den Südtiroler Gemeinden, die als solche sogar in den früheren Gemeindehandelsplänen berücksichtigt wurde bzw. werden musste (z.B. Gemeinde Deutschnofen, 2009). Beide statistischen Fehlerquellen dürften das Ergebnis allerdings nur dahingehend verzerren, dass regionale Unterschiede *weniger* gewichtig erscheinen als sie es tatsächlich sind. Weiterhin wurde eine wichtige Größe hier nicht berücksichtigt, die sowohl als Versorgungsindikator relevant ist als auch viel über die sektorale Entwicklung des Handels vor dem Hintergrund von dessen Regulierung aussagt, nämlich die Entwicklung der Beschäftigtenzahlen im stationären Einzelhandel; diese lagen hier weder für alle Zeiträume noch in regionalisierter Form vor.

Teile der Liberalisierung des Handels in Südtirol wurden im Jahr 2016 rückgängig gemacht, insbesondere im Hinblick auf die Verkaufsflächenbegrenzungen in Gewerbegebieten. Die hier durchgeführte Untersuchung sollte daher sinnvollerweise in zeitlichem Abstand hierzu wiederholt werden, um den (möglichen) Effekt dieser wiedergekehrten Steuerungsfunktion zu evaluieren. Hierbei wäre zugleich eine Erweiterung dahingehend sinnvoll, auch Betriebsschließungen, -erweiterungen und -verlagerungen im Zusammenhang mit der Liberalisierung zu analysieren (s.o.), wozu Mikrodaten benötigt werden, wie sie in Südtirol z.B. über die amtlichen *Arbeitsstättenzählungen* oder das *Statistische Archiv der tätigen Unternehmen* (*ASIA*) für interne Zwecke der amtlichen Statistik vorliegen.

6 LITERATUR

ALLINGTON, Nigel F. B./McCOMBIE, John S. L.: Economic growth and beta-convergence in the East European Transition Economies. In: ARESTIS, Philip/Baddeley, Michelle/McCOMBIE, John S. L. (Hrsg.): Economic Growth. New Directions in Theory and Policy. S. 200-222. Cheltenham, 2007.

ALTIERI, Mattia/FREI, Patrick/GÄRTNER, Timon/MIOTTI, Ivonne/PÖRNBACHER, Helmuth: Handel in Südtirol. ASTAT-Schriftenreihe, Bd. 175. Bozen, 2011.

ARCIDIACONO, David: Convergence and Mediterranean Capitalism: some empirical evidences on the liberalization of the Italian economic system. In: European Scientific Journal, Juni 2014, Special edition Bd. 1, S. 224-236.

ASTAT: Wohnbevölkerung nach Geschlecht, nach Gemeinden (Interaktive Tabellen). Stand: 2017.

BARRO, Robert J./SALA-I-MARTIN, Xavier: Economic Growth. 2. Auflage. Cambridge, 2004.

CAPELLO, Roberta/NIJKAMP, Peter: Introduction: regional growth and development theories in the twenty-first century - recent theoretical advances and future challenges. In: CAPELLO, Roberta/NIJKAMP, Peter (Hrsg.): Handbook of Regional Growth and Development Theories. S. 1-16. Cheltenham, 2009.

CHRISTALLER, Walter: Die zentralen Orte in Süddeutschland. Eine ökonomisch-geographische Untersuchung über die Gesetzmäßigkeit der Verbreitung und Entwicklung der Siedlungen mit städtischen Funktionen. Darmstadt, 1933.

DAPENA, Alberto Díaz/VÁZQUEZ, Esteban Fernández/MOROLLÓN, Fernando Rubiera: The role of spatial scale in regional convergence: the effect of MAUP in the estimation of β-convergence equations. In: The Annals of Regional Science, Bd. 56, Nr. 2, S. 473–489. 2016.

DER VINSCHGER WIND: Liberalisierung bereitet Kopfzerbrechen. 04.04.2012. URL: http://www.vinschgerwind.it/archiv-beitraege-vinschgau/ausgaben-2012/ausage-7-12/1932-vinschgau-liberalisierung-kopfzerbrechen-hds (Letzter Zugriff: 28.09.2017).

DER VINSCHGER: Bedrohen die Liberalisierungen die Nahversorgung? 14.03.2012. URL: https://www.dervinschger.it/de/thema/bedrohen-die-liberalisierungen-die-nahversorgung-16112 (Letzter Zugriff 07.12.2017). 2012.

ELTGES, Markus: Regionale Konvergenz und Divergenz – die Frage der Fragen. In: Informationen zur Raumentwicklung, Bd. 1.2013, S. 51-66. 2013.

FUJITA, Masahisa/Thisse, Jacques-Francois: Economics of Agglomeration: Cities, Industrial Location, and Regional Growth. Cambridge, 2002.

FURCERI, Davide: Beta and sigma convergence: A Mathematical Relation of Causality. In: Economic Letters, Bd. 89, Nr. 2, S. 212-215.

GEMEINDE DEUTSCHNOFEN: Gemeindehandelsplan. URL: http://www.gemeinde.deutschnofen.bz.it/system/web/GetDocument.ashx?fileurl=%2fgemeindeamt%2fdownload%2f133422325_1.pdf (Letzter Zugriff 09.01.2018). 2009.

GOECKE, Henry/HÜTHER, Michael: Regional Convergence in Europe. In: Intereconomics, Bd. 51, Nr. 3, S. 165-171. 2016.

JANSSEN, Fanny/VAN DEN HENDE, Anthe/DE BEER, Joop/VAN WISSEN, Leo: Sigma and beta convergence in regional mortality: A case study of the Netherlands. In: Demographic Research, Bd. 35, S. 81-116. 2016.

KULKE, Elmar: Einzelhandel in Europa. In: Geographische Rundschau, Bd. 49, Nr. 9, S. 478-483.

KÜPPER, Patrick/SCHEIBE, Christian: Steuern oder fördern? Die Sicherung der Nahversorgung in den ländlichen Räumen Deutschlands und Südtirols im Vergleich. In: Raumforschung und Raumordnung, Bd. 73, Nr. 1, S. 45-48. 2015.

LANGE, Siegfried: Wachstumstheorie zentralörtlicher Systeme. Beiträge zum Siedlungs- und Wohnungswesen und zur Raumplanung, Bd. 5. Münster, 1973.

MARKTGEMEINDE ST. LORENZEN: Gemeindeverordnung über die Ausübung des Friseurgewerbes und verwandter Tätigkeiten. URL: http://www.sanktlorenzen.it/system/web/GetDocument.ashx?fileid=884626 (Letzter Zugriff 09.01.2018). 1998.

MATTHES, Jürgen: Strukturreformen der Krisenländer: Bestandsaufnahme und Abschätzung der Relevanz für Wachstum und Währungsraum. IW policy paper, Nr. 5/2015. Köln, 2015.

NELSON, Phillip: Information and Consumer Behavior. In: Journal of Political Economy, Bd. 78, Nr. 2, S. 311-329. 1970.

NEUE SÜDTIROLER TAGESZEITUNG: Angefochtenes Gesetz. 13.01.2015. URL: http://www.tageszeitung.it/2015/01/13/angefochtenes-gesetz/ (Letzter Zugriff 07.12.2017).

NEUE SÜDTIROLER TAGESZEITUNG: Neue Handelsbestimmungen. 27.10.2016. URL: http://www.tageszeitung.it/2016/10/27/neue-handelsbestimmungen/ (Letzter Zugriff 07.12.2017).

OECD: Italy. Better regulation to strengthen market dynamics. OECD Reviews of Regulatory Reform. Paris, 2009.

POTZ, Petra: Die Regulierung des Einzelhandels in Italien: Grundlagen und Einfluss auf die Handelsstruktur. WZB Discussion Paper, Nr. FS I 02-104. Berlin, 2002.

R CORE TEAM: R: A language and environment for statistical computing. URL: https://www.R-project.org/ (Letzer Zugriff 28.07.2016). R Foundation for Statistical Computing, Wien, 2016.

REGMI, Anita/TAKESHIMA, Hiroyuki/UNNEVEHR, Laurian: Convergence in Food Demand and Delivery: Do Middle-Income Countries Follow High-Income Trends? In: Journal of Food Distribution Research, Bd. 39, Nr. 1, S. 116-122. 2008.

SOLOW, Robert M.: A Contribution to the Theory of Economic Growth. In: The Quarterly Journal of Economics, Bd. 70, Nr. 1, S. 65-94. 1956.

TAKAHASHI, Takaaki: Agglomeration in a city with choosy consumers under imperfect information. In: Journal of Urban Economics, Bd. 76, S. 28-42. 2013.

WIELAND, Thomas: Nahversorgung und Erreichbarkeit in Südtirol. ASTAT-Dok, Bd. 1/2012. Bozen, 2012.

WIELAND, Thomas: Räumliches Einkaufsverhalten und Standortpolitik im Einzelhandel unter Berücksichtigung von Agglomerationseffekten. Theoretische Erklärungsansätze, modellanalytische Zugänge und eine empirisch-ökonometrische Marktgebietsanalyse anhand eines Fallbeispiels aus dem ländlichen Raum Ostwestfalens/Südniedersachsens. Geographische Handelsforschung, Bd. 23. Mannheim, 2015.

WIELAND, Thomas: REAT: Regional Economic Analysis Toolbox. R package version 1.3.2. URL: https://CRAN.R-project.org/package=REAT (Letzer Zugriff 28.07.2016).

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WOLINSKY, Asher: Retail Trade Concentration due to Consumers' Imperfect Information. In: The Bell Journal of Economics, Bd. 14, Nr. 1, S. 275-282. 1983.

YOUNG, Andrew T./HIGGINS, Matthew J./LEVY, Daniel: Sigma Convergence versus Beta Convergence: Evidence from U.S. County-Level Data. In: Journal of Money, Credit and Banking, Bd. 40, Nr. 5, S. 1083-1093. 2008.

ZANDERIGHI, Luca: Italy. In: HOWE, Stewart (Hrsg.): Retailing in the European Union. Structures, competition and performance. S. 102-125. New York, 2003.

Virtual Reality und Urban Emotions – Biosensorik im virtuellen Kontext städtebaulicher Planungsmethoden

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1 ABSTRACT

Das Urban-Emotions-Projekt versucht, mit Hilfe von Biosensorik festzustellen, wie sich Menschen in der Stadt fühlen. Hierbei geht es auch um die Qualität der Architektur, des Stadt- und Freiraumes und des Städtebaus. Waren die Versuche in der Vergangenheit stärker auf das Thema des Fußgänger- oder Radverkehrs, der Barrierefreiheit sowie des sogenannten Wayfinding fokussiert, so wird in diesem neuen Ansatz erstmals versucht, virtuelle Modelle als Grundlage für die humansensorische Messung zu nutzen. Der virtuelle Raum bietet nun die Möglichkeit, externe (Umwelt-) Einflüsse zu minimieren und den Fokus auf die Bewertung gestalterischer Eindrücke zu legen. Die Methode ist eine Weiterentwicklung des Q-Sortings nach Stephenson (1953) sowie des im städtebaulichen Kontext angewandten Ansatz nach Krause (1974). Mithilfe von virtuellen Modellen realer Situationen soll festgestellt werden, ob Probanden auf die gebaute Umwelt positiv oder negativ reagieren. Zum Einsatz kommen die Formate 360°-Videos und Virtual Reality Ambiente sowie als Ausgabegeräte VR-Brillen. Mithilfe dieses Settings können vergleichbare Laborsituationen geschaffen werden, die es erlauben, die alleinige Fokussierung auf die Bausituation herzustellen.

Keywords: Stadtgestaltung, Ästhetik, Q-Sorting, Biosensorik, Virtual Reality

2 EINLEITUNG

Durch die Digitalisierung erleben alle Gesellschaften einen starken Wandel hinsichtlich der Informationsbeschaffung, Zugänglichkeit zu Informationen, potenziell stärkerer Transparenz aber gleichzeitig auch Phänomenen wie Fake-News. Durch soziale Netzwerke und Blogging-Systeme ist die Hürde der Meinungsäußerung verhältnismäßig niederschwellig. Die Teilhabe an gesellschaftlichen Prozessen kann demnach durch die Digitalisierung vereinfacht werden. Partizipation – so könnten Optimisten sagen – ist ein Selbstläufer geworden. Ein Trend, der für die planende Zunft als selbstverständlich erscheint, und der "theoretisch längst umfassend durchdrungen und in der Praxis hinreichend implementiert sein sollte" (STREICH 2014, 137). Andererseits zeigt die Realität, dass immer nur dieselben Akteursgruppen an urbanen Prozessen teilhaben. Viele Gruppen werden speziell durch mangelnde Information immer noch ausgeschlossen. Die Realität sieht, trotz neu gestalteter Formate an Zukunftswerkstätten (PETRIN 2012; PETRIN & WILDHACK 2015) oder Makeathons (FRAUNHOFER IAO 2018)) und der Einsicht, dass Stadtentwicklung eine Gemeinschaftsaufgabe ist (SELLE 2014), bis hin zur Angst der Politiker in die "Mitmachfalle" zur geraten (WAGNER 2014), anders aus. Vielfach finden städtebauliche Prozesse noch immer in den Büros hinter dem Schreibtisch statt. Sie entsprechen nicht den Bedürfnissen der Bürger und berücksichtigen nicht die digitalen Beteiligungsformate (BRENNER et al. 2012). Aber wie können digitale Methoden schon im Vorfeld einer Planung eingesetzt werden, um diesem Anspruch besser zu genügen?

Einige neue Methoden, als auch die Wiederentdeckung "alter Klassiker, digital renoviert" bieten hier einen vielversprechenden Werkzeugkasten für Planer. Interessant sind allgemein solche Methoden, die versuchen, den Menschen (digital) mit in diesen Prozess mit einzubeziehen.

3 STAND DER FORSCHUNG

Jane Jacobs war eine der Pioniere eines bottom-up und bürgernahen Planungsansatzes (JACOBS 1961). Damals in den USA revolutionär, heute gesetzlich verankert, adaptiert und in das Urban Emotion Projekt als immer wiederkehrende Grundsatzfragen integriert, unterliegen folgende Problemstellungen immer wieder einer Prüfung: Wie können alle heterogenen Interessen in den Planungsprozess integriert werden? Ist Raumwahrnehmung durch Bürger messbar? Welche neuen technologischen Ansätze verbessern den Planungsprozess? Der Urban Emotions Ansatz nutzt hierfür "menschliche Sensoren": sei es aus Social Media, aus biostatistischen „Wearables" oder über digitale Partizipationsmethoden. Das entstehende Methodenset betrachtet die Stadt als ein System aus Strömen (CASTELLS 1999), oder wie Fritz Schumacher

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schon 1920 und Geoffrey West als „Organismus“ (FISCHER 1977; WEST 2017). Christian Wolfe stellt die Frage, ob nicht die „Context City“ (WOLFE 2017), eine Stadt auf der Suche nach ihrem einzigartigen lokalen Kontext, in einer globalisierten Welt als Abgrenzung zu wirtschaftsgetriebenen „Smart-City“ die Lösung sein kann? Auch hierbei steht der Mensch wieder im Mittelpunkt, denn nur mit dessen Hilfe kann die Stadt "intelligent" agieren und verliert ihre Identität nicht.

3.1 Participatory Sensing

Das wahrscheinlich wichtigste Forschungsgebiet im Rahmen des Participatory Sensings (BURKE et al. 2006) ist das des „Emotional Mappings“, des Kartieren von Emotionen. Dabei steht immer die Frage im Mittelpunkt, wie der Mensch die natürliche und gebaute Umwelt wahrnimmt (DOWNS & MEYER 1978). Schon die situationistische Internationale hat mit der „Psychogéografique“ und „Dérive“ hier die Grundlage für „Mental Maps“ gelegt (DEBORD 1956); Kevin Lynch nutzt diese Karte als Planungsunterstützung: "Wir sind nicht einfach Beobachter dieses Spektakels, sondern sind selbst ein Teil davon, auf der Bühne mit den anderen Teilnehmern. [...] Fast jeder Sinn ist in Betrieb, und das Bild ist das Ganze von allen“ (LYNCH 1960, 2). Stefan Dinter porträtiert mithilfe von drei Bildern und einer einfachen Triangulation die Stadt (DINTER 2015). In Kombination mit digitalen Kartierungsmethoden zur Aufnahme von Emotionen (NOLD 2009; KLETTNER et al. 2013), der zunehmenden Beachtung im wissenschaftlichen Diskurs und der Anwendung im urbanen Kontext (SCHÖNING & BONHAGE 2015; VERNIER et al. 2016), zeigt die steigende Akzeptanz des Ansatzes, gemessene Emotionen als Grundlage für städtebauliche Planungen mit einzubeziehen.

Eine methodische und technologische Übersicht der zu Verfügung stehenden „affektiven Sensorsysteme“ ist bei Kanjo et al. (2015) zu finden. Die Zukunft des „Partizipativen Messens“ mit neuartig entwickelten Umweltsensoren beschreib Christian Nold in „Device Studies of Participatory Sensing“ (NOLD 2017). Die Anwendung in Korrelation mit epidemiologischen Daten im SmartAQnet-Projekt wird in Augsburg durchgeführt (SCHÄFER et al. 2017). Im Kontext des Urban Emotion Projektes wurden hier unter anderem die Anwendungsbereiche des „Barrierefreien Planens“ (RODRIGUES DA SILVA et al. 2014; BEYEL et al. 2017) sowie des Fahrradverkehrs (GROß et al. 2015; GROß & ZEILE 2016; ZEILE et al. 2016) unter Verwendung des psychophysiologischen Monitorings bearbeitet.

3.2 Virtual Reality und 360° VR

Da die Stadt ständig wechselnden Einflüssen ausgesetzt ist, sei es nur das Wetter oder die Dichte des Verkehrs, eignet sich für die laborhafte Untersuchung mit replizierbaren Rahmenbedingungen der Einsatz von Virtual Reality. Früher als frei navigierbares 3D-Stadtmodell auf dem Monitor (COORS & ZIPF 2005; DÖLLNER et al. 2006; ZEILE 2010), so sind heute die Modelle „voll immersiv“ in einem abgeschlossenen 3D-Ambiente erlebbar, entweder als Fantasiewelt oder als Abbildung einer gebauten Realität. Head-Mounted Displays (HMDs) wie Oculus Rift oder HTC Vive erlauben durch mithilfe neuartiger Eingabegeräte und Ortungssysteme im Raum die Erfassung der körperlichen Aktivitäten des Nutzers und ermöglichen Interaktionen mit dem Computersystem. Der Immersionsgrad ist dabei so hoch, dass der Übergang zwischen realer und virtueller Welt fließend wird, sofern das menschliche Sichtfeld bei der Aufnahme und anschließenden Darstellung einer räumlichen Situation richtig simuliert wird (YUHAN et al. 2015; BROSCHART 2017, 133ff). Vielversprechende Ansätze der Emotionsmessung im virtuellen Kontext wurden zum Beispiel bei der Untersuchung des Gameplays von Assassin’s Creed unternommen (OSBORNE & JONES 2017) - zwar mit einer Monitor VR, jedoch mit einem sehr hohen Grad an Detaillierungstiefe im Modell.

Da dieser Aufwand bei der Modellerstellung jedoch noch höher als bei Innenarchitekturmodellen ist (BROSCHART & ZEILE 2015), stellt sich die Frage, ob zumindest für die Bestandsaufnahme als auch für eine einfache Manipulation von realexistierenden Umgebungen eine 360° VR Aufnahme ausreichend ist? Panorama-Fotografien als auch Videos, auch bekannt als 360°-Videos wurden schon zur Bewertung der Landschaftsbildästhetik in den späten 1990ern Jahren eingesetzt (BISHOP & HULL 1991; BISHOP 2005). Erste Versuche von 3D-Stereoaufnahmen (zwei Action Cams und Anaglyphenvideo) und 180°-Videos sind bei Folz et al. (2017) zu finden, deren Versuche die Grundlage für das hier befindliche Setting bilden. Limitiert war die Anwendung seinerzeit durch die Tatsache, dass das immersive Erlebnis nur auf Google

Cardboards oder Oculus Developer Edition (DK1) möglich war. Die Monitorauflösung war hier noch stark verpixelt.

Der Einsatz von sphärischen Kameraträgersystemen mit sechs Action-Kameras wurde bislang in den raumbezogenen Planungsdisziplinen wie Architektur, Stadtplanung oder Landschaftsplanung nur geringfügig bis gar nicht untersucht (Stand Dez. 2017). Lediglich Publikationen zur Arbeitswissenschaft und Educational Games nehmen diese Technologie auf (RUPP et al. 2016).

4 DAS EXPERIMENT

Da in diesem Projekt erstmals zwei unterschiedliche Technologien zur Messung von biostatistischen Feedback eingesetzt werden, müssen sowohl einige technologische als auch methodische Voruntersuchungen durchgeführt werden, um die folgenden Fragen zu beantworten:

- Wie kann ein 360°-Video so aufbereitet werden, dass es für eine biostatistische Messung eingesetzt werden kann?
- Ist es sinnvoll, die Untersuchungen an einem festen virtuellen Standort durchzuführen oder sind auch Parcours möglich?
- Kann der virtuelle Kurs im VR-Ambiente mit den bestehenden Technologien gemessen werden? Wie wird der Kurs virtuell getrackt?
- Können virtuelle Modelle eingebunden in die Q-Sorting-Methode eingebunden werden?

Im folgenden Kapitel werden die aktuellen Lösungen dieser Fragen erörtert, sowie Vor- und Nachteile diskutiert.

4.1 Content-Aufbereitung

Die Aufbereitung als reproduzierbare Situation mit immer gleichen visuellen und auditiven Inhalten ist ein Schlüsselelement im Versuchsaufbau. Dabei ist es wichtig, städtische Routen, in denen Emotionen gemessen werden sollen, möglichst komfortabel aufzubereiten.

Abb. 1: Das Omni-Rig (1) mit seinen sechs synchronisierten Action-Cams zur Erstellung von sphärischen Videos. Testfahrten im sogenannten „Auslegermodus“ (2) und im „Streetview-Modus“ (3). Das zusammengesetzte Video kann nun auf der Oculus betrachtet werden (4) und als audiovisuelle Testumgebung für das biostatistische Monitoring eingesetzt werden.

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4.1.1 360° Videos

Für die 360°-Videos wurde ein sogenanntes Omni-Rig der Firma GoPro verwendet (Abb. 1-1). Vorteil bei dieser Technologie ist, dass das Array die sechs Kameras automatisch auf Pixelebene synchronisiert und dabei jede Kamera Videos in einer Auflösung von 4K liefert.

4.1.2 3D-Modelle

Sollen für das Experiment zusätzlich Situationen neuer Planungsszenarien hinzugefügt werden, so wird eine Möglichkeit für die Visualisierung von 3D-Modellen auf dem VR-Headset benötigt. Hierfür eignet sich durch den sehr simplen und intuitiven Workflow die Software-Lösung Kubity (BAILLY et al. 2015). Nativ können so BIM-Modelle im RVT-Format als SKP-Dateien direkt eingelesen werden. Indirekt sind durch die Importmöglichkeiten über REVIT auch DGN, DXF, DWG, IFC, SAT (ASCII) Dateien als auch über Sketchup 3DS sowie COLLADA (DAE)-Dateien möglich. Als Zeichenelemente können Ellipsen (Arcs), Kreise (Circles), Linienstärken (Entities with thickness), 2D-und 3D-Flächen, Layer, Linien (Lines), Polylinien, Blocks, Regionen, Punkte, Splines und Rasterbilder importiert werden.

Neben der direkten Ausgabe auf die VR-Brille bietet die Software zusätzliche, für die räumliche Planung sinnvolle Ausgabemöglichkeiten: eine Weboberfläche, VR zusätzlich auf Cardboards, sowie Anzeige auf Smartphone und Tablets in Modellansicht als auch als Augmented Reality Lösung in Fußgängerperspektive (Abb.2). Für das Experiment hier wird sich jedoch auf die VR-Variante beschränkt. Da Kubity (noch) keine Exportmöglichkeit für Filme zu Verfügung stellt, müssen die Modelle als sogenannte „Tour“ organisiert werden. Dadurch ist für das Experiment die Zeitkomponente für jeden Probanden gleich und die Ergebnisse sind miteinander vergleichbar.

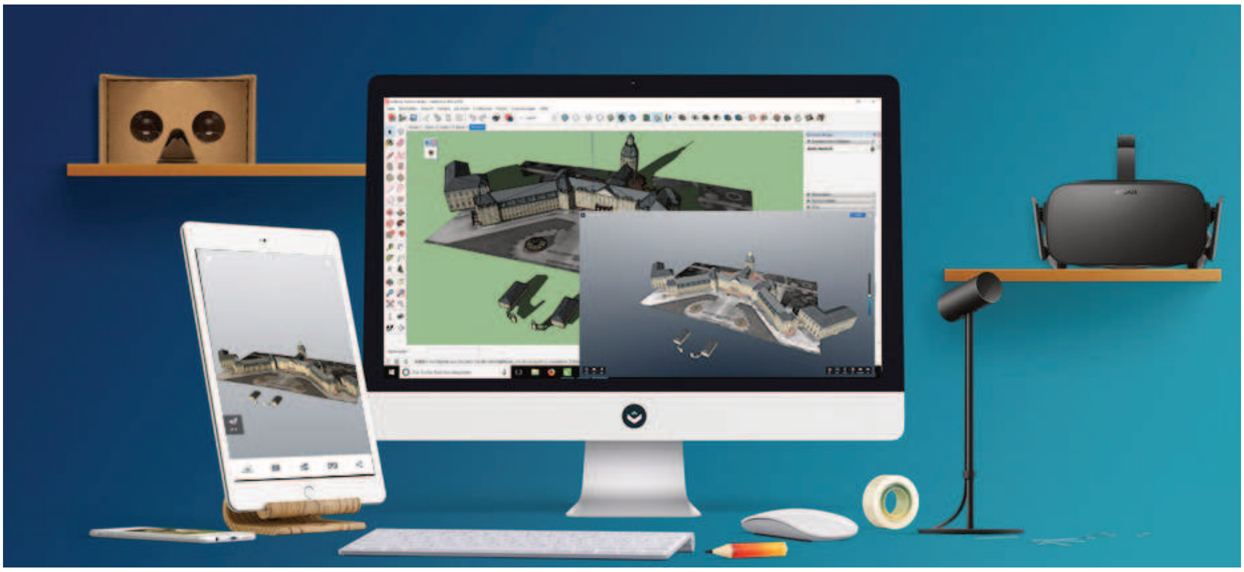

Abb. 2: Kubity-Workflow und Exportmöglichkeiten für verschiedene Endgeräte. Revit als auch Sketchup-Modelle können auf VR-Headsets exportiert werden (adaptiert nach O'BRIEN 2018).

4.1.3 360°-Panoramen

Auf der Suche nach weiteren Beispielen für „gute“ und „schlechte“ Architektur, die es zu messen gilt innerhalb des Experimentes, wurde eine Crowdsourcing-Aktion ins Leben gerufen. Das Ziel ist es, möglichst verschiedene, von Fachleuten als auch Laien, beurteilte städtische Situationen zu sammeln, die dann im Rahmen des Experimentes biostatistisch auf ihre Wirkung hin getestet werden können.

Abb. 3: Aufnahmeregeln für 360°-Panoramen zur Nachbearbeitung in Autopano Giga

Der Sammlungsprozess lief sehr einfach ab, lediglich 5-7 Reihen mussten überlappend abfotografiert werden. Dies werden anschließend in Autopano Giga automatisch gestitcht (KOEHL et al. 2013) und können als Panorama in einer Auflösung im Verhältnis 2:1 als VR-taugliches Bildmaterial abgespeichert werden. In Filmschnittsoftwares (z. B. Adobe Premiere in Verbindung mit dem GoPro VR Plug-ins) ist die Produktion von immersiv erlebbaren Filmen möglich. Zusätzlicher Nebeneffekt bei der Erstellung ist die Möglichkeit, alle Bilder in der „Little Planet bzw. Tiny Planet" Projektion auszugeben, bei denen das Projektionszentrum der sogenannte „Nadir" ist (GERMAN et al. 2007).

4.2 Messequipment

Bei dem Messinstrumentarium wird auf die bewährte Kombination aus dem Bodymonitor Smartband, GPS-Tracker sowie GoPro Hero ActionCam zurückgegriffen (ZEILE et al. 2016). Einzige Ergänzung ist, wie schon oben angesprochen, das Omni Rig und für das virtuelle Ambiente das Oculus Rift Set-up.

4.3 Versuchsaufbau

Für die Voruntersuchung wurde auf die Untersuchung von Núñez et al. (2017) zurückgegriffen: Gedacht als Studie zur Identifikation des Komforts von Fahrbahnoberfläche- und Infrastrukturbedingungen, wurde in diesem Projekt mithilfe Beschleunigungsmessern von Smartphones und Videoaufzeichnungen der Straßenzustand aufgezeichnet und bewertet (NÚÑEZ, JAVIER Y. M. & RODRIGUES DA SILVA 2017). Unter Zuhilfenahme des Smartbandes konnten so Belastungsspitzenreaktionen identifiziert werden. Die Strecke wurde zusätzlich noch mit dem GoPro Omni Rig aufgezeichnet und anschließend manuell für die 360°VR-Anwendung im Horizont angeglichen und stabilisiert. Für diese erste Untersuchung wurde sich bewusst auf einen kleinen Teilnehmerkreis beschränkt: Eine Person, die bei der Omni-Aufnahme auch das Smartband trägt (J1) und anschließend die virtuelle Strecke „fährt" (JV), sowie eine Person, die im Anschluss nur noch die virtuelle Strecke nachfährt (PV).

5 ERGEBNISSE

Für alle Strecken wurde das psychophysiologische Monitoring durchgeführt. Erwartungsgemäß wurden in der Realität mehr Stresssituationen „Moments of Stress – MoS" identifiziert als im virtuellen Modus (31 in Realität vs. 10 im virtuellen Raum). Weiterhin wurden bei Proband PV auch nur 14 Stresssituationen im virtuellen Kontext festgestellt. Insgesamt wurde bei beiden Probanden nur an drei Positionen im virtuellen Raum ein gleichzeitiger Stresstrigger ausgelöst. Dies erscheint erst mal wenig, kann jedoch auch an der schon gemachten Erfahrung des Testfahrers der realen Strecke liegen. Bei dem Vergleich zwischen den Reaktionen von Testfahrer (J1) und dem nur virtuellen Fahrer (PV) konnten immerhin neun Übereinstimmungen festgestellt werden. Die reale Fahrt von Testfahrer J1 und seine retrospektive virtuelle Fahrt (JV) hatten eine Übereinstimmung an sieben Punkten.

Unabhängig von den Ergebnissen haben beide Teilnehmer im virtuellen Raum nach der 15-minütigen Testfahrt über Übelkeit geklagt, der Motion Sickness Effekt auf dem virtuellen Fahrrad war doch stärker als angenommen. Aus diesem Grund wurden die Tests im Bewegungsmodus ausgesetzt.

Bei einer näheren Betrachtung der Ergebnisse fällt auf, dass nach Abgleich des Videomaterials mit allen Heatmaps nur Stellen als „stressig" empfunden wurden, bei denen das obere Blickfeld in eine Art Tunnel überführt wird (Bäume nah über der Fahrbahn). Viele Situationen, bei denen nicht klar ist, wie andere Teilnehmer reagieren, wurden vom Teilnehmer der retrospektiven Fahrt nicht mehr als stressig empfunden. Interessanterweise gab es aber bei der realen Fahrt sowie der des nur virtuellen Fahrers hier bei Engstellen, Vorfahrtssituationen als auch Reaktionen auf andere Verkehrsteilnehmer wiederum sehr viele Übereinstimmungen.

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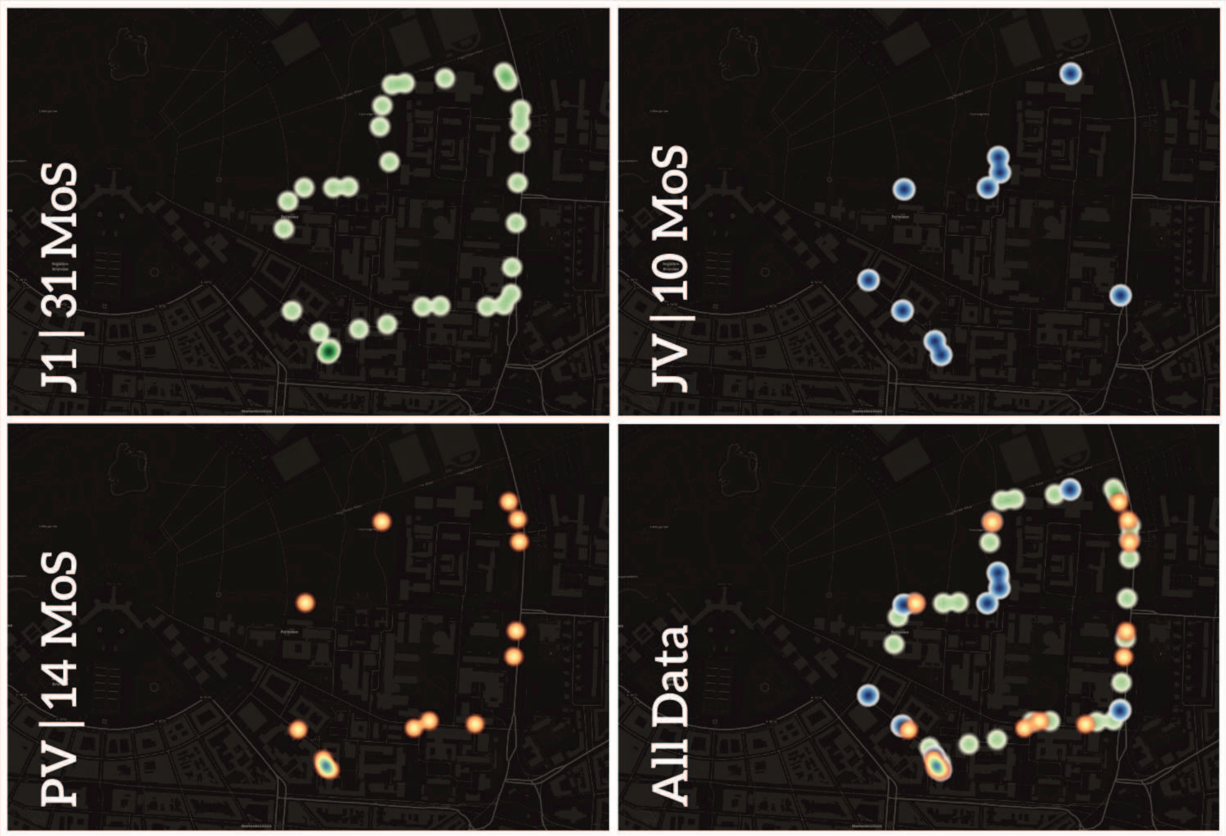

Abb. 4: Biostatistische Auswertung der Läufe. Der reale Lauf (J1) mit 31 Moments of Stress (MoS), sowie die zwei in der Oculus aufgezeichneten biostatistischen Stressmomente (PV, JV) sowie alle Daten überlagert.

6 DISKUSSION UND AUSBLICK

Das vorliegende Set-up verspricht ein großes technologisches Potenzial für die Anwendung in der räumlichen Planung und der Architektur.

Die Vorteile der Methode liegen eindeutig in der schnellen Aufnahme der real existierenden Umgebung. Der Workflow ist sehr konsistent. Die per Crowdsourcing gewonnenen Beispiele lassen sich problemlos mit den Bildern aus den Bewegungssituationen zu einem Film zusammenführen. Additive Inhalte sind hier mithilfe von Plug-ins auch mittlerweile integrierbar. Kubity bietet zudem die Möglichkeit, virtuelle Modelle im virtuellen Ambiente zu erleben.

Nachteilig bei der Herangehensweise ist, dass Aufnahmen von einer bewegten Kameraposition heraus das Phänomen der Motion Sickness bei den Probanden auslöst. Hier muss sowohl bei der Kamerabefestigung als auch im Post-Processing nach einer geeigneteren Lösung gesucht werden. Prinzipiell ist der Stabilisierungsprozess laut Herstellerangabe soweit optimierbar, dass Motion Sickness nicht mehr vorkommt. Dennoch ist die Empfehlung momentan, dass die Aufnahmen von einem festen Kamerastandpunkt durchgeführt werden. Dadurch sind auch die Standpanoramen besser einzubinden.

Auch ist noch keine zufriedenstellende Lösung gefunden worden, wie verschiedene Planungsszenarien aneinandergereiht präsentiert werden können. Noch liegt hier ein Medienbruch zwischen 360°Video und den virtuellen Modellen vor. Ein Export als Video ist nicht möglich. Einzig das Abspielen von Touren könnte hier eine Alternative sein.

Das Tracken im virtuellen Ambiente funktioniert grundsätzlich sehr gut, da auf den bestehenden GPS-Track zurückgegriffen werden kann. Dadurch sind die Messungen gut zu synchronisieren. Für das Q-Sorting im virtuellen Raum muss allerdings eine virtuelle GPS-Koordinate mitgeführt werden, sodass eine eindeutige Zuordnung zu der zu beurteilenden Situation entsteht.

Der Crowdsourcing Prozess für das Q-Sorting ist mittlerweile im Gange. Die Modellsammlung muss nun aufbereitet, klassifiziert und auf ihre mögliche bzw. erhoffte emotionale Reaktion hin überprüft und in die Testumgebung integriert werden. Als Lösung für die Integration von virtuellen Modellen wird in Zukunft die Software Enscape getestet, bei der ein integrierter Datenworkflow zwischen Revit oder Sketchup in das virtuelle Ambiente möglich ist. Die Editierfunktionalitäten bieten sogar eine Live-Manipulation der Modelle an. Für die Arbeit mit Videoschnittsoftware sind der direkte Filmexport als 360°Video vorhanden und ermöglicht somit den Vergleich der 3D-Modelle mit den real existierenden Situationen. Dadurch wird das 360°Video Compositing erleichtert. Die ganze Bearbeitungstechnik erinnert somit ein wenig an Fotomontagen im Bildbereich, welches nun aber auch im 360°Ambiente geschehen kann.

7 DANKSAGUNG

Der vorliegende Beitrag und die Studie zum virtuellen Tracking entstand im Rahmen des von der DFG und des FWF geförderten Projektes „Urban Emotions“ mit dem Förderkennzeichen ZE1018/1-2 und RE3612/1-2. Besondere Dank geht an Javier Yesid Mahecha Nuñez, der während seines Aufenthaltes am KIT maßgeblich an der Durchführung der Studie beteiligt war.

8 LITERATUR

BAILLY, J.-P., CHECINSKI, A., ROMAIN, G., GULLY, R., JOBBE-DUVAL, H., SCHONER, N., SECCIA, S. & VASSEUR, N. (2015), System, method and computer program product for injecting directly into a web browser commands and/or contents created on local desktop applications of a computer device, and vice-versa. Google Patents.

BEYEL, S., WILHELM, J., MUELLER, C., ZEILE, P. & KLEIN, U. (2017), Stresstest städtischer Infrastrukturen – ein Experiment zur Wahrnehmung des Alters im öffentlichen Raum. In: SCHRENK, M., POPOVICH, V., ZEILE, P., ELISEI, P. & BEYER, C. (Hrsg.), REAL CORP 2017. Proceedings/Tagungsband, Wien, 689–698.

BISHOP, I. D. (Hrsg.) (2005), Visualization in landscape and environmental planning. Technology and applications. Taylor & Francis, London u. a.

BISHOP, I. D. & HULL, B. R. (1991), Integrating technologies for visual resource management. In: Journal of Environmental Management, 32 (4), 295–312, doi: 10.1016/S0301-4797(05)80068-4.

BRENNER, N., MARCUSE, P. & MAYER, M. (Hrsg.) (2012), Cities for people, not for profit. Critical urban theory and the right to the city. Routledge, London.

BROSCHART, D. (2017), Mobile Geoweb-Methoden für die Planung - Die Fortentwicklung des stadt- und umweltplanerischen Methodenrepertoires im Rahmen von Crowdsourcing, Monitoring und Echtzeitplanung. https://kluedo.ub.uni-kl.de/files/5078/_2017_Broschart_Diss_kluedo.pdf.

BROSCHART, D. & ZEILE, P. (2015), ARchitecture: Augmented Reality in Architecture and Urban Planning. In: BUHMANN, E., ERVIN, S. M. & PIETSCH, M. (Hrsg.), Peer Reviewed Proceedings of Digital Landscape Architecture 2015. at Anhalt University of Applied Sciences. Herbert Wichmann Verlag, VDE Verlag GmbH, Berlin, Offenbach, 111–118.

BURKE, J., ESTRIN, D., HANSEN, M., PARKER, A., RAMANATHAN, N., REDDY, S. & SRIVASTAVA, M. (2006), Participatory sensing. In: World Sensor Web 2006 Proceedings, 1–5.

CASTELLS, M. (1999), The power of identity. Blackwell, Cambridge, Mass.

COORS, V. & ZIPF, A. (Hrsg.) (2005), 3D-Geoinformationssysteme. Grundlagen und Anwendungen. Wichmann, Heidelberg.

DEBORD, G. (1956), Theory of the dérive. In: Les Lèvres Nues (9).

DINTER, S. (2015), Karlsruhe. Eine Stadt erleben. Fotografien. INFO Verlag, Bretten.

DÖLLNER, J., KOLBE, T. H., LIECKE, F., SGOUROS, T. & TEICHMANN, K. (2006), The virtual 3d city model of Berlin. Managing, integrating, and communicating complex urban information. In: Proceedings of the 25th International Symposium on Urban Data Management, Aalborg.

DOWNS, R. M. & MEYER, J. T. (1978), Geography and the Mind: An Exploration of Perceptual Geography. In: American Behavioral Scientist, 22 (1), 59–77, doi: 10.1177/000276427802200104.

FISCHER, M. F. (1977), Fritz Schumacher, das Hamburger Stadtbild und die Denkmalpflege. Christians, Hamburg.

FOLZ, S., BROSCHART, D. & ZEILE, P. (2017), Raumerfassung und Raumwahrnehmung – aktuelle Techniken und potenzielle Einsatzgebiete in der Raumplanung. In: SCHRENK, M., POPOVICH, V., ZEILE, P., ELISEI, P. & BEYER, C. (Hrsg.), REAL CORP 2017. Proceedings/Tagungsband, Wien, 541–550.

FRAUNHOFER IAO (2018), Smart City Makeathon. https://www.morgenstadt.de/de/veranstaltungen/werkstatt-2017/makeathon.html (15.02.2018).

GERMAN, D. M., BURCHILL, L., DURET-LUTZ, A., PÉREZ-DUARTE, S., PÉREZ-DUARTE, E. & SOMMERS, J. (2007), Flattening the viewable sphere. In: Proceedings of Computational Aesthetics 2007.

GROß, D., HOLDERLE, C. & WILHELM, J. (2015), EmoCycling –Analyse von Radwegen mittels Humansensorik für Kommunen. In: SCHRENK, M., POPOVICH, V., ZEILE, P. & ELISEI, P. (Hrsg.), REAL CORP 2015. Proceedings/Tagungsband. CORP – Competence Center of Urban and Regional Plan, Wien, Ghent, 249–259.

GROß, D. & ZEILE, P. (2016), EmoCyclingConcept – Potenziale der emotionalen Stadtkartierung. In: STROBL, J., ZAGEL, B., GRIESEBNER, G. & BLASCHKE, T. (Hrsg.), AGIT. Journal für Angewandte Geoinformatik. Wichmann Verlag, Berlin, Offenbach, 273–278.

JACOBS, J. (1961), The death and life of great american cities. Random House Vintage Books, New York.

KANJO, E., AL-HUSAIN, L. & CHAMBERLAIN, A. (2015), Emotions in context. Examining pervasive affective sensing systems, applications, and analyses. In: Personal and Ubiquitous Computing, doi: 10.1007/s00779-015-0842-3.

KLETTNER, S., HUANG, H., SCHMIDT, M. & GARTNER, G. (2013), Crowdsourcing affective responses to space. In: Kartographische Nachrichten, 2013 (2), 66–72.

KOEHL, M., SCHNEIDER, A., FRITSCH, E., FRITSCH, F., RACHEDI, A. & GUILLEMIN, S. (2013), Documentation of historical building via virtual tour:. the complex building of baths in Strasbourg. In: ISPRS - International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences, XL-5/W2, 385–390, doi: 10.5194/isprsarchives-XL-5-W2-385-2013.

KRAUSE, K.-J. (1974), Stadtgestalt und Stadterneuerung. Bundesvereinigung Deutscher Heimstätten e.V., Bonn.

LYNCH, K. (1960), The image of the city. MIT Press, Cambridge Mass. u. a.

NOLD, C. (2009), Emotional cartography. Technologies of the self. http://emotionalcartography.net (15.01.2015).

NOLD, C. (2017), Device Studies of Participatory Sensing: Ontological Politics and Design Interventions. Thesis / Dissertation, London.

NÚÑEZ, JAVIER Y. M. & RODRIGUES DA SILVA, A. N. (2017), Assessment using smartphone sensors and a geographic information system. In: Proceedings of CUPUM2017, Adelaide.

NÚÑEZ, JAVIER Y. M., ZEILE, P. & RODRIGUES DA SILVA, A. N. (2017), Management of infrastructure for cycling transportation systems using smart sensors, Annweiler.

O'BRIEN, R. (2018), Kubity | SketchUcation. https://sketchucation.com/kubity-for-sketchup (11.01.2018).

OSBORNE, T. & JONES, P. I. (2017), Biosensing and geography. A mixed methods approach. In: Applied Geography, 87, 160–169, doi: 10.1016/j.apgeog.2017.08.006.

PETRIN, J. (2012), Nexthamburg. Bürgervisionen für eine neue Stadt. Ed. Körber-Stiftung, Hamburg.

PETRIN, J. & WILDHACK, A. (2015), Ein Inkubator für Bürgerprojekte. Stadtmacher erprobt einen neuen Ansatz der nutzergenerierten Stadtentwicklung. In: Planerin (3), 25–27.

RODRIGUES DA SILVA, A. N., ZEILE, P., AGUIAR, FABIOLA DE OLIVEIRA, PAPASTEFANOU, G. & BERGNER, B. S. (2014), Smart sensoring and barrier free planning - project outcomes and recent developments. In: PINTO, N. N., TENEDÓRIO, J. A., ANTUNES, A. P. & CLADERA, J. R. (Hrsg.), Technologies for Urban and Spatial Planning: Virtual Cities and Territories. IGI Global, Hershey PA, 93–112.

RUPP, M. A., KOZACHUK, J., MICHAELIS, J. R., ODETTE, K. L., SMITHER, J. A. & MCCONNELL, D. S. (2016), The effects of immersiveness and future VR expectations on subjec-tive-experiences during an educational 360° video. In: Proceedings of the Human Factors and Ergonomics Society Annual Meeting, 60 (1), 2108–2112, doi: 10.1177/1541931213601477.

SCHÄFER, K., EMEIS, S., BUDDE, M., BEIGL, M., CYRYS, J., SCHNELLE-KREIS, J., PHILIPP, A., ZIEGLER, V., RIEDEL, T., GRIMM, H. & GRATZA, T. (2017), SmartAQnet. Remote and in-situ sensing of urban air quality. In: COMERÓN, A., KASSIANOV, E. I. & SCHÄFER, K. (Hrsg.), Remote Sensing of Clouds and the Atmosphere XXII. SPIE, 12.

SCHÖNING, J. & BONHAGE, C. E. (2015), On the Acquisition of Human Emotions in Space and Time. The Eurographics Association.

SELLE, K. (2014), Über Bürgerbeteiligung hinaus. Stadtentwicklung als Gemeinschaftsaufgabe? ; Analysen und Konzepte. Rohn, Lemgo.

STEPHENSON, W. (1953), The Study of Behavior. Q-technique and Its Methodology. University of Chicago Press.

STREICH, B. (2014), Subversive Stadtplanung. Springer VS, Wiesbaden.

VERNIER, M., FARINOSI, M. & FORESTI, G. L. (2016), A Smart Visual Information Tool for Situational Awareness. In: MAGNENAT-THALMANN, N., RICHARD, P., LINSEN, L., TELEA, A., BATTIATO, S., IMAI, F. & BRAZ, J. (Hrsg.), VISIGRAPP 2016. Proceedings of the 11th Joint Conference on Computer Vision, Imaging and Computer Graphics Theory and Applications. SCITEPRESS, Setúbal, 236–245.

WAGNER, T. (2014), Die Mitmachfalle. Bürgerbeteiligung als Herrschaftsinstrument. PapyRossa-Verl., Köln.

WEST, G. (2017), Scale. The universal laws of growth, innovation, sustainability, and the pace of life in organisms, cities, economies, and companies. Penguin Press, New York.

WOLFE, C. R. (2017), Seeing the Better City. How to Explore, Observe, and Improve Urban Space. Island Press.

YUHAN, S., LANGE, E. & THWAITES, K. (2015), Improved Photographic Representation of Human Vision for Landscape Assessment. In: BUHMANN, E., ERVIN, S. M. & PIETSCH, M. (Hrsg.), Peer Reviewed Proceedings of Digital Landscape Architecture 2015. at Anhalt University of Applied Sciences. Herbert Wichmann Verlag, VDE Verlag GmbH, Berlin, Offenbach, 90–100.

ZEILE, P. (2010), Echtzeitplanung. Die Fortentwicklung der Simulations- und Visualisierungsmethoden für die städtebauliche Gestaltungsplanung. Dissertation. http://kluedo.ub.uni-kl.de/volltexte/2010/2497/index.html.

ZEILE, P., RESCH, B., LOIDL, M., PETUTSCHNIG, A. & DÖRRZAPF, L. (2016), Urban Emotions and Cycling Experience – enriching traffic planning for cyclists with human sensor data. In: CAR, A., JEKEL, T., STROBL, J. & GRIESEBNER, G. (Hrsg.), GI_Forum 2016. Journal for Geographic Information Science. Verlag der Österreichischen Akademie der Wissenschaften, Wien, 204–216.

Vorübergehende Einrichtungen zur Unterbringung von Personen: Ausnahmen von bau- und planungsrechtlichen Bestimmungen zur Unterbringung Geflüchteter

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1 ABSTRACT

Verfügungstellung ausreichender Einrichtungen zur vorübergehenden Unterbringung von geflüchteten Personen. Um die Vergleichbarkeit der Regelungen der neun österreichischen Bundesländer zu erreichen wurde ein Raster erarbeitet, an Hand dessen die entsprechenden Landesgesetze untersucht wurden. Abschließend erfolgt eine überblicksmäßige Bewertung der unterschiedlichen Rechtsnormen in Bezug auf Umfang, Zeitrahmen und eventueller verfassungsrechtlicher Bedenken.

Keywords: vorübergehende Einrichtungen, Planungsrecht, Baurecht, Geflüchtete, Migration

2 EINLEITUNG

Wie viele europäische Staaten sah sich Österreich im Jahr 2015 mit einer überdurchschnittlich hohen Zahl[1] von Asylwerberinnen und Asylwerbern konfrontiert. Um eine adäquate Unterbringung dieser großen Anzahl von Personen gewährleisten zu können ergriffen die österreichischen Gesetzgeber einige weitrechenden Maßnahmen.

Einerseits wurde auf Bundesebene das Bundesverfassungsgesetz über die Unterbringung und Aufteilung von hilfs- und schutzbedürftigen Fremden erlassen. Dieses Verfassungsgesetz sollte einen Engpass bei der Unterbringung von hilfs- und schutzbedürftigen Fremden verhindern und zu diesem Zweck dem Bund ermöglichen, die Unterbringung solcher Personen ersatzweise vorzunehmen, wenn die Gemeinden ihrer Verpflichtung Unterbringungsplätze zur Verfügung zu stellen nicht im notwendigen Ausmaß nachkommen (was in den Medien als "Durchgriffsrecht" bezeichnet wurde).[2] Im Rahmen dieses bis 31.12.2018 befristeten Gesetzes wurde festgelegt, dass die Nutzung von Bauwerken und die Aufstellung beweglicher Wohneinheiten als Flüchtlingsunterkünfte (bis zu einer Gesamtpersonenzahl von 450 Personen) unter Außerachtlassung einschlägiger bau- und raumordnungsrechtlicher Bestimmungen des Landes geschehen könne, was als Einschränkung der Kompetenzverteilung und des Selbstverwaltungsrechtes der Gemeinden zu bewerten ist.[3]

Andererseits beschlossen fast alle Landesgesetzgeber Ausnahmen von der Anwendbarkeit von bau- und raumplanungrechtlichen Bestimmungen für die Einrichtung von Unterbringungsmöglichkeiten geflüchteter Personen. Diese sind naturgemäß unterschiedlich in Form und Inhalt. Um eine bestmögliche Vergleichbarkeit herzustellen folgt der Bundesländervergleich konsequent folgendem Aufbau:

<u>(1) Formale Form der Ausnahme</u>

Wurden die rechtlichen Bestimmungen in Form eines eigenen Gesetzes erlassen oder in bestehende Rechtsnormen (idR Bauordnungen / Baugesetze) inkludiert?

<u>Zeitrahmen der Rechtsnorm</u>

Wurden die Rechtsnormen zeitlich befristet erlassen? Gab es diesbezüglich nachträgliche Änderungen (nachträgliche Befristungen bzw. Entfristungen)?

<u>(2) Persönlicher Anwendungsbereich</u>

Für welchen begünstigten Personenkreis wurden die Ausnahmeregelungen geschaffen? Oft wurde die Defintion des jeweiligen Grundversorgungsgesetzes übernommen, manchmal wurden Verbindungen zu völkerrechtlichen, unionsrechtlichen oder innerstaatlichen Verpflichtungen genannt. In einigen Fällen wurde

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[1] Laut Asylstatistik des Bundesministeriums für Inneres suchten im Jahr 2013 ca.17.500, im Jahr 2014 ca. 28.00, im Jahr 2015 ca. 88.000, im Jahr 2016 ca. 42.000 und im Jahr 2017 ca. 24.000 Personen um Asyl an. Bundesministerium für Inneres, Asylstatistik 2017, S. 4

[2] näher siehe: Bußjäger, das Verfahren zur Nutzung von Grundstücken für die Unterbringung von hilfs- und schutzbedürftigen Fremden aufgrund des Durchgriffsrechts, S. 67ff

[3] näher siehe: Winkler, Die Nutzungsbescheide der BMI nach dem „Durchgriffsrecht" gemäß dem BVG über die Unterbringung und Aufteilung von hilfs- und schutzbedürftigen Fremden, S. 105

die Anwendbarkeit auch an humanitäre Gründe oder an Naturkatastrophen gebunden. In Ausnahmefällen nahmen Landesgesetzgeber die große Anzahl an Geflüchteten zum Anlass, Ausnahmebestimmungen vom Bau- und Planungsrecht einzuführen, die auch auf gänzliche andere Personengruppen, z. B. Studierende, anwendbar sind. Oft wurde dazu das legistische Mittel einer demonstrativen Auszählung (z. B. “insbesondere”) in der Beschreibung der Personengruppe gewählt.

Quantitative Beschränkungen

Geben die gesetzlichen Bestimmungen eine Maximalanzahl an betroffenen Personen (z. B. in Relation zur Einwohneranzahl der jeweiligen Gemeinde) an?

(3) Ausmaß der Ausnahme

Gelten die Ausnahmebestimmungen „lediglich“ für Bebauungsvorschriften oder sind auch raumordnungsrechtliche Vorgaben (z. B. Widmungen) davon berührt?

Einschränkungen der Bauweise

Regeln die Ausnahmebestimmungen eine Bebauung in bestimmter Ausführung (z. B. Leichtbauweise, Container)?

Mindestkriterien

Werden Mindestkriterien von baurechtlichen Bestimmungen (z. B. Stand-, Brandsicherheit, Hygiene) vorgegeben?

(4) Zeitlicher Rahmen

Ist der Bestand der Unterbringungseinrichtungen zeitlich limitiert? Wenn ja, mit welchem Zeitraum? Gibt es Verlängerungsmöglichkeiten?

Bestimmungen nach Ende des zeitlichen Rahmens

Sieht die Regelung vor, was nach Ablauf des vorgegebenen Zeitraumes mit den Einrichtungen geschehen soll (z. B. Abrissverpflichtungen)?

(5) Nachbarinnen- und Nachbarrechte

Wird die Rechtssituation der Nachbarinnen und Nachbarn von der Rechtsnormen berücksichtigt (z.B Zuerkennung oder Ausschluß von Rechtsmittelmöglichkeiten)? Wenn ja, in welcher Art und Weise? Kommt es dadurch zu einer Schlechterstellung der Nachbarinnen und Nachbarn?

(6) Rechte der betroffenen Gemeinde

Durch den teilweise geschaffenene Ausnahmetatbestand vom Anwendungsbereich der jeweiligen Baugesetze entfallen teilweise Bauverhandlungen und Genehmigungen der Baubehörde erster Instanz. Gibt es stattdessen Zustimmungs- bzw. Anhörungsrechte der Gemeinde in deren Gebiet Unterbringungsmöglichkeiten geschaffen werden sollen?

3 VERGLEICH DER VON DEN ÖSTERREICHISCHEN LANDESGESETZGEBERN GESCHAFFENEN AUSNAHMEBESTIMMUNGEN VON BAU- UND PLANUNGSRECHTLICHEN BESTIMMUNGEN ZUR (VORÜBERGEHENDEN) UNTERBRINGUNG GEFLÜCHTETER PERSONEN (UND ANDERER GRUPPEN)

3.1 Burgenland

Das Burgenland hat als einziges Bundesland keine spezielle Regelung für vorübergehende Einrichtungen zur Unterbringung von Geflüchteten erlassen.

3.2 Kärnten

3.2.1 Formale Form der Ausnahme

Der Kärntner Landtag beschloss im März 2016 eine Novelle[4] zur Bauordnung,[5] mit der eine Ausnahme von der Baubewilligungspflicht (§ 7 Abs. 1 Ziffer x) für die Änderung der Verwendung von Gebäuden oder

[4] Gesetz mit dem die Kärntner Bauordnung geändert wird, LGBl. Nr. 19/2016

[5] Kärntner Bauordnung 1996 - K-BO 1996, LGBl Nr 62/1996, aktuelle Fassung 66/2017

Gebäudeteilen in ein Gebäude oder einen Gebäudeteil zur Unterbringung von Personen im Sinne des Kärntner Grundversorgungsgesetzes[6] festgeschrieben wurde.

3.2.2 Zeitrahmen der Rechtsnorm

Die Bestimmung wurde unbefristet erlassen.

3.2.3 Persönlicher Anwendungsbereich

Die Ausnahmebestimmung gilt für unterzubringende Personen im Sinne des § 2 Kärntner Grundversorgungsgesetzes.

Quantitative Beschränkung

Es gibt keine mengenmäßige Beschränkung der Unterzubringenden.

3.2.4 Ausmaß der Ausnahme

Die Sonderbestimmung regelt eine Ausnahme von der Bewilligungspflicht der beschriebenene Bauvorhaben, legt allerdings fest, dass bestimmte Anforderungen der Bauordnung erfüllt sein müssen. Diese Anforderungen sind die Einhaltung des Flächenwidmungs- und des Bebauungsplans, sowie des Ortsbildschutzes, sofern nicht eine zulässige Abweichung von Flächenwidmungsplan gemäß § 14 Kärntner Bauordnung vorliegt. Weiters müssen die Kärntner Bauvorschriften eingehalten und nur zulässige Bauprodukte verwendet werden.

Einschränkungen der Bauweise

Auf Grund des geringen Maßes der Ausnahme sind keine weiteren Einschränkungen der Bauweise vorgesehen.

Mindestkriterien

Es werden keine Mindestkriterien genannt.

3.2.5 Zeitlicher Rahmen

Es wird kein zeitlicher Rahmen der Nutzung von gemäß der Ausnahmebestimmungen errichteten Gebäuden genannt. Dies könnte daran liegen, dass die bau- und raumordnungsrechtlichen Bestimmungen weitgehend eingehalten werden müssen.

Bestimmungen nach Ende des zeitlichen Rahmens

Mangels zeitlichen Rahmens gibt es auch keine Bestimmung nach Ende eines solchen.

3.2.6 Nachbarinnen- und Nachbarrechte

Es werden keine dezidierten Nachbarinnen- und Nachbarrechte genannt. Da die Unterbringungsmöglichkeiten aber den bau- und raumordnungsrechtlichen Bestimmungen entsprechen müssen erscheint eine Beeinträchtigung der Nachbarinnen- und Nachbarrechte unwahrscheinlich.

3.2.7 Rechte der betroffenen Gemeinde

Vorhaben sind vor Beginn ihrer Ausführung der Behörde schriftlich mitzuteilen.

3.3 Niederösterreich

3.3.1 Formale Form der Ausnahme

Der Niederösterreichische Landtag erließ die Bestimmungen in Form eines zusätzlichen Paragraphen im Rahmen einer speziell zu diesem Thema erlassenen Novelle[7] zur Niederösterreichischen Bauordnung.[8]

Zeitrahmen der Rechtsnorm

[6] Gesetz vom 4. April 2006 über Maßnahmen zur vorübergehenden Grundversorgung für hilfs- und schutzbedürftige Fremde (Asylwerber, Asylberechtigte, Vertriebene und andere aus rechtlichen oder faktischen Gründen nicht abschiebbare Menschen) in Kärnten, LGBl. Nr. 43/2006

[7] § 16a Niederösterreichische Bauordnung, LGBl. Nr. 103/2015

[8] NÖ Bauordnung 2014 (NÖ BO 2014), LGBl. Nr. 1/2015 aktuelle Fassung 52/2017

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Das Land Niederösterreich konnte Meldungen zur Errichtung von Betreuungseinrichtungen bis 30. Juni 2017 einbringen. Alle bis spätestens zu diesem Zeitpunkt gemeldeten Einrichtungen dürfen auf die Dauer ihres gemeldeten Bedarfs bestehen bleiben und betrieben werden.

3.3.2 Persönlicher Anwendungsbereich

Vorübergehende Betreuungseinrichtungen für Zwecke der Grundversorgung müssen der Definition des niederösterreichischen Grundversorgungsgesetzes entsprechen.[9]

Quantitative Beschränkung

Es bestehen keine mengenmäßgigen Beschränkungen, die Belagszahl muss allerdings im abzuschließenden Vertrag zwischen dem Land Niederösterreich und den zur Mitarbeit herangezogenen Einrichtungen und Personen enthalten sein.

3.3.3 Ausmaß der Ausnahme

Das Land Niederösterreich hat die Errichtung von Betreuungseinrichtungen sowie die für diese Zwecke bestimmte Erweiterung und Abänderung bestehender Bauwerke und die Änderung des jeweiligen Verwendungszweckes der Baubehörde lediglich zu melden. Daher ist davon auszugehen, dass sowohl bebauungsrechtliche, als auch raumordnungsrechtliche Vorschriften dieser Ausnahmenbestimmung unterliegen.

Einschränkungen der Bauweise

Es sind keine diesbezüglichen Einschränkungen vorgesehen.

Mindestkriterien

Es sind keine baurechtlichen Mindestkriterien der Betreuungseinrichtung vorgesehen.

3.3.4 Zeitlicher Rahmen

Betreuungseinrichtungen dürfen einem höchstens auf fünf Jahre befristeten Bedarf diesen. Eine Verlängerung der gemeldeten Dauer ist zulässig, allerdings darf die Gesamtdauer für den Bestand der Betreuungseinrichtung den Zeitraum von fünf Jahren nicht überschreiten. Spätestens mit 30.Juni 2022 darf damit keine Betreuungseinrichtung, welche auf Grund dieser Ausnahmebestimmung eingerichtet wurde, weiter betrieben werden.

Bestimmungen nach Ende des zeitlichen Rahmens

Die niederösterreichische Regelung postuliert explizit, dass nach Ablauf des gemeldeten Bedarfs die Betreuungseinrichtung aufzulassen und die baulichen Maßnahmen innerhalb von 6 Monaten zu entfernen bzw. bei Änderungen bestehender Bauwerke deren letzter rechtmäßiger Zustand wiederherzustellen ist.

3.3.5 Nachbarinnen- und Nachbarrechte

Als Minimum müssen die Sicherheit von Personen, die Hygiene, die Standsicherheit, Trockenheit und der Brandschutz der baubehördlich bewilligten oder angezeigten Bauwerke der Nachbarinnen und Nachbarn und bei Neu- und Zubauten die aureichende Belichtung der Hauptfenster zulässiger Gebäude der Nachbarinnen- und Nachbarn gewährleistet sein.

3.3.6 Rechte der betroffenen Gemeinde

Der zuständigen Baubehörde ist die Errichtung von Betreuungseinrichtungen lediglich zu melden.

3.4 Oberösterreich

3.4.1 Formale Form der Ausnahme

Oberösterreich hat sich für ein eigenes Gesetz zur Sicherstellung von Unterbringungsmöglichkeiten für u.a. geflüchtete Personen entschieden.[10] Dieses Gesetz ermächtigt die Landesregierung durch Verordnung allgemein oder im Einzelfall zu bestimmen, dass Einrichtungen der definierten Art zu errichten und/oder zu verwenden sind (zu den bau- und planungsrechtlichen Bedingungen siehe unten).

[9] § 2 Abs. 1. Z 5 Niederösterreichisches Grundversorgungsgesetz LGBl. Nr. 9240-0
[10] Oberösterreichisches Unterbringungs-Sicherstellungsgesetz LGBl. Nr. 88/2015

3.4.2 Zeitrahmen der Rechtsnorm

Das zitierte Landesgesetz zur Sicherstellung von Unterbringungsmöglichkeiten tritt mit Ablauf des 31. Dezember 2022 außer Kraft. Allerdings ist die Verwendung von Bauwerken und Anlagen für welche nach diesem Gesetz eine Ausnahme genehmigt wurde im Einzelfall weiter zulässig, sofern dies für den Zweck des Gesetzes notwendig ist. Im Ergebnis kann damit von einer unbeschränkten Anwendbarkeit, allerdings lediglich in Einzelfällen, gesprochen werden.

3.4.3 Persönlicher Anwendungsbereich

Das oberösterreichische Unterbringungs-Sicherstellungsgesetz gilt für eine größere Anzahl von Personen, die auf Grund von unerwarteten oder unabwendbaren Ereignissen, insbesondere Naturereignissen oder technischen Unfällen oder in deren Folge oder auf Grund völkerrechtlicher, unionsrechtlicher oder Verpflichtungen des Landes gegenüber dem Bund oder aus humanitären Gründen notwendig ist.

Quantitative Beschränkung

Unterbringungen sind mit höchstens 100 Personen je Unterbringungsstandort beschränkt.

3.4.4 Ausmaß der Ausnahme

Die Landesregierung kann mit Verordnung festlegen, dass Bauwerke und Anlagen zur Unterbringung im Bauland und auf geeigneten sonstigen Flächen, also auf Verehrsflächen und im Grünland, errichtet und für diese Zwecke verwendet werden dürfen. Dies gilt auch für Veränderungen des Verwendungszwecks, Umbauten oder sonstige Änderungen von bestehende Gebäuden. Die Geltung der oberösterreichischen Bauordnung und des Raumordnungsgesetzes wird explizit ausgeschlossen. Die Landesregierung ist dabei frei näher festzulegen, welche Typen von Bauwerken bis zu welcher Größe und Höhe und welcher Höchstfläche für welche Höchstdauer zulässig sind. Damit hat die Landesregierung die Möglichkeit verschiedene Begrenzungen festzulegen, sie ist aber keineswegs dazu verpflichtet.

Einschränkungen der Bauweise

Es gibt keine verpflichtende Einschränkung der Bauweise, die Landesregierung kann diese allerdings per Verordnung festlegen.

Mindestkriterien

Das Gesetz legt fest, dass auf die Standsicherheit, den Brandschutz, die Hygiene und die Nutzungssicherheit Bedacht zu nehmen ist, sowie die notwendigen Ver- und Entsorgungsanschlüsse zuzulassen sind.

3.4.5 Zeitlicher Rahmen

Es besteht keine zeitliche Einschränkung des Bestandes der Unterbringungen.

Bestimmungen nach Ende des zeitlichen Rahmens

Neubauten, in denen die Unterbringung von Personen dauerhaft beendet ist, gelten als bewilligungslose bauliche Anlagen im Sinne der oberösterreichischen Bauordnung.[11] Demzufolge kann der Eigentümer oder die Eigentümerin des Grundstückes eine Baubewillung beantragen (für welche allerdings die bau- und raumordnungsrechtlichen Bestimmungen eingehalten sein müssen) oder er/sie muss den vorigen Zustand des Grundstücks wiederherstellen.

3.4.6 Nachbarinnen- und Nachbarrechte

Es gibt keine Zuerkennung spezieller Nachbarinnen- und Nachbarrechte im Gesetz, daher ist davon auszugehen, dass Nachbarinnen und Nachbarn kein Rechtschutz gegen die Errichtung von Unterbringungsmöglichkeiten zusteht.

3.4.7 Rechte der betroffenen Gemeinde

Erlässt die Landesregierung eine Verordnung, welche sich auf konkrete Standorte in einzelnen Gemeinden bezieht, hat sie, außer bei besonderer Dringlichkeit, die betroffene Gemeinde, sowie den Oberösterreichischen Gemeindebund und den Österreichischen Städtebund Landesgruppe Oberösterreich

[11] Landesgesetz vom 5. Mai 1994, mit dem eine Bauordnung für Oberösterreich erlassen wird (Oö. Bauordnung 1994 - Oö. BauO 1994), LGBl.Nr. 66/1994 aktuelle Fassung 95/2017

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anzuhören. Kann keine Anhörung stattfinden, ist die Gemeinde vor Erlassung der Verordnung zumindest zu informieren.

3.5 Salzburg

3.5.1 Formale Form der Ausnahme

Der Salzburger Landtag hat im Juli 2015 ein eigenes Gesetz beschlossen, mit dem bau- und raumordnungsrechtliche Sonderbestimmungen für die Unterbringung von hilfs- und schutzbedürftigen Fremden erlassen wurden.[12]

3.5.2 Zeitrahmen der Rechtsnorm

Das Gesetz wurde ursprünglich mit einer Geltungsdauer von zwei Jahren limitiert,[13] im Juli 2017 wurde das Gesetz allerdings dahingehend novelliert,[14] dass es erst mit Ablauf des 31. Dezember 2020 außer Kraft treten wird.

3.5.3 Persönlicher Anwendungsbereich

Das Flüchtlingsunterkünftegesetz ist anwendbar für die Unterbringung von hilfs- und schutzbedürftigen Fremden im Sinne des Salzburger Grundversorgungsgesetzes.[15] Bemerkenswert hierbei ist, dass das Flüchtlingsunterkünftegesetz in seiner ursprünglichen Variante den Anwendungsbereich auf die Unterbringung ebendieser Personengruppe beschränkte, diese Definition allerdings mit der angesprochenen Novelle 2017 auf die Unterbringung „vorwiegend“ dieser Personen deutlich ausgeweitet wurde und nunmehr auch für andere Unterbringungsbedürftige anwendbar ist.

Quantitative Beschränkung

Es bestehen keine mengenmäßigen Beschränkungen der Unterzubringenden.

3.5.4 Ausmaß der Ausnahme

Das Salzburger Flüchtlingsunterkünftegesetz bietet sowohl raumordnungsrechtliche als auch baurechtliche Erleichterungen für die Unterbringung von (nunmehr vorwiegend) Flüchtlingen. Im Bereich des Raumordnungsrechtes sind derartige Unterkünfte sowohl in allen Baulandkategorien zulässig, als auch im Grünland, ohne dass in zweiteren Fall die üblichen Voraussetzungen für eine Einzelfallbewilligung von Bauten im Grünland vorliegen müssen. Für die Verwendung von im Grünland bestehenden Bauten sowie widmungswidrigen Bestandbauten mit Aufenthaltsräumen für Menschen als Flüchtlingsunterkunft ist nicht einmal eine Einzelbewilligung notwendig.

Als baurechtliche Erleichterung ist vorgesehen, dass für die Verwendung von bestehenden Bauten mit Aufenthaltsräumen für Menschen als Flüchtlingsunterkunft keine Bewilligung der Baubehörde benötigt wird. Eine Sonderregelung besteht für die zeitweilige, zwei Jahre nicht übersteigende Aufstellung von Wohncontainern für Flüchtlingsunterkünfte im Bauland. Für diese ist weder eine Bauplatzerklärung noch eine Baubewilligung erforderlich.

Einschränkungen der Bauweise

Es besteht keine prinzipielle Einschränkung, für die Errichtung von Gebäuden gilt die Ausnahme von der Bewillungspflicht lediglich für die zwei Jahre nicht übersteigende Aufstellung von Containern.

Mindestkriterien

Als bautechnische Anforderung an Flüchtlingsunterkünfte werden ein der voraussichtlichen durchschnittlichen Unterbringungsdauer angemessenes Maß an Festigkeit, Brandschutz, Hygiene, Nutzungssicherheit und Schallschutz gefordert. Bei der Neuerrichtung von Unterkünften können auf Antrag Ausnahmen von bautechnischen Anforderungen gewährt werden.

[12] Salzburger Flüchtlingsunterkünftegesetz, LGBl. Nr. 58/2015
[13] § 4 leg. cit.
[14] Gesetz vom 28. Juni 2017, mit dem das Flüchtlingsunterkünftegesetz geändert wird, LGBl. Nr. 52/2017
[15] Salzburger Grundversorgungsgesetz LGBl. Nr. 35/2007 idF 51/2016

3.5.5 Zeitlicher Rahmen

Das Flüchtlingsunterkünftegesetz postuliert dass für den Geltungszeitraum des Gesetzes das Salzburger Raumordnungs-[16] und Baupolizeigesetz[17] mit den festgeschriebenen Einschränkungen anzuwenden sind. Daraus ergibt sich, dass nach Außerkrafttreten des Gesetzes die auf dessen Grundlage errichteten bzw. benutzten Gebäude konsenslose Bauwerke bzw. Nutzungen im Sinne der gennaten Gesetze sein werden.

Bestimmungen nach Ende des zeitlichen Rahmens

Es gibt keine dementsprechenden Sonderbestimmungen, daher ist zu folgern, dass die allgemeinen Bestimmungen über konsenslose Bauwerke bzw. Nutzungen zur Anwendung kommen.

3.5.6 Nachbarinnen- und Nachbarrechte

Das Flüchtlingsunterkünftegesetz nennt keine speziellen Nachbarinnen- und Nachbarrechte im Gesetz, daher ist davon auszugehen, dass Nachbarinnen- und Nachbarn kein Rechtschutz gegen die Errichtung von Unterbringungsmöglichkeiten zusteht.

3.5.7 Rechte der betroffenen Gemeinde

Das Flüchtlingsunterkünftegesetz regelt keine Mitbestimmungs- und/oder Informationsrechte für die betroffenen Gemeinden.

3.6 Steiermark

Die Situation in der Steiermark ist komplex: 2015 wurde einerseits eine umfangreiche Bestimmung über vorübergehende Betreuungseinrichtungen zur Grundversorgung eingeführt. Diese war allerdings bis 31. Dezember 2017 befristet und ist mittlerweile nicht mehr in Kraft. Ebenfalls 2015 wurde eine neue Ausnahme von den baurechtlichen Vorschriften für Bauten in Leichtbauweise und Container für die Unterbringung von Personen aus humanitären Gründen (ohne Befristung) aufgenommen. Diese (deutlich weniger genau definierte) Ausnahmebestimmung ist weiterhin in Kraft. In den folgenden Ausführung wird daher immer zwischen diesen beiden Regeln differenzierend eine Beantwortung der Forschungsfragen vorgenommen.

3.6.1 Formale Form der Ausnahme

Der Steirische Landtag beschloss 2015 eine Novelle[18] zum Steiermärkischen Baugesetz[19] mit dem ein neuer Paragraph über vorübergehende Betreuungseinrichtungen zur Grundversorgung in das Baugesetz inkludiert wurde. Diese Sonderbestimmung trat allerdings mit 31. Dezember 2017 außer Kraft. Gleichzeitig mit diesem Sonderpargraphen ergänzte der Landtag die Ausnahmen vom Anwendungsbereich des Baugesetzes (§ 3 leg cit) um eine neue Ziffer 9, welche Neu- und Zubauten in Leichtbauweise, Wohncontainer und sonstige Fertigbauteile oder die Nutzung von baulichen Anlagen zur vorübergehenden Unterbrinung von Geflüchteten vom Anwendungsbereich des Baugesetzes ohne zeitliche Beschränkung ausnimmt.

3.6.2 Zeitrahmen der Rechtsnorm

Die Sonderbestimmung des § 21a Steiermärkisches Baugesetz war bis 31. Dezember 2017 in Kraft, die Ausnahmebestimmung des § 3 Ziffer 9 ist ohne zeitliche Beschränkung weiterhin gültig.

3.6.3 Persönlicher Anwendungsbereich

§ 21a nannte als persönlichen Anwendungsbereich Personen, welche die Zielgruppe der Grundversorgung gemäß des Steiermärkischen Betreuungsgesetzes[20] bilden. § 3 Ziffer 9 spricht von einer vorübergehenden Unterbringung einer größeren Anzahl von Personen aus humanitären Gründen, wenn die Unterbringung staatlich organisiert ist.

Quantitative Beschränkung

[16] Gesetz vom 17. Dezember 2008 über die Raumordnung im Land Salzburg (Salzburger Raumordnungsgesetz 2009 - ROG 2009), LGBl Nr 30/2009 aktuelle Fassung 96/2017

[17] Baupolizeigesetz 1997 – BauPolG, LGBl Nr 40/1997 aktuelle Fassung 96/2017

[18] Änderung des Steiermärkischen Baugesetzes, LGBl. Nr. 75/2015

[19] Gesetz vom 4. April 1995, mit dem Bauvorschriften für das Land Steiermark erlassen werden (Steiermärkisches Baugesetz – Stmk. BauG), LGBl. Nr. 59/1995 aktuelle Fassung 61/2017

[20] Steiermärkisches Betreuungsgesetz, LGBl. Nr. 101/2005 aufgehoben durch LGBl. NR. 111/2016

Weder postulierte § 21a, noch nennt § 3 Ziffer 9 eine Maximalanzahl an unterzubringenden Personen.

3.6.4 Ausmaß der Ausnahme

Gemäß § 21a waren Umbaumaßnahmen und Nutzungsänderungen an bestehenden Anlagen sowie Neu- und Zubauten in Leichtbauweise, Wohncontainer und sonstige Fertigbauteile zur Unterbringung von Personen, welche Zielgruppe der Grundversorgung sind baubewilligungsfrei. Weiters war festgelegt, dass für die genannten Bauten Abweichungen von baurechtlichen und bautechnischen Vorschriften zulässig waren und diese jeweils in allen Baugebietskategorien, auf Verkehrsflächen und im Freiland zulässig waren, wobei von raumordnungsrechtlichen Vorschriften abgewichen werden konnte.

§ 3 Ziffer 9 nimmt Neu- und Zubauten in Leichtbauweise, Wohncontainer und sonstige Fertigteilbauten für die Unterbringung aus humanitären Gründen pauschal vom Anwendungsbereich des Baugesetzes aus.

Einschränkungen der Bauweise

In beiden Fällen besteht eine Einschränkung auf Neu- und Zubauten in Leichtbauweise, Wohncontainer und sonstige Fertigteilbauten.

Mindestkriterien

§ 21a nannte als Mindestanforderung Festigkeit, Brandschutz, Hygiene und Nutzungssicherheit, welche von der Landesregierung mittels Verordnung festzulegen waren. § 3 Ziffer 9 nennt keine Mindestanforderungen.

3.6.5 Zeitlicher Rahmen

§ 21a sprach von „vorübergehenden“ Betreuungseinrichtungen, eine konkrete maximale Zeitangabe wurde allerdings nicht genannt. Auch § 3 Ziffer 9 spricht nur vage von „vorübergehender Unterbringung“.

Bestimmungen nach Ende des zeitlichen Rahmens

Bauvorhaben nach § 21a mussten nach Außerkrafttreten der Bestimmung binnen einer Frist von einem Monat in den Zustand versetzt oder der Nutzung zugeführt werden, der oder die vor den Maßnahmen auf Grund der Novelle bestand. Neu- und Zubauten waren zur Gänze zu beseitigen.

§ 3 Ziffer 9 nennt mangels zeitlichen Rahmens keine Bestimmungen nach Ende eines solchen.

3.6.6 Nachbarinnen- und Nachbarrechte

Beide Bestimmungen beinhalten keine Regelungen in Bezug auf Rechte der Nachbarinnen- und Nachbarn.

3.6.7 Rechte der betroffenen Gemeinde

§ 21a verlangte, dass Bauvorhaben vor ihrer Ausführung der Gemeinde schriftlich mitzuteilen waren, in § 3 Ziffer 9 fehlt eine solche Klausel.

3.7 Tirol

3.7.1 Formale Form der Ausnahme

Der Tiroler Landtag entschied sich für eine eine Ausnahme[21] der Bestimmungen über vorübergehende Betreuungseinrichtungen für Zwecke der Grundversorgung in die Tiroler Bauordnung.[22]

3.7.2 Zeitrahmen der Rechtsnorm

Die gesetzliche Regelung wurde ohne Befristung erlassen.

3.7.3 Persönlicher Anwendungsbereich

Betreuungseinrichtungen im Sinne der Tiroler Regelung sind Einrichtungen gemäß des Tiroler Grundversorgungsgesetzes[23] oder Betreuugseinrichtungen gemäß des Grundversorgungsgesetzes des Bundes.[24] Gleichzuhalten sind kurzfristige Unterbringungen von Transitflüchtlingen durch das Land Tirol.

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[21] § 46a, Gesetz mit dem die Tiroler Bauordnung 2011 geändert wird, LGBl. Nr. 103/2015.

[22] Kundmachung der Landesregierung vom 28. Juni 2011 über die Wiederverlautbarung der Tiroler Bauordnung 2001, Tiroler Bauordnung 2011, LGBl. Nr. 57/2011 aktuelle Fassung 129/2017

[23] §1 lit. b Tiroler Grundversorgungsgesetz, LGBl. NR. 21/2006

[24] § 1 Z 5 Grundversorgungsgesetz-Bund 2005, BGBl. Nr. 405/1991

Angemerkt werden soll, dass gleichzeitig mit § 46a auch ein neuer § 46b in die Tiroler Bauordnung eingefügt wurde, welcher die Bestimmungen des § 46a auch für die vorübergehende Bereitstellung von Wohnraum bei Katastrophen[25] vorsieht.

Quantitative Beschränkung

Die Anzahl der jeweils unterzubringenden Personen ist auf höchstens 2 Prozent der Einwohnerzahl der betreffenden Gemeinde (nach dem Ergebnis der letzten Volkszählung) limitiert.

3.7.4 Ausmaß der Ausnahme

Unter den beschriebenen Voraussetzungen bezüglich quantitativer Beschränkung und zeitlichem Rahmen bedürfen die definierten Betreuungseinrichtungen statt einer Baubewilligung oder einer Bauanzeige nach § 21 der Tiroler Bauordnung ausschließlich einer „vereinfachten“ Bauanzeige nach § 46a leg. cit. Weiters wird festgehalten, dass sie weder den Festlegungen des Flächenwidmungsplanes, von Bebauungsplänen und von textlichen Festlegungen im örtlichen Raumordnungskonzept noch den Vorschriften der Bauordnung in Bezug auf Bauplatzgrenzen, Abstandvorschriften, Bauhöhen, Abstellplätzen und Nebeneinrichtungen unterliegen.

Einschränkungen der Bauweise

Die Tiroler Ausnahmebestimmung umfasst den Neubau von Gebäuden in Leichtbauweise, wie Container und Fertigbauten, den Zu- und Umbau von Gebäuden und die sonstige Änderung von Gebäuden oder Gebäudeteilen für Betreuungseirichtungen sowie die Verwendung von bisher anderwertig verwendeten Gebäuden oder Gebäudeteilen zur Unterbringung von Fremden im Rahmen einer Betreuungseinrichtung.

Mindestkriterien

Sicherzustellen ist, dass bautechnischen Erfordernissen und geschützten Interessen, insbesondere dem Schutz des Lebens und der Gesundheit von Menschen entsprochen wird.

3.7.5 Zeitlicher Rahmen

Die Bauvorhaben dürfen höchstens einem fünfjährigen Bedarf dienen. Die Berechtigung auf Grund der Bauanzeige kann einmal um höchstens zwei Jahre verlängert werden.

Bestimmungen nach Ende des zeitlichen Rahmens

Nach dem Ablauf der maximalen Nutzungsdauer ist das betreffende Gebäude ganz oder teilweise zu beseitigen, in seinen vormaligen Zustand zu versetzen oder seinem vormaligen Verwendungszweck zuzuführen, sofern dies zur Herstellung eines den bau- und raumordnungsrechtlichen Vorschriften Zustandes erforderlich ist.

3.7.6 Nachbarinnen- und Nachbarrechte

Nachbarinnen- und Nachbarrechte werden in der Tiroler Regelung nicht explizit erwähnt, allerdings wird festgehalten, dass den durch die Vorschriften der Mindestkriterien geschützten Interessen, insbesondere dem Schutz des Lebens und der Gesundheit von Menschen entsprochen werden muss. Daraus lassen sich zumindest in diesem Bereich Rechte der Nachbarinnen- und Nachbarnableiten.

3.7.7 Rechte der betroffenen Gemeinde

Die betroffene Gemeinde muss im Rahmen der Bauanzeige informiert werden. Diese Bauanzeige muss die Planunterlagen beinhalten und die Zeitdauer angeben, für die das angezeigte Bauvorhaben bestehen soll. Weiters kann die Baubehörde die Ausführung innerhalb von vier Wochen mit schriftlichem Bescheid untersagen oder diesbezügliche Auflagen vorschreiben, so die Maßgaben des § 46a nicht eingehalten werden.

[25] Im Sinne des Tiroler Katastropgenmanagementgesetzes LGBl. Nr. 33/2006

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3.8 Vorarlberg

3.8.1 Formale Form der Ausnahme

Der Vorarlberger Landtag erließ 2015 eine Änderung[26] des Baugesetzes,[27] welche einen neuen Paragraphen über Unterkünfte zur Grundversorgung einführte.

3.8.2 Zeitrahmen der Rechtsnorm

In der Erstfassung war die Regelung bis 1. Juli 2017 befristet, allerdings wurde sie 2017 bis 1. Juli 2019 verlängert.[28]

3.8.3 Persönlicher Anwendungsbereich

Begünstigte Personen der Ausnahmebestimmung sind Personen, die zur Zielgruppe der Grundversorgungsvereinbarung gehören.[29]

Quantitative Beschränkung

Es wird keine quantitative Beschränkung festgelegt.

3.8.4 Ausmaß der Ausnahme

Die Bestimmung legt fest, dass abweichend von den bau- und planungsrechtlichen Vorschriften Bauvorhaben betreffend bestehende Anlagen als freie Bauvorhaben gelten. Allerdings sind lediglich Vorhaben auf Bauflächen oder in Sondergebieten zulässig.

Einschränkungen der Bauweise

Es wird keine Einschränkung der Bauweise vorgegeben, allerdings bezieht sich die Bestimmung lediglich auf bereits bestehende (und damit schlüssigerweise rechtskonforme) Anlagen, sodass lediglich Fälle von Zu- oder Umbauten bzw. Nutzungsänderungen vorliegen dürften.

Mindestkriterien

Interessen der Sicherheit und der Gesundheit dürfen den Anlagen nicht entgegen stehen.

3.8.5 Zeitlicher Rahmen

Anlagen dürfen längstens bis 2 Jahre nach Ablauf der gesetzlichen Ausnahmebestimmunge betrieben werden. Ursprünglich war dies bis 1. Juli 2019, nunmehr wurde der Stichtag auf den 1. Juli 2021 verschoben.

Bestimmungen nach Ende des zeitlichen Rahmens

Es gibt keine explizite Bestimmung was nach Ablauf der Berechtigung mit den Anlagen zu geschehen hat.

3.8.6 Nachbarinnen- und Nachbarrechte

§ 20a legt explizit fest, dass Abstandsflächen und Mindestabstände eingehalten werden müssen.

3.8.7 Rechte der betroffenen Gemeinde

Es werden keine Mitbestimmungs- und/oder Informationsrechte für die betroffenen Gemeinden festgelegt.

3.9 Wien

Die Wiener Bestimmung ist komplex, da sie drei verschiedene Fälle behandelt.

Unterschieden wird im relevanten Paragraphen der Bauordnung[30] nach Nutzungsdauer: Bei einer Nutzungsdauer von maximal sechs Monaten ist weder eine Baubewilligung noch ein Bauanzeige notwendig. Für eine Nutzungsdauer von bis zu fünf Jahren ist eine Baubewilligung notwendig, die Behörde kann aber auf die Einhaltung der Bauordnung (und damit auch der raumordnungsrechtlichen Bestimmungen derselben)

[26] § 20a, Gesetz über eine Änderung des Baugesetzes, LGBl. Nr. 37/2015
[27] Baugesetz, LGBl. Nr. 52/2001 aktuelle Fassung 78/2017
[28] Gesetz über eine Änderung des Baugesetzes, LGBl. Nr. 8/2017
[29] § 7, Gesetz über die Mindestsicherung, LGBl. Nr. 64/2010 idF 37/2017
[30] § 71c Wiener Stadtentwicklungs-, Stadtplanungs- und Baugesetzbuch (Bauordnung für Wien – BO für Wien), LGBl. Nr. 11/1930 idF 27/2016

verzichten. Auch bei einer Nutzungsdauer bis zu 15 Jahren kann die Behörde im Rahmen der Erteilung der baurechtlichen Genehmigung auf die Einhaltung der Bestimmungen der Bauordnung verzichten. Im Unterschied zum zweitgenannten Fall, muss bei der längstmöglichen Bestandsdauer aber sicher gestellt werden, dass subjektiv-öffentlichrechtliche Nachbarinnen- und Nachbarrechte nicht verletzt werden. Im Folgenden wird bei den relevanten Punkten des Prüfschemas zur übersichtlicheren Erfassung der Wiener Regelung die Gliederung des § 71c übernommen und daher bei der Analyse der Bestimmung in 6-Monate-/5-Jahre-/15-Jahre-Szenarien unterschieden.

3.9.1 Formale Form der Ausnahme

Wien hat sich dazu entschlossen die Ausnahmebestimmungen für die vorübergehenden Einrichtungen zur Unterbringung von Personen im Rahmen einer Novelle zur Wiener Bauordnung zu erlassen.[31]

3.9.2 Zeitrahmen der Rechtsnorm

Der neue § 71c der Bauordnung für Wien wurde unbefristet erlassen.

3.9.3 Persönlicher Anwendungsbereich

Wien wählte einen weiten persönlichen Anwendungsbereiches der Bestimmung. Demgemäß spricht die Legaldefintion von einer größeren Anzahl von Personen, deren Unterbringung auf Grund von bereits eingetretenen oder bevorstehenden Ereignissen, insbesondere Naturereignissen, oder auf Grund völkerrechtlicher, unionsrechtlicher oder Verpflichtungen der Gemeinde bzw. des Landes gegenüber dem Bund oder aus humanitären Gründen notwendig ist. Anzumerken ist, dass die Wiener Bestimmung nur dann anwendbar ist, wenn die Unterbringung staatlich organisiert ist.[32]

Quantitative Beschränkung

§ 71c nennt keine mengenmäßige Einschränkung.

3.9.4 Ausmaß der Ausnahme

6 Monate: Die Nutzung bestehender Bauwerke, sowie die Errichtung von Neu- und Zubauten in Leichtbauweise bedürfen weder einer Baubewilligung noch einer Bauanzeige. Die Gültigkeit der bau- und planungsrechtlichen Vorschriften wird explizit ausgenommen.

5 Jahre/15 Jahre: Die Baubehörde kann im Baubewilligungsbescheid auf die Einhaltung der Bestimmungen der Bauordnung verzichten. Hiermit liegt Ermessen der Behörde vor, ob sie von dieser Ausnahme Gebrauch macht, oder nicht.

Einschränkungen der Bauweise

6 Monate: Die Errichtung von Neu- und Zubauten ist auf Leichtbauweise (Conatiner, Fertigbauteile etc.) begrenzt.

5 Jahre/15 Jahre: Dem Ansuchen um Baubewilligung muss u.a. ein Gutachten, dass es sich um ein geringfügiges Bauvorhaben mit technisch einfacher Tragekonstruktion bzw. Fundierung handelt, bei dem aus statischen Belangen keine Gefahr für das Leben oder die Gesundheit von Menschen sowie das Eigentum zu besorgen ist beigelegt werden.

15 Jahre: Zusätzlich zu den oben genannten Kriterien muss das Erdgeschoß des Bauwerks barrierefrei zugänglich sein.

Mindestkriterien

6 Monate/5 Jahre/15 Jahre: Auf „allgemeine Anforderungen“ an die mechanische Festigkeit und Standsicherheit, den Brandschutz, die Hygiene und Gesundheit sowie die Nutzungssicherheit muss Bedacht genommen werden.

5 Jahre/15 Jahre: Zusätzlich zu den oben genannten Kriterien muss der Nachweis der Verfügbarkeit über eine ausreichende Wassermenge zur Brandkämpfung sowie Angaben über die maximal zu erwartende Personenzahl sowie die Flucht- und Rettungswege geliefert werden.

[31] Gesetz, mit dem die Bauordnung für Wien geändert wird, LGBl. Nr. 21/2016

[32] näher dazu (auch in Bezug auf die verfassungsrechtlichen Bedenken dieser Vorgabe): Geuder, Fuchs, Bauordnung für Wien, Linde, 2016, S. 344ff; Hiltgartner, Unterbringung von Geflüchteten in Städten, zoll+, 2016

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15 Jahre: Zusätzlich zu den oben genannten Kriterien muss ein Nachweis über den Wärmeschutz gemäß § 63 der Bauordnung erbracht werden.

3.9.5 Zeitlicher Rahmen

Wie oben (Punkt 9 Wien) einleitend beschrieben bestehen die Möglichkeiten Unterbringungsmöglichkeiten für sechs Monate, fünf Jahre und 15 Jahre, mit jeweils unterschiedlichem Ausmaß der Ausnahme von bau und planungsrechtlichen Bestimmungen zu schaffen. Das Gesetz nennt keine Möglichkeit der Verlängerung der jeweiligen Nutzungsdauern.

Bestimmungen nach Ende des zeitlichen Rahmens

Die Wiener Regelungen nennen in keinem der drei Fälle was nach Ablauf der jeweiligen Nutzungsdauer mit den benutzten Gebäuden geschehen soll. Folglich müssen errichtete Gebäude abgerissen, oder ein reguläres Bauverfahren eingeleitet werden, falls eine andere genehmigungsfähige Nutzung nach den Bestimmungen der Bauordnung möglich ist.

3.9.6 Nachbarinnen- und Nachbarrechte

6 Monate: Im Fall der Unterbringung für maximal sechs Monate nennt das Gesetz keine Rechte der Nachbarinnen und Nachbarn. Folgerichtig ist davon auszugehen, dass Nachbarinnen- und Nachbarn keine Rechtsmittel gegen vorübergende Unterbringungen der kürzesten Nutzungsdauer einbringen können.

5 Jahre: Die rechtliche Bestimmung sieht explizit vor, dass die Verletzung subjektiv-öffentlicher Nachbarinnen- und Nachbarrechte der Erteilung der baurechtlichen Bewilligung nicht entgegen steht. Als einzige Einschränkung wird genannt, dass die Bebaubarkeit von benachbarten Grundflächen nicht vermindert werden dürfe.

15 Jahre: Im Fall der längstmöglichen Unterbringungen ordnet das Gesetz an, dass der baurechtlichen Bewilligung durch die Bauordnung postulierte subjektiv-öffentlichen Rechte nicht entgegen stehen dürfen und die Bebaubarkeit der Nachbargrundfläche nicht vermindert werden dürfe. Einschränkend zu baurechtlichen Verfahren, welche nicht den Sonderbestimmungen des § 71c unterliegen muss allerdings hervorgehoben werden, dass Beschwerden gegen Bescheide in diesem Fall der vorübergehenden Einrichtungen zur Unterbringung von Personen nicht automatisch aufschiebende Wirklung zukommt. Diese kann lediglich auf Antrag der beschwerdeführenden Partei von der Behörde zuerkannt werden, wenn dem nicht zwingende öffentlich Interessen entgegen stehen und nach Abwägung der berührten öffentlichen Interessen und Interessen anderer Parteien mit der Ausübung der durch den angefochteten Bescheid engeräumten Berechtigung für die Beschwerde führende Partei ein unverhältnismäßiger Nachteil verbunden wäre.

3.9.7 Rechte der betroffenen Gemeinde

6 Monate: Der Beginn der Nutzung ist der Behörde innerhalb einer Woche schriftlich zur Kenntnis zu bringen.

5 Jahre/ 15 Jahre: in diesen Fällen muss eine baurechtliche Genehmigung der Baubehörde eingeholt werden.

4 CONCLUSIO

Österreich sah sich im Jahr 2015 mit der Herausforderung konfrontiert ausreichend adäquate Unterkünfte für geflüchtete Personen zur Verfügung zu stellen. Gemäß des in Österreich geltenden bundesstaatlichen Prinzips waren Maßnahmen sowohl auf Bundes- als auch auf Landesebende zu treffen.

Zur Bewältigung der außerordentlichen Situation erließ der Nationalrat ein Bundes-Verfassungsgesetz über die Unterbringung und Aufteilung von hilfs- und schutzbedürftigen Fremden, mit dem er eine punktuelle Durchbrechung der bundesstaatlichen Kompetenzverteilung vornahm, indem er vorgab, dass die Nutzung von Bauwerken und die Aufstellung beweglicher Wohneinheiten als Flüchtlingsunterkünfte unter Außerachtlassung einschlägiger bau- und raumordnungsrechtlicher Bestimmungen des Landes geschehen könne.[33] Dieses Bundesverfassungsgesetz wird teilweise dadurch begründet, dass Gemeinden durch bau- und

[33] näher: Stolzlechner, Stoll, Zur ersatzweisen Unterbringung und Aufteilung hilfs- und schutzbedürftiger Fremder durch den Bund, baurechtliche blätter 19, 77-93 (2016)

raumordnungsrechtliche Bestimmungen wirksame Instrumente zur Verzögerung der Errichtung von Flüchtlingsunterkünften gegeben waren.[34] Der Bund gab diesbezüglich eine zweifache quantitavie Beschränkung von maximal 1,5 Prozent der Wohnbevölkerung der Standortgemeinde, maximal 450 Personen pro Unterkunft vor. Auch eine doppelte Informationsverpflichtung des BMI, an die Bürgermeisterin oder den Bürgermeister der betroffenen Gemeinde und die Bezirksverwaltungsbehörde wurde festgeschrieben.

Die beschriebenen Regelungen der Landesgesetzgeber zur Unterbringung Geflüchteter variieren beträchtlich. Die meisten Bundesländer erließen entsprechende Regelungen bereits am Höhepunkt der Zuwanderung im Jahr 2015, einige Bundesländer (Salzburg, Kärnten und Wien) erst im Jahr 2016, das Burgenland hat bis jetzt auf die Erlassung einer dementsprechenden Regelung verzichtet.

In Kärnten, Tirol und Wien wurden die Regelungen unbefristet erlassen, alle anderen Bundesländer entschieden sich für Befristungen (zwischen 30. Juni 2017 und 31. Dezember 2022), allerdings wurden diese Befristungen teilweise bereits verlängert bzw. vergleichbare Bestimmungen in den unbefristeten Teil der jeweiligen Bauordnung übernommen.

Im persönlichen Anwendungsbereich zeigt sich, dass viele Bundesländer an die Berechtigung zur Grundversorgung, einige auch an völker- und unionsrechtliche Verpflichtungen bzw. humanitäre Gründe, teilweise im Zusammenhang mit Katstrophen anknüpfen. Ein sehr breiter Zugang wurde vom Wiener Landtag gewählt. Da einige Vertreter der Regierungparteien in Wien offen aussprachen, dass die Regelung auch für mobile Studierendenheime verwendet werden könne,[35] wurde die gewählte Defintion von den Wiener Oppositionsparteien scharf kritisiert.[36] Im Unterschied zur quantitativen Maximalzahl, welcher der Bund in seinem Unterbringungsgesetz vorsah, legten die meisten Bundesländer (anders nur Oberösterreich und Tirol) keine maximale Belegungszahl der Unterbringungen fest.

Die meisten Bundesländer wählen einen weitgehenden Ausnahmebereich, indem sie ein Abweichen von sowohl bau- als auch planungsrechtlichen Vorschriften (und damit Unterbringungen z.B. auch im Grünland) zulassen. Dies ist als beträchtliche Abweichung vom Planungs- und Baurecht zu qualifizieren. Lediglich Kärnten und Vorarlberg beschränken die Anwendbarkeit auf Bauland.

Bei den meisten Bundesländerregelungen wird darauf geachtet, dass Neuerrichtungen von Unterbringungsgebäuden lediglich in Leichtbauweise vorgenommen werden, ebenso legen die Mehrzahl Mindestkriterien in Bezug auf Festigkeit, Brandschutz, Hygiene und Nutzungssicherheit fest.

Der zeitliche Rahmen der Unterkünfte ist sehr unterschiedlich geregelt, manche Bundesländer formulieren maximale Nutzungsdauern (teilweise mit Verlängerungsmöglichkeiten), andere sprechen lediglich von „vorübergehend“ ohne dies näher zu definieren. Ebenso gibt es keinen einheitlichen Zugang über eventuelle Verpflichtungen Grundstücke nach Nutzung wieder in ihren ursprünglichen und/oder regelkonformen Zustand zu versetzen.

Bezüglich der Nachbarinnen- und Nachbarrecht kann festgestellt werden, dass diese in allen Bundesländern, wenn auch in unterschiedlichem Ausmaß, beschränkt werden, was durchwegs als Gefährdung des rechtstaatlichen Prinzips bzw. des Grundrechts auf Eigentum verstanden werden kann.[37]

Auch in Bezug auf die Informations- bzw. Mitwirkungsrechte der gemeindeeigenen Baubehörde zeigt sich eine große Vielfalt bei den diskutierten Ausnahmebestimmungen. Die Bandbreite richtet sich von Entscheidung im Rahmen der Erlassung der baubehördlichen Genehmigungsbescheide über zumindest Information (teilweise durch Bauanzeige) bis zu keinerlei Einbeziehung oder Information.

Aus rechtsstaatlicher Sicht wäre eine einheitlichere Vorgehensweise (angelehnt an das Bundes-Unterbringungsgesetz) wünschenswert erschienen. Jedenfalls wenig nachvollziehbar wirkt der stark divergierende persönliche Anwendungsbereich, das Ausmaß der Ausnahmen von den bau- und

[34] näher: Knasmüller, Diem, Flüchtlinge und Integration, Recht & Finanzen für Gemeinden, 2015/13, S. 140ff
[35] SPÖ-Landesparteisekretär Niedermühlbichler in die Presse, Printausgabe: Wien: Die Fallen der neuen Bauordnung vom 09.03.2016; Planungssprecher der Grünen Chorherr in oe1.orf.at/artikel/429743 vom 25.01.2016
[36] Presseaussendung der WK Wien, Baurechtnovelle benachteiligt Wiener Unternehmen, 14.3.2016
[37] näher: Hiltgartner, Unterbringung von Geflüchteten in Städten, zoll+, 2016; Winkler, Die Nutzungsbescheide der BMI nach dem „Durchgriffsrecht“ gemäß dem BVG über die Unterbringung und Aufteilung von hilfs- und schutzbedürftigen Fremden, baurechtliche blätter 19, 94-105 (2016)

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planungsrechtlichen Bestimmungen und die unterschiedlichen (bzw. fehlenden) Befristungen der Regelungen.[38]

5 LITERATURVERZEICHNIS

BUNDESMINISTERIUM FÜR INNERES, Asylstatistik 2017

BÜRO DER VOLKSANWÄLTIN, Brinek: Nationaler Schulterschluss zur Flüchtlingsunterbringung verabsäumt, Presseaussendung, 30.03.2016

BUßJÄGER, Das Verfahren zur Nutzung von Grundstücken für die Unterbringung von hilfs- und schutzbedürftigen Fremden aufgrund des Gurchgriffsrechts, migraLex 3/2016

GEMEINDEBUND, Drei Bundesländer locker die Baubestimmungen für Asylquartiere, Presseaussendung, 08.07.2015

GEUDER, FUCHS, Bauordnung für Wien, Linde, 2016

HILTGARTNER, Unterbringung von Geflüchteten in Städten, zoll+, 2016

KNASMÜLLER, DIEM, Flüchtlinge und Integration, Recht & Finanzen für Gemeinden, 2015/13

PRESSE, Wien: Die Fallen der neuen Bauordnung, Printausgabe, 09.03.2016

STOLZLECHNER, STOLL, Zur ersatzweisen Unterbringung und Aufteilung hilfs- und schutzbedürftiger Fremder durch den Bund, baurechtliche blätter 19, 77-93 (2016)

WINKLER, Die Nutzungsbescheide der BMI nach dem „Durchgriffsrecht" gemäß dem BVG über die Unterbringung und Aufteilung von hilfs- und schutzbedürftigen Fremden, baurechtliche blätter 19, 94-105 (2016)

WIRTSCHAFTSKAMMER WIEN, Baurechtsnovelle benachteiligt Wiener Unternehmen, Presseaussendung, 14.3.2016

[38] siehe auch: Büro der Volksanwältin, Brinek: Nationaler Schulterschluss zur Flüchtlingsunterbringung verabsäumt, 30.03.2016

🏆 *reviewed paper*

What is Urban Sprawl in Flanders?

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1 ABSTRACT

At the country level, Belgium was found to be the European country with the highest degree of urban sprawl (EEA report on Urban sprawl in Europe, 2016). The phenomenon is most pronounced in Flanders, the highly populated northern part of the country. No less than 32.6% of its territory is taken in by settlement area, and, its landscapes are highly fragmented by ribbon and scattered development. An increase of ribbon development in Flanders from 3612 km in 1989 up to 4155 km in 2012 was calculated by Verbeek et al. (2014). This means an increase of 15% over 23 years. Given this urban fragmentation of the landscape, concerns and discussions rise about the pros and cons of this development and strategies to mitigate or stop urban sprawl.

Urban sprawl can refer to both a state (level of sprawl at a certain point in time) and a process (evolution of the level of sprawl in time). To gain better insights in the state of urban sprawl, detailed data of high quality are necessary. Several measures have been used in the literature to quantify (different aspects of) urban sprawl. Depending on the measure, but also on the type of input data used, different results can be obtained which in turn can lead to completely different interpretations and conclusions regarding the level of urban sprawl in Flanders. In this paper we analyse the effect of alternative input data on the outcome of the quantitative sprawl measure "WUP" (weighted urban proliferation) (EEA, 2016). Using sealed surfaces as an input to calculate WUP leads overall to an underestimation of the space taken in by urban settlements, hence of the importance of urban sprawl. Using the total settlement area of Flanders (including sealed surfaces, but also gardens, parks, etc.) leads to a much better representation of the phenomenon of urban sprawl.

The process of urban sprawl in Flanders is analysed by means of a temporal analysis using Landsat images of 1976, 1988 and 2000. The images are processed into urban settlement maps and urban sprawl is measured by means of WUP for the different time steps. Difference maps show the temporal and spatial dynamics of urban sprawl throughout the region.

Finally, in order to make measures of urban sprawl, and hence the phenomenon itself, easier to interpret and understand for a wider public, and, to answer the question "What is urban sprawl and where is it affecting Flanders?", the WUP-maps are translated into an urban sprawl typology map with characterizing examples and typical spatial configurations for each type. These will be used to stimulate the public awareness and debate with respect to sprawl and the generally devastating effects that it has on the Flemish landscapes.

Keywords: Flanders, spatial analysis, mapping, measures, urban sprawl

2 INTRODUCTION

Landscapes in Flanders are highly fragmented by ribbon and scattered development. In 2014 Verbeek, Boussauw and Pisman calculated an increase of ribbon development in Flanders from 3612 km in 1989 up to 4155 km in 2012, hence, an increase of 15% over 23 years. At the country level, Belgium was found to be the European country with the highest degree of urban sprawl together with the Netherlands (EEA, 2016). With this urban fragmentation of the landscape, the concern and discussions rise about the pros and cons of this development. The monetary cost of sprawled development is entering the public and political debates. This causes the need for a sound quantification and monetization of urban sprawl in Flanders and to gain better insights in the societal gains and losses of policy measures aimed at limiting and counteracting urban sprawl. With a view to get a better understanding of the nature and cost of urban sprawl, the Flemish Department of Environment & Spatial Development ordered a scientific study. In this paper results of the first phase of the study are reported.

3 QUANTIFYING URBAN SPRAWL IN FLANDERS

3.1 The state of urban sprawl

The EEA report of 2016 on urban sprawl in Europe reported on the recently developed WUP-method (Schwick et al, 2010) to quantify and compare urban sprawl between different regions and/or periods. This method combines measurements of the proportion of built-up areas (PBA – percentage of built-up), the degree of urban dispersion (DIS), and the land uptake per person (LUP) to give an overall – weighted – quantification of the degree of urban sprawl. The European sprawl analysis was done at the level of 1km² cells, based on sealed surface information derived from remote sensing (Copernicus) and population data at a 1km² resolution for 2011. When further analysing the results for Flanders, use can be made of available spatial data with a higher level of detail. Population, employment and land use (built-up) information are available at a 1ha resolution thus enabling a more precise quantification.

The input for carrying out WUP-calculations are:

- Number of inhabitants and jobs in 2013: derived from a population and employment map at 1ha resolution (Poelmans et al., 2016)
- Built-up areas: The definition of 'built-up', or better, what should be mapped as 'built-up' in order to fully grasp urban sprawl can be quite divergent. Three different definitions of 'built-up area', using four different data sources, are used and compared:
    - o Buildings in Flanders
    - o Sealed surfaces at a 5x5m² resolution
    - o Sealed surfaces from the European Copernicus dataset at a 20x20m² resolution
    - o Settlement areas, representing all land uses occupied by socio-economic functions, including residential and economic land uses, infrastructure, recreational grounds, gardens, etc.

Table 1 gives an overview of the input maps of the corresponding four 'runs'.

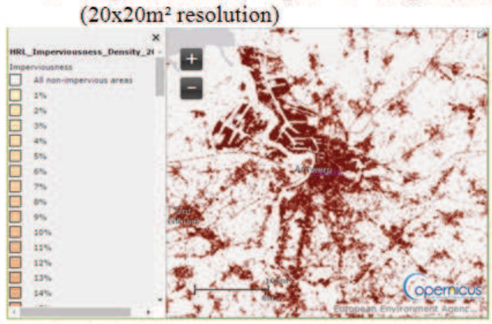
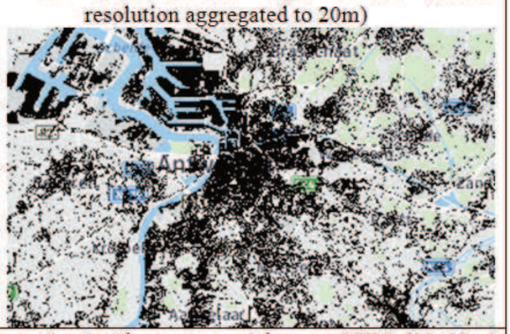
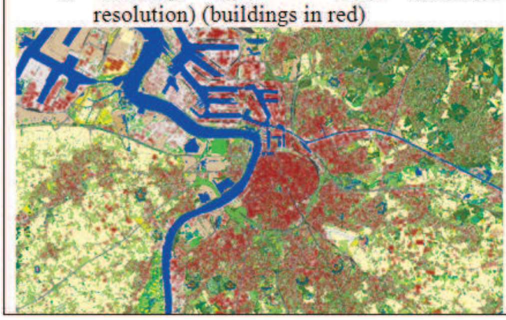
1. 'Imperviousness' layer – Copernicus (20x20m² resolution) 	2. 'sealed surface' layer – AIV (5x5m² resolution aggregated to 20m) 
3. 'building' layer – VITO (10x10m² resolution) (buildings in red) 	4. 'settlement areas' layer – VITO (10x10m² resolution) 

Table 1: Alternative input 'built-up' layers to calculate WUP (zoom on Antwerp)

Figure 2 shows the resulting WUP-scores in the four runs, summarised over the whole of Flanders. WUP-scores are on average the lowest when using 'buildings' as a proxy for built-up area, since WUP strongly correlates with percentage built-up. The settlement areas run shows significantly higher WUP values (Figure 2) due to the fact that it includes the complete plots occupied by buildings as well as infrastructure, recreational grounds, gardens, etc.

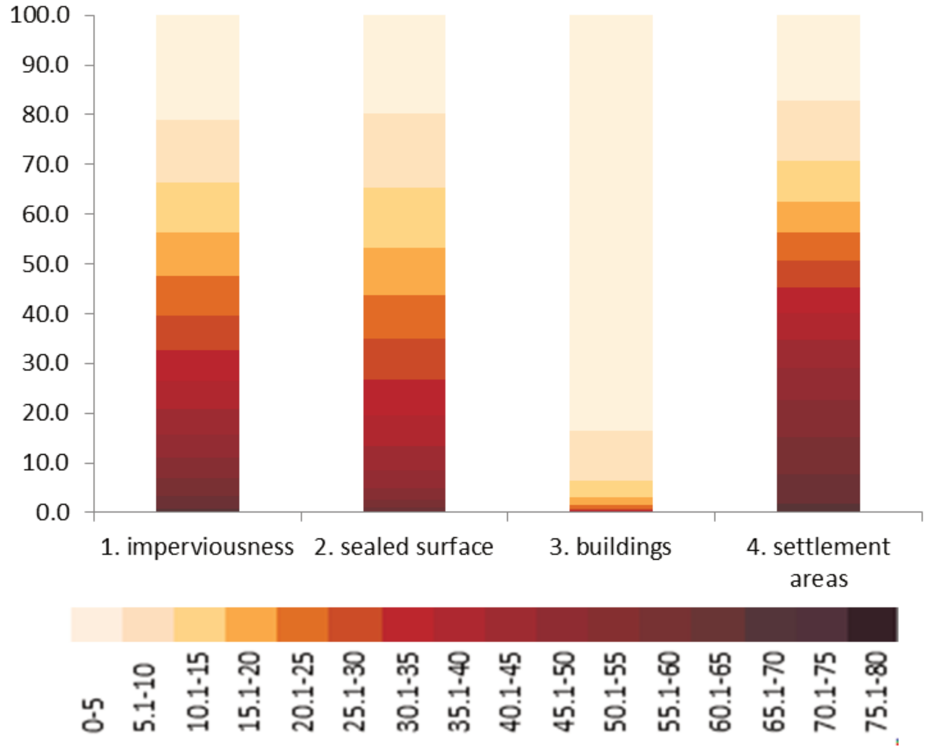


Figure 2: cumulative relative division of WUP values of 1ha-cells of four runs

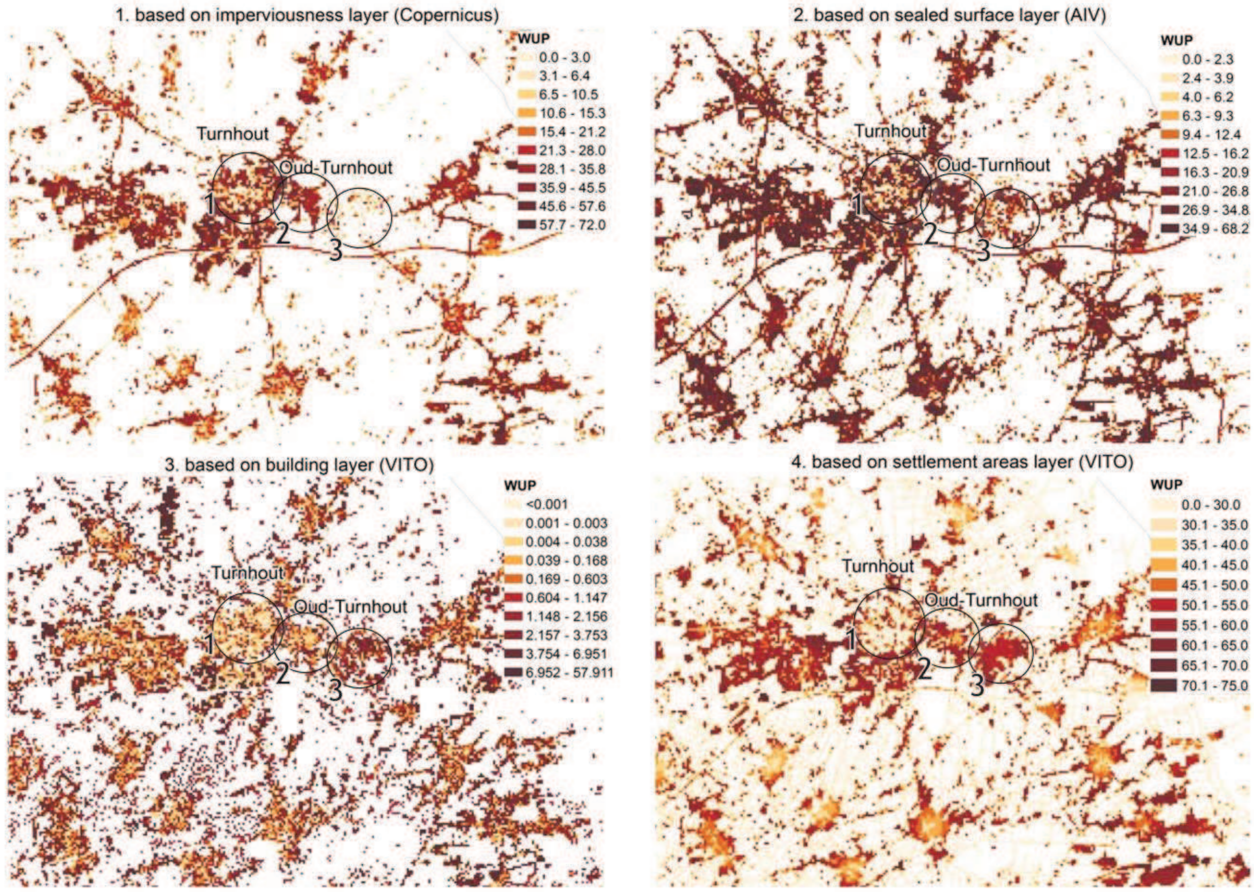


Figure 3: results of four alternatives, zoom on region Turnhout - Oud-Turnhout

Figure 3 shows the resulting WUP-maps zooming in on a region in which a – to Flemish standards - high density city centre (Turnhout, circle 1) is located next to a medium density suburban centre (Oud-Turnhout,

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circle 2) with a high income residential neighbourhood to its east (circle 3). This high income residential neighbourhood developed in green surroundings and is characterised by large plots with leafy park-like gardens. Since the average WUP is highly different in the four alternatives, the legends to map the WUP values are slightly adapted for each run, in order to be able to discern regional differences on the map.

In Figure 3 both alternatives using ‘sealed surface’ as a proxy for built-up area (top) show a relative low WUP in the high-income residential quarter since the garden plots are not counted for in the square meters of land used per inhabitant. When using ‘buildings’ as a proxy, the result is a highly scattered image with on average lower WUP values since only individual buildings, a subset of the sealed surfaces, are accounted for. The result of the ‘settlement areas’ alternative corresponds most to the perception of urban sprawl in Flanders: relatively low WUP values in the city centres (Turnhout) and at the countryside, slightly higher values in smaller city centres (Oud-Turnhout), and, high values in the suburban areas radiating out from the centres.

As all of the maps in Figure 3 show a rather scattered appearance, filtering these maps can help to discern more clearly zones with high versus low WUP values. Figure 4 shows the filtered version of the WUP-map based on ‘settlement areas’. On this map the suburban areas and urban fringes of large cities appear as highly sprawled areas. Also residential areas with high average land uptake due to large parcels containing luxurious housing accompanied by large gardens, among others to the Northeast of Antwerp, stand out on the map.

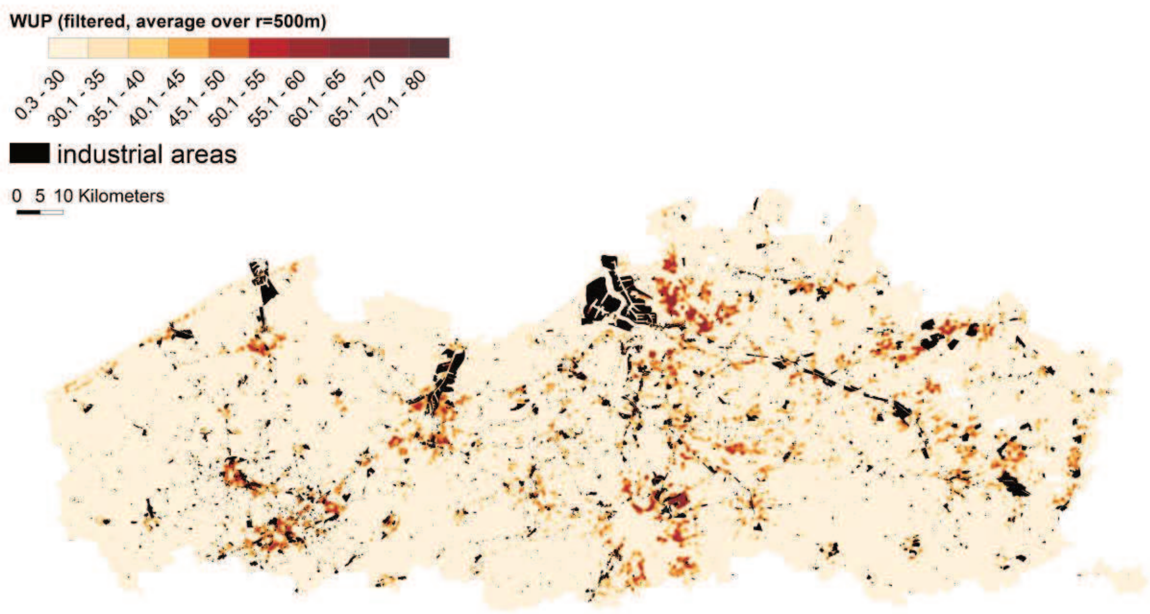

Figure 4: zones of urban sprawl – at 1ha resolution – based on settlement areas map

3.2 Urban sprawl as a process

The process of urban sprawl in Flanders is analysed by means of a temporal analysis using land-use maps of 1976, 1988 and 2000, based on Landsat images readily available from earlier work by Poelmans & Van Rompaey (2009). The land-use maps distinguish 5 land-use types at a 1 ha resolution: built-up land, arable land, grassland, forest and water. The built-up category is used in the calculations of WUP. In comparison the alternatives discussed so far, this holds somewhat the middle between ‘sealed surface layer’ and ‘settlement areas’. Estimates of the historical number of inhabitants per ha are based on (Crols et al., 2017).

Figure 5 shows the resulting WUP-maps for each year. In general, an increase of WUP, and thus of urban sprawl throughout time, is observed. Differences can be analysed both in absolute and relative terms (Figure 6). In absolute values (Figure 6, top), WUP is mainly increasing in the surroundings of large cities and alongside roads. Also a strong increase is observed in the Southwest of Flanders, more in particular in the Roeselare-Kortrijk-Waregem conurbation (black triangle, figure 5). Rural areas, on the other hand, experience a strong relative increase (Figure 6, bottom) due to the urban development which is slowly intruding in the landscape. In absolute terms, however, WUP values are still rather low at present. Medium relative increase (<10%) in WUP is observed in suburban areas around large cities. A decreasing WUP is only observed in the centre of Brussels, meaning that the city centre is densifying over time (higher population densities).

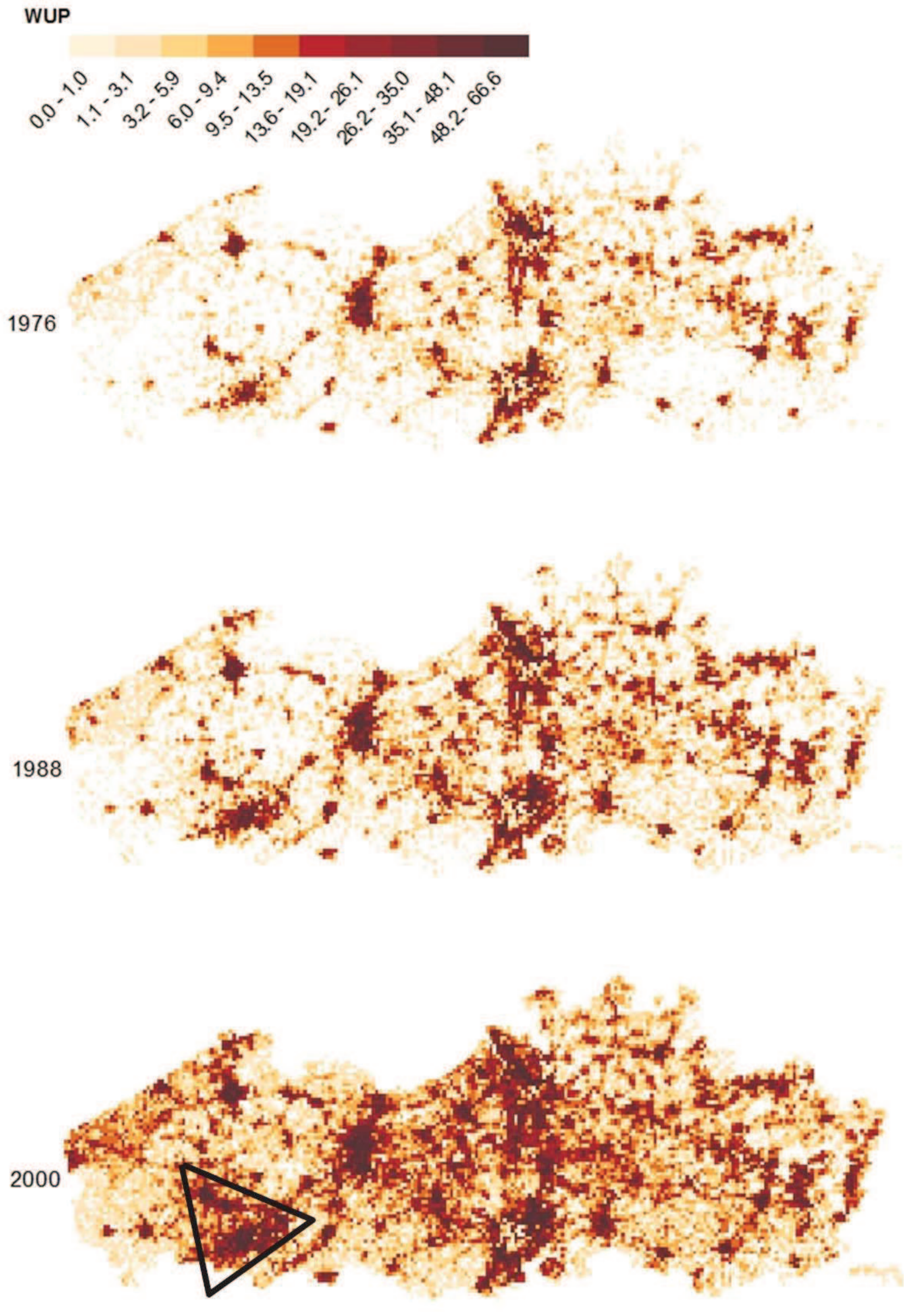

Figure 5: historical time series of WUP for years 1976, 1988 and 2000

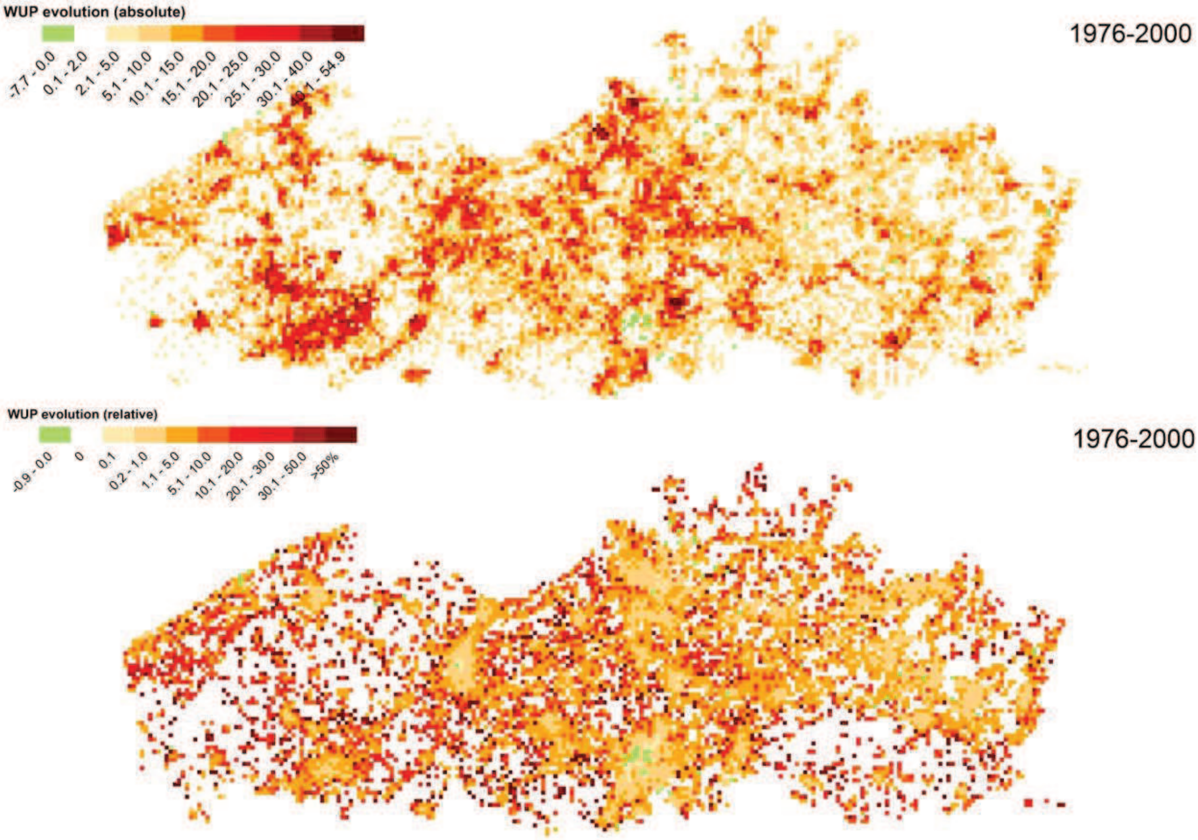

Figure 6: absolute (top) and relative (bottom) evolution of WUP 1976-2000

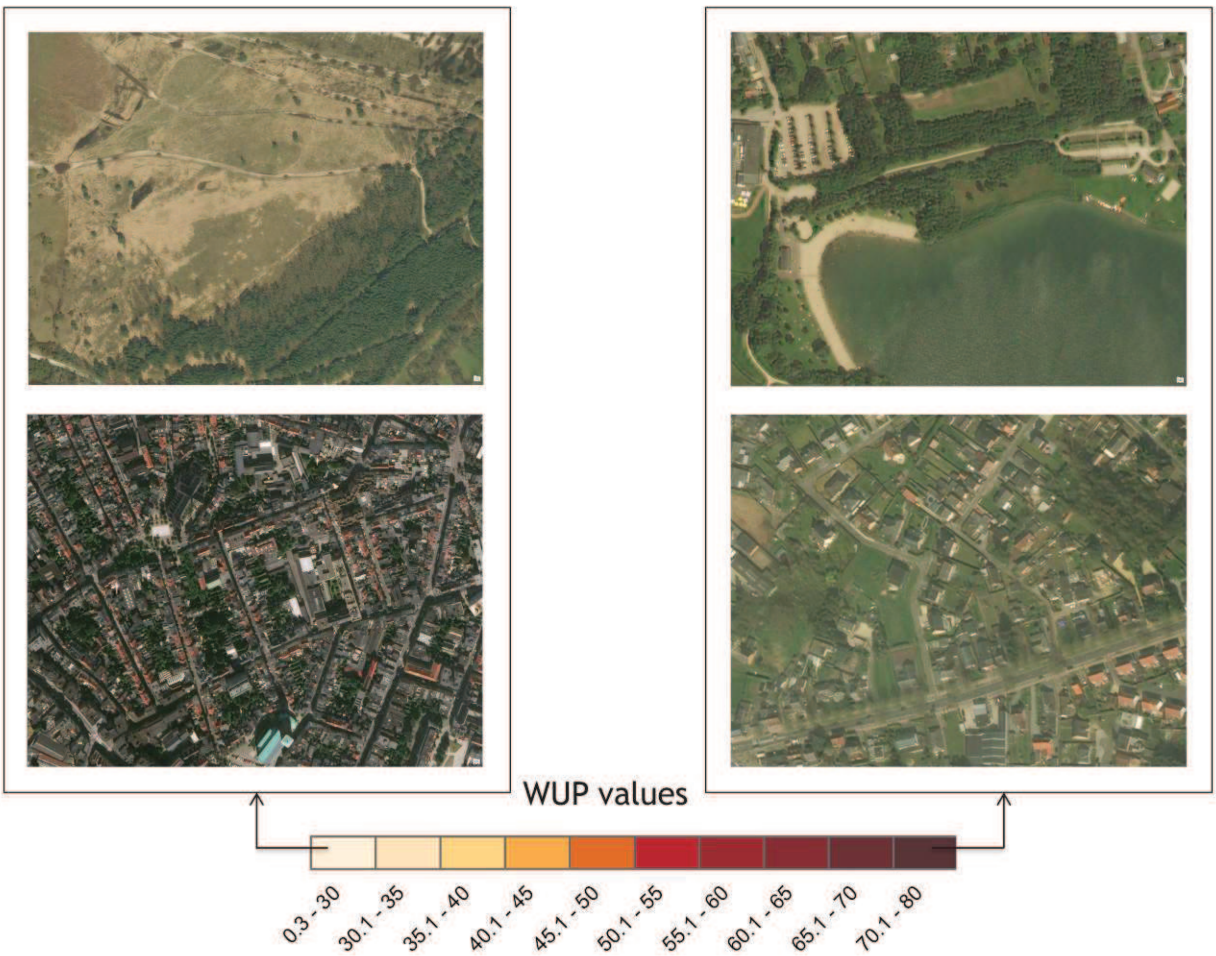

Figure 7: diverse profile of extreme values of WUP

4 URBAN SPRAWL TYPOLOGY

Although WUP is a highly valuable measure to objectively quantify urban sprawl, the measure is overly complex to use in a communication strategy for a broader public. In part this is so because it is not unambiguous. For example, low WUP-scores can be related to both open green areas as well as dense city centres. Figure 7 shows a set of four Google Earth screenshots (of 300 by 300 meters) with similar WUP-scores for the pairs left and right, but, with very contrasting building morphology types. Both low as well as high WUP values occur in locations with varying built-up density and population or employment density. Therefore, in this study, a more intuitive urban sprawl typology was created based on WUP, which can be used to encourage and inform public and political debate on the topic in Flanders.

To make WUP more transparent, the filtered WUP-map (see Figure 4) is crossed with a filtered activity map (summed number of inhabitants and number of jobs). First, both the WUP- and the activity map are categorized in four categories (very low – low – high – very high) according to natural breaks. These categorical maps are then crossed to create a 16-classed typology map. Figure 8 shows for each of the 16 classes a Google Earth tile which represent the typical building morphology.

Finally, classes similar to each other are aggregated in order to obtain a limited number of distinct building morphology types. This results in a final sprawl typology class map with six distinct building morphology types (Figure 9).

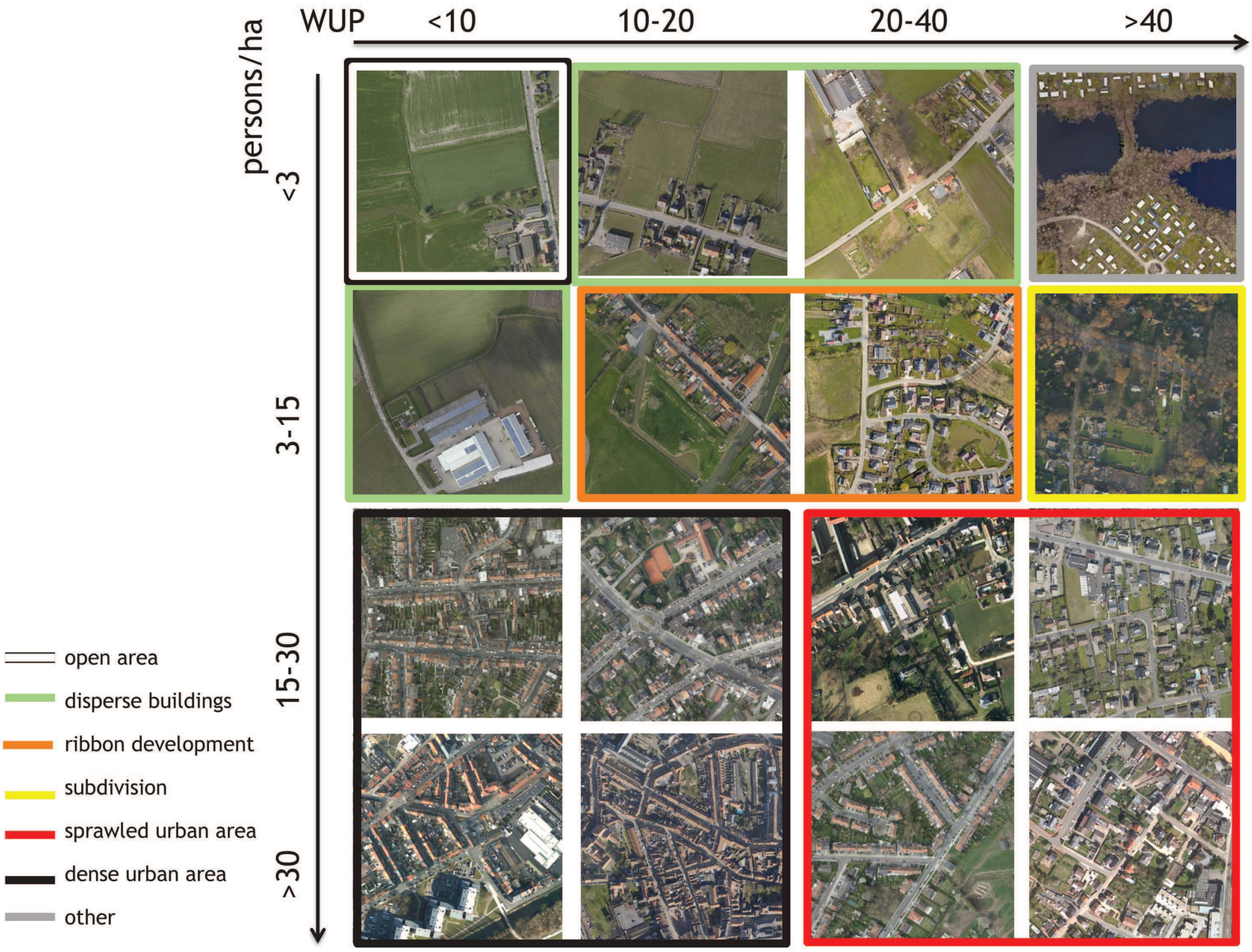

Figure 8: profile of sprawl typology classes

The least sprawled and most dense (in terms of activity) type consists of dense urban areas. These inner zones of Flanders largest cities (marked in black in Figures 8 and 9) refer to densely populated areas where multiple households reside in relatively small terraced houses or residential apartment buildings. Land used per capita and distances between buildings is lowest at these locations resulting in low WUP values.

Zones with higher WUP-values but comparable activity density, are marked in red on Figure 8 and 9. These sprawled urban areas are found either in the suburban fringe of the largest cities as well as in the centres of

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intermediate to small cities. Such areas consist of mainly single-household dwellings surrounded by gardens, thus increasing the average land use per person.

Ribbon development (orange in Figures 8 and 9), which is often associated with ‘sprawl’, is found almost everywhere in Flanders, but with a clear concentration in the centre (Figure 9). The typical ‘allotments’ in Flanders are also interpreted as a specific form of ribbon development. The activity density is low to very low in such areas. On average the WUP-values vary between low and high in these regions. The reason for the low WUP-values of this ‘sprawled’ morphology is that some forms of ribbon development consist of rather compact linear structures in the countryside. The rather low percentage of built-up thereof in a 1ha-cel is causing the relatively low WUP-values.

Disperse buildings (grey in Figures 8 and 9) score low to very low on WUP as well as on activity density. A high concentration of this building morphology is found in the West of Flanders. The percentage built-up in these areas is too low to result in high WUP-values. Areas with a dominance of disperse buildings are not perceived as sprawled areas, which is also explained in the European urban sprawl report (EEA, 2016).

On the other hand, subdivisions (yellow in Figures 8 and 9), are characterised by relatively large parcels with moderate sized to large buildings and large gardens. Most of these areas originate from a subdivision of large – previously agricultural – parcels into multiple residential parcels. Such a subdivision is in fact a ‘grid of ribbon development’. Large yellow spots in Figure 9 indicate areas where these subdivisions spread out widely due to very large parcels with large buildings and very large gardens, accommodate higher socio-economic classes. Land use per person is very high in these areas (i.e. low activity level). Therefore WUP-values are high, hence contributing to urban sprawl.

One remaining sprawl type consists of remaining areas occupied by human activities but without residents nor significant employment (i.e. very low activity level). This other category (pale grey in Figures 8 and 9) gathers recreational areas, camping grounds, infrastructure, secondary home areas, …

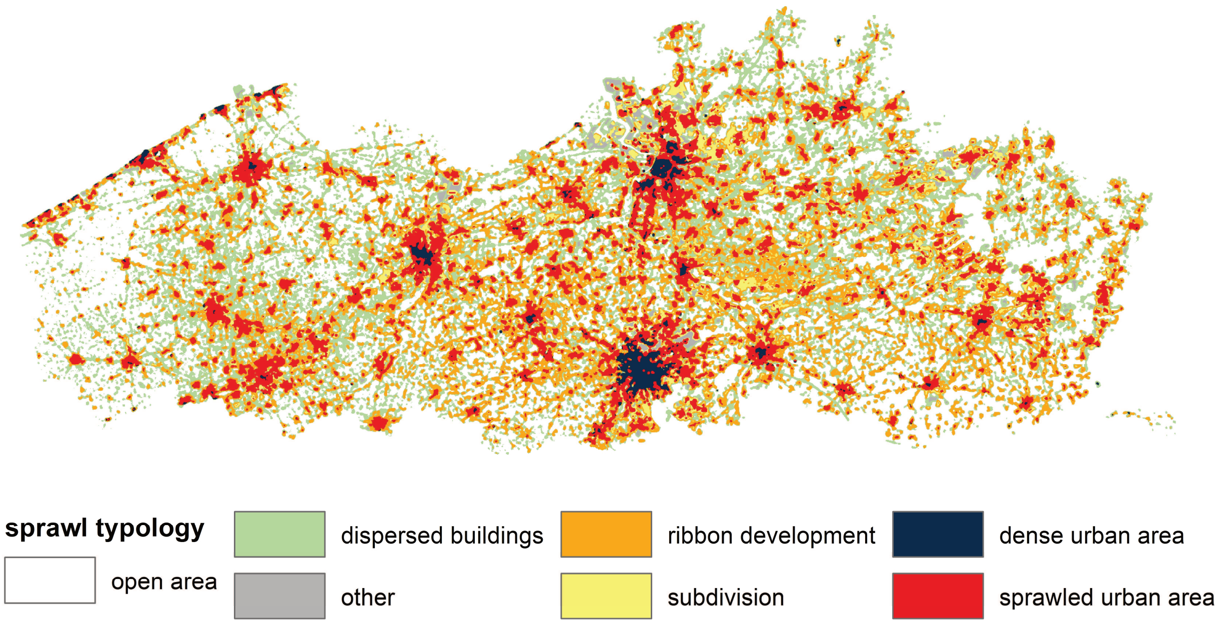

Figure 9: sprawl typology map of Flanders

The map in Figure 9 and the accompanying profiles in Figure 8 have the potential not only to assist urban policy makers in developing and putting into practice measures to reduce or at least to prevent further expansion of urban sprawl, but also, to increase the awareness of urban sprawl for a wider audience.

5 DISCUSSION

Urban sprawl is a complex phenomenon. Measuring urban sprawl as well as understanding what urban sprawl means in terms of building typology is challenging. This study shows that, in measures like WUP, the input data have a strong impact on the quantification of urban sprawl. Results show that using the impervious area, as has been the case in the EEA-study in 2016, leads to a clear underestimation of the problem of sprawl in Flanders since many green areas (gardens) solely fulfil a residential function. Using settlement area as an alternative input encompases the complete residential areas in the WUP and leads to a better measure to quantify sprawl in a Flemish context. It is therefore important to take into account the type of input data used to analyse and compare the results of sprawl measures.

Another drawback of the WUP-measure is its conflict with the common sense of what urban sprawl means in terms of building morphology. By applying this measure in Flanders, small to medium urban centres appear as highly sprawled areas (high WUP), while in the Flemish context these areas perform as urban centres with an increased concentration of population and buildings compared to their surroundings. The typical Flemish ribbon development, on the other hand, does not always score high on WUP, while they appear as urbanized tentacles reaching out into rural and open areas. They are therefore perceived as urban sprawl by the public opinion in Flanders. The urban sprawl typology implemented in this study tries to remedy these effects by translating the WUP-measure into a more intuitive sprawl measure. Both the spatial and historical analyses and maps of sprawl deliver useful insights and even steering handles to guide policy and the public debate. While the maps indicate the ‘hotspots’ of present as well as past urban sprawl, the images give ‘face’ to sprawl and initiate the debate on how and where to prevent sprawl from increasing.

In the remainder of the study, more effort will go in the development of scientific material to feed the public debate and produce practical levers for planners and policy makers. To begin with, the types developed will be an input to compute monetary costs and benefits of urban sprawl. This will involve costing public services associated with each urban sprawl-type: dwellings, energy, roads and other infrastructure, services provided to inhabitants, transportation, etc. It is expected that high sprawl will involve high public costs, but, this relation is not unambiguous. Next, land use scenarios will be developed and run using RuimteModel Vlaanderen (White et al., 2015) to explore the development of urban sprawl towards 2050. Detailed land use maps at the 1ha resolution will extend the time series discussed in section 3.2, hence, allow to compute the evolving WUP-values associated with each scenario. Scenarios will implement expected demographic and economic growth alongside various sets of policy measures aimed at combatting urban sprawl, and, it is expected that the analysis will reveal inputs for policies to deal with urban sprawl in Flanders.

With these instruments at hand, understanding and controling urban sprawl should be closer.

6 REFERENCES

CROLS, T., VANDERHAEGEN, S., CANTERS, F., ENGELEN, G., POELMANS, L., ULJEE, I. & WHITE, R. (2017). Downdating high-resolution population density maps using sealed surface cover time series. Landscape and Urban Planning 160 (2017) 96-106.

POELMANS, L., VAN ESCH, L., JANSSEN, L. & ENGELEN, G. (2016). Landgebruiksbestand voor Vlaanderen, 2013. VITIO Report 2016/RMA/R/0846.

POELMANS, L. & VAN ROMPAEY, A. (2009). Detecting and modelling spatial patterns of urban sprawl in highly fragmented areas: a case study in the Flanders-Brussels region. Landscape and Urban Planning 93(1) 10-19.

VERBEEK, T., BOUSSAUW, K. and PISMAN, A. (2014) Presence and trends of linear sprawl: Explaining ribbon development in the north of Belgium, Landscape and Urban Planning 128 (2014) 48–59

EUROPEAN ENVIRONMENT AGENCY (2016) Urban sprawl in Europe - Joint EEA-FOEN report, EEA Report No 11/2016..

SCHWICK, C., JAEGER, J., BERTILLER, R., KIENAST, F. (2010). Urban Sprawl in Switzerland - unstoppable? Quantitative Analysis 1935 to 2002 and Implications for Regional Planning. Bristol Publication Series, vol. 26.

WHITE, R., ENGELEN, G., & ULJEE, I. (2015). Modeling cities and regions as complex systems: From theory to planning applications. MIT Press.

About the Transition to an Eco-Compatible Society: the Example of Urban Spread

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1 ABSTRACT

The transition to an eco-compatible society will depend on the conclusions of many "logical duels", to use the words of the French sociologist Tarde. Therefore, to make prospective is uneasy: the logical duels of the day after tomorrow will depend on the conclusions of the logical duels of tomorrow, which are unknown. However, in this framework one can state what this transition will not be: (1) BAU (Business As Usual) is impossible (2) to take into account the stake of the metabolism of cities, only, is not enough (3) an Ecological Cultural Revolution is improbable. It seems that two logical duels matter very much: demography (the answer to the question: "how many do we want to be?") and quality of life (the answer to the question: "do we want, or not, quality of life?"). Therefore one can build two scenarios, ecological emergency (in case of high population growth) and quality of life. Concerning several stakes (energy, water, agriculture …) the choices which are made in each scenario are different. In each scenario there is struggle against urban spread but for different reasons: in the scenario "ecological emergency" countryside is a reservoir of indispensable resources, in the scenario "quality of life" countryside is a place to preserve (use for leisure, quality of landscapes …).

Keywords: social change, environment, urban spread, philosophy, transition

2 INTRODUCTION: WHAT THEORY ON SOCIAL CHANGE?

For the second time, the modern society is struck by a shock, a crisis. There is the same kind of gap between the time of the American sociologist Cooley and that of the Spanish philosopher Ortega i Gasset, than between the appearance of the consumers society and the time of IPCC (Intergovernmental Panel on Climate Change). Cooley enthusiastically announced the "enlargement of the Ego" thanks to information technologies (around 1900). Thirty years later, Ortega i Gasset speaks of the Mass Man, a metaphor describing the all powerful Opinion in a homogeneous society (Ortega i Gasset, 2010). The Mass Man is hedonistic, without historical consciousness[1] and follows demagogues (who promise power in a direct democracy to him). The meaning of society has been restored in 1945, when the consumers' society appears: if the individual remains hedonistic, he admits that there are conditions of progress (democracy, economic competition, science and technology…). Then there is a shock again: the indispensable production destroys the Planet. Again the meaning of society disappears. The Opinion has to be aware of the conditions of Progress: this time, eco-compatibility is concerned. One can quote the German philosopher Gunther Anders: "our goal is no more to change the world, but it is to preserve it". Anxiety has triggered the appearance of an "ecological existentialism": when the rural exodus was ending (in the developed countries) the ruined peasant leaving the countryside to the city, to become a Mass Man, there is a flow in the opposite direction, that of neo-rurals. There are two kinds: (1) some are tenacious entrepreneurs who remain farmers, often choosing bio farming (2) "existentialists" spending several years in the countryside before returning to the city. Their behavior is explained by the rejection of urban life (waste, stress…).[2]

How can we theorize social change, or "shocks", or "crises"?

In this paper one has recourse to the theory of the French sociologist Tarde, on "logical duels". The society is like a brain (Tarde, 1999). As the individual, it has to select ideas (beliefs) desires and even sentiments, otherwise it would be the chaos. A logical duel occurs. After some time it ends, a syllogism (or a conclusion) being chosen or refused. A syllogism is made up or (1) a major, a statement about general phenomenon or goal (2) a minor, a statement about a specific phenomenon or means (3) a conclusion, which is true if the major and minor are true.

The elites in the cities fix the majors (the goals of society) and the populace in the countryside approves the minors (they accept that if they cooperate, it is a good opportunity allowing to achieve the goals described in

[1] He overlooks the cultural, social and political conditions which are necessary to the development of science and technology.

[2] There is even an "ecological despair". The great French mathematician Grothendiek ruined his academic career because of his radical speeches on capitalism destroying Nature.

the majors). In other words, the elites in the cities are influent and the populace in the countryside is obedient. Even, it could be domination of cities on countryside. In general, the populace in the countryside accepts to consider the goals of society as theirs (even if they are chosen by the elites in the cities) and countryside imitates cities. A rural revolution was expected by some (Virgil, Rousseau, and Tolstoy) but never occurred.

But now the cities are no more followed by countryside, they annex and destroy it.

One can present scenarios concerning the transition to an eco-compatible society, using the notions of majors and minors:

	Scenario: the majors do not change	Scenario: the majors are replaced	Scenario: trade-off, some majors change, other remain
Majors (goals)	Economic growth BAU (Business As Usual) Consumption Indifference to environment	Ecological Revolution Degrowth Radicalism	Quality of life Sector changes because of the impact of Opinion
Minors (means)	Technology for growth Examples: fossil energy, towers, planes …	Distrust of technology	Selection of technologies taking into account their consequences (environment, quality of life)

Table 1: three scenarios on the transition to an eco-compatible society

To choose a scenario is uneasy, and one finds the reason in the Tarde's ideas: the logical duels of the day after tomorrow depend on the conclusions of the logical duels of tomorrow, which are unknown. In other terms, the conclusions of the current logical duels become the majors of the future logical duels.

One can give an example: demography. In the scenario "The majors do not change" high population growth is chosen, the syllogism accepted by Opinion being:

Major: more power for our country is desirable

Minor: a large population allows more power for a country

Conclusion: a larger population in our country is desirable.

In the scenario "trade-off" the syllogism is different:

Major: more quality of life is desirable

Minor: urban congestion and urban spread are detrimental to quality of life.

Conclusion: one has to thwart urban congestion and urban spread.

Then this conclusion becomes a major in a new logical duel:

Major: one has to thwart urban congestion and urban spread.

Minor: high population growth triggers urban congestion and urban spread

Conclusion: population growth is not desirable.

However, even if the choice is uneasy, it seems that the good scenario is "trade-off". Perhaps it is easier to state what the good scenario is not. One argues that the good scenario cannot be: (1) BAU (Business As Usual) (2) mastering the metabolism of cities, as a unique stake (3) an Ecological Cultural Revolution.

Now one can give the plan of this paper.

- First, one gives examples of current logical duels
- One argues that BAU (Business As Usual) is impossible
- Also, to take into account the metabolism of cities, only, is not enough
- An Ecological Cultural Revolution seems improbable.

- One concludes presenting two scenarios concerning urban spread, one in the hypothesis “Ecological emergency” (high population growth) and the other in the hypothesis “Quality of life” (demography is mastered).

3 SOME EXAMPLES OF CURRENT LOGICAL DUELS

Current logical duels are numerous. Some examples are useful to show how the society selects “possibles” and rejects other. When a logical duel ends, a decision is taken. The Opinion accepts it. A choice is made, imitation having its role.

One can quote these examples:

Alcohol. The proponents of free consumption of alcohol have won.

Tobacco. The opponents of tobacco have won.

Drugs. The logical duel lasts. No decision is taken. However, recently the proponents of free consumption of cannabis have scored points.

Cars. Currently the proponents of attrition of cars are winning in many large cities.

Public transport. The same remark holds. Public transport substitutes to cars in many large cities.

Energy. The logical duel lasts. In Europe choices which are opposite have been made. Germany refuses nuclear power and France develops it. In the long term, renewable energy should win, when it will be cheap, given its advantages (no emission of carbon).

Global warming. Probably the proponents of the precautionary principle will win. The topic is dealt with in the following chapter.

The car is an interesting example because there have been four successive logical duels concerning it: (1) Around 1900, the car prevails (2) Around the middle of the 20 th century, when consumers’ society appears, it is the triumph of the car in the large cities and outside (highways) (3) Then attrition of the car is decided (at least in the European large cities) (4) Today the car has to change to be accepted. Some want to substitute public transport to the car in the large cities. The car should be electrical (to not pollute the atmosphere) and shared. Thanks to shared cars and public transport, space could be spared in the large cities (to struggle against urban spread). For instance, the large car parks near the supermarkets could be cancelled (more, as it is tarmac, it triggers a risk of flood when it rains). This example shows how the conclusions of logical duels accumulate (the duels 1 and 2) or substitute one another (the duels 3 and 4).

The logical duel concerning urban spread has started. This is a sign showing it: In France, recently, a project of airport in the Western part of the country has been given up. It should have destroyed a rural zone with farmland and wet zones. Ecological militants opposed the project.

4 WHY BAU (BUSINESS AS USUAL) IS IMPOSSIBLE

The Tarde’s social and individual logics are not the classical logics. He uses a “degree of belief”, anticipating on what is called today fuzzy logics. If the major is true with a degree of belief x, and the minor with y, the conclusion is true with the degree of belief which is the lower. For instance, the degree of belief of the major “global warming has anthropic causes” is 95%, that of the minor “some model of eco-compatible society is efficient to struggle against global warming” is 80 % and the degree of belief of the conclusion “we have to choose this model of eco-compatible society” is 80 %.

In the same way, the models in climatology and meteorology are not accurate and certain (Taleb, 2013). They should be accepted with a degree of belief. But it is enough to alert. Also, many models converge. Therefore the precautionary principle should be chosen (Taleb, 2013). The global warming because of anthropic causes seems to be confirmed. It would be too risky to neglect the stake. Therefore BAU (Business As Usual) is impossible. There are two goals: (1) thanks to scientific work, to increase the degree of belief of the hypothesis of global warming (2) to invent a model of eco-compatible society able to thwart global warming, the degree of belief being as high as possible.

5 WHY MASTERING THE METABOLISM OF LARGE CITIES, ONLY, IS NOT ENOUGH

For the French philosopher Lupasco, there are three kinds of matters, physical matter, living matter and psychic energy. Physical matter is understood thanks to an objectifying / homogenizing logic (Lupasco, 2009). It is objective and homogeneous (law of increasing entropy). Living matter is understood thanks to a subjectifying / heterogenizing logic. The Self struggles to potentiate the obstacle to its survival. It preserves its identity, as different from the environment. The only limit is wear (ageing) but the species is more and more adapted to the environment, and different from it. In Taleb's words, the species is antifragile and an individual is fragile (Taleb, 2013). Psychic energy appears when the Self is stable, the Ego observes the world and the consciousness emerges. It is an objectifying / homogenizing process, because knowledge does not allow distinguishing the Ego from the world. But there is the role of knowledge of knowledge. The Ego interprets the data stored in this consciousness (there is an "interpretative center" in the cortex according to the biologist Penfield). Psychic energy corresponds to the "state T" in which the two logics (objectifying / homogenizing and subjectifying / heterogenizing) are actualized and potentiated both. It is a kind of equilibrium (between the two general trends).

Now if we consider the analogy between the individual Ego and the collective Ego (the City) as Tarde, one finds:

- Mastering the metabolism of the city corresponds to the subjectifying / heterogenizing logic.
- What is the role of knowledge of knowledge? It is the "goal" of the society according to Tarde (he speaks also of "maxims", "dogmas" and "laws"). One can use the word "values". For instance, it was Art in Athens, Law in Rome and the court life in France in the 17 th century ... One can also speak of social imaginary. In any case mastering the metabolism of the city only cannot be a project for the society. The psychic energy of the collective Ego is between the logic of the Self and the mere knowledge without struggle against entropy. Again, one can have recourse to the Tarde's ideas. For Tarde, the city is analogous to a brain (selecting beliefs, desires and sentiments). For Spencer, it is analogous to a living organism and its networks. Of course, if one chooses and develops this analogy (between the city and a living organism) urban metabolism appears as the main stake.

6 AN "ECOLOGICAL CULTURAL REVOLUTION" SEEMS IMPROBABLE

According to Tarde, when a civilization develops, there are three successive stages:

- The "inventions" (new models) in all fields accumulate. There are no contradictions between them. There are waves of imitation and no conflict.
- Then the "inventions" are contradicting one another and there are logical duels. The new models are incompatible. There are different ends of logical duels: (1) replacement (2) prevalence only (there remain some "relics") (3) victory with concessions (to allow those who are won saving face (4) victory with the won people choosing the party of the winning people to get advantages (5) partial victory …
- The third stage is harmony and unanimity.

The second stage is the more interesting: the society has to make choices to get out of contradictions.

Today the rival models are:

- The "industrial model" has been described by Saint Simon. A limitless increase of production is the goal.
- This model collided with the "social model", requiring Social Justice. The Socialism was proposed as a synthesis allowing the limitless increase of industry and Social Justice.
- During the 20 th century one got out of contradictions thanks to the new model of consumers' society. Progress of productivity allowed higher salaries and access to consumption for workers.
- Today the model (consumers' society) which remains based on massive production collides with the "ecological model". This model aims at preserving environment threatened by industry, agriculture and even leisure (when resorts for tourists invade the shores, the mountains and the countryside) at the time of the consumers' society. One has to invent an eco-compatible society. It depends on the conclusions of many logical duels. Probably there will be a partial victory of the "ecological model",

but a total victory seems improbable. Consumers cannot accept austerity: to consume local products only, give up trips, fashion which involves waste etc. However, concessions should be made. For instance one will be able to consume some products generating pollution but access to these goods will be reduced: they will be expensive, being taxed (thanks to bonus / malus systems like that which already concerns big cars).

The Tarde's ideas on unity and conflict when beliefs and desires are concerned can be shown in a tableau:

	Conflict	Unity
Individual logic (beliefs)	Necessity to select beliefs	Mutually reinforcing beliefs Increase of faith
Social logic (beliefs)	Logical duels	Mutually reinforcing beliefs Unity of the doctrine of the society
Individual teleology (desires)	Necessity to select desires	Mutually reinforcing desires Motivation
Social teleology	Logical duels	Mutually reinforcing desires Unity of the goals of the society

Table 2: conflict and unity concerning beliefs and desires according to Tarde.

An Ecological Revolution supposes that all the logical duels, present and future, are ended by the same kind of conclusions. Beliefs and desires should be always in accordance with the "ecological model". It is not sure. For instance, people in emerging countries want to access mass consumption.

The Ecological Revolution would be characterized by (1) unity of beliefs (doctrine concerning environment) (2) unity of desires (goals) (3) unity of sentiments. Zeal when environmental stakes are concerned should exist. "Stars" able to translate the environmental sciences for people would be admired (4) unity of interests. The convergence of interests could allow directing resources towards production of goods and means preserving the environment (renewable energies, bio farming and energy saving and not polluting transport systems …).

However a perfect unity of society is not sure. Some Revolution according to the American sociologist Sorokin would be necessary. The values of the society can change. They are individualistic, materialist and hedonistic, then become collectivist, ascetic and spiritual (Sorokin, 1925).It is not sure that one can pass from the consumers' society to a society fashioned by the Ecological Revolution.

7 CONCLUSION: TWO SCENARIOS CONCERNING URBAN SPREAD

The stake of urban spread requires a response from the society. The decisions should be taken in accordance with the conclusions of logical duels. It is the same approach than that of the sociology of the actor-network of the French sociologist Bruno Latour. An actor-network achieves existence thanks to success when it participates in controversies (Latour, 2007). Here the society is part of the actor-network, with "actants" which are fields, rivers, beaches etc. It is not that the mere point of view of experts does not matter. In some cases (but not always) they know clear responses, but what is required is a decision taken by the society itself (Latour, 2007). Therefore there are controversies involving the society itself. Take the example of the seashore. Decades ago experts have found a good solution: the resorts where the tourists are accommodated are at some distance from the beach. To access the beach one has to walk several hundreds of meters. It warrants that the landscape of the beach is preserved and remains "natural" and pretty.[3] Because there is no decision taken by the society itself, it is rarely applied.[4] On the other side it is useless when experts present themselves as knowing "unquestionable truths" (Latour, 2004). The stake is to translate the "scientific truths" when controversies occur.

Now one presents the characteristics of the two scenarios in a tableau.

[3] It is called "glove fingers".

[4] There is an example near Tavira, in Portugal. One accesses the beach by a little train. On the beach, only a few restaurants, bars or shops where beach equipment is rented.

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	Scenario “Ecological emergency”	Scenario “Quality of life”
Population	Dense population in the countryside is not encouraged. Countryside is a place for specialists: farmers, specialists of forestry, water, energy etc.	Population in the countryside is allowed, since it is pleasant settings, but not in excess (to preserve quality of life)
Networks and transport	The networks are adapted to a population which is not dense. Not too much tarmac (to avoid floods and allow refill of phreatic zones)	Some networks are allowed since countryside is populated. But not too many, for ecological reasons and to preserve landscapes. Use of electrical cars.
Housing	Urban spread is forbidden to save resources in the countryside	Urban spread is controlled for environmental reasons and to preserve landscapes
Water	No tarmac. Fields and forests are useful to keep water	Vegetation is useful to keep water and to have nice landscapes
Energy	Wind farms in all windy places. Solar farms in all sunny places. Shale oil and shale gas if possible	No wind farms in nice places where the landscape is preserved. No solar farms in nice places. No shale oil and shale gas
Tourism and leisure	Tourists stay in a few places where they are many (towers …) such as resorts on the seashore. It is to save space in the countryside. Trips are not encouraged.	Tourism is accepted if it is sustainable. Trips are allowed.
Biodiversity	Indifference	Biodiversity is preserved
Agriculture	Agriculture in vast areas is aimed at feeding the numerous populaces of the cities. Intensive animal breeding authorized (if it triggers no pollution)	Bio-farming. Agriculture delivers high quality products. Farmers benefitting from sufficient revenues. High enough price of land which limits urban spread. Intensive animal breeding prohibited.
Pollution	Struggle against pollution since the provision of services from countryside (food, water …) has to be sustainable	Struggle against pollution for environmental reasons and to preserve landscapes
Mid-sized cities	Not encouraged	Accepted if it does not trigger urban spread
Villages	Not encouraged	Accepted (for inhabitants of the countryside and visitors)

Table 2: characteristics of the two scenarios “Ecological emergency” and “Quality of life”.

The choices in the two scenarios are either different, either the same but for different reasons. For instance struggle against pollution aims at sustainability in the scenario “Ecological emergency” and at warranting the provision of high quality products and preserving landscapes, in the scenario “Quality of life”.

8 REFERENCES

LATOUR B. Changer de société, refaire de la sociologie (Re-assembling the social: an introduction to the actor-network theory). Paris. 2007.

LATOUR B. Politiques de la nature : comment faire entrer les sciences en démocratie (Politics of nature : how to make sciences participate in democracy). Paris. 2004.

LUPASCO S. La tragédie de l’énergie (The tragedy of energy). Paris. 2009.

ORTEGA I GASSET J. La révolte des masses (The rebellion of the masses). Paris. 2010.

SOROKIN PA. The sociology of revolution. Philadelphia. 1925.

TALEB N. Antifragile: les bienfaits du désordre (Antifragile: things that gain from disorder). Paris. 2013.

TARDE G. La logique sociale (The social logic). Le Plessis Robinson. 1999.

Analyse von Barrierefreiheit und Nutzungsqualitäten sowie deren Anwendung in Wien

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1 SOZIALE INKLUSION IN EINER SMARTEN UND NACHHALTIGEN STADT

Eine zeitgemäße Ausrichtung städteplanerischer und –baulicher Planungsprozesse einer modernen Stadt basiert auf ganzheitlicher Konzipierung und Durchführung, wodurch die Betrachtung einer nachhaltigen Stadtentwicklung interdisziplinär beziehungsweise zusammenhängend erfolgt. Die Notwendigkeit einer integrierten Stadtentwicklung bedingt auch soziale Aspekte, urbane Ausprägungen, Phänomene und Dynamiken in Relation mit raumverändernden Strukturen, Bauformen, Mobilität, Verkehr und Umwelt zu setzen. Die sozial inklusive Gestaltung von Stadt ist dringlich und bedeutend für die gegenwärtige und zukünftige Lebensqualität einer Stadt.

Die Themenlandschaft der Smart-City Vorstellung verschneidet sich mit Überlegungen der Nachhaltigen und sozial inklusiven Stadt, dessen Inhalt sich auf ökonomischen, ökologischen sowie sozio-kulturellen Schwerpunkte bezieht. Bei einem smarten Nachhaltigkeitsansatz liegt eine der Herausforderungen darin, eine umfassend erfolgreiche Umsetzung der soziokulturellen Dimension zu gewährleisten. Die Berücksichtigung aller Menschengruppen muss im Mittelpunkt stehen, um bei Veränderungen und Maßnahmensetzungen nicht erneut potenziellen Gefahren einer sozialen Exklusion bestimmter Bevölkerungsteile entstehen zu lassen. Bedeutender denn je ist es eine gesamheitliche Sichtweise mit interdisziplinären Ansätzen auf die Problemstellungen heutiger Städte zu projizieren, die unter anderem eine sozial nachhaltige beziehungsweise inklusive Gestaltungsentwicklung ermöglichen.

Die Sicherstellung von multipel nutzbaren und universell zugänglichen Räumen und Wegen, unter anderem im Bereich Öffentlicher Raum, städtischer Wohnraum/ Nahverkehr/ Dienstleistungseinrichtung sowie im öffentlichen Bereich der Verwaltung, unerlässlich. Weiche Standortfaktoren, die sich auf die Lebensqualität beziehen spielen hierbei eine wesentliche Rolle. Im Sinne einer flexiblen Nutzbarkeit für eine möglichst breiten Bevölkerungsgruppe unabhängig ihres Alters, (temporäreren) körperlichen Beeinträchtigungen, ihrer generellen physischen und psychischen Verfassung, von kulturellen Prägung und Herkunft oder als Begleit- und Betreuungsperson mit zu betreuenden Menschen (Baby, Kleinkind, altersschwache Personen), leisten inklusive Entwürfe von Stadt- und Wohnraum einen enormen Beitrag zu einer unabhängigeren und selbstbestimmteren Alltagsbewältigung.

Gerade bauliche Barrieren sind ein repräsentatives Beispiel für soziale Ausgrenzung bestimmter Menschengruppen. Barrierefreiheit ist vielfältig zu behandeln, denn es korreliert mit den Aspekten der freien Zugänglichkeit, chancengleicher Teilhabemöglichkeit, Antidiskriminierung nach den Menschenrechtlichen Gesichtspunkten, eine unabhängiger Mobilität und selbstbetimmte Alltagsbewältigung im Bereich der öffentliche Versorgungssystematik. Umso selbstverständlicher muss es für eine Stadt mit sozialer Prägung wie Wien sein, in ihrer Funktion als Landes-/Kommunal- Gebäudeverwaltung mit einem gutem Beispiel voranzuschreiten und innovative Maßstäbe in Sachen Barrierefreiheit und offener Nutzungssicherheit zu setzen.

Eine sozial inklusive und nutzungsoffene Stadtgestaltung, getragen von der Leitvision einer barrierefreien Stadt mit einem universellen Design für alle Menschen im grundsätzlichen, und Menschen mit unterschiedlichsten und (temporär) speziellen Bedürfnissn im engeren Sinne. kann würde der Weertigkeit einer sozial innovativen Smart City entsprechen. Eine intelligente Stadt schafft neue Standards.

Keywords: universelle Infrastrukturen, Nutzungsoffenheit, Urbanität, Barrierefreiheit, Inklusion

2 VORGABEN AN BARRIERFREIHEIT

Wie bei allen Rechtsvorschriften gibt es auch zur Barrierefreiheit Regelungen auf den verschiedenen Rechtsebenen. Das folgende Kapitel bietet eine kurze Übersicht welche Rechtsnormen zu Barrierefreiheit auf den jeweiligen Ebenen des Stufenbaus der Rechtsordnung zu finden sind.

2.1 Völkerrechtliche Vorgaben an Barrierefreiheit

Das bedeutendste völkerrechtliche Dokument bezüglich der Rechte von Personen mit Behinderungen ist das Übereinkommen über die Rechte von Menschen mit Behinderungen der Vereinten Nationen.[1]

2.2 Europarechtliche Vorgaben an Barrierefreiheit

Die Europäische Union beschloss bereits im Jahr 2000 eine Richtlinie über die Gleichbehandlung[2] und folgedessen einen Aktionsplan über Chancengleichheit für Menschen mit Behinderungen.[3] Die EU als supranationale Organisation trat auch dem VN Übereinkommen über die Rechte von Menschen mit Behinderungen bei und entwickelte zu dessen Umsetzung eine eigene Strategie.[4] Ebenso wurde ein Aktionsplan zur Umsetzung der Chancengleichheit für Menschen mit Behinderungen beschlossen.[5]

2.3 Verfassungsrechtliche Vorgaben an Barrierefreiheit

Artikel 7 Absatz 1 des österreichischen Bundesverfassungsgesetzes legt seit 1997 folgenden Grundsatz fest: „Niemand darf wegen seiner Behinderung benachteiligt werden. Die Republik (Bund, Länder und Gemeinden) bekennt sich dazu, die Gleichbehandlung von behinderten und nichtbehinderten Menschen in allen Bereichen des täglichen Lebens zu gewährleisten."

2.4 Bundesrechtliche Vorgaben an Barrierefreiheit

Am ersten Jänner 2006 trat das Bundes-Behindertengleichstellungsgesetz[6] in Kraft. Es sieht vor, dass niemand aufgrund einer Behinderung unmittelbar oder mittelbar diskriminiert werden darf und postuliert folgedessen eine umfassende Barrierefreiheit. Allerdings schränkt das Gesetz die Verpflichtung zur Barrierefreiheit insoweit ein, als ein Abwägen zur Wirtschaftlichkeit der benötigten Maßnahme festgelegt wird. Eine Diskriminierung liegt demnach nicht vor, wenn die Beseitigung von Barrieren wegen unverhältnismäßiger Belastung unzumutbar ist. Bei der Prüfung, was unverhältnismäßig ist, soll unter anderem die wirtschaftliche Leistungsfähigeit der Verpflichteten, aber auch die Zeit zwischen dem In-Kraft-Treten dieses Gesetzes und der behaupteten Diskriminierung berücksichtigt werden. Für viele bauliche Barrieren sah das Bundes-Behindertengleichstellungsgesetz eine Übergangsfrist bis 31.12.2015 vor, sodass es erst seit relativ kurzer Zeit im privaten Bereich anwendbar ist.

2.5 Landesrechtliche Vorgaben an Barrierefreiheit

Da Themen der Bauordnungen auf Grund des föderalen Prinzips in die Kompetenz der Bundesländer fallen, sind die Vorgaben aus dem EU Recht in Bezug auf behindertengerechtes Bauen im Rahmen der Bauordnungen der Länder umzusetzen, da in diesen die Voraussetzungen für Neu-, Zu- und Umbauten festgelegt werden.[7]

Die österreichischen Bundesländer schlossen eine Vereinbarung gemäß Art. 15a des Bundes-Verfassungsgesetzes über die Harmonisierung bautechnischer Vorschriften. In dieser findet sich die Anforderung an Barrierefreiheit unter den allgemeinen bautechnischen Anforderungen an Bauwerke. Konkretisiert wird die Ausgestaltung in Artikel 32 der Vereinbarung, welcher festlegt, dass Bauwerke für öffentliche Zwecke, für Bildungszwecke, Handelsbetriebe, Banken, Gesundheits- und Sozialeinrichtungen, Arztpraxen und Apotheken, öffentliche Toiletten, sowie sonstige Bauwerke, die allgemein zugänglich sind und für mindestens 50 Besucher ausgelegt sind barrierefrei geplant und ausgeführt werden müssen, sodass sie auch für Kinder, ältere Personen und Personen mit Behinderungen gefahrlos und tunlichst ohne fremde

[1] UN Convention on the Rights of Persons with Disabilities and its Optional Protocol (A/RES/61/106), angenommen am 13.12.2006, in Kraft getreten am 3.5.2008. Mitlerweile sind 175 Staaten der Konvention beigetreten. Österreich hat die Konvention am 26.09.2008 ratifiziert.

[2] Richtlinie des Rates 2000/78/EG vom 27. November 2000 zur Festlegung eines allgemeinen Rahmens für die Verwirklichung der Gleichbehandlung in Beschäftigung und Beruf (ABl. EG Nr. L 303)

[3] KOM (2003) 650

[4] Europäische Strategie zugunsten von Menschen mit Behinderungen 2010-2020, Erneuertes Engagement für ein barrierefreies Europa, KOM (2010) 636

[5] Amann, Barrierefreies Wohnen – Förderungen der Länder, 286

[6] Bundesgesetz über die Gleichstellung von Menschen mit Behinderungen (Bundes-Behindertengleichstellungsgesetz – BGStG), BGBl. I Nr. 82/2005, aktuelle Fassung BGBl. NR. 155/2017

[7] Benesch, Martin, Barrierefreiheit bei Planung, Bau und Sanierung von Gebäuden, 282

Hilfe zugänglich sind. Als Mindestumsetzung ist gesetzlich vorgesehen: mindestens ein Eingang, der stufenlos erreichbar ist; Stufen und Schwellen grundsätzlich zu vermeiden und unvermeidbare Niveauunterschiede durch Rampen oder Aufzüge auszugleichen; notwendige Mindestbreiten für Türen und Gänge einzuhalten und eine dem Verwendungszweck entsprechende Anzahl von behindertengerechten Sanitärräumen einzurichten.

In den letzten Jahrzehnten wurden von der Stadt Wien grundlegende Maßnahmen gesetzt um barrierefreie Planungsgrundsätze umzusetzen und behinderten Menschen eine ihren Bedürfnissen und Fähigkeiten entsprechende Lebensgestaltung zu ermöglichen.[8] Beispielhaft sollen hiervon das Programm zur Absenkung der Gehsteigkanten[9] oder die Einrichtung der Fachstelle für barrierefreies, behinderten- und generationsgerechtes Planen, Bauen und Wohnen erwähnt werden.[10]

Auch Wien erließ ein Antidiskriminierungsgesetz[11], dessen Schutz behinderte Menschen, wie auch die Diskriminierung auf Grund des Alters umfasst. Ebenso, wie das Bundes-Behinderten-Gleichgestellungsgesetz sieht es allerdings eine Einschränkung der Barrierefreiheit auf Zumutbarkeit vor. Bei der Prüfung wird wieder einerseits auf die wirtschaftliche Leistungsfähigkeit, andererseits auf die Zeit zwischen In-Kraft-Treten des Gesetzes und der behaupteten Diskriminierung verwiesen.

Das Gesetz sieht auch vor, dass die Gemeinde Wien bis zum 30. Juni 2012 einen Plan zum Abbau baulicher Barrieren für die von ihr genutzten Gebäude zu erstellen und die etappenweise Umsetzung vorzusehen habe.

3 BARRIEREFREIES PLANEN UND BAUEN IN WIEN

3.1 Allgemeine Rahmenbedingungen

Die rechtliche Basis zur Regelung hinsichtlich der Vermeidung sowie des Abbaus von Baubarrieren ist in diversen Wiener Landesgesetzen und ergänzenden Verordnungen niedergeschrieben. Allen voran im Bau- und Planungsgesetz der Wiener Bauordnung (BO für Wien)[12], die seit der bedeutenden Novellierung 1991 speziell das barrierefreie Bauen berücksichtigt. Zusätzlich bestehen in einzelnen Sachmateriegesetzen spezifische Festlegungen zur Barrierefreiheit. Das betrifft vor allem das Wiener Aufzugsgesetz (§4, §9)[13], Wiener Garagengesetz (§15)[14], die Spielplatzverordnung (§2)[15], die Wiener Gemeindewahlordnung (§46, §51)[16], das Wiener Veranstaltungsgesetz (§15, §32)[17], etc. Desweiteren existieren allgemeine und speziellere Bestimmungen zur Dimensionierung und Ausgestaltung von diversen Baummaßnahmen. Dazu zählen die Wiener Bautechnikverordnung (WBTV)[18] und damit zusammenhängend die integrierte und verbindliche OIB-Richtlinie 4[19] als auch die ÖNORM B 1600ff.[20] als Ergänzung.

[8] Groiss, Barrierefreies Wohnen am Beispiel von Wien, 20

[9] https://www.wien.gv.at/verkehr/strassen/einrichtungen/gehsteige.html 30.01.2018

[10] https://www.wien.gv.at/menschen/barrierefreiestadt/kompetenzstelle.html 30.01.2018

[11] Gesetz zur Bekämpfung von Diskriminierung (Wiener Antidiskriminierungsgesetz) LGBl. Nr. 35/2004, aktuelle Fassung LGBl. NR. 22/2017

[12] Wiener Stadtentwicklungs-, Stadtplanungs- und Baugesetzbuch (Bauordnung für Wien – BO für Wien), StF.: LGBl. Nr. 11/1930, aktuelle Fassung LGBl. Nr. 27/2016

[13] Gesetz, mit dem Bestimmungen über den Bau und den Betrieb von Aufzügen erlassen werden (Wiener Aufzugsgesetz 2006 – WAZG 2006), StF.: LGBl.: Nr. 68/2006, aktuelle Fassung LGBl. Nr. 17/2016

[14] Gesetz über das Einstellen von Kraftfahrzeugen, kraftbetriebene Parkeinrichtungen und Tankstellen in Wien (Wiener Garagengesetz 2008 – WGarG 2008), aktuelle Fassung LGBl. Nr. 26/2014

[15] Verordnung der Wiener Landesregierung, mit der nähere Vorschriften für Kleinkinderspielplätze, Kinder- und Jugendspielplätze und Kinder- und Jugendspielräume erlassen werden (Spielplatzverordnung) , aktuelle Fassung LGBl. Nr. 35/2009

[16] Gesetz über die Gemeindewahlordnung der Stadt Wien (Wiener Gemeindewahlordnung 1996 – GWO 1996) [CELEX Nr. 394L0080], StF.: LGBl. Nr. 16/1996, aktuelle Fassung LGBl. Nr. 20/2016

[17] Gesetz über die Regelung des Veranstaltungswesens (Wiener Veranstaltungsgesetz), StF.: LGBl. Nr. 12/1971, aktuelle Fassung LGBl. Nr. 11/2016

[18] Verordnung der Wiener Landesregierung, mit der bautechnische Anforderungen festgelegt werden (Wiener Bautechnikverordnung 2015 – WBTV 2015), LGBl. für Wien Nr. 31/2008, aktuelle Fassung StF: LGBl. Nr. 35/2015

[19] Österreichisches Instituts für Bautechnik, OIB-Richtlinie 4 Nutzungssicherheit und Barrierefreiheit OIB-300.4-012/07, aktuelle Fassung OIB-330.4-020/15

[20] Austrian Standards, Barrierefreies Bauen - Planungsgrundlagen ÖNORM B 1600: 1977 07 01, aktuelle Fassung ÖNORM B 1600: 2017 04 01

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Die Techniknovelle 2007 erfolgte als bedeutende Ergänzung des 9. Teils der Wiener Bauordnung (Bautechnische Vorschriften). Sie ist eine Gesetzesnovelle, mit der die Bauordnung für Wien ab Mitte 2008 insofern geändert wurde, da in der Bauordnung im Allgemeinen grundsätzliche technische Anforderungen formuliert sind. Hinsichtlich der barrierefreien Gestaltung von Bauwerken gilt jedoch vor allem der essentielle §115 der BO für Wien. In diesem Paragraphen sind die grundsätzlichen Anforderungen an die Barrierefreiheit von Gebäuden in Wien normiert und gleichzeitig auch die Bauwerke definiert, die in Wien barrierefrei zu gestalten sind.

Grundsätzliche technische Anforderungen von Seiten der Wiener Bauordnung werden allerdings erst dann als vollständig erachtet, wenn die wesentliche OIB-Richtlinie 4, die als Anlage in der WBTV ist, eingehalten wird. Diese Festlegungen sind in der WBTV entsprechend verankert.[21]

Die konkreten Anforderungen an die Barrierefreiheit, die ein Gebäude aus technischer Sicht erfüllen muss, sind somit sowohl in der Bauordnung als auch in umfassenderer Form in der OIB-Richtlinie 4 zu finden. Sie regelt sowohl die grundsätzlichen Anforderungen an die sichere Erschließung von Gebäuden, als auch konkrete Vorgaben an die barrierefreie Ausgestaltung der im § 115 genannten Bauwerke mit festgelegten Mindestdimensionierungen.[22]

Die Planungsgrundsätze der ÖNORM B 1600 umfassen bauliche Maßnahmen (Neu-, Zu- und Umbauten), Einrichtungen und Ausstattungen sowie Kennzeichnungen, die notwendig sind, um die unterschiedlichen physischen Möglichkeiten von Menschen berücksichtigen zu können. Die Norm ist allerdings mittlerweile nicht mehr verbindlich einzuhalten. Sie kann aber, ähnlich wie andere Regelwerke auch, als optionale Methodikvorlage herangezogen werden, um die bautechnischen Anforderungen der OIB-Richtlinie 4 und der BO für Wien zu erfüllen. In der Planungspraxis kann dies erfolgen, wenn die OIB-Richtlinie oder die Bauordnung entweder unbestimmte (zielorientierte) Anforderungen oder keine Anforderungen zu einem bautechnischen Detail enthalten.

3.2 Wiener Bauordnung

Die Rechte und Verpflichtungen zur Barrierefreiheit fließen in 4 Teilen, hauptsächlich im Artikel VII, beziehungsweise 17 der 161 Paragraphen wesentlich ein.

Mit dem 5. Abschnitt des 9. Teils der Bauordnung – Nutzungssicherheit und Barrierefreiheit – wird der Barrierefreiheit ein hoher Stellenwert beigemessen, insbesondere im §115 Barrierefreie Gestaltung von Bauwerken sind zahlreiche Bestimmungen, insbesondere für Kinder, Senioren und Menschen mit Behinderungen ausreichend verankert und betreffen generell neben Um- und Zubauten von Gebäuden auch weitgehend alle öffentlichen Gebäude im Bestand und Neubauten mit allgemeinen Zugänglichkeiten.

Die Wiener Bauordnung postuliert bereits in ihrem ersten Paragraphen, dass für die Festsetzung und Abänderung des Flächenwidmungs- und Bebauungsplan die Grundsätze des barrierefreien Planens und Bauens zu berücksichtigen sind. Die raumstrukturellen Gegebenheiten (unter anderem Infrastruktur) sind hinsichtlich barrierefreier Ausgestaltung für eine weitgehend selbstständige Nutzung aller Lebensbereiche durch die Bevölkerung zu erheben (vgl. BO für Wien §1 - §2). Hierbei beststeht eine erste direkte Verzahnung von Raumplanung, Städtebau und Architektur bei allen Planungs- und Bautätigkeiten in Wien. Zusätzlich muss für jedes konkrete Bauvorhaben ein von der MA 37 Baupolizei ausgegebenes Formular des Planverfassers eingereicht werden. Dabei handelt es sich um eine Bestätigung über die Einhaltung der Grundsätze des barrierefreien Planens und Bauens, der in der Wiener Bautechnikverordnung verbindlich erklärten OIB-Richtlinie 4 (gegebenenfalls in Verbindung mit der ÖNORM B 1600) aber auch über die Abweichung der Vorschriften im Sinne des §68 BO für Wien (vgl. BO für Wien §63).

Die Wiener Bauordnung mit der dazugehörigen OIB-Richtlinie 4 betrifft alle Gebäudebereiche und führt zu erhöhten Anforderungen des barrierefreien Bauens. Ausnahmebestimmungen von den Bauvorschriften sind meist nur bei Änderungen beziehungsweise Ergänzungen rechtmäßigen Baubestandes anzuwenden (siehe

[21] Stadt Wien MA 37 Baupolizei, Barrierefreies Planen und Bauen in Wien. Zusammenfassung baurechtlicher Interpretationen. Gültig für Bauvorhaben, die nach dem 1. Oktober 2015 eingereicht wurden (Oktober 2015), aktuelle Ausgabe August 2017, URL: https://www.wien.gv.at/wohnen/baupolizei/pdf/barrierefreies-planen-bauen.pdf 06.01. 2018

[22] GEUDER, FUCHS, Bauordnung für Wien. Kommentierte Gesetzesausgabe samt Nebengesetzen und wichtige höchstgerichtlichern Entscheidungen, Wien 2016

dazu auch §115 BO für Wien). Prinzipiell sind diese Regelungen restriktiv zu interpretieren (VwGH 10.10. 2006, 2005/05/0021; siehe Geuder, Fuchs, Bauordnung für Wien S.211, §68). Die Zulässigkeit von Baumaßnahmen kann gegeben sein, wenn der neue Bauwerkzustand durch die bauliche Veränderungen den gegenwärtigen Baustandards mehr entspricht als zuvor (wie beispielsweise eine verbesserte Zugänglichkeit), auch dann, wenn der neue Bauwerkszustand nicht vollständig den gesetzlichen Anforderungen im Baurecht entspricht.

Eine weitere Ausnahme besteht bei Raumzusammenlegungen (Grundrißveränderung) für notwendige Vergrößerungen von Sanitärräumen hinsichtlich einer verbesserten Zugänglichkeit sowie Benützbarkeit für Menschen mit Behinderung. Hier dürfen Scheidewände entfernt werden.

Eine wesentliche Ausnahmebestimmung bezieht sich auf den unverhältnismäßigen Umsetzungsaufwand bei Baumaßnahmen. Eine genauere Bewertung möglicher Unverhältnismäßigkeiten im Sinne einer technischen Umsetz- sowie wirtschaftlicher Durchführbarkeit ist durchzuführen, bei der jeweils das konkrete Bauvorhaben individuell zu beurteilen ist. Hierbei wird im Einzelnen eine gegenüberstellende Abschätzung von Argumenten, die für und gegen die Regelungen hinsichtlich des barrierefreien Bauens sprechen, vorgenommen und anschließend entschieden. Die Unverhältnismäßigkeitsbewertung gilt auch für nachträgliche Aufzugsein- beziehungsweise Aufzugszubauten sowie bei nicht zwingend notwendigen Personenaufzügen. Zwingend notwendige Aufzüge hingegen sind in §111 der Wiener Bauordnung bestimmt und müssen für Rollstuhlfahrer zugänglich sein.

Handelt es sich um umfangreicherer Umbauten, sind Bauvorschriftsabweichungen im Allgemeinen nicht möglich (vgl. Geuder, Fuchs, Bauordnung für Wien S.211, §68).

Dieser Paragraph ist vor allem bedeutend für die zahlreichen Gebäude im Altbestand mit vielerorts nicht mehr zeitgemäßen Baustandards. Die Einhaltung der gesetzlichen Bedingungen bei heutigen Neubauten ist im Vergleich zu Sanierungsvorhaben als überschaubarer Aufwand zu bezeichnen. Die Situation bei Sanierungsvorhaben vom Baubestand ist eine gänzlich andere, da die historische Gebäudearchitektur mitunter eine vollständige Beseitigung von Barrieren aus bautechnischer oder statischer Sicht nahezu unmöglich machen kann oder bei einer theoretischen Durchführbarkeit der entstehende Kostenaufwand in einem finanziell exorbitanten Verhältnis zu den Gesamtbaukosten stehen kann. Gerade die infrastrukturelle Adaptierung von Stiegenhäusern und Personenaufzügen können enorme Kostentreiber sein. Auch die Vergrößerungen von barrierefreien Wohnungs-, und Gebäudeverbindungsflächen sind vielerorts technisch aufwendig umzusetzen und korrelieren mit sinkenden Wohnnutzflächen bei gleichbleibender Bauwerksgröße, was ebenfalls eine Verteuerung der Baukosten nach sich zieht.

Bei Bauvorhaben, die als temporäre Einrichtungen zur Unterbringung und Versorgung von Personen dienen, können bestimmte gesetzliche Festlegungen unberücksichtigt bleiben, sofern allgemeine Anforderungen, wie unter anderem die Nutzungssicherheit und das Vorhandensein einer barrierefreien Zugänglichkeit im Erdgeschoß, gewährleistet wird (vgl. BO für Wien §71c).

Bauwerke und alle ihre Teile müssen so geplant und ausgeführt sein, dass sie unter Berücksichtigung der Wirtschaftlichkeit gebrauchstauglich sind und die im §88 angeführten bautechnischen Anforderungen wie beispielsweise die Nutzungssicherheit und Barrierefreiheit erfüllen (vgl. BO für Wien §88).

Generell ist bei der Planung und Ausführung von Bauwerken - entsprechend dem Verwendungszweck - insbesondere auf Kinder, ältere Personen und Menschen mit Behinderungen zu achten. Bei der Bauwerkserschließung muss eine sichere Zugänglichkeit und Benützbarkeit gewährleistet werden. Alle Gebäudegeschoße in Gebäuden mit mehr als zwei Hauptgeschoßen haben miteinander durch Personenaufzüge und der notwendigen Verbindungswege zu den Wohnungen und Haustore verbunden zu sein, sodass eine dauerhafte Benützbarkeit auch für Rollstuhlfahrer besteht. Ebenso miteinzubeziehen ist die Anordnung von den Aufzugshaltestellen in jenen Geschoßen, in denen sich die einzigen Zugänge zu Dachgeschoßwohnungen oder Betriebsstätten befinden. Der Bereich vor der Aufzugstür muss im Zusammenhang mit barrierefreien Liften dabei die Mindestmaße für rollstuhlgerechte Bewegungsmöglichkeit (Wendekreis) einhalten. Davon ausgenommen sind Häuser mit nur einer Wohnung, Kleinhäuser und Reihenhäuser (vgl. BO für Wien §109 - §110).

Zur sicheren sowie unkomplizierten Erreichbarkeit und Nutzung von Gebäuden müssen durch entsprechende bauliche Vorrichtungen potenzielle Unfallgefahren weitgehend ausgeschlossen werden (vgl. BO für Wien § 112 - § 113).

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Ausgewählte Bauwerke und Bauwerksteile mit jeweils bestimmten Funktionen, die barrierefrei sowie weitgehend nutzungsautonom für Kinder, ältere Personen und Personen mit Behinderungen ausgestaltet sein müssen, sind in der WBO definiert. Das bezieht sich auch auf Um- und Zubauten von Gebäuden. Ausnahmen gelten wieder für Reihenhäuser, Bauwerke mit nur einer Wohnung sowie für Wohngebäuden mit maximal zwei Wohnungen (bei einer Gebäudehöhe von bis zu 7,50 m) und in denen für Betriebs- oder Geschäftszwecke höchstens ein Geschoß in Anspruch genommen wird. Unabhängig von den einzelnen baulichen Maßnahmen ist keine Verschlechterung des Bauwerkszustandes bezüglich der barrierefreien Ausgestaltung gestattet. Je nach Gebäudezweck müssen eine entsprechende Anzahl von behindertengerechten Sanitärräumen errichtet werden. (vgl. BO für Wien§ 115).

Die Gestaltung von Wohngebäuden und -einheiten muss abgesehen von den Ausnahmebestimmungen so konzipiert sein, dass einerseits alle Gemeinschaftsräume mit ihren Verbindungswegen barrierefrei zugänglich und benützbar sind, andererseits im Fall einer Benützung von Menschen mit Behinderung nachträglich und ohne massiven Aufwand adaptiert werden kann. Das gilt auch für die dazugehörigen Spielplätze (vgl. BO für Wien § 119).

Der Fertigstellungsanzeige ist unter anderem eine Bestätigung, dass die Grundsätze des barrierefreien Planens und Bauens eingehalten wurden anzuschließen (vgl. BO für Wien § 128).

3.3 Wiener Etappenplan zum Abbau baulicher Barrieren

Der Wiener Etappenplan umfasst eine 30-jährige Laufzeit, aufgeteilt in drei Prioritätsstufen zu zehn Jahren zwischen 2012 und 2042. 33% der öffentlich genutzten Gebäude sollen gemäß der Prioritäteneinteilung in den ersten zehn Jahren bis Ende 2022 barrierefrei sein. Bis zu 57-prozentige Barrierefreiheit soll bis Ende 2032 bestehen und eine komplette Barrierefreiheit wird bis Ende 2042 festgesetzt. Die Kosten für das vorgesehene Maßnahmenpaket wurden anhand von nicht näher erläuterten Kennzahlen ermittelt und belaufen sich ursprünglich in etwa auf 162 Millionen Euro (5,4 Millionen Euro jährlich). 27 % der Gesamtgebäudeanzahl wird budgetär dem Zentralbudget des Landes Wien und 73 % dem Dezentralbudget der Wiener Gemeindebezirke zugeordnet. Die Hauptlast der Finanzierung liegt demnach bei den Bezirken mit ihren vorhandenen Budgets, die als zugewiesene Haushaltsmittel aus dem Zentralbudget (Gemeindebudget) stammen.

Der veröffentlichte Teil des Etappenplans besteht aus einer reinen Auflistung ausgewählter Objekte.[23] In dieser Masterliste sind 1.117 Gebäude vermerkt. Im Detail handelt es sich um 447 Kindergärten, 417 Schulen, 193 Amtsgebäude, 39 Büchereien, 11 Marktgebäude, 5 Gesundheitsstellen, 3 Musen, 1 Hort sowie 1 Pensionistenlokal.[24] Laut Wiener Stadtbaudirektion sind jene Objekte nicht in der Liste enthalten, die den baulichen Anforderungen bereits entsprechen. Welche Gebäude davon betroffen sind bleibt ungeklärt. Der enorm hohen Zahl an verbesserungswürdiger Kindergärten und Schulen versucht die Stadt Wien unter anderem mit eigenen Sanierungsprogrammen entgegenwirken (siehe unten; Schulsanierungspaket).

Im Vorfeld wurden die Bestandsobjekte auf ihre grundsätzliche Barrierefreiheit grob überprüft. Relevante, zu bewertende Gebäudeelemente waren hierbei Zugangsbereiche, Aufzugssituation, Behindertentoiletten, Stiegenhausgestaltung und das Vorhandensein taktiler Leitsysteme. Im engeren Sinne handelt es sich bei den Etappenplanmaßnahmen um keine ganzheitliche Herstellung von Barrierefreiheit gemäß der entsprechenden OIB-Richtlinien 4 oder ÖNORMEN B1600 ff., sondern eher um Adaptierungen. Aus dem Masterplan geht oberflächlich hervor, welcher Umbau in welchen Zuständigkeitsbereich fällt. Das heißt, ob das Objekt vom Zentralbudget des Landes Wien oder den Bezirksbudgets der jeweils betroffenen Bezirke finanziert wird. Ergänzend ist der Auflistung zu entnehmen, welche Magistratsabteilung direkt verantwortlich ist.[25]

Die Kompetenzstelle barrierefreies Planen, Bauen und Wohnen in Wien kann prinzipiell keine Auskunft über den aktuellen Umsetzungsstand geben und verweist auf die Stadtbaudirektion, die ebenfalls keine konkrete Auskunft bei Nachfrage über die bereits sanierten Objekte ausgibt.[26] Wie viel oder welche Objekte

[23] Gemäß dem Wiener Antidiskriminierungsgesetz (WADG) - Masterliste WADG Zentral- und Dezentralbudget

[24] Behindertenberatungszentrum-BIZEPS; Zentrum für Selbstbestimmtes Leben, Masterliste WADG Zentral- und Dezentralbudget (29.06.2012), URL: https://www.bizeps.or.at/downloads/etappenplan_wien.pdf 01.02. 2018

[25] BIZEPS, URL: https://www.bizeps.or.at/wissenswertes/wiener-etappenplan/ 28.01. 2018

[26] Kompetenzstelle barrierefreies Planen, Bauen und Wohnen in Wien, Telefonische Anfrage zum Umsetzungsstand barrierefreier öffentlicher Gebäude der Stadt Wien, Ing. Rosenberger. am 15.01. 2018

bis heute tatsächlich auf barrierefreien Mindeststandards umgebaut wurden bleibt unveröffentlicht. Der Wiener Monitoringstelle zufolge sind keine Umsetzungsstrategien des Etappenplans ersichtlich. Sie fordert eine übergeordnete Koordinierungs- und Überwachungsstelle für die Umsetzung des Etappenplans mit entsprechenden Kompetenzen in der Stadtverwaltung

einzurichten und zeitlich ambitioniertere Ziele zu setzen, die sich an denen des Bundes (Erste Umsetzungsfrist bis 2019) orientieren. Es wird daher die Erstellung eines transparenten, alle Gebäude umfassenden Etappenplans empfohlen.[27]

Weitaus konkretere Informationen zu Abbautätigkeiten von Barrieren der Stadt Wien bekommt man bei den zwei großen Schulsanierungsprojekten für Wien. An rund zwei Drittel der Wiener Schulen, die zwischen 1855 und 1991 errichtet wurden, sind substanzsichernde Maßnahmen erforderlich. Durch das Schulsanierungspaket I (Substanzsanierungen) wurden von 2007 bis 2017 Sanierungsmaßnahmen an 117 Wiener Schulen fertiggestellt. Die Stadt Wien war mit 40% und die Bezirke mit 60% an der Finanzierung beteiligt. Das Gesamtkostenvolumen wurde nicht veröffentlicht. Aufgrund des Schulsanierungspaketes II (Substanzsanierungen), das von der Stadt Wien bis zu 90% der Kosten der Bezirke gefördert wird, sind seit 2017 Sanierungsarbeiten an rund 150 Wiener Pflichtschulen fortgesetzt worden. Der Sanierungsumfang von 100 weiteren Schulen ist für 2018 geplant. Die Gesamtkosten für das Schulsanierungspaket II belaufen sich in etwa auf 570 Millionen Euro.[28]

3.4 Stadtentwicklungsplan für Wien (STEP2025)

Der auf zehn Jahre ausgelegte STEP2025[29], der Prinzipien und Leitlinien zur räumlichen Auswirkung Wiens beinhaltet, stellt eines der bedeutenden Raumplanungsinstrumente der städtischen Verwaltung dar und wird durch weitere Fachkonzepte wie beispielsweise die Smart-City-Wien-Rahmenstrategie[30] unterstützt. Wien hat mit dem Stadtentwicklungsplan von 1994 und 2005 erste Vorgaben zur Barrierefreiheit geschaffen und verfolgt diesen Weg im aktuellen STEP2025 weiter.

Die Bedeutung der Barrierefreiheit wird im Wesentlichen in zwei Zusammenhängen näher behandelt und im weiteren Sinne unter der Thematik der Sozialen Inklusion subsummiert. Zwei der vier Hauptkapitel setzen die Barrierefreiheit in einen konkreten Kontext. Im Kapitel 2 (Wien baut auf) geht es im Unterpunkt 2.2, Flächen für das Stadtwachstum, um qualitätsvolle Urbanität, was eine Fortführung der Zielvorstellung einer barrierefreien Stadt darstellt. Qualitätsvolle Urbanität bezieht im Entwicklungsplan auf Stadtquartiere mit vielfältigen Nutzungsmöglichkeiten, kurzen Wegen zu Versorgungseinrichtungen sowie einem barrierefreien, belebten Straßenraum (vgl. STEP2025 Kapitel 2.2).

Im Unterpunkt 4.2 Freiräume: Grün & Urban des vierten Kapitels (Wien ist vernetzt) steht die Qualität der urbanen öffentlichen Räume im Fokus. Diese sollen hochwertig, barrierefrei, robust, alltagstauglich und flexibel nutzbar sein und Möglichkeiten ohne entstehende Exklusion anderer Menschengruppen für unterschiedliche Nutzerinnen und Nutzer bieten (vgl. STEP2025 Kapitel 4.2).

Wien streicht im Punkt 4.3 (Soziale Infrastruktur) die Bedeutung einer auf soziale Inklusion orientierte Stadtentwicklung der Stadt hervor, die in diesem Zusammenhang die Teilhabe der Wiener Bevölkerung an allen gesellschaftlichen Prozessen ermöglicht. Der Schwerpunkt richtet sich bei diesem stadtplanerischen Ansatz besonderes auf potenzielle Ausschlussmechanismen für bestimmte

soziale Gruppen, die in Anbetracht der Zielvorstellung der sozialen Gerechtigkeit und Gleichheit minimiert werden müssen.

[27] Wiener Monitoringstelle für die Rechte von Menschen mit Behinderungen, Empfehlung der Monitoringstelle Wien zum Etappenplan zum Abbau baulicher Barrieren der Stadt Wien (25. Juli 2013), URL: http://www.monitoringstelle.wien/empfehlung-etappenplan.pdf 16.11. 2017

[28] Stadt Wien MA 56 Wiener Schulen, Sanierung vonn Schulen, URL: https://www.wien.gv.at/bildung/schulen/schulbau/sanierung/index.html, 24.11. 2017

[29] Stadt Wien MA 18 Stadtentwicklung und Stadtplanung, STEP 2025 Stadtentwicklungsplan Wien, 2014, URL: https://www.wien.gv.at/stadtentwicklung/studien/pdf/b008379a.pdf, 05. 11. 2017

[30] Stadt Wien MA 18 Stadtentwicklung und Stadtplanung, Smart-City-Wien-Rahmenstrategie, 2014, URL: https://smartcity.wien.gv.at/site/wp-content/blogs.dir/3/files/2014/08/Langversion_SmartCityWienRahmenstrategie_deutsch_doppelseitig.pdf 10.12. 2017

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Vor dem Hintergrund einer Inklusions- und Diversitätsorientierung Wiens soll dabei die gesamte Stadtbevölkerung in den Mittelpunkt der Betrachtung rücken, unabhängig von Herkunft, Geschlecht, sexueller Orientierung und geschlechtlicher Identität, Religion, Weltanschauung, Gesundheit,

Behinderung, Alter, oder ökonomischem Status und somit die Chancen eines sozialen Aufstieg gleichermaßen gewährleisten (vgl. STEP 2025, Kapitel 4.3).

3.5 Wiener Smart-City-Rahmenstrategie

Die Wiener Smart-City-Rahmenstrategie, mit ihrem Mehrjahreshorizont bis 2050, repräsentiert die großen langfristig angelegten Schwerpunktbereiche, stadtplanerische Leitsätze und grundlegenden Pfade zu Erreichung ihrer Zielvorstellungen. Die Lebensqualität auf hohem Niveau zu sichern steht für eines der drei großen Zielebenen im Strategiepapier. Das Leitmotiv dafür ist Wien als soziale Stadt, die alle Menschen gleichermaßen in ihrem Streben unterstützt, ein selbstbestimmtes Leben zu führen. Von den 13 Hauptkapiteln nimmt einzig das Kapitel 8 (Ziel: Lebensqualität auf höchstem Niveau sichern) direkten Bezug auf die Barrierefreiheit. Es wird die Absicht der Förderung der sozialen und politischen Teilhabe aller Bevölkerungsgruppen unter anderem auf den Ebene der Barrierefreiheit betont (vgl. Smart-City-Wien-Rahmenstrategie, 8.1 Soziale Inklusion).

Die Sicherstellung eines quantitativ und qualitativ vorhandenen Grün- und Freiraums muss im Stadtgebiet der wachsenden Stadt ausreichend gewährleistet werden und unter Berücksichtigung einer raschen Erreichbarkeit mit dem öffentlichen Personennahverkehr barrierefrei und möglichst öffentlich zugänglich sein (vgl. Smart-City-Wien-Rahmenstrategie, 8.3 Wien Die Umweltmusterstadt).

Die Verbesserung der Alltagsabläufe der Wiener Bevölkerung wird dahingehend angestrebt, indem rasche und effiziente Abläufe sowie Orts- und Zeitsouveränität beispielsweise durch den Abbau von Barrieren ermöglicht werden (vgl. Smart-City-Wien-Rahmenstrategie, 8.2 Gesundheit als Voraussetzung).

4 CONCLUSIO

Grundsätzlich ist festzuhalten, dass das Thema Barrierefreiheit in den diversen Wiener Landesgesetzen (insbesondere in der Wiener Bauordnung), bautechnischen Verordnungen, Richtlinien und Normstandards umfangreich und ausreichend verankert ist. Mit der Kompetenzstelle barrierefreies Planen, Bauen und Wohnen in Wien, dem Wiener Monitoringausschuss, der Meldestelle für Baubarrieren und andere Organe wurden noch dazu ergänzende Stellen geschaffen, um einen verbesserten und effizienteren verwaltungstechnischen Ablauf beim Abbau von Barrieren der Stadt Wien zu etablieren. Diesbezüglich hat die Stadtverwaltung große Schritte Richtung barrierefreie Stadt gemacht. Was zukünftige Aus-, Zu- oder Neubauten betreffen hat Wien eine gute Ausgangssituation geschaffen, um die Barrierefreiheit insgesamt anzuheben.

Bei Adaptierungen von Gebäuden im Bestand erscheint die Umsetzung deutlich komplexer, kostenintensiver und langfristiger. Die zeitlichen Etappen sowie der Umfang des Unterfangens der Stadt Wien zum Abbau von Barrieren in öffentlichen Gebäude könnte transparenter gestaltet werden. Bei der Finanzierungsverteilung sollte Bedacht genommen werden, dass die Bezirke den nötigen finanziellen Spielraum bekommen, um eigenständig genug und der Bezirkssituation angemessen reagieren können. Im Bereich der Schulsanierungsmaßnahmen funktioniert die Verteilung bereits erfolgreich und kann durchaus als Referenz dienen.

Zusammengefasst kann man das grundsätzliche Engagement der Stadt Wien und ihre Mechanismen zum Abbau von Barrieren hervorheben, allerdings gäbe es im Bereich von magistratsübergreifender Zusammenarbeit, Veröffentlichung von Informationen, der Integration von Interessensvertreterinnen und Interessensvertretern oder Budgetierung noch Potenziale. Es liegt in Zukunft am neuen Bürgermeister und seinen Stadträtinnen und Stadträten, hierbei positive Entwicklungen einzuleiten und den Weg der Barrierefreiheit möglichst ganzheitlich zu gehen.

5 REFERENZEN

AMANN, Wolfgang, Barrierefreies Wohnen – Förderungen der Länder, Immolex 2014

BENESCH, Martin, Barrierefreiheit bei Planung, Bau und Sanierung von Gebäuden, Immolex 2014

GEUDER, FUCHS, Bauordnung für Wien, Kommentierte Gesetzesausgabe, Wien 2016

GROISS, Peter, Barrierefreies Wohnen am Beispiel von Wien, Wohnbau Forschung, 2/2001

CentropeMAP – Cross-Border Data at a Glance

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1 ABSTRACT

The Centrope region unites the territory near the common boundaries of Austria, the Czech Republic, Hungary, and the Slovak Republic. To foster cross-border issues in municipal and regional planning, CentropeMAP was introduced in the year 2005. CentropeMAP is a geoportal displaying datasets from the Centrope partner countries in a common interface, thus allowing an easy view across the borders.

CentropeMAP is also the basis for the interactive cross-border statistics information system CentropeSTATISTICS which allows statistic figures from the fields of demography, economy, and land use to be compared with each other, analysed and graphically displayed.

CentropeSTATISTICS concentrates on data at municipality level, which is the major difference to other existing cross-border statistics portals which often present their data only on NUTS 3 or even NUTS 2 levels which is insufficient for a cross-border analysis on a small scale.

Since autumn 2017 CentropeSTATISTICS contains a municipality and region comparison tool. Data for one or more municipalities can be compared with each other, or user-defined regions can be analysed – of course across the borders within the whole Centrope region.

Keywords: Centrope, geodata, geoportal, statistical data. thematic maps

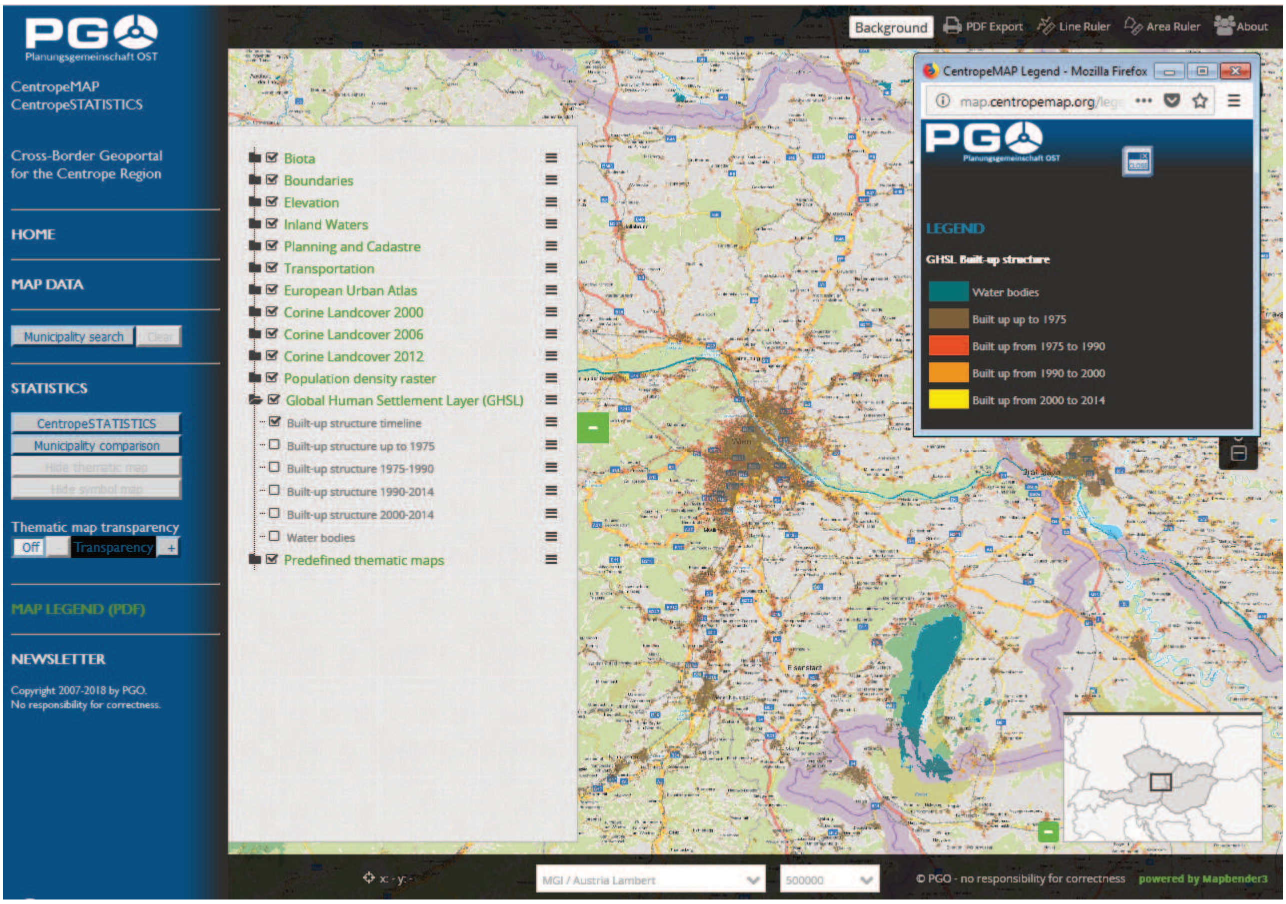

Fig. 1: The geoportal CentropeMAP.

2 BACKGROUND

2.1 Genesis of Centrope

The Centrope region is an artificial region consisting of the counties/federal states Burgenland, Lower Austria, Vienna; Jihočeský kraj, Jihomoravský kraj, Győr-Moson-Sopron, Bratislavský kraj, and Trnavský kraj.[1] It was founded in the year 2003 by politicians and economic actors from the four countries Austria, Czech Republic, Hungary, and Slovak Republic who came together in Kittsee (Burgenland) to declare the foundation of the Centrope region within an INTERREG project to compensate the social and economic disadvantages which were laid on this region during the decades of the Iron Curtain.

At that time the Planning Association East (PGO – Planungsgemeinschaft Ost)[2] launched the pilot project "Base Map Centrope" which aimed at the collection of geodata throughout the Centrope region. These data were put on offline storage media and offered to interested partners and actors in the region. However, due to their offline characteristics, the contents of the base map were difficult to be kept up to date and only little present.

2.2 Genesis of CentropeMAP

The Centrope base map could not make its way because it was difficult to access, being available only on offline media. In 2005 the Planning Association East started an initiative to create the online geoportal CentropeMAP which relies on cooperation between the GIS and statistics departments of Vienna, Lower Austria, and Burgenland as well as with colleagues from the Centrope partner countries and counties in the Czech Republic, Hungary, and the Slovak republic.

During almost 15 years of run-time an excellent communication and exchange basis between all partners could be established, mainly because of the regular annual workshops where latest developments are discussed, new ideas are exchanged and datasets are harmonised.

CentropeMAP is a web-based appication which does not need any software installation, but can be run from any standard computer with internet connection.

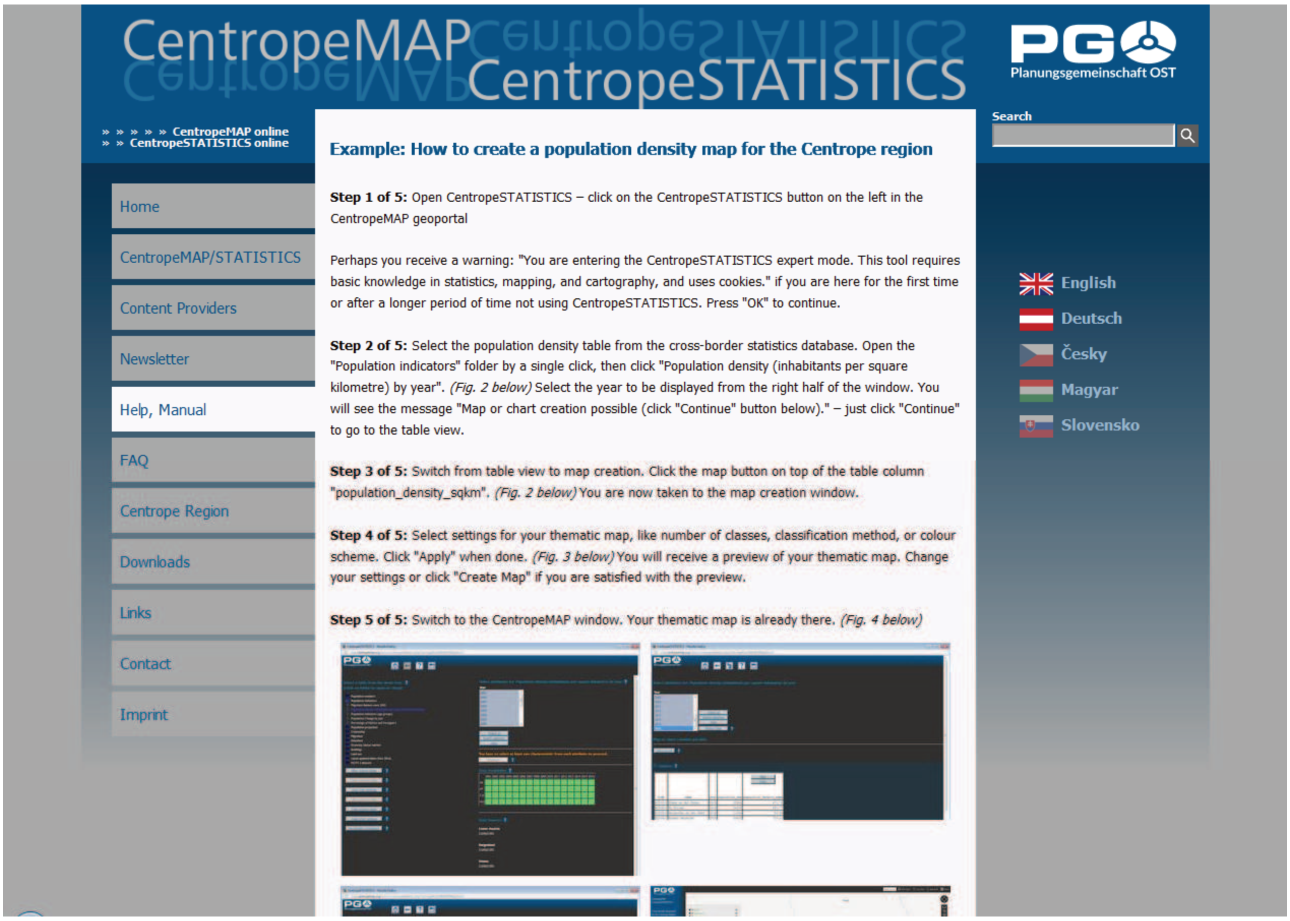

Fig. 2: The CentropeMAP website – most content is available in five languages.

[1] The Centrope region as seen by CentropeMAP and CentropeSTATISTICS also features data from Vysočina kraj (Czech Republic) and Vas county (Hungary)..

[2] PGO is a common association of the Austrian federal states Burgenland, Lower Austria, and Vienna dealing with calibration, coordination, and preparation of spatial planning relevant issues in Eastern Austria.

3 WHAT MAKES CENTROPEMAP UNIQUE?

3.1 Combination of geodata from cour countries

CentropeMAP concentrates on datasets which are important for spatial planning and related disciplines like

- basic spatial information like boundariesm biota, water courses/water bodies, transport infrastructure, land use etc.,
- statistical data on demography, migration, education, economy/job market etc.,
- time series of data to analyse the development of the region.

CentropeMAP obtains its geodata directly from the data keeping authorities, which are mainly the GIS departments of the Austrian federal states Burgenland, Lower Austria, and Vienna, the Austrian agroforestry computing centre LFRZ, geoland.at, ITS Vienna Region, the European Environment agency, the Czech counties Jihomoravský and Vysočina, the Czech environment agency CENIA, and the Slovak environment agency SAZP.

3.2 Harmonised municipality data across the borders

Harmonisation of geodata across Europe is currently ongoing within the INSPIRE directive.[3] However, this process turned out to have rather slow progress during the past years so that there are currently no results which can be used in CentropeMAP. We are nevertheless keeping an eye on the INSPIRE implementation in the Centrope countries and are technically ready to use the results in our geoportal.

As far as statistics are concerned, data harmonisation on municipality level is a challenging process. Data from the partner regions may only be merged into a common table if data survey and data processing were done in the same way in all countries. This is quite simple when talking about demographic data; but as soon as other areas like unemployment or household size are reached, problems arise because terms like “unemployed” or “household” are differently defined in the partner countries. Also the methods of data survey are sometimes different – for example, the number of unemployment people is counted by due date in one country, but by monthly annual averages in other countries. In some cases it is possible to eliminate such differences by data aggregation, but this may lead to datasets with weak explanatory power.

Also, when talking about data on municipal level, data protection guidelines become an important issue. Combining attributes in small municipalities allows conclusions regarding single persons, therefore such datasets are not available throughout all partner countries. Nevertheless, CentropeSTATISTICS concentrates on municipality data because only this level allows detailed analyses on a small-scale regional level.

3.3 Easy map and chart creation

CentropeMAP and CentropeSTATISTICS have become a very extensive and complex information system. Nevertheless, we take care that map and chart creation remain a simple, user-friendly designed process which can be done step by step, comprehensible and well-documented. Every statistical process starts with the selection of the topic (table). Each table offers some possibilities to create maps or charts from certain table columns; it is also possible to combine values from more than one table in a user-defined table. CentropeSTATISTICS users whould bring along some basic knowledge in mapping and cartography to make sure they produce meaningful output. An extensive manual in English and German helps understand how CentropeSTATISTICS works.

On the CentropeMAP website we also prepared some examples of map and chart creation to illustrate that it is an easy process to turn statistical figures into colourful maps and different types of charts for one or more municipalities or regions.

4 MUNICIPALITY AND REGION COMPARISON

Have you ever been asked how many inhabitants or how many employable people live in your municipality, compared to its neighbouring municipality or the surrounding region? Neighbours do not always live in the

[3] INSPIRE: Directive 2007/2/EC of the European Parliament and of the Council of 14 March 2007 establishing an Infrastructure for Spatial Information in the European Community.

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same administrative district or region, sometimes even in another country. Administrative boundaries disappear more and more in practise, however, they are still a limiting factor in statistics.

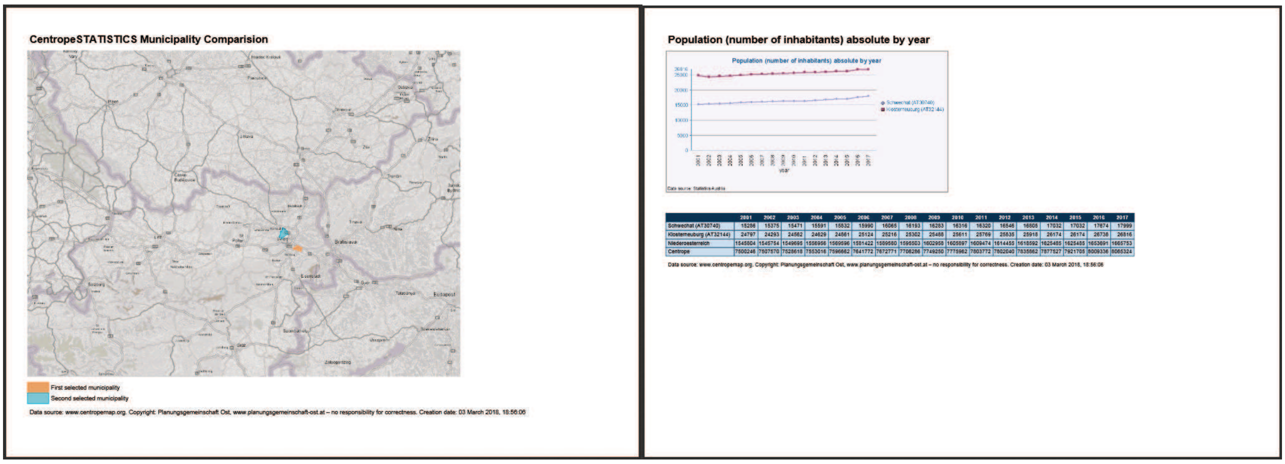
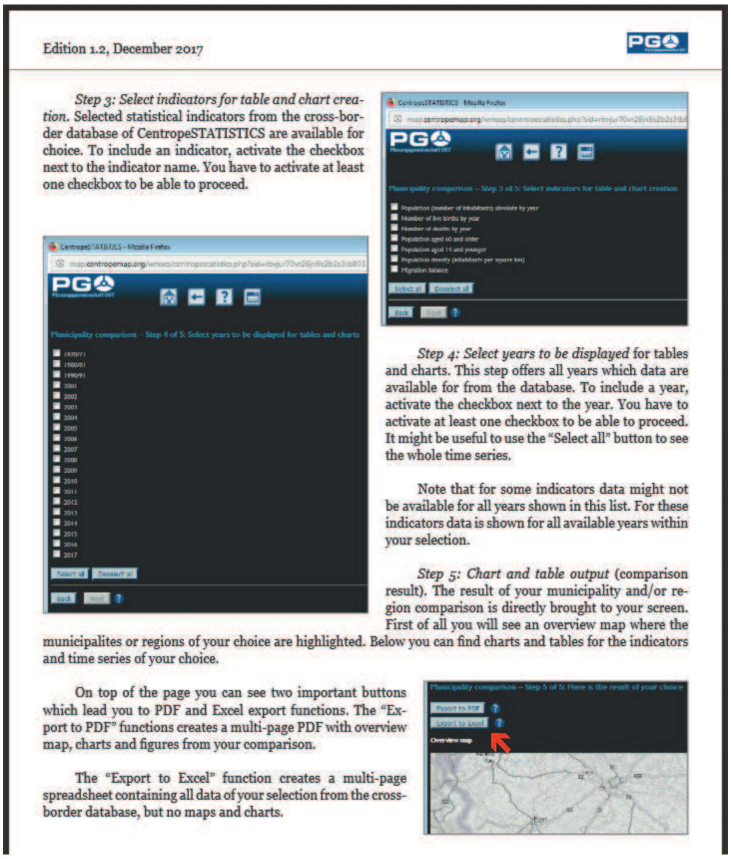


Fig. 3: Parts of the formatted output of municipality comparison (PDF version).



Edition 1.2, December 2017

Step 3: Select indicators for table and chart creation. Selected statistical indicators from the cross-border database of CentropeSTATISTICS are available for choice. To include an indicator, activate the checkbox next to the indicator name. You have to activate at least one checkbox to be able to proceed.

Step 4: Select years to be displayed for tables and charts. This step offers all years which data are available for from the database. To include a year, activate the checkbox next to the year. You have to activate at least one checkbox to be able to proceed. It might be useful to use the "Select all" button to see the whole time series.

Note that for some indicators data might not be available for all years shown in this list. For these indicators data is shown for all available years within your selection.

Step 5: Chart and table output (comparison result). The result of your municipality and/or region comparison is directly brought to your screen. First of all you will see an overview map where the municipalites or regions of your choice are highlighted. Below you can find charts and tables for the indicators and time series of your choice.

On top of the page you can see two important buttons which lead you to PDF and Excel export functions. The "Export to PDF" functions creates a multi-page PDF with overview map, charts and figures from your comparison.

The "Export to Excel" function creates a multi-page spreadsheet containing all data of your selection from the cross-border database, but no maps and charts.

Fig. 4: Screenshot from the CentropeSTATISTICS manual offering an easy and richly illustrated guide to all functions of CentropeSTATISTICS.

The new municipality and region comparison tool in CentropeSTATISTICS allows the comparison of a municipality or a region with another municipality or region. The main aspects are flexible application and customising options for users from the Centrope region – for example, adjacent municipalities can be queried automatically or a user-defined region can be built by selecting municipalities via a map. These functions are currently available:

- comparison of single municipalities or municipalities and regions,
- creation of tables and charts for selected statistical indicators and time series of CentropeSTATISTICS (will be continuously extended),
- display of the individual query results on the web or as PDF download.

The municipality and region comparison tool is directly available from the CentropeMAP geoportal (click the "Municipality comparison" button in the left menu); more content will be added in the future. Detailed instructions on how to use this tool are available from the CentropeSTATISTICS manual which can be obtained from the CentropeMAP website in English and German.

5 WEB LINK

http://www.centropemap.org/

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Climate-fit.city Online Analytical Platform Needs

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1 ABSTRACT

Urban areas are very vulnerable to the impacts of climate changes, because of the high concentration of people, infrastructure, and economic activity, but also because cities tend to exacerbate climate extremes such as heat waves and flash floods. This article focuses on project Pan-European Urban Climate Service - PUCS Grant Agreement Number: 730004, Service Name: Climate-fit.city. Climate-fit.city translated the best available scientific urban climate data into relevant information for public and private end-users operating in cities across a range of different sectors. The service will quantify the impacts of climate (change) on a range of urban sectors and propose relevant solutions to customers. For Czech republic the main topic is urban planning. The sectoral service on urban planning is focused on the (cor)relation between urban climate (heat) and urban land use structure and development. The first step of the project was to define the needs and expectations for an aplication of online analytical platform (one of the project products). The platform will also allow dedicated tailored scenario analysis based on climate change modelling and varying urban land use datasets. In three pilot areas, Prague, Ostrava and Hodonín, administration responsible for urban planning and strategical planning defined the needs and expectations. In this article will be described in more detail why these three pilot cities were involved and how different expectations and needs representatives have for these three areas.

Keywords: climate-fit.city, urban planning, heat island, urban development, climate platform

2 SHORT INTRODUCTION TO CLIMATE-FIT.CITY PROJECT

The current period is bringing more and more debate about responses to climate change. Given the high vulnerability of cities to climate extremes and considering that decisions regarding climate adaptation measures are often made at the city authority level, it is clear that cities deserve tailor-made urban climate information that accounts for their particular urban physical and socio-economic characteristics to assist decision-making.

In this context, Climate-fit.city will demonstrate the added value of integrating urban climate services within user practices and to establish and further upscale an urban climate service, which will translate the best available scientific urban climate data into relevant information for public and private end-users in cities. The service will quantify the impacts of climate (change) on a range of urban sectors and propose relevant solutions to customers.

The added-value of the Climate-fit.city urban climate services for local decision-making is being demonstrated in 6 service cases located across Europe. The demonstration activities are being conducted jointly with service providers and end-users in the domains of active mobility, building energy, tourism, emergency planning, health, and urban planning. Over the course of this project, we will extend this initial portfolio of 6 cases towards new sectoral applications.

Six sectoral service cases are being fully elaborated and demonstrated in the first phase of the project, in a joint effort involving end-users and service providers as project partners. These service demonstration cases are being implemented in Barcelona, Bern, Antwerp, Prague/Ostrava/Hodonín, Vienna, and Rome in the domainof health, building energy, emergency planning, urban (spatial) planning, active mobility, and cultural heritage.

This article focuses on application to the Czech Republic, where testing is being done in the field of spatial planning The urban (spatial) planning sectoral service case will focus on the (cor)relation between urban climate/heat and urban land use structure and development.First, the current status of the climate conditions of pilot cities (Prague, Ostrava, Hodonín,all CZ) will be explored by assessing the dependency of the temperature distribution on theurban structure and identifying the location of the heat hot-spots.

Second, various urban planning scenarios will be introduced by modifying the city's land use plan and will be combined with different climate development scenarios. The urban planning scenarios will represent different city development strategies at different levels of spatial detail and decision making processes, including the entire city level as well as the local neighbourhood level. The effect of these urban planning scenarios on urban temperature conditions will be explored. This will be fulfilled by integrating different versions of the land use/land cover input layers into the UrbClim model (in particular the Copernicus Urban Atlas Layer and 3D models of the cities) (more about UrbClim model,. De Ridder 2015) and generating corresponding versions of the urban temperature maps.

An online analytical platform will be prepared by GISAT (partner of project), in order to enable the user to visualize and interactively analyse this multi-temporal temperature information, as well as to enable dedicated tailored scenario analysis based on climate change modelling and varying urban land use datasets.

3 SPATIAL (URBAN) PLANNING IN CZECH REPUBLIC AND HEATING SPOTS

In the Czech Republic spatial planning can be in a very simplified way divided into the urban planning part itself and the part of the strategic planning and development. The part dedicated to urban planning itself is quite strictly described in the Act No. 183/2006 Coll.,) . On Urban Planning and Building Code, as amended. It describes the process of creating the necessary documents together with defining its content and responsibilities. (Czech Republic. Act no. 183/2006 Coll.). In contrast, the strategic planning part is defined rather generally, even if it is partially addressed by Act No. 248/2000 Coll. on regional development support, as amended (Czech Republic. Act no. 248/2000 Coll).

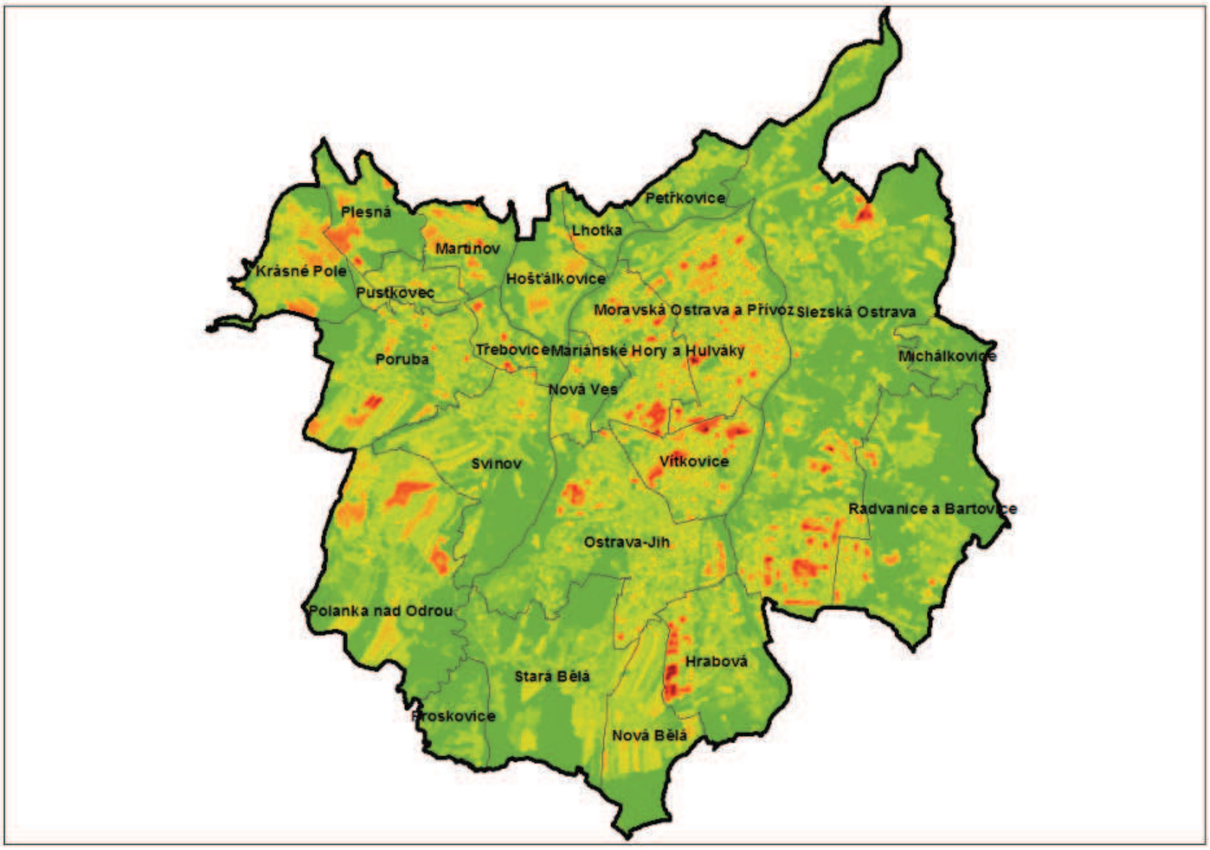

Fig. 1: The thermal islands in the urban structure of the city Ostrava (source Adaptation Strategy of the Statutory City of Ostrava 2017).

The State Environmental Policy of the Czech Republic 2012 – 2020 among the most important and urgent problems indicates Reducing the permanent appropriation of farmland and basement rocks (Ministry of Environment The State Environmental Policy of the Czech Republic 2012 – 2020). The policy noted that in recent years the annual losses of agricultural land totalled approximately 5000 hectares, which means 14 hectares per day. At present, according to (ISSAR, 2014) built-up areas in the Czech Republic occupy about

10.6% of the entire country area. Calculation made by (Prokop, 2011) specified the daily loss of agricultural land in the Czech Republic even to 16 hectares per day. This information is closely related to landscape change and urban planning issues.

Strategy of Adaptation to Climate Change in the Czech Republic has been prepared by the Ministry of Environment in cooperation with other ministries and with use of climatological findings and recommendations of the Czech Hydrometeorological Institute. The strategy is a national adaptation strategy of the Czech Republic. It assesses the likely impacts of climate changes and contains also proposals for specific adaptation measures. This document has direct links to the documents in the urban planning area. It mainly refers to Spatial Development Policy, but also refers to urban plans.

These and other documents mention warmth, thermal comfort and heatind spots as one of the phenomena that need to be reflected in the field of planning.

In one of the pilot areas of this project - Ostrava has been prepared and approved the Adaptation Strategy of the Statutory City of Ostrava for the Impacts and Risks of Climate Change - In its analytical part, the points of view that are the most important of the thermal islands in the urban structure of the city.(fig.1)

4 PILOT CITY IN CZECH REPUBLIC

In the Czech Republic, 3 plot areas were selected, Prague, Ostrava and Hodonín.

Prague is the capital city of the Czech republic. It is characterized by a high density of inhabitants and a very compact urban structure. Changes in land use can take place either in the build up area where land use is used, or it is possible to work with the area of brownfields within the structure of the city. Discussions about the use of brownfields are the subject of many public discussions on the territory of Prague, and the public is watching closely how these unique areas are used. Application of the model will help to discuss how to use it so that the future of these areas responds to the sustainable development of the whole city and does not create new problem areas and thermal islands.

Ostrava is the third largest city in the Czech Republic. It is a former industrial city with a polycentric settlement structure. In the territory of Ostrava, the project will be tested, among other things, the effects of burning mines heaps on the UrbClim model. (See Fig. 2) His ability to describe and evaluate these unique phenomena that are located in the urbanized area will be tested. It will be assessed if and how these thermal points affect the climate in the neighborhood and what changes would bring about their extinction.

Fig.2 Burning mines heap Ema in Ostrava

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Hodonín and the surrounding area has an area of 63.05 square kilometers and a population of over 25,000 inhabitants HOdonín itself is a male town in the south of Moravia situated in the flat terrain of the Pannonian Plain in the framework of the project being studied Reflection of urban planning strategy in urban climate development – small city – very local level (e.g. development of the main square or gardening colony)boundary conditions for UrbClimb model – level of spatial detail, city size. Thus, the capability of the model and its application in a small country will be assessed

5 SOLUTION PROCEDURE

The first step in the testing was to obtain a shorn of needs and expectation from the expert to the urban planning in connection with the application of the Ur Clim model.

In order to collect initial user need specifications, as well as information about the current awareness and perception of the urban climate and urban heat problematics, an introductory workshop was organized for the urban planning sectoral case. The workshop took place in the city of Ostrava, in Slezská Ostrava quarter town hall on 31st June 2017.

Main workshop participants: Pilot cities City of Prague, Ostrava city representatives, Slezská Ostrava sub-city district representatives,– Hodonín city representatives (including the major of the city). Regional development agencies (North and South Moravia).VSB - Technical University of Ostrava, Czech Academy of Science – Institute of Geonics, EKOTOXA - Centre for environment and land assessmen

At the end, a questionnaire prepared to explore the specific user requirements was handedaround to be filled in by the participants. The outcomes of this questionnaire are incorporated into the specification of stakeholder needs.The workshop was concluded by an excursion to the top of the near mining heap Ema. The heap Ema is a source of the local temperature maximum and its influence on the surrounding local temperature in the neighbourhood will be examined during the project. During the workshop, all pilot cities as well as other participants made important contributions to the topic. However, the main intention of the workshop was to identify the gaps in urban climate data and services supply, which can be filled by the service provider and, most of all, to gather specific needs and requirements of the present stakeholders.

Urban heat is perceived as a critical issue, especially in big cities. Both, Prague and Ostrava are highly interested in monitoring, predicting and mitigating this negative climate phenomenon. However, urban heat is also considered to be an issue in smaller cities, which,in this case, has been confirmed by representatives of Hodonín.

6 CONCLUSION

From workshop the main conclusion can be summary into this short text. For Hodonín, a specific use case has been identified, dealing with different development scenarios at the very local level: the exploration of how the local temperature will be influenced in case that the local gardening colony will be transformed into an industrial/commercial area or other urban land use. Also, Hodonín asked for the exploration of the modifications in the temperature conditions related to the planned construction of the highway bypass around the city.

For Ostrava, the initially required use-case was the exploration of the influence/impact of three heat heaps (related to the local mining activity) on the city’s climate. For both larger cities involved – Ostrava and Prague – the impact of their long-term urban planning strategy on the climate/temperature conditions in the city and the surrounding area would be of major interest. This includes the requirement for different scenarios and predictions until 2030 and 2050.

The next main idea. Users are highly interested in the topic of urban climate/heat. Urban heat is perceived as a big issue. • They are aware of the linkage between urban land use and urbanclimate/temperature. They support sustainable development of the cities – need to address environmental issues, including urban climate in the decision making processes. Biggest climate issues: urban heat, torrential rain events, floods.

6.1 Conclusion for project team and the next steps

First, the more detailed input land cover / land use datasets (than the currently used Corine Land Cover layer) will be collected and integrated into the UrbClim model, in order to increase the spatial resolution and accuracy of the results – this will cover, Copernicus Urban Atlas Layer (0,25ha MMU) – for City of Ostrava and Prague,• Local urban planning database for Hodonín City (which is not covered by Urban,Atlas), 3D model from OSM (available for all three cities). Precise 3D model of the City of Prague. Using these datasets, temperature maps for all three cities will be generated, in hourly step and in time series, including the year 2012 (defined by Urban Atlas reference year), as well as predictions until the years 2030 and 2050.The basic set of the maps will be generated for all three cities in 100m spatial resolution.

Second, an interactive online platform will be prepared, for data visualisation, multitemporal interactive analysis and scenario modulation/modification. Time-series of temperature maps will be integrated into this platform, in order to provide the users with a simple visualisation and analytical tool. The tool will also have functionalities for statistical assessments at the level of analytical units, including raster values aggregation, interactive selections of units of interest and their benchmarking.

Third, various urban planning scenarios will be introduced by modifying the input land cover/land use layers. This will be done for various levels of spatial detail, i.e. the entire city level and local neighbourhoods. The impact of urban land use structure modification on temperature distribution will be observed and assessed, at the city level also in the sense of meeting the goals/thresholds of climate change adaptation strategies. In order to enable the users to modify their development scenarios on their own (through modification of the input land cover/land use layers), the interactive tool will allow users tomodify the input land use layer and explore the impact of these modifications on the UrbClim model results, represented by temperature maps.

7 ACKNOWLEDGEMENT

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8 REFERENCES

Adaptation Strategy of the Statutory City of Ostrava for the Impacts and Risks of Climate Change : [cit. 08-01-2018]. 8 https://www.ekotoxa.cz/wp-content/uploads/2017/09/AS-Ostrava-Analytická-část-plus-pocitová-mapa-a-zranitelnost-1209.pdf , 2018

Koen De Ridder, K., Lauwaet, D., Maiheu, B.: UrbClim – A fast urban boundary layer climate model. Urban Climate 12 (2015) 21–48, 2015

ISSAR: What is current state and chat are trends in land use in the Czech Republic? [online]. Key environmental indicators, Land and Landscape, agriculture [cit. 08-01-2018]. IT system of statistics and reporting. Available at: http://issar.cenia.cz/issar/page.php?id=1598., 2014

Prokop, G., Jobstmann, H., Schonbauer, A., : Overview on best practices for lifting soilsealing and mitigating its effects in EU – 27 (Environment Agency Austria) [online]. Technical Report – 2011-50 [cit. 08-08-2016], 2011.

Strategic Framework for Sustainable Development in the Czech Republic,. Prague: Ministry of the Environment of the Czech Republic. 2010. 97 pp. ISBN 978-80-7212-536-4. (In Czech), 201

Strategy of Adaptation to Climate Change in the Czech Republic, 2016. [online]. Ministry of the Environment of the Czech Republic 2008 - 2015 [cit.04-01-2018]. Available at: http://www.mzp.cz/cz/zmena_klimatu_adaptacni_strategie. 2016

ESPRIT – a Public Car System

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1 ABSTRACT

The following images and texts taken from the future presentation to be made in April at CORP 2018 conference and used here to constitute a full paper.

Keywords: last-kilometre mobility, car sharing, public car sharing, Horizon 2020, public space

ESPRIT is a disruptive mobility solution that provides a reliable supply of vehicles when and where they are needed, the hardware for a public car system. The ESPRIT project is funded by the Horizon 2020 programme. The project started in 2015 and finishes in autumn 2018. There are 18 EU partners co-ordinated by the CEA (Commissariat à l'énergie atomique et aux énergies alternatives) Grenoble.

Private cars were the dream of the 20th century, but their success has made them the nightmare of the 21st century. However, …

Though urban space was monopolised by private cars, cities are now learning to keep them under control. Here are some before and after photographs of Vienna's main shopping street, Mariahilferstrasse - freed from car traffic in 2012.

One-way carsharing offers the use of a car when required. There are now over a million one-way carsharing members in Germany alone.

Smartphone access technology one vehicle can replace up to 30 private cars. However, one-way carsharing has problems: 1. unreliable vehicle supply, 2. restricted operating areas, 3. dependent on sponsorship, as will be explained ...

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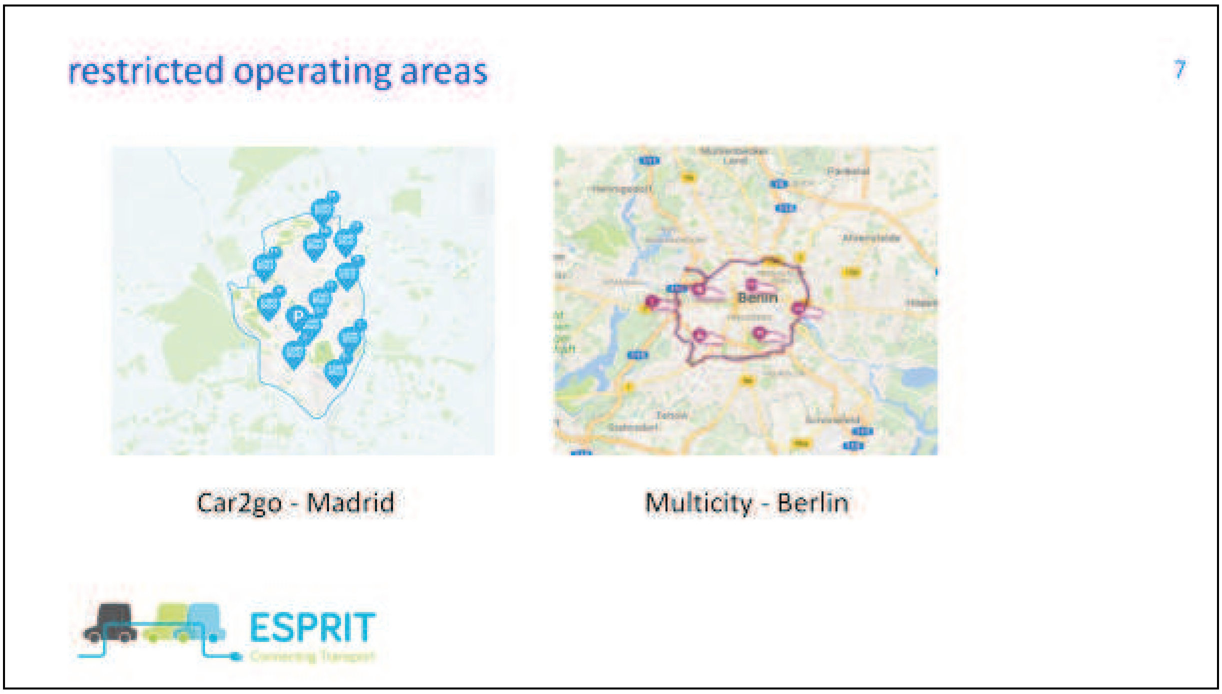
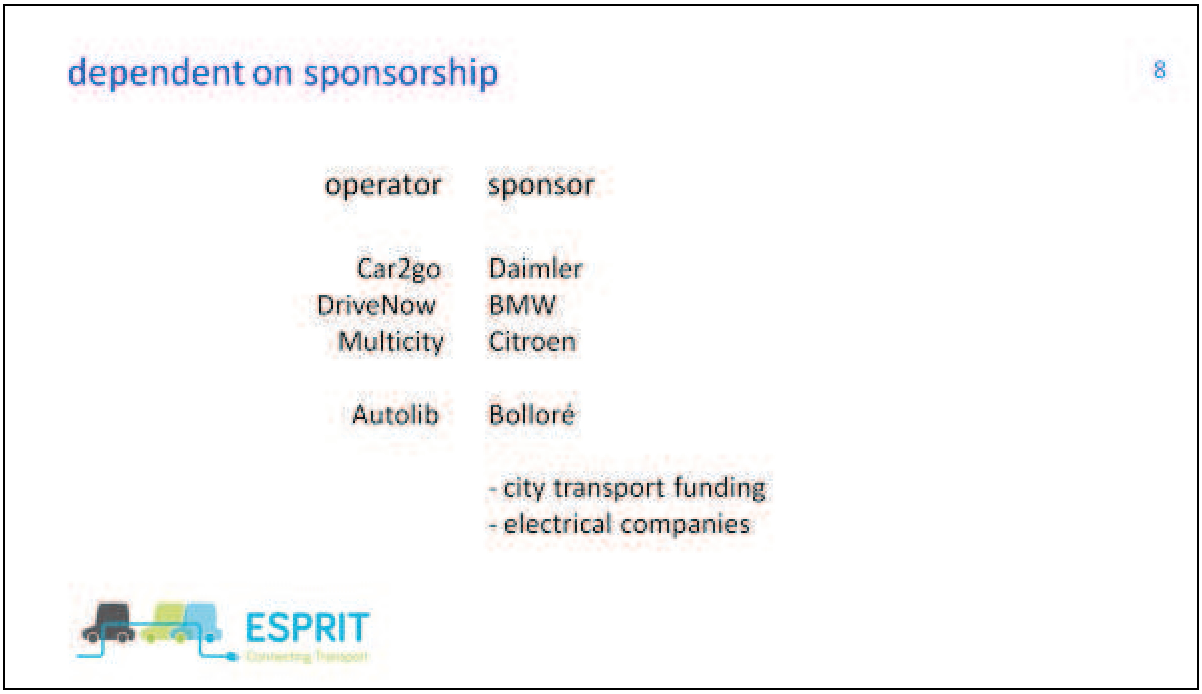
During the morningDuring morning rush hour in Paris, the nearest available Autolib car to Châtelet station is sometimes up to a kilometre away. Iin the evening rush hour in Amsterdam clusters of Car2go cars are left around the central stations by people taking their train home, leaving other areas without any vehicles available.



About one relocator is employed for every five one-way carsharing vehicles, driving them one-by-one to where they are needed. This logistic difficulty therefore limits one-way carsharing to central city districts only.



Due to limited supply or cars when they are most needed and the restricted operating areas, one-way carsharing is not commercially viable and only exist with sponsorship by manufacturing OEMs, city transport funding and electrical companies.

ESPRIT offers: 1. efficient vehicle distribution , 2. extensive operational areas and 3. viability for all operators.

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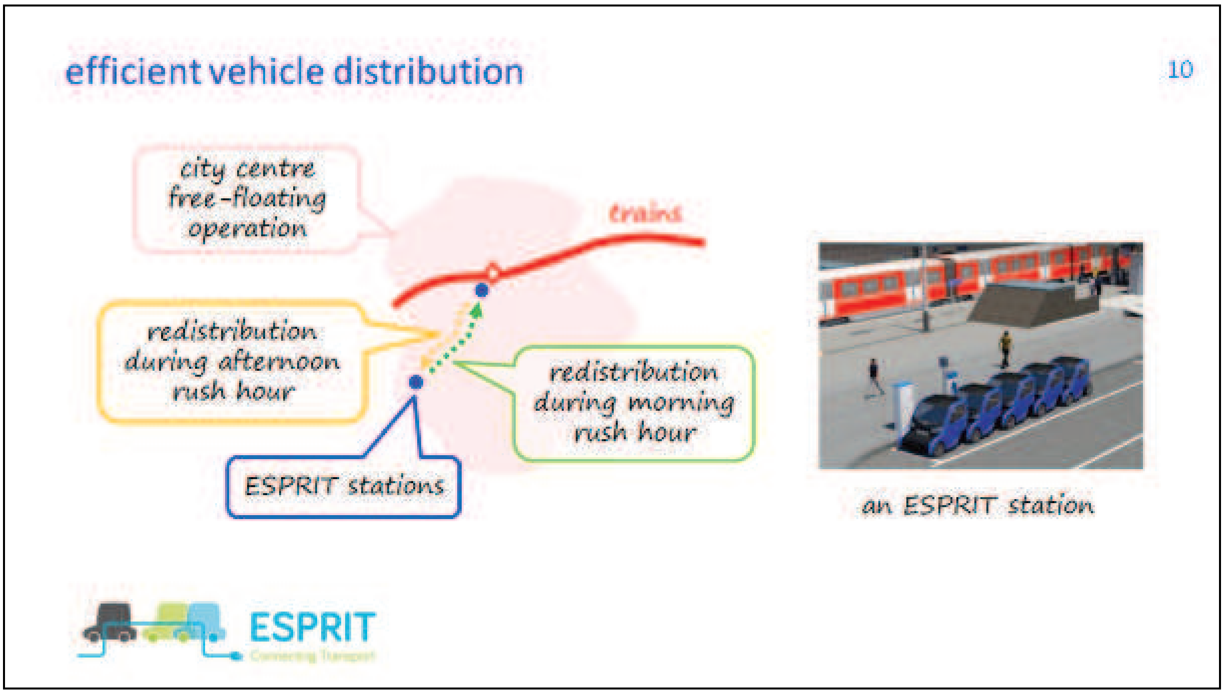
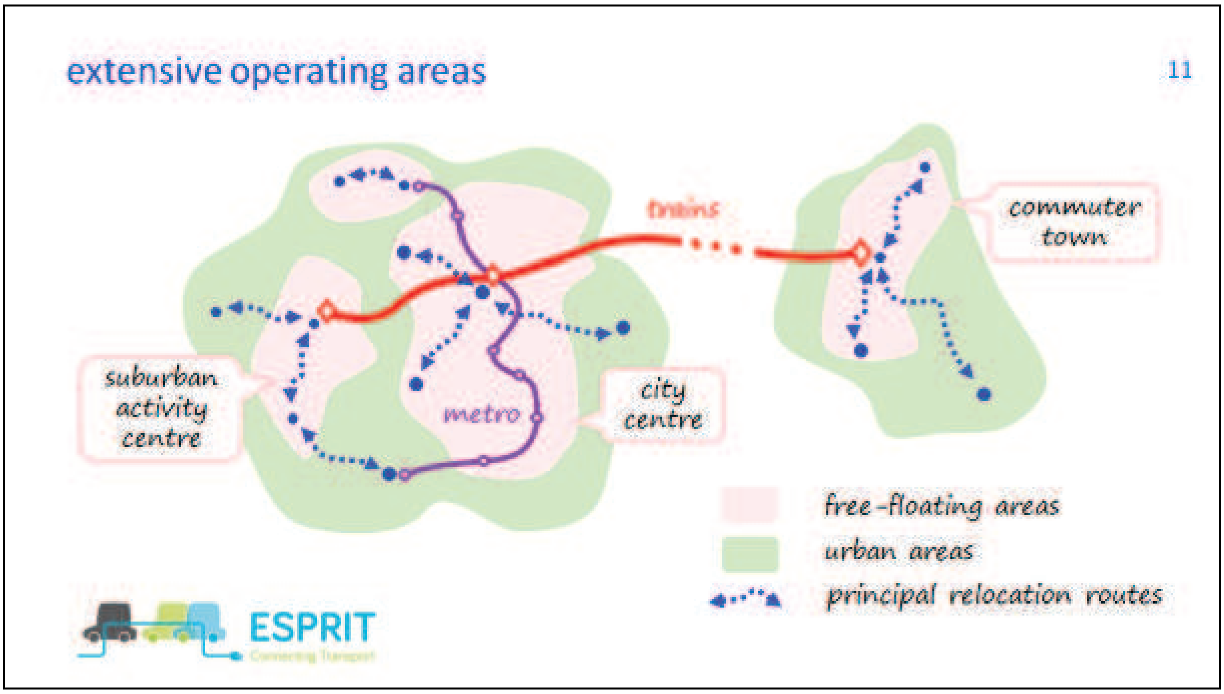
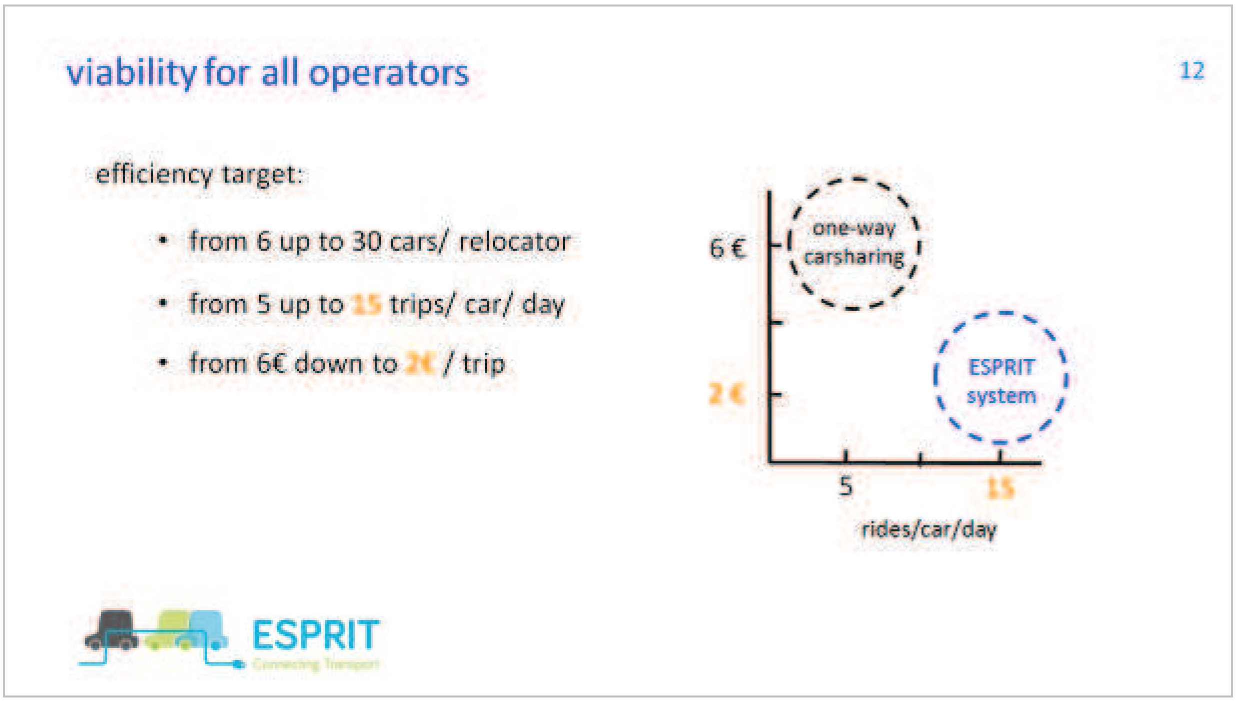


ESPRIT cars can be redistributed in road trains of up to 8 vehicles at a time, enabling a balancing of car supply, in particular during rush hours between train stations and work places.



The ESPRIT redistribution system allows extensive operating areas, with station-based operation through all urban areas and the option of free-floating operation in those of high demand.



The combination of efficient vehicle supply and extensive operating areas should make it possible to increase the ratio of cars per relocator from 6 up to 30 cars, the number of trips made per vehicle increase from 5 up to 15 per day and the fares to therefore be reduced from EUR 6 down to EUR 2, thereby creating service fidelity and commercial viability for all operators, i.e. without the need for sponsorship.

The efficient vehicle supply, extensive operational areas and viability for all operators makes possible:

- a public car system.

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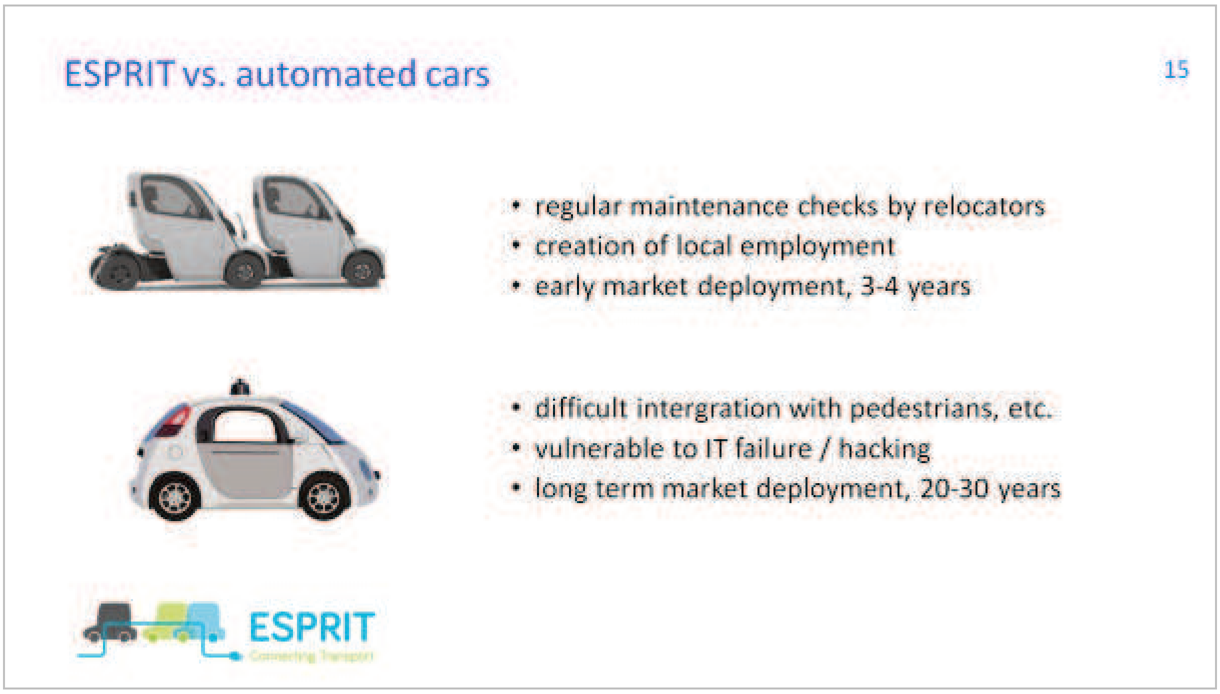
Demonstrations of ESPRIT car road trains and test driving will be made in the 3 collaborating towns, Lyon, Glasgow and L'Hospitalet (Barcelona) in the autumn of this year.

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From Sustainable Cities to Sustainable People – Making Behaviour Change towards Sustainability a Priority in Urban Planning Processes

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1 ABSTRACT

For many years, cities across the globe have developed sustainability strategies, trying to combat environmental pollution and its effects on climate change, health, and quality of life. Even though most of them are following similar strategies, not every city is successful. The discussion about urban sustainability mainly focuses on technical solutions such as public transportation systems, green buildings, and the use of renewable energy. However, most cities don't take into consideration that the main factors that make a city sustainable are the people who live in it. Sustainability is not just about using new technologies to make cities and their systems more sustainable by addressing the technical causes of inefficiencies. Sustainability is about changing behavior of people by addressing the root causes of unsustainable behavior. Building public transportation systems and bike lanes doesn't guarantee that people will use them and drive less. To create a sustainable city, planners have to address the factors that encourage people to choose the sustainable option over the unsustainable one. Hence, urban planning must be about creating an environment that allows and motivates sustainable behavior.

The main findings of this work are five factors that can make a change towards sustainable behavior possible when incorporated into the planning process: availability, accessibility, affordability, attractiveness, and awareness of sustainable options (the five A Planning Approach).

This paper outlines these five factors and explain how they can be integrated in urban planning processes in order to enable long-term behavior change towards sustainability.

Keywords: sustainable urban planning, environmental psychology, sustainable cities, behaviour change, urban sustainability

2 INTRODUCTION

With the adoption of the New Urban Agenda during the UN-Habitat III conference in Quito, Ecuador in 2016, national and subnational governments across the globe committed to "a new global standard for sustainable urban development" that "provides guidance for achieving the Sustainable Development Goals and provides the underpinning for actions to address climate change."[1]

Throughout the last decades, more and more cities around the world joined the movement towards sustainable places, developing climate action agendas and sustainability strategies in order to combat environmental pollution, minimize GHG emissions, and conserve natural resources. Urban planners, architects, engineers and urban designers have been pushing the envelope to make cities and the built environment more resource-efficient. "Planning serves as a tool for translating political purposes into specific policies, programs, and projects" (Hoch 2011), however, strategies such as the implementation of public transit systems in the transportation sector or the construction of green buildings in the building sector are not always successful. Building public transit systems doesn't guarantee that people really use them and drive less (Stieninger Hurtado 2018). Building energy-efficient buildings doesn't guarantee that the occupants use less energy than in a conventional building (Turner & Frankel 2008). The technical solution alone doesn't necessarily solve the problem. What planners design on paper doesn't necessarily work out in reality.

Conventional planning approaches focus too much on the technical causes of unsustainable developments and ignore the root causes of unsustainable user behaviour. The "success of an urban sustainability project doesn't only depend on its technical design and its technical feasibility; it mainly depends on the preferences, needs, and behavior of its users." (Stieninger Hurtado 2018)

This paper looks at this missing link between plans and reality and the human factor of urban sustainability. It will elaborate urban sustainability from a user's perspective, trying to answer the following questions:

[1] http://www.un.org/sustainabledevelopment/blog/2016/10/newurbanagenda/

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Why are some sustainability projects successful and others are not, even though they are following similar strategies and objectives? What is missing in current planning approaches?

Additionally, the necessity of making behavior change towards sustainability a priority in urban planning processes will be explained. A planning approach that integrates the factors that can make urban sustainability projects work out successfully, not only from a technical perspective, but also from a user behavior perspective, will furthermore be provided.

3 METHODOLOGY

This project started in 2009 as part of a dissertation project, trying to find solutions for energy efficiency in cities with a focus on the transportation and residential buildings sectors. Between 2009 and 2013, field investigations were carried out in select cities in Europe and North America (Europe: Vienna, Linz, Stockholm, Madrid, Hamburg; North America: Chicago, New York, Los Angeles, San Francisco, Phoenix, Seattle, Vancouver, Montreal), including expert interviews with city planners, planning consultants, and academics as well as an evaluation of current urban development plans, sustainability plans, and climate action programs. In addition, statistical data on energy consumption in different sectors, mode share, greenhouse gas emissions, and other energy consumption-related issues was anaylzed and compared between the select cities.

The results of these investigations, evaluations, and analyses were clustered into categories of influencing factors and compared with the results from the field investigations. The comparison resulted in five factors that were varying between the different cities and appeared to have a significant influence on the success of energy efficiency strategies: the availability, attractiveness, accessibility, affordability, and awareness of energy-efficient options. These results were published in a monograph (Stieninger 2013). It describes a new planning approach that incorporates these five factors in order to create new energy efficiency strategies by focusing on people’s behavior (the Five A Planning Approach).

Over the past four years this project has been continued and further elaborated with a stronger focus on the psychological part of behavior change in general and the way planning processes are being organized, including additional investigations in cities in the U.S. (Washington D.C.), Europe (Paris), and Colombia (Medellin, Cartagena, Bogota) and the application of the five factors to the broader sustainability topic (resource efficiency and urban climate action). Furthermore, the Five A Planning Approach was discussed with experts from the international planning and sustainability community during various presentations and panel discussions at conferences hosted by the Chicago Architecture Foundation (2014), the U.S. Green Building Council (2015), the American Planning Association (2016 and 2017), the Inter-University Sustainable Development Research Programme (2017), and the Society for the Advancement of Socio-Economics (2017). In addition, input from further literature review on environmental psychology and new findings from field investigations were incorporated in the approach. For this paper, the previously elaborated planning approach was transferred to the broader urban sustainability context.

4 PLAN VERSUS REALITY – THE HUMAN FACTOR OF SUSTAINABILITY

Despite the efforts towards sustainability and resource-efficiency undertaken by urban planners/designers, architects, and engineers when designing green buildings, public transportation or renewable energy systems, the best design doesn’t work out if the users don’t use the system the way it had been designed to be used. Examples for this phenomenon, such as the Valley Metro lightrail in Phoenix, Arizona and the Solar City in Linz, Austria, have been described in previous publications (Stieninger 2013, Stieninger Hurtado 2018) and will here be mentioned only briefly.

The award-winning Solar City in Linz, Austria was meant to be a showcase for sustainable urban development, featuring solar energy systems, low-energy buildings, and a public transit connection to the city center of Linz. However, a post-occupancy evaluation done by the Johannes Kepler University in Linz (Lins 2009), showed that less than 15% of the people who lived in the Solar City used the tramway for their daily commutes and more than 80% were still driving. Furthermore, the lack of knowledge on how to use the building ventilation systems efficiently resulted in an increase of energy consumption. The lack of knowledge on how to use HVAC-systems efficiently in green buildings in order for them to function the way they were designed is one important factor that influences the behavior of occupants. A study on the energy performance of LEED-certified building by the New Buildings Institute (Turner & Frankel, 2008) confirms this issue.

The Valley Metro lightrail in Phoenix was meant to spur urban development along its over 20-mile long corridor. However, due to the financial crisis the expected development didn't take place and only a few people used the lightrail for their daily commutes (mainly students and people who couldn't afford a car), as driving remained more attractive than taking the train with plenty of inexpensive parking options and an extensive street network. (Stieninger 2013).

How can planners and designers make the missing link between what is planned and how it is used part of their planning processes? How can they make sure what is being designed is in line with people's needs and at the same time results in more sustainable behavior? How can planners make sure the users behave the way it was expected in the plan?

Looking at the mentioned examples, one major factor that seems to affect user behavior is the design. The way the buildings of the Solar City were designed was not self-explanatory to the end users and therefore they weren't able to use the building systems efficiently. The design failed in that respect; it couldn't meet its purpose. How must planners design the built environment so the desired behavior (intention of the design) takes place? Gibson's concept of affordances (Maier & Fadel & Battisto, 2009) and affordance-based design (Norman) ask for this relationship between the built environment and its users. Any design that doesn't meet its design purpose is considered a failed design.

The post-occupancy study of the Solar City, furthermore, showed that only 25 percent of its occupants moved to the Solar City because of its award-winning, green/sustainable design. The majority, however, moved to the Solar City because of its suburban location outside of the city, offering green space, proximity to the city, and the affordability of big appartments in that area (Lins 2009); factors that support urban sprawl and are therefore considered as unsustainable.

Many barriers have to be overcome in order to make a behavior change in daily activities possible. Humans are creatures of habits and the simple construction of a public transit system or a LEED-certified building won't make that behavior change happen. Those barriers include technical aspects that enable the desired behavior as well as organizational aspects that build the awareness of sustainable options, explain usage to the user, and give them incentives to make the desired changes.

Up until today, cities have been mainly focused on the technical aspects, providing the infrastructure, but missing the question of how convenient or even possible is usage for the actual user. The knowledge and awareness of options and the obvious benefits of using them are being neglected. Planners have to keep in mind that as long as previous, unsustainable affordances of the built environment remain unchanged, the new sustainable options will be very hard to sell. Incentives and positive reinforcement for using sustainable options as well as disadvantages and negative reinforcement for using the usual, unsustainable option, must be clearly communicated in order to make behavior change possible (Skinner, 1971 & 1987).

5 THE FIVE A PLANNING APPROACH TOWARDS SUSTAINABLE CITIES

Obviously, the main problem of urban sustainability projects are the missing drivers for behavior change, the factors that can overcome the above mentioned barriers. The remaining question is what do planners / designers have to do to not just offer the hardware and software for a more sustainable life, but to also make people want to use it.

The evaluation of sustainability projects resulted in five factors that are essential and have to be integrated in sustainability projects in order to make a behavior change more likely:

"It is essential that sustainable options are (1) available, (2) accessible, (3) affordable, and (4) attractive, and people have to be (5) aware of them - the five A Planning Approach (Stieninger 2013). In addition, it must be obvious that the benefits of the sustainable options exceed those of the unsustainable options. According to Skinner (1987), people are more likely to change their behavior if there is an obvious consequence for choosing the unsustainable option. The consequence must therefore be an obvious disadvantage for choosing the unsustainable option over the sustainable one. The unsustainable options should be less attractive and more expensive than the sustainable options, with limited availability and accessibility, and people should be aware of these disadvantages." (Stieninger Hurtado, 2018), see also figure 1.

Availability:

First of all, sustainable options have to be available in order to make behavior change possible. Without a public transit system or bike lanes, people won't be able to give up driving. This is what many cities have been working on for the last decades, making sustainable options such as public transportation systems, bike lanes, green buildings, and renewable energy systems available. The next step, however, would be to make unsustainable options unavailable. As the example of Phoenix showed, as long as parking and four lane streets are still available, the existence of a public transit system alone may not be enough reason for people to change their behavior.

Accesssibility:

Sustainable options have to be physically and legally accessible. That is, for the case of public transit, it has to be accessible from every place in the city, not just in downtown. In order for people to be able to take the train to work, they have to have access to a station from their home and their work place. At the same time, when it comes to the urban fabric and the problem of urban sprawl, physical and legal accessibility of suburban, sprawling areas through highways and zoning maps that allow sprawl to happen have to be changed. As long as people are able to physically access sprawled areas outside the city in their cars and they are legally allowed to build their single-family houses in the middle of nowhere, they will keep doing it. Therefore, unsustainable options should not be accessible.

Affordability:

Sustainable options have to be more affordable than unsustainable options. When it comes to green buildings or public transit use, prices are generally perceived as higher than the unsustainable options of conventional buildings and driving. This is not true though. Studies have proved that green builindgs don't have to be more expensive than conventional buildings and, with the right use, a payback through energy and water savings adds additional value (Stieninger Hurtado 2018). Furthermore, prices are wrongly perceived when it comes to transportation. Every transit trip starts with either paying for it or validating a transit card that reminds people of the price they paid for it. On the other hand when driving a car, people are usually not aware of the total costs including the gas, the cost of new tires, insurance, tolls, and the cost of buying a car in the first place. The perception of prices has to be corrected in many cases. However, in many places, the use of public transit is still very high (e.g. a single ride ticket in Washington D.C. costs up to five U.S.-Dollars (depending on the length of travel) compared to only one Euro for an entire day of transit use in Vienna when purchasing an annual ticket). Germany will soon be piloting the possibility of offering free public transit.[2]

Attractiveness:

Sustainable options have to be attractive. The term attractiveness is meant as in beautiful design, safe, and comfortable. Obviously, beauty is very subjective. However, so called "secondary times of transit use" such as waiting times and time needed for the first and last mile can be the main decision factor for people to choose between taking transit or driving (Grohmann 2006). A cut of these secondary times can be as essential as the design and operation of the places where these secondary times take place. A run-down, dirty train station with no benches to sit down, no heating or cooling, known as a place where crimes take place, will definitely attract less people than a new, modern station that offers ample space to sit down, heating in the winter and cooling in the summer, maybe a coffee shop and free wifi, known as a place to meet friends or coworkes on the way to work.

Awareness:

Probably the most important factor is awareness. People have to be aware not just of the availability, affordability, accessibility, and attractiveness of sustainable options, they also have to be aware of the advantages of using them over the unsustainable options. If there is no awareness of the sustainable and the unsustainable options, their advantages and disadvantages, the greenest building and the best public transit system won't be able to make behavior change happen.

[2] https://www.theguardian.com/world/2018/feb/14/german-cities-to-trial-free-public-transport-to-cut-pollution?CMP=share_btn_tw

The Five A's	Definition	Examples
Availability	Sustainable options must be available. The availability of unsustainable options has to be limited.	Walkable distance (500m) to at least one bus or train station from any point in the city; limited parking throughout the city; etc.
Accessibility	Sustainable options must be physically and legally accessible. The accessibility of unsustainable options must be limited.	Public transit accessibility of any point in the city; growth boundaries regulated by law to minimize sprawl & optimize transit use; etc.
Attractiveness	Sustainable options must be attractive in terms of beauty, comfort, safety, and quality. Unsustainable options must be less attractive than sustainable options.	Bus/train frequencies <5 min. during the day; lighting in stations and pedestrian areas for safety; pedestrian areas and shared streets; traffic lights in favor of busses; etc.
Affordability	Sustainable options must be affordable and less expensive than unsustainable options.	Road pricing in cities and on highways; attractive transit passes; free transit or incorporation of price in property tax; etc.
Awareness	People must be aware of the availability, the accessibility, the attractiveness, and the affordability of sustainable options as well as the benefits of choosing them over the unsustainable options.	Create awareness of benefits of sustainable options by obvious design (e.g. visible subway stations), laws and regulations, information and education (e.g. car-free day).

Fig. 1: The Five A Factors of Behavior Change (Source: Stieninger Hurtado 2018)

For a successful integration of these drivers for behavior change into planning processes, the following points are essential:

- Sustainable options have to be available, accessible, affordable, and attractive.
- Unsustainable options should not be / be less available, accessible, affordable, and attractive.
- People have to be aware of the advantages and benefits of choosing the sustainable option over the unsustainable one.
- The five A's have to be integrated into a planning process as motivators for sustainable behavior and discouragement from unsustainable behavior.
- All five A's have to be applied. If only one or two A's apply (e.g. the availability of affordable public transit) and the rest of them are ignored (e.g. unsafe and dirty train stations) it will not be enough for people to change their daily habits.
- The interrelations between the five A's are important as well. That is, for example, the awareness of the affordability, the affordability of attractiveness, or the accessibility of affordability.

6 CONCLUSION

Summing up, there are three main reasons for why urban sustainability projects don't always work out successfully:[3]

(1) Cities focus too much on the technical problems and their technical solutions.

(2) Sustainability is about changing behavior of ordinary people who are living their ordinary lives.

(3) Urban planning should be about creating an environment that allows and motivates sustainable behavior (concept of affordances).

Planners and designers have to integrate drivers towards behavior change into their designs the way they design technical components that help insulate the building, reduce water flow in bathroom fixtures or reduce energy use in LED lighting.

[3] Hurtado Stieninger

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Furthermore, planners have to be aware that they “can’t expect people to behave sustainably just to behave sustainably“ (Stieninger Hurtado 2018). People just want to live their lives and get things done. When planning for sustainability, planners have to consider this and focus on what people really need.

Lastly, taking Gibson’s concept of affordances, an affordance-based design of a sustainable city that automatically affords the possibility of living a sustainable lifestyle without any extra efforts would be the ultimate goal of a new approach for behavior change towards sustainability.

However, these are all very rational considerations. The difficulty for urban planners and city governments in finding successful ways to implement sustainable solutions will always be the fact that human beings are creatures of habits that don’t necessarily base their decisions on rationality or economic models, but rather on emotions. The way the criticism of a lover about one’s bad breath from smoking is more effective than any alert on lung cancer; social pressure and self-identification may be more effective for a behavior change towards sustainability than a piece of infrastructure or a legal regulation.

The American economist Richard H. Thaler received the 2017 Nobel Prize in Economic Sciences for his research on this issue. Limited rationality, social preferences, and a lack of self-control are, according to him, the main factors in decision making processes (Thaler & Sunstein, 2008). When planning for sustainable cities, planners are planning the living environments of an emotions-driven species that is very hard to understand. Even the knowledge about environmental needs does not necesarily result in environmental behavior. Environmental behavior does not correlate with environmental knowledge (Skinner 1987) nor with general environmental beliefs (Corral-Verdugo & Bechtel & Fraijo-Sing 2003). Even if people know it would be better and more sustainable to turn off the light when leaving the house, they don’t always do that for a variety of personal reasons.

The Five A Planning Approach tries to integrate those factors of behavior change into urban planning processes that can be changed and influenced by planners based on the nature of their profession. Factors as discussed by Thaler might never be fully addressed in a planning process, but can be touched by the five A’s. Integrating the five A factors is one way to make the success of urban sustainability projects more likely.

7 REFERENCES

Barr, S. (2007). Factors Influencing Environmental Attitudes and Behaviors. A UK Case Study of Household Waste Management. Environment and Behavior, 39(4), 435–473.

Corral-Verdugo, V., Bechtel, R. B., & Fraijo-Sing, B. (2003). Environmental beliefs and water conservation: An empirical study. Journal of Environmental Psychology, 23(3), 247–257.

Grohmann, P. (2006). Angebotsänderungen im öffentlichen Personennahverkehr (ÖPNV) und Auswirkungen auf die Nachfrage. Vienna: Österreichischer Kunst- und Kulturverlag.

Hoch, C. (2011). What planners do: Power, Politics, and Persuasion. San Francisco: APA Planners Press.

Lins J (2009) Sozialwissenschaftliche Evaluierung der solarCity Pichling. Johannes Kepler Universität Linz.

Maier, J. R. A., Fadel, G. M., & Battisto, D. G. (2009). An affordance-based approach to architectural theory, design, and practice. Design Studies, 30, 393–414.

Norman, D.: Affordances and Design http://www.jnd.org/dn.mss/affordances_and.html

Skinner, B. F. (1971). Beyond freedom & dignity. Indianapolis: Hackett Publishing Company.

Skinner, B. F. (1987). Upon further reflection. Englewood Cliffs: Prentice-Hall Inc.

Stieninger, P. (2013). Changing human behavior towards energy-saving through urban planning. Chicago: LAP LAMBERT Academic Publishing.

Stieninger Hurtado P. (2018) From Sustainable Cities to Sustainable People—Changing Behavior Towards Sustainability with the Five A Planning Approach. In: Leal Filho W., Marans R., Callewaert J. (eds) Handbook of Sustainability and Social Science Research. World Sustainability Series. Springer, Cham

Richard H. Thaler & Cass R. Sunstein (2008): Nudge: Improving Decisions about Health, Wealth, and Happiness

Turner C, Frankel M. (2008). Energy performance of LEED for new construction buildings. New Buildings Institute.

How Do We Live

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1 ABSTRACT

Nowadays, technology is everywhere, in our homes and working areas, we even carry a lot of electronic technology with us. It is one of the most used notions and a part of life. Our houses also have a lot of electronic technology, it relieves our lives. Technology can also make our space more comfortable, saves our time in many ways. However, technology can not physically enlarge or replace our spaces. Flexibility is an essential component of our lives, increases our space and allows the most possibilities through the changes of our lives. It remains a part of our lives and complements our space. How do we live today between a lot of technology and often a lack of living space that many people have? A smart addition of these two components, technology and flexibility would be an ideal combination.

Keywords: smart living, function, flexibility, technology, housing

2 TECHNOLOGY AND HOUSING

Technology is one of the most mentioned notions; it is also connected with the way we live. All the technology that accompanies us every day has become an inseparable part of our lives and our living spaces. Even in our narrow areas of life, technology helps us to do our everyday tasks faster and more efficiently, so that we are often made better by the technology, but at the same time stressed and over-strained.

If we have not enough space, technology my help us to feel better, like by using a better light or a different kind of technical features. A smart home, can be understood by a lot of technology within and around the house.

Can smart homes be the answer to the challenges of urban living through "smart technologies"? Does it help to replicate the space that is missing? For sure technology is important. Do our homes need so much technology? Is that what people need the most? Or is technology or different building techniques needed just for some of the cases? What is really the aim of living? For sure it is great to live in a smart house with a lot of technology and automation, but it is not something that everybody can afford. What’s the percentage of people that can afford this? Better said, what is the percentage of the people that have a flat with enough space and number of rooms that can meet their basic needs first? What do people need the most? What is really smart, to achieve enough space for people to live, or to have a lot of technology in the house?

2.1 Household

The housing market has become tense in many aspects. Large cities complain about housing shortages, increasing conversions of flats into private property and rising rents. There are solutions that are urgently needed in most major cities; on one hand there is need to maintain the existing number of apartments, but on the other hand there is a need to find solutions for affordable housing. It is important to achieve a comfortable lifestyle in the big cities, so that the quality of living does not get lost. There is value in securing the quality of living, but it must be improved as well.

According to Statistics Austria, Family and Household Statistics 2016, there is a strong increase in one-person households, “in the last 30 years, the number of private households in Austria increased by 37%. The reduced average household size also played an important role: 30 years ago, a household still had an average of 2.66 people, compared to only 2.22 people in 2016”.[1]

[1] http://wohnservice-wien.at/wohnen/smart-wohnen, 2017

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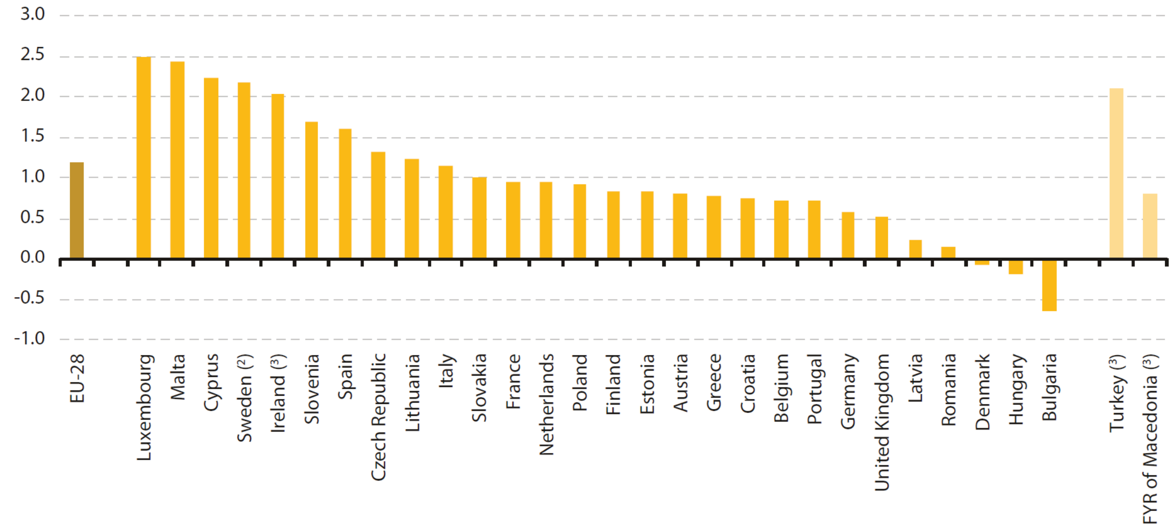

Fig. 1: Distribution Annual average change in the number of households, 2005–13 (1) (% per annum)

Source: Eurostat

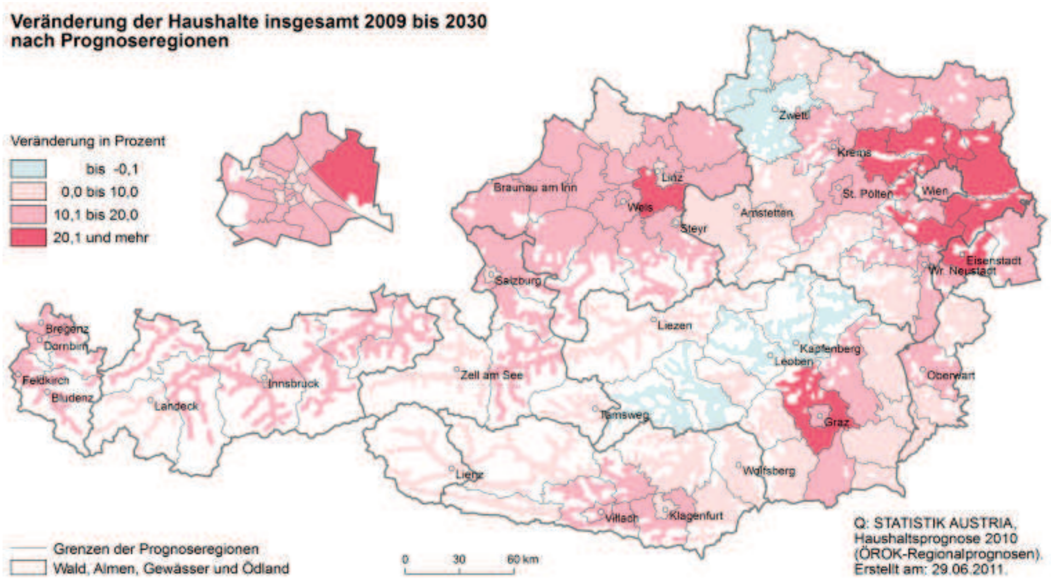

Fig. 2: Changes in the number of households, A-2009–30, Source:https://www.statistik.at

In this sense, there is an increased demand for smaller apartments "The proportion of single people living in private households increased from 10% to 17% over the same period, with the largest group of single people aged over 65, one-third of whom lives alone in a private household. In the 25- to 34-year-old age group, 20% lived in one-person households".[2] As a result, there are more households with smaller household sizes.

In a dynamic life, with relatively rapid changes, as a result of relatively rapid developments in the cities, demographic changes, changes in families, a new approach is needed for finding solutions for housing. At the same time these solutions need to be able to be transformed or altered, depending on life expectancy or changes.

A fully transformable apartment should not cost more than a standard or conventionally planned apartment.

[2] Statistik Austria, Familien- und Haushaltsstatistik 2016

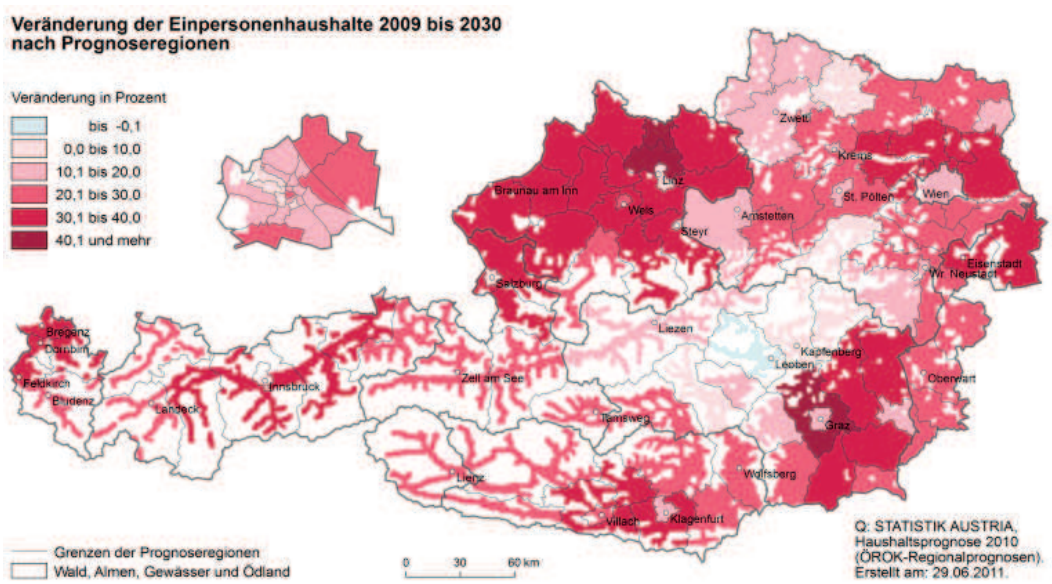

Fig. 3: Changes to one-person households, A-2009–30. Source: https://www.statistik.at/

3 SMART HOUSING[3]

“The City of Vienna has developed certain programs to make housing affordable, so that the housing follows to the people's needs. An example of this are SMART apartments. Every third subsidized apartment built in Vienna, is designed as a particularly cost-effective SMART apartment, whereby compact, cost-effective living so that every square meter is used optimally”. In the equipment and in the open spaces to allow additional individual scope and added value for the residents. “SMART apartments are available in different sizes with 1, 2, 3, 4 or 5 rooms. They are a bit more compact than the classic subsidized apartments and, thanks to their good and compact layout, offer a comfortable living experience, especially more cost-effective apartments”.[4]

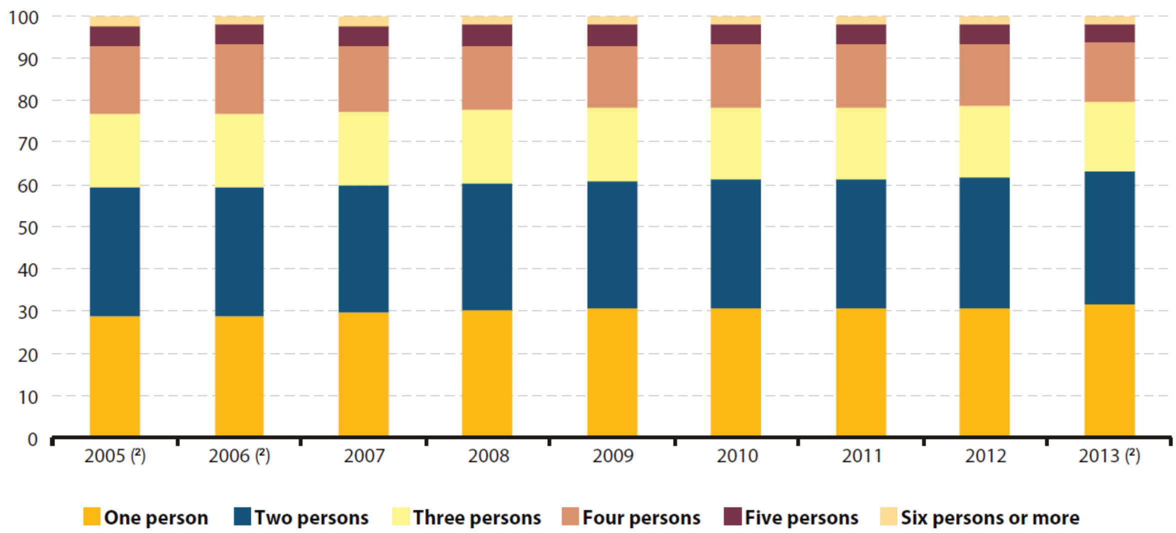

Fig. 4: Distribution of households by size, EU-28, 2005–13 (1) (% of all households). Source: Eurostat (online data code: ilc_lvph03)

4 SMART APARTMENT VERSUS FLEXIBLE APARTMENT

However, the Viennese SMART apartments are reaching their limits, on the question of flexibility outside the first stage of use of this apartment. It is very difficult to alter a first stage apartment later on if there are changes in the family structures.

[3] http://wohnservice-wien.at/wohnen/smart-wohnen, 2017
[4] http://wohnservice-wien.at/wohnen/smart-wohnen, 2017

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The concept of "SMART apartments" is directed towards a solution that has a larger number of rooms in the minimal possible space; meaning a small space, would have as many rooms as possible. Later changes in the floor plans, due to changes in the family structure, are unlikely since most of the apartments are very rigidly built, in the first place. Thus in the case of rented apartments, changes are almost impossible and rarely happen.

Financing versus construction costs: how smart are the "SMART apartments". Although, they should cost less (for the tenants or buyers), since a small space means more flats should be available, they aren't always. This can work only if the city has the prices for this type of apartments under supervision, e.g. with demands etc. In reality, even SMART apartments are more expensive; the construction costs are higher when compared to a residential complex with the same total area, in which each apartment would have a larger footprint. Reason being is that the total number of bathrooms would increase for this building and investors in SMART apartments will not find this investment lucrative, to a certain extent.

Build affordable living spaces not only for profit, but for the environment too. Intentionally create a long term suitable and useful apartment that can be easily repurposed without having to move out, because of the changes in our life.

There is a need for creative ideas in apartment designs that do not cost more than a conventional way of building-planning, so that developers find these new ideas acceptable on a voluntary basis.

As we know from practice, the stricter the guidelines are and the more precious the apartments are, the more resistance is expected from property developers.

5 LONG TERM FLEXIBILITY OF HOUSING

How does a SMART apartment react to changes in life and in family structures? How customizable are our apartments? SMART apartments, are a very good beginning idea and solution from the City of Vienna, but it should be modified and further developed.

Appropriate standards and guidelines have long been dubbed the "adaptable housing" and regulated so that a person does not have to change his apartment. In the case of a disability, a new apartment must be easily altered into a handicapped accessible apartment.

Like with other changes in life, such as changes in the family structures, the family gets bigger, etc., in most cases, the apartment is too small, so a change of residence is required. A change of residence often takes a larger apartment and is associated with high costs. Therefore often, larger families will live in a confined flat, often missing one or two rooms, to avoid paying the additional expense.

In response, SMART flats allow for flexible floor plans that could be easily changeable in later times. Floor plans that are very easily changeable and not inexpensively adaptable should be able to follow our life changes.

Planning is not just a kind of tool used to achieve as much square meters or rooms as possible, but it is a strategy as well. A strategy that we can use to make our living space adaptable on our road of life. A well designed flat can achieve a better architecture by allowing for very easy change at a low cost to parallel changes in different living situations.

This issue is very important; being aware of what is to come in the future is also very important and that is why the planning has to be done in this way according to the building law. If we want to make a similar kind of offer for flexible flats, through rigid laws and regulations over the planning, architects would lose the flexibility on planning, which would not be very reasonable.

There are many good planned flexible flats, for example, with sliding walls etc.

It is a good way of adapting the space constantly, at any time. Except this way of planning becomes a cost issue that cannot be approved on every building, especially on SMART flats.

Technology is a bit too much talked to us. It brings a lot of good and it is also exaggerated to a proven extent. We can achieve a lot with technology; it makes life a lot easier, but also more difficult.

Through technology we can virtually visualize our spaces into which we can also move, modify and complement, etc., but only virtually. In reality, the spaces remain as they are, unchanging from the size. We can change the color, refurnish and decorate, even move the walls, but all within the scope that we are in, to specific and known limits, but not beyond and very much connected with the costs.

The limits of the space we have remain unchanged, during which we can change the spaces we have disproportionately with each other.

Therefore, it is very important to treat the space virtually, while thinking realistically. If possible, try to erase the boundary between the virtual and the real world, in a way that we can achieve a certain flexibility by working to adapt the spaces to each other as needed. The result of merging them together or connecting them with each other will bring all this technology closer and make it available to the users of apartments in a useful form allowing flexibility in the future of their flats according to their needs.

6 CONCLUSION

To make possible for the user of the flats to get involved on planning process for the residents according to family planning (for later changes).

To enable a high quality of life even at low incomes with affordable housing.

To achieve flexible floor plans, so that later modifications in function can be done very easily and with a low budget, according to the changes in life situations.

The more flexible the floor plans for the later modifications, the less relocation and housing demands, the more environmentally friendly the buildings would be (also in issue of technology).

Easy adaptable floor plans are needed, depending on later changes on our life. To be also acceptable for developers on a voluntary basis.

Flexibility is the answer to the challenges we face. The more adaptive the flats are, the fewer required structure changes would be necessary, and accordingly the number of appartment seekers would decrease.

We live in a digital society, this could be used in a smart way to achieve this kind of goal.

Plan for basic long term needs of the people.

7 REFERENCES

STATISTIK AUSTRIA, Familien- und Haushaltsstatistik, 2016: starke Zunahme der Ein-Personen-Haushalte. http://www.statistik.at, Vienna, 2009.
EUROSTAT, People in the EU: who are we and how do we live? http://ec.europa.eu/eurostat, edition 2015
WOHNSERVICE WIEN, Wien ist SMART, www.wohnservice-wien.at, 04/2013

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Inner Courtyards as Public Open Spaces

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1 ABSTRACT

Over the years more and more researches proved, major part of the world's population moving back to the cities and in the future even more people will live there. All this is due to that in the metropolitan regions high level economic activity is taking place and their services getting better quality. Besides of that the cities are not only information and service nodes but also varied cultural and educational centers which providing a lot of opportunities for occupational change or to learn new professions which could be attractive to the high qualified people too. Therefore the cities of the future will have to face significant demographic and sociological problems because besides moving into the city various ethnic and religious groups according to the characteristic of the western countries the urban population shows an aging trend. And in addition the increasing number of the disabled people whose mobility even in a crowded city must be ensured. Therefore the public spaces will play an even more significant role in the cities life because this is the "space" in every city where regardless of gender, age, religion, qualification, etc. all social classes can be found. This is especially true for the public squares and parks where people can not only meet with each other from the different social groups but they can dialogue with each other as well; actively or passively relaxing, having fun, etc. All of this can significantly contribute so that these groups could get know each other. However the public spaces of the cities including the squares and parks looking at their size are bounded. All for this could provide solution for example the opening of the inner courtyards to the pedestrians. Because the inner courtyards similar to the public spaces providing opportunities not only for relaxation and conversation but for buying and entertainment also because the ground floor part of the inner courtyards offering the possibility for the creation of shops, offices, coffee shops and restaurants. Therefore in my presentation I would like to show what is needed to an inner courtyard could become a successful public space.

Keywords: parks, squares, cities, public space, inner courtyard

2 INTRODUCTION

In the urban planning since from the beginning the research of the public open spaces played an important role. And in the 21st Century the topic has become even more important. The main reason for this can be found in the globalization processes. Because in the 20th Century more and more people has moved into the cities and as a consequence the in the 21st Century the growing cities will face significant demographic and sociological problems.

The growing number of the population will have significant effect to the public spaces because the people if they can trying to spend as much time as it possible outdoors. The public spaces are the "places of meeting" where people regardless of gender, religion, age, nationality could have dialog with each other, but there can people actively or passively relax or having fun. And all of this is especially important from the aspect of the disabled and old people. Because the western societies of our time aging are typical therefore form the aspect equal opportunities not negligible that the elderly and disabled people could easily approach the public spaces. (Thompson, 2002)

One of the main reasons the mass moving to the cities is that in the metropolitan regions high level economic activity taking place, and their services are becoming more and more quality. Beside of that the cities are not just information and service nodes, but also varied cultural and educational centers which offering their inhabitants many opportunities for professional change. Or to learning new professions which could be attractive for high qualified people. But most into the poor neighbourhoods moving immigrants belongs to the low qualified. And the growing number of the different ethnic minorities in more European large cities (e.g. France) newer residential quarter has already led to a series of serious conflicts. (Enyedi, 2011) But the public spaces of the cities offering good opportunities that the individual ethnic groups could get know each other, becoming friends, and having dialogue with each other.

But the public spaces of the cities have to be facing with another great challenge. Because due to the population growth especially in the case of the historical city centres will increase the needs to the expansion

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of the pedestrian areas. Therefore in the city centres could ensure the expansion of the pedestrian areas the alternate routes. One of those alternate routes are the inner courtyards which can function as public spaces. Because the inner courtyards similar to the larger squares not just relaxation or conversation are possible on the benches but shopping and having fun also. The ground floors of the inner courtyards are offering the possibilities for the creation of shops, offices, coffee shops, and restaurants. But it's a question what people really needs on a public spaces or an inner courtyard, to enjoy themselves? And similar to a public space how could become successful and well used among the people an inner courtyard? In the next chapters I will focus to those questions.

3 THE SUCCESSFUL PUBLIC SPACE

Within the framework of the Project for Public Spaces worldwide more than 1000 public space were studied which results it turned out that the success of the public spaces basically depends on four things:

- Community spirit
- Use and activity
- Approach and relationships
- Comfort and overall picture

The community spirit which in fact means on the public spaces happening social life is the key element of every successful public space. Besides of the Project for Public Spaces many other researches has proved that for the people is one of the most important activity on a public space besides the meeting with friends or family members to meet strangers. Due to this can be formed bonding not only to the given public space, but to the local community and city also. Besides of the community is also equally important that for what kind of activity offers possibilities the given public space. Because that is what attracts the new people and invites back the old ones, and that makes individual and special the given public space. And the activity could be from the playground across the outdoor games until the cycling anything. On that public space where is nothing to do, will be left and empty because nobody will use it. (Madden, 2008)

Of course none public space worth anything itself if it can't be approach easily and it's not visible. Namely the successful squares are not just well walked around and usable but the there leading roads are also safe and interesting to the pedestrians. Because people are using in higher rate that routes and public spaces which are bounded for example with stores having buildings. This is due to that they felling themselves more secure if a public space has more watchful look. The another specialty of the well approachable public open space is that its surrounding area has a parking place and also accessible by public transport. Last, but not least in vain attractive are for people a public space due to the there taking place social life, activity, or good accessibility, if there is nowhere to sit down. Public spaces have to provide the opportunity that anytime, anywhere could people sitting down of them. Therefore during the design of every public space must be priority the location of street furniture because due to this could them become comfortable. (Madden, 2008)

4 RESULTS OF AN ONLINE SURVEY FORM PUBLIC SPACES AND INNER COURTYARDS

4.1 The background of the online survey respondents

To determine that what is important to people nowadays on a public space I made an online survey. During the survey I collected the answers of 84 people. Looking at the gender of the surveyed a little bit more than the half was woman, and approximately a quarter men. And looking at the education more than half of the respondents had college degree which compared the number of the high school/ technical school, and vocational degree was far behind, elementary and specialized school degree wasn't included in the sample. With regard to the profession more than three-quarter of the respondents confessed himself as employed which was pretty high rate. The number of the students, university students, and entrepreneurs was far behind who haven't even accounted for a quarter of the respondents. The employees in senior positions and the pensioners have participated in the survey in a small rate.

According to the age groups distribution between the 21 and 30 years old more than half were of the surveyed, between the 31 and 40 were slightly less than the quarter, between the 41 and 50, the 51 and 60, and between 61 and 70 were even fewer. Unfortunately from three age groups failed to take samples: Under the age of 14 years, between the 14 – 20 years old, and over the age of 71 years. This is due to in the case of over the age of 71 years probably that this age group interested in, or uses the internet least. Which is especially true to the social networking sites where first appeared the online survey. And probably under the age of 14 years didn't attract interest of the research. In their case certainly would have be one of the most effective method to make the questionnaire query in the school, but therefore source, and longer research time would be needed. However it would have been interesting to see especially in the case of the primary schoolchildren and teenagers what they would like to see on a public space or a park. Because they are who still using all functions of the public spaces (eg. playing soccer, talking with each other on a bench, playing sports, etc.).

4.2 About the creation and function of the public spaces and squares

In the first question the respondents had to give answer about that which are those street furniture, functions, or services which they would like to see on a public space. Not surprisingly most of them had marked the benches (87%) as the best known and most popular street furniture. But because maximum three answer could give each responder therefore only 2% behind form the benches on the second place (85,7%) were the plants (Trees, Bushes, Flowers, etc.) (Fig. 1.). All this is therefore surprising because according to the plants are far behind any further function, street furniture, and service. From this only the fountain was an exception which was marked almost by the half (45,2%) of the questioned. However interestingly drinking fountain significantly fewer people want to see in a public space as fountain. Therefore the water primarily as microclimate and wellbeing enhancement "aesthetic experience" should represented on the public spaces and not as liquid source possibility.

Among the answer options has been marked in similar rate (18%) the bicycle storage and the tourist map. In the case of the first one all this is interesting because the bicycle is one of the most popular and cheapest alternate vehicles what more and more people are using to go to work or school. Beside of that also the cyclist tourists likes to take a rest on the larger city squares which would also justify the placement of bicycle storages. Related to this the tourist map which from touristic aspect has great significance didn't get significant support. Although for the local population could be also useful among others the city's historical attractions marking map on its public spaces.

In our accelerated world the internet and the information flow has become a key element, therefore the question raises right how much feels people necessary to surf on the internet on a public space. Because with the appearance of the "smart phones" on the different restaurants, and besides of the coffee shops today on more public institutions, railway stations, and now in some trains the free wireless so called "wifi" is also provided. But only just 13% has marked the need for using wifi on a public space.

From the another answer possibilities the creation of a public lavatory has marked only one person, three the placement of refuse bins, and held important the placement of advertising columns.

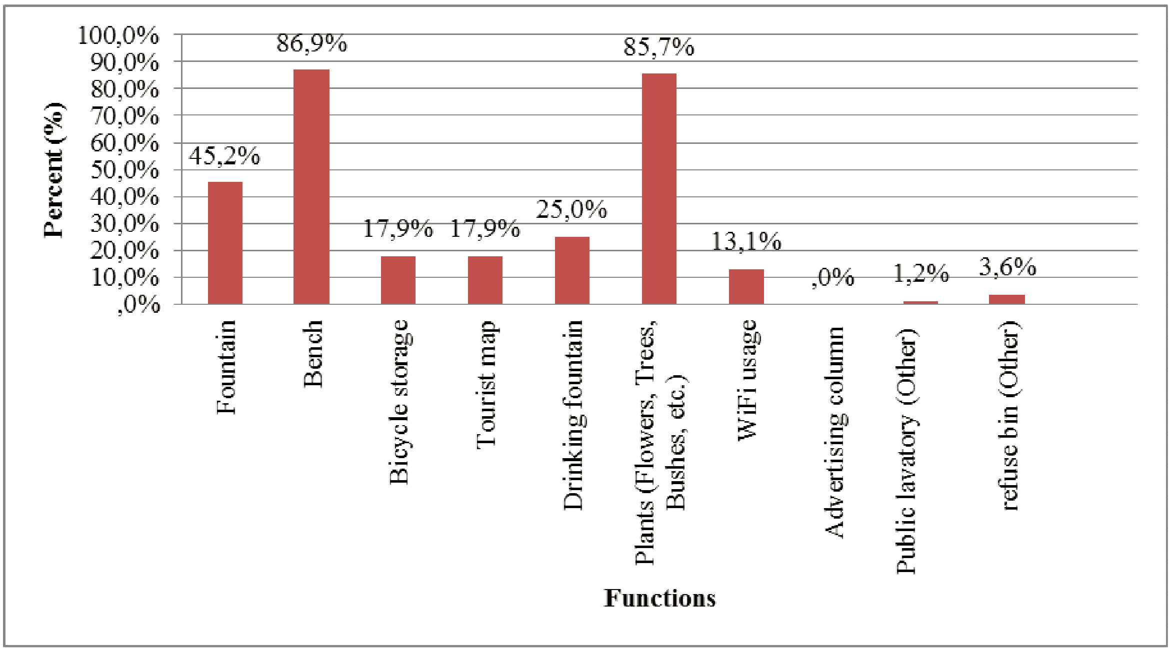

Fig 1.: The rate of the marked public space street furniture/functions/services

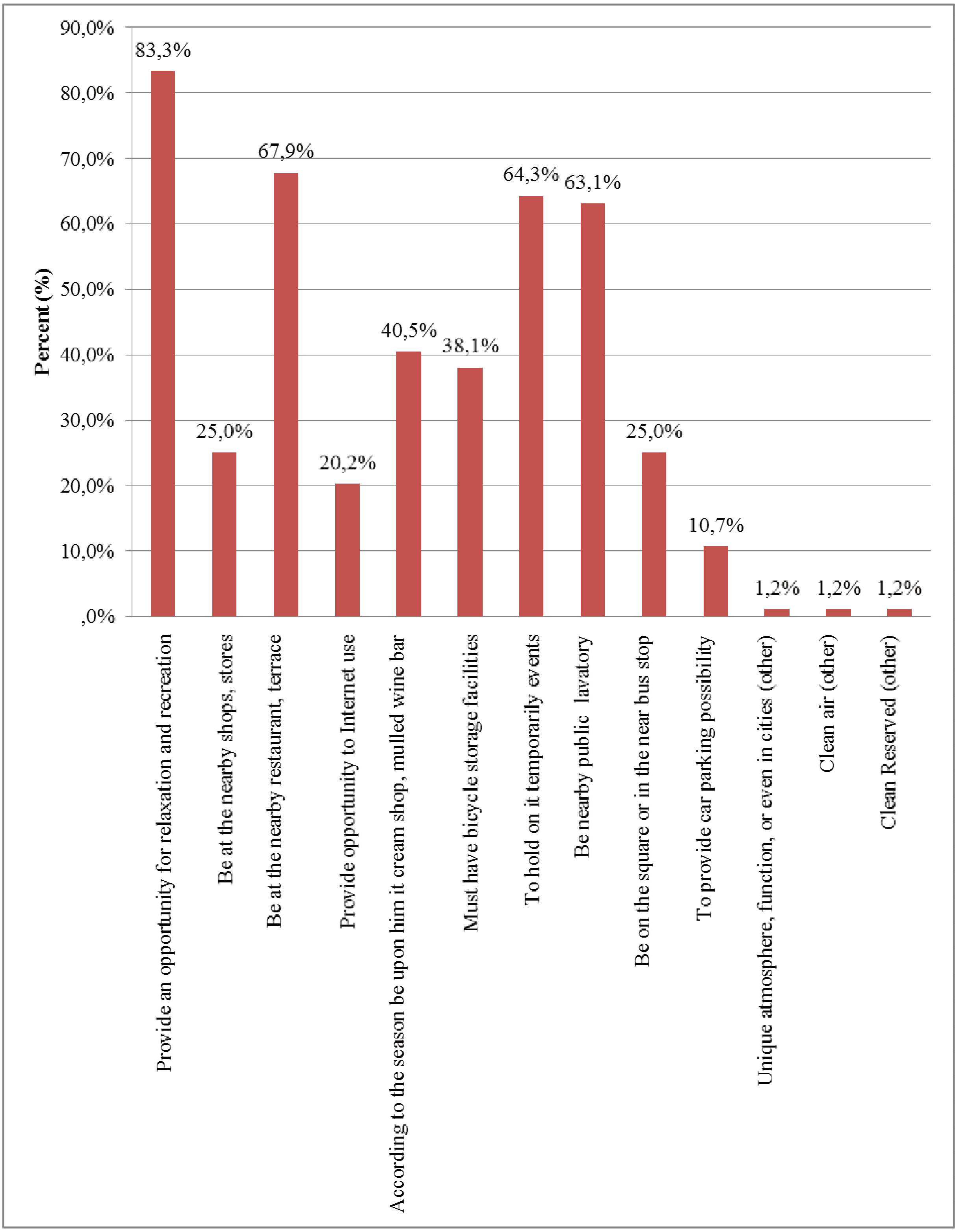

Fig 2.: The use and functional needs of the squares

In the following questions the respondents has to give the answer of which are those aspects which has to prevail on a square or a park. Would they prefer there for example shops, restaurants, terrace, or even a bust stop. Maximum five answers could mark the surveyed form the listed aspects.

In the case of the squares on the first place it was featured that they must provide an opportunity for relaxation and recreation (83,3%), on the second place that near them should be a restaurant with terrace (67,9%), and on the third that it should be holding on them temporarily events (64,3%) which from not far left behind that in the near should be a public lavatory (63,1 %) (Fig. 2.). In the case of this last one was an interesting contrast with the previous question, because as it was showed in Fig. 1. only one person has marked that it would be necessary the placement of public lavatory on the public spaces. According to this the respondents doesn't want that on the squares themselves but near them should be public lavatories. However they also want that besides of relaxing and recreation should be hold on them events, festivals but interestingly only 40,5% would have to liked it that according to the season for example in summer ice cream shop and in winter mulled wine bar works on it.

It was also interesting to see that at this question 38,1% of the surveyed have thought that it's necessary the placement of bicycle storages, and only 25% that nearby of the squares should be shops or stores. But in the same rate they want it also that a square could be approachable even by bus. Internet use like the former, wanted only the fifth (20,2%) of the respondents and parking places even less (10,7%). In the other category three people has given three more such as: Clean Reserved, Clean air and Unique atmosphere, function, or even in cities.

In the case of parks compared to the squares in higher rate was marked that they must provide an opportunity for relaxation and recreation (91,7%) (Fig. 3.).

Most of the parks has playground therefore it wasn't surprise that 77,4% of the respondents still wants that they would be part of them in the future. From this not far falls behind also the varied flora (with 4,8%) but it must be noted that the playground had overtook the basic function of the parks.

The public lavatory similar to the squares was the fourth most often marked (56%) need. But interestingly only the 9,5% of the surveyed wanted dog toilet. All this from that aspect also surprising that most people who lives in the city and who has a dog usually takes his pet walking to the park nearby to his residence. But to the dog faeces removal despite to the legal obligation fails to comply every owner. Although in the parks many families among them especially with young children are who most often spend their free time. Therefore primarily to the young children means serious hygiene risk the not removed or not properly removed dog faeces. However the dog toilet could help not only with the preservation of the parks cleanliness but it could assure also the regular placement of the faeces.

However, the city parks not only for those who want relaxation and to the dog walkers offers space but also for sports enthusiasts. Because most of them got a smaller soccer field, basketball court, or maybe sports field. Nonetheless only 41,7% of the surveyed have thought that they hast to give offer for playing sport although the obesity resulting from the sedentary lifestyle in our country is also an increasingly serious problem. And the parks ensuring free movement possibilities for all age groups. But several parks can be found where next to the sport field smaller snack bar, coffee shop or ice cream shop are also operating. Therefore it's not a coincidence that near then one third of the respondents wants that the snack bars, coffee shops, etc. continue to be part of them or be developed. With this connected it should be extra noted that these catering features were more importantly rated than the placement of bicycle storages (28,6%) or the selective waste collection containers (23,8%). The bicycle storages were only with 1% left behind from the catering facilities but compared to the squares there 10% more people (38.1%) has marked it. Although the parks are approachable by bicycle as well as the squares also moreover there are parks where bicycle learning track has been developed for the children.

Environmental protection is one of the key elements of sustainability which part is the waste management. In order to preserve the squares and parks cleanliness is especially important question the possibility and the way of the waste location. The placement of waste collection containers are today a statutory requirement in the case of the public spaces. But for the selective waste collection containers got other specifications. Right now more parks and squares can be found in Hungary where are available the selective waste collection containers island. Therefore to the park visitors the selective waste collection is insured, and along with it the environmental protection and the sustainability. Nonetheless from the survey it turned out that only 23,8% of the respondents think so that the parks should have selective waste collection island.

As it previously already has been mentioned only 9,5% of the surveyed has marked the dog toilet. Therefore it wasn't surprise that only 10,7% wants dog running place to the parks. Although as it already has been also mentioned in order to preserve the hygiene of the parks it would be appropriate enclose an area on them only for the dogs.

Most people similar to the squares doesn't want near to the parks bus stop, because only 13,1% has marked it, 12% less as in the case of the squares. As the car parking possibility also has been marked 3% less, so it hasn't reached even the 10% in the case of the parks.

Among the other category three people has given separately the drinking fountain, the regular maintenance of the parks, and the cleanliness.

From the questions related to the squares and parks clearly turned out, that for the people primarily in both cases the relaxation, the comfort and the vegetation is the most important. However a significant difference has been appeared because until at the squares most people have marked the restaurants, and terraces until at the parks the playgrounds. The third most often marked aspect in the case of the squares were the temporarily events on them, and in the case of the parks the varied flora. After that in similar rate has been marked in both of them the public lavatory.

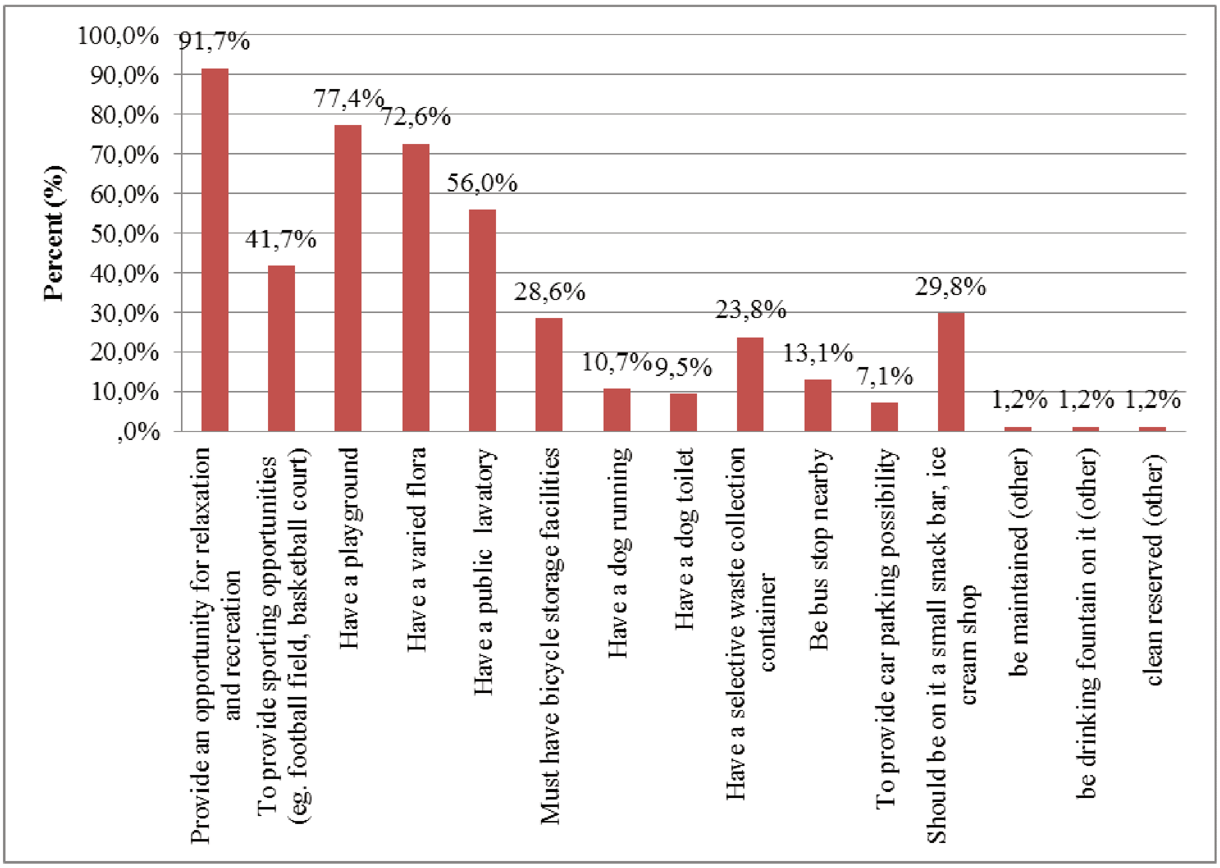

Fig. 3.: The use and functional needs of the parks

4.2 The public use and opening of the Inner Courtyards

As already has been mentioned in the Introduction, in the future the public space would playing more significant role in the cities life which primarily would due to the high number moving. But the cities public spaces size are mostly bounded and there is no real potential for their extension or new squares perhaps parks creation. This is especially true to the historical city centers where the buildings often got historical protection. Therefore on these areas could be a solution for the public spaces extension the opening of the inner courtyard having buildings to the pedestrians. This way the inner courtyards could function further as public spaces which could give place to smaller shops, stores, coffees shops, ice cream shops, or even restaurants. But in the larger courtyards park or playground could be also developed. And unlike to the squares and parks another benefit could be of the inner courtyards, that they can be closed for the night because they are private areas. Therefore the calm of the there living people would be ensured because the pedestrian use of the courtyard would be possible only during the day which significant part most people are working.

Therefore in the next question the surveyed had to answer where it's possible would it be worth the inner courtyards of the old downtown buildings open to the pedestrians. And depending on the courtyards sizes the creation of stores, shops, or restaurants in them. After that they have to be justified why it would be worth or not worth to open such courtyards for the pedestrians.

More than half of the respondents (56%) has marked that he wants the opening of the inner courtyards for the public use and where it's possible the creation of stores, shops, and restaurants. Only 19% were disagreed with this type of development however the rate who has marked the "I do not know" answer was pretty high (25%) (Fig. 4.).

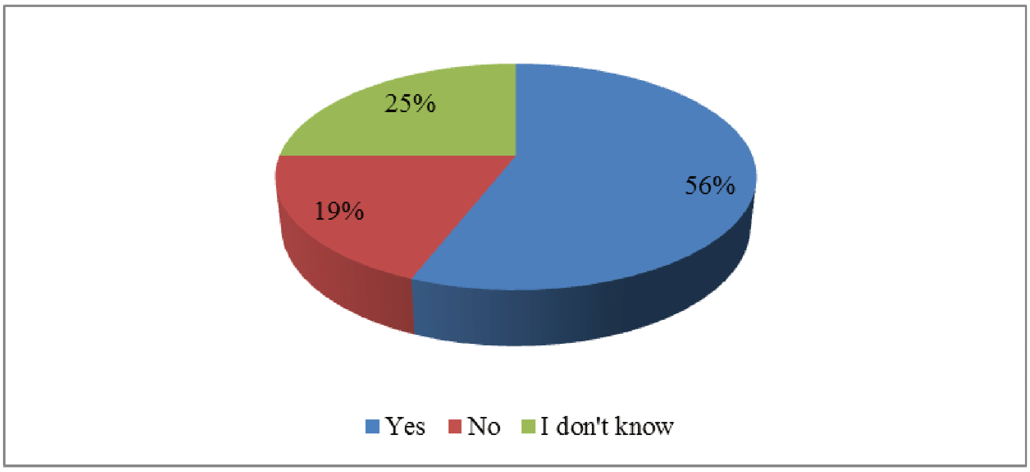

Fig. 4.: The respondents answer regarding on that where it is possible would it be worthy the old inner city buildings yards (for example by the model of the Bécsi garden, or the Gozsgu garden) open for the pedestrians and creating in them even shops, stores, or smaller restaurants

Those who had supported the public opening of the inner courtyards for the pedestrian traffic had primarily highlighted the "mood" and the "magic" of the courtyards. But more people had mentioned the tourist attractiveness and they would like to visit themselves such places. And some people because of the trading and restaurant creation possibility have thought that it would be worth the public open of the courtyards. From the answers received it turned out clearly that for the respondents it's important that the historical city centers should have not only stores, shops or restaurants but smaller "more intimate" inner spaces. It's important for them that the city where they are living should be not just varied and colourful but it should have unique mood.

Those who were disagree with the public opening of the inner courtyards for the pedestrian traffic mostly they have referred to the generated traffic which would confuse the calm of the there living people. And some people had given that answer that the stores there wouldn't have proper traffic or the rent would be so high which due to they have to close later. It must be noted that the survey doesn't had information about that the inner courtyards can be closed for the night. Therefore probably the rate of the answer would have changed if this would be mentioned because as it could be seen, more than half of the respondents had even so supported the public opening of the inner courtyards.

5 CONCLUSION

From the results of the survey can be definitely concluded, that for the people who lives in cities are important, that the square or park which is located next to them must have varied flora. This is confirmed by that English study in which was mentioned, that for the people who lives in cities is important to have in some way connection to nature. (Thompson, 2002) Because by the squares and parks were almost equally marked the plants. And in the large cities the public spaces could provide place for the significant number of plants.

Which must be also highlighted in the case of the public spaces is beside of the plants is the water. But more like the microclimate and mood enhancement function of the water because as it was showed the respondents had prefer more the fountain against the drinking fountain.

The squares and the parks first of all must provide opportunities for relaxation and recreation. In both cases were this marked in the highest rate by the respondents. The other aspects have been separated from each other after that but similar support has become in both cases the placement of public lavatory. The second most supported function of the parks were the playground until in the case of the squares the restaurants and terraces. According to that the parks has to give the opportunity for families to relaxation and ensure the entertainment of children. So it can be said that for the people who lives in the cities primarily considering

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the parks as appropriates places to relaxation for the whole family. In contrast to this the primarily function of the squares besides of relaxation is the “entertainment” and the “catering”. Because besides of the restaurants most people would like to see events on the squares. Therefore we can say that on the essential historical use and function of the parks and squares no change has occurred. And the surveyed had confirmed these essential functions and hasn’t given newer needs.

The rest of the research has dealt with the inner courtyards. As it was showed most people want that where it is possible the inner courtyards should be open for the pedestrians and to have such functions (stores, shops, restaurants, etc.) which can be found around any square. All of this was justified by most people that in this way the city center would be much more charming which is so for the tourist could become more attractive.

According to the results of the research the inner courtyards giving good possibilities for the expansion of the public spaces in the growing population cities. Because the inner courtyards could function as smaller squares island like in the city (centers). Furthermore similar to the squares can be appearing on them the catering and the trade. True due to their size not or only limited could give possibilities for certain services (eg. events) or street furniture (eg. fountain). But these courtyards are also able to become giving place for meeting, dialogue, or relaxation for the people who lives in the cities as it was mentioned in the beginning of the study. Therefore in the future it would be worth to made further researches related with the use and the pedestrian traffic of the inner courtyards.

6 REFERENCES

ENYEDI, Görgy: A városnövekedés szakaszai – újragondolva. In: Tér és Társadalom Vol. 25, Issue 1. pp.5-19, Budapest, 2011

MADDEN, Kathleen: Hogyan varázsoljunk újjá egy közteret? Kézikönyv jól működő közösségi terek létrehozásához, Budapest, 2008

THOMPSON, Catharine Ward : Urban open space in the 21st century, In: Landscape and Urban Planning, Vol.60, Issue 2, pp. 59–72, Amsterdam, The Netherlands, 2002

Innovative Approaches to Integrative Energy Planning – Experiences and Results from the EU Project Urban Learning

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1 ABSTRACT

Many cities in Europe and worldwide are searching for answers and effective approaches to the challenges of implementing ambitious climate objectives in liberalised energy markets while having to accomodate growing populations. Providing new infrastructure, jobs and affordable housing for city dwellers in urban areas offers unique chances for introducing renewables and largely decarbonised energy systems. At the same time, cities struggle with high building costs, urban planning approaches that only partially factor in energy planning as well as governance systems that would require much more collaboration and cooperation between key stakeholders involved in urban energy planning.

The EU project Urban Learning (March 2015 – November 2017) involved seven capital cities across Europe (Vienna, Berlin, Paris, Stockholm, Amsterdam, Warsaw and Zagreb) as well as the City of Zaanstad (NL) and focused on enhancing their capacity to work towards integrative energy planning through improved governance processes. All cities concentrated their efforts on improving governance processes in new development and transformation areas to fulfill their commitments for reducing the consumption of fossil fuels and to respond to the immediate pressure of population growth.

The consortium analysed innovative technical solutions and their implications for planning processes, evaluated existing instruments and tools and explored ways to develop governance solutions that contribute to more effective integrative energy planning. In order to improve communication and interdepartmental exchange between key stakeholders from e.g. planning, sustainability or environmental departments, each partner city installed a so called Local Working Group. Intrinsic to the project design was a strong emphasis on learning from each other and on exchanging insights, barriers and lessons learned regularly between members of the consortium, with local working group members and with other associated cities from all partner countries throughout the entire project period.

After 33 months of collaboration, a number of insights and results surfaced that can be passed on to other cities facing similar hurdles and wanting to improve their own (integrative) energy planning practices and capacities. Without a clear legal base and strategy for energy planning, integrating energy and urban planning will not work. Clear, long-term decarbonisation strategies further support cities' paths toward achieving more integrated energy planning. It also showed that more awareness is required about the need for public energy planning competences in city administrations and beyond. A key success factor includes a constantly high level of cooperation and collaboration among and across city departments and with stakeholders such as energy system operators, energy suppliers, developers and planners. This paper describes lessons learned, insights and results from the Urban Learning project highlighting concrete examples from different partner cities.

Keywords: cross-departmental collaboration, governance, energy planning processes, decarbonisation, integrative energy planning

2 INTRODUCTION

Many European cities are facing similar challenges in their quest to fulfill very ambitious climate change objectives in liberalised energy markets, while having to provide affordable housing and jobs for increasing populations. Cities are interested in finding new and innovative approaches to decarbonise their energy systems by providing energy infrastructure based on renewables in new housing developments, but are often lacking adequate tools, instruments and governance approaches.

In order to respond to these challenges and work towards more integrative urban and energy planning and enhance their governance capacities, seven European capital cities (Vienna, Berlin, Paris, Stockholm, Amsterdam, Warsaw and Zagreb) as well as the City of Zaanstad (NL) collaborated in an EU Project called Urban Learning. Major emphasis was placed on increasing communication and collaboration across city departments involved in urban or energy planning to work towards more integrated planning processes. To that end, cities created multi-stakeholder working groups who have been ideal platforms for exchange at city level.

Cities benefit greatly from a thorough analysis of existing instruments and tools and from creating a complete scheme of their urban planning processes in order to better understand where energy aspects are missing, what adaptations might need to be made and which external stakeholders should be involved. An adapted, upgraded version of processes including energy aspects then serves as the basis for implementation plans.

This paper describes a number of important lessons learned and key insights from the Urban Learning project that can be passed on to other cities interested in a more efficient and more integrative urban and energy planning approach.

3 THE SCOPE OF URBAN LEARNING

The core objective of the Urban Learning project was to enhance existing governance processes in eight different European cities in order to achieve more integrative energy planning. Please refer to figure 1, which depicts the steps in the project described in the following chapters.

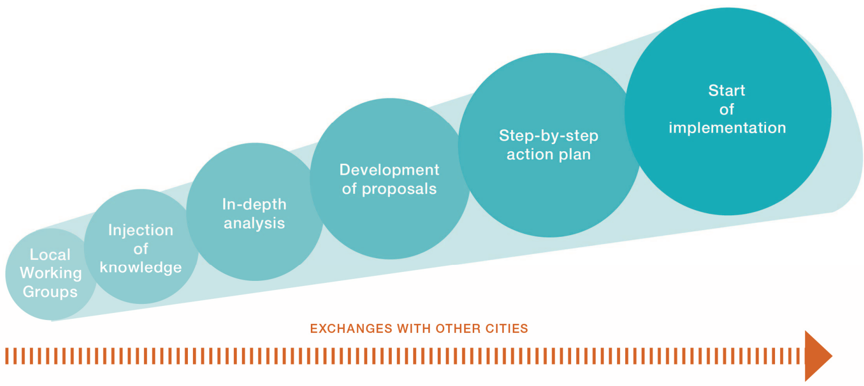

Fig. 1: Main steps in the Urban Learning project: Source: Schmid, 2018

3.1 Why integrative energy planning?

One of the major reasons for all partners to participate in this project was that it was very difficult in day-to-day planning activities to integrate energy issues as a rule into exisiting planning processes. With an eye on climate objectives, however, cities are very much interested in finding appropriate energy supply solutions for (new) urban developments. These include building/ developing low-energy buildings/quarters and using on-site renewables on the demand side to implementing innovative distric heating and cooling systems (low-exergy networks, etc.), smart grids and new storage systems on the supply side. Moreover, it includes also the finding of criteria for steering the development of renewable sources and grid-bound energy carriers, mainly gas and district heating, in an efficient way. A focus on system integration also requires to consider implications for the planning process in a timely manner. Urban planning processes and the way buildings are being constructed (volume, surfaces, uses) as well as the whole structure of quarters (densities, location of grids and possible storage systems) very much impact energy demand and energy use. Thus, urban planning and energy planning need to be much more interwoven than they have been in the past.

In the Urban Learning project, the consortium used the term ‘Integrative energy planning’. For purposes of this project, it is defined as an institutionalised means to integrate energy aspects (demand and supply-side) in more or less standardised urban planning processes. Investing in energy infrastructure also requires a more integrative approach since it is installed for the long-term and often rather costly. In order to achieve such an integrated approach, urban and energy planners, energy utilities, local decision-makers, investors, developers and other stakeholders need to collaborate during all phases of the planning process and in particular at the very beginning.

3.2 The role and lessons of multi-stakeholder groups

One of the major vehicles of the project to improve the status quo of urban and energy planning in each of the Urban Learning cities, was to set up and install a so-called 'local working group' in order to initiate an interdisciplinary dialogue across various city departments and support institutional capacity building. These groups typically include representatives of all relevant city departments such as e.g. urban and energy planning, mobility, environment, sustainability, etc. Some cities such as Berlin included other stakeholders higly relevant to an integrative approach to planning such as energy suppliers and grid companies or housing and tenant associations from the very beginning (Schmid et al., 2015). Others including Vienna chose to work with a core group of representatives from city departments initially. In the course of the project, Vienna formed a new working group that also included representatives from energy and grid companies, because it enabled faster decision-making.

Specific topics discussed at the local working group meetings vary and are tailored to the needs of each of the cities. The number of times they convened also varied from a few times a year to once/month. E.g. the group in Stockholm met about once/month because it was a small executive group of individuals who discussed project specificities that affect the Royal Seaport area and also ensured that lessons learned were directly transferred to the city level (Gigler et al., 2016).

Fig. 2: Local working group meeting in the City of Zagreb: Source: Gigler et al., 2017

Since local working groups played such a key role in the projects, all cities invested considerable time in selecting representatives for the groups that were to work together for years to come. Efforts were also made to foster trust between members, create stable attendance and high levels of motivation. Attention was also paid to allowing for a good transfer of personal learning from members to their respective institutions/organisations who are then responsible to make the necessary changes (Schmid et al., 2015). In particular, the groups focused on increasing understanding of framework conditions in each others' respective organisations and they spent considerable time in drafting the cities' planning processes as they currently stand.

3.3 Lessons from other means of exchange and vehicles for learning from one another

Aside from the local working groups, the project consortium very much focused on maximising possibilities for exchange and discussion during project meetings and it reached out to different groups throughout the project in order to spread new insights and to learn from one another. Workshop formats and time for bilateral meetings between cities and individuals were the preferred means of exchange during consortium meetings. As the project progressed, this time for in-depth discussions became more and more valuable to all partners.

All cities also went on several (inter)national study tours and collaborated with so called 'inner circle cities' in their respective countries to learn from each other (Uong et al, 2017). Each partner city selected a number of cities within its own country to pass on project insights and obtain information from participating cities on e.g. effective tools and instruments or new and innovative combinations of technologies. The dialogue which ensued during those meetings was highly valued by project partners and will continue even beyond the end of the project.

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Communication in local working groups, with inner circle cities and in local/regional/national workshops took place in the partners' native languages which was a great advantage given the highly complex nature of the subject matter. Comparing planning systems from seven different countries or different tools and instruments and how they function, understanding advantages and drawbacks proved to be very difficult in English. Therefore, it took the consortium considerable time to understand the ins and outs of all systems/tools/instruments and to find common ground.

4 ANALYSES OF URBAN (AND ENERGY) PLANNING PROCESSES

The starting point of the approach was an in-depth analysis of instruments and tools as well planning processes. Based on the insights of these analyses, each city developed an approach to integrate energy into the planning process and adapted the related framework such as regulations. Finally, each partner created implementation plans containing concrete steps and a time-frame.

4.1 Results from the status quo analyses of instruments and tools

The main task at the beginning of the project was to thoroughly analyse the status quo of how urban and energy planning actually was done in each of the cities. To that end, an analysis of instruments and tools currently used was undertaken. In parallel, cities began to assess their current governance processes for new developments or transformation areas (see figure 4.2). Initially, all partner cities focused on gathering all relevant tools and instruments that might be relevant to integrative energy planning at all spatial levels (city/region, district, quarter, building). In this process, a total of over 170 instruments and tools (104 instruments and 66 tools) surfaced. A more detailed analysis reduced that number to 22 tools and 22 instruments which proved to be most relevant to urban and energy planning in each of the cities. The majority of instruments have strategic character (partly mandatory) or they are mandatory regulations and laws (Meskel et al., 2017).

A thorough analysis across all cities resulted in a number of findings (Meskel et al., 2017):

- Adequate instruments for energy planning are still lacking
- Missing frameworks hinder the integration of energy issues in contracts or competitions
- Diagnosis tools for early planning phases need to be improved
- Monitoring tools after the implementation phase are rare

Cities are already in the process of developing new ideas to overcome the above described current limitations. Amsterdam has developed an Energy atlas which serves as a database for the TRANSFORM tool (Decision support environment utilizing the power of energy data) which is used to generate maps based on energy and urban planning data and is going to be adapted for use all across the country (http://urbantransform.eu/decisionsupportenvironment/). The City of Stockholm wants to further develop their SRS Monitoring tool which is currently used for the Royal Seaport area only, but is intended to be adapted and applied city-wide. Vienna is using public property development competitions to ensure a high level of quality in the subsidised housing sector in 4 different areas (economy, ecology, social, architecture). All the above examples demonstrate that a number of valuable instruments and tools that consider energy aspects already exist. In many cases, they need to be either adapted or streamlined or made available in more than one context (e.g. subsidized housing and beyond) (Meskel et al., 2017).

4.2 Insights from the status quo analyses of urban (and energy) planning processes (governance processes)

During local working group discussions, city departments realised that urban planning departments were only partially aware of their respective complete planning processes and how energy issues are currently being handled. Therefore, each city embarked on drafting what the process currently looked like in a step by step manner for any given development area from the initial idea to project implementation. This step required detailed interviews with experts responsible for different planning phases, single elements, decision-points, instruments, subprocesses, etc. of any given phase. The following figure provides a simplified overview of an urban planning process which is the common denominator of all cities' planning processes.

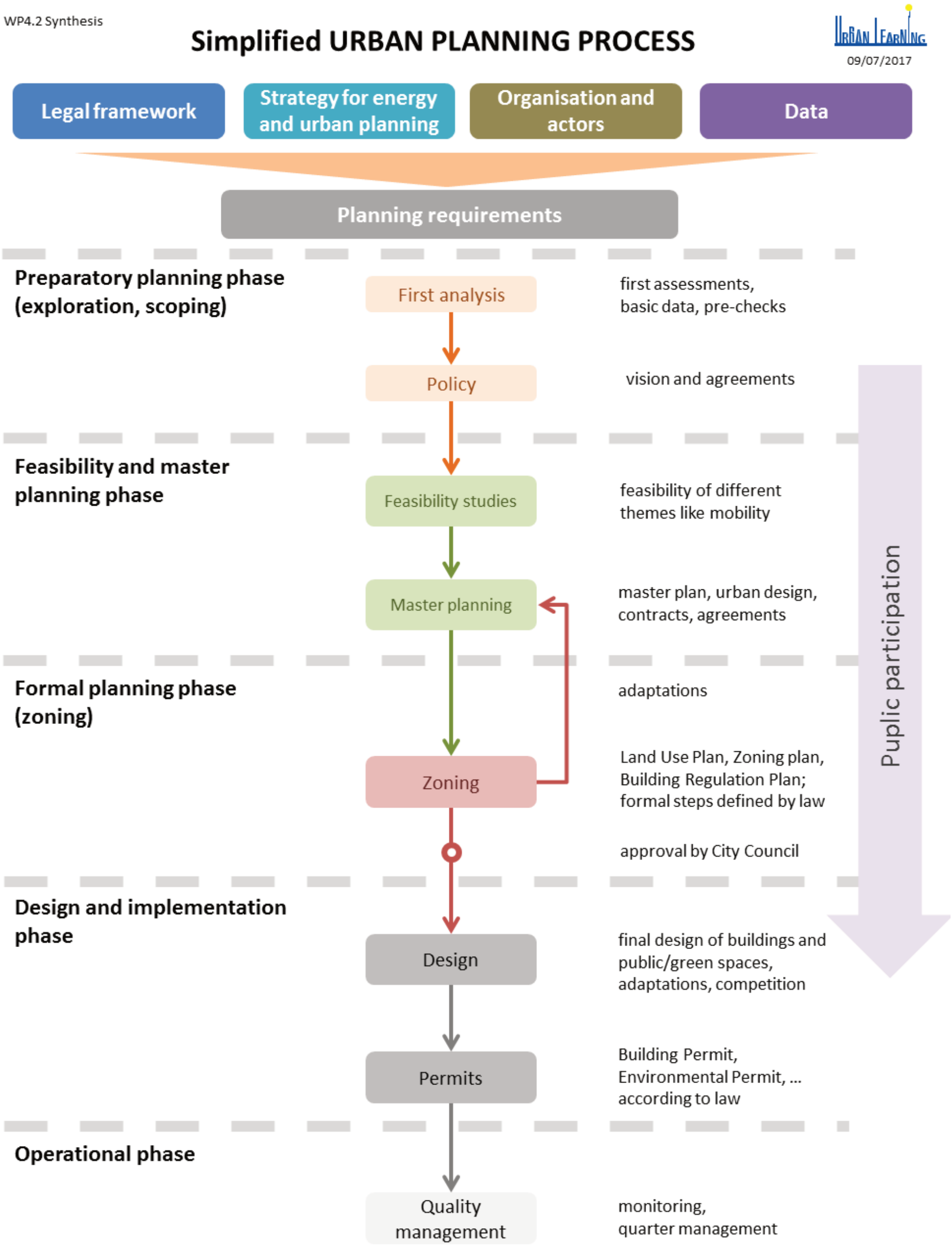

Fig. 3: Simplified urban planning process; Source: Hemis et al., 2017a

This process turned out to be much more time-consuming than anticipated and at the same time tremendously valuable for all city partners, because these governance processes ended up being the basis for all further steps in the project (upgraded integrated energy and planning processes and implementation plans). Discussions about integrating energy and urban planning centered around energy supply for an area. The complete process overview also allowed each stakeholder/city department who may only be responsible for one particular element to understand the entire process, the terminology and all its individual steps and enabled stakeholders to become aware of potential deficits and losses of qualities regarding the need to conduct integrative energy planning (Hemis et.al, 2016).

4.3 Cities in need of upgraded governance processes

In a second step, the cities focused on developing proposals for an upgraded governance process that included new and adapted approaches towards more integrative energy planning. The upgrades not only included changes that affected planning (processes) directly, but rather the legal framework, strategies or potentially required changes in organisation as well (refer to the top of figure 3). For each phase, the changes could include a number of options: completely new instruments (e.g. separate energy zoning plan) or

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adaptations (e.g. integration of energy in urban contracts), new tools (assessment tool of the energy system for different planning stages), new stakeholder(s) or new elements (e.g. a consortium which assesses energy aspects for each project). Figure 4 indicates a number of options according to the urban planning phases.

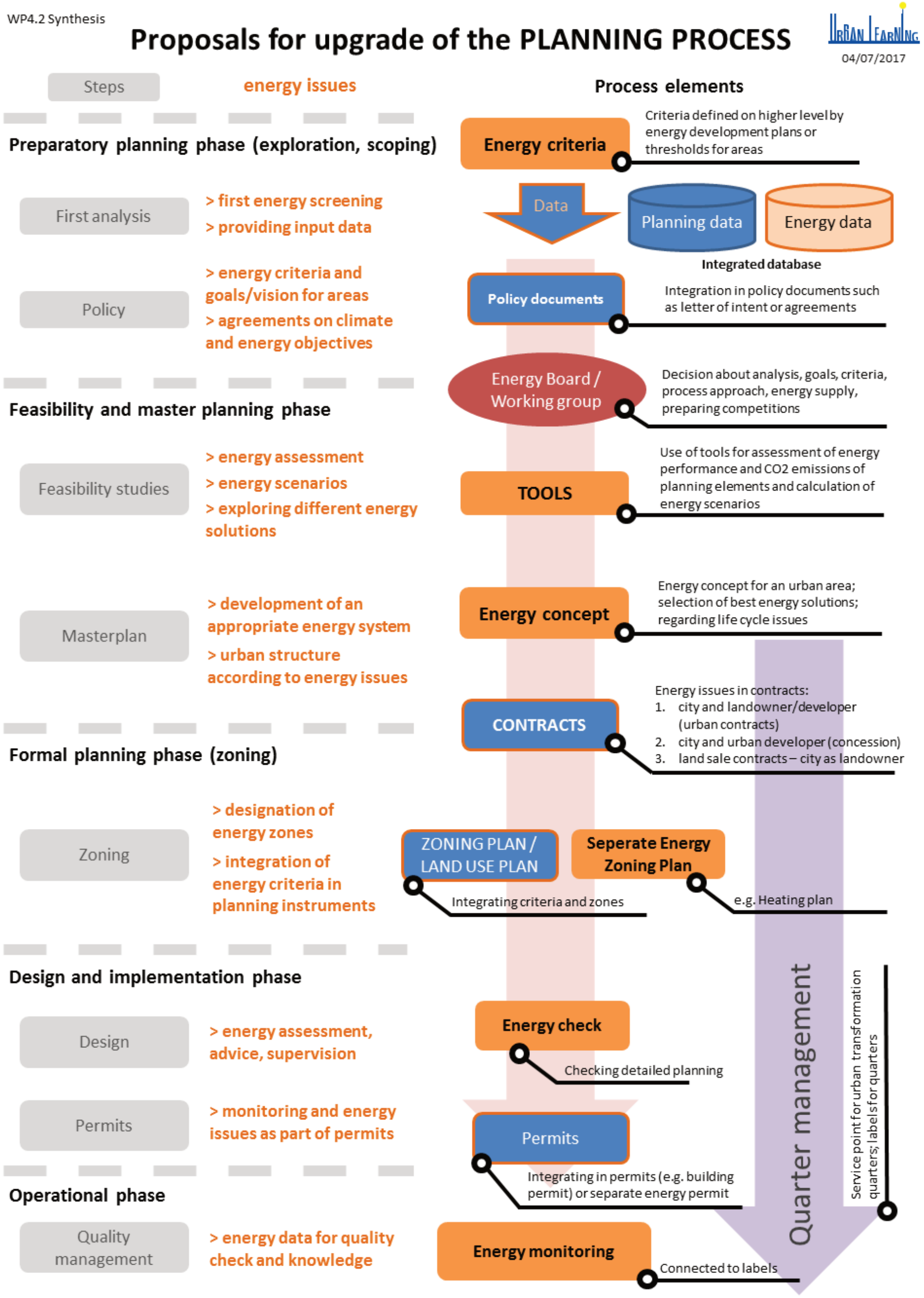

Fig.4: Proposals to upgrade urban planning processes; Source: Hemis et al., 2017a

This process turned out to be crucial for the cities and took a significant amount of time for a number of reasons:

- the cities are very much under pressure to fulfill their objectives to decarbonise the energy system: new developments are thus being observed closely and often carry a high potential to install low-carbon energy infrastructure. Decisions need to be made at the very beginning of the planning phase whether grid infrastructure is being installed or a combination of different renewable energy sources.
- the legal framework and strategic level were highly relevant to the entire process and needed to be linked to the operational level (Hemis et. al., 2017a).
- governance processes need to focus on the quarter or the district level rather than just the city or the building level to optimise possibilities for energy generation and storage across buildings and quarters (Hemis et. al., 2017a).

- each proposal for an adaptation of an existing tool or a proposal of a new process element required negotiations between a number of internal and external stakeholders and different municipal departments before it was adopted into the draft planning process.
- in several instances, different cities were inspired by good practice process elements from another city and proposed its implementation (e.g. SRS monitoring tool from Stockholm, Ecolabel from the City of Paris, etc.)

Case study from the City of Paris

The City of Paris is in the process of developing a new Climate Action Plan (2018), which will contain a carbon-neutral vision for 2050 and a comprehensive roadmap for 2030. Based on discussions in Urban Learning, those objectives will be part of the Land Use Plan (PLU) which can set requirements for buildings, blocks or districts. This link between a strategic document and the land use plan is very important in order to place binding requirements in the PLU. As depicted in Figure 4, the City is also currently developing an Energy Master Plan (adopted in 2019) for the city and the metropolitan region. This plan will include requirements for heating and cooling and at least 50% of the future energy demand needs to be covered by renewable energy sources. Potential changes on the district heating grid are also included in the Energy Master Plan (Hemis et al., 2017a). It will be the basis for new concessions between the City and energy providers.

Another very important element in the operative phase, which was initiated during the project period, is the Energy Board whose responsibility it should be to assess development-related studies, define criteria and negotiate with energy companies regarding supply options. Concessions contracts with developers and land sale contracts will then include the negotiated elements. Throughout the entire operative phase of an urban development project, a so-called eco-district management should be in place with district managers responsible for assessing progress and coordinating stakeholders. Once the project is concluded, it is planned to install a monitoring regime to make sure that the objectives set in the planning phase are actually achieved during the operative phase (Hemis et al., 2017a). These elements were already used in the area of Clichy-Batignolles and should be transferred to other areas.

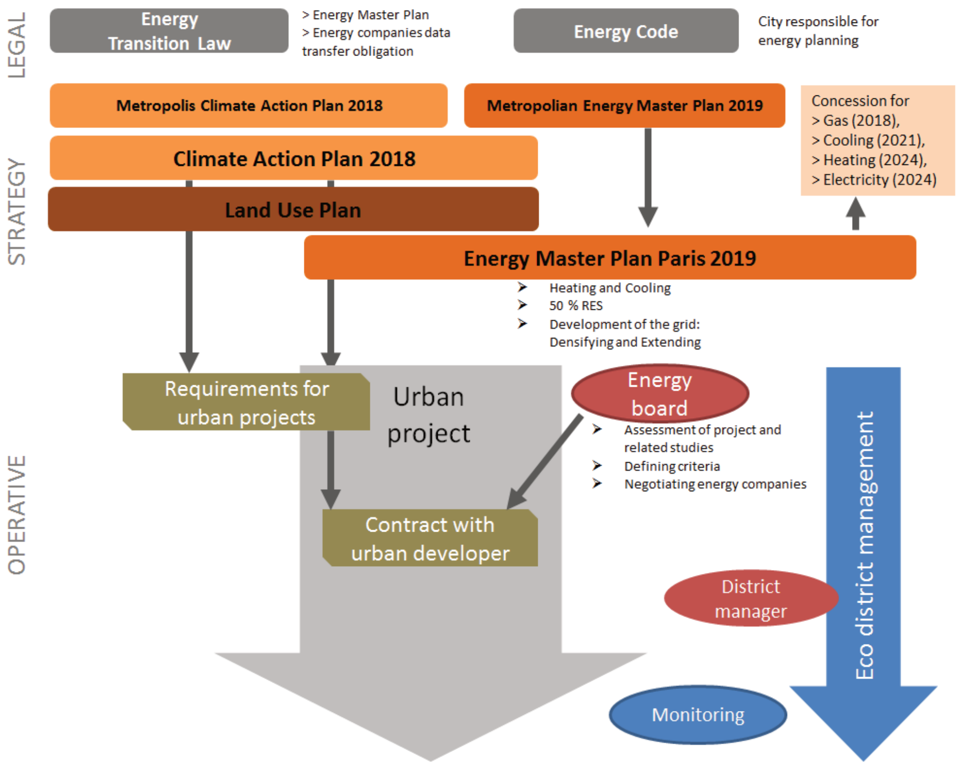

Fig. 5: Overview of the integrative energy planning approach of Paris, Source: Hemis et al., 2017a

4.4 Towards implementation

In a last and final step, the cities drafted implementation plans which built on the previously developed approaches of the upgraded governance processes. At first, each city selected key elements that should be

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part of the plan such as strategies, instruments, tools or monitoring requirements, etc.. Thereafter, necessary decisions and actions as well as responsibilities were defined to ensure that the necessary steps towards realisation are carried out. Lastly, a suggested timeframe was added which ended up being a phase of several months to a number of years depending on the element. Each city spent considerable time in discussions with high level administrative and political representatives before defining elements of the plan. All cities committed themselves to implementing elements of these plans step by step in the coming years.

The synthesis across all cities showed that certain elements were particularly important to have in implementaion plans in most cities. Energy data and studies provide a necessary basis to understand a situation in a given development/city and is necessary to make energy-related decisions especially in the case of using binding instruments (Energy Atlas Berlin, Paris 3D model integrating energy, etc.). Similary important are visionary documents and strategies that have an integrative function and guide cities in their energy policies (Agenda Sustainable Amsterdam, Energy strategies for urban projects in Stockholm, etc.). Some cities also intend to define new/adapted administrative responsibilities for integrative energy planning, because appropriate adminstrative units do not yet exist (Zagreb) (Hemis et al., 2017b).

Finally, the implementation of a certain energy supply system for an area should be ensured by using planning instruments. That could be a new instrument such as a heating plan (Amsterdam) or an adaptation of existing ones (e.g. by integrating energy zones within the zoning plan). Also, the use of contracts between the city and the developer (concession contracts) or the land owner (urban contracts or land sale contracts if the city is the land owner) plays a crucial role (Paris, Zaanstad, Warsaw, Vienna). Tools are important to support the city administration to assess and find energy solutions for an area. Monitoring (Stockholm Royal Seaport Area Monitoring) will help to assess the efficiency of the choosen energy system and can serve as a quality management tool.

5 KEY INSIGHTS AND RESULTS

There are a number of important lessons learned that can be passed on to other cities which are in the process of working toward more integrative energy planning and a largely decarbonised energy system.

Successful integrative energy and urban planning needs a strong focus on clear legal and strategic frameworks such as long-term decarbonisation strategies or on defining the energy planning competences and goals of a city in legal instruments (e.g. in the Planning Act). It is equally important for cities to create a supportive and efficient organisational framework and to dedicate sufficient staff with clear mandates, responsibilities, financial resources and political support to the process. Such a unit or subunit/group in an organisation would assume the role of a ‘keeper’ for integrative energy planning for the long term. (Hemis et al., 2017a). During the analyses it became evident that there is a need to increase energy planning competences in city administrations and beyond to ensure that there is sufficient understanding of all key elements and decision-points in the process and support for the integrative energy planning approach.

It became very clear early on in the project, that excellent data management and comprehensive energy and urban planning databases (GIS) across departments are invaluable for cities. This is needed to increase the knowledge about energy, to have a basis for decisions on the energy supply and finally to justify any measures and regulations for energy. Additionally, there is a need for good models that help in assessing and evaluating the situation in different planning phases and in developing forecasts and scenarios (Hemis et al., 2017a).

Developing planning processes charts that depict the status quo of governance processes and illustrate all relevant elements/decisions points/boards/stakeholders is an important first step for cities to obtain a visual overview and have a tool available that can easily be shown to internal and external stakeholders. In a second step, cities need to add energy-related aspects and create an upgraded urban and energy planning process with a focus on integrative energy planning which is then the basis for an implementation plan. (Hemis et al., 2017a). This approach could be transferred to other important processes (e.g. building permits or other instruments).

Since energy planning is a cross-sector topic, interdepartmental collaboration within administrations and a continual dialogue and cooperation with external stakeholders such as energy providers, grid operators, developers, planners, etc. has proved to be highly relevant in the overall process. To that end, cities can establish working groups which meet regularly and exchange/decide on integrative energy planning aspects for development areas (Schmid, 2017).

Particular attention needs to be paid to the early planning phase, because decisions on the type of energy supply need to be made very early on in any development project. This is especially true for grid-bound infrastructure such as district heating. It is important that energy is integrated in every step of the whole process till implementation and to reduce losses of qualities between phases while using appriopriate instruments and tools.

The important spatial level for integrative energy system solutions is the quarter or building level, which enables to handle energy demand, generation and storage of different buildings and to increase overall efficiency. At the level of quarters, district quarter managers who function as keepers of the development process are required to ensure that all energy planning aspects are carried out as planned in the different planning phases. Since such developments are often long-term, management continuity is key to a successful approach.

All cities agreed that monitoring the performance of buildings at several time-points after completion is necessary, because it would provide an invaluable check whether objectives have been reached/not reached or even overachieved. Feedback from monitoring serves as an instrument for quality management and can be used to adapt policies, energy performance requirements, etc.

The above list constitutes a condensed version of important insights and results that the Urban Learning consortium in cooperation with all its city partners and external partners gained throughout the project period and beyond. A number of the above lessons have already been tested or are already being applied in Urban Learning cities. In the coming years, cities will strive to implement their plans as set out during this project.

6 CONCLUSIONS AND OUTLOOK

In response to the need to decarbonise their energy systems, cities are looking for innovative approaches to utilise innovative district heating and cooling systems and to increasingly install renewable energy technologies when planning and constructing new housing developments. However, existing urban planning approaches often do not sufficiently include energy planning aspects and lack governance systems with a high level of interdepartmental and cross-sector collaboration.

Therefore, the Urban Learning consortium joined efforts to find new and innovative governance approaches towards more integrative energy planning. One of the major success factors towards that goal were multi-stakeholder groups, installed by each city, with the explicit aim to increase collaboration across planning departments thereby increasing their capacity towards better integration of urban and energy planning. The consortium also strongly emphasised continuous learning – through exchange at city level, with other national and international cities as well as through numerous dissemination activities and strongly benefitted from that approach.

It is also crucial that cities draw up their own planning processes and integrate energy aspects into the exsiting process. Involving multiple stakeholders and making potential deficits and chances visible to internal and external stakeholders through these process schemes, carry a high potential to speed up the implementation and change process.

Examples from cities such as Paris illustrate the importance of having a strong legal and strategic framework guiding the governance process and establishing clear links to the operative planning level by changing the land use plan and installing an energy board with key competences and decision-making power for urban development areas.

Installing strict monitoring regimes to assess whether the actual perfomance of buildings after completion correlates with objectives set in the planning stages is very important for cities, because insights gained can be directly used to adapt exisiting policies or requirements.

This project has kicked off a large number of processes, connected individuals across departments, generated numerous ideas and recommendations that can be invaluable for cities who are interested in improving their governance capacities and implementing more integrative approaches towards urban energy planning. More details for interested individuals and city partners on all aspects described in this paper and beyond can be found on www.urbanlearning.eu (e.g. deliverables, publications, toolbox, videos, etc.).

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8 REFERENCES

GIGLER, Ute et al.: Periodic technical report 1, Part B, Urban Learning Project Deliverable, 2016

GIGLER, Ute et al.: Periodic technical report 2, Part B, Urban Learning Project Deliverable, 2017

HEMIS, Herbert et al: Review of current governance processes of urban and energy planning in Amsterdam/Zaanstad, Berlin, Paris, Stockholm, Vienna, Warsaw and Zagreb (D4.1), Synthesis report of work package 4 – Innovative governance solutions for integrative urban energy planning, Urban Learning Project Deliverable 4.1, Vienna, 2016.

HEMIS, Herbert et al.: Integrating energy in urban planning processes – insights from Amsterdam/Zaanstad, Berlin, Paris, Stockholm, Vienna, Warsaw and Zagreb, Synthesis report of work package 4 – Innovative governance solutions for integrative urban energy planning, Urban Learning Project Deliverable 4.2, Vienna, 2017a.

HEMIS, Herbert et al: Implementation plans from Amsterdam/Zaanstad, Berlin, Paris, Stockholm, Vienna, Warsaw and Zagreb, Synthesis report of work package 4 – Innovative governance solutions for integrative urban energy planning, Urban Learning Project Deliverable 4.3, Vienna, 2017b.

http://urbantransform.eu/decisionsupportenvironment/; TRANSFORM tool developed by the TRANSFORM project consortium, 2016

MESKEL, Elsa et al.: Review of instruments and tools used for energy and urban planning in Amsterdam/Zaanstad, Berlin, Paris, Stockholm, Vienna, Warsaw and Zagreb, Synthesis report of Work Package 3 – Instruments and tools under scrutiny (D 3.2), Urban Learning Project Deliverable, Paris, 2017

SCHMID, Waltraud et al.: Report on setup of the local working groups, Urban Learning Project Deliverable 1.1, Vienna, 2015

SCHMID, Waltraud: The importance of integrating energy and urban planning now. In: European Energy Innovation, Summer 2017, pp. 30-31.

SCHMID, Waltraud et al.: Integrative energy planning How to support decarbonisation by integrating energy planning + urban planning. Experiences from Amsterdam, Berlin, Paris, Stockholm, Vienna, Warsaw, Zaanstad, Zagreb, Vienna, 2018

UONG, David et al.: Documentation of study tours and workshops. Urban Learning project deliverable 2.2., Berlin, 2017

ISTmobil: Customer Needs Orientated, Individual Mobility Services in Suburban Areas (Individual Mobility as a Service)

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1 ABSTRACT

January 2014, challenges concerning urban mobility worldwide and strategies for cities to shape urban mobility better are identified (Arthur D. Little, UITP (2014)). The study indicates that in most cities the potential of urban mobility measures is not achieved and most cities are still badly equipped to cope with the challenges ahead.

According to the Arthur D. Little study developements toward individualization and sustainability will require mobility services portfolio extension as well as business model transformation (Arthur D. Little, UITP (2014)). So the developement of urban mobility systems that are able to respond to this challenges is one of the greatest challenges facing cities today.

Connection ISTmobil and Urban Mobility

Initially the concept of ISTmobil was developed for rural or sub-urban areas. These areas are often characterized by marginal public transport supply.

In some cases inhabitants and visitors depend on the private car and have no other choice. One aspect which is linked to this problem is the high rate of motorization within the communities.

Looking at the initial situation and the urbanisation trend, which forces people from rural areas to commute in urban areas, there is also a connection to the topic urban mobility.

In order to strengthen the use of public transport systems and at the same time mitigating commuting flows of motorised individual transport in the cities the ISTmobil system was developed. Therefore a special offer for commuters, the so called „Pendlerabo“, was developed.

The ISTmobil concept

The underlying idea behind the concept ISTmobil is the creation of micro public transport systems for rural and suburban areas which are cross-linked to exisiting public transport supply. Moreover, it should be possible to travel in a region or in near future in the whole country with one card and one booking number.

A „One-stop shop“ supply of complete mobility services would ease the usage of the mobility services.

Another important aspect is to foster cooperations and increase coordination of the different mobility services, which leads to the pooling of regional transport providers.

Figure 1: ISTmobil vehicle

Keywords: micro transport, urban mobility, public transport, individual mobility, rural areas

2 THINKING MOBILITY NEW

Foreseeing the future of “physical” mobility in a time of rushing technical development is hardly possible.

Who is for example able to say which impact “virtual working”, “3D printing”, “automated driving” will have? Even more important could be the continuous changes in society: How will the working world of tomorrow look like? How will the financial power of average individuals develop?

There are only a few factors that have an influence on physical mobility which can be taken as granted:

- The growth of population will continue worldwide
- Urbanisation will continue and effect even sub-urban areas
- Requirements of individuals will become even more versatile, and for example depend on:
  - Age (education / working / support travels)
  - Preferrend type of housing ("My garden")
  - Working Live (8 hour working day? Several jobs? Work from home?)
  - Environmental attidutes of the individual
  - Financial potential of the individual
  - Cooperation within families may decrease
- Individual mobilty with cars in cities will become more and more politically defeated because of:
  - Space restrictions (Congestions / Parking Space)
  - Infrastructure costs (build & maintain)
  - Environmential restrictions (Dieselabgase, CO2 Goals, Saving ressources)
- Internet shopping will increase

It is also important to realise the limitations of current planning procedures and transportation systems:

- Spatial planning is a longterm issue and does not (cannot) consider the continousely changing mobility requirements of the different individuals in a region (static planning – dynamic planning)
- High speed train systems cannot serve widespread areas
- Conventional bus systems are expensive and not very flexible
- Current law (trade law, ÖPNRVG) mainly protects the current status of transportation systems and thus prevents the development of new mobility solutions through legal restrictions
- Current tenders for public transport service are often thinking "old fashioned": instead of challenging transport providers to present "best solutions for the mobility demand of a region" often only the operation of already existing train/bus routes are subject of very ristrict tenders where only the cheapest – not the best – provides have a chance to win
- There is hardly any marketing for mobility services (because we are not used to it)

Taking into account these facts, a modern, future-orientated society should consider to:

- Review the organisation forms of the public transport systems (planning – buying – operation – financing)
  - Solely state planned, financed and organised public transport alone will not be able to solve the challenges of the future
- Review the current legislation about transportation and traffic, thus allowing the development of new mobility services
- Promote cooperations and sharing
  - between cities and their surrounding
  - between individuals
- Apply planning processes with the individuals, not only for them:
  - Observing the mobility behaviour is not sufficient, people should have the chance to state their requirments on mobility continiousely

2.1 Individual MOBILITY SERVICES with ISTmobil

Main goal of ISTmobil is to provide individual, affordable mobility services in rural and sub-urban areas.

It shall be possible to live in such areas without owning a car and without abandonment of quality of life. If people share a ride, it becomes cheaper for them.

The main effects of such services are:

- The quality of life for the inhabitants increases
- The region becomes more attractive (better transport service = less traffic = less pollution)
- New regional jobs arise
- Fostering co-operation

2.2 Constraints, Requirements and Quality Parameters

2.2.1 Contraints

Today, many contraints hinder the development of individual mobility services.

For example, it is currently for financial reasons only possible to develop such new services within the existing framework for public transport services. Unfortunately, these frameworks are not really designed for such services yet.

In Austria, also a strict legislation has to be followed, unfortunately the current legislation favors protection and is not made for fostering cooperation.

Furthermore, people are simply not used to new types of mobility service. Today it is still “EITHER (own car) OR (public transport). Everything else is either not available in rural/sub-urban areas or very expensive.

All in all, public transport is still dominated of very conventional thinking (state planned, financed and organised) and therefore it is a challenge to create new services.

2.2.2 Requirements on individual mobility services

The requirements for individual mobility services are many and manifold and can therefore hardly be described here.

Currently the main focus of the ISTmobil service is on:

- Spontaneous trips in the service region (mainly used by elederly people for shopping, health travels, visiting friends, social reasons)
- Commuter trips (special priced transport service for commuters to public transport intersections in suburban regions)
- Door to door mobility services for elderly people
- Parcel services for the last mile (in development)
- Easy payment for the ISTmobil service by mobilCard

2.2.3 Quality Parameters

When establishing new services it is always a good idea to take into account critical success factor right from the start. From our experience, we can state, that the following issues are especially important:

- Availability, Reliablity, Safety, Payment Opportunities (one accounting), Price

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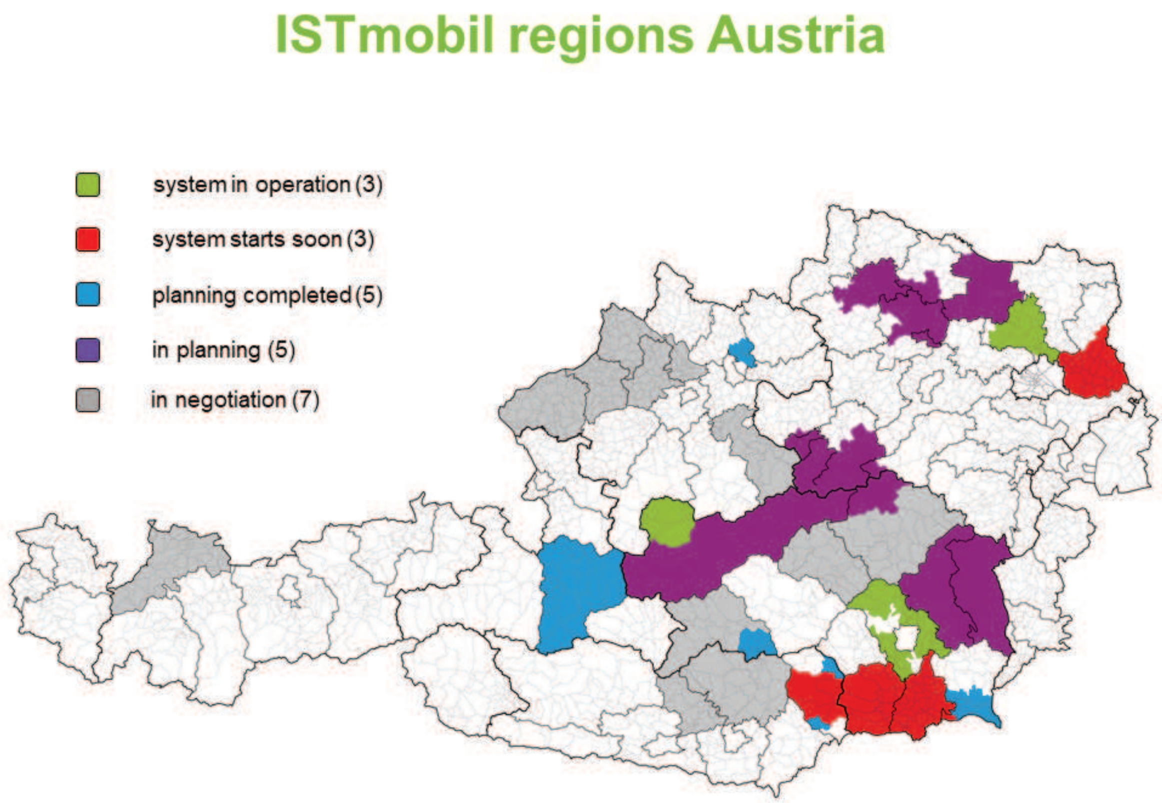
3 CURRENT AND UPCOMING ISTMOBIL PROJECTS



Korneuburg	Lavanttal	Pongau	Oststeiermark	Mittelkärnten
Graz Umgebung	Mobil Südwest	Neumarkt Mühlen	Liezen	Obersteiermark Ost
Narzissenjet	Marchfeld	Bad Radkersburg	Ybbstal/Ötscher	Murtal
		Gusental	Kamptal	Reutte
			Hollabrunn	Innviertel
				Steyr Land

4 CONCLUSION

- Individual mobility services in sub-urban areas will be a “must have” in the future.
- A solely state planned, financed and organised public transport system alone will not be able to solve the challenges of the future.
- Therefore it is necessary to rethink the current planning procedures and organisation form of public transport systems. In accordance current legislation has to be modernized, changing its focus from “protectionism” to “enableism”.
- To be able to design effective and accepted / demanded mobility services, it is also necessary to take individual needs and requirement of potential customers (planning with the customer!) into account.
- Finally succesfull service requires continuous development, improvement and marketing.
- We know what has to be done. Let´s do it!

5 REFERENCES

Stefan Brunner, Organisation of individual transport towards public transport through the concept of ISTmobil , Graz, 2015

Arthur D. Little, UITP, 2014

Beirão, G. & Cabral, Understanding attitudes towards public transport and private car: A qualitative study. Transport Policy, 14(6), 478-489, J.A.A., 2007

Looper: Towards a Methodology of Co-Design Approaches

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1 ABSTRACT

When setting up their own participatory process, researchers and citizens alike are confronted with a wide array of online and offline tools targeted towards facilitating co-creation. With such a multitude of solutions available and approaches differing across countries and fields, how can one make an informed choice? This paper lays out the first results of a methods review that will create a co-creation and co-design toolbox for Living Labs. The review scopes across various disciplines and fields of application. Two promising physical toolkits and three comprehensive handbooks for facilitators are presented, detailing the circumstances under which they are potentially the most useful.

The research takes place within LOOPER (Learning Loops in the Public Realm), a JPI Europe funded research project with Living Labs running in Brussels, Manchester and Verona. The aim of this project is to build a participatory co-creation methodology and platform to demonstrate 'learning loops', bringing together citizens, stakeholders and policy-makers to iteratively learn how to address urban challenges (road safety, traffic calming, air and noise pollution). The review of existing tools serves as a preparatory activity for the Living Labs by developing the preliminary methodology which will form the backbone for the co-design of solutions in the living labs.

Keywords: co-creation, co-design, participation, collaborative planning, mobility

2 INTRODUCTION

When setting up their own participatory process, researchers and citizens alike are confronted with a wide array of online and offline tools targeted towards facilitating the co-creation of solutions to urban conflicts and problems. With such a multitude of techniques available and approaches differing across countries and fields, how can one make an informed choice?

In this paper we present the first results of a methods review undertaken within the project LOOPER (Learning Loops in the Public Realm), a JPI Europe funded research project with Living Labs running in Brussels, Manchester and Verona that aims to build a participatory co-creation methodology and platform to demonstrate 'learning loops', bringing together citizens, stakeholders and policy-makers to iteratively learn how to address urban challenges like road safety, traffic calming, air and noise pollution.

The paper first conceptualizes the terms co-creation and co-design and their pocess steps. The methodology chapter describes the review process and defined criteria. In the results section, we provide an overview and propose a categorization of four different professional fields where co-design approaches are employed. Lastly, five promising face-to-face facilitation tools identified during the review are described, highlighting the context in which they may be the most useful.

3 CONCEPTUAL APPROACH

Co-creation is an umbrella term for a wide range of participatiory and open-design processes. It is an approach to creative practice by moving beyond consultation towards collaboration between the citizens impacted by particular issues. It puts the user and citizen as the 'expert' of their own life at center stage of the design process. Co-creation is usually facilitated by a professional, who might choose a certain approach, and within that various methods or tools to spark creativity and keep a process of reiterative questioning, refining and reflecting going. Scenario or prototypes might be built and reviewed. So, while co-creation as an approach asserts users to be capable experts of their own experiences, they must still be supported through tools that allow them to express themselves (Chrisholm, 2017).

Figure 1 lays out how the co-creative planning process is conceptualized within LOOPER: it comprises three sequential planning stages that form the basis of each living lab. This three-stage process will be conducted twice in each urban living lab for an iterative process of contextualisation, deliberation, decision-making, and implementation.

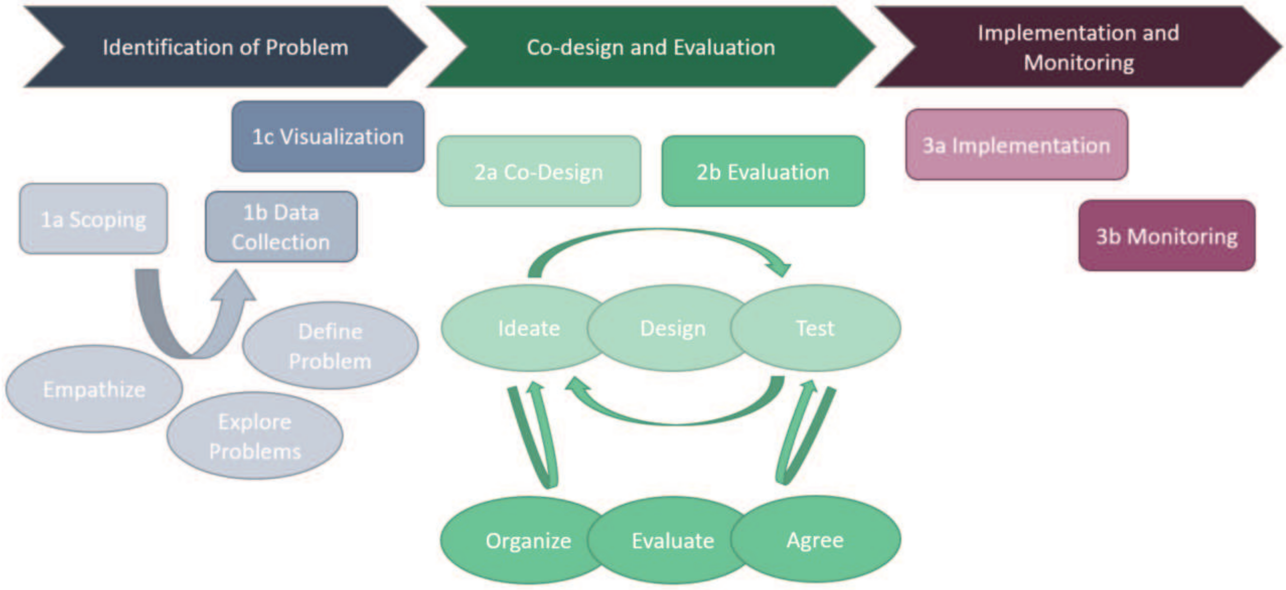

Fig. 1: Conceptualization of the LOOPER process

In LOOPER, the term co-design is defined rather narrowly for a sub-stage, the process of designing a solution from the initial idea to a product ready to be implemented. While reviewing methods for this co-design (ideate – design - test) stage, it became clear that many tools span beyond that, providing methods for the scoping (empathize – explore - define) stage and parallel evaluation (organize – evaluate - agree). Sanders and Stappers (2008) point out that the terms co-creation and co-design are often even treated synonymously with one another. An integrated design process would include stages of scoping and evaluation. In addition, the co-design of ideas and the evaluation of ideas can happen in parallel rather than subsequently. After a phase of creative and unbounded ideation, intermediate reality checks, merging of ideas and compromise to eliminate what is not feasible can be appropriate. Reviewed tools were therefore evaluated in their strength in aiding citizens to empathize with each other, explore problems, define problems, ideate (generate ideas), design (refine ideas) or test (prototype) ideas as well as organize (renking and merging), evaluate (for feasibility, desirability) and agree (compromise or consensus) on solutions.

4 METHODOLOGY

4.1 Review methodology

Methods for co-design are available in many different forms, ranging from publications on government or NGO websites, to interactive websites, wikis, toolkits for sale, publications of source code of pilot projects that have never been made available as software to case study narratives of past projects. In terms of online platforms, some are non-profit yet many are start-ups selling their services targeting public bodies in a specific region. Many of these have never been discussed in academic publications. While marketed to different audiences, underlying concepts may be similar. To efficiently scope such a broad range of potential tools, we conducted an internet search using the keywords listed in Table 1. A total of 54 tools were initially identified and the ones putting too little emphasis on community or design were eliminated. It was then checked for which of the stages of co-design (see Section 2) the remaining could be used. Lastly, they were evaluated in terms of their ease of implementation.

Online	Approach	Living Lab	State of The Art
Digital	Tool	Urban Lab	Literature Review
Web-Based	Support System	Co-Design	
Interface	Technique	Co-Creation	
Application	Toolkit	City Lab	
	Method	Collaborative Planning	
		Co-Operative Design	
		Collaborative Placemaking	
		Community Design	
		Design Thinking	
		Consensus Building	
		Co-Production	

Table 1: Keywords employed in review.

4.2 Defined criteria

During the review, the following aspects of the evaluated tools were identified:

Audience: The methods of co-design are applied in various contexts and professional fields. While similarly trying to engage all stakeholders and creatively innovate, the type of solution designed (physical object or a service) or the underlying theoretical roots may differ.

Medium: Is the tool digital (software or hardware which requires a computer but not necessarily web access) online (focused on online interaction) or meant to be used for face-to-face interaction in workshops?

Type: Various types of tools exist, which can enhance the quality of co-design. Toolkits provide a ready-to-use set of (sometimes physical) materials for workshops. Facilitation handbooks are brochures or books providing a range of workshop methods to choose from. Some of them are online repositories of methods. The category Discourse includes tools (mostly online) enabling communication between citizens. Games allow for a playful approach to the problem. Trainings are offered online and offline to improve a facilitator’s workshop skills.

5 RESULTS

As the above listed criteria implicate, there is a wide breadth of products which can potentially be useful to co-design solutions. Yet, a key part of co-design is the open innovation format and specific circumstances may only emerge during the process. Often it is unclear what type of solution (redesign of public space, routing of traffic, new service, new ruling like new speed limit, limited access rights during weekends) will emerge. In fact, predefined problem framings and solutions are to be avoided (Scholl et al., 2017) as they limit innovation. Similalry, having an already predefined set of tools would limit innovation as well. In Living Labs like LOOPER, it is therefore difficult to predict what will be the most appropriate tool and one needs to leave some room to react flexibly to evolving circumstances. This review therefore remains broad and is a scoping of what tools exist.

In the following section, we will first identify four areas in which co-design and participatory approaches are employed in professional practice. We then provide the first results of the review by presenting five promising face-to-face tools, with a short profile and small debrief under which circumstances they could become useful.

5.1 Co-Design in its various contexts

During the review, we found four professional fields or audiences emerging as recurring themes in the way tools were targeted and framed. We propose the below grouping as guidance and claim that most surveyed tools can be classified in one of these streams. They distinguish themselves by the theoretical roots and academic field from which they emerged and determine for which audience and context a tool has been developed.

5.1.1 Public Service Design

One co-design audience is in the public sector for (re)designing services. Numerous toolboxes have been created by public institutions (often national bodies) who collated useful tools and handbooks for their local agencies to redesign services with their users. These are at their core focused on improving the experience of users of the service. An example would be: How can we improve the experience of delivering warm lunches to the elderly, both for the receiving person, their caretakers and the employee delivering the meals? Designing a service lends itself to different methods than designing something physical. Ideation sessions here are oftentimes revolving around roleplay or the “travel” of a person through the bureaucracy when accessing a service.

5.1.2 Collaborative Planning

In the Urban and Spatial Planning sector, the term "Collaborative Planning" has become popular (Patsy Healey, 1997; Innes and Booher, 2010). Similarly to the sectors of service provision and product design where professionals have come to understand the user to be an "expert" in his own way, urban planners realized the same: The urban planner as the "expert" who can single handily assess the "common good" and make his own informed decision about what will be best for the residents in each scenario has been heavily criticized and reviewed in the past decennia. Depending on the country, and whether in an academic or professional context, it is now often a common position that the urban planning professional understands himself as a facilitator rather than an expert. He brings the necessary tools and some technical knowledge to the table to enable collaborative decision with stakeholders. Especially where urban planning conflicts have reached a gridlock, planning professionals furthermore turn to consensus-building approaches which propose that continued value-based conversation between disagreeing parties can lead to mutually beneficial outcomes (Innes and Booohe, 2010).

5.1.3 Design Thinking for Social Innovation and Product Development

Design Thinking (Brown and Wyatt, 2010) describes academic and popular science field that takes the Designer's approach to innovation to solve real-world conflicts. Here, the focus is much more on the methodology of how a problem is thought about, rather than the interaction between laypeople and designers. It stipulates: the way designers think about problems is effective and even people working outside of the traditional design fields should learn to think like designers when tackling their problems. Therefore many methods propagated by design thinking will likely be highly effective in sparking creativity in urban contexts.

5.1.4 Public Participation

Tools classified as belonging to this group are part of a broader development towards increasing the engagement of citizens in the decision-making processes in public administrations. Aside from some facilitation handbooks, most tools surveyed in this category were online websites. Termed as e-democracy, all-in-one websites are offered to municipalities for their public engagement processes. The rationale behind putting public engagement online is that it allows for transparency and continuous flow of information. However, stakeholder engagement cannot be taken care of simply by launching a website. Most often, there is not enough particpatory culture for real online democracy to take place without parallel face-to-face sessions. Instead, only a minority of the population participates and real-world work (interacting face to face) gets neglected. In addition, going beyond simple information gathering towards empathizing, developing shared values, compromising and consensus-building is hard to achieve without face to face dialogue. For real civil discourse, these online tools would enable to explore the breadth of opinions and people even changing their opinion rather than just giving it. However, some parts of the public may indeed only be reached through the online channel, and its transparency and openness are valuable.

5.2 Face to face facilitation tools

Living labs are first and foremost physical spaces for face to face interaction for open innovation. In this context, citizens are affirmed as experts of their own experiences and capable of reaching solutions. To enable the participants, a planning or design professional facilitates sessions. High quality workshops are therefore at the core of a successful co-design process. To run them facilitators can choose to employ ready-to-use toolkits, choose their own methods from facilitation handbooks or method repositories and undergo training in workshop facilitation. Since single methods (single workshop activities) have been collated and arranged many times into such handbook, this review mostly refrains from analysing single methods. Apart from methods books or physical kits as described below, workshops profit from good materials with which to visualize information and manage feedback. Thick paper cards and pens will allow ideas to flow better. Ideas written down by participants can be put up on walls, rearranged and still be read from a distance.

5.2.1 Physical toolkits

Some toolkits come with physical materials ready to use during the workshops. While incurring costs, it is often good to have as the framework around which to build workshops. In addition, good materials for workshop facilitation can considerably improve thequality of discussion and reduce preparation time for the facilitator.

Urb@exp

The LAB kit has been designed as a tool for inspiration to help municipalities or other stakeholders in a city on their way in drafting or sharpening the outlines of an urban lab. The LAB kit helps to raise and discuss key questions that are worth asking before engaging in such an endeavour. It is the outcome of a collaborative effort between researchers and practitioners and has been tested with various potential user groups to improve the final version. It consists of a booklet introducing the mindset of Living Labs, plus the materials for a two-day workshop that can be conducted in the beginning phases of a Lab. The pdf of the booklet is offered for free and the full kit can be ordered for 90€. The documents are licensed as creative commons and can be expanded upon. (http://www.urbanexp.eu/)

KETSO Toolkit

Ketso is a hands-on kit for creative engagement, useful in encouraging ideas and thoughts from everyone participating. Ketso uses a workshop approach with a facilitator to form a structured way of encouraging participation and to prompt discussions. Ideas are written down on re-usable material and the information is captured in a succinct structure. Its focus is on encouraging creativity when sharing ideas. It is a re-usable set of table top tools to capture and display people’s ideas. It is not aimed at a specific niche and can be used in all sorts of team discussions. Costs are £549, or £75 rental for 1 month. (http://www.ketso.com/)

5.2.2 Facilitation handbooks

Some of the handbooks are broad in their scope and are a collection of workshop ideas. For more experienced facilitators, it can be handy to have a broader range of methods at hand to be more flexible and respond to needs. These handbooks include some sort of short guidance for the facilitator(s) of a living lab as well as a toolbox, listing single methods - workshop activities- to be carried out face to face with a group. It is up to facilitator to choose amongst the options as he/she sees fit. There are many such products and most of them are freely available as a pdf to be downloaded online. Next to co-design, many of these handbooks also go to earlier and later stages, detailing how to reach out and engage individuals, and how to follow up on any outcomes.

The handbooks have a different “tone” deepening on which field they are rooted in: "Design Thinking" is very broad and can be targeted towards a product or a social innovation. They are likely to aim for something disruptive and fosters "thinking out of the box" more than the other handbooks. "Service Co-design" handbooks are aimed at public officials or NGOs working on improving a service together with the receivers of that service. It often aims to improve an experience (i.e. the service of receiving dialysis for chronically ill patients; the process of submitting a complaint to the local government). "Collaborative Planning" handbooks are targeted towards urban planning professionals and are more likely to revolve around physical interventions, managing the conflicting interests around the use of public space and may consider the longer planning horizons.

COPack - Collaborative planning methods manual

COPack has been produced in 2012 by a Finnish led research team as part of an EU funded project under a creative commons license. It is based on an in-depth survey of 25 workshop methods and rates them on various scales: Understandability, Quantification, Expertise needed, Equipment needed. It also assesses their degree to which they suit different project stages: Problem Identification, Problem Structuring, Problem Solving. Each method is described, its benefits and drawbacks are highlighted and further resources are listed. This toolkit is quite academic and more suited for researchers or professionals wanting to receive in-depth reviews rather than a ready-to-use product. However, the information provided is very rich and targeted more towards Urban Planners than many other toolkits. (http://copack.oamk.fi/docs/methods/methods_manual.pdf)

Participatory Methods Toolkit. A practitioner’s manual. New edition

To facilitate practical knowledge sharing, the King Baudouin Foundation and the Flemish Institute for Science and Technology Assessment (viWTA) edited a publication in 2006 (Elliot et al.) with the ambition to create a hands-on toolkit for starting up and managing participatory projects. The core focus is therefore to open any sort of decision-making process to the public. The toolkit includes 13 in-depth fiches on the most promising participatory methods. Per method there is a description of when to use it, the different steps, best practices and budget. All these are accompanied by different hints and tips. A chapter with general guidelines for using participatory methods includes a comparative chart of the discussed methods and the brief overview of 50 methods and techniques. The descriptions of the 13 methods are very much in depth and oriented towards practicalities (at least 10 pages for each, with suggested timelines, prep lists, workshop plans). These methods might be described in other toolkits and then it might be useful to check in this publication for the step-by-step practicalities. (https://www.kbs-frb.be/en/Virtual-Library/2006/294864)

Participedia

Participedia is a well-managed wiki of participatory methods across all fields: Anyone can join the Participedia community and help crowdsource, catalogue and compare participatory political processes around the world. All content on Participedia is collaboratively produced and open-source under a Creative Commons License. Both a searchable database of case studies and of methods are offered (Fung and Warren, 2011). The quality of the descriptions of methods varies enormously with some being excellent and others mere stubs. Yet with 233 entries, one is likely to find something relevant or additional information on an approach already discovered elsewhere. (https://participedia.net/)

6 CONCLUSION

In this paper we have laid out the first results of a methods review that will create a co-design methods toolbox to be used in Living Labs. The review tried to scope across various disciplines and fields of application. Two promising physical toolkits and three comprehensive handbooks for facilitators have been presented, detailing the circumstances under which they are potentially the most useful. Further research will be carried out (online and digital tools, trainings for facilitators). More detailed factsheets for all reviewed methods will be published on http://looperproject.eu/. The goal is to link the most promising methods within an online platform, to function as a toolbox accessible to the public, where users can choose from various options depending on their specific context.

7 ACKNOWLEDGEMENTS

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8 REFERENCES

BROWN, T., & WYATT, J. (2010). Design thinking for social innovation. Development Outreach, 12(1), 29-31.
CHISHOLM, J. (2017). What is co-design?. Londres, Inglaterra. Design for Europe. Available at:< http://designforeurope. eu/what-co-design>.
ELLIOTT J, HEESTERBEEK S, LUKENSMEYER C, SLOCUM N. Participatory methods toolkit A practitioner’s manual. New Edition. King Baudouin Foundation and the Flemish Institute for Science and Technology Assessment; 2006. Available: http://www.kbs-frb.be/uploadedFiles/KBS-FRB/Files/EN/PUB_1540_Participatoty_toolkit_New_edition.pdf
FUNG, Archon; WARREN, Mark E. The participedia project: An introduction. International Public Management Journal, 2011, 14.3: 341-362.
HEALEY, P. (1997). Collaborative planning: shaping places in fragmented societies. UBc Press.
INNES, J. E., & BOOHER, D. E. (1999). Consensus building and complex adaptive systems: A framework for evaluating collaborative planning. Journal of the American planning association, 65(4), 412-423.
INNES, J. E., & BOOHER, D. E. (2010). Planning with complexity: An introduction to collaborative rationality for public policy. Routledge.
SANDERS, E. B. N., & STAPPERS, P. J. (2008). Co-creation and the new landscapes of design. Co-design, 4(1), 5-18.
SCHOLL, C., Agger Eriksen, M., Baerten, N., Clark, E., Drage, T., Essebo, M., ... & Seravalli, A. (2017). Guidelines for Urban Labs.

Mitigation of Greenhouse Gas Emissions from Urban Environmental Infrastructures

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1 ABSTRACT

The world's population will increase to 9.4 billion people by 2050 and 70% of whom will be living in urban areas. Such urbanization with population growth and industrial development demands in turn create a need for the planning, design, and construction of environmental infrastuctures (e.g., water and wastewater treatment plants: WTPs and WWTPs). The environmental infrastructures are essential to provide cities and towns with water supply, waste disposal, and pollution control services.

During the operation of WTPs and WWTPs, massive amount of energy, fuels, and chemicals are consumed. Therefore, they could be major contributors to urban greenhouse gas (GHG) emissions (i.e., 17% of GHGs are generated from water and sewer sector in urban area). To make cities resilient and sustainable, the emission of GHGs from WTPs and WWTPs should be estimated as accurately as possible and effective mangement plans should be set up as soon as possible.

A comprehensive model was developed to quantitatively estimate on-site and off-site GHGs generated from WTPs and WWTPs. The model was applied to an advanced WTP (treating 200,000 m³/d of raw water with micro-filtration membrane) and a hybrid WWTP (treating 5,500 m³/d of municipal wastewater with five-stage Bardenpho processes). The overall on-site and off-site GHG emissions from the advanced WTP and hybrid WWTP were 0.193 and 2.337 kgCO_2e/d*m3. The major source of GHG generation in the advanced WTP was off-site GHG emissions (98.6%: production of chemicals consumed for on-site use and electricity consumed for unit-process operation). On the other hand, on-site GHG emissions related to biochemical reactions (64%) was the main GHG source of the hybrid WWTP.

Reducing electricity consumption in advanced WTPs could be the best option for generating less GHG emissions and acquiring better water quality. Various options (CO_2 capture and conversion to other useful materials, recovery and reused of CH_4, and operation of WWTPs at optimal conditions) could significanlty reduce the total amount of GHG emissions in hybrid WWTPs. The results could be applied to the development of green and sustainable technology, leading to a change in paradigm of urban environmental infrastructure.

Keywords: wastewater treatment plant, water treatment plant, urban environmental infrastructure, greenhouse gas, sustainable technology

2 METHODOLOGY

2.1 System boundary

The system boundaries and the emission pathways of the advanced WTP and hybrid WWTP are demonstrated in Fig. 1 and 2. The system boundary of advanced WTP includes a chemical supply, a rapid mixing, a flocculation, a micro-filtration (MF) membrane, and an ozone disinfection process. In case of the hybrid WWTP, this includes a primary clarifier (PC), a five-stage Bardenpho process [anaerobic (ANAE), first anoxic (ANOX1), first aerobic (AER1), second anoxic (ANOX2), and second aerobic (AER2) stages], a second clarifier (SC), a filter bed (FB), and a ultra-violet disinfection (UVD) process. The baseline task of WTP was treating 200,000 m3/d of raw water with 10 NTU to 0.005 NTU and that of WWTP was dealing with 5,500 m³/d of wastewater (200 mg/L influent BOD) to meet the effluent standard (less than 10 mg/L BOD, 20 mg/L TN, and 0.5 mg/L TP). Typical operating conditions and parameters of the WTP and WWTP in South Korea were used to estimate GHG emissions.

2.2 Estimation of GHG emissions from the WTP and WWTP

There are two types of GHG emissions generated from the WTP and WWTP. We define on-site GHG emissions stem from biochemical reactions in unit processes. Off-site GHG emissions are due to consumption of electricity and fuel for unit process operations as well as for the production and transportation of chemicals for on-site consumption. We developed a comprehensive model for the accurate estimation of on-site and off-site GHG emissions that could provide a rational basis for tactics useful in establishing sustainable environmental infrastructures.

2.2.1 Estimation of on-site GHG emissions

In case of the WTP, on-site GHG emissions (CO_2) are mainly caused by alkalinity consumption during chemical reactions of coagulants (aluminum sulfate, ferric sulfate, and poly aluminum chloride) and buffers anions (CO_3^{2-} and HCO_3^-) in mechanical mixing processes. On the other hand, WWTP produce three primary on-site GHGs (CO_2, CH_4, and N_2O) during wastewater treatment, sludge digestion, and system maintenance.

2.2.2 Estimation of off-site GHG emissions

Off-site GHG emissions converted from the consumption of electricity for operating unit processes. The emission factor (0.5584 $kgCO_2e/kWh$) for electricity use were obtained by considering the portions of power provided by different electric-power sources in South Korea. The amount of GHG emissions related to chemical production and transportation was calculated by multiplying the emission factor of each chemical by its daily consumption.

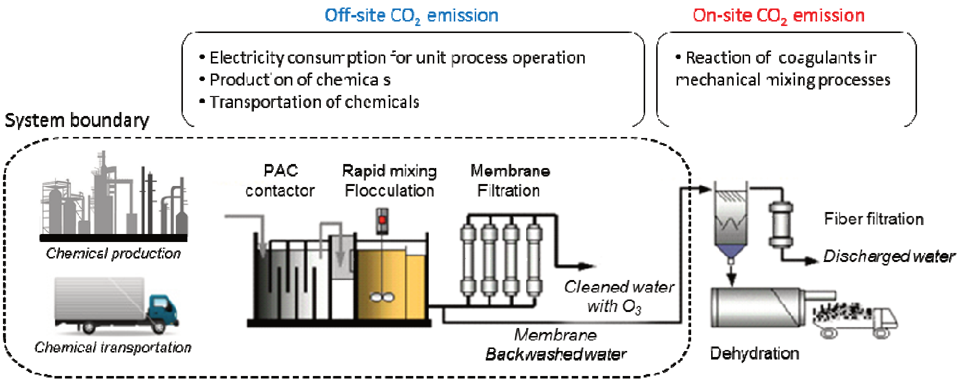

Fig. 1: The system boundary and emission pathway of the advanced WTP

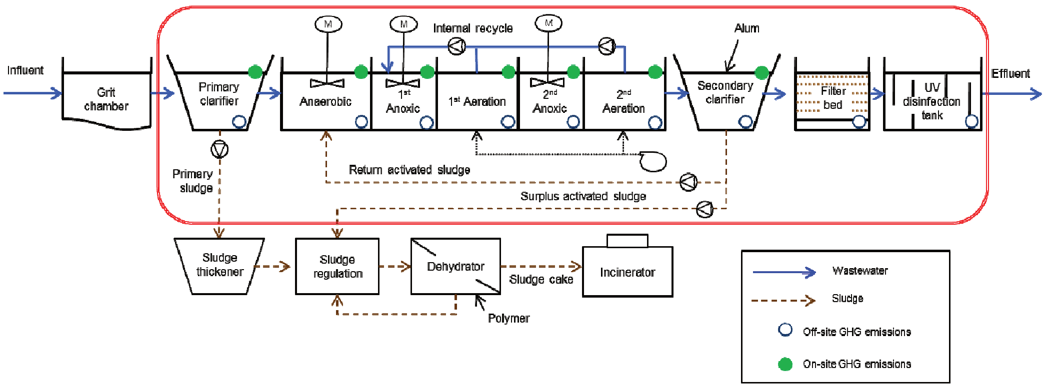

Fig. 2: The system boundary and emission pathway of the hybrid WWTP

3 RESULTS AND DISCUSSION

The GHG emission from each unit process of the advanced WTP under usual operating conditions are shown in Table 1. An enormous amount of electricity was consumed for unit process operations in the advanced WTP, causing it to generate 7,636 ± 1,558 $kgCO_2e/d$ of GHG (19.8% of overall emissions of the plant). The MF membrane process consumed the most electricity, since continuous high pressure (100 kPa) was required for the proper operation of the membrane system. This consumed 6,716 ± 536 kWh/d for filtration and 151 ± 12 kWh/d for backwashing; resulting in 3,835 ± 306 $kgCO_2e/d$ of GHG emission from the process. Ozone disinfection ranked 2nd (2,759 ± 1,107 $kgCO_2e/d$) for GHG emissions in unit processes, consuming 4,941 ± 1,982 kWh/d electricity to meet the required ozone demand (3mg/L). To keep the ozone feeding concentration constant at 3 mg/L, 704.6 kg of ozone needs to be produced and introduced to the process under 85% ozone transfer rate. Rapid mixing and flocculation in the advanced WTP produced 659 ± 92 and 383 ± 53 $kgCO_2e/d$ of GHG, and consumed 1,181 ± 165 and 686 ± 95 kWh/d of electricity, respectively. On-site GHG emission from the advanced WTP was 395 ± 115 $kgCO_2e/d$ when aluminum sulfate was used as a coagulant. The on-site GHG emission from the advanced WTP amounted to 1.0% of its overall GHG emissions. Chemical transportation (0.4%) rarely influenced overall GHG emission in the advanced WTP. Reducing electricity consumption in advanced WTPs could be the best option for emitting less GHG emission and getting better water quality. Basic understanding of electricity consumption factors and their impacts can directly contribute to the reduction of CO_2 emissions during advanced WTP operations. It can also be applied to the development of novel water treatment technology with low GHG emissions, as well as for decision-making on GHG emission policies and reduction tactics for WTPs.

Emission type	Category	Emission ($kgCO_2e/d$)	Summation ($kgCO_2e/d$)	Ratio (%)
Off-site GHG emission	Electricity consumption	7,636 ± 2,217	38,197 ± 2,922	19.8
	Chemical production	30,400 ± 1,958		78.8
	Transportation	161 ± 8		0.4
On-site GHG emission	Chemical reaction	395 ± 115	395 ± 115	1.0
Overall GHG emission		38,592 ± 3,005		100

Table 1: The total amount of on-site and off-site GHG emissions from the advanced WTP

The amounts of on-site GHG emissions produced from each unit process in the hydbrid WWTP are shown in Table 2. The results showed that AER1 is the major source (7,095±570 $kgCO_2e/d$) of on-site GHG production in the hybrid WWTP, covering 86.0% of total on-site GHG emissions. This is because the substantial amounts of major GHGs dissolved and accumulated in wastewater and sludge floc, can easily be stripped off and released by aeration. The amount of CO_2 (3,673±265 $kgCO_2e/d$) and N_2O (2,646±247 $kgCO_2e/d$) emissions was 4.73 and 3.41 times, respectively, higher than that of CH_4 emissions (776±58 $kgCO_2e/d$) in these processes. The solubility of CO_2 (0.034 M/atm) and N_2O (0.024 M/atm) was much higher than that of CH_4 (0.0013 M/atm), leading to higher dissolution and accumulation of CO_2 and N_2O than of CH_4 in suspension, and to higher emissions of CO_2 and N_2O during aeration. The second largest on-site GHG emission source was the ANAE (510±36 $kgCO_2e/d$) process due to high CH_4 emission (497±35 $kgCO_2e/d$) during the anaerobic degradation of organic materials. Methane could be directly released from wastewater to the atmosphere due to its low solubility and high capacity for mass transfer. Considerable amounts of on-site GHG emissions were also released from PC treating floating organic matter before aeration, and from SC removing soluble organic matter and sludge after aeration, due to substantial removals of carbonaceous materials and nutrients in the processes. On-site GHG production from PC was 366±36 $kgCO_2e/d$ due mainly to CH_4 emission, while that from SC was 252±31 $kgCO_2e/d$ due to N_2O emission. This indicates that the different roles assigned to the unit processes can influence the amount of GHG emissions and their type. Relatively small amounts of GHG emissions were found from ANOX1 (16.8±1.2 $kgCO_2e/d$), ANOX2 (15.1±3.1 $kgCO_2e/d$), and AER2 (9.4±1.1 $kgCO_2e/d$) due to slight removals of carbonaceous materials and nutrients in the processes, and/or substantial GHG emissions from AER1. According to the results above, total on-site GHG emissions related to biochemical reactions at the hybrid WWTP were 8,264±678 $kgCO_2e/d$. This indicates that considerable amounts of GHGs are generated by biochemical reactions during WWTP operations.

Unit process	CO_2 emission ($kgCO_2e/d$)	CH_4 emission ($kgCO_2e/d$)	N_2O emission ($kgCO_2e/d$)	Total ($kgCO_2e/d$)
PC	7.7±0.7	287±27	71.2±7.9	366±36
ANAE	1.3±0.1	497±35	11.4±0.8	510±36
ANOX1	1.8±0.2	0.4±0.1	14.6±0.9	16.8±1.2
AER1	3,673±265	776±58	2,646±247	7,095±570
ANOX2	2.1±0.3	0.1±0.0	12.9±2.8	15.1±3.1
AER2	2.3±0.3	0.6±0.1	6.5±0.7	9.4±1.1
SC	13.2±2.0	1.1±0.2	238±29	252±31
Total ($kgCO_2e/d$)	3,701±269	1,562±120	3,001±289	8,264±678
	8,264±678			

Table 2: The amounts of on-site GHG emissions generated from each unit process in the hybrid WWTP

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The total amounts of off-site GHG emissions from the hybrid WWTP, and the percentage contribution of each category, are presented in Table 3. The results showed that the manufacturing of chemicals and their transportation for on-site use is the major source of off-site GHG generation in the hybrid WWTP (2,698±336 $kgCO_2e/d$), and that this amounts to 58.8% of total off-site GHG emissions (4,591±576 $kgCO_2e/d$). Among the chemicals, alkaline materials (1,392±186 $kgCO_2e/d$) and ferric-chloride (1,178±132 $kgCO_2e/d$) were the main contributors to off-site GHG emissions by chemical production and transportation. This is due to the high GHG emission factor for these chemicals and to the relatively high demand for them during the wastewater treatment processes. This indicates that the methods used to manufacture and convey chemicals for on-site use can significantly influence off-site GHG emissions, and suggests that alternative methods for producing lower amounts of GHGs are required to effectively reduce off-site GHG emissions, without affecting the water quality of the treated effluent. The second greatest GHG off-site emission was due to electric energy consumed for the unit process operations (1,893±240 $kgCO_2e/d$), covering 41.2% of the total off-site GHG emissions. The GHG emissions related to electricity consumption seem to be directly affected by the efficiency of the operating equipment; therefore enhancement of their efficiency by retrofitting old equipment, as well as by optimizing unit operations and process conditions should significantly reduce off-site GHG emissions from the hybrid WWTP.

Category	Emissions ($kgCO_2e/d$)	Total ($kgCO_2e/d$)	Ratio (%)
Electricity consumption	1,893±240	4,591±576	41.2
Chemical production and transportation	2,698±336		58.8

Table 3: The total amount of off-site GHG emissions from the hybrid WWTP

4 CONCLUSION

The comprehensive model developed in this study made it possible to estimate both on-site and off-site GHG emissions from advanced WTP and hybrid WWTP. GHG emissions were estimated exactly with respect to system type and operating conditions. The patterns of use for each unit-process of the environmental infrastructures were analyzed and tactics to reduce emissions from these processes were suggested. A variety of WTP and WWTP have been built and operated under different operating conditions to properly treat water contaminants. Their optimal types and operation conditions can be changed depending on different water environment scenarios. The model developed in this study cannot compare estimated GHG emissions from entirely different types of WTPs and WWTPs, under different operating conditions; in different water environment scenarios, at this stage. However, the model and estimated results obtained here have provided fundamental knowledge useful to modify its original form to allow estimation of GHG emissions from any kind of WTP and WWTP.

The boundaries of the model can be extended and protocols of the model can be modified to estimate GHG emissions from different WTP and WWTP by adding or deleting a variety of unit processes and associated operating conditions. Additionally, the boundaries of this model can be extended to other environmental and industrial sectors (even to cities and countries) to estimate total GHG emissions. The model can also offer real-time estimation of GHG emission from each unit process in WTP and WWTP with real-time water quality monitoring. This should lead to the development of novel green and sustainable water and wastewater treatment technologies with high contaminant removal efficiency and low GHG emissions. Consideration of GHG emission issues in the urban environmental sector is advancing the understanding of the relationship between quality and GHG. This, in turn, should assist officials in making correct, and now indispensable, public decisions and environmental policy. In the near future, these results might also be applied to develop an optimization model for determination of the proper type and unit processes (with optimal removal efficiency and GHG emissions) under different environmental scenarios.

5 REFERENCES

Alina, I. R., Bryan, W. K., Christopher, A. K., Andrew, F. C.: Life-cycle energy use and greenhouse gas emissions inventory for water treatment systems. Journal of Infrastructure Systems, Vol. 13, Issue 4, pp. 261-270, 2007.

Bani Shahabadi, M., Yerushalmi, L., Haghighat, F.: Estimation of greenhouse gas generation in wastewater treatment plants - Model development and application. Chemosphere, Vol. 78, Issue 9, pp. 1085-1092, 2010.

Cakir, F. Y., Stenstrom, M. K.: Greenhouse gas production: a comparison between aerobic and anaerobic wastewater treatment technology. Water Research, Vol. 39, Issue 17, pp. 4197-4203, 2005.

Kyung, D., Kim, D., Park, N., Lee, W.: Estimation of CO2 emission from water treatment plant – Model development and application. Journal of Environmental Management, Vol. 131, pp. 74-81, 2013.

Kyung, D., Kim, M., Chang, J., Lee, W: Estimation of greenhouse gas emissions from a hybrid wastewater treatment plant. Journal of Cleaner Production, Vol. 95, pp. 117-123, 2015.

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Reintroduction of the Building Code for Canton Sarajevo as a Prerequisite of Urban Planning and Urban Management in the Cantonal Transformation Process

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1 ABSTRACT

The City of Sarajevo, since its establishment in the 15th century, was facing a constant population growth and enlargement process of the city area. Due to the topographical conditions of Sarajevo's location in the valley, the potential expanding city area is very limited and the future expanding zones should be carefully selected (Arhiv Zavoda za planiranje razvoja Kantona Sarajevo, 1984a). Different phases and epochs of city's development history are readable along the valley from east towards west, from Ottoman, through Austro–Hungarian, Modern and Post–Modern period. As a part of former Austro-Hungarian Monarchy, Sarajevo got its first Building Code in 1880. This planning document should have helped to regulate the upcoming development of the city and its settlement area in an integrative way. In 1893 Sarajevo got its second Building Code, an "update" of the first one, and ever since then, this kind of spatial planning instrument was and is missing in Sarajevo's development and planning regulative (Biblioteka Zemaljskog muzeja BiH, 1884). This paper explains why it is important to reintroduce the planning tool of the “Building Code for Canton Sarajevo” as an instrument of the integrative, balanced and smart trans-sectoral development of Canton Sarajevo.

Keywords: building code, development process, urban and regional planning, Sarajevo, transformation

2 INTRODUCTION

One of the most important impacts on contemporary urban planning has had Haussmann with his plan for Paris reconstruction. That period of Haussmanization (definition which implies creating urban landscape which uses the parameters of uniformity and regularity, that most people consider “monotone and redundant”), was firstly criticized, but would have showen it’s positive sides after the “failure” of urban visions of the Modern movement. In 1852 Haussmann started with the interventions of the Paris urbanization, and in twenty years of reconstructions, he created the basis for the future development. The holistic approach in city’s center development, as well as the development of suburbs, which were for the first time included in the city plan, reflected itself in two methods or approaches: registering the actual state and the graphic description of the future interventions (creating new streets, space for public buildings and green areas) and additional regulations in form of the building code. “Organization of network, term used by Haussmann in his memoirs in order to classify work, shows the will to think the city as a whole and in order to modify it (networks) till the deepest structures in order to improve it. Not a new reality questioned paratactically or integrated in an old city, but a transformation of it, to arrive to, on the basis of hygienic, demographic, technical and esthetic parameters, new forma urbis”.[1]

Soon after Paris and some other cities in Europe started to follow its example and started to create their own “regulation plans” and “building orders”, amongst the first cities were Vienna and Barcelona: «... we talk about a big project, «a Program», according to Haussmann’s definition, which had to be “completed” and “perfected” in order to transform the old Paris. It seems that Joseph Alexander von Hűbner, Austrian Ambassador in Second Empire period, shared Haussmann’s opinion. He new Haussmann privately, met him often and considered him “the inspiration and soul” of all those works which he admired in French capital. It is interesting to notice that the ambassador stayed in Paris from 1851 to 1859, and soon after Vienna will announce the competition for the systematization of Ring, which will provoke Austrian Capital to

[1] Haussman e il piano per una capitale moderna, Rosa Tamborrino, URBANISTICA, No. 111, Dec. 1998, Rivista semestrale di Urbanistica, str. 116, (Mémoires du Baron Haussman, Havard, Paris, 1890-93. tri toma: 1. Avant l'Hôtel de Ville; 2. Préfecture de la Seine; 3. Grands travaux de Paris).

experiment with its own model of urban reconstruction, different from Paris, but analog by the initiatives for the role of public buildings and introducing the infrastructure networks.[2]

3 DEVELOPMENT OF SARAJEVO

The City of Sarajevo, since its establishment in the 15th century, was facing a constant population growth and enlargement process of the city area. Due to the topographical conditions of Sarajevo's location in the valley, the potential expanding city area is very limited and the expanding zones should be carefully selected (Fig. 1) (Arhiv Zavoda za planiranje razvoja Kantona Sarajevo, 1984a). Different phases and epochs of city's development history are readable along the valley from east towards west, from Ottoman, through Austro–Hungarian, Modern and Post–Modern period (Fig. 2) (Tabori, 2017).

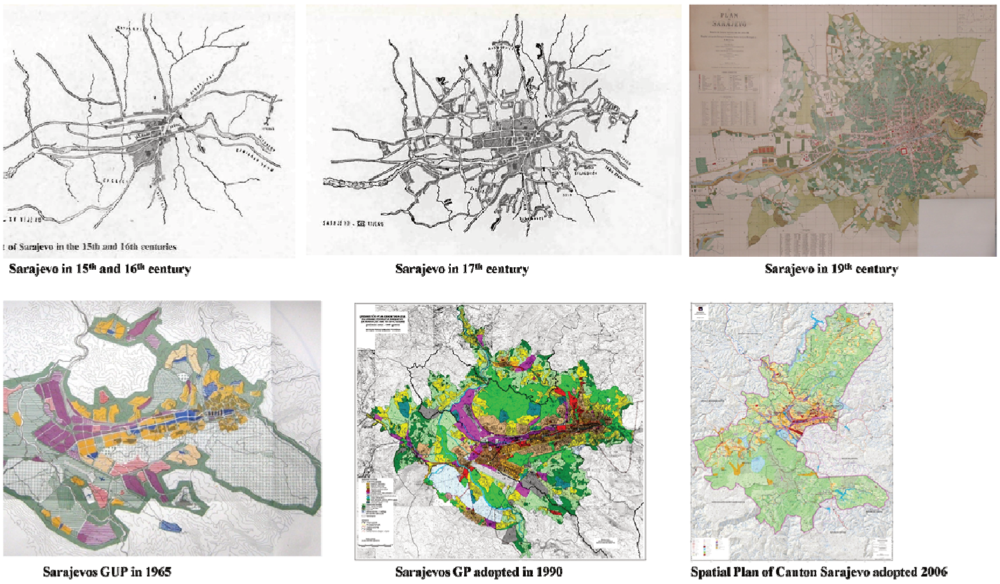
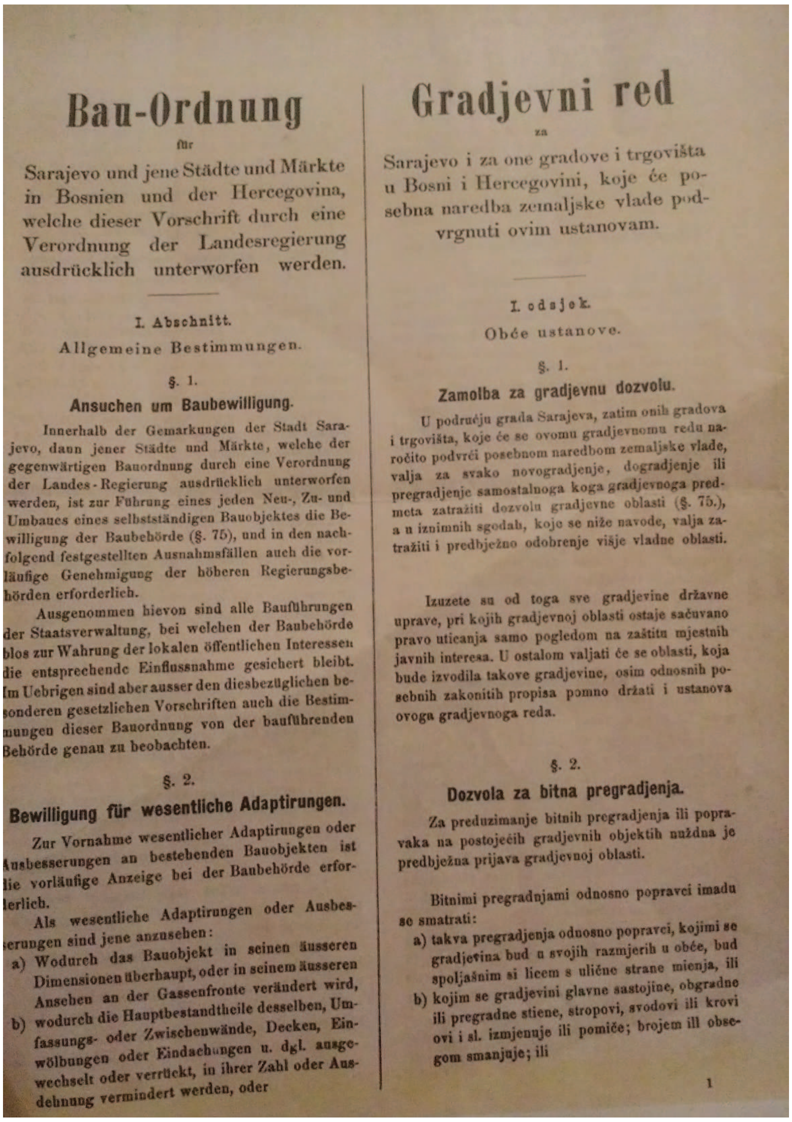


Fig. 1: Sarajevo's development history through centuries (Tabori, 2017)

Sarajevo, as a part of former Austro-Hungarian Monarchy, got its first Building Code in 1880 (Fig. 3), followed by a second Building Code in 1893. Ever since then, the Building Code Document is missing in Sarajevo's spatial regulative, which resulted in unclear building procedures and urban "cacophony". In 1932, there was an attempt to make a unified Building Code for all cities in former Kingdom of Yugoslavia, but it failed. The last valid Building Code for Sarajevo was from Austro-Hungarian period, which was set at the same time as in Vienna. For the comparison, since then Vienna has novelized its Building Code about 60 times, sometimes four times per year (Geuder, 2016).

Fig. 2: Reading Sarajevo's development history along the valley (Tabori, 2017)

[2] Op.cit.



Bau-Ordnung

für

Sarajevo und jene Städte und Märkte in Bosnien und der Hercegovina, welche dieser Vorschrift durch eine Verordnung der Landesregierung ausdrücklich unterworfen werden.

I. Abschnitt.

Allgemeine Bestimmungen.

§. 1.

Ansuchen um Baubewilligung.

Innerhalb der Gemarkungen der Stadt Sarajevo, dann jener Städte und Märkte, welche der gegenwärtigen Bauordnung durch eine Verordnung der Landes-Regierung ausdrücklich unterworfen werden, ist zur Führung eines jeden Neu-, Zu- und Umbaues eines selbstständigen Bauobjektes die Bewilligung der Baubehörde (§. 75), und in den nachfolgend festgestellten Ausnahmsfällen auch die vorläufige Genehmigung der höheren Regierungsbehörden erforderlich.

Ausgenommen hievon sind alle Bauführungen der Staatsverwaltung, bei welchen der Baubehörde blos zur Wahrung der lokalen öffentlichen Interessen die entsprechende Einflussnahme gesichert bleibt. Im Uebrigen sind aber ausser den diesbezüglichen besonderen gesetzlichen Vorschriften auch die Bestimmungen dieser Bauordnung von der bauführenden Behörde genau zu beobachten.

§. 2.

Bewilligung für wesentliche Adaptirungen.

Zur Vornahme wesentlicher Adaptirungen oder
usbesserungen an bestehenden Bauobjekten ist
lie vorläufige Anzeige bei der Baubehörde erfor-
lerlich.

Als wesentliche Adaptirungen oder Ausbes-
erungen sind jene anzusehen:

a) Wodurch das Bauobjekt in seinen äusseren Dimensionen überhaupt, oder in seinem äusseren Ansehen an der Gassenfronte verändert wird,

b) wodurch die Hauptbestandtheile desselben, Umfassungs- oder Zwischenwände, Decken, Einwölbungen oder Eindachungen u. dgl. ausgewechselt oder verrückt, in ihrer Zahl oder Ausdehnung vermindert werden, oder

Gradjevni red

za

Sarajevo i za one gradove i trgovišta u Bosni i Hercegovini, koje će posebna naredba zemaljske vlade podvrgnuti ovim ustanovam.

I. odsjek.

Obće ustanove.

§. 1.

Zamolba za gradjevnu dozvolu.

U području grada Sarajeva, zatim onih gradova i trgovišta, koje će se ovomu gradjevnomu redu naročito podvrći posebnom naredbom zemaljske vlade, valja za svako novogradjenje, dogradjenje ili pregradjenje samostalnoga koga gradjevnoga predmeta zatražiti dozvolu gradjevne oblasti (§. 75.), a u iznimnih sgodah, koje se niže navode, valja zatražiti i predbježno odobrenje višje vladne oblasti.

Izuzete su od toga sve gradjevine državne uprave, pri kojih gradjevnoj oblasti ostaje sačuvano pravo uticanja samo pogledom na zaštitu mjestnih javnih interesa. U ostalom valjati će se oblasti, koja bude izvodila takove gradjevine, osim odnosnih posebnih zakonitih propisa pomno držati i ustanova ovoga gradjevnoga reda.

§. 2.

Dozvola za bitna pregradjenja.

Za preduzimanje bitnih pregradjenja ili popravaka na postojećih gradjevnih objektih nuždna je predbježna prijava gradjevnoj oblasti.

Bitnimi pregradnjami odnosno popravci imadu se smatrati:

a) takva pregradjenja odnosno popravci, kojimi se gradjevina bud u svojih razmjerih u obće, bud spoljašnim si licem s ulične strane mienja, ili

b) kojim se gradjevini glavne sastojine, obgradne ili pregradne stiene, stropovi, svodovi ili krovi i sl. izmjenuje ili pomiče; brojem ili obsegom smanjuje; ili

1

Fig. 3: The Second Building Code Document for Sarajevo in 1893 (Tabori, 2017)

After the Bosnian war in the 1990s, the sociopolitical and spatial development opportunities of Sarajevo have become more complex and limited by the new administrative structure and the division of the city settlement area in local, cantonal and entity units (Korijenić, 2015). On the other hand, Sarajevo continued to attract new population as a capital city, which it has become after the war. Population migrations have accelerated the transformation process of the city and it's uncontrolled settlement area growth, which negatively affected its net of infrastructure, as well as, the city's image and its quality of living (Fig. 4) (Arhiv Zavoda za planiranje razvoja Kantona Sarajevo, 2015) (Uruci, 2017).

Fig. 4: Uncontrolled settlement development in Sarajevo (Uruci, 2017)

Due to the new state structure, the competence of spatial planning has spread over several levels. This fact have had for the consequence an absence of connection between many strategic documents which have little

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or no connection to each other and therefore many matters of spatial planning and development are decided case by case (Uruci, 2017).

Today, in Canton Sarajevo, the procedure of obtaining the urban permit has no clear structure and rules about how to build in a specific area. Obtaining the building permit depends on individual aesthetic criteria of municipality clerk who is creating an individual frame of rules. This makes procedures unclear, not transparent and often open for corruption. The result of unclear procedures is urban and architectural "cacophony", which is especially visible in the urban area of Sarajevo valley.

4 IMPORTANCE OF THE REINTRODUCTION OF THE BUILDING CODE FOR CANTON SARAJEVO

The Building Code Document is an instrument of spatial planning, which makes procedures for obtaining the urban and building permits clear, transparent and strengthen the rule of law equal to all social groups, citizens and investors. The content of the "Building Code" document needs to be reinvented, but it should treat and link all relevant strategic documents and law regulations, which deal with developing of the living area and its environment. The buliding code is an important planning and regulating instrument, by which a city and a region can be modified and which completes the vision of the future development given by other spatial documents.

Therefore, it is highly necessary to develop and implement planning tools which enable control development such as the "Building Code" which should manage, the current and the future city and regional transformation process in Sarajevo valley in a balanced, integrative and contemporary way. To prevent the described uncoordinated and disintegrated development in Canton Sarajevo, especially in the densely populated Sarajevo valley, the future document of the "Building Code" should (Arhiv Zavoda za planiranje razvoja Kantona Sarajevo, 2015):

- ...be a formally regulative act on the cantonal level, which is connected and interlinked with all other, regulations and strategies on all legislative and administrative levels of Bosnia and Herzegovina.
- ...claim the role of the roof document in terms of spatial planning and development of the Canton Sarajevo.
- ...contain regulations about:
    - building regulations and structures (settlement structure, mahala design, design type, object height, density, mixed use, etc.)
    - environmental (city parks, recreations areas, natural parks, urban gardening, fresh-air corridors etc.)
    - social infrastructure (hospitals, schools, kindergartens, theatres, cinemas, universities, etc.)
    - technical infrastructure (heating, electricity, gas, water, channel, waste disposal, etc.)
    - traffic (public transport, bicycle routes, pedestrian zones and routes, parking zones, hubs, etc.)
    - culture and heritage (monuments, sacral objects, history objects, etc.)
    - potential areas for smart development (vertical farming, green roofs, solar roofs, sharing ports, logistic hubs, etc.)

5 REFERENCES

AGENCIJA ZA STATISTIKU BOSNE I HERCEGOVINE:, Bosna i Hercegovina u brojevima 2016, Sarajevo. 2017.

ARHIV, BIH: Zbornik zakona, naredbi i propisa za Bosnu i Hercegovinu 1893, Sarajevo 1932.

ARHIV ZAVODA ZA PLANIRANJE RAZVOJA KANTONA SARAJEVO: Urbanistički plan za urbano područje Grada Sarajeva za period 1986 – 2015, Sarajevo 1984a.

ARHIV ZAVODA ZA PLANIRANJE RAZVOJA KANTONA SARAJEVO: Prostorni plan Grada Sarajeva za period 1986 – 2015, Sarajevo 1984b.

ARHIV ZAVODA ZA PLANIRANJE RAZVOJA KANTONA SARAJEVO: Prostorni plan Kantona Sarajevo za period 2003 – 2023, Sarajevo , 2004.

ARHIV ZAVODA ZA PLANIRANJE RAZVOJA KANTONA SARAJEVO: Strategija razvoja Kantona Sarajevo, Sarajevo, 2015.

BIBLIOTEKA ZEMALJSKOG MUZEJA BIH: Sammlung der für Bosnien und Die Herzegovina, Erlassenen, Gesetze, Verordnungen und Normalweisungen, I. Band, Allgemeiner Theil. – Politische verwaltung., Zum amtlichen gebrauche, Aus der Kaiserlich – Kőniglichen hof – und Staatsdruckerei, Wien, 1884.
FEDERACIJA BOSNE I HERCEGOVINE: Prostorni plan Federacije Bosne i Hercegovine za period 2008.-2028. godine, Mostar/Sarajevo, 2012.
GEUDER, Heinrich & FUCHS Gerald: Bauordnung für Wien, 4. aktualisierte Auflage, Stand 1.9.2016, Wien. 2016.
GOVERNANCE ACCOUNTABILITY PROJECT: Priručnik iz Prostornog planiranja, USAID, Sarajevo, 2013.
KORJENIĆ A.: Prostorno planiranje u Bosni i hercegovini - legislativni okvir, in Acta geographicae Bosniae i Hercegovinae, 3, 63-74, Sarajevo, 2015.
PEŠTEK E.: Referentni priručnik za investitore. Građevinski propisi u Bosni i Hercegovini, Chemonics International Inc., Sarajevo, 2009.
TABORI, Natasa: Function of the communist planning system in the City of Sarajevo 1945-1990", 2017, Vienna.
TABORI, Nataša: Advisability of Reintroducing the Building Code Document to Canton Sarajevo Spatial and Urban Planning Legislation, Literature for PhD, TU Wien, 2018.
TAMBORRINO ROSA: Haussman e il piano per una capitale moderna, in URBANISTICA, No. 111, Torino, 1998.
URUCI, Edib: The Bosnian spatial planning system - attempt at an explanation. Lisbon, 2017.

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Salzburger Raumordnungsgesetz und Landesentwicklungsprogramm Neu: Bodenpolitische Wende und Planungsinnovation oder alter Wein in neuen Schläuchen?

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1 ABSTRACT

Der Beitrag befasst sich mit den zentralen Herausforderungen der Raumplanung mit spezifischem Bezug auf die aktuellen raumordnungspolitischen Entwicklungen im Land Salzburg.

Die Salzburger Landesregierung verfolgt mit einer umfassenden Neuregelung der Raumordnung (durchführt von Herbst 2014 bis Frühsommer 2017) die wirksamere Lösung zentraler räumlicher Herausforderungen an Die planerischen Herausforderungn in Salzburg sind typisch für Alpenländer: stark eingeschränktes Flächenangebot im Dauersiedlungsrraum inneralpiner Täler und Becken mit hohem Naturraumgefahrenpotential, traditionell stark gestreute Siedlungsstruktur mit enormem Siedlungswachstum außerhalb der Siedlungskerne und Widmungsgebiete. Technologischer und demographischer Wandel (Migration mit Landflucht aber auch multiplen Wohnsitzen, neue Lebensentwürfe, hohe Lebenserwartung) fordern zusätzlich ebenso wie Internationalisierung des Immobilienmarktes mit enormen Preissteigerungen sowie Abbau öffentlicher und sozialer Infrastruktur in kleinen Landgemeinden.

Für Salzburg bzw. Österreich spezifisch ist die Herausforderung einer politisch-administrativen Kleinteiligkeit: für ca. 550.000 Menschen (davon rd. 1/3 in der Landeshauptstadt) gibt es 119 unterschiedliche räumliche Entwicklungskonzepte und Flächenwidmungspläne. Auch ist die Struktur der Regionalverbände sehr unterschiedlich, mit ebenso unterschiedlichen Qualitäten bei Regionalprogrammen bzw. regionalen Entwicklungskonzepten. Und schließlich konnte das Landesentwicklungspramm 2003 landesweiten und regionalen Raumprobleme noch keinen befriedigenden wirksamen Lösungen zuführen.

Um salzburgs räumliche Herausforderungen besser lösen zu können, beinhaltet die Raumordnungsgesetz-Novelle vom 28.6.2017 (LGBl Nr. 82/2017) viele neue Regelungen für die Planungsebenen Land, Regionalverband und Gemeinden (vgl. Kap. 2).[1] Seit 2016 wird zusätzlich das Landesentwicklungsprogramm Salzburg grundlegend erneuert und lösungsorientierter gestaltet (s. Kap. 3)

Keywords: Baulandmobilisierung, Zersiedelung, Flächeninanspruchnahme, Landesentwicklungsprogramm, Landesplanung

2 HAUPTSTOSSRICHTUNG DER ROG-NOVELLE

Die wesentlichen Neuerungen in dieser Novelle sind Folgende (gruppiert nach Schwerpunkthemen, die Auswirkungen des Übergangsrechts bleiben an dieser Stelle unerwähnt):

2.1 Allgemeines und Überörtliche Raumplanung

Die Abschnitte 1 (Allgemeines) und 2 (Überörtliche Raumplanung) wurden vollständig neu erlassen. Im Abschnitt 1 wurden die Raumordnungsziele und -grundsätze aktualisiert und im neuen § 5 zentrale Begriffe definiert. Im Abschnitt überörtliche Raumplanung wurden die Aufgaben der Überörtlichen Raumplanung (Landes- und Regionalplanung) definiert (was es bisher nicht gab), § 7 (Raumforschung) wurde im Wesentlichen belassen, neu wurde die Erhebung von Indikatoren festgeschrieben. Umfassend geändert wurden die Instrumente der Landes- und Regionalplanung. Das Landesentwicklungsprogramm (LEP) ist nun das alleinige und zentrale Instrument der Landesplanung, die Sachprogramme wurden abgeschafft. Dafür wurden für das LEP neue Mindestinhalte festgelegt. Diese wurden systematisch mit den Mindestinhalten von Regionalprogrammen und Räumlichen Entwicklungskonzepten verbunden, um eine funktionstüchtige und kooperative Festlegung auf überörtlicher und örtlicher Ebene zu ermöglichen. Neu eingeführt wurde auch eine Evaluierungsverpflichtung für alle Entwicklungsprogramme nach 15 Jahren.

[1] Im Gegensatz zu anderen europäischen Ländern wie z.B. der deutschen Planungsgesetzgebung sind in Österreich die Länder für die Raumordnungesetzgebung allein zuständig, d.h. für jedes Bundesland gibt es ein eigenes Raumplanungs- oder Raumordnungsgesetz bzw. für Wien das Wiener Baugesetzbuch.

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Bei der Regionalplanung wurde die verpflichtende Erstellung von Regionalprogrammen wieder eingeführt, inkl. am LEP orientierten Mindestinhalten. In der überörtlichen Raumplanung wurde das Instrument der überörtlichen Bausperre, neu eingeführt um die Durchführung von überörtlichen Planungen für linienhafte Infrastrukturprojekte nicht zu erschweren oder unmöglich zu machen. Die Bausperre ist zeitlich auf 3 Jahre befristet und kann einmal um ein Jahr verlängert werden (auf maximal 4 Jahre).

Die verschiedenen Verträglichkeitsprüfungen wurden im 2. Teil "Raumverträglichkeitsprüfungen" zusammengefasst. Leicht geändert wurde dabei die Standortverordnung für Handelsgroßbetriebe. Hier wurde festgelegt, dass Handelsgroßbetriebe mit überwiegend zentrenrelevantem Sortiment nunr dann eine Standortverordnung erhalten können, wenn das Vorhaben mit der überörtlichen Funktion der Gemeinde zur Versorgung mit Gütern zusammenpasst und das Vorhabens keine maßgeblich nachteiligen Auswirkungen auf die Verwirklichung des Raumordnungsziels der Revitalisierung und Stärkung der Orts- und Stadtkerne bewirken kann. Um Gutachterstreite zu vermeiden, ist es erforderlich, im LEP dazu Näheres zu bestimmen.

2.2 Örtliche Raumplanung

Bei der fakultativen Vertragsraumordnung nach § 18 ROG 2009 erfolgten Klarstellungen, die Rechte der Grundeigentümer wurden gestärkt, wenn zwischen Gemeinde und betroffenen Grundeigentümern Einvernehmen über die im Hinblick auf den Verwendungszweck notwendigen und angemessenen Inhalte einer Vereinbarung bestehen. In letzteren Fall ist die Gemeinde nun zum Vertragsabschluss verpflichtet.

Schon seit dem ROG 2009 ist das Räumliche Entwicklungskonzept das strategische und zentrale Planungsinstrument jeder Gemeinde. Es wurde inhaltlich inkl. verpflichtender Abgrenzung von Siedlungsschwerpunkten geändert und erweitert. In den Siedlungsschwerpunkten können Raumeinheiten zur Sicherstellung einer städtebaulichen Ordnung festgelegt werden. Für diese ist ein gesamthafter Bebauungsplan der Grundstufe aufzustellen und sie werden als „städtebauliche Planungsgebiete“ bezeichnet.

Eine der wesentlichsten Änderungen ist die Einführung befristeter Widmungen für neu auszuweisendes Bauland. Dies ermöglicht eine 10 Jahre Befristung ausgenommen Baulandneuwidmungen für Gebiete für Handelsgroßbetriebe, Gebiete für Beherbergungsgroßbetriebe und Sonderflächen, bei denen den Frist auf 5 Jahre verkürzt werden kann (mit einmaliger Verlängerungsmöglichkeit um 5 Jahre). In Verbindung mit dem ebenfalls in dieser Novelle eingeführtem Infrastrukturkostenbeitrag erhofft sich der Gesetzgeber mittelfristig das "Ende der Baulandspekulation" wie es plakativ in einer Pressemeldung zu lesen war.

Umfassende Änderungen gibt es auch bei Zweitwohnungsbeschränkungen. Hier wurde auf das Meldesystem umgestellt und festgelegt, dass Zweitwohnsitzverwendungen auf sogenannte Zweitwohnunges-Beschränkungsgemeinden beschränkt ist. Dies sind Gemeinden, wo der Anteil an Nicht-Hauptwohnsitz-Wohnungen höher als 16 % des gesamten Wohnungsbestandes in der Gemeinde ist. Weiters gilt es in Gebieten, die eine Gemeinde im Flächenwidmungsplan als Zweitwohnungs-Beschränkungsgebieten bezeichnet. Daran knüpft sich eine Folge von Bestimmungen, wobei zur Abwehr von unrechtmäßigen Zweitwohnnutzungen auch eine gerichtliche Zwangsversteigerung ermöglicht wurde.

Die Bestimmungen gegen die Zweckentfremdung von Wohnungen wurden ebenfalls verschärft und präzisiert. Als Zweckentfremdung gilt die Verwendung einer Wohnung für touristische Beherbergungen. Zum Zweck der Überwachung dieser Bestimmungen wurde festgelegt, dass den damit betrauten Organen der Zutritt zum Objekt zu ermöglichen ist bzw. es wurde die Gemeinde ermächtigt, sich bei Versorgungs- und Entsorgungsunternehmen, bei Postdiensten oder Zustelldiensten die erforderlichen Daten zu besorgen.

Bei den Bestimmungen für Handelsgroßbetriebe erfolgten Präzisierungen und Klarstellungen, wobei die bestehenden fünf Kategorien Verbrauchermärkte, C&C-Märkte, Fachmärkte, Bau-, Möbel- oder Gartenmärkte und Einkaufszentren unverändert blieben, jedoch für die Kategorie "Einkaufszentren" festgelegt wurde, dass bei dieser die höchstzulässige Verkaufsfläche für den Anteil an Verbrauchermärkten gesondert festzulegen ist. Damit soll in Zukunft verhindert werden, dass eine bestehende Widmung für ein multifunktionales Einkaufszentrum für einen großflächigen Verbrauchermarkt verwendet wird.

Weitere Änderungen erfolgten bei Zonieren von Gewerbegebieten, Kennzeichnen von Stadt- und Ortskernen und Flächen für Apartmenthäuser und Vorbehaltsflächen für den förderbaren Miet- und Eigentumswohnbau. Ebenso neu eingeführt wurde die Widmungskategorie "Gebiete für den förderbaren Wohnbau", deren Ausweisung nur in Siedlungsschwerpunkten zulässig ist. Weiters neu sind diverse Klarstellungen bei den

Sonderflächen, die Erhöhung der zulässigen Geschoßfläche bei Einzelbewilligungen für Mehr-Generationen-Häusern auf 375 m² sowie die Verkürzung von Fristen bei den verfahrensrechtlichen Bestimmungen.

3 SALZBURGER LANDESENTWICKLUNGSPROGRAMM NEU

Die Autoren und die Autorin (nachfolgend als LEP-Kernteam bezeichnet) arbeiten seit 2016 an einem neuen Landesentwicklungsprogramm, welches innovative Wege in Methodik, Problemsicht, Erstellungsprozess und in der Umsetzung anpeilt. Bis Ende März 2018 wurde ein fachlicher LEP-Diskussionsvorschlag erarbeitet, welcher anschließend in breiter Beteiligung reflektiert, ergänzt und weiterentwickelt werden soll. Darauf aufbauend soll dann die Ausarbeitung des LEP-Entwurfs erfolgen. Wenn das neue LEP gültig ist, soll dieses in innovativen LEP-Umsetzungspartnerschaften bestens in der Praxis verwirklicht werden.

3.1 Problemanalyse nach Schönwandt et al. an den Raumordnungs-Grundsätzen orientiert

Bereits zwischen Herbst 2016 und Februar 2017 wurden die aktuellen räumlichen Herausforderungen und Fehlentwicklungen in LEP-Bezug strukturiert. Es stellte sich die Frage, wie eine passende Problemanalyse auf Grundlage der bestehenden Strukturanalysen in konsistenter Form erstellbar ist. Im Sommer 2017 entschied sich das LEP-Kernteam, eine Problemanalyse nach dem Vorbild des Handbuches „Komplexe Probleme lösen“ von Schönwandt et. al. (2013) durchzuführen und ging dabei folgendermaßen vor:

(A) Zuerst wurden die größten Missstände definiert

(B) Jedem Missstand wurde anschließend ein Raumordnungs-Grundsatz aus der ROG Novelle 2017 zugeordnet, welcher diesem Missstand lösend engegenwirken soll.

(C) Dann wurden für jeden Missstand mit der Frage „Der Missstand existiert weil …“ mehrstufig die Ursachen stufenweise bis zu folgender Entscheidungspunkt gesucht:

- Kein planerischer Lösungsansatz möglich
- Lösungsansatz liegt in Bundeskompetenz oder in der Kompetenz anderer Politikbereiche
- Ein Lösungsansatz in der Kompetenz der Raumplanung ist vorstellbar.
- Für diese Ursache wurde über die ROG Novelle 2017 ein Lösungsansatz implementiert.

Erkenntnisse: Die „Rückschau“ erfolgt dann bis zur „dritten Sufe“ was bedeutet, dass erst nach drei Stufen der Usachenanalyse Klarheit zu möglichen Lösungsansätzen verfügbar war.

(D) Zu jedem Missstand wurden auch Profiteure und Leidtragenden definiert, was klar zeigte, dass jeder Missstand Nutzen wie auch Schaden produziert. Damit wiederum wird noch verständlicher, warum Missstände oftmals nicht behoben werden, da möglicherweise die Profiteure über mehr Entscheidungskraft verfügen als die Leidtragenden.

(E) Zusätzlich wurden globale Megatrends beigefügt, da diese räumliche Entwicklungen stark beeinflussen und für Ursachenanalyse sowie aufbauendes Vorausschauen nützliche Hinweise geben.

Dieser innovative Zugang der Ursachenanalyse für das neue Landesentwicklungspramm zeigte

- dass es zwar aufwändig ist, dafür ein Systemverständnis mit viel mehr Klarheit bestens unterstützt. Diese Ursachenanalyse ist darüber hinaus eine sehr gute Basis für jegliche Entwicklungsplanung,
- dass darauf aufbauend Visionen, Leitstrategien, Handlungsfelder und Maßnahmen nachvollziehbar, integriert, reflektiert und realistische Möglichkeiten adressierend formulierbar sind,
- und dass so bessere, durchgängigere Beziehungen zwischen Maßnahmen und Fragen wie z.B. „Warum sollen wir das denn machen? Wozu brauchen wir das denn eigentlich?“ herstellbar sind. Maßnahmen werden nachvollziehbarer und können besser mitgetragen werden.

3.2 Grundstuktur des LEP-Diskussionsvorschlags

Die Grundstruktur des LEP wurde im § 9 der ROG-Novelle 2017 legistisch festgelegt. Die Autoren sahen keine Notwendigkeit, von dieser Grundstuktur beim Aufbau des Diskussionsvorschlages abzuweichen. Der inhaltliche Vorschlag beginnt mit einer Präambel, der Begründung für die Neuaufstellung und der Darstellung des grundsätzlichen Aufbaus (Hauptkapitel A). Das Hauptkapitel B widmet sich der

Ausgangslage und den Herausforderungen der Raumentwicklung Salzburgs, erläutert die bestehende Siedlungs- und Raumstruktur und stellt die Kernprobleme und Herausforderungen in den Vordergrund. Im Hauptkapitel C. Vision, Strategie, Grundsätze und Leitlinien werden im 1. Teil die Werkzeuge für eine Vision für Salzburg 2040 bereitsgestellt: fünf mögliche Entwicklungsszenarien als politische Handlungsmöglichkeiten werden dargestellt und die Bausteine für einen Beteiligungsprozess erklärt.

3.3 Leitlinien der Landesplanung

Siedlungs- und Infrastrukturen	Gesellschaft & Zusammenhalt
Leitlinie 1: Salzburg ist als Wohnstandirt für die Stadt- und Landbevölkerung attraktiv und stärkt die regionale und nationale Wettbewerbsfähigkeit	**Leitlinie 2**: Die gesellschaftliche und regionale Vielfalt Salzburgs und die regionale Identität werden gestärkt. Partnerschaft und Solidarität werden gelebt.
Leitlinie 3: Die Siedlungs- und Freiraumentwicklung in Salzburg richtet sich auf die strategischen nachhaltigkeitsziele, auf Klimawandelanpassung, Energiewende und Ressourceneffizienz.	**Leitlinie 4**: Salzbrug entwickelt kooperative und effiziente Handlungsstrukturen und stärkt die Zusammenarbeit

Table 1: Leitlinien der Landesplanung

Davoen werden, wie in § 9 ROG 2009 gefordert, die Grundsätze und Leitlinien der Landesplanung abgeleitet. Auf diesem Kapitel baut das Hauptkapitel D. Die Landesstruktur gemeinsa aktiv gestalten auf. Darin werden zuerst die Planungsregionen abgeleitet und dann ein Strukturmodell für das Land Salzburg vorgeschlagen, bestehend aus polyzentrischem Siedlungsmodell und Freiraummodell. Dieses Hauptkapitel definiert auch die Handlungsfelder und weiteren Handlungsräume und endet mit der Darstellung der LEP-Umsetzungspartnerschaften. Im Maßnahmenkapitel D.4. erfolgt nach ROG-Vorgaben die Festlegung der Umsetzungsmaßnahmen bzw. Vorschläge für dazu passende LEP-Umsetzungspartnerschaften. Der verbindliche Teil endet mit dem Kapitel D.5. Planungsdeterminanten, -kriterien und -methoden sowie dem Kapitel D.6. Qualitätsziele und Indikatoren. Im Anhang finden sich die Vorschläge für weitere raumbezogene Festlegungen sowie die Erläuterungen und die Bewertung der Umwelt-, Wirtschafts- und gesellschaftlichen Auswirkungen sowie eine ausführliche Darstellung des Planungsprozesses.

3.4 Wirkungsabschätzung zu Sozialverträglichkeit, Umweltverträglichkeit, Wirtschaftsverträglichkeit

Bewertung der Umweltauswirkungen	**Bewertung der wirtschaftlichen Auswirkungen**	**Bewertung der Auswirkung auf den Lebensalltag der vielfältigen Bevölkerung**
Auswirkungen auf einzelne Schutzgüter		
Bevölkerung und Siedlungsgefüge Gesundheit des Menschen Biologische Vielfalt Fauna und Flora Boden Wasser Luft Klimatische Faktoren Landschaft Kulturelles Erbe Sachwerte	Standortattraktivität Immobilienpreise Betriebsstandorte Land- u. Forstwirtschaft Tourismus Handel, Dienstleistungen Gewerbe, Industrie InnovationenWirtschaftlich Resilienz	Kinder und Ju-gendliche Frauen und Männer Seniorinnen und Senioren Menschen mit Be-hinderung aller Al-tersgruppen
Die Beurteilung erfolgt dabei in folgender Abstufung: ++ positive Wirkung + tendenziell positive Wirkung 0 keine bzw. neutrale Wirkung	-- negative Wirkung - tendenziell negative Wirkung	

Table 2: Bewertung der Auswirkungen.

Bei der Arbeit an den Zielen und Maßnahmen für den LEP-Diskussionsvorschlag wurde rasch erkannt, dass für diese eine passende und einheitliche Wirkungsabschätzung erforderlich ist, um ein gutes Verständnis, eine passende Akzeptanz und später eine optimale Umsetzung erreichen zu können. Das LEP-Kernteam nahm sich die drei Nachhaltigkeitskriterien aus dem Brundtland-Report 1987 (ökologische, ökonomische, soziale Nachhaltigkeit) zum Vorbild und benannte sie für das LEP-Salzburg folgendermaßen:

- Bewertung der Umweltauswirkungen
- Bewertung der wirtschaftlichen Auswirkungen
- Bewertung der Auswirkung auf den Lebensalltag der vielfältigen Bevölkerung

Innerhalb dieser drei Kategorien wurden folgende Auswirkungen beurteilt.

3.5 Erstellungsprozess im Dialog mit den Gemeinden und Regionen

Ein wesentliches Ziel ist, dass das neue Salzburger Landesentwicklungsprogramm seine innovativen Qualitäts-Meilensteinen inhaltlich und organisatorisch vor allem in bestmöglicher realer Raumentwicklung erfüllen kann. Es gilt die vielfältigen Raum-Qualitäten des Standorts Salzburg bestmöglich in die Zukunft weiterzuentwickeln. Damit dies realistisch erreichbar ist, braucht es bessere Formen der Zusammenarbeit als bisher. Und dies soll im Rahmen der Landesentwicklungsplanung in folgenden zwei Komponenten erfolgen:

(A) Mit einen innovativen Beteiligungsprozess in der Ausarbeitung des LEP-Vorentwurfs

(B) Mit dem Aufbau bestens funktionierender LEP-Umsetzungspartnerschaften.

Der Beteiligungsprozess soll hierbei folgende Nutzenpunkte entfalten:

- Die LEP-Erarbeitung mit Beteiligung bringt den Sinn und Zweck der Landesentwicklungsplanung verstärkt in ein breites Bewusstsein. Politik und Verwaltung werden so besser verstanden warum das LEP für alle Menschen im Land sinnvoll und nützlich ist.
- Mit dem Beteiligungsprozess werden Betroffene und Interessierte selbst Mitgestalter des LEP. Sie finden eigene Inputs und Prioritäten darin wieder was die die Akzeptanz steigert!
- Wenn Regionen, Gemeinden und weitere Partner im LEP gut einbezogen sind, kann die LEP-Umsetzung besser funktionieren als bisher. Regionen, Gemeinden und weitere Partner stärken in dieser Beteiligung ihre Vernetzung, Kooperationspotenziale und Lösungsmöglichkeiten.
- Die Beteiligten sind Partner der LEP-Gestaltung und in der folgenden LEP-Umsetzung, was die Umsetzungswahrscheinlichkeit der Ziele und Maßnahmen steigert.
- In der Beteiligung wird die kollektive Intelligenz in Salzburg nutzbar um mit dem LEP Salzburgs räumliche Zukunft bestens gestalten und komplexe räumliche Herausforderungen lösen zu können.
- Die gestärkte Zusammenarbeit löst Kommunikationstaus auf und legt bereits hier eine wertvolle Basis für die späteren qualitätsvollen und produktiven LEP-Umsezungspartnerschaften.

Um dies erreichen zu können, wird

(a) Der Beteiligungsprozesse fundiert vorbereitet und bestens organisiert geanaged. Die Vorbereitung soll im Juli 2018 starten, damit der Beteiligungsprozess im Herbst 2018 starten kann.

(b) Der Beteiligungsprozess läuft bis zum finalen auch internen Abschluss bis Februar 2020.

(c) Es sollen vielfältige Methoden angewendet werden, welche im Rahmen der komplenden Anforderungen den Prozess optimal nütlich gestalten, Diese sind überwiegend chronologisch aufeinander aufbauend, teilweise laufen sie länger im Prozess über mehrere Phasen und sie sind systemisch wirksam miteinander verbunden.

(d) Sinnvolle und mögliche zur Anwendung vorgesehene Methoden umfassen Bürgerräte, wertschätzende Befragungen, Open Spaces, eine LEP-Zukunftskonferenz, World Cafes, Pro Action Cafes, gemeinsames Lernen aus Geschichten, regionale LEP-Peergruppen und LEP-Aktivgruppen.

Der Beteiligungsprozess ist eine fachlich wertvolle Komponente für den LEP-Vorentwurf und eine Vorbereitung für die spätere LEP-Umsetzung. Denn die LEP-Umsetzung ist in LEP-Umsetzungspartnerschafen geplant. Die Arbeitsgruppen im Beteiligungsprozess werden am Ende desselben zu LEP-Aktivgruppen, welche später eine Basis für die LEP-Umsezungspartnerschaften sein sollen.

Der Beteiligungsprozess

(A) hat eine klare Strukur inhaltlich, kommunikativ, im Management

(B) arbeitet auf Basis klarer Prozessregeln

(C) fokussiert auf ergebnisbezogene Aktivitäten

Übersicht zu den Arbeitsphasen im Beteiligungsprozess

N	Aktivität	Wann
A.	Vorbereitungsphase und interner Start	Juli bis Okt. 2018
B.	Startphase und Informationsphase „Warming up“	Nov. bis Dez. 2018
C.	Kreativphase: Das kollektive Potenzial	Jän. bis April 2019
D.	Entwicklungsphase: Was alles kann nun konkret entstehen	Mai bis Juni 2019
E.	Interne Reflexion zur „Halbzeit“, keine öffentlichen Beteiligungstermine	Juli 2019
E.	Produktivphase - alles formt sich konkret! Welche integrierten Inputs (v.a. Maßnahmen) sollen eingearbeitet werden?	Sept. bis Okt. 2019
G	Reflexion II und Finalisierende Integration der Ernte: Alles zusammenführen.	Nov. 2019
H	Abschluss, Ausblick, weitere Schritte	Jän. bis Feb. 2020

Table 3: Phasen des Beteiligungsprozesses.

3.6 LEP-Umsetzungspartnerschaften

Das neue Salzburger Landesentwicklungsprogramm soll lebendig sein, als eines, das in der Praxis ankommt und dort vielfältig umgesetzt wird. Die Erfahrung zeigt, dass bei räumlichen Herausforderungen häufig jede Institutionen häufig nur für sich oder maximal mit wenigen anderen über Lösungen nachdenken. Dabei bleibt das Potenzial wirklich guter Problemlösungen in vielfältigen Kooperationen. Wenn Gemeinden, Regionen und Landesstellen Problemlösungen gemeinsam angehen, ist das, wenn gut organisiert, kostengünstiger, qualitativ besser und realistischer umsetzbar.

Zu diesem Zweck sind LEP-Umsetzungspartnerschaften vorgesehen um das neue LEP bestmöglich gemeinsam umzusetzen. Als Vorbild dazu wurden die ÖREK-Partnerschaften herangezogen und diese Struktur wird für Salzburg passend adaptiert. Eine wesentliche Basis für die LEP-Umsetzungspartnerschaften wird bereits in der LEP-Erstellung im Beteiligungsprozess gelegt. Hier wird der Sinn, Zweck, die Begeisterung, die Community, die Aktivgruppen aufgaut, welche später die Motoren im Aufbau der LEP-Umsetzungspartnerschaften sein können.

Die LEP-Umsetzungspartnerschaften selbst werden professionell landesweit organisatorisch und inhaltich unterstützt. Sie sind nachhaltig für Gemeinden, Regionen und das ganze Land wertvolle Handlungsstrukturen um beste räumliche Lösungen verwirklichen zu können.

4 LITERATUR

DAVY, Benjamin (1996): Baulandsicherung: Ursache oder Lösung eines raumordnungspolitischen Paradoxons? – In: Zeitschrift für Verwaltung, 21. Jg., H. 2, S. 193-208

DOLLINGER, Franz (2015): Raumplanung oder: Warum Österreich 9 verschiedene Planungssysteme und Bauordnungen „braucht.“ – In: Alfred Kyrer und Michael A. Populorum (Hrsg.): Über Politische Kultur in Österreich oder: Die Eier legende Wollmilchsau. Salzburg und Bergheim: Interregio-Verlag, S. 251-291

DOLLINGER, Franz, Fackler, Andreas und Heidrun Wankiewicz (2018 – in Ausarbeitung): Salzburg 2040: Ein Lebensraum mit Zukunft: gemeinsam Salzburgs Räume wirtschaftlich, sozial und ökologisch nachhaltig gestalten. Diskussionvorschlag für eine Neufassung des Landesentwicklungsprogramms. Salzburg.

DOUBEK, Claudia und Ulrike Hiebl (2001): Soziale Infrastruktur, Aufgabenfelder der Gemeinden. Expertengutachten des Österreichischen Instituts für Raumplanung (ÖIR). Wien: (= ÖROK Schriftenreihe, Nr. 158), 86 S.

LEITNER, Tarek (2012): Mut zur Schönheit. Streitschrift gegen die Verschandelung Österreichs. Wien: Brandstätter, 205 S.

SCHÖNWANDT, Walter L., Voermanek, Katrin, Utz, Jürgen, Grunau, Jens und Christoph Hemberger (2013): Komplexe Probleme lösen. Ein Handbuch. Jovis. Berlin.

WANKIEWICZ, Heidrun (2016): Gender Planning, Gender Mainstreaming in der räumlichen Planung. Top-down und bottom-up Strategien als Bausteine für eine nutzerinnen- und gleichstellungsorientierte feministische Raumplanung. Dissertation am FB Geographie und Geologie der Universität Salzburg. Salzburg

Shrinking Spaces and Emerging Role of Information Technology in India

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1 ABSTRACT

The ever expanding Indian cities and its population from 27 million from early 20th century to 377 million in early 21st century put forth a challenge for urban planners and managers to solve complex integrated problems and to design smart sustainable cities. Even in near future the scale of problem will be going to rise as it is estimated that about 50 percent of total Indian population, which is about 814 million person, will be living in Indian cities by 2050. Moreover, the fastest growing or changing Information Technologies are playing a greater role in transformation of urban spaces in Indian cities. Hence, the present paper is an attempt to analyse the impact of Information Technologies in transformation of urban planning process in India. The paper, in relation with the case study of Delhi, analyse the implication of IT on city structure and urban spaces. It is certain the all aspects of urban fabric have an Information Technological print in different magnitudes and scale. Cybernetic age has given us different life style, working pattern and mobility behaviour. Increasing speed of internet from 2G to 3G, 4G and even 5G; from participatory interactive Web 2.0 technologies to Web 3.0, 4.0 technology; shrinking physical spaces of financial banks from whole building to Sq. meter, Sq. feet (ATM), inches (laptop), cm (Mobile), even mm (intelligent banking chip). Such technological, social, physical and economical changes will raise many question in the mind of planner, like is the functional boundaries of cities will vanish? Is IT will bridge the gap or create the digital divide among urban community? Is IT shrinking the urban spaces or not? After analysing the Indian urban and IT policy and understanding the Delhi Urban structure, the present paper tries to answer these questions. By understanding the existing complex settlement interdependence the present paper also recommends the possible solutions that IT may facilitate or hasten the development and, whether it needs to be treated as process and not an end. Finally the paper proves the hypothesis that “IT will shrink the space by eliminating the factor of time and distance by creating virtual space, but in reality it will make urban functional boundaries to sprawl and thus expand the physical urban space”.

Keywords: urban structure, spatial planning, web 2.0 technology, information technology, urban mobility

2 INTRODUCTION

Information and Communication Technology (ICT) along with Web 2.0 Technologies during the twenty first century has not only bring people closer but have affected the every aspect of urban community. With the innovation of ICT the physical and social structures of cities are not only changing but the system of governance and administration is also giving way to e-governance. In India the planning organisations and development authorities are under rapid transformation for giving way to IT and Web 2.0 Technologies for the preparation of development plans and projects. Infact, without any control, how rapidly the IT is transforming the people life style, mobility pattern, social behaviour, consumption pattern and access to knowledge, what will be the implication of IT on city structure? And what will be the effect on transport and traffic behaviour and pattern?, is a big question among Urban Managers and Town Planners. The present paper is an attempt to analysis the changing process of planning in information age in India and its implications on city structure. The present paper also explores the implication of information technology on city structure; urban transport, education and training. The interaction between human mind, information technology, computer system and communication network will guide the city structure, mobility behaviour, working pattern and life style. The Informational functional boundaries of cities will probably vanish but planning of cities through information technology base spatial planning will mark the boundaries of cities for preparation of development plans and will continue to serve the basic objective of planned design and development. The Informational functional boundaries of cities will probably vanish but planning of cities through information technology spatial planning will mark the boundaries of cities for preparation of development plans and will continue to serve the basic objective of planned design and development. Thus IT will shrunk the space by eliminating the factor of time and distance by creating cyber space but in reality IT will make urban activities to sprawl and contribute to further suburbanization making a challenge for

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planner to plan the actual space for cyberspace. Hence, 'IT and Web 2.0 Technologies will probably explode the cities beyond it boundaries'.

3 EMERGING ROLE OF IT FOR URBAN AND REGIONAL PLANNING

At present the planning process in India is sectoral in nature and coordinated by various centrally sponsored scheme for the development of urban and rural areas. Hence, information or data generated at various level/ departments are not well coordinated/ shared to meet the annual planning needs. Introduction of Information Technology (IT) would have a greater role in providing this much needed information base for planning and designing. Moreover plans are prepared by a participatory process in which vast number of human resources with technical and non-technical qualifications are mobilized. Introduction of IT will enhance the scope of participatory process of planning in India. If participatory annual planning and management is accepted by constitution then Internet based planning and management is the only approach available for urban and regional planning.

The information regarding the city, villages or regions are constantly changing in recent time than sixty years back when planning started in India. The same knowledge base regarding city and region is used by a variety of people for activities and functions. In the past, a 20 years plan was the main stay of urban and regional planning. Internet based planning allows coordinated working of departments and helps to participate people in planning and management. Networking with Internet breaks the conventional inter departmental barriers between the planners, technical providers of urban services, land and infrastructure developers and beneficiaries of planning. The interdepartmental coordination that was cited as main cause of plan implementation failure melts away in Internet based urban and regional planning. The Internet offers a domain in which every one can participate in formulation of perspective plan, five-year plan and annual plan at central, state and local level.

4 URBAN PLANNING THROUGH WEB 2.0 AND INFORMATION TECHNOLOGIES

ICT in it fully convergent form encompasses various forms of information delivery systems such as remote sensing based aerial photography and satellite imagery, media based information both electronic and print media, computers, internet, communication, etc., into one integrated environment which is considered as a major vehicle for all round socio-economic development in the country. IT has wide spread application in various sectors of development including planning, development and management of human settlements. IT should not be taken as replacement of existing techniques and medium available for planning and development rather it should be taken as an extension to facilitate the process of development, as such Internet is known as fourth mode of communication.

The basic data and information, both spatial and attribute, is the pre-requisite for preparation of Perspective, Development or Project Plan for any city or region. Aerial Photography and satellite imageries have successfully been used to generate layers of information in terms of base maps, physical and geomorphologic maps, land use analysis maps, spatial development and growth pattern maps, assessment and identification of physical resources, like water, soil, forest minerals, fauna and flora, structure and density of development environmentally hot spots, problematic and sensitive areas, identification of buildable and suitable sites for habitation, slum and squatter settlements, rough population estimates, unauthorised construction and development, flood prone areas, severe pollution affected areas, congested and overcrowd areas, traffic bottleneck areas, etc. All these information through IT, coupled with conventional means could be generated in a cost-effective manner with accuracy and authenticity. This will reduce the time required for preparation of plan.

Another set of attribute data, now available online are from the Census and National Informative Centre (NIC), Survey of India, National Spatial Data Information (NSDI) or other networks including Internet and theme based web sites. With the click of mouse a wealth of information could be scanned and downloaded for plan preparation. The data can also be collected though internet base household survey and participatory survey using Web 2.0 Technologies.

Once the basic data and information is compiled and collected through IT, it needs to be supplemented to bridge the gaps wherever necessary through conventional means, field surveys, sample surveys, participatory survey and from other secondary sources. All these information fed into the computer in Geographical Information System (GIS) mode could be analysed, processed and generated in the required format using

GIS packages and data base management packages. In this process computation and analysis of large amount of data, which otherwise takes months and years, can be done in few days ensuring accuracy in processing. In addition, it can handle any amount of complex data and help in developing models and alternatives.

The next stage is presentation of plan proposals and preparation of draft reports, computer based graphic packages, spreadsheet packages and word processing packages have almost revolutionised the presentation techniques. All the maps, drawings, charts, graphs, pictorials, etc., are generated through these techniques in a neat desired format and in the required presentation manner. Application of IT for this purpose not only improve the quality of output but also accelerate the generation of maps and drafts in a quickest possible time. The draft of the plan and project once put on Internet and specific web sites in an interactive system the public participation and inter-sectoral collaboration would be easier for refinement of the plans and draft.

The final plan and project once made available on internet and web site the various agencies responsible for implementation and enforcement of plans and projects could easily refer the proposals and provisions while taking up various projects and schemes for implementation. Monitoring of plan implementation would be easier in an interactive system. The entire plan with geo-reference in the computer provides a sound base for regulating the development, monitoring the development, and management of services. Sub-system for various aspect of plan like building permission and disposal system, land registration and deed issue system, recovery of land and property tax could be developed as part of Urban Information System through IT which would be helpful in monitoring and management of development as well as for review and revision of the plan in periodical manner. Smart and intelligent system for critical aspects of the development plan need to be developed for tackling the problems on fire-fighting basis like problems of unauthorised development, polluting units and industries in non-conforming areas, re-densification and decongestion in particular settings. Packaging of essential citizen's services at one central point has been successful experiments in redressal of public grievances and delivery of service through IT. For operationalising the emerging planning system in an effective manner the information technology will play a crucial role in facilitating the planning process at various stages ranging from collection of basic data and information for implementation and enforcement of plans. The Indian policy initiatives taken for wider application of information technology indicate that how IT can facilitate the planning and development process.

5 POLICY INITIATIVE IN INFORMATION TECHNOLOGY

Considering IT as an agent of transformation of every facet of human life, the Government has decided to make India a Global IT superpower and a front runner in the age of Information Revolution.

In order to achieve the goal of IT, the policies are envisaged for setting up the base for a rapid spread of IT awareness, propagation of IT literacy, networking of government functioning, IT led economic development application and penetration of IT in rural areas, development of training for IT, wider use of day to day IT services such as Tele-banking, Tele-medicine, Tele-education, Tele-document transfer, Tele-library, Tele-information centres, e-commerce, public call centres, etc. In view of the importance of information technology to be he frontier area of knowledge, an operation knowledge campaign is required to be launched by initiating various schemes and programmes. Information technology would be used as vehicle for all round socio-economic development in the country which in turn would facilitate creation of a strong domestic IT market. While taking pro-active steps to promote the growth of IT industry it is also being taken care of that, these developments do not create a new division in society, referred to as digital divide by some people- divide between those who have access to IT based services and those who do not. As Government has constituted a Working Group on Information Technology for Masses in May 2000, thereafter the Group is deliberating on major initiatives taken by various State Governments agencies for taking IT to masses i.e. potential areas and application for development of IT, schemes and programme for citizens participation and a comprehensive plan for taking IT to masses.

Over the years, departments of Central and State Governments as well as other agencies have been taking active interest to use IT in various public sectors. Some of the initiatives taken by Central and Government having direct and indirect bearings on Urban and Regional Development Planning may include: creation of web sites by the departments regarding various programmes and schemes operated by them for information of the public; development of Integrated Information System by the Planning Commission on various schemes being executed by NGOs in the country through various departments; countrywide programmes for land record computerization in collaboration with states etc.

At state level the Government of Andhra Pradesh has taken a lead in developing IT industry and use IT in the process of governance in citizens oriented schemes. Computer Aided Registration of Deed (CARD) is an important system developed by Registration Department for Completion of Registration deeds in one hour. Twin city Network Services (TWINS) has been implemented as a single counter packaging 18 types of citizen services and networking six departments of the state government. This service is being replicated at 285 counter on Build, Own and Operate (BOO) basis. Fully Automated Service of Transport department is another example of the use of IT. The Government of Delhi is preparing an IT policy to make Delhi into a Cyber city. IT Kiosks are being set up so that common man could interact with the government. Gujarat Government also plans to establish 1500 Information Kiosks in collaboration with private sector. Smart Card is being used by the Transport Department of issuing driving license. In Haryana it has been planned to have e-governance for urban and planning processes. Private sector would be associated for setting up IT kiosks. Action initiated for computerized operation of local bodies and municipal committees in the State.

The Government of Karnataka (at state level) has launched an ambitious IT policy called Mahiti to take IT to masses. In Bhoomi Project 190 lakh land records concerning to 60 lakh farmers have been computerized. High-speed network is being set up. IT initiatives taken by Kerala Government relates to project to be implemented in 1300 'panchayats' in the state which will have information on birth-death, caste ration card, social welfare scheme, housing schemes, etc., and subsidies and incentives. Single counter based services for seven departments known as Friend Project is being operated through IT. Housing Portal has been set up for providing information on housing schemes, availability of financing, and construction technologies. In Madhya Pradesh (State), Gyandoot is the main project under which 21 rural Cyber Cafes called Soochanalaysa have been established. Each Soochanalaya provides service to about 10 - 15 Gram Panchayats, 20 to 30 villages covering 20000 to 30000 population - located at various public places, The service provided by these centres include among others marketing information, land records, etc. In Maharashtra (State) some of the major projects include registration and stamp duly, sales tax and transport departments. In Pune, District Collectorate (in Maharashtra State) has provided one point service to citizens on various functions performed by the collectorate. In Punjab Geographic Information System is being planned with basic parameters like village data base, road network, irrigation and canal network, power network and information regarding each department in the form of layers. The Government of Rajasthan (State) has decided to implement most of e-governance initiatives on it own. An information system for Mandis connecting 236 mandies (market) on line has been developed. Tamil Nadu (State) has given lot of emphasis on IT services being provided in local language. Broadband network infrastructure is being developed. In Uttar Pradesh (State) 70 out of 83 districts have optical fiber connectivity. Government is introducing separate channel on cable network in Lucknow (capital city of Uttar Pradesh State) to disseminate information related to government plans. In fact, lot of work done in the government sector need to be publicised to the public so that benefit of the existing level of IT induction reach to the people of the country. Thus, so far, the planning process in India is changing with the emerging role of Information Technology policy of India. We will move on to the implication of IT on spatial planning.

6 IMPLICATION OF IT ON CITY STRUCTURE

The major impact of IT on the Indian cities and region will be on land-use pattern as the information technology revolution will make hierarchical pattern of settlements obsolete and will lead to a new electronic cities and regions. Bill Gates, Kevin Kelley and John Naisbitt expect to see an array of positive developments and foresee radical changes in economics, politics, and culture of the cities and region. Involvement of IT in the planning process will lead majority of people empowered to participate in preparation of Master and Regional Plans and decision making process, which hope to expand productivity with improved employment opportunities and improved democratic process. Morphology of the settlements historically depends upon the spatial function of the cities and regions. However, with the IT revolution function of the cities and regions will occupy the place in cyberspace. Locational importance of the functions of the cities and region will lose to the cyberspace and mixed land-use will emerge on the real space. Hence, planning will be needed to plan the real space for the cyberspace. For example New Delhi, Capital City of India, has distinct land use zones of residential, industrial and commercial etc with multiple nuclei around which the city has developed. In New Delhi clustering of related land-uses around several nuclei created a cellular structure and the pattern is determined by the unique factors of specific site, culture and history. This ‘multiple nuclei structure' of the city will transform into 'exploded structure' because most of the city functions specific to the location will be lost to the cyberspace. As shopping will give way to virtual-shopping and commercial centre (which at present act as nuclei of the city) will loose the importance of location, and, can be located any where in the city or out of the city, or in other words, commercial zone will be merge with the residential zone and transform the city structure into mixed land use. Thus with the popularity of e-commerce, e-governance, virtual shopping, virtual university, virtual classroom, virtual school, virtual theatre, virtual entertainment, more and more functions of the city will immerge over cyberspace and city will be dispersed by a process of leap-frogging over an enormously wide area. Thus New Delhi will spread over the suburbs with smaller satellites. These satellites will not even be reached by train or even by road but by super highways and optical fiber. Thus, if actual space not be planed judiciously and appropriately it will lead to several problems not only on space but also for cyberspace. As much as city functions released form locational constraints related to maximum acceptable commute time and distance, Information technology will contribute further suburbanization and urban sprawl. This will also have a direct impact on transport by reducing automobile and office use.

7 MANAGEMENT AND IMPLICATION OF IT ON CITY TRANSPORT

Transportation is an essential component of modern day living. Rise in per capita income copied with inadequacy of public transport system has resulted in high private vehicle ownership in urban areas. The growth in per capita income coupled with the developments on other sectors have led to surge of vehicular traffic invading and consuming road spaces in the most unprecedented and unexpected manner. Traffic and transportation sector has been under severe stress in the cities. It is felt that only information technology revolution shall be able to cater the ever- increasing demand so this sector. Information technology will bring work place closer to the living place or at living place. This will reduce the commute trips and distance. By reducing trip distances and frequencies, overall fuel use by Tele-commuters will be reduced. In addition those Telecommuters will save themselves as well as the society in the related costs of operating motor vehicles. Reducing automobile use is one of the primary benefits of telecommuting. Studies of telecommuters have shown clear and dramatic reductions in all aspects of automobile usage (Handy, 1994; Kitamura, 1991). Thus IT users will eliminate two trips per day when they work at home. Elimination of automobile trips has tremendous environmental benefits, including reduced emission and reduced non-renewable fuel use. In 1985 Fathy's study shows that 32 percent reduction freeway congestion could be achieved by just 12 percent of the workforce telecommuting. IT can reduce speed-period commuting travel, and thus help reduce congestion and traffic load on freeways would remain more constant throughout the day, thus reducing peak period congestion. Telecommuters and teleshoppers may find less need for automobiles, and thus teleactivity may result in lower car ownership rates.

With the revolution of IT there may not be a need to travel long distance for the sake of job, thus may reduce pressure on urban infrastructure related to transportation. This will further have an indirect influence on the requirements of the flyovers. The information super high ways will reduce the use of roadways. The introduction and full use of new advance technology will affect inter-personal and inter-group equations. Delhi has been a case in India where the traffic is controlled at a central position in the traffic policy. The traffic conditions in the city became so grim that it was almost impossible to control it. But today the junctions of most important areas are signalised and are controlled and regulated by on-line technology. A computer programme i.e. SCOOT is integrating and co-ordination the signal system on a stretch. Also, the blank spots (accident points) of the city are on-line and are handled with GIS technology. Thus helps in reducing the number of accident.

The Intelligent Transport System (ITS) technology further enhancethe safety efforts on the roads because they are centrally controlled in an integrated manner. Thus the role of information technology in streamlining the traffic by improving its efficiency and enhancing safety on the road can not be ignored. The Online/Tele-commuting facility for railways and airways reservation is another important area where many trips have been curtailed. The booking of tickets or inquires into any matter has been made easy by Tele-commuting facility that is controlled centrally. The role of IT in implementing various transportation improvements measures in important and crucial. Intelligent Transportation system (ITS) helps in vehicle identification, vehicle guidance and provision of bus priority. The component elements would include Traffic Signal Controlled, Bus priority including Traffic Gates, Gap Generation, and Advance Stop Line etc. vehicle detection is enable by use of fixed equipment like induction loops beneath the road surface, transponders in the bus or/ by Global Positing System (GPS) linked to computer on board the bus.

In recent times IT is increasingly applied to improve the operational efficiency of city bus system. Some of the examples include: Adelaide (Australia), Guided bus way, Sao Paulo (Brazil), Bus Convoy, Curitiba (Brazil), Segregated bus way, Istanbul (Turkey), Bus way Transit System, Ottawa (Canada), Bus Network and Bus Transit mail, Leeds (England), Guided Bus way.

8 IMPLICATION OF IT ON URBAN MANAGEMENT

Management aims at policy making and its implementation. This includes the issues pertaining to organizational resources such as financial and human, organizational structures and procedures. These are wider issues, which also cover the ways in which the managers interact with each other beyond their departments and also with the decision-makers and the public. Policy decisions affect the interrelations to a greater extent. Urban management has a close link with economic development and rural urban links. This has resulted in more expectations from the urban managers.

Technological advancements in the fields of computer application, data management, Geographic information System (GIS), GPS, Remote Sensing, Satellite communication system and information technology etc. have influenced the lives of urban people. These advancements have tremendous impact on urban systems especially telecommunications, micro processing, Tele-fax, email, e-commerce, fiber optics, digital calendars, file transfer protocol (FTP) software and CAD, CAM etc. These have been encompassing every sphere of urban activity including design, construction and management of construction projects, preparation of town plans and layouts and traffic automation and global information superhighways.

Organizing information is an essential element of urban management. Right to information of public domain data, consumer data, citizens rights, universal access, data relevant to development planning, financial data etc. drives the need for developing an urban information infrastructure. Proper urban planning, decision making and implementation of development proposals call for a generation of comprehensive information systems. The urban information system should include some of the areas like urban sprawl; urban land use; zoning, demography; urban environment; transportation housing settlement; urban infrastructure like water supply; sewerage; solid waste disposal; power supply; service facilities etc. Thus with the application of IT will not only help to manage the urban problems but also bring governing body and inhabitant of the city closer. And finally, more and more people will have the authority to take part in location specific decision making process.

9 CONCLUSION

Advancements in Information Technology, telecommunications, computer and satellite technology during the twentieth century has not only improved the connectivity but have affected the life style of people, process of governance and administrations, approach for planning and development, functioning of various urban systems, urban structure, social structure, education and various other facets of human activities. Urban and regional development was greatly influenced by access, distance and the average speed of motor vehicles. With the information and communication revolution-taking place, access, distance and average speed of motor vehicle need not be the major determinant of urban and regional development.

With the globalization, the price sensitive movement of commodities that can creatively make use of information and communication technology will determine the commodity movement. This will result in complex settlement interdependence. This is analogous to a situation where the dependent settlement structure will face sudden rapid change which need to be judiciously and appropriately planned. Fast convergence of Infotech, communication technologies and satellite technologies will have greater implication on the planning and development process of human settlements (town and villages). IT may facilitate or hasten the development scenario and as such it needs to be treated as process and not an end. The real test lies in the application of Information technology for making urban development planning an effective tool. The Informational functional boundaries of cities will probably vanish but planning of cities through information technology spatial planning will mark the boundaries of cities for preparation of development plans and will continue to serve the basic objectives of planned design and development. Thus IT will shrink the space by eliminating the factor of time and distance by creating cyber space but in reality, IT will make urban activities to sprawl and contribute to further suburbanization making a challenge for planner to plan the actual space for cyberspace. Thus, Web 2.0 and Information Technology will may possibly explode the city.

10 REFERENCES

Banerjee U.K. (Eds.) ,: Planning and Management of Town Planning Education in India, I.I.T., Kharagpur, 1995.

Brail, R.K. : Microcomputers in Urban Planning and Management, Rutgers, New Jersey, The State University of New Jersey Press, 1987.

Drucker, P. : The Next Information Revolution, Forbes ASAP, 24 August, 1998.

Government of India : UDPFI Guidelines, Institute of Town Planners, India, New Delhi, 1996.

Hoffman, D.L. and Novac, T.P. : Bridging the Racial Divide on the Internet, Science, 280, 17 April, 1998.

Luithlen, L. : The Gravity of Information: A new Order of Cities and the Role of Urban Planner, Journal of Urban Technology, Vol.14 No.2, 1998, pp. 61-77.

Mingers, J and Stowell, F.: Information System: An Emerging Discipline, The McGraw-Hill Companies, 1997.

Peter Droege (Eds.), : Intelligent Environments Spatial Aspects of the Information revolution, North Holland, 1997.

RAUT, S.K. and RAUT P.B.: Building Inclusive Smart Sustainable Cities through Virtual Environment, REAL CORP 2015.

RAUT, S.K. and RAUT P.B.: Smart Sustainable E-Solutions for Implementation and Enforcement of Smart Cities in India, REAL CORP 2016.

RAUT, S.K. and RAUT P.B.: Implementation Challenges for Establishing Smart Urban Information and Knowledge Management System. In: Sustainable Smart Cities in India: Challenges and Future Perspectives, Ed. Sharma P. and Rajput S., Springer, pp. 59-72, 2017.

Wagale L.R. : Urban Management Planning, Challenges and opportunities in the next Millennium, Proceeding of 48th National Town and Country Planner Congress, Jaipur, December, 1999.

Zenial Kotval, : Telecommunication: A realistic strategy for re-vitalization of American Cities", Cities, Vol. 16, February, 1997.

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Smart Occupancy – How to Avoid City Expansion by High-Density Use of Existing Buildings

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1 ABSTRACT

Any hope of reducing CO_2 to 26 percent below 1990 levels by 2020 [in Britain] has to focus on 'green occupancy', argues Andrew Mawson, Managing Director of Advanced Workplace Associates in London, in 'Premises & Facilities Management Magazin' in September 2010. Further her explains: "The greenest building you have could be the one that you do not need to occupy".

Surveys carried out 2011 in Austria, Germany and Switzerland demonstreted, that class rooms stand empty for an average of 90 percent of the time of potential use, lecture rooms and office space for up to 95 percent. Still, they have to be financed, built, heated, cooled, maintained, refurbished and connected by roads, pipes and cables [Wiegand 2011].

Green Occupancy is defined ‚as an intensive use of space over time combined with a user behavior taking into account all appropriate possibilities to reduce climate relevant emissions of the building'. This idea is complimentary to the concept of Green Building. Buildings that do not incorporate intensity of use and user behavior are contradictionary to the overall target of Green Building: the mitigation of climate change by avoidance of climate relevant emissions!

- If companies, public authorities and individuals strive to improve ecological impact of human activities, it is most effective to think beyond the completion of construction and include the time of use by calculating the occupancy cost and climate relevant emission per user unit, e.g. one hour of education of one class or one hour of work of one employee.
- If companies, public authorities and individuals are in need of more space and consider spatial expansion, they should first analyse the space they already occupy and the degree of use. Optimisation of efficieny then can focus on improvements of the ecological footprint and of saving money. Both can be achieved by just changing the approach to workplace allocation over time. Very likely it is possible to meet demand completetly or at least in parts without additional office space.

„Intelligent" management of space and its use over time has more than just ecological benefits. For example, it is social, because it makes education cheaper and affordable for low income households; it is economical, because it saves money; and it can promote casual meeting of people – a major source for innovation. Due to these facts the authors intend to widen the approch towards Smart Occupancy.The conference contribution provides the results of a research study finished in 2017 by the Division Real Estate Development and Management at Vienna University of Technology (TU Wien) and Unternehmensberatung Wirth. In this study, a structured list of topics was discussed with real estate managers in Austria and Germany from companies with a staff of more than 500. The intention was to understand if these companies apply, or are able to implement, priciples of smart occupancy beyond mere cost reduction.

The results show that Corporate Real Estate Management at the time being mostly does not consider ecological aspects of intensive use of space over time nor targetted adaption of user behavior. This also applies to Facility Management, and even for employee representatives and the management of big companies. ‚Intesifying of use' and ‚avoiding new building' do not have lobbies yet.

The survey also reveals the necessities for implementation of an integral strategy for optimised use of built environment:

- Buildings readily to be used by different user groups with various demand – easy to realize with new objects, challenging in building stock
- Organisational framework of company structures and procedures including technical feasability by housing technology and booking system
- Company culture enabling shared space and shared responsibility

Keywords: green occupancy, high density, expansion, smart city, real estate management

2 INTRODUCTION

2.1 Problem statement

Intensity of the use of buildings and open space over time is societal highly relevant for cities and metropolitan regions with rapidly growing numbers of inhabitants. Limited space, growing demand and attractivity for investment in periods of low interest make up for a price rally in real estate. Smart occupancy is aimed to make available more space without more buildings, traffic areas and other infrastructure while reducing sealing of soils and urban sprawl.

While there are some theoretical works and research projects on Green Building there is an open field for further effort to make it happen. The term Green Occupancy has been coined to describe measures that enhance the concept of green building into the life span of buildings. We suggest the use of Smart Occupancy with respect to the role and function of housing technology and building services using IT as well as new approaches to the organisation of work including options made available by IT. This should help to make the next big step in creating awareness for the significance of intensified use of buildings.

The first mentioning of Green Occupancy might have been in 2009 in an article by Jerry JACKSON [2009], then an energy economist with over 35 years experience, in The Journal of Sustainable Real Estate. Dealing with expectations of higher return because of ‚green' qualities, this is a valuable approach but not what we understand by the term today: „Findings reveal a mean internal rate of return for Leadership in Energy and Environmental Design (LEED) buildings of 126% with a 10% probability of achieving an IRR of 50% or less. [The internal rate of return (IRR) is a widely used investment performance measure in commercial real estate.] Buildings with an ENERGY STAR certification achieve a mean IRR of 140% with virtually no probability (1.6%) of achieving an IRR less than 50%." The essence is, that green buildings yield higher with less risk.

JACKSON further states: „Financial benefits of a sustainable building option can be calculated with data on conventional building rent (R, $/square foot), the green rent premium (RP, $/square foot), conventional building occupancy (O, %), the green occupancy premium (OP, %, difference between conventional and sustainable occupancy rates), the mean incremental cost of sustainable construction (CP, $/square foot) from Exhibit 2, and the discount rate, r, with the following equation: …" [‚premium' standing for higher rental yield].

According to our research, the term Smart Occupancy was first used by Nilesh Y. NADHAV [2016] in his book ‚Green and Smart Buildings - Advanced Technology Options': „The building sector is the largest contributor to global greenhouse gas (GHG) emissions. Buildings use about 40 % of global energy, 25 % of global water, 40 % of global resources, and they emit approximately 30 % of GHG [Green House Gas] emissions. These emissions are set to double by 2050 if we carry on business as usual. Buildings present the most impactful and also economical mitigation potential for GHG emissions globally. In this book, we look at several green building design technologies, including the design methodology itself (i.e. integrated design). A green and smart building is an interplay of various integrated design strategy such as passive and active design features, as well as water and waste reduction techniques, renewable energy integration, building management systems and controls, efficient operations and rating systems that allow effective benchmarking and performance analysis and guidelines for various stakeholders involved in the building industry".

While NADHAV's approach mostly concentrates on technical aspects, others [like McNESTRIE 2013] deal with the changes of work itself: "…the old conception of the office is dead. Globalisation, the telecoms revolution and the inflation of consumer demands have ganged up to do away with it. A wasted hour commuting each way everyday, one-person-one-desk, telephones tethered to desks, a heavy reliance on face-to-face meetings, territoriality, status hierarchies and an obsession with presenteeism: all have been jettisoned. The sacred cows of 150 years of management practice have been unsentimentally culled."

An approach for practical use was developed by WIEGAND at ETH Zurich in 2005 and later on at Vienna University of Technology (TU Wien) since 2009. Creating new, improved management processes was a central aim of the cooperative project integrating Facility Management and the Institute for Analysis und Scientific Computing at TU Wien.

To make optimisation of buildingspace applicable WIEGAND et al. developed a discrete events simulation (DEVS) based software tool named MoreSpace. The representation / the dynamic simulation of the dynamic behavior of employees over time when using different workplaces, visiting customers etc. enables the estimation of workplaces needed and enables the optimization of office space and management related to its occupancy. It was uccessfully tested and applied e.g. at DATEV in Nurnberg [Schöner et al 2014].

The current situation concerning the application of Smart Occupancy concepts and tools in Austrian coporate Real Estate Management could be summarized as follwos: ´There is some interest, but the majority has not yet realised the readily available resource.´This has been confirmed by ‚Expertenbefragung Zukunft Bauen‘ several times. The series of annual online survey with representatives from building and real estate sectors was started in 2011. On average, it yielded over 200 questionaries filled in by qualified experts, peaking at 228 in 2017. The question concerning ‚Challenges for the construction sector‘ started with 16 items, with more added in following years, and was repeated in every run: „Construction sector is facing many challenges: How important will these topics be for you / your company within the next 5 years? Please assign [to the following items, 25 in 2017] marks from 1 to 5 standing for 1 = very important, 2 = important, 3 = indifferent, 4 = less important, 5 = unimportant.“ In 2014, the item ‚MoreSpace‘ was added, and, to broaden the topic, two more in 2016, without stating ‚Green Occupancy‘: ‚Increasing density …‘, and ‚Making use of vacancy …‘. Both diagrams following show the same selection of items:

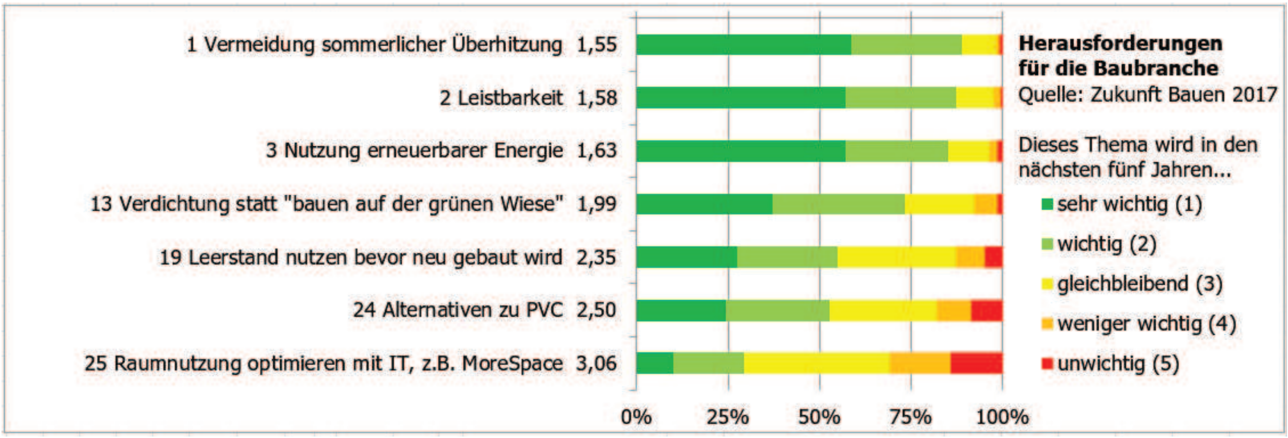

Fig. 1: Challenges for the construction sector within the next five years, as inquired 2017

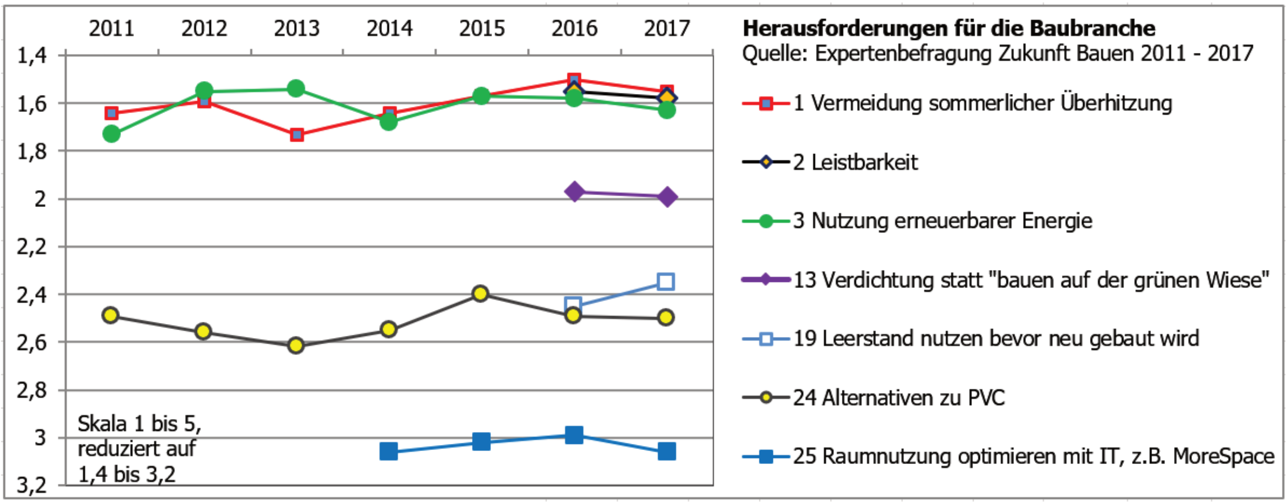

Fig. 2: Challenges for the construction sector within the next five years, as inquired 2011 to 2017

1 Avoiding overheating in summer

2 Affordability

3 Using renewable energies

13 Increasing density [of use] instead of building in open countryside

19 Making use of vacancy [upgrading existing infrastructure] before building new

Note: Top three items receive similar mark in 2017

Items 1 to 24 cluster within the range of 1.5 to 2.5

Item 25 lags far behind at 3.06

24 [Using] alternatives for PVC

25 Optimising use of existing space supported by IT e.g. by MoreSpace

Time series show the average mark for item 25 like fixed around 3.0. This, at first glance, seems to indicate indifferency. In fact, this mark hides strong polarisation between two blocks, with 64 respondants voting ‚important', and 67 ‚unimportant'. Suprisingly, this makes for a hopeful outlook: Indeed, two thirds do not see the necessity of using IT-based support for optimising occupancy of space. The remaining third, in effect, stands for a considerable potential of persons and companies willing to pay more attention to it.

Of the new items from 2016 ‚Increasing density …', gets rank 13, well ahead of ‚Making use of vacancy …' at 24. Obviously, ‚Increasing density …' implies building activity, like rooftop extension, while ‚Making use of vacancy …' would not generate much new business for the building industry. This obviously results from architects and building companies prevailing in the sample.

While everything seeems clear in theory, adequate practice is missing. To make the challenge visible, WIRTH conceived a diagram showing one year with the shares of typical activities for an employed person in Austria. This diagram shows a year consisting of 8640 hours resulting from 360 days at 24 hours. This assumption allows simple calculation of shares and their presentation in a data matrix, with a deviation of less than 1.4 percent from the true figure, 8760 hours for a year of 365 days.

Every year consists of three parts – night time (shown in dark blue), leisure time (in yellow) and work time. Talking about paid working time, two thirds of every day are not at disposal. From the remainig third of 2880 hours we have to deduct time for different reasons. Please keep in mind that a day in the following calculation consists of only 8 hours.

(1) Weekends and holidays (in yellow, separated from leisure by a fat dashed line.), meaning 104 plus up to 13 days a year in Austria, rounded down to 108 days, or 864 hours. Remainig are 2016 hours of ‚Potential working time' (framed by a fat line).

(2) Vacation days (in green) – at least five weeks in Austria, totalling 25 days as weekends have been deducted before – and days resulting from other time-off entitlements like Sick leave, Family reasons like children's weddings or care for relatives, and Residential change, adding up to 60 days, or 480 hours. Remainig are 1536 hours of ‚Effective working time'.

(3) Trainings and business Events (in light green), and Work dates (in pale green) out of offce and in office but not at the desk, estimated to be 3 days per month, in total 288 hours. Remainig is the white block of 1248 hours of ‚Effective working time at desk'.

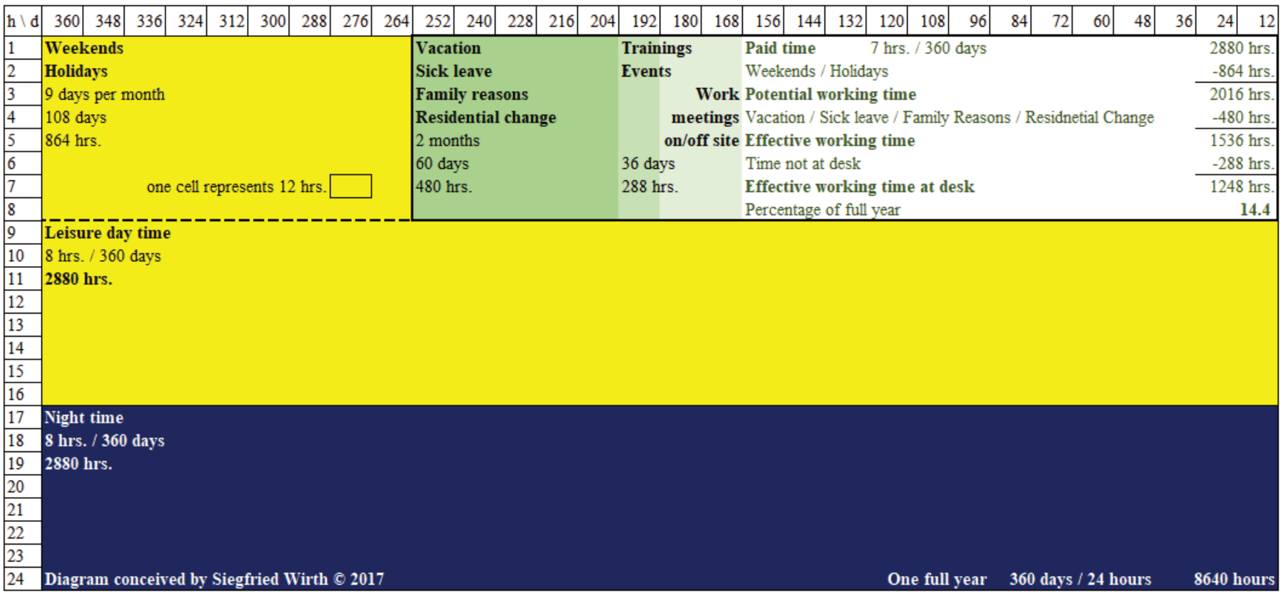

Fig. 3: Annual working time - Cautious assumption for the proportion of effective work time at desk during one full year

According to this calculation the average employee spends on the job at desk only 14.4 percent of the total annual time, or 61.9 percent of the ‚Potential working time' and 81,25 percent of the ‚Effective working time'. This gives a scope of action of at least 18,75 percent at the time beeing. This percentage is likely to expand, possibly very soon and fast, with further developement towards more flexible and even agile working, which after McNestrie [2013] “is flexible working that is extremely flexible”.

2.2 Defining the research question and methods

Green Occupancy is defined as an intensive use of space over time combined with a user behavior taking into account all approptiate possibilities to reduce climate relevant emissions of the building. This idea is complimentary to the concept of Green Building. Buildings that do not incorporate intensity of use and user behavior are contradictionary to the overall target of Green Building: the mitigation of climate change by avoidance of climate relevant emissions!

To make the challenge manageable the research question was focussed on the obviously most rewarding target group, big companies. They engage staffs of hundreds or even thousands that share space in more or less big buildings. In the average company, the traditional approch still widely in use allocates a personal workspace to every person. This may have some benefits but definitely is maluse of space.

For a preliminary research project, funded in parts by vienna business agency (Wirtschaftsagentur Wien), a guideline was conceived along which narrative interviews could be conducted to find out about the current approaches and practices. In this study, seven leading experts for real estate and facility management from companies with staffs of over 500 have been interviewed. Findings from this research are the basis for others that are intended to provide representative results as an input to a commucations process aimed to creating, in a longer term, expanding and deepening awareness for an integrated approch to occupancy, encompassing the life span from the building concept to the end of occupancy and beyond.

3 RESEARCH FINDINGS

The expert talks reveal that any occcupancy process is not just happening but every company has a clear approach of how to allocate workspace. Also, there mostly is an idea of optimised organising of occupancy. The scope of action strongly varies according to the type of building, the existing status of occupancy, and company culture.

- Older buildings with a grid resulting from technical limitations also are limited regarding flexibility of use.
- Traditional companies tend to have a strong relationship between attributes like size and/or location of offices and hierarchic values, limiting flexibility of use even more.
- With new buildings, the future use is an aspect of planning and can be optimised in interchange of shaping the grid – or mostly avoiding to create one, thanks to improved building techniques - and providing technical services to allow intelligent, intense use over time as well as parallel multiuse.
- Projects of relocation like moving whole companies, transferring departments, or merging company sites in one building, theotretically give the best opportunity for the application of smart occupancy.
- There is no automatism for the application of Green Occupancy even in cases as mentioned before: The focus is on aspects of costsaving by reduction of space, improvement of communications and cooperation, while there is hardly any awareness for the relation beteween intensity of use and ecological effects.
- Successful occupancy planning requires the inclusion of the of future users’ needs and desires from the start of building develeopment.
- Allocation of space is not only a question of building and housing technologies and efficient work but also has to include the users and their wellbeing.
- New office conceptions will reduce the demand for space in centralized offices.
- Green Occupancy is not a particular step to be achieved but an ongoing process allowing for adaption and improvement.

4 CONCLUSION AND OUTLOOK

As even the term Green Occupancy has been mostly unknown to the experts interviewed, there is strong necessity for the creation of awareness. As internal guidelines for occupancy come from the company leaders

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whose main interest rightfully is the core business, intensity of use of their offices is merely a side aspect. The challenge is to combine cost saving with maximum benefits for environment – outside of buildings and inside – and the wellbeing of employees. For future application, the term of Green Occupancy shall be changed, and the content extended, to Smart Occupancy prior to any further action, with this statement at REAL CORP 2018 as a kickoff.

Effective roll out calls for diversified action:

- Widening the knowledge about the companies methods and habits for the allocation of workspace by representative studies, the first one to be launched as soon as possible, and, if required, later ones according to progress focussing on fine tuning.
- Starting a long term process of communications on Smart Occupany.
- Identifying building and relocation projects with potential for application of Smart Occupancy. With new buildings, the future use is an aspect of planning and can be optimised in interchange of shaping the grid – or mostly avoiding to create one, thanks to improved building techniques - and providing technical services to allow intelligent, intense use over time and parallel multiuse.
- Supporting responsible experts in the process of implementing and continuosly practicing Smart Occupancy.
- Help creating a holistic mindset regarding all aspects of building and real estate over time and for the life cycle of buildings, focussing simultaniously on economical, ecological, and social factors, in paticular the wellbeing of users.

As the latter is an upcoming trend in human resource policy, we see an opportunity to accelerate the awareness rate by putting the side benefits in front. Further, this can combine with the other trend mentioned before, making cities, quarters and, of course, buildings smart.

5 AFTERTHOUGHT

Optimising space is not only an issue for big companies, according to another international trend in housing. People tend to live in ever smaller homes. In Austria, we see two reasons for this new behaviour: Rising prices for property, mostly caused by increasing prices of building plots, and stagnation of net incomes.

This trend is met by an expanding range of space-saving furniture. A very impressing and convincing example is given by Resource Furniture, a New York based international company co-founded by Ron BARTH. When talking to journalist David FRIEDLANDER he stated: “Most high end furniture doesn’t take space efficiency into account because the people who can afford it usually have huge homes. We’ve been successful because we offer something unique: quality furniture with high design that optimizes any space it’s put in.”

6 REFERENCES

FRIEDLANDER, David: We Talk to Ron Barth of Resource Furniture at: LifeEdited, New York, 2013
http://lifeedited.com/we-talk-to-ron-barth-of-resource-furniture/ http://resourcefurniture.com/
https://www.youtube.com/watch?v=wp6mG7YrnHQ#action=share
JACKSON, Jerry Ph.D.: How Risky Are Sustainable Real Estate Projects? An Evaluation of LEEDand Energy Star Development Options. in: The Journal of Sustainable Real Estate, Editor Norman Miller, University of San Diego, 2009, Volume 1, Number 1
http://www.josre.org/wp-content/uploads/2012/09/JOSRE-Volume1-20091.pdf
MAWSON, Andrew: Less is ‘Green’. Premises & Facilities Management Magazine Tonbridge, Kent, England London, 2010
http://www.pfmonthenet.net/article/36541/Less-is--Green-.aspx
McNESTRIE, Adam: British Telecom moves one step beyond Flexible Working — to Agile Working. in: FMWORLD 2013, quoted after http://fmlink.com/articles/british-telecom-moves-one-step-beyond-flexible-working-to-agile-working-2/
NADHAV, Nilesh Y. affiliated with Energy Research Institute, Nanyang Technological Universit, Singapore: Green and Smart Buildings - Advanced Technology Options. Singapore, 2016
https://link.springer.com/book/10.1007/978-981-10-1002-6#toc
PFEFFERLE, Dirk: Arbeitsplatz der Zukunft - One size fits all? Blog at report Online Magazine. Vienna, 2017
http://www.report.at/index.php/blogs/neue-welt-des-arbeitens/entry/202663-arbeitsplatz-der-zukunft-one-size-fits-all
SCHÖNER, D., HAMER, H., KOVACS, A., WIEGAND, D.: Dynamische Simulationen im Flächenmanagement. in: Schweizer Energiefachbuch 2014. Nachhaltig Planen, Bauen und Betreiben. 31. Jahrgang; herausgegeben von: Roland Köhler; Kömedia AG, St. Gallen, 2014, ISBN: 978-3-9523902-8-3, S. 45 - 48.
red.tuwien.ac.at/publikationen

WIEGAND, Dietmar: Flächeneffizienz / Initiative more-space.org / gefühlt mehr Raum durch intelligente Nutzung. in: Facility Management. Messe und Kongress. Frankfurt am Main, 25. - 27.02.2014, 1; herausgegeben von: Mesago Messe Frankfurt GmbH, Stuttgart; VDE Verlag GMBH, Berlin und Offenbach, 2014, ISBN: 978-3-8007-3576-1, S. 464 - 468.

WIEGAND, Dietmar: Ein neuer Ansatz, um Energie zu sparen. in: Schweizer Energiefachbuch 2012, herausgegeben von: künzlerbachmann medien; künzlerbachmann medien, St. Galllen, 2011, ISBN: 978-3-9523902-0-7, S. 111 - 114.

WIEGAND, Dietmar, et al.: MoreSpace - Mehr Raum für die Lehre durch dynamische ereignisorientierte Simulation der Raumbelegung at: ZiDline Die Zeitschrift des Zentralen Informatikdienstes, Vienna 2008

https://www.zid.tuwien.ac.at/zidline/zl19/morespace_mehr_raum_fuer_die_lehre_durch_dynamische_ereignisorientierte_simulation_der_raumbelegung/

WIEGAND, D., MEBES, P., PICHLER, V.: Event based simulations: enabling improved development planning and partnerships.

Vortrag: Internationale Konferenz zu Stadtplanung und Regionalentwicklung in der Informationsgesellschaft, TechGate Vienna, Wien; 20.05.2007 - 23.05.2007; in: Real Corp 2007: To Plan Is Not Enough, 12. Intern. Konferenz zu Stadtplanung und Regionalentw. in der Informationsges. M. SCHRENK, V. POPOVICH, J. BENEDIKT (Hrg.); (2007), ISBN: 978-39502139-3-5; S. 17 - 23.

WIEGAND, D., MEBES, P., PICHLER, V.: Event based simulations: enabling improved lifecycle and risk management of facilities. Speach at EuroFM Research Symposium, Zurich, Switzerland; 26.06.2007 - 27.06.2007; in: 6th EuroFM Research Symposium - Conference Papers, H. SCHALCHER, T. WEHRMÜLLER (Hrg.) ISBN: 978-3-033-01258-5; S. 55 - 64. 2007

WIEGAND, D., WIRTH, S.: Green Occupancy - Welchen Stellenwert hat eine intensive Gebäudenutzung für gewerbliche Büromieter? Vienna, 2017

WIRTH, Siegfried: Ressourceneffizienz beim Bauen. at: Expertenbefragung "Zukunft Bauen", Vienna, 2013

http://www.expertenbefragung.com/index.php/andere-studien/29-expertenbefragung-zukunft-bauen-2013

WIRTH, Siegfried: Herausforderungen für die Baubranche 2011 – 2017. at: Expertenbefragung "Zukunft Bauen", Vienna, 2017

http://www.expertenbefragung.com/index.php/zukunft-bauen

Strategien für Regionen mit Bevölkerungsrückgang. Zwischenergebnisse aus der ÖREK-Partnerschaft und dem ASP-Projekt INTESI

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1 KURZFASSUNG

Die regionale Bevölkerungsprognose 2030/2050 der Österreichische Raumordnungskonferenz (ÖROK) zeigt, dass der demografische Wandel und der Bevölkerungsrückgang in vielen österreichischen Regionen und Gemeinden ein zentrales Thema der nächsten Jahre sein wird. Vor diesem Hintergrund läuft im Zeitraum 2016 – 2018 eine kooperative Zusammenarbeit, in welcher sich Vertreterinnen und Vertreter von 14 ÖROK-Mitgliedern, beauftragte Expertinnen und Experten und Beteiligte aus 3 Pilotregionen mit den sich daraus ergebenden Problemen, Herausforderungen und Handlungsmöglichkeiten auseinandersetzen.

Bevölkerungsrückgang und die damit verbundenen sozialen Veränderungen lösen starke Emotionen aus. Für eine Auseinandersetzung bzw. einen Umgang mit diesen Emotionen besitzen Raumplanung und Regionalentwicklung derzeit keine geeigneten Settings und Instrumente. Eine zentrale Rolle in der Deutung dieser Entwicklung aus der Innen- und der Außensicht spielt die sorgfältige Verwendung der Sprache.

Für die Organisation und Gestaltung einer zukunftsfähigen Daseinsvorsorge, für die Entwicklung von Gemeinden und Regionen mit Bevölkerungsrückgang spielen staatliche Planungen und Programme eine wichtige Rolle. Das Projekt baut auf den Zielen des Österreichischen Raumentwicklungskonzepts 2011 (ÖREK 2011) auf und entwickelt auf Grundlage von Analysen der Expertinnen und Experten Empfehlungen für Strategien, welche über eine rein wachstumsorientierte Entwicklungsperspektive hinausgehen, mehr Ergebnisoffenheit aufweisen und die administrative Komplexität verringern können.

Pilotregionen wie der Bezirk Lienz (Osttirol) sind Gebiete, in denen auf Basis bestehender Konzepte und Programme im Rahmen dieser ÖREK-Partnerschaft Umsetzungsprojekte stattfinden. Zudem werden die von Expertinnen und Experten entwickelten Handlungsvorschläge im Rahmen von Veranstaltungen von regionalen Akteurinnen und Akteuren reflektiert. Auch dieser Austausch erfolgt unter dem Fokus auf „Sprache, Emotionen und Tabus“.

Das Land Tirol nimmt im Zeitraum 2016 – 2018 am EU-Alpenraum Projekt „Integrierte territoriale Strategien in der Grundversorgung - INTESI“ als einer von 10 Partnern im Alpenraum teil. Das Ziel von INTESI ist es Möglichkeiten der Integration und Kombination von staatlichen Strategien in der Grundversorgung aufzuzeigen. Damit sollen Synergien zwischen verschiedenen Sektoren generiert werden, durch die multisektorale Vorgehensweise soll die Leistungserbringung unterstützt werden.

Die Sicherung der Daseinsvorsorge im ländlich strukturierten Raum stellt eine wichtige Maßnahme der Landesentwicklung dar. Die qualitätsvolle Grundversorgung der Bevölkerung durch öffentliche bzw. von der öffentlichen Hand unterstützte Dienstleistungen ist eine unerlässliche Voraussetzung für lebenswerte Siedlungs- und funktionsfähige Wirtschaftsräume.

Diese Zielsetzung gilt es in besonderer Weise für abgelegene und dünn besiedelte Landesteile im Auge zu bewahren und durch das Zusammenwirken verschiedener Versorgungseinrichtungen ständig umzusetzen. Im Rahmen des EU-Alpenraum Projekts INTESI wird der Bezirk Reutte (Ausserfern) als Testregion „unter die Lupe genommen“. Darüber hinaus wird im Pilotprojekt „Digitales Gesundheitstagebuch Ausserfern“ eine praxistaugliche Anwendung in der Verbindung der Schwerpunkte mobile Pflege und Informations- und Kommunikationstechnologie aufgezeigt.

Keywords: Framing, Bevölkerungsrückgang, Strategien, Daseinsvorsorge, Lebensqualität

2 DAS PHÄNOMEN BEVÖLKERUNGSRÜCKGANG

2.1 ÖROK-Prognose 2014

Die Einwohnerzahl Österreichs wächst, gleichzeitig altert die Bevölkerung. Das sind die Haupttrends der aktuellen und auch weiterhin absehbaren demographischen Entwicklung auf nationaler Ebene. Das Bevölkerungswachstum ist nahezu ausschließlich durch Wanderungsgewinne begründet. Differenziert nach Prognoseregionen (Bezirke) sind im Prognosezeitraum bis 2030 starke Zuwächse allerdings nur in den großen Städten und deren Umland zu erwarten. Hauptmotoren des Wachstums in diesen von (Wieder-)

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Urbanisierung und anhaltender Suburbanisierung geprägten Ballungsgebieten sind positive Salden der Außen- und Binnenwanderung. Im darauf folgenden Projektionszeitraum bis 2060 ändert sich das Bild kaum.

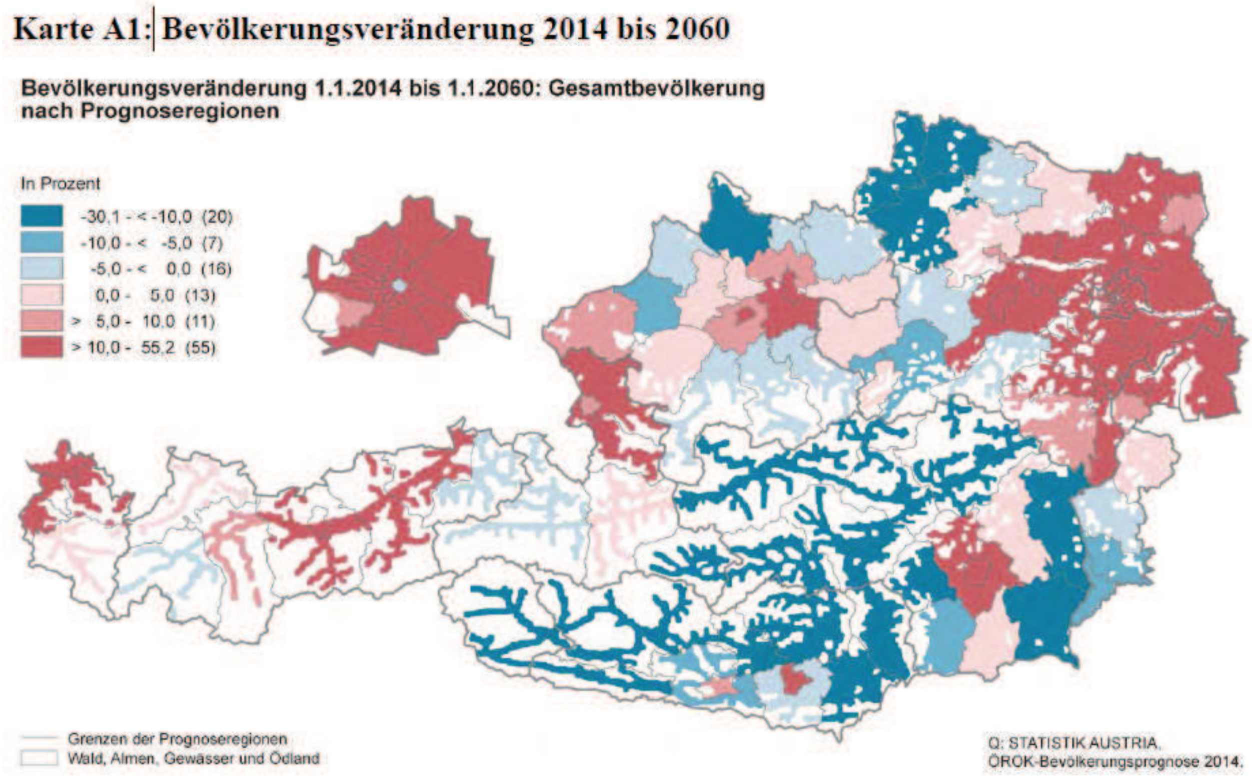

Abbildung 1: Bevölkerungsveränderung 2014 bis 2060 nach Prognoseregionen (Bezirke)

Die Gebiete mit der nach Prognose und Projektion abnehmenden Bevölkerungszahlen sind in nationaler Sichtweise eher peripher gelegene Regionen. Sie finden sich vorwiegend in den südlichen und nördlichen Bundesländern Österreichs und dort außerhalb der überregionalen Zentren. Auslöser der regionalen Bevölkerungsabnahme sind immer weniger oft die negativen Wanderungssaldi sondern vielmehr und infolge der zunehmenden Alterung der Bevölkerung die deutlich an Einfluss gewinnenden Geburtendefizite.

Analyse des Bevölkerungsrückgangs

Das Phänomen des Bevölkerungsrückganges hat sich in Österreich und wohl auch im gesamten Ostalpenbereich deutlich ausgebreitet, in Österreich sind 30 % der Bezirke und 40 % der Gemeinden davon erfasst. Gemäß den Bevölkerungsprognosen wird jedenfalls bis 2030 keine Stabilisierung oder gar Trendumkehr eintreten, es dürften aber keine zusätzlichen Regionen in Richtung Bevölkerungsrückgang kippen.

Obwohl sich die demografische Entwicklung in Bezirken mit abnehmender Bevölkerungszahl deutlich unterscheidet, wird vielerorts eine negative Geburtenbilanz zum ausschlaggebenden Faktor dafür. Dieser Umstand ist der oftmals etablierten „Abwanderungskultur", dem längst eingetretenen Rückgang der Fertilität insbesondere auch in ländlichen Gebieten und der zunehmenden Alterung der verbliebenen Bevölkerung geschuldet. Die Folgen negativer Geburtenbilanzen wirken nachhaltig und können selbst mit leicht positiven Wanderungsbilanzen nicht kompensiert werden. Der Bevölkerungsrückgang führt zu einer älteren Bevölkerung. Das Durchschnittsalter in Regionen (Bezirke) mit abnehmender Bevölkerungszahl liegt bei ca. 45 Jahren, in städtischen Regionen bei ca. 40 Jahren (2015).

In einer Betrachtung der Bevölkerungsentwicklung auf Ebene der Gemeinden ergeben sich in den meisten Prognoseregionen (Bezirke) mit abnehmender Bevölkerungszahl kleinräumig deutliche Unterschiede. Zumeist aber nicht generell zeigen sich geringe Zunahmen oder Stagnation in den regionalen Zentren und deren Umlandgemeinden. Dieser Entwicklung stehen oftmals deutliche Abnahmen und sehr deutliche Alterung der Bevölkerung in regional schwer erreichbaren Gebieten gegenüber. Am Beispiel der aktuellen Bevölkerungsentwicklung aller Tiroler Gemeinden und deren Einstufung nach Raumtypen lässt sich dieser Umstand eindeutig aufzeigen.

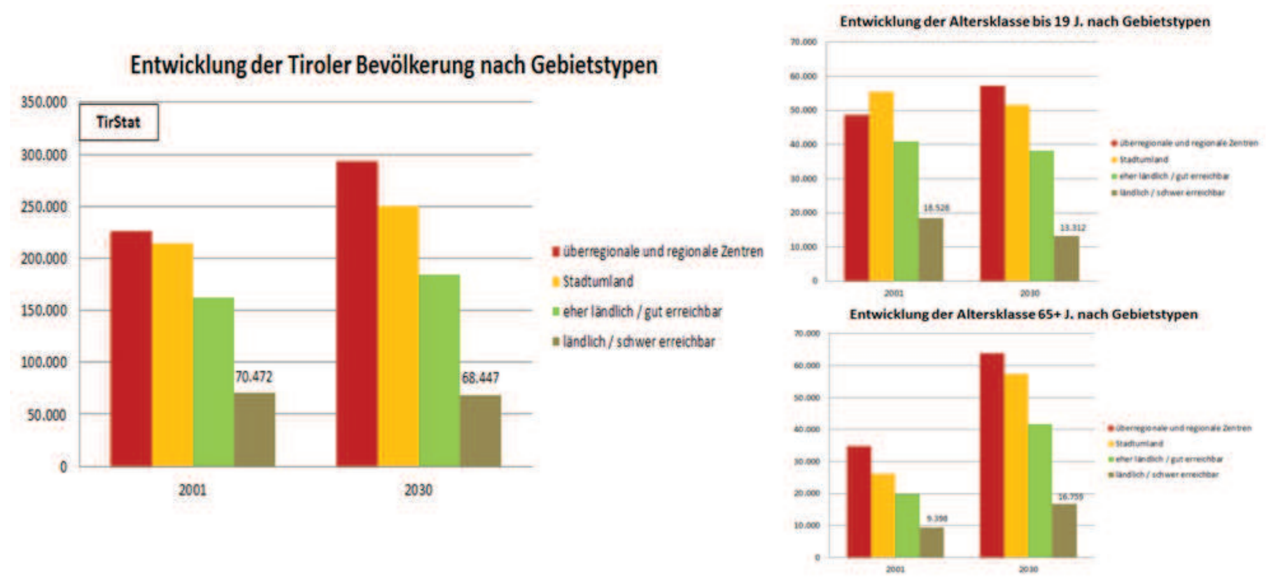

Abbildung 2: Entwicklung der Tiroler Bevölkerung (auch Altersklassen bis 19 bzw. 65+ Jahre) von 2001 bis 2030 nach Raumtypen

Im Allgemeinen wird davon ausgegangen, dass Wanderung infolge von ungleichen Lebensbedingen und Entwicklungsmöglichkeiten stattfindet. Zu den bekannten Faktoren treten auch gesellschaftlich selektive Umstände, insbesondere auch solche für junge Frauen. Die Alterskohorte von 15 bis 29 Jahren zeigt in ihrem Wanderungsverhalten infolge der Ausbildungsphase, dem Eintritt in die Erwerbsarbeit, den Haushalts- und Familiengründungen eine verstärkte Mobilität. Dabei ergibt sich im Zeitraum von 2005 bis 2015 auf nationaler Ebene selbst für die peripheren ländlichen Regionen ein nahezu ausgeglichenes Wanderungssaldo, sowohl das quantitative Ausmaß als auch den geschlechtsselektiven Anteil betreffend.

Regionen (Bezirke) mit abnehmender Bevölkerungszahl weisen auch Zuwanderung aus dem In- und Ausland auf. Die Binnenzuwanderung, welche vorwiegend in die regionalen Zentren und ihr Umland führt, kompensierte im Zeitraum von 2005 bis 2015 zwischen 70 und 100 % die Binnenabwanderung. Damit zeigt sich über einen längeren Zeitraum eine erhebliche demografische Dynamik mit Anteilen von 20 bis 40 % an zugezogenen Personen, darunter auch Rückkehrerinnen und Rückkehrer. Dieser Umstand wurde im bisherigen Diskurs über Regionen mit Bevölkerungsrückgang wenig beachtet.

3 DEN BLICKWINKEL WENDEN

3.1 Faktor Lebensqualität

Bei der Betrachtung der Lebensqualität wurden vor allem jene Bereiche analysiert, welche einen Raumbezug haben. Die Analyse der Erhebung EU SILC 2012/2013 ergab unter Bezugnahme auf Gemeinden und Regionen mit abnehmender Bevölkerungszahl, dass in solchen Gebieten

- die verschiedenen Angebote der Daseinsvorsorge signifikant schwieriger zu erreichen sind - dies kann als schlechtere „objektive“ Lebensqualität ausgelegt werden;
- die Zufriedenheit mit der Wohngegend als zusammenfassender Indikator für „subjektive“ Lebensqualität signifikant höher ist.

Diese scheinbar paradoxe Situation ist ein bekanntes Phänomen in der Lebensqualitätsforschung. Ein schlechteres oder fehlendes Angebot der Daseinsversorgung vor Ort kann durch Erhöhung der Mobilität kompensiert werden. Durch höhere Verbundenheit mit benachbarten Personen können soziale Unterstützung und praktische Hilfe erbeten werden. Hingegen können Personen, welche in Ballungsräume ziehen, über unvollständige Informationen verfügen oder überzogene Erwartungen hegen.

Nimmt man die Lebensqualität als Maßstab, so sehen sich Menschen in Regionen mit Bevölkerungsrückgang nicht als „Verlierer“. Sie haben vielfach gelernt, mit der sinkenden „objektiven“ Lebensqualität umzugehen oder sich einzuschränken.

Das Zusammenwirken von „Having – Loving – Being“ scheint sich an menschlichen Bedürfnissen zu orientieren und ein „gutes Leben“ zu kennzeichnen. Zu den materiellen Komponenten der Lebensqualität

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treten das Bedürfnis nach Anschluss zu Menschen(gruppen) durch Kontakte sowie die Selbstbestimmung durch Einbindung in (politische) Entscheidungen hinzu. Lebensqualität stellt sich als ein komplexes und mehrdimensionales Konzept vor, welches sich nicht durch Erfüllung eines einzelnen Aspektes definiert.

3.2 Faktor Regionalwirtschaft

Der Zusammenhang zwischen Demografie und regionalwirtschaftlicher Entwicklung zeigt auf, dass Regionen (Bezirke) mit Bevölkerungsabnahme beim BIP / EW zwar tendenziell unter dem österreichischen Durchschnitt liegen, jedoch in den letzten zehn Jahren überdurchschnittliche Zuwächse aufweisen. Zwischen Arbeitsplatzentwicklung und Bevölkerungsentwicklung, zudem auch beim Einkommensniveau unselbständiger Beschäftigter, lassen sich keine statistische Zusammenhänge herstellen.

Hingegen beeinflusst die Veränderung der Wirtschaftsstruktur die demografische Entwicklung der Regionen (Bezirke). Es gibt einen Zusammenhang zwischen Bevölkerungszunahme und dem Anteil der Beschäftigten im Dienstleistungssektor, wobei darunter der Anteil an unternehmens- und wissen bezogenen Diensten deutlich korreliert. Ein überraschendes Detailergebnis in der Betrachtung der letzten Dekade ergibt sich in Zusammenhang von Tourismus- und Bevölkerungsentwicklung: Je höher die lokale Tourismusintensität (touristische Nächtigungen pro Einwohner) ausgeprägt ist, desto wahrscheinlicher ist ein Bevölkerungsrückgang. Die Zusammenhänge zwischen abnehmender Bevölkerungszahl und dem Anteil der Beschäftigten im primären (Land- und Forstwirtschaft) und sekundären (Industrie und Gewerbe) Sektor sind schwach ausgeprägt.

Die Standortpolitik von Regionen mit abnehmender Bevölkerungszahl sollte sich verstärkt auf die Ansiedlung hochwertiger Dienstleistungen ausrichten. Der Tourismus trägt in solchen Gebieten nach wie vor wesentlich zur regionalen Wertschöpfung bei, er ist aber kein „Allheilmittel“ gegen den Bevölkerungs-rückgang. Für Industrie und Gewerbe, mehr noch für die Land- und Forstwirtschaft, gilt es, mit regionaler Spezialisierung und hoher Qualität die Substanz und Wettbewerbsfähigkeit zu erhalten.

3.3 Neue Orientierung finden

Spricht man von Regionen mit abnehmender Bevölkerungszahl, werden sehr häufig Sprachbilder verwendet, die um das „Sterben" bzw. das „Schrumpfen“ dieser Regionen kreisen. Dieser Deutungsrahmen steht im unmittelbaren Zusammenhang mit dem Konzept des Wachstums: Dies setzt „mehr“ mit positiv gleich und bewertet „weniger“ negativ. Daraus entwickeln sich die Emotionen der Menschen in diesen Regionen: Sie fühlen sich allein und zurückgelassen, empfinden sich als unbedeutend, machtlos und schwach. Diese Emotionen sind nicht nur schwer zu bewältigen, sie verstärken auch eine Stimmung, durch welche diese Regionen erst recht für viele unattraktiv erscheinen – vor allem in der Außensicht.

Eine zentrale Erkenntnis der Arbeiten der ÖREK-Partnerschaft ist, dass eine umfassende und differenzierte Betrachtung der jeweiligen Region sowohl auf der Faktenebene als auch auf der emotionalen Ebene notwendig ist. Die neu zu findenden Vorwärtsgeschichten greifen daher Themen auf, die in den Regionen positiv konnotiert sind und die Zukunftspotenziale bieten; kurz: Themen, die Menschen positiv berühren, motivieren und eine neue Stimmung, die von innen kommt, schaffen. Soche Erzählungen handeln von naturnaher Lebensqualität und gelungener Zusammenarbeit, von Entwicklungsmöglichkeiten für Mädchen und Frauen, sehen Zuwanderung als Chance für die Region, regen Offenheit und Vielfalt an, stellen erfolgreiche Firmen als „hidden champions“ vor den Vorhang, bieten Ansätze für inovative und selbst organisierte Dienstleistungen.

Diese Narrative stellen eine essentielle Ressource bei der Umsetzung von zukunftsorientierten Projekten und Initiativen dar. So kann man von Sprachbildern des Sterbens und des Todes in Sprachbilder von Leben und Zukunft wechseln, damit nicht in der rein quantitativen Betrachtungsweise („wir werden immer weniger") verharren, sondern auch hoffnungsvolle Zukunft für Regionen mit abnehmender Bevölkerungszahl erkennen.

4 HANDLUNGSEMPFEHLUNGEN

- Dem demografischen Wandel kann trotz starker äußerer Einflüsse aktiv begegnet werden.

Das Phänomen des Bevölkerungsrückganges und des Alterns der Gesellschaft benötigt die aktive und gestaltende Befassung. Die Umsetzung braucht das Zusammenspiel von verschiedenen Akteuren in Form einer Multi-level-Governance. Dabei geht es nicht um einen Standortwettbewerb, sondern um Kooperation und Selbstbestimmung, Ausgleich und Förderung.

Den Folgen des demografischen Wandels kann durch Anpassung begegnet werden, dabei steht die Verbesserung der Lebensqualität für die verbleibende Bevölkerungung und die Zuwanderinnen und Zuwanderer im Vordergrund. Auf die bestehenden Stärken einer Region aufbauend soll ein Imagewandel betrieben werden.

Individuelle Wanderung kann auch als „Bewegung vorwärts“ zur Selbstentfaltung begriffen werden, wodurch eine Hinwendung zur Rückbindung von Abwanderinnen und Abwanderer und eine „Empfangskultur“ für Rückkehrerinnen und Rückkehrer und Zuzügler möglich werden.

- Neue Perspektiven in der Regionalentwicklung sind nötig.

Die klassischen auf Wachstum orientierten Ziele und Strategien der Regionalentwicklung reichen nicht aus, um den anhaltenden Bevölkerungsrückgang in etlichen Regionen (Bezirke) und vielen Gemeinden Österreichs zu verhindern. Für eine positive Entwicklung braucht es zusätzliche Perspektiven.

Für die Aufrechterhaltung der Lebensqualität sind innovative und integrative Konzepte auf (klein)regionaler Ebene gefordert, welche den vorhandenen Human-Ressourcen an Kreativität und Selbstorganisation freien Raum bieten. Die Funktionen von Wohnstandorten und hoher Freizeit- und Erholungsqualität sollen gegenüber einer zu stark wirtschaftlich orientierten Perspektive an Bedeutung gewinnen. Eine kulturell aktive und sozial offene gesellschaftliche Atmosphäre soll gefördert werden.

- Regionalwirtschaftliche Empfehlungen

Die Rahmenbedingungen für Dienstleistungen, darunter insbesondere für unternehmens- und wissensbasierte Dienste, sind ein Schlüsselfaktor im wirtschaftlichen Strukturwandel. Bisher haben von dieser Entwicklung vor allem städtische Regionen in Form attraktiver Arbeitsplätze profitiert. Regionen mit hoher Abwanderung verfügen potenziell über ein Netzwerk an „ausheimischen“ Expertinnen und Experten, dessen Aktivierung und Nutzung dem Brain Drain entgegenwirken und neue Entwicklungsperspektiven ermöglichen kann.

Die Ausstattung mit leistungsfähiger Breitband-Infrastruktur, die Etablierung regionaler Wertschöpfungsketten und „smarte“ Spezialisierungen in der Produktion sind ebenso wichtig wie soziale und kulturelle Angebote. Die Angebote und regionale Verankerung von „Lebenslangem Lernen“ haben hohen Einfluss auf die Innovationsfähigkeit von Regionen und deren Attraktivität. Attraktiven regionalen Zentren kommt dabei eine besondere Rolle zu.

- Weiche Faktoren der Lebensqualität werden wichtiger.

Hochwertige Dienstleistungen und Einrichtungen der Daseinsvorsorge benötigen eine ausreichende Nachfrage und gute Erreichbarkeit. Für eine Bündelung solcher Angebote eigenn sich regionale und interkommunale Zentren. In dünn besiedelten Gebieten gilt es innovative Dienstleistungen zu entwickeln, darunter mobile und digitale Angebote, verbunden mit Bündelung und Zusammenführung von (sektoralen) Leistungen, ermöglicht durch Selbstorganisation, Anerkennung und Aufwertung von Familienarbeit und freiwilliger Sozialarbeit.

Die negativen Geburtenbilanzen zeigen auf, dass hochwertige Angebote der Kinderbetreuung, kinderfreundliche Arbeitszeiten und spezifische Unterstützung für Alleinerzieherinnen und Alleinerzieher gefragt sind. Die Gleichstellung von Frauen in der politischen Öffentlichkeit und bei der Erwerbsarbeit, die soziale und kulturelle Vielfalt sind Merkmale einer dringend erforderlichen Öffnung einer zukunftsfähigen Gesellschaft.

5 INTEGRIERTE, TERRITORIALE STRATEGIEN IN DER GRUNDVERSORGUNG

5.1 Ziele und Bausteine im ASP-Projekt INTESI

Gute Grundversorgungsleistungen sind eine Voraussetzung für eine hohe Standort-, Wohn- und Lebensqualität. Verschiedene Gebietskörperschaften sind zuständig für die Entwicklung und Bereitstellung von Dienstleistungen der Grundversorgung. Dabei wurde und wird zumeist ein sektoraler Ansatz gewählt, der zu isolierten Lösungen führt und keine Synergien zwischen den vorhandenen spezifischen Strategien der Grundversorgung generiert. Die Zusammenführung von Angeboten an Dienstleistung ist insbesondere in dünn besiedelten Gebieten erforderlich, um die Marginalisierung der Grundversorgung zu verhindern.

Deshalb besteht ein großer Bedarf für eine vertikale (verschiedene Ebenen) und horizontale (verschiedene Sektoren) Integration von Strategien der Grundversorgung in einem territorial konkreten Ansatz.

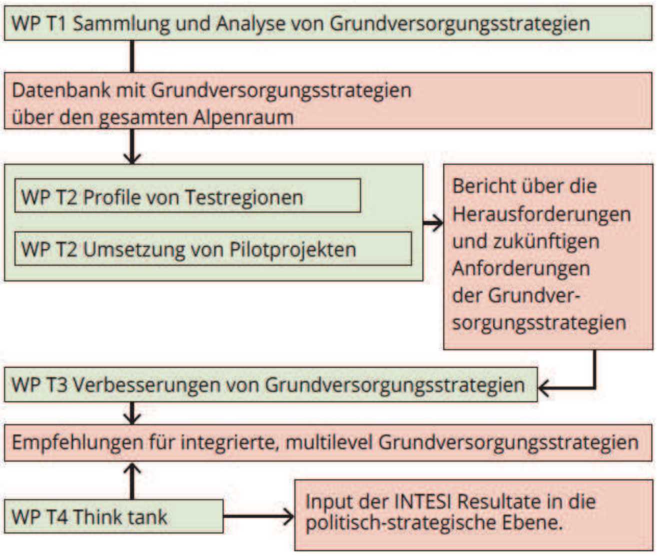

Abbildung 3: Projektfluss im ASP-Projekt INTESI

5.2 Aspekt der Integration in Strategien der Grundversorgung

Der Vergleich von 257 staatlichen Strategien aus den Alpenregionen zeigt eine breite und vielfältige „Landschaft" an Leistungsangeboten in der Grundversorgung auf. In diesen Dokumenten wurden 5 Modelle der Integration und ihre Kombinationen näher untersucht: Die Ebenen der Akteure und Verwaltungen, die Finanzierung und (politischen) Richtlinien, sowie andere Elemente des Zusammenwirkens.

Als ein Ergebnis zeigt sich, dass der Aspekt der Integration einen grundsätzlichen Ansatz in allen Sektoren der Grundversorgung darstellt. Die Zusammenarbeit der Akteure sticht in den Bereichen Regionalentwicklung und Pflege besonders hervor. Am ehesten wird in den Strategien die Zusammenarbeit zwischen unterschiedlichen Verwaltungsebenen, also in vertikaler Ausrichtung definiert. Die Finanzierung erfolgt in den Bereichen Bildung, Gesundheit und Pflege, sowie Regionalentwicklung oftmals auf verschiedene Träger verteilt. Am geringsten ist das Zusammenwirken von Sektor Politiken in Gesetzen zu erkennen, am ehesten erfolgt dies noch im „weichen" Bereich der Regionalentwicklung. Die Strategien aus dem letztgenannten Bereich weisen damit auch die höchste Häufung an integrativen Modellen auf.

Grundsätzlich sind deutliche Erfordernisse einer besseren Vernetzung der Leistungsangebote im öffentlichen Verkehr und im Telekommunikationsbereich mit allen anderen Versorgungsbereichen erkennbar. Ein identifiziertes Bedürfnis nach besserer Zusammenarbeit besteht zwischen den Sektoren Gesundheit und Pflege, sowohl auf Sektor politischer Ebene als auch im persönlichen Dienstleistungsangebot.

5.3 INTESI-Think Tank als Beitrag zum EUSALP-Prozess

Im Think Tank diskutieren Vertreterinnen und Vertreter aus den Verwaltungen und der Wissenschaft, von NGOs und Dienstleistungsunternehmen aus den Alpenregionen die Ergebnisse der Analysen und erörtern die Möglichkeiten für alpenweite Synergien in der Grundversorgung. Für die laufende Projektdauer stellt diese Tätigkeit einen Beitrag über den Zugang zu Diensten der Grundversorgung im Rahmen der Action Group 5 im EUSALP-Prozess dar. Damit soll angesichts territorial differenzierter Entwicklungen von Bevölkerung und Wirtschaft im Alpenraum eine integrierte Strategie der EU und der Alpenregionen entwickelt und umgesetzt werden.

6 REFERENCES

Strategien für Regionen mit Bevölkerungsrückgang, References:
http://www.oerok.gv.at/raum-region/oesterreichisches-raumentwicklungskonzept/oerek-2011/oerek-partnerschaften/aktuelle-partnerschaften/strategien-fuer-regionen-mit-bevoelkerungsrueckgang.html
http://www.alpine-space.eu/projects/intesi/en/home

This paper was removed due to conference non-appearance of the speaker.

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The Challenge of Transforming Urban Supply and Disposal Infrastructures to more Resource and Energy Efficiency

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1 ABSTRACT

Facing global climate change, the transformation of energy systems in many countries of the world has already been progressed significantly. In line with this development, a shift towards closed loops has been iniciated in some parts of the world by separating urban solid wastes for recycling purposes. In contrast, the more than 5.000 year tradition of urban water supply and urban waste water discharge seems to be without any alternative: cities import fresh water from their hinterlands and flush the sewage to areas situated downstream in order to avoid the appearance of epidemics. This longlasting practice was supplemented by stepwise adding end-of-the pipe technologies of sewage treatment from the early 20th century on. Now in many parts of Europe three treatment stages are standard. The current debate in some European countries about a forth and even fifth stage rise the question whether this development of adding more and more treatment stages to the old sewer pipe technology can be assessed as sustainable with respect to resources and energy consumption on one hand and impacts on the environment on the other hand.

During the last 20 years new and innovative infrastructure systems for water supply and waste water management have been developed and implemented on a pilot scale. Most of the associated technologies make use of the separate collection and treatment of specific waste water streams. The separate handling of these different streams requires physical modifications but also challenges behavioral patterns and institutional frameworks. Therefore, investigation is necessary to know how the implementation of these technologies can be made more convenient in order to achieve a significantc impact on the urban sustainability performance.

Keywords: energy, supply and disposal, urban transition, solid waste, separate waste water treatment

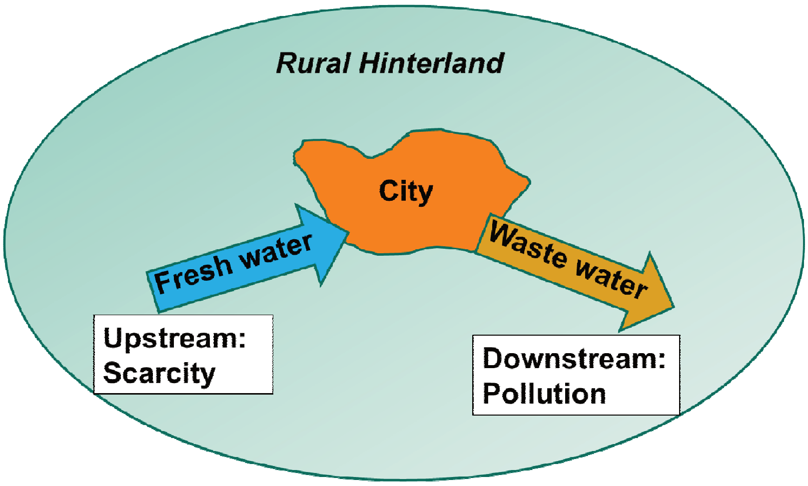

Fig. 1: Water – connection between city and hinterland.

2 HISTORY OF URBAN WATER SUPPLY AND WASTE WATER DISPOSAL

2.1 The relation of cities with their hinterlands

The high aggregation of many humans within a limited spatial dimension forms a socio-technical artefact which is called "city". The high concentration of people results in a lot of advantages compared to a rural dissipated form of settling (e.g. short distances, accumulation of best brains, better affordable technical infrastructures) but creates relevant challenges as well. Among these challenges are the supply with nutrients and water as well as the save handling of human excreta. In the long run any failings in the excreta management result in the outbreak of epidemics with the risk of a reduced or even liquidated urban

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population. Thus, the existence of cities was and is dependent on appropriate waste water management systems and the associated infrastructure. Archeological excavations of ancient cities therefore necessarily will not only discover infrastructures of water supply but as well technologies of waste water collection and transport.

The water supply and waste water disposal infrastructure systems from the very beginning until today used the gravity as driving force of transport. Because of this, upstream regions of cities are used as water supply areas whereas sewage is lead to downstream regions. This pattern often results in situations of water scarcity upstream of a city and and regularly in situations of pollution downstream a city (compare fig. 1).

2.2 Examples of the ancient world

It can be assumed that ancient societies have been conscient about the fact that fresh water and waste water should be kept separately in order to avoid hygienic problems and related diseases. They made use of the physical separation of surface water and ground water by the soil. In most cases, e.g. Mohenjo-daro in the Indus valley, Greece and in the Roman Empire, water from springs, upstream reaches of creeks and rivers or groundwater was used for water supply and waste water was lead to agricultural areas or lead back to rivers (e.g. Cloaca Maxima in Rome). In Assur, part of ancient Mesopotamia (see figure 2), it seemed to have been the opposite case: Fresh water was taken from the river and waste water has been collected and seeped afterwards into the underground (fig. 3).

Fig. 2: Ancient Egypt and Mesopotamia c. 1450 BC (Source: http://geschichte-wissen.de/blog/assyrien-geschichte-ueberblick).

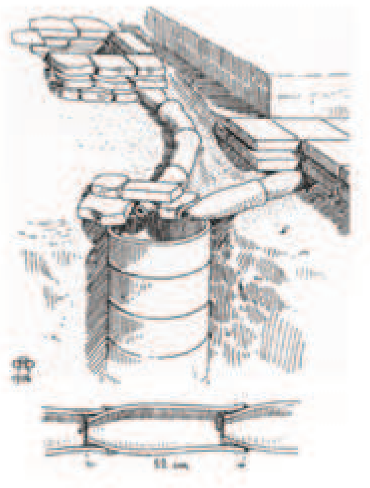

Fig. 3: Waste water disposal into the underground in Assur (Mesopotamia) 2.500 BC (Source: Illi 1987).

This practise could have been more widespread for a long time periode in the arid and semi-arid countries of the Midle East, as the Greek historian Herodotus (484 – 425 BC) reported 2.000 years later about the customs of the Persians: "They never defile a river with the secretions of their bodies, nor even wash their hands in one; nor will they allow others to do so, as they have a great reverence for rivers" (Herodotus 2012).

2.3 Middle Ages and Modern Era in Europe

In Central Europe with the decline of the Roman Empire the knowledge about and the capability to handle the waste water infrastructures of the ancient high cultures got lost. Waste water including excreta was led not only into small trenches between buildings (fig. 4), but it was even poured out into the streets ("gardez l'eau"), latrines were used for defecation and local water courses were used to get rid of all kinds of waste and waste water. Hygienic pollution of ground water and surface waters followed by severe epidemic diseases were the consequences of this unappropriate management of waste water.

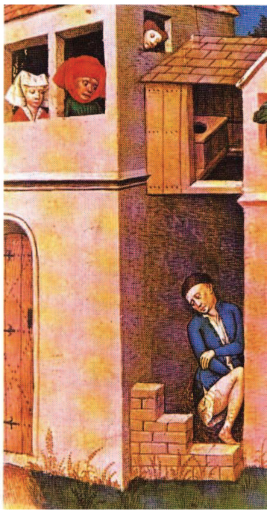

Fig. 4: Defecation in trenches between houses in the Middle Age (Source: Höfler and Illi 1992).

In the 19th century narrow housing spaces as a result of increasing population in towns (see table 1) and leaky latrines led to a "small water cycle" between latrines and wells, contaminating drinking water with faecal microbes. As a consequence, severe epidemic diseases occurred in Central Europe during this period, for example in London in 1830 and in Hamburg in 1848 [ATV 1999].

More and more towns were cleaned at the cost of the quality of rivers, which often degenerated into cesspools. In 1907 William Philips Dunbar (since 1892 director of the governmental hygienic institute in Hamburg) described the situation of some rivers in England as follows: "Children delighted in lighting the gas bubbles, rising up from the courses of the rivers. The flames coming into being were 6 feet high and were running on the water surface up to 100 m. A great number of carcasses were drifting in the rivers …" [ATV 1999].

Town	1800	1850	1880	1910
Berlin	172.000	419.000	1.122.000	2.071.000
Frankfurt / Main	40.000	65.000	136.000	414.000
Hamburg	130.000	132.000	290.000	932.000
London	1.117.000	2.685.000	4.770.000	7.256.000
Paris	547.000	1.053.000	2.269.000	2.888.000

Table 1: Population dynamics in European towns between 1800 and 1910 (Source: Simpson 1983)

To avoid these epidemics, the provisional waste water handling of towns and cities had to be changed. From 1850 to 1906, a fierce discussion took place between the advocates of the two alternatives: collecting faeces for agricultural usage or flushing them out of town by sewerage systems. Natural scientists, for example Justus von Liebig, recommended the use as fertiliser, whereas hygienic specialists and technicians proposed the introduction of sewerage systems.

With the invention of the siphon around 1860, which could avoid odours from the sewerage system to enter the houses, the debate ended and the water toilet gained growing popularity as a result of the increased comfort. Consequently, water toilets and sewerage systems became more and more widespread. Nevertheless, the use of drainage systems to transport toilet effluents differed considerably between the individual towns in Germany (table 2).

Town	First drinking water line	First drainage system	Input of faeces into the drainage system before the year 1906
Berlin	1857	1873	Yes (obliged)
Cologne	1872	1881	Yes (1029 WC in 1882)
Frankfurt	1873	1867	Yes
Freiburg	1876	1881	No
Hamburg	1849	1848	Yes
Karlsruhe	1871	1883	No
Leipzig	1866	Before 1882	No (but 5343 WC in 1882)

Table 2: Drinking water lines and drainage systems in Geman towns in the 19th century (source: Grahn 1883)

After 1906, sewers became the standard solution for collecting sewage and for draining settlements. In Germany, it took more than a century (1880 – today) to retrofit the sewerage systems with purification plants. At first the plants worked only mechanically. Biological decomposition of sewage still took place in streams and rivers. Because of the high oxygen demand, this process caused severe oxygen depletion in water courses. To avoid this, in the 1960’s and 70’s a second cleaning stage – the biological - was implemented which transferred the biological cleaning from rivers to purification plants.

2.4 Present design of urban water infrastructure

2.4.1 Waste water treatment plants

From the 1980’s onwards, a third stage has been introduced – the elimination of nitrogen and / or phosphorous to avoid eutrophication of the North Sea and of some lakes. The introduction of this 3rd cleaning step has not been finished when after the year 2000 the political discussion on pollution of water bodies with micropollutants got more and more widespread. Consequently, the attention had been drawn to pharmaceuticals and their residues. To cope with this challenge, in Switzerland 100 of 700 sewage treatment plants (62% of the treated waste water) will be equipped until 2040 with a 4th cleaning step. The investment costs are an estimated 1.2 billion CHF (Reckter 2017).

For Germany the costs of the 4th cleaning step are estimated with 2,50 € to 7,50 €/inhabitant and year. The additional energy demand will be 5% to 15%. In the summer of 2017, 18 of about 10.000 treatment plants in Germany had already installed this 4th cleaning stage on voluntary basis. These pilot plants are operating by different physico-chemical processes: Ozonization combined with a biological filtering, adsorption with pulverisized activated carbon and different filtering steps, filtering with granulated activated carbon with or without a subsequent biological decomposition step, ozonisation combined with granulated activated carbon filters. Different micro pollutants are decomposed by these processes to different degrees (Reckter 2017).

During the equipment phase a new challenge has come up: the pollution of water bodies with multi resistant bacteria. On February 6th 2018, the North German Broadcast informed that scientist from two German universities analysed 12 samples of different water courses in Lower Saxony and found multi-resistant bacteria in each sample, which can be considered as a “really alarming” result according to an expert from German Robert-Koch-Institute (NDR 2018). Hembach et al. (2017) analysed influents and effluents of 7 waste water treatment plants. In each of them, the existence of multi resistant bacteria was detected. Further, it was found that the treatment process could reduce the concentrations of these highly dangerous bacteria only by one to max. two orders of magnitude, which is much too low to protect the receiving water bodies from hygienic pollution.

Current findings point out that the 4th cleaning stage of treatment plants cannot eliminate all bacteria in the waste water (Jäger et al. 2017). By comparing different technical set ups for the 4th cleaing stage Ternes et al. (2017) found that, for example, the “ozonation of treated wastewater reduced the abundance of pathogens and of clinically relevant antibiotic resistance genes significantly but also selected some antibiotic resistance determinants." This indicates that even the 4th cleaning step might not be the final solution of the current end-of-the-pipe systems. If the society decides to hold on to the conventional system, additional cleaning steps seem to be unavoidable (Hiller pers. communication 2017).

2.4.2 Sewer system

Not only the outflows of existing waste water treatments plants have an influence on the water quality. The technical performance of waster water collections systems additionally contribute to chemical and hygienic pollution of receiving water bodies. This is especially true in the case of combined sewer systems. In these systems not only municipal waste water is transported but in times of precipitation collected strom water coming from roofs or other paved surfaces is collected and transported together in the system as mixture of waste water and strom water. Because waste water treatment plants in general are designed for the double volume of waste water occuring in dry days and because of the fact that during (heavy) rainfalls, the volume of combined sewage can increase up to the hundred fold compared to dry conditions, the treatment plant can not take the whole volume of waste water during such a periode of precipitation. The surplus volume first is collected in retention basins. When the basins are filled, the combined sewage overflow (CSO) is activated and part of the combined waste water is led untreatedly into receiving water bodies (compare fig. 5). Launay and colleagues (2015) could demonstrate that in the case of a treatment plant situated in the Neckar-catchment (Germany), different substances – depending on their physico-chemical properties – behave very differently and thus are emitted from the sewerage system into the receiving water bodies in very wide variety via the treatment plant and/or by the CSO: whereas the CSO contributed e.g. to 20% of the total emission volume, in the case of COD it has been 30%, for total suspended solids 50% and the range of micropollutants varied between >90% (coffeine) and <5% (Diclofenac). Therefore it will not be sufficient just to add additional treatment steps to the processes running in waste water treatment plants.

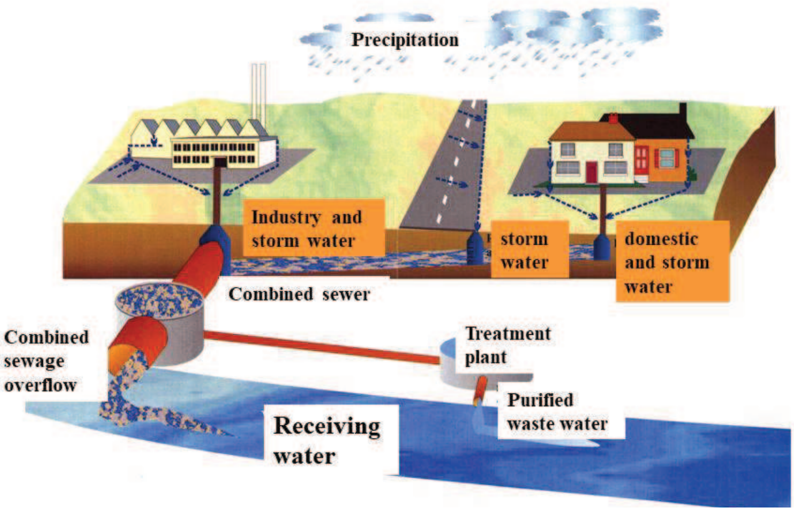

Fig. 5: Combined sewer system under rainy conditions (modified after: Lehn 2002).

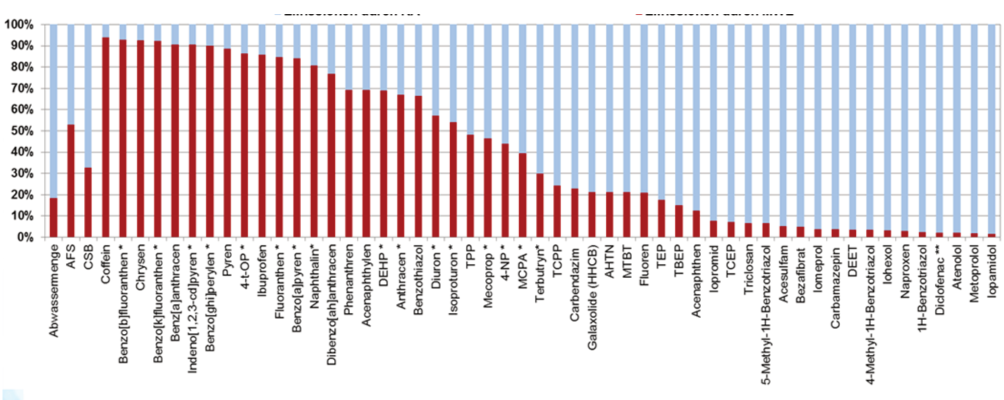

Fig. 6: Emissions of different substances via a waste water treatment plant (blue) and combined sewage overflow (red) (Source: Launay et al. 2015).

This improvement would include the treatment plant, the overflow system (in case of combined systems) and the – often leaky – pipe system. With regard to more energy and ressource efficiency, water saving necessities in arid or semi-arid regions and the quality of aquatic ecosystems, the introduction of newly developped waste water systems (New Alternative Sanitation Systems = NASS) should be analysed and compared with a completely improved conventional system in terms of ecological, economic and social aspects.

3 NEW ALTERNATIVE SANITATION SYSTEMS (NASS)

Because water as a resource, in cities can be part of many and very different products and processes (e.g. foodstuffs, cleaning, cooling, transporting, wellness), water as a waste having passed these processes can show very different properties in terms of quality and quantity. Since the second half of the 20th century the idea of a separate collection and optimised treatment of different waste water streams has grown similar but much more reduced compared to the topic of solid waste.In the year 2008 the German Association for Water, Wastewater and Waste (DWA) published a systematised overview on such new alternative sanitation systems (NASS) focussing on the reuse of water and the use of waste water ingredients (DWA 2008). Waste water contains not only ingredients such as plant nutrients but as well energy in different forms – thermal and chemical. That's why the approach of recycling water and reusing ingredients should be combined with approaches of a change in energy supply and energy consumption (Energiewende). As a result, the energy saving house could be expanded to a more resource efficient building. Despite the fact, that NASS can show many specific characteristics, the basic idea is to separate urban waste water streams in at least three fractions: a) storm water, b) grey water, and c) black water.

Ad a): Depending on the climatic conditions and the degree of impervious surfaces, storm water can contribute to a very high percentage of the total waste water volume, and its occurance is not constantly. Therefore it has to be calculated very carefully, if it is possible to manage storm water onsite within the settlement e.g. by irrigation of green areas, green roof and green facades and infiltration into the underground after an appropriate treatment. If possible, this way of using storm water can contribute to cool the urban atmosphere (due to the evaporation of water) and thus to counteract the urban heat island effect, and to rise ground water levels (Mann 2013). Because the storm water volumes in this case no longer have to be transported to treatment plants those can be operated more efficiently and the costs for a large dimensioned sewer system could be avoided.

Ad b): Grey water is domestic waste water coming from showers, bath tubs, washing machines, and dish washers. Compared to black water it is less polluted but warm. Therefore the separated treatment of grey water offers the chance to recover thermal energy on a comperatively high level of temperature by a simple heat exchanger. In an apartement house in Berlin with 41 flats built according to the German Passive House Standard this is already in practise. After the heat exchanger a biological cleaning step and UV-disinfection follow before the treated water is used to flush the toilets of the building – compare fig. 7 (Nolde 2013). Treated grey water can also be used for other purposes: irrigation, evaporation and cooling.

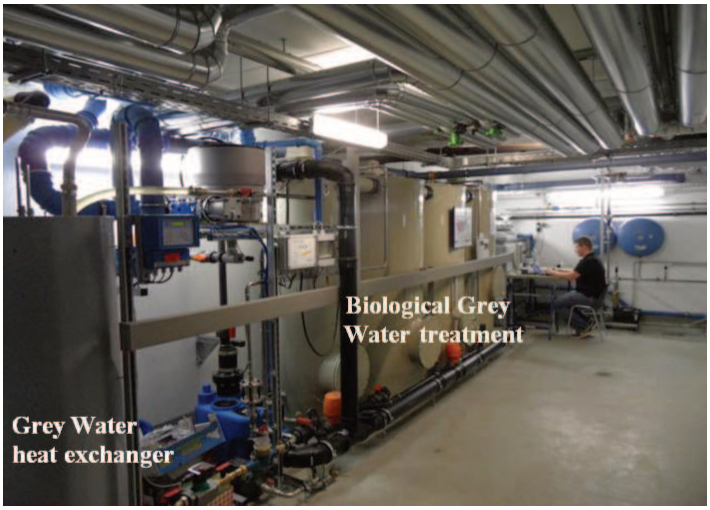

Fig. 7: Heat exchange and biological treatment of separated Grey Water in an apartment house in Berlin (Germany). Foto: H. Lehn

Ad c): Black water is waste water coming from toilets. he volume of black water is comparatively small compared to grey water, especially if vacuum toilets are used instead of traditional flush toilets. Because black water does not only contain plant nutrients (Nitrogen, Phosphorous, Potassium) but as well carbon compounds, black water with little dilution can be used to produce biogas through an unaerobic treatment. The energy output of this process can be increased by co-fermentation of the black water fraction together with organic kitchen waste and other organic waste. In the city of Hamburg the conversion area “Jenfelder Au” will be equipped with this black water treatment technology (Hamburg Water Cycle)

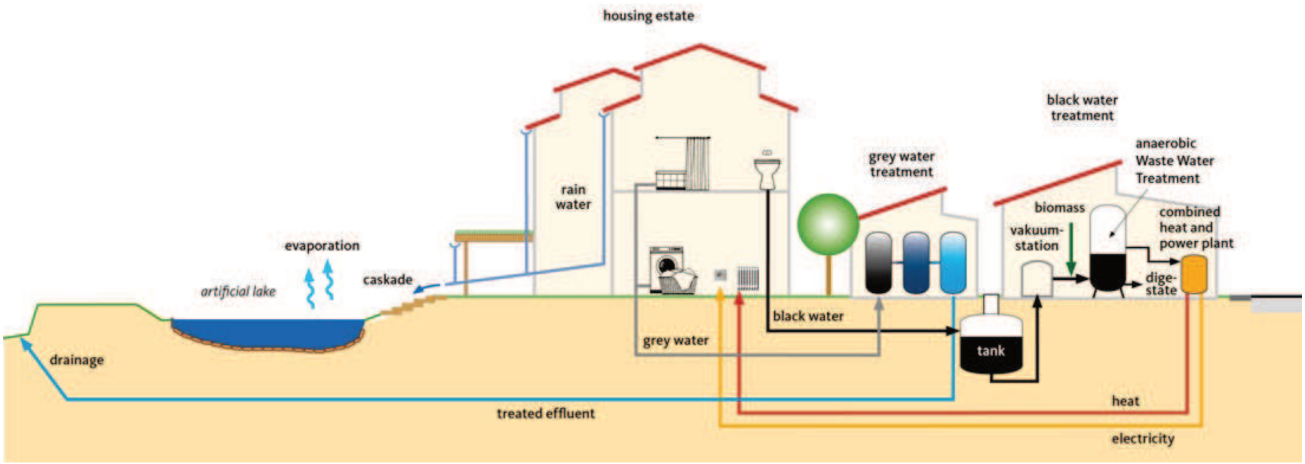

Fig. 8: Separate treatment of storm-, grey- and black water in the new settlement Hamburg Jenfelder Au. Source: Hamburg Water Cycle

4 CONCLUSION

Despite the fact that traditional sewer systems in Central Europe have been equipped with tretment plants of more and more stages, the receiving water bodies are still at risk to get polluted chemically by nutrients and micropollutants and hygienically by protozoa, viruses and bacteria. Especially the multiresistant bacteria species seem to survive even very modern treatment stages constructed for the removal of micropollutants. To avoid theses risks, the conventional systems have to be improved at the level of the treatment plant, the overflow system (in case of combined sewer systems) and the pipe system.

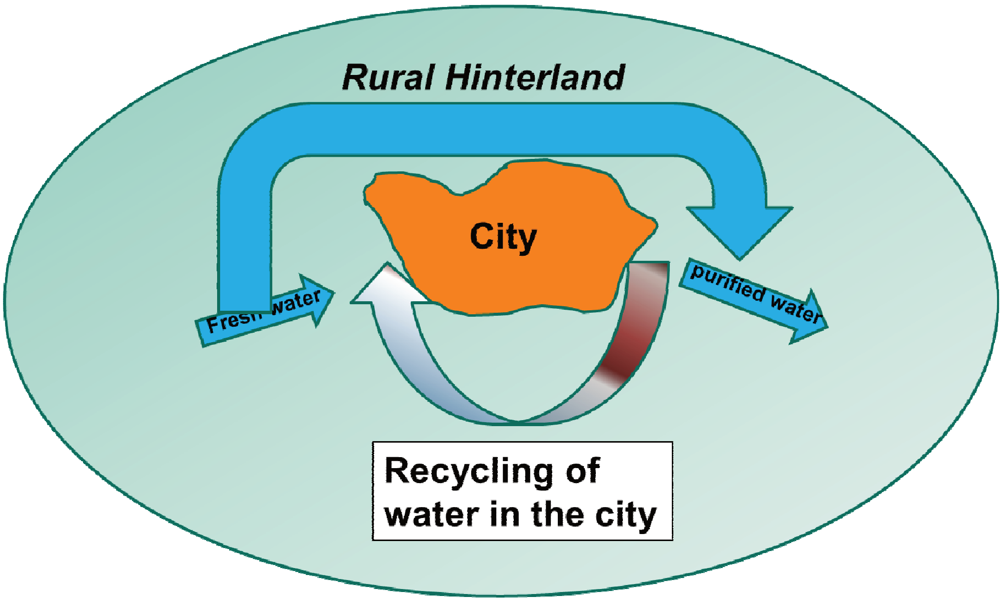

Fig. 9: Water – more sustainable connection between city and hinterland.

New Alternative Sanitation Systems = NASS are options to achieve a better outflow quality, to be more energy and ressource efficient and to save fresh water. Thus these systems represent a big chance for cities to

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improve their sustainability performance and to cope better with the challenges of global changes – compare fig. 9. These systems partly work on other principles than the traditional system, which means that technologies, awareness, attitudes and handling of users, professionals and institutions have to be harmonized to make these systems run smoothly. From a merely technical point of view these systems can be established rather easily in new built-up areas, whereas the change of supply and disposal infrastructures in the existing building stock is more difficult. But also in new built-up areas legal, institutional and social framework conditions make the transformation a complex challenge. Therefore, more research is needed to support decision makers if and under which conditions it is preferable to stick to the well-established technologies of the conventional system and improve it and when time is ready to change to NASS.

5 REFERENCES

ATV – Abwassertechnische Vereinigung (Ed.): Geschichte der Abwasserentsorgung – 50 Jahre ATV. Hennef: GFA 1999

DWA – Deutsche Vereinigung für Wasserwirtschaft, Abwasser und Abfall e.V. (Hrsg.): Neuartige Sanitärsysteme. Hennef, DWA (2008)

Evans, R. J.: Tod in Hamburg – Stadt, Gesellschaft und Politik in den Cholera-Jahren 1830-1910, Reinbek: Rowohlt 1987

Grahn, E.: Die Art der Wasserversorgung der Städte des Deutschen Reiches, München und Leipzig: Oldenbourg 1883.

http://www.hamburgwatercycle.de/fileadmin/watercycle/bilder/Bildarchiv%20Pressebereich/Drainage%20scheme%20of%20the%20HWC.jpg; last downloaded 2018-02-19

Hembach, N.; Schmid, F.; Alexander, J.; Hiller, C.; Rogall, E.T.; Schwartz, T.: Genes in Microbial Populations at Different Municipal Wastewater Treatment Plants in Germany. Frontiers in Microbiology | 1 July 2017 | Volume 8 | Article 1282www.frontiersin.org

Herodotus: On The Customs of the Persians. Ancient History Encyclopedia. 2012, January 18 Retrieved from https://www.ancient.eu/article/149/

Jäger, T; Alexander, J.; Kirchen, s.; Dötsch, A.; Wieland, A.; Hiller, C.; Schwartz, T. (2018): Live-dead discrimination analysis,qPCR assessment for opportunistic pathogens, and population analysis at ozone wastewater treatment. Plants. Environmental Pollution 232 (2018) 571-579

Illi, M. (1987): Von der Schîssgruob zur modernen Stadtentwässerung, Zürich 1987 (Buchverlag NZZ, 2. Auflage 1992, 264 S., 300 Abb.)

Launay, M.; Droste, F.; Dittmer, U.; Steinmetz, H. (2015): Emittierte Spurenstoffströme von Kläranlage und Mischwasserentlastungen im Vergleich. 5. Aqua Urbanica und 90. Siedlungswasserwirtschaftliches Kolloquium: Wasser Schutz Mensch. ISBN: 978-3-8356-7292-5, Stuttgart, Stuttgarter Berichte zur Siedlungswasserwirtschaft, Band 225, 143-156, 07.-08.10.2015.

Lehn H (2002): Ist unsere Siedlungsentwässerung noch zeitgemäß? Nova Acta Leopoldina, NF 85, Nr. 323, 347 - 374

Mann, Gunter (2013): Dach- und Fassadenbegrünung - Gezieltes Regenwassermanagement entlastet die Kanalisation, kühlt und verbessert das Kleinklima. In: fbr-Schriftenreihe Band 16. Energetische Nutzung von Regenwasser, Band 16: Energetische Nutzung von Regenwasser (2013), S. 71–94.

NDR – Norddeutscher Rundfunk (2018): Gefährliche Keime in Bäche, Flüssen und Seen. Published 2018 – 02- 06. Online at https://www.ndr.de/nachrichten/niedersachsen/Gefaehrliche-Keime-in-Baechen-Fluessen-und-Seen,keime302.html, last downloaded 2018-02-07

Nolde, Erwin (2013): Grauwasser, ein unverzichtbarer Baustein der Energiewende. In: fbr-Schriftenreihe Band 16. Energetische Nutzung von Regenwasser, Band 16: Energetische Nutzung von Regenwasser (2013), S. 133–147.

Höfler, E.; Illi, M. (1992): Versorgung und Entsorgung der mittelalterlichen Stadt. In: Flüeler-Grauwiler, M. [ed.]: Stadtluft, Hirsebrei und Bettelmönch: Die Stadt um 1300. Stuttgart: Theiss Verlag. S. 353.

Reckter, B. (2017): Die vierte Reinigungsstufe. VDI-Nachrichten, Ausgabe 25, 22. Juni 2017. Online unter https://www.vdi-nachrichten.com/Technik/Die-vierte-Reinigungsstufe, last downloaded 2018-02-07.

Simpson, J. v. (1983), Kanalisation und Stadthygiene im 19. Jahrhundert, Düsseldorf: VDI.

Ternes, T A; Prasse, C; Eversloh, C L; Knopp, G, Cornel, P; Schulte-Oehlmann, U; Schwartz, T; Alexander, J; Seitz, W; Coors, A; Oehlmann, J (2017): Integrated Evaluation Concept to Assess the Efficacy of Advanced Wastewater Treatment Processes for the Elimination of Micropollutants and Pathogens. Environ. Sci. Technol. 2017, 51, 308−319

The Future of the Countryside

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1 ABSTRACT

The main assumption of Expanding Cities – Diminishing Space, is that, while, Cities are growing, agricultural land, but also natural retreats and buffer zones, are diminishing if not totally disappearing (Vacant Countryside). In what follows, I propose to challenge this central assumption. This assumption amounts to the idea that the urban condition is ubiquitous, it encloses everything; urbanization is planetary urbanization. Planetary urbanization absorbs the rural, disintegrates the hinterland and makes nature disappear; it is the urban without an outside. I will challenge this central proposition by looking briefly at India's policy of urbanization through development corridors and smart cities. Thus, the history of for instance, modern India is clear: industrialise, or perish. The government says agriculture has not done enough to generate employment and has pushed industry as a more lucrative alternative. means cities without country-side, without the nonurban (everything that is not the city). This generates a collision between the urbanizing imperative and the conditions of rurality (agrarian environments and the subjects that inhabit them). planetary urbanization tends to do without. Thus. Alternative models are needed.

Keywords: experimentation, strategic thinking, smart cities, countryside, future

2 INTRODUCTION

The main assumption of Expanding Cities – Diminishing Space, is that, while, Cities are growing, agricultural land, but also natural retreats and buffer zones, are diminishing if not totally disappearing (Vacant Countryside). In what follows, I propose to challenge this central assumption. This assumption amounts to the idea that the urban condition is ubiquitous, it encloses everything; urbanization is planetary urbanization. Planetary urbanization absorbs the rural, disintegrates the hinterland and makes nature disappear; it is the urban without an outside. I will challenge this central proposition by looking briefly at India's policy of urbanization through development corridors and smart cities. Thus, the history of modern India is clear: industrialise, or perish. The government says agriculture has not done enough to generate employment and has pushed industry as a more lucrative alternative. That means cities without country-side.

More than half of the world's population will soon be living in urban agglomerations. If over half the global population lives in urban agglomerations, it might also mean that almost half lives elsewhere, in something called the countryside, the "nonurban" (every-thing that is not the city). The countryside is changing drastically. Meanwhile, metropolitan centres are becoming ruralized (cities grow smaller and more rural, as one-way streets become children's play zones). Major companies build their corporate centres outside of the city, with views of bays and nature reserves; headquarters visually blend in with nature; gigantic buildings with artificial landscapes. Rather than the countryside disappearing what we see are cultural landscapes and villages that are losing much of their original population while drastically expanding to accommodate new urban residents and tourists who built houses they inhabit temporarily. The village and the landscape are simultaneously growing and shrinking. Agriculture might migrate elsewhere as result of global warming and climate change impacts, while farming communities might have become increasingly isolated by hundreds of shrinking cities around the developed world.

These shrinking cities need to find new purposes. Else-where, agricultural cultural landscapes, frontiers and borders might be turned into smart cities' back of house and server farms, where city corporate data is stored and evaluated. Gargantuan distribution and logistics centres and server farms are built outside of the city limits, lying around the countryside like fallen high-rises. Thus, in order to feed, maintain and entertain ever-growing smart or otherwise cities, the countryside is becoming a colossal back-of-house. Satellite information might have a direct impact on agriculture. Satellite knowledge of every square inch of the earth will be transmitted to the laptop of the farmer. From the laptop, the farmer feeds the data to a robotised tractor. Refugees might be channelled in developed cities to revive moribund, abandoned regions. Thus, what we may observe are changes to rural environments everywhere. Rural landscapes are being altered by technology, migration and climate change.

The countryside is not any-more a kind of pre-modern relaxation zone for big-city dwellers. We cannot ignore the country-side, as it and its landscapes have been completely involved in modernisation, on a global scale. How the world's rural landscapes are being altered by (smart) technology, migration and climate change? How do we redefine the rural in a globalised urban world? In developing countries, the rural looks like dense slums; factories intersect fields and farmers might farm less, while in developed countries the rural has become a landscape of production and consumption, a leisure landscape for tourism, retirement, second homes or recreation. This contrast reveals the rural to be an emerging condition that requires as much smart-innovation, strategic thinking and design experimentation as the city.

3 THE PROCESS OF ACCELERATED GLOBAL URBANIZATION- THE RISE OF THE CITY

Rapid urbanization is a global phenomenon. In 2008, for the first time in human history, there were more urban dwellers than rural, and the trends show that this is not going to be reversed. The United Nations estimates that by 2030, over 60% of the global population of will be living in "megacities" (10+ million), large (5-10 million), medium (1-5 million), and smaller cities and peri-urban communities, increasingly concentrated in Asia, Africa, and Latin America. This fraction could rise to two thirds by 2050.[1] The recent Intergovernmental Panel on Climate Change (IPCC) report[2] on Human Settlements, Infrastructure and Spatial planning states that the expansion of urban areas (urban centers and suburbs) is on average twice as fast as the urban population growth, and that the anticipated growth in the first three decades of the 21st Century will be larger than the cumulative urban expansion in all of human history. The urban condition is ubiquous, it encloses everything, urbanization is planetary urbanization; it is the urban without an outside. Planetary urbanization absorbs the rural, disintegrates of the hinterland" and makes nature disappear.[3] The countriside is operationalized as the "back-end" or the "back-of-house" of global supply chains and logistics infrastructure. The ecological outcome of rapid urban growth is the destruction of such natural systems and resources as wetlands, forests, lakes, glaciers, and the atmosphere.

With this rapid planetary urbanization comes the increased demand for resources such as energy, water, and sanitation along with services such as education and health care. The accelerating growth of cities and their disproportionate consumption of physical and social resources are unsustainable, as are the traditional systems cities rely upon to deliver resources.

4 SMART CITIES

This above emphasizes the necessity to use the resources efficiently or in 'smart' ways and the need to develop 'smart' cities to meet the needs of city residents. Responding to these needs, there are currently hundreds of smart city projects worldwide in both developed and developing countries. Examples abound, such as Amsterdam, Barcelona, Beijing, Cafeidian, Kashiwa-noha, Konza, Lavasa, Masdar, San Francisco, Santander, Sant Cugat, Shanghai, Shenyang, Singapore (Smart Nation), Songdo, Tianjin, Wuxi and the 100 smart cities initiative recently launched by the Government of India. A smart city can contribute towards improved governance and efficient management of infrastructure such as water, energy, transportation and housing and to a higher quality of life

Smart Cities use information and communication technology (ICT) to engage citizens, to deliver city services, and to enhance urban systems. A smart city is designed to optimize residents' quality of life by leveraging technology and integrating several essential functions like managing citizens' data, intelligent transportation, public safety and security among others. Primarily, smart city deployments come with multiple features and state-of-the-art technologies (ICT implementations) and comprise of diverse ecosystems of technology providers. Various devices like sensors, gateways, communication infrastructure

[1] UN (2014) World Urbanization Prospects, 2014 available at: http://esa.un.org/unpd/wup/highlights/wup2014-highlights.pdf

[2] https://www.ipcc.ch/pdf/assessment-report/ar5/wg3/ipcc_wg3_ar5_chapter12.pdf

[3] Neil Brenner, "Theses on Urbanization," Public Culture, vol. 25, no. 1 (2013): 85–114, link; Neil Brenner and Christian Schmid, "Planetary Urbanisation," in Urban Constellations, ed. Matthew Gandy (Berlin: Jovis, 2011), 10–14; Brenner and Schmid, "The Urban Age in Question," International Journal of Urban and Regional Research, vol. 38, no. 3 (2014): 731–755; Brenner and Schmid, "Towards a New Epistemology of the Urban?," City, vol. 19, no. 1 (2015): 151–182

and servers will collectively bring to life the concept of Internet of Things, what is said to be a critical component in shaping the cities of the future.

5 THE CASE OF INDIA'S SMART CITIES

The current global urbanisation rate of 50% as in 2015 is expected to rise to about 70% by 2050; however, the process is slower in India, being at 31.3% nationally[4], and expected to rise to approximately 52% by 2050. Thus, the urban growth rate in India has been steep in the past couple of decades. The steady increase in the number of million-plus urban areas bear witness to this event. The number of cities with a population of 1 million or more went up from 35 to 53 between 2001 and 2011.[5] During the same time, the number of towns with a population of more than 100,000 rose from 393 to 465.[6] The United Nations has predicted that between 2014 and 2050, India will add another 404 million people to its urban population and will have the highest rate of urbanization among all nations.[7]

Such rapid urbanization will put tremendous pressure on existing city services such as water, sanitation, sewage, schools, health, and transportation. To accelerate the response to this growing urbanization challenge, and to make Indian cities truly global, in 2015 the Government of India launched the Smart Cities Mission program, which aims to transform a hundred small and medium–sized settlements into smart cities.

While smart cities in the west rely on the mining and analysis of big data to create urban networks, Indian smart cities aim to provide basic urban services: water, sanitation, electricity, housing and so on. The provision of e-governance, fibre-optic cables and superfast broadband is a key part of this plan. The ultimate goal is to develop 100 smart cities by 2022. It aims to develop cities that provide essential infrastructure, a decent standard of living for its citizens, and a clean and sustainable environment through the application of smart solutions.[8]

A smart city development push at this scale from a central government is one of its kind. The central government will invest $7.5 billion over five years—an average of $16 million per city per year.[9] The state governments will match the central funds for the cities identified for participation through a competitive selection process. At the city level, the initiatives will be implemented through a newly formed Special Purpose Vehicle, incorporated as a public company. The SPV will be headed by a CEO and supported by an external project management consultant to drive the projects.[10]

After the program launch in 2015, the Government of India held the India Smart Cities Challenge inviting participation from cities across India. The focus of the challenge was on selecting at least one potential city from each state, while the total number of cities selected from a state depended on the state population. Bloomberg Philanthropies collaborated with the ministry spearheading the mission, the Ministry of Housing and Urban Affairs (MHUA), to support, design, and deliver the challenge. A competitive framework was used by the Government of India, to advance a major urban development mission and allocate funding.[11] From the first round of the challenge, 20 cities were shortlisted, also called as "lighthouse cities", for the first phase of the Smart Cities Mission.[12] To date, 90 of the 100 cities have been selected through multiple rounds of the India Smart Cities Challenge.[13]

[4] GoI-MHA. http://www.censusindia.gov.in. 2011.
[5] Ministry of Housing and Urban Affairs, "Number of cities towns by city size class," http://moud.gov.in/cms/number-of-cities–towns-by-city-size-class.php
[6] Ministry of Housing and Urban Affairs, "Number of cities towns by city size class," http://moud.gov.in/cms/number-of-cities–towns-by-city-size-class.php
[7] United Nations, "World Urbanization Prospects: The 2014 Revision," 2015, https://esa.un.org/unpd/wup/Publications/Files/WUP2014-Report.pdf.
[8] India.gov, "Smart Cities Mission," https://india.gov.in/spotlight/smart-cities-mission-step-towards-smart-india
[9] India.gov, "Smart Cities Mission," https://india.gov.in/spotlight/smart-cities-mission-step-towards-smart-india
[10] Ministry of Housing and Urban Affairs, "Smart Cities," http://moud.gov.in/cms/smart-cities.php
[11] Bloomberg Philanthropies, "India Smart Cities Mission,' https://www.bloomberg.org/program/government-innovation/india-smart-cities-mission/
[12] C, "20 cities make the cut for smart cities phase 1," Maps of India, January 29, 2016, https://www.mapsofindia.com/my-india/government/20-cities-make-the-cut-for-smart-city-project-in-phase-1
[13] Pretika Khanna, "Smart cities mission: 30 new cities selected in third round," Live Mint, June 24, 2017, http://www.livemint.com/Politics/JQvXByK7n5ZDDXGRLuwn3L/Smart-Cities-Mission-30-new-cities-selected-in-third-round.html

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While there is no universal definition for a smart city, the Mission seeks to develop cities through application of information and communications technology (ICT) for efficient management of basic urban services such as water supply, sanitation, housing, waste management, and urban mobility. Its two components include pan-city development, whereby a particular ICT solution is applied to one or more aspects of city-wide infrastructure, and area-based development, which looks at investment in infrastructure creation in a smaller area.

The Mission is operated as a centrally sponsored scheme and the central government will be extending financial support to the Mission to the extent of Rs 48,000 crore over five years (2015-2020), i.e., on an average Rs 100 crore per city per year. An equal amount, on a matching basis, will have to be contributed by the state or urban local body

Until now, 99 cities have qualified to receive central funding. The latest addition to the list was made in January this year when nine cities were added in the fourth round of the selection. These were: Silvassa (Dadra and Nagar Haveli), Erode (Tamil Nadu), Diu (Daman & Diu), Bihar Sharif (Bihar), Bareilly (Uttar Pradesh), Itanagar (Arunachal Pradesh), Moradabad (Uttar Pradesh), Saharanpur (Uttar Pradesh) and Kavaratti (Lakshwadeep). Shillong is the 100th proposed city, but it has been given more time to submit its proposal since it failed to submit it in time. The selected cities have received an investment of Rs 12,824 crore (on 409 projects). Of this, Rs 10,639 crore would be on area-based development and Rs 2,185 crore in pan-city initiatives that would impact 35 lakh persons living in these areas.

6 HOW HAS THE MISSION EVOLVED, WHAT IT HAS ACHIEVED, AND HAS IT KEPT THE PROMISE IT HOLDS FOR THE FUTURE OF URBAN DEVELOPMENT IN INDIA?

The Smart Cities Mission finds itself at a crossroads today. The governance structure, financing, participant cities, and smart city projects are all in place. Yet, the progress on smart cities has been slow.[14] Thus, in the case of the development of the 20 "lighthouse" smart cities (those above that were selected in the first round in January 2016), only 83 of 964 projects (8.6 per cent of the projects) were completed up to 2017. Projects worth Rs 46,800 crore were planned under this phase with a major chunk being devoted to infrastructure (626 projects worth Rs 26,714 crore). Only 5.2 per cent of total identified projects in 90 smart cities have been completed (this is before the announcement of the nine new smart cities).[15] 148 projects worth Rs 1,872 crore have been completed. Work on another 407, accounting for about 14 per cent of the total investment envisaged under the Mission, has started. Some 72 per cent of the identified projects are still at the preparation stage of the detailed project report.

7 THE IMPLEMENTATION CHALLENGES THE MISSION IS FACING

The Mission is facing several implementation challenges. Some of these challenges might relate to the bureaucratic processes of investment and approvals for smart city contracts; a lack of sustained financing, lack of centre-state coordination, inefficiency of administration, and the absence of a master plan for the cities. Looking at the official version on the progress, the reason for such a small number of projects being completed thus far is the long gestation periods for large projects, especially infrastructure and retrofitting ones.

The mission seems to have been grounded in a strong separation between the town and the village, the city and the country-side. Thus, the history of modern India is clear: industrialise, or perish. The government says agriculture has not done enough to generate employment and has pushed industry as a more lucrative alternative. That means cities, no country-side. That is, it means, expanding the areas of land under the control of cities (include them into urban development authorities) and swallow up the villages.

Yet, in India, this strong separation between the categories of "town" and "village", are categories of formal governmental administration that are distinct from, and often inconsistent with, the socio-spatial and morphological features that characterize the urban.[16] An interesting case in point: in India's cities vehicles

[14] https://economictimes.indiatimes.com/news/politics-and-nation/surat-tops-ranking-of-smart-cities-with-largest-number-of-projects-completed/articleshow/62548416.cms

[15] https://timesofindia.indiatimes.com/india/2-5-years-into-smart-city-plan-only-5-of-projects-finished/articleshow/62436408.cms

[16] Ananya Roy, "What Is Urban about Critical Urban Theory?," Urban Geography, vol. 37, no. 6 (2015): 810–823

drive in the direction contrary to the flow of traffic. This practice which is widely accepted even by the traffic police, might have originated in agricultural environments.[17] Thus, the rural, does not simply constitute the "not-urban" but is a "constitutive outside" of the urban. In India, the categories of "town" and "village" are highly unstable, continually reshaped by governmental practices.

I believe an important force that is being left out of consideration here is that undoubtedly, India lives in its villages; and, much of the nation is still dependent on agriculture as a primary means of livelihood.[18] This is not to deny that rapid global urbanisation is a significant factor to contend with, not just in India, but worldwide; but, to recognize that the rate of urbanisation however, varies by state and country. It would be appropriate to suggest that the process of urbanisation in India is mostly because of lesser options in the countryside to make a suitable living, than of a choice of a better life in the city. Let us look at this briefly.

8 THE CURRENT PATTERN OF URBANIZATION AND URBAN DEVELOPMENT IN INDIA'S CITIES AND TOWNS

The current pattern that one finds almost everywhere is as follows: as one moves out from the crowded old neighbourhoods of Indian inner walled historic cities (e.g., Ahmedabad, Udaipur, etc), the roads broaden, buildings rise taller and vehicles (2-3-4 wheelers), line the streets. Thus, new wealthy, modern neighbourhoods begin to engulf the countryside, and the fields of wheat and corn begin to go. Thus, the countryside is disappearing.

People who live in villages on the city's fringes today fear that the same process of urbanization will happen to them. Modern neighbourhoods will submerge their countryside and their fields of wheat and corn will disappear.

Planetary urbanization is a reality that runs parallel to de-peasantization and de-ruralization.[19] The process of deruralization tends to constrict rural space via depopulation, an expansion of enclosed suburbias and exurbias, smart cities, and the increasing encroachment of industrial, agro-commercial, information and service economies into what was formerly rural space.

Yet, villagers, living in villages surrounding the cities, are resisting their state government's efforts to hyper-urbanize. They seem to be wanting to resist this process and pattern of urbanization: they are happy with their agriculture and do not want a large city smart or otherwise, in place of their farms and homes. They want to be left alone with their land and rural landscapes. This is what this people wishes and aspires to. And farmers get together to protest and protect their lands. Thus, the fast urbanization and industrialization policy of the Government (National and state government), and the expansion of the areas of land under the control of cities, seems to be doing so against the wishes of its people.

Yet villages keep protesting against their inclusion into urban development authorities. Some villages have managed to get themselves removed from the Urban Development Authorities; but other villagers continue to protest to little avail.

In some cases, state and national government propose to develop 40% of villages' land, paving roads and building hospitals, schools and housing colonies. In turn, this-from the government points of view-, will lead the remaining 60% to appreciate in value. And that is supposed to compensate for the 40% the villagers will initially give up. Yet, farmers in these villages around cities are not thrilled to give up nearly half of their land for the mere promise of a better future. More importantly, villagers don't think this is a better future.

[17] As such, the category of the rural has attendant to it a set of qualitative values that might recede and almost disappear but never cease to exist. In other words, even though the category of the rural might become weak to the point of perceptual invisibility, its symbolic and cultural constructions persist.

[18] In addition, the advent of the 20th century has also brought with it a major population increase in India. India is set to overtake China as the most populous nation by around 2028. The foremost factors contributing to the increased population over the last century can be traced to better biological immunisation, enhanced living conditions, improved nutrition, adequate health policies, modernised medical care, and such

[19] Farshad Araghi, "The Invisible Hand and the Visible Foot: Peasants, Dispossession, and Globalization," in Peasants and Globalization: Political economy, Rural Transformation, and the Agrarian Question, eds. A. Haroon Akram-Lodhi and Cristóbal Kay (London and New York: Routledge, 2009), 112. See also Araghi, "The Great Global Enclosure of Our Times: Peasants and the Agrarian Question at the End of the Twentieth Century," in Hungry for Profit: The Agribusiness Threat to Farmers, Food, and the Environment, eds. Frederick H. Buttel, Fred Magdoff, and John Bellamy Foster (New York: Monthly Review Press, 2000)

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Farmers meet to strategize ways to oppose cities' expansion because, they feel that large-scale urbanisation will rob them of both, land[20] and water[21]. Young people from the villages, in particular question the quality of urban employment. They do not seem to have the skills needed to work in an urban setting. They consider that ending up being daily wage workers in cities, will hit their dignity the most. Such forms of underemployment are considered as a natural consequence of rapid urbanisation. It is argued that industries and urban centres need disposable low-wage workers, and those displaced from their villages provide for just that.

Figures from the 2011 census suggest a massive rural-urban migration from villages to cities. The government argues that people are flocking to cities from villages because they want a comfortable life. Cities have better schools, better hospitals, roads, connectivity, therefore, people prefer to move to cities, the government often argues. Yet, villagers who had incorporated their land into Urban Development Authorities few years back, have not seen any fancy roads and sprawling houses in their nearby cities. Instead, cities are expanding at a rapid rate and in an unplanned fashion, with open drains and mud roads, electrical outages/power-cuts, crowded, delayed or dysfunctional public transportation, air pollution, insufficient water supply, non-existent drainage, the mosquito menace or the resulting in health problems, with water and housing supply proving particularly problematic. In India, the growth of cities has been quite haphazard, and for the most part without the required intervention from the planning authorities.

Thus, villagers have renewed their fight to be removed from their lands. People from villages seem to be turning against urbanisation.[22] The government maybe prohibiting its citizens from leading better lives in villages, instead forcing them into cities where the quality of life is lower. Villagers are on the one hand, questioning the wisdom of steering people into cities, and on the other, bringing dysfunctional cities to their countryside and agricultural landscapes. Alternatives are badly needed. Let us look at this briefly

9 URBAN DEVELOPMENT IN INDIA

In India, the growth of cities has been quite haphazard, and for the most part without the required intervention from the planning authorities. India's growth of its urban areas is relatively recent; it can be argued that cities historically date back to the time of the Indus valley civilisation (3300-1300 BCE), such as it is the case with the development of Fatehpur-Sikri (1567), or Jaipur (1727), and Udaipur (1559). However, it is changes in the last 100 years, and since gaining independence, that urban growth has occurred mostly; since then many of the cities have taken on a relatively organic pattern of growth, rather than of being planned.[23] For the most part, cities of India have been unplanned, frequently organic, and maybe to a certain extent also dependent on the urges of public servants. A partial accomplishment is that they have been able to accommodate infrastructure for the growing need for transportation, a minimal electrical supply, water and tele-communications, however haphazard or rudimentary. Such combination of factors has led to cities being developing not just without any lasting vision, but more dependent on a bureaucrat-builder life or on the market mechanism. While it might have been expected that most development authorities were meant to spearhead the growth of cities by laying out the basic infrastructure before growth happened, such planned development has happened only sporadically, leaving most of the development to the 'market' to determine. Thus, this has also involved not just unplanned growth, but such without the required infrastructure of roads, power, water or drainage. Much of this seems to have been left for the owners to figure out on their own, or for the municipality or corporation authorities to fix, whenever they finally got to it. Thus, most urban

[20] For villagers losing nearly half their land (the 40% above), would split up large holdings, posing a risk to their agricultural industry. They consider that farming small tracts of lands is a disaster. Crops will not grow well on smaller tracts, and they cannot sustain themselves with that.

[21] Agricultural land is often irrigated by rivers. Reducing this supply of river water for agricultural irrigation. will force farmers to rely heavily on groundwater. Yet rapid urbanization means pouring concrete everywhere, which entails means that there will not be any groundwater left

[22] https://www.hindustantimes.com/india-news/gujarat-election-results-rural-urban-divide-behind-bjp-s-big-saurashtra-setback/story-6oPxPm2hlZSAk1kUn4ZyZI.html

[23] the partial exceptions are a few like Lutyen's Delhi (1911-1931), Koenigsberger's Bhubaneswar-Cuttack (1946), Le Corbusier's Chandigarh (1947-60), more recently Correa's involvement with CIDCO's Navi Mumbai (1971). Some measure of city planning also happened in the development of the steel-towns like Jamshedpur (1919), Rourkela (1959), and Bokaro (1964); similar planning and development has been part of the growth of Bidhannagar-Salt Lake City, Kolkata (1958-65)

development in India has been the result of post-hoc coping with the realities of already built-up space, or even of jugaad.[24] This also might have resulted in the inability of the municipal authorities being unable to get ahead of the growth curve. Thus, a major driving force of expansion seems to have been economics, particularly real estate prices, the control of development only being dictated by some minimal amount of floor area ratios (FAR), or elementary building byelaws, which acted as a restraining force. As result the realities of urban daily life of the common wo/man in India is plagued by electrical outages/power-cuts, crowded, delayed or dysfunctional public transportation, air pollution, insufficient water supply, non-existent drainage, the mosquito menace or the resulting health problems. The smart cities mission is expected to change all this. Let us look at this briefly

10 FROM SMALL VILLAGE TO SMART CITY AND ENTREPRENEURIAL URBANIZATION

Yet, in some cases, the smart cities mission might be promoting rapid regional urbanisation by transforming land which belongs formally or informally to farmers and tribes people (the commons), who have used it for generations, into real estate. As part of the urban and industrial development in the country, the Indian government launched the Golden Quadrilateral highway project linking the four major metros of Delhi/NCR, Bombay/Mumbai, Calcutta/Kolkata and Madras/Chennai. As an extension to this, the Delhi-Mumbai Industrial Corridor (DMIC) was proposed as a mega infrastructure project, covering a 1,483 km. long and 300 km. wide corridor between Delhi and Mumbai.[25] When (and if) completed, (DMIC) will be the largest and most expensive infrastructure project ever undertaken in the Indian subcontinent. Stretching between Delhi and Mumbai, the DMIC—termed a “mega-project” in infrastructural parlance—is projected to cost over $100 billion and produce twenty-four “new” cities along a 1,500-kilometer-long Dedicated Freight Corridor (DFC): a freight rail spine that will radically reduce the travel time of goods between India’s northern states and the ports on its western coast. Smart cities are to be constructed along the (DMIC) on greenfield sites, agrarian landscapes that are as yet “undeveloped”[26]

The largest and most prominent of these smart cities is the Dholera Special Investment Region (DSIR) in the western state of Gujarat. Dholera, a small village on the coastal region falling in the path of the proposed DMIC (At a distance of 100 km. from the dedicated freight corridor at Vadodara/Ahmedabad) was proposed to be made a smart-city. It is part of a scheme with a greenfield port development, with nine mega-industrial zones, high-speed freight line, three seaports and six airports. Some of the included components of this development are: a port and shipyard, export-oriented industrial units/SEZ, industrial estates, IT/ITes/biotech hubs, knowledge hubs/skill development centres, a knowledge city, a logistics hub with container freight station, a 3500 MW power plant, townships, an international airport, private residential enclaves, etc. The transportation links include interchanges, access roads for freight and passenger movement, links for passenger and freight, and similar connections.[27] The Dholera Activation Area will be an “industrial park” that will occupy 22.5 square kilometers (4.25 percent) of the total area of the DSIR. The Activation Area is the pilot project that is anticipated to trigger investments in the rest of the DSIR.

Projected to occupy a total area of 920 square kilometers (the city of Mumbai, by comparison is about 600 square kilometers), the DSIR, when completed, will overwrite/superimpose itself over what is now a smattering of small villages in the bhal region of Gurajat – a tidal flat that extends approximately 15 kilometers inland from the coast of the Gulf of Khambat.[28] The mixing of saltwater and freshwater makes the soil of this region highly saline, a geological characteristic that is used as the basis for categorizing vast swathes of its landscape as “barren” or “waste”. Yet, the villages in the region are predominantly agricultural, engaged in a combination of subsistence as well as small-scale commercial farming and

[24] C.H.Betancourth. How open frugal innovation and smart local eco-systems can help in the transition to smartness of many Indian cities. Speaker thematic session: services integration and open innovation to improve urban management. Smart City Expo World Congress Barcelona 14-16 Nov 2017

[25] . http://delhimumbaiindustrialcorridor.com/dmic-gujarat.html (accessed 23/09/2015); 2014

[26] Ayona Datta, “New Urban Utopias of Postcolonial India: ‘Entrepreneurial urbanization’ in Dholera Smart City, Gujarat,” Dialogues in Human Geography, vol. 5, no. 1 (2015): 3–22

[27] McKinsey Global Initiative. India's urban awakening: building inclusive cities, sustaining economic growth. McKinsey & Co., April 2010

[28] Like tidal flats around the world, this region is inundated with seawater during high tide and the monsoon season. SJ Vyas and AJ Joshi, “Quantitative Study of Coastal Flora of ‘Bhal’ Region in Gujarat,” International Journal of Science and Research (IJSR), vol. 4, no. 5 (2015): 337–341

livestock husbandry. Their survival and sustenance has depended on their ability to develop agricultural practices suited to saline environments, in spite of having been denied access to modern infrastructure for irrigation and salinity remediation.[29] Yet, the region is characterized by the government as being unproductive and, therefore expendable for the purposes of urbanization and industrial development.[30]

The construction of Dholera is emblematic of the implantation of an industrial environment in the rural environment.[31] In many ways, the DMIC is a project of extended and "planetary" urbanization, along an infrastructural freight rail spine (Dedicated Freight Corridor" (DFC)[32], imposed on apparently "undeveloped" landscapes. Thus, the production of the new space of the DMIC necessarily relies on the availability of agrarian landscapes heretofore undeveloped or not-urban. Thus, the Delhi Mumbai Industrial Corridor (DMIC), will function here as an urbanization machine

Yet, The plans for Dholera[33], expected to be a greenfield scheme, has already run into issues and protests from the local people, whose land was to be acquired, and where the city was to develop.[34] Similar cases may be found in the Mumbai-Nagpur development corridor. An underlying issue seems to be that in top-down schemes such as these, where the local population is not taken into confidence, there is bound to be protests and differences of opinion.[35]

In Dholera, (but also, Rajarhat, Amravati, Haolenphai and several other new smart cities), farmers, tribespeople and indigenous groups are resisting their exclusion from India's smart city makeover. They are campaigning for their constitutional rights to land, livelihoods and local cultures.[36] Their struggles are proof that India's experiments with rapid urbanization, the demise of the countryside, and, smart urban futures is contested, and will continue to evolve. A possible alternative maybe as follows

11 FROM SMART CITY TO THE HYBRID LANDSCAPES, AGRARIAN ENVIRONMENTS AND SMART VILLAGES

We begin by considering the hybrid landscapes of agrarian India as agrarian environments, and so as to acknowledge the intertwining of "the agrarian" and "the environmental," manifest in landscapes that are malleable and plastic.[37] Agrarian environments offer alternatives to planetary urbanization. Agrarian environments take as their point of origin the "outside" of planetary urbanization, the category of the not-urban.[38] Agrarian environments are the non-urban where the natural is not separated from the human, and where nature and social relations are co-constitutive.[39] In these agrarian environments the urban does not

[29] SJ Vyas and AJ Joshi, "Quantitative Study of Coastal Flora of 'Bhal' Region in Gujarat," International Journal of Science and Research (IJSR), vol. 4, no. 5 (2015): 337–341

[30] See the 2014 Environmental Impact Assessment Report (EIA) prepared by ABC Techno Labs for the Dholera International Project. In the report, the word saline is repeatedly paired with the word barren to form a compound phrase, "saline and (therefore) barren" (ES-1, ES-7, ES-13, 2-2, 3-47, 4-5)

[31] Lukasz Stanek, Henri Lefebvre on Space: Architecture, Urban Research, and the Production of Theory (Minneapolis and London: University of Minnesota Press, 2011)

[32] It is important here to note that the DFC is the basis for a project of corridor urbanization. It stands in sharp contradistinction to earlier "corridor projects" in India that were typically based along highways and expressways. This infrastructural system is intended to engender urban growth rather than service it. See our proposal for the Mumbai-Nagpur corridor (2017)

[33] Preeti Sampat. Dholera Smart City: Urban Infrastructure or Rentier Growth? The Hindu Centre for Politics & Public Policy, 2015

[34] Datta A. The smart entrepreneurial city: Dholera and 100 other utopias in India

[35] Datta A. New urban utopias of postcolonial India: 'Entrepreneurial urbanization' in Dholera smart city,Gujarat. manuscript unpublished (accessed 20/09/2015); n.d.2.

[36] https://www.hindustantimes.com/india/land-pooling-looks-fertile-but-dholera-farmers-not-reaping-benefits/story-h0jvIaSWO5fklUADQYB9cN.html

[37] Arun Agrawal and K. Sivaramakrishnan, "Introduction: Agrarian Environments," in Agrarian Environments: Resources, Representations, and Rule in India (Durham, NC: Duke University Press, 2000)

[38] C.H.Betancourth. How open frugal innovation and smart local eco-systems can help in the transition to smartness of many Indian cities. Speaker thematic session: services integration and open innovation to improve urban management. Smart City Expo World Congress Barcelona 14-16 Nov 2017

[39] They need to be comprehended as being part of a biophysical and social environment that always includes the urban and the nonurban, the arable and the nonarable, the other areas that are integrally linked to the world of agriculture and environment and their allied social-economic relations (air, water, forests, pastures, fisheries, and wildlife). See for instance our proposals for the case of Udaipur smart city project. 2017-2018

simply “internalize” the rural. Rather, rurality persists in intense yet apparently weak forms, for instance, in the form of the small rural village. Unsurprisingly, the villages affected by the DSIR are the epicenter for local and regional activism by coalitions of agriculturists and landowners protesting against the mechanisms of land acquisition employed by the state to develop the Dholera Special Investment Region (DSIR) DSIR.[40]

Thus urbanization, DMIC, and smart cities can not rely on a refusal of the rural . On the contrary. the urbanizing imperative of a machine such as the DMIC needs to contend with, the conditions of rurality (agrarian environments and the subjects that inhabit them) it collides with. A step in this direction maybe as follows.

Smart city or otherwise, the country-side is still so strong that it is rejecting global rapid urbanization. Therefore, an alternative model needs to be found that is neither absolute urbanization nor the return to the rural. The urban village maybe a case in point

What if instead of transforming the small village into a smart city with the concomitant destruction of the countryside that this implies, we were to take smart technology to the small village and so that so that the multi-fold objectives to advances of technological development could benefit the rural people as much as the residents of the cities?[41] Besides, the localised wisdom of the rural areas could be formalised into applications which would be both indigenous to the site, and possibly even find universal relevance[42]

Physical connectivity like roads and railways, electronic connectivity like telecommunications, the internet and knowledge, which will then result in economic connectivity; this will empower villagers, giving them sufficient employment opportunity, and hence bring down poverty levels in the rural areas. Such development would also lessen the need of the villagers to have to migrate to cities for jobs, and the need for India to be urbanised in the manner that one commonly understands as being physically present in cities to avail its opportunities. The uplift of the majority is a foremost requirement in the country, in all spheres of life.

Such progress could be achieved by the use of advancing technologies such as solar energy for electrical power, as well as broadband, wi-fi and satellite networks, without actually needing to be actually physically connected; while physical connections with roads and transportation would certainly need to be there, much could be achieved by providing the facilities itself, and minimally some rudimentary training.

A smart-village could be imagined as a place where a population of 30,000-40,000 would be given the amenities of an urban area, with infrastructure and services in a rural hub, with electricity, roads, potable water, telecom services as well as health and educational services. Such smart-villages could be distributed along the above development corridors, and the project implemented in a public-private participation mode.[43]

The aim of such a smart-village will be to stem the unnecessary migration from the rural areas to the urban; by providing the facilities of the cities in the rural areas, the divide between the rural and urban would be bridged, and the need for a permanent move to the city could be minimised; this would also imply providing a balance of the socio-economic development between the urban and rural areas. In short, the aim will be to bring up the country as a whole into the 21st century, without having to physically change the rural-urban distribution.

The critical factors that differentiate between urban and rural life is the development of

proper infrastructure which will give the facilities of the cities to the villages. The necessity for actual migration to the urban areas is probably not a fundamental requirement, as may be made out to be. While it might not be necessary to migrate to the urban areas to be economically better lifestyle, it really could be a myth that was being perpetuated, before the development of current technological solutions

[40] see Preeti Sampat and Simi Sunny, “Dholera and the Myth of Voluntary Land Pooling,” Socio-Legal Review, vol. 12, no. 2 (2016): 1–17

[41] Kalam APJA, Singh SP. Target 3 Billion. Penguin Books; 2011.

[42] C.H.Betancourth. How open frugal innovation and smart local eco-systems can help in the transition to smartness of many Indian cities. Speaker thematic session: services integration and open innovation to improve urban management. Smart City Expo World Congress Barcelona 14-16 Nov 2017

[43] See our prototype proposal for Virul along the Mumbai-Nagpur development corridor. 2017

12 THE INHERITED SMARTNESS OF THE RURAL AND ITS FARMERS WILL THEN BE ENHANCED

The rural-smart village inhabitant will be living in usually un- or minimally polluted air, water or land; she will enhance and utilise her knowledge of the seasons, of the use of natural cycles, and similarly for the benefit of their own existence or subsistence, of that of others (farmers produce food for the nation and is also therefore part of the national economic system). The farmer also has that natural attachment to the land that she owns or cultivates, as a source of livelihood, as the sole economically viable property, as well as has a psychological affinity; she would part with it only when forced to, and under extraordinary circumstances

The reasons why the proposal for a smart village, or similar suggestions need to be taken seriously is because 1) it curtails the need for rural-urban migration, 2) bridges the rural-urban divide by providing facilities of the urban areas to people in rural areas, and 3) it provides balanced socio-economic development.[44] The provision of adequate infrastructure in rural areas, including physical, commercial or educational, can act as a deterrent to expected migration, both in time and in space; this deterrence would, if at all necessary, provide time for the planning authorities to lay out some basic or possibly the best infrastructure, in the expectation of future needs.

13 CONCLUSION

There is a collision in the making between the urbanizing imperative of a machine such as the Delhi-Mumbai industrial corridor (DMIC) and the conditions of rurality it has to contend with. Otherwise, as planetary urbanization descends upon rural landscapes, the essential ability to perform "actions at a distance" embedded in the smart city, will be repeatedly undermined as it comes into contact with agrarian environments and the subjects that inhabit them. Thus, we need to move beyond the notion that the urban simply "internalize" the rural, and of rendering rurality as anything other than islets of marginal existence, precariously embalmed in buffer zones, with their populations expected to submit to "shift in livelihoods from agrarian to non-agrarian and The service sector[45]

Rather, rurality persists in intense yet weak forms. As we have been arguing for the case of Udaipur's smart city, within the mesh of the city's urban fabric survive islets and islands of rurality, often (but not always) poor areas with ageing peasants, badly 'integrated', stripped of what had been the nobility of peasant life.

Planetary rapid urbanization (DMIC) relies on an epistemic refusal of the rural to smooth over variegated regional economies and their attendant morphologies. While it, (DMCI), conveys new urban life, rurality does not disappear. Rurality persists in the constitution of the urban through symbols and representations as well as the politics and practices of "nature and the countryside.

It could be posited that beyond the originary proposition of a world without the rural, or a total urban world, we have instead a co-evolutionary framework where rurality is not considered disappeared or dissolved but reconstituted in an infinite spectrum of mutable categories—"more than rural" or "less than urban," or "more or less rural" or "more or less urban" – an oscillating and fluctuating mediation between the urban and the not-urban

The countryside does not need to disappear. Some of the reasons adopted by the government[46], and by McKinsey[47], that the national urbanisation rate would reach fully 52% by 2050 does not necessarily have to be a given. These kinds of seeming predictions could set in motion a wave of unrest among residents of rural areas, into the belief that life as we know it cannot continue, and that migration to urban areas is almost a necessary fact

[44] IANS. http://www.siliconindia.com/shownews/PURA__is_150_Billion_business_oppourtunity-nid-74057-cid-3.html, of 17/11/2010. Schön DA, Sanyal B, Mitchell WJ (eds). High technology and low-income communities: prospects for the positive use of advanced information technology. Cambridge, MA: MIT Press; 2002.

[45] SENES Consultants India, "Environmental Impact Assessment of Dholera Special Investment Region (DSIR) in Gujarat" (2013), 377

[46] GoI-MHA. http://www.censusindia.gov.in (accessed 23/09/2015); 2011.

[47] McKinsey Global Initiative. India's urban awakening: building inclusive cities, sustaining economic growth. McKinsey & Co., April 2010.

Urban Green and Open Spaces under Pressure: The Potential of Ecosystem Services Supply and Demand Analysis for Mediating Planning Processes in the Context of Climate Change

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1 ABSTRACT

Climate change is a phenomenon which is discussed to be affecting cities and urbanising societies to a great extent. Thus, land use management of green and open spaces in the direction of climate protection and climate mitigation is an important aspect of sustainable urban and regional planning. However, land use planning holds the potential of causing conflicts between different stakeholders from administration, politics and civil society. The analysis of the demand of ecosystem services may therefore be a useful indicator to identify the interests of different stakeholders. Besides the demand, the analysis of the supply of ecosystem services might help to derive potential offers of climate relevant system functions and to support the planning processes of the areas of interest. Until now, the results of the analysis of ecosystem service supply and demand have been applied predominantly in regional or national contexts. For sustainable urban planning, the local level of observation thus seems to be more relevant.

This study presents results of the interdisciplinary research project GREIF (Karlsruhe Institute of Technology and University of Heidelberg, Germany). It aims at identifying ecological and socio-cultural potentials of local urban green and open areas in the Rhine-Neckar metropolitan region, Germany, using an ecosystem service supply and demand approach. Thereby, six ecosystem services of the categories provisioning, regulating and cultural services are analysed for three predefined urban areas. Furthermore, the demand of ecosystem services of local residents as direct users of these areas is determined by conducting comprehensive surveys. The study focuses on the comparison of quantitative supply and qualitative demand data in order to identify discrepancies between supply and demand of ecosystem services. The results will be communicated to administrative bodies and political authorities of the region to enable the integration of additional knowledge into planning decisions.

Preliminary results indicate that there are particular differences between the supply and demand of ecosystem services that affect the local residents in a direct way. Where the demand of the ecosystem services food provision and biodiversity is always higher-rated than the supply implies, the ecosystem service demand of climate regulation or renewable energy sources is always lower-rated than the supply indicates. These findings suggest that by incorporating the perceived demands of further stakeholders like planners or politicians, potential conflicting interests between ecosystem service demand and supply might become even more evident. Using this additional knowledge in the early stages of planning processes in the context of climate change might thus help to mitigate conflicts between different stakeholders.

Keywords: supply and demand analysis, ecosystem services, urban planning, climate change, urbanisation

2 INTRODUCTION

2.1 Motivation

In the context of climate protection and climate mitigation, sustainable land use management practices for green and open spaces are an important aspect of urban and regional planning (Jenks and Dempsey, 2005; Kenworthy, 2006; Peter and Swilling, 2012). However, land use planning has the potential of causing conflicts between different stakeholders from administration, politics and civil society. An analysis of the ecological potentials of areas of interest is hence a useful tool to identify climate relevant system functions and to assess the interests and perceptions of different stakeholders (Fisher et al., 2009). This paper makes use of an ecosystem services (ES) analysis to address the question of how ecological potentials can be used for mediating planning processes in the context of climate change.

Recently, ecological knowledge is gaining increasing acceptance in urban planning processes (Niemelä et al., 2010; Ahern et al., 2014; Rössler, 2015). However, it is rather discussed in research than implemented in practice (Hansen et al., 2015). Furthermore, ecological potentials are predominantly determined on a regional scale (e.g. Tyrväinen et al., 2007; Hansen et al., 2015) and monetized rather than distinguished between supply and demand (e.g. Nedkov and Burkhard, 2012; Gómez-Baggethun and Barton, 2013).

In this study, an analysis of urban green and open spaces is conducted on a local scale. It uses an approach that highlights the supply as well as the demand side of ES for the specific study site. It thus reveals matches and discrepancies between the ecological potentials of an area and the requirements and desires from other stakeholders. By combining methods from natural and social sciences, the paper responds to recent calls for the implementation of different knowledges about ecological potentials of urban spaces in planning processes (Castree et al., 2014).

2.2 Background

The concept of ecosystem services was introduced as a result of the increasing demands of humans on the limitied resources of the earth (Grunewald and Bastian, 2012). It aims at illustrating the relevance and meaning of the environment for society (Ehrlich and Mooney, 1983).

After Daily (1997), ecosystem services “are the conditions and processes through which natural ecosystems, and the species that make them up, sustain and fulfill human life.” According to the Millennium Ecosystem Assessment, initiated by the UN, ecosystem services can be divided into four categories: provisioning services such as timber and food production, regulating services as flood protection or climate regulation, cultural services as recreational or aesthetic values and supporting services as soil formation and nutrient cycling (United Nations (UN), 2015).

2.3 Study Site

The three selected study areas are based in the Rhine-Neckar metropolitan region in south-western Germany. The areas are located in three different cities (Heidelberg, Mannheim and Weinheim) distinguished by size and socio-economic profile. In this paper, only the study site in Heidelberg will be considered. This area is situated at the north-western fringes of the city between the district Heidelberg-Wieblingen and the adjacent municipality of Edingen-Neckarhausen. It covers approximately 410 ha and is framed in the north by the river Neckar, in the west by residential areas and in the south and east by highways (see figure 1).

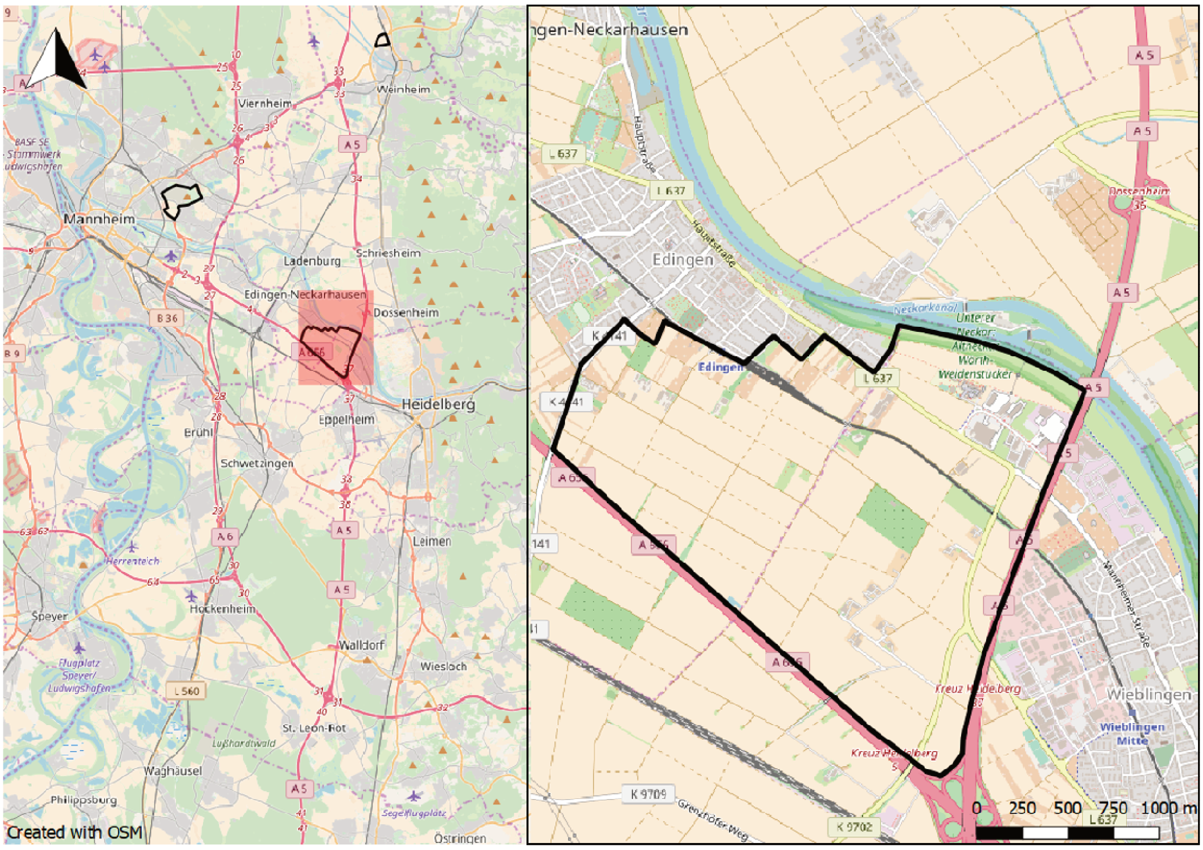

Fig. 1: Investigation areas of Mannheim, Heidelberg and Weinheim (left) and study area of Heidelberg (right).

3 METHOD

3.1 Ecosystem services - matrix analysis

Landscapes consist of different ecosystem structures depending on natural conditions and anthropogenic use and therefore hold differing capacities to offer ecosystem services (Burkhard et al., 2010). Due to changing land use forms, geographical population distributions and other socio-economic conditions, there are also differing demands for ES. These differences in supply and demand of ES can be represented with the matrix analysis. This approach is based on an evaluation matrix where relative and not monetized ES capacities and ES demand intensities of different land use forms can be put into relation (Grunewald and Bastian, 2012). Supply and demand of ES can be visualized in form of a budget matrix where the X-axis represents the chosen ES and the Y-axis the existing land use forms of the area of interest.

For this study, the following six ES were chosen:

Category provisioning services:

- Food and crops
- Renewable energy sources

Category regulating services:

- Climate regulation
- Biodiversity

Category cultural services:

- Aesthetics
- Recreation

3.2 Supply of ecosystem services

The supply of ecosystem services was analysed for the occurring land use forms in the study area. These were derived from Urban Atlas data that provide pan-European land use and land-cover data of urban regions. Urban land use forms have a minimum mapping unit (MMU) of 0,25 ha (= 50 m x 50 m), rural land uses a MMU of 1 ha (= 100 m x 100 m). They are based on Earth Observation Data (EOS), Open Street Map Data (OSM) and data from topographic maps (European Union, Copernicus Land Monitoring Service and European Environment Agency (EEA), 2018). The ecosystem services for the different land use forms were evaluated with categories ranging from 0 (= no relevant capacity to provide the ES) to 3 (= maximum relevant capacity to provide ES). The evaluation is based on general available literature data (Koschke et al., 2012) and field data. Additionally, literature data were adapted in case of available site-specific data (e.g. harvest data for crops). To ensure comparability, the selected ES were evaluated for the whole area by weighting them in relation to the size of the land uses. Subsequently, they were averaged and re-categorized into the defined evaluation categories from 1 to 3.

3.3 Demand of ecosystem services

For the analysis of the demand of the selected ES, a household survey was conducted to explore uses and perceptions of the study area (Yeh, 2016; see figure 2). Thereby, residents directly neighbouring the investigation area in Heidelberg were interviewed face-to-face using a paper and pencil questionnaire. The interviewees were asked to individually evaluate the ES of the study site according to a categorization from 0 (= not important) to 3 (= very important). All in all, 129 households were surveyed in Heidelberg. For evaluation, the mean value for each ES was calculated and re-categorized into the evaluation categories from 0 (= no relevant demand for ES) to 3 (= maximum demand for ES).

4 RESULTS

4.1 Supply of ecosystem services

Figure 2 shows the existing land uses for the area of Heidelberg derived from Urban Atlas.

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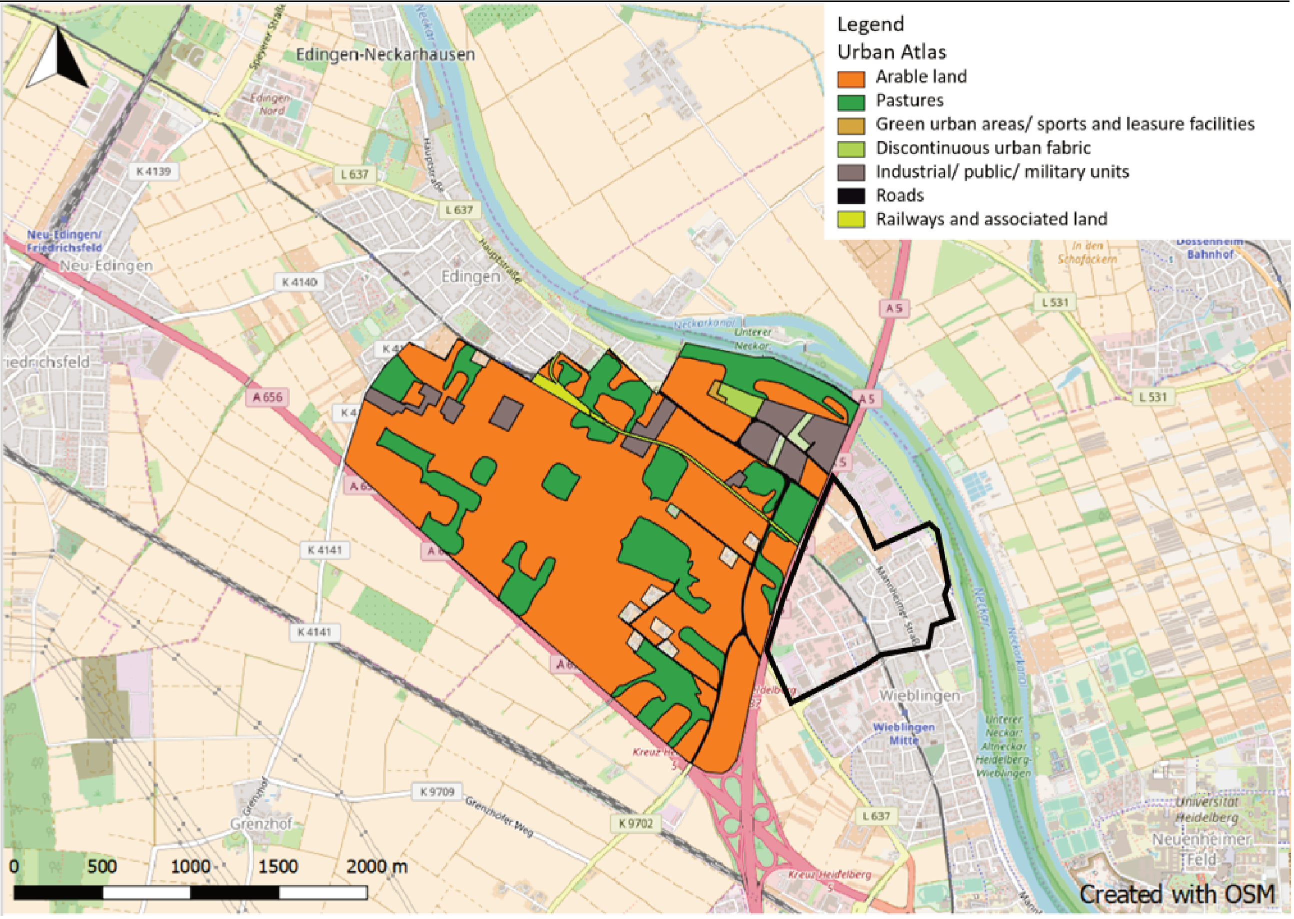

Fig. 2: Study site in Heidelberg with identified land use forms after Urban Atlas (European Union, Copernicus Land Monitoring Service and European Environment Agency (EEA), 2018). Outlined in black, the area of inquiry for the household survey is highlighted.

Most of the area consists of arable land (approximately 70 %) and pastures (approximately 20 %). There exist some industrial units, railways and roads (approximately 9 %) and with a very low share, discontinuous urban fabric and sports and leasure facilities which comprise a school and a nursery garden (approximately 1 %). In figure 3, the weighted supply matrix for the selected ecosystem services is shown.

Supply matrix

- 3 maximum capacity
- 2 high relevant capacity
- 1 relevant capacity
- 0 no relevant capacity

	Provisioning ES	Food and crops	Renewable energy sources	Regulating ES	Climate regulation	Biodiversity	Cultural ES	Aesthetics	Recreation
Arable land (69 %)		1	3		3	0		2	1
Pastures (21 %)		1	0		3	0		2	2
Green urban areas/sports and leasure facilities (0.5 %)		0	0		1	0		2	2
Discontinuous urban fabric (0.5 %)		0	0		0	0		1	1
Industrial/public/ military units (6 %)		0	0		0	0		0	0
Roads and railways (3 %)		0	0		1	0		0	0
Sum of capacity after weighting and averaging		1	2		3	0		2	1

Fig. 3: Supply matrix for selected ES for the study site in Heidelberg.

The matrix shows that the area has a maximum capacity to provide the ES “climate regulation”. This ES is measured by the area’s capacity to produce and to circulate fresh air. As the site is predominantely under agricultural use, the density of wind-inhibiting obstacles is low what may explain this evaluation. This ES is followed by the ES of “renewable energy sources” which is evaluated by the harvest amount of rape in the area, and the cultural ES “aesthetics”. No relevant capacity can be found for the ES “biodiversity”, measured by the number of vascular plant species that do not occur in the investigated area.

4.2 Demand of ecosystem services

Figure 4 illustrates the demand matrix for the selected ES. The ES "biodiversity" is the most requested by the citizens, followed by the ES "climate regulation", "aesthetics", "food and crops" and "recreation". The lowest demand was found for the ES "renewable energy sources". It becomes clear that especially those ES, which affect the citizens directly, are evaluated with a high category. The low importance of the ES "renewable energy sources" may be due to the fact that the personal advantage of this ES is not obvious for the respondent, as renewable energy sources need to be transformed before they can actually be used (directly or indirectly) by the consumer.

Demand matrix

3	maximum demand
2	high relevant demand
1	relevant demand
0	no relevant demand

	Provisioning ES	Food and crops	Renewable energy sources	Regulating ES	Climate regulation	Biodiversity	Cultural ES	Aesthetics	Recreation
Area of Heidelberg		2	1		2	3		2	2

Fig. 4: Supply matrix for selected ES for the study site in Heidelberg.

4.3 Budgeting supply and demand of ecosystem services

The supply of ES can be compared with the demand for ES using a budget matrix (see figure 5).

Budget matrix

-3	Demand exceeds supply
-2	
-1	
0	
1	Supply exceeds demand
2	
3	

	Provisioning ES	Food and crops	Renewable energy sources	Regulating ES	Climate regulation	Biodiversity	Cultural ES	Aesthetics	Recreation
Supply		1	2		3	0		2	1
Demand		2	1		2	3		2	2
Budget		-1	1		1	-3		0	-1

Fig. 5: Budget matrix for selected ES for the study site in Heidelberg.

It shows that there is a clear difference between the services the area offers and the demand of services from the citizens. Where the demand of ES exceeds the supply, values of the budget matrix are negative, as recognizable for the ES "food and crops" as well as "biodiversity" and "recreation". Where the supply exceeds the demand, values of the budget matrix are positive, visible for the ES "renewable energy sources" and "climate regulation".

The budget matrix reveals that those ES having an immediate effect on the life of the citizens and are thus assigned to a high evaluation category, cause negative values in the budget matrix. The demand for food (ES "food and crops") as basic need of human beings as well as the demand for recreational space (ES "recreation") are reflected in the matrix. A considerable difference between supply and demand can be detected for the ES "biodiversity". The preservation of nature proves highly important for the well-being of citizens but can not be provided by the study site at all. In contrast, the ES "renewable energy sources" can be provided with "high relevant capacity" but is not as relevant to the citizens.

5 DISCUSSION AND OUTLOOK

This study focussed on the analysis of ES of green and open spaces on a local scale. The analysis of supply and demand of ecological services highlights, which ES are provided with which capacity by the study site. Moreover it reveals, with which priority these ES are demanded by the citizens. Thus, the matrix analysis exposes to what extent supply and demand differ for the study site. It showed for example that the ES „climate regulation" could be offered with a high potential by the area and was also highly demanded by the citizens. For urban planning processes, this result could indicate for example, that construction projects delimiting this capacity should be negotiated between planning authorites and citizens.

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These findings suggest that by incorporating the perceived demands of further stakeholders like planners or politicians, potential conflicting interests between ecosystem service demand and supply might become even more evident. Using this additional knowledge in the early stages of planning processes in the context of climate change, might thus help to mitigate conflicts between different stakeholders. In the further progress of the project, planning, administration and political authorities will be incorporated in the analysis to gain a differentiated picture of the stakeholders' interests in the area. These interests should again be analysed under use of the matrix analysis and results be communicated at a round table conference and discussed with the individual stakeholders. Thereby, a sensitization for ecological subjects may be fostered, what could lead to an adaption of land use planning to the actual ecological potentials of areas of interest.

6 FUNDING

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7 REFERENCES

Ahern, J., Cilliers, S., Niemelä, J., 2014: The concept of ecosystem services in adaptive urban planning and design: A framework for supporting innovation. Landscape and Urban Planning 125, 254–259.

Burkhard, B., Kroll, F., Müller, F., 2010: Landscapes Capacities to Provide Ecosystem Services? A Concept for Land-Cover Based Assessments. Landscape Online 1–22.

Castree, N., Adams, W.M., Barry, J., Brockington, D., Büscher, B., Corbera, E., Demeritt, D., Duffy, R., Felt, U., Neves, K., Newell, P., Pellizzoni, L., Rigby, K., Robbins, P., Robin, L., Rose, D.B., Ross, A., Schlosberg, D., Sörlin, S., West, P., Whitehead, M., Wynne, B., 2014: Changing the intellectual climate. Nature Climate Change 4, 763–768.

Daily, G.C. (Ed.), 1997: Nature's services: societal dependence on natural ecosystems. Island Press, Washington, DC.

Ehrlich, P.R., Mooney, H.A., 1983: Extinction, Substitution, and Ecosystem Services. BioScience 33, 248–254.

European Union, Copernicus Land Monitoring Service, European Environment Agency (EEA), 2018: Urban Atlas.

Fisher, B., Turner, R.K., Morling, P., 2009: Defining and classifying ecosystem services for decision making. Ecological Economics 68, 643–653.

Gómez-Baggethun, E., Barton, D.N., 2013: Classifying and valuing ecosystem services for urban planning. Ecological Economics, Sustainable Urbanisation: A resilient future 86, 235–245.

Grunewald, K., Bastian, O. (Eds.), 2012: Ökosystemdienstleistungen. Springer Berlin Heidelberg, Berlin, Heidelberg.

Hansen, R., Frantzeskaki, N., McPhearson, T., Rall, E., Kabisch, N., Kaczorowska, A., Kain, J.-H., Artmann, M., Pauleit, S., 2015: The uptake of the ecosystem services concept in planning discourses of European and American cities. Ecosystem Services 12, 228–246.

Jenks, M., Dempsey, N. (Eds.), 2005: Future forms and design for sustainable cities. Architectural Press Amsterdam, Boston.

Kenworthy, J.R., 2006. The eco-city: ten key transport and planning dimensions for sustainable city development. Environment and Urbanization 18, 67–85.

Koschke, L., Fürst, C., Frank, S., Makeschin, F., 2012: A multi-criteria approach for an integrated land-cover-based assessment of ecosystem services provision to support landscape planning. Ecological Indicators, Challenges of sustaining natural capital and ecosystem services 21, 54–66.

Long, Y., Gu, Y., Han, H., 2012: Spatiotemporal heterogeneity of urban planning implementation effectiveness: Evidence from five urban master plans of Beijing. Landscape and Urban Planning 108, 103–111.

Modica, G., Vizzari, M., Pollino, M., Fichera, C.R., Zoccali, P., Di Fazio, S., 2012: Spatio-temporal analysis of the urban&rural gradient structure: an application in a Mediterranean mountainous landscape (Serra San Bruno, Italy). Earth System Dynamics 3, 263–279.

Nedkov, S., Burkhard, B., 2012: Flood regulating ecosystem services—Mapping supply and demand, in the Etropole municipality, Bulgaria. Ecological Indicators, Challenges of sustaining natural capital and ecosystem services 21, 67–79.

Niemelä, J., Saarela, S.-R., Söderman, T., Kopperoinen, L., Yli-Pelkonen, V., Väre, S., Kotze, D.J., 2010: Using the ecosystem services approach for better planning and conservation of urban green spaces: a Finland case study. Biodiversity and Conservation 19, 3225-3243.

Peter, C., Swilling, M., 2012: Sustainable, resource efficient cities – Making it happen! United Nations Environment Programme.

Tyrväinen, L., Mäkinen, K., Schipperijn, J., 2007: Tools for mapping social values of urban woodlands and other green areas. Landscape and Urban Planning 79, 5–19.

United Nations (UN), 2015: Water for a sustainable world includes data and indicators annex for water and energy. Unesco, Paris.

Yeh, E.T., 2016: 'How can experience of local residents be "knowledge"?' Challenges in interdisciplinary climate change research. Area 48, 34–40.

Urban Planning in Bosnia and Herzegovina

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1 ABSTRACT

This article explains areal planning in Bosnia and Herzegovina in the system of regional planning, starting from government politics and circumstances, along with regional development perspectives through planning on local and municipal levels. (Nurković, R., 2011) The aim of this article is to present key issues of the modern areal planning in Bosnia and Herzegovina, as well as problems that cities are faced with. In that sense, the basis of everything is demographics, economics, environment, energy and traffic. Demographic averages in Bosnia and Herzegovina are important in determining urban areal planning of development in future. Numerous urban areas in Bosnia and Herzegovina are taken by dynamic urbanization. The consequence of that is small cities and villages have adopted the significance of suburban satellites. However, such position, without adequate planning, is not sustainable for long, and current advantages may be easily lost. Sarajevo functional urban region takes the central place in Bosnia and Herzegovina around the capital city of Sarajevo. It is the most prosperous urban planning area in Bosnia and Herzegovina, and it contains all functions of the typical European urban region.

Local communities within the urban planning of Bosnia and Herzegovina, in the conditions of mainly spontaneous transition, have taken over a significant role through which funds are directed towards urban areas with the purpose of their revivification and enabling a higher life standard for population settling in these areas. Rural potentials in Bosnia and Herzegovina are emphasized as the main precondition of efficient planning and usage, from the aspect of political and economic factors of development considering the physical characteristics of land.

Keywords: urbanisation, urban planning, development, local communities, Bosnia and Herzegovina

2 INTRODUCTION

Urban areal planning represents one of the most significant characteristics of modern development in Bosnia and Herzegovina. Spatial arrangement and urbanization make one important element of rational and humane use of space and development of economic activities, directing urban planning with technological factors of development and life needs of population in Bosnia and Herzegovina. Urban areal planning unfolds based on areal and urban plans that are in accordance with development of the activity sector in Bosnia and Herzegovina. Areal urban plans are social documents through which the politics of urban areal planning in Bosnia and Herzegovina are realized. Through urban and areal plans, a long term politics of city and area development is determined, and it is regulated by the areal plan of Bosnia and Herzegovina, the general urban plan of settlements and the detailed urban areal plan. (Nurković, R. 2012).

Until 1992, urban areal planning in Bosnia and Herzegovina was regulated by legislation that was founded on theories of the socialist economic development. In that period, plans were not flexible in urban planning of area development (for example, there was not a possibility of different intent to use land or a different development of urban settlements). Those plans assumed narrow goals of urban planning in Bosnia and Herzegovina. Urban planning in Bosnia and Herzegovina was developing on non-transparent way, where government institutions were only participants in the process of development of urban areal plans and their adoptions.

In 195, new laws on urban planning and spatial arrangement in Bosnia and Herzegovina were introduced. In that period, spatial arrangement was primarily defined as a government activity, and private sector had a possibility to significantly impact the decisions. These new entity laws were defective. Even though, they introduced participation of citizens in the process, they have not created a basis for using more flexible planning and development strategies (they were basically identical in content to the laws of the socialist period), and they have changed a lot. (Blaut, J., 1961) Due to that, new adopted laws in Bosnia and Herzegovina in 2010 had a mutual goal: to achieve efficiency in the area of urban planning and spatial arrangement through amendment of procedures in administration and through more flexible planning. The new legislation enables use of the new ways of urban planning in Bosnia and Herzegovina, including the new implementation planning document. Amongst other obligation, Bosnia and Herzegovina must synchronize its areal politics with the European Union legislation in order to fulfill new criteria for membership. Bosnia and Herzegovina must abide by the principles of urban areal planning for the European continent contained in (European Commission's European Spatial Development Perspective-1999) and the leading principles (European Conference of Ministers responsible for Regional Planning) (2000), as well as other directives of the European Union relating to areal planning. (Čeme, A., 1999)

Dynamic development of urban planning in Bosnia and Herzegovina is especially significant on the grounds of high standard, great areal population mobility, and different values, where new processes of transformation of cities and urban areas are introduces, that is: suburbanization, counterurbanization, excavation and reurbanization. The common characteristic in all these processes is deconcretation and decentralization of city population and urban activities. From the modern perspective, Bosnia and Herzegovina has a small number of more significant urban centers. Besides Sarajevo, in the regional sense, the following are significant: Tuzla, Mostar, Banja Luka, Gorazde, Doboj, Prijedor, Brcko, Bijeljina, Bihac and Zenica.

3 METHODOLOGICAL POSTULATES

Urbanization development of urban settlements in Bosnia and Herzegovina with own specificities and moderately small areas requires using special methods. According to methodology of urban geography scientific methods have been used, such as methods of analysis and synthesis, mapping method, statistical method and descriptive method, method of field research as well as method of text analysis. Therefore, styding the general models and urban geography methodology in a combination with urban-geographic approach have been used. Agencies of the entity institutes for statistics, together with the Agency for Statistics of Bosnia and Herzegovina have been conducting a Survey on Urban Population in accordance with methodological rules and principles of the International Labour Organisation and requirements of Eurostat for five years, by which international comparability of data in the area of statistics of urban settlements has been provided. (Gillend, D., Lall, A.) As a basic method of collecting primary data sources, an interview method has been used, ie. an in-depth interview, where the main instrument was a reminder for an interview. About 25 urban settlements in Bosnia and Herzegovina have been surveyed. Research was also completed by an analysis of secondary sources contents, interpretation and description of adequate data bases of the Agency for Statistics of Bosnia and Herzegovina.

Today, Bosnia and Herzegovina is, like many countries in the world, in the stage of more emphasized polarized development. The effects of such development are expressed in many spatial processes and structures. In this structure, agriculture, protection of environment, planning the land use and economic planning, are treated as equal, but with different development under responsibility of different governmental agencies that are in contact with different groups for economic development. Bosnia and Herzegovina is under the fundamental constitution reform that will, among other issues, solve the basic issue of its administrative-territorial organization. Analysis is founded on various expert explanations, that is, clarification. Therefore, it is founded on determination, description and establishment of area reality in Bosnia and Herzegovina. It is one of the ways to reach expert analysis, some type of attempt of logical analysis of shape and process of creation of an area. All knowledge, gained through using scientific methods of research, is more or less relating to past events. Planners still need an image of past events, and this is why they are into visions, concepts, prognosis and projections, that is, planning future considering desires and development possibilities. Analysis provides “knowing and theoretically organized cognitive results” and other forms of cognitive results from various professions about various elements, occurrences and processes of area structure. Determinations in an analysis are founded on facts about area, which are a result of research of numerous professions. Facts must be true, correct, attested and gathered from a primary source, regardless if they are a result of real area relations or historic documents. Authentic facts about area create an expert foundation, that is, they ensure it a scientific character. Based on the named methodological approach, we present steps taken in expert analysis on areal planning, which we used during the creation of expert materials for the Strategy of area development planning in Bosnia and Herzegovina, and these are as follows:

- Situation analysis;
- Situation evaluation;

- Development possibilities;
- Area visions;
- Area development versions.

4 ANALYSIS SUBJECT OF AREAL PLANNING IN BOSNIA AND HERZEGOVINA

Planning has geographic, time, function and institutional spread. Time spread comes from direction of planning into the future. From past, it includes elements and factors that are of foundational significance for analyzing existing conditions of future development, that is, it is used for determining possible and desired changes and pathways to them (Friedmann, 1987). Areal planning deals with questions of areal establishment of development on a significant comprehension, to have an area of limited ability to establish development and growth, rather than on its general disturbances. It would be very unsure if areal planning would separate, that is if it would move away from development interests. The core subject of areal planning (we mean planning subject, that is, what is being planned) is especially areal. Material planning subject is an area as a physical reality, its formal subject, then deciding on "reaching into area". The final intent of planning is surely influencing changes of the material subject – area. The word area is used in its widest meaning, since it is not limited only to tridimensional geometry, rather, it is its economic and psychological and perceptible area. With such analysis, we are interested in what is happening with the area in Bosnia and Herzegovina. In that context, from the foundational meaning, it is "area quality" relating to attempts of its merging, that is connecting social values with changes and stabilities of areal structure. Area quality is changing, and besides that, its relative location is changing as well, and finally, its geographic spread is changing. Changing area structure, occurrences and processes, and their facts, impacts changes of relative position of provinces and regions within the global models of areal relations. (Čeme, A., 1999)

Areal planners are most often interested in area spread of economy and society as a whole. Because of that exactly, special attention is paid to area relations between social and economic activities, that is, area structure where those activities are performed. Planners must get introduced with the size and location of economic area and its function, that is, area relations between activities. Regardless of that, since real area is distorted due to economic and psychological factors, it must be the core subject of interest for planners to study mutual area relations in real (geographic) area. From the area perspective, foundational significance is that development has an area component, meaning spread. For manufacturing and consumption, area disparity is significant, in order to overcome distance in area, we need time, energy and money. All activities are such or different users of area. Area aspect, today, is proportionally very different from first understanding of that concept, even though, the concept of area, that is area concept, was always accepted.

5 URBAN POPULATION IN BOSNIA AND HRZEGOVINA

Urban population and its share in total population are among more relevant indicators of urbanisation level in Bosnia and Herzegovina. The pronounced differences between total population growth, which is low, and relatively high urban population growth correspond to adequate stage of demographic transition with a low rate of natural growth, and so called industrial stage of urbanisation with a strong concentration in cities. In earlier periods Bosnia and Herzegovina also recorded a rapid growth of urban population as well as other neighbouring countries (Nurković R, 2013).

In many developing countries rates of growth of total and urban population as well as their differences are considerably bigger, while in developed countries rates of growth of total and urban population are low, and differences between them are insignificant. These data may be used as an orientation for evaluation of development of our country and its parts. High rates of urban population growth are certainly indicators of population concentration in the cities. Such is the case with Bosnia and Herzegovina. Development of total population also confirms this. Observing from contemporary perspective, Bosnia and Herzegovina has a small number of more significant urban centres. Sarajevo city, according to first official Austro-Hungarian census had 21.377 inhabitants in 1879. Despite the frequent war events, natural disasters and similar difficulties, population number in Sarajevo had been increasing rapidly, so, according to estimations about 750.000 inhabitants lived in Sarajevo in 2015. Except Sarajevo, Tuzla, Mostar, Banja Luka, Goražde, Doboj, Prijedor, Brčko, Bihać and Zenica are significant in regional sense (Table 1 and Figure 1).

City	1879.	1885.	1910.	1971.	1991.	2015
Banja Luka	9.560	11.357	13.566	158.736	195.692	225.000
Bihać	3.097	3.506	3.943	58.185	70.732	63.000
Brčko	2.901	4.281	5.998	74.771	87.627	100.000
Goražde	846	1.226	1.460	34.685	37.573	17.000
Doboj	1.351	1.749	2.768	88.985	102.549	80.000
Mostar	10.848	12.665	14.370	89.580	126.628	112.000
Prijedor	4.681	4.746	4.999	97.894	112.543	95.000
Sarajevo	21.377	26.268	38.083	359.452	527.049	750.000
Tuzla	5.119	7.189	10.227	107.293	131.618	174.000
Zenica	2.101	3.073	4.226	60.910	145.517	118.000

Table 1: Review of population number in more significant cities of Bosnia and Herzegovina, 1879-2015

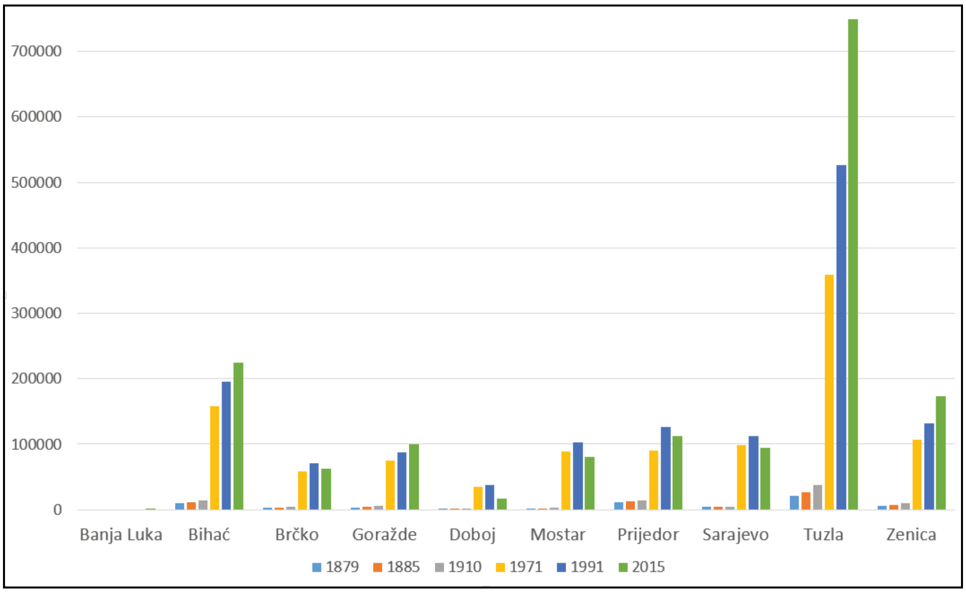

Fig 1: Review of population number in more significant cities of Bosnia and Herzegovina, 1879-2015

The mentioned directions of urbanisation are mainly followed by main lines of communication, which shows the significance of traffic accessibility in their appearance. The same conditions are also present in other regions of Bosnia and Herzegovina. Dynamics of urban settlement development and expansion of the urbanised zones in Bosnia and Herzegovina show the polarisation tendency in urbanisation process. Distinguishing the urban settlements in Bosnia and Herzegovina is a permanently present problem.With development of various activities, primarily of industry and mining; in particular, urban settlements had been developing production of different industrial products and services, not only within their borders, but also in a broader gravitation area. However, in practise of differentiation of settlements in Bosnia and Herzegovina, a small number of indicators had been applied. Most commonly this was a settlement size , then people’s lifestyles, which was mostly expressed by ratio of agricultural and nonagricultural population, and other relative indicators. In 2010, there was diversity in distinguishing urban settlements in Bosnia and Herzegovina. As it is known, Institute of Statistics of Bosnia and Herzegovina separated three categories of settlements: urban, mixed and rural. For these categories a model of settlement size and participation of non-agricultural population was applied. It may be concluded that this model satisfied the needs of differentiating the settlements in 1981 but in differentiation of settlements some shortcomings have appeared.Therefore, it was necessary to adjust a model of differentiating the urban settlements with the existing development level.

If the separated cities of Bosnia and Herzegovina are analysed on the whole as a unique urban system, edifying results are obtained. In order of urban settlements size, which indicates to hierarchic features of urban system, a certain irregularity was noticed that was present in urban development of Bosnia and Herzegovina in earlier periods as well. The first thing to notice in order of urban settlements size in Bosnia and Herzegovina is overemphasised size of cities of Sarajevo, Banja Luka, Tuzla and Mostar, actually of the largest urban settlements, in relation to other settlements. Differences in urban population share, respectively the urbanisation level, are consequences of unequal dynamics of urban settlements development in all areas of Bosnia and Herzegovina. These differences are noticeable from data that were present in the first decade of the 21st century. For this purpose, it is possible to analyse dynamics of total and urban population growth in the period 1981-1991. As the data on population numbers in 1981 and 1991 are not comparable due to different criteria of separating the cities, it is possible to compare urban population of separated urban settlements according to mentioned model in 1981, as well as the population of cities in 1991.

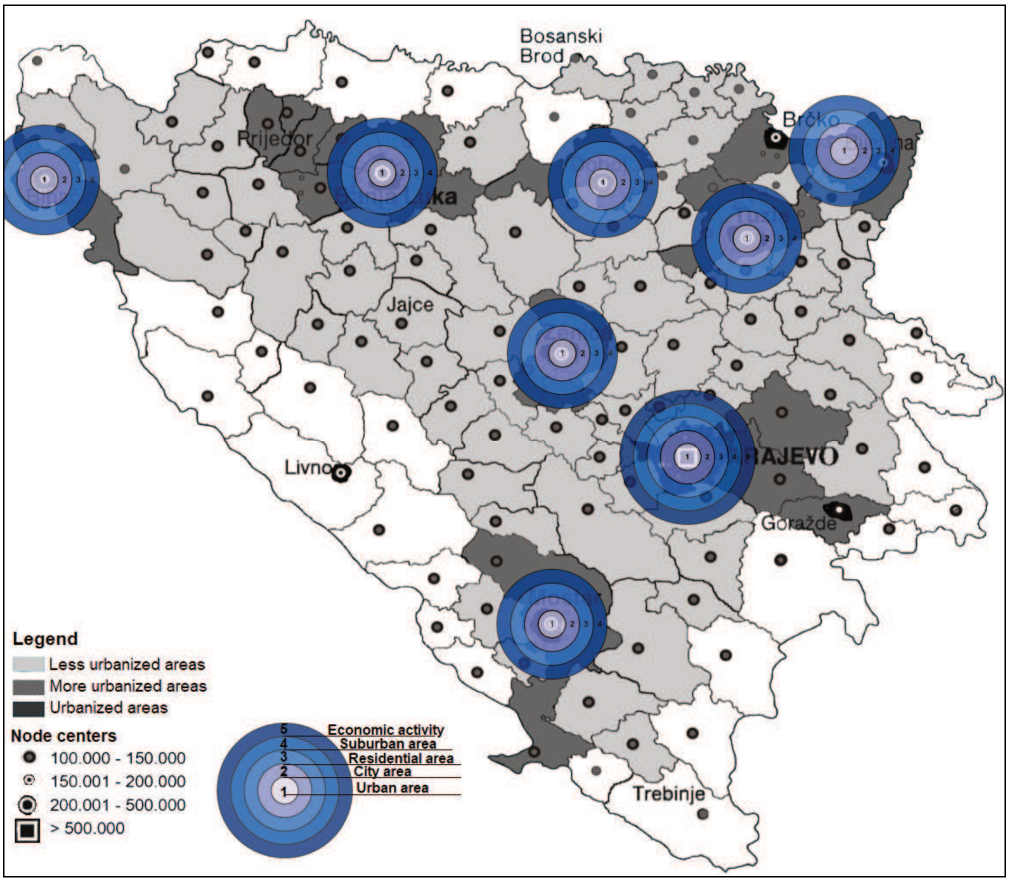

Fig 2: Urbanisation level of urban settlements in Bosnia and Herzegovina, 2015. Author: Nurković, R.

Comparing the growth of total and urban population in Bosnia and Herzegovina in the period 1981-1991, it should be emphasized, first of all, that total population growth in Bosnia and Herzegovina was 38,2 %. Differences between the growths of total and urban population were big. Sarajevo, Tuzla, Zenica and Banja Luka are the hubs in urban network of Bosnia and Herzegovina, more important than others, because they are the centres of larger number of connections. Such hubs have good accessibility. Settlements in which there are the largest numbers of central functions have the highest accessibility, as it is a precondition of a better spatial organisation. The least accessible hubs are in South and East Bosnia and in West Herzegovina. These are: Foča, Goražde, Trebinje and Livno. (Nurković, R., 2012)

Data on number and dynamics of urban settlements growth in Bosnia and Herzegovina are available, so it may be judged according to census data from 1961, 1971, 1981 and 1991, as well as according to estimations for 2011. Until 1991, Bosnia and Herzegovina had 109 municipal centres, respectively urban settlements. In 2015, after the war events and a new territorial arrangement, Bosnia and Herzegovina had 141 municipal centres, which is more by around 30% than twenty years ago. With the changes in structure of settlements according to size and with an increase of number and size of cities, urban systems of the regions have changed as well as the country's urban system on the whole. In these changes, a positive trend is also noticed, respectively creation of regular urban systems. Degree of primeness in Bosnia and Herzegovina was more than two. Data on population number in cities of Bosnia and Herzegovina refer to certain differences in courses of urbanisation of the regions as well as to differences in development of single agglomerations. Namely, it is obvious that in single regions a process of pronounced concentration is present, first of all, in regional centres, and that in some other regions polycentric urban development, with metropolization tendency is more expressed.

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6 LAND VALUES IN URBAN PLANNING

According to (Nurković, R., 2012), theoretically, open land auctions have created two different and mutually related patterns of distance decrease. One relates to land values, and the other relates to population density. As the principal states, as the distance increases from CBD, the population density decreases. With one important variation, the pattern of urban planning of population density in the more central settlements of Bosnia and Herzegovina shows a comparative order of distance decrease. Still, the accessibility is attractive to numerous residential users and it brings its tax to high land prices. However, we should also take into account urban planning in Bosnia and Herzegovina and that the accessibility is not decreased only in the horizontal direction – distance from the center towards the outskirts, but also in the vertical direction – from the ground floor towards the higher levels of the city. According to that, there is a zonality of using space in the vertical direction (Figure 3).

Nevertheless, planned creation of new centers in Bosnia and Herzegovina, or new poles of attraction, may create a balanced areal system along with the existing ones. In the development of urban planning of cities in Bosnia and Herzegovina, tendencies of centralization and decentralization are very noticeable. Through centralization, increase of land use is emphasized, along with development of new economic activities, which leads to expansion of urban planning. For example, in Bosnia and Herzegovina, possibilities are created to move population from the city center to spacious city outskirts, where new peripheral settlements are built with smaller city centers, and cities are expanding over large areas.

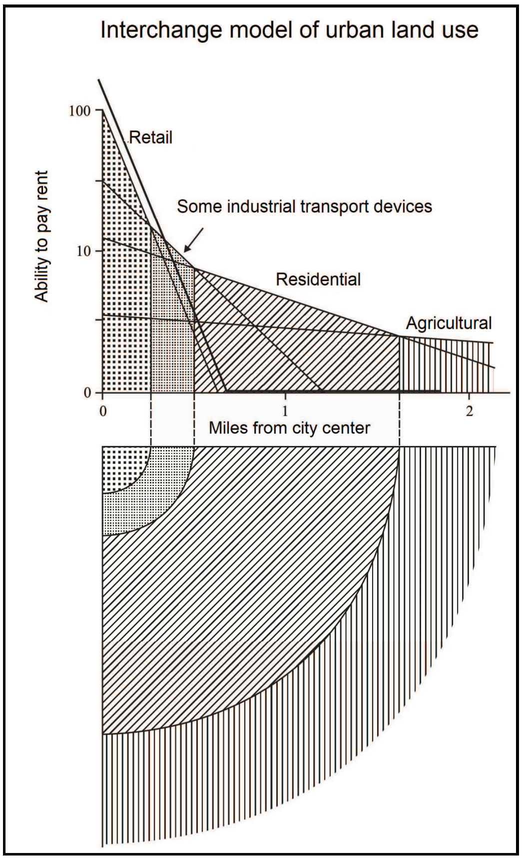

Fig 3: Economic model of urban use of land in Bosnia and Herzegovina

7 URBAN SYSTEM IN URBAN PLANNING PROCESS

Here, we are speaking of the process of urbanization in Bosnia and Herzegovina encouraged by the industrialization through mass employment of rural population in city centers. In the population structure and the degree of urbanization of Bosnia and Herzegovina, from one year to another, greater and greater changes occurred. Bosnia and Herzegovina had 38.2% of city population in 2011. Urban areas in Bosnia and Herzegovina were considered as a system, integrating physical, social, economic, ecological, environmental, infrastructural and institutional subsystems, where urban expansion is the result of change in function of these subsystems. Discussions with experts and conducted surveys identify problems of urban systems in Bosnia and Herzegovina, while forming models reveals that there are three controlling parameters, such as population, connection and functions responsible for urban expansion in the system (as represented on figure 4).

Population in Bosnia and Herzegovina acts as the basis of the existence of urban planning. Every change in population directly affects functioning of the urban system. Increase in population, at the expense of natural growth, migration balance, leads towards variation in functioning of the urban system and it is subject to urban expansion, if they are not affected adequately. Connection of urban planning in Bosnia and Herzegovina provides a vital connection in interactions of human activities in tangible and intangible forms, in and outside of the urban system. Each change in connection on intercity and intracity level at the expense of economic prosperity is empowered by technological progress, and it leads to dispersion/reorganization of population and function, in and outside the urban system, and it is subject to urban expansion, if they are not affected adequately. Functions act as one of the most important dynamic entities in the urban system. Urban systems contain different types of functions, such as social and economic ones. (Denmark Lovvards 2018, 1992)

Each change in functioning in the conditions of scale or any other variation in them directly impacts the urban system, attracting more and more population, which leads to urban expansion, if they are not affected adequately. (Christensen, K. S., 1985) The work of these mutually dependent parameters, on and individual level or combined together, leads to change in the total functioning of the urban planning system, and it results in urban expansion, if it is not affected adequately. This is why these important controlling parameters must be taken into account when forming politics and useful guides for sustainable development of a system without urban expansion (Chadwick, G., 1971). Transportation of goods, people and services is conducted through traffic connections, such as railroads, roads, air links, telephone connections or other forms. Urban system is developed and it acts as a whole. Changes in one element condition changes in the whole system. Development of large cities in the urban system affects development of towns, therefore, the differences between them are not significantly changed. Concept of the urban system relates to a series of towns and cities, which are connected in such way that any change in population, economic vitality, employability or providing services has consequences for other areas.

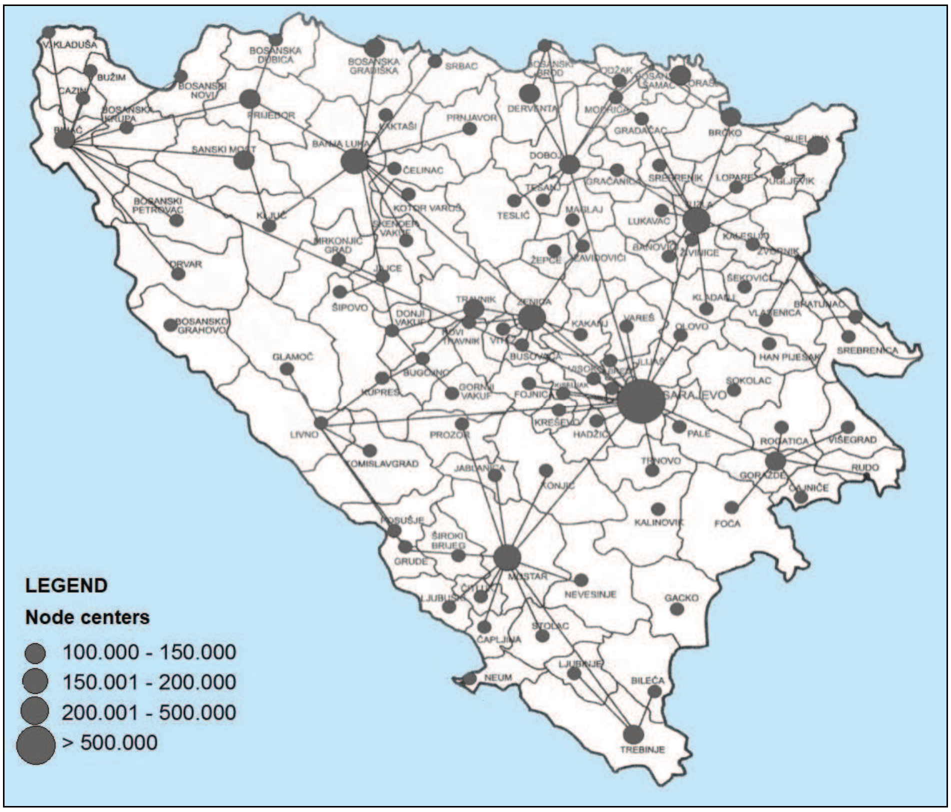

Fig 4: Network of regional and subregional centers in Bosnia and Herzegovina, 2015. Autor: Nurković, R. (2011)

Population in Bosnia and Herzegovina is very uneven. Special population characteristics occurred in the period after 1995, when it came to great movement of population from Eastern parts of Bosnia and Herzegovina towards the middle, and also from other parts towards the border areas and outside borders into

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neighboring countries of Croatia and Serbia. Recent population disposition in Bosnia and Herzegovina was not a subject of interest of any geographers almost ever. Similar to countries of the former Yugoslavia, urban system of Bosnia and Herzegovina has also developed gradually. In the nineteenth century, urban system of Bosnia and Herzegovina has started to transform in a more powerful way under the influence of deagrarization and industrialization. Settlements that have represented industrial centers – Tuzla, Sarajevo and Zenica – have started to expand. At the beginning of the twentieth century, urban system has already had its hierarchical level. The greatest level of centrality was Sarajevo, then Tuzla, Banja Luka and Mostar. At the same time, through strengthening of these cities, a slight occurrence of forming regional centers – Bihac, Doboj and Foca – has started. According to data from Agency for Statistics of Bosnia and Herzegovina, Bosnia and Herzegovina has become a country with over 140 city settlements in 2010, and with the same number of municipal centers. Many of these city settlements were created through dying of mountain villages taken by deagrarization. The largest number of cities has up to 20,000 residents, while there is a small number of cities with over 100,000 residents. Amongst those are Sarajevo, Banja Luka, Tuzla, Zenica, Mostar, Bihac and Brcko, and they are regional centers as well. Also, amongst those, great differences are noticed, from the aspect of population and also the social-economic and political significance (Nurković, R. 2012).

Size of cities that make the urban system of Bosnia and Herzegovina should be discussed on the basis of distribution of numerous factors. Cities in Bosnia and Herzegovina will occur in various size. Surely, the occurrence of a small number of large cities will also be present here, such as in many countries in the world. For the area of Bosnia and Herzegovina, it is possible to apply the criterion of city size according to the following classification:

- Up to 5,000 residents, settlements, towns, boroughs
- From 5,000 to 20,000 residents, towns
- From 2,000 to 50,000 residents, medium cities
- From 50,000 to 100,000 residents, cities
- From 100,000 to 200,000 residents, large cities.

Distribution of cities in Bosnia and Herzegovina, according to the Rank-size rule, unveils that the urban system of Bosnia and Herzegovina is very complex. It is made up of the global government urban system and eight regional urban systems. Both of these systems are a consequence of historical, economic and political opportunities. In the period after 2015, there were great changes in the urban system of Bosnia and Herzegovina. Through migration of population due to war events, it came to sudden strengthening of cities of Sarajevo, Tuzla, Bihac, Brcko, Zenica and Bijeljina. Contribution to strengthening of named cities is given by an intensive process of suburbanization, due to which cities expand, and in a very close future, it will come to a complete accretion of parts of a cities with a neighboring city settlements. Radial expansion of the named process is especially emphasized in Sarajevo, Mostar, Tuzla and Banja Luka. We may conclude that traffic connections in named directions have enabled the development of suburbanization. They are very important intersecting connections with Sarejevo, and they have a certain function of activity as its gravitational zones of daily migrations (Nurković, R., 2013).

8 CONCLUSION

Urban areas of Bosnia and Herzegovina will be integrated into an urban network of Europe (Euro-regions) through regional cooperation, formation of urban center networks and development of multimodular transport corridors. It is valued that this concepts fits the new process of urbanization, which is characterized by a polycentric urbanized regional area, strong communication corridors, regional classification of work, as well as various advantages related to living environment.

The ideas of understanding new conurbations, as competitive parts of the European urban system, may be applied on already formed agglomerations of Bihac, Banja Luka, Tuzla, Zenica, Sarajevo and Mostar. Sarajevo areas should be treated as a metropolitan region, which will form as one of the more significant centers of the South-East Europe. For urban continuity and cultural identity of Bosnia and Herzegovina, historical heritage has a special significance, therefore, it is necessary to ensure its revival and inclusion into development, as a part of the European cultural heritage. Through areal planning of Bosnia and Herzegovina, an area of natural values was planned, with about 16% of the total area of Bosnia and Herzegovina, and it should be planned through special areal plans of special areas in order to protect it and include it in the natural heritage of Europe and the World. Cities have a great significance as development centers and generators of development, which makes them intersections in areal organization and development of Bosnia and Herzegovina as a whole. Approach to the conception of the new Law on areal planning should be based on European areal guidelines and legislative experiences of the European Union countries. All levels of planning, as well as organization of institutions for creation and enforcement of plans and sources of funding, should be resolved by law.

9 REFERENCES

BLAUT, J.: Space and Process, Professional Geographv, Vol. 13, str. 1-7, 1961
CHADWICK, G.: A Svstems View of Planning. Pergamon, Oxford., 1971
DENMARK L..: The Spatial Structuring of Denmark in the Future Europe. Ministrv of Environment, Copenhagen. Year 2018, 1992
ČERNE, A.: Prostorska identiteta - koncept različnosti. Anthropos, Časopis za psiholo¬gijo in filozofijo ter za sodelovanje humanističnih ved, letnik 31, štev. 4-6, str. 296-300, 4 cit. Lit3- 9503110 -1-3, Essen, Germanny, p.113-119
ČERNE, A.: Cmestions of Regional Development in Slovenia (Vprašanja regionalnega razvoja Slovenije). Razvojne možnosti Slovenije, Bodočnost mest, 80. letnica Oddel¬ka za geografijo, Dela 14, Oddelek za geografijo, Filozofska fakulteta, Univerza v Ljubljani, Ljubljana, str. 137-150., 1999
CHRISTENSEN, K. S: Coping with Unceratintv in Planning. Journal of the American Planning Association, Vol. 51, No, 1, str. 63-73., 1985
GILLEN, D., Lall, A.: Competitive advantage of low-cost carriers: some implications for airports. In: Journal of Air Transport Management, 10 (1), pp. 41-50. 2014.
NURKOVIĆ, R.: Contemporary bases of clasification of the roads and their influence on regional development of Bosnia and Herzegovina. IN: Proceedings ,University of Tuzla, Faculty of natural sciences, Bosnia and Herzegovina, 19-31. Tuzla, 2007.
NURKOVIĆ, R.: Contemporary Spatial and Hierarchic Characteristics of Urban System of
Bosnia and Herzegovina , 16th International Conference on urban Planning, Reg ional Development
and Infornation Societh REAL CORP 2011, ISBN:978., 2011
NURKOVIĆ, R.: Geographical aspects of contemporary aviation in Bosnia and Herzegovina. In: Geographical review, Vol. 37, pp. 35-50. Sarajevo, 2016.
NURKOVIĆ, R: „U rbanization and rural development in Bosnia and Herzegovina”, UGI 2011. Regional Geographic Conference, Santiago Chile (CD-ROM); 26 Local Development 37., 2012
NURKOVIĆ, R.:Geographic Views on Regional Planning and Development of Bosnia and Herzegovina,17th International Conference on Urban Planning, Regional Development and Infornation Societh REAL CORP 2012 RE-MIXING THE CITY,ISBN: 978-3-9503110-2-0 (CD- ROM); ISBN: 978-3-9503110-3-7 p.1-6 Multiversum Scwechat, Austria., 2012
NURKOVIĆ. R: Rural space as a product of contemporary economic-geographic development in Bosnia and Herzegovina, IGC COLOGNE 2012. 32 International Geographical Congress, University of Cologen, Institute of Geography, Germany, p.178 -179., 2012
NURKOVIĆ, R.: Urban-Geographic Study of Urban Settlements in Bosnia and Herzegovina As An Element of Area Planning. 3rd International Geography Symposium, Kemer, Antalya–Turkey, ISBN 978-605-62253-7., 2013
State Agency for Statistics of Bosnia and Herzegovina, 2010.
State Agency for Statistics of Bosnia and Herzegovina, 2015.
State Agency for Statistics of Bosnia and Herzegovina, 2016.

WAY-KEY – smarter Mobilitätsassistent für Menschen mit Demenzerkrankung

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1 EINLEITUNG

In Österreich sind etwa 1,2 Prozent der Bevölkerung an Demenz erkrankt, was einer Gesamtzahl von rund 100.000 Personen entspricht. Mit zunehmendem Alter nimmt auch die Prävalenz stark zu, was im Zuge der demographischen Alterung daher einen starken Anstieg der Zahl der Betroffenen in der Zukunft erwarten lässt.

Der Erhalt von und die Motivation zur Mobilität wirkt aus mehreren Gründen zumindest verzögernd auf den Verlauf dementieller Erkrankungen. Mangelnde Bewegung ist laut Norton et al. jener Risikofaktor, der den meisten vermeidbaren Alzheimer-Demenz-Fällen in den Vereinigten Staaten von Amerika (USA) und Europa zugrunde liegt. Der österreichische Demenzbericht nennt als Risikofaktor bei der Entwicklung demenzieller Erkrankungen: „... weniger als 20 Minuten flotte Bewegung an drei oder mehr Tagen pro Woche oder weniger als 30 Minuten moderate Bewegung an fünf oder mehr Tagen pro Woche...“.

Da Mobilität bei Demenz aber auch Risken wie Verlorengehen und Stürze mit sich bringt, zielen bisherige technische Lösungen in erster Linie darauf ab, die Mobilität demenziell erkrankter Menschen von außen her zu überwachen und einzuschränken oder zu verhindern. Sie unterstützen damit in erster Linie Pflegepersonal oder Angehörige und machen Personen mit Demenz zum passiven Teil der Wirkungskette. Dort, wo versucht wurde, ältere Menschen selbst durch technologische Lösungen mobil zu erhalten, wurde bisher auf Smartphones bzw. Smartwatches gesetzt, deren Handhabung demente Personen jedoch überfordert.

Das WAY-KEY-Konsortium möchte existierende technische (Teil-)Lösungen der Firmenpartner in einem stark partizipatorisch ausgelegten Designprozess mit Hilfe der Wissenschaftspartner für demenziell Erkrankte zur Förderung ihrer Mobilität nutzbar machen.

Keywords: Demenz, Mobilität, Assistenz, alternde Gesellschaft, AAL

2 BEDÜRFNISSE, VORAUSSETZUNGEN

Das Ziel der ersten Phase des Way-Key-Projekts war es, über die Bedürfnisse und Anforderungen von Personen mit Demenz, ihrer Angehörigen und ihrer Betreuungspersonen zu lernen. Um diesem Ziel nachzukommen, wurden einerseits Interviews und Gruppendiskussionen, andererseits eine aktuelle Literaturrecherche durchgeführt.

Das Way-Key-Team besuchte verschiedene Institutionen, um das Thema Navigation und Wandern mit Demenz besser zu verstehen. Unter den Interviewpartnern waren professionelle Betreuer, Angehörige, Management von Pflegeheimen und Demenztageszentren, Ärze und Therapeuten, Stationsleitungen, Pflegewissenschaftler und eine Selbsthilfegruppe von Menschen mit frühen Stadien der Demenz. Die Ziele der Interviews waren, Demenz besser und aus verschiedenen Blickwinkeln zu verstehen; zu erfahren, wie Betroffene ihren Alltag bewältigen; Situationen zu sammeln, in denen Wandern auftritt und wie Betroffene damit umgehen; herauszufinden wie man Menschen mit Demenz zu Bewegung motiviert; zu sammeln, welche Technologien derzeit genutzt werden und was bei der Entwicklung neuer Technologien, im Speziellen einer wie in Way-Key angedachten Lösung, berücksichtigt werden soll. Die Gespräche wurden in Folge von den Teams der Akademie für Altersforschung, sowie der TU Wien in einem gemeinsamen Workshop qualitativ ausgewertet und daraus einerseits Anforderungen an das Endgerät für ältere Nutzer sowie Anforderungen an die Technologie für Sekundärnutzer (Pflegepersonal, Angehörige etc.) abgeleitet.

Die wichtigsten Anforderungen sind:

- Vertrautes: die Technologie sollte Vertrautem ähneln um die Akzeptanz zu erhöhen;
- Unauffällig, nicht stigmatisierend: Technologie sollte unauffällig sein und die Personen, die sie anwenden nicht in der Öffentlichkeit stigmatisieren;
- Einfachheit: die Technologie sollte einfach zu bedienen sein.
- Balance zwischen Wahrung der Privatsphäre und notwendiger Kontrolle

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- Autonomie wahren: Menschen sollte soweit möglich die Kontrolle über ihr Leben selbst überlassen werden, auch in Notfallsituationen

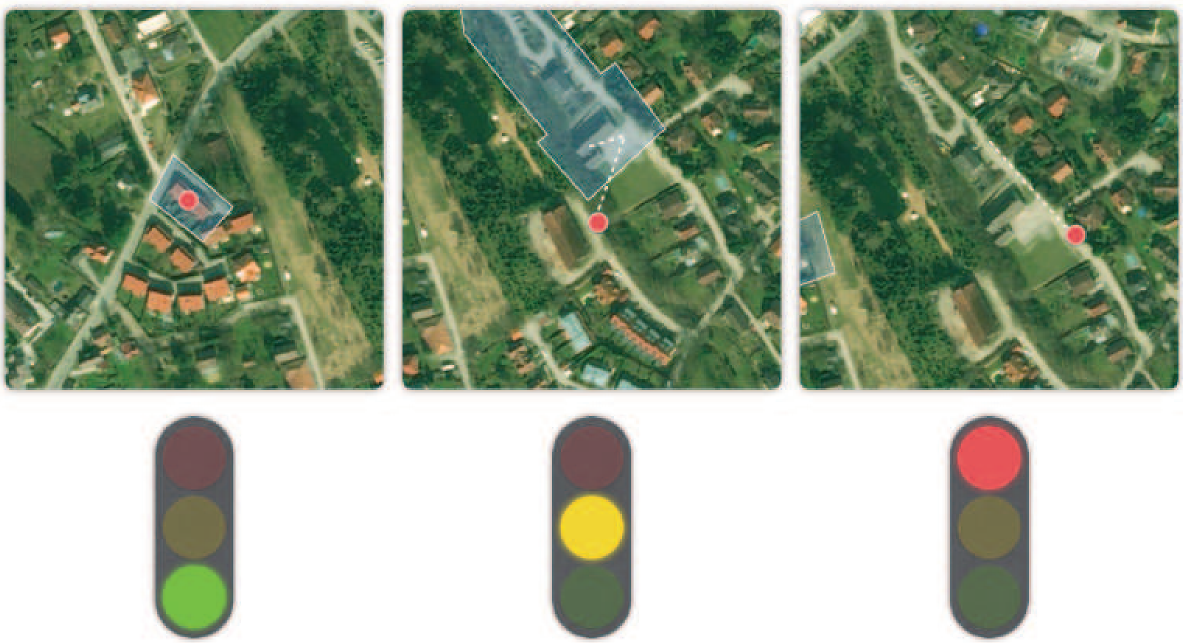
Die Einführung neuer Technologien ist am realistischsten in frühen Stadien der Demenz beziehungsweise sogar schon vorher möglich, wenn die Technologie einen guten Mehrwert für den Nutzer darstellt. Selbst wenn jemand schon an Demenz erkrankt ist, ist dies prinzipiell möglich, kann aber länger dauern und der Nutzen muss noch stärker in den Vordergrund treten. In späten Stadien ist der Einsatz von technischen Hilfsmitteln oft problematisch. Auch vertraute Hilfsmittel, wie zum Beispiel ein Notrufarmband, werden in einer etwaigen Notsituation häufig vergessen, auch wenn sie schon langfristig eingesetzt wurden.

Gestützt auf diese Anforderungen sowie eine Spezifikation der möglichen Hard- und Softwarebestandteile stellte sich heraus, dass es zielführend ist, unterschiedliche Prototypen zu entwerfen, die sich jeweils auf bestimmte Aspekte des Gesamtvorhabens konzentrieren. Dadurch ist es möglich, diese einzelnen Aspekte im Detail zu berücksichtigen und als Soft - bzw. Hardwarepakete prototypisch zu realisieren, ohne dabei befürchten zu müssen, dass durch langsameren Fortschritt oder gar Rückschläge bei einem Teilaspekt die Gesamtentwicklung in Verzögerung gerät. Zur Realisierung kommen die drei nachfolgend angeführten Prototypen.

3 PROTOTYPENENTWICKLUNG

3.1 Prototyp 1: „Alarmstufe Rot“

Der Prototyp „Alarmstufe Rot“ soll sich mit der Analyse des Bewegungsstatus älterer Nutzer beschäftigen. Dazu werden die Personen getrackt. Die Bewegungsmuster werden analysiert, um übliche Bewegungsmuster von außergewöhnlichen unterscheiden zu können. Ziel ist es, ein System zu implementieren, das nach der Vorbereitungszeit Angehörigen einen Bewegungsstatus der Nutzer anzeigen kann. Dieser Status ist stark abstrahiert und gibt keine direkte Lokalisierungsinformation an Angehörige weiter. Dadurch wird die Privatsphäre der Nutzer gewahrt. Wenn die Bewegung zu stark von den üblichen Mustern abweicht, soll das System bei den Angehörigen Alarm schlagen (zum Beispiel durch eine Kurznachricht oder einen automatisierten Anruf). Zu jedem beliebigen Zeitpunkt soll den Angehörigen angezeigt werden, ob sich die Bewegungsmuster in den üblichen Parametern befinden oder beginnen davon abzuweichen (eventuell in Form einer Entwicklungskurve).



3 Zustände, die das System einnehmen kann: links befindet sich die Person innerhalb des derzeitigen Geofence, in der Mitte hat sich die Person einige Schritte entfernt, aber noch keine auffälligen Anzeichen von verwirrtem oder verirrtem Zustand, rechts bewegt sich die Person konstant vom derzeitigen Geofence weg.

Abb. 1: Alarmstufen-Modell mit drei möglichen Zuständen.

3.2 Prototyp 2: „Context-aware“

Der Prototyp „Context-aware“ spricht Situationen an, in denen eine Person einen momentanen Orientierungsverlust erleidet und Hilfe benötigt. Der Prototyp besteht aus zwei Komponenten: (1) ein einfach verfügbarer Notfallknopf, der idealerweise ausschließlich für diesen Notfall zur Verfügung steht. Mögliche Erscheinungsformen für diesen Notfallknopf wären eine Smart Watch, eine eigene Smartphonehülle mit Notfalltaste oder ein separater Notfallbutton nach dem Vorbild von externen Bluetooth-Buttons sowie (2) ein Script für ein Telefongespräch, das aus der verfügbaren Information und potenziell aus den gelernten oder beschriebenen Verhaltensmustern der betroffenen Person (vgl. Prototyp 1 „Alarmstufe Rot“) eine potenziell hilfreiche Intervention macht.

Das Aktivieren des Notfallknopfes würde dazu führen, dass die betroffene Person angerufen wird; die Anruferin bzw. der Anrufer würde mit Hilfe des durch die verfügbare Information angereicherten Scripts ein Gespräch mit der betroffenen Person führen, das idealerweise eine konstruktive Auflösung der Desorientierungssituation induziert. Sollte eine positive Auflösung nicht möglich sein, so wären passende Eskalaktionsschritte vorzusehen, beispielsweise die Benachrichtigung einer Pflegeperson, der Behörden etc.

Abb. 2: Schnittstelle für Pflegepersonal und Angehörige mit Anzeige von Orientierungspunkten (Landmarks, Points of Interest).

3.3 Prototyp 3: „Kooperativer Tagesplan“

Einer der Prototypen wird in Form eines digitalen Tagesplans umgesetzt. Dieser soll im ersten Schritt in Kooperation mit Angehörigen bzw Pflegepersonal erstellt werden können und dadurch als Anknüpfungspunkt für soziale Interaktion fungieren sowie auch eine emotionale Bindung zu Terminen und deren Einhalten erzeugen. Desweiteren kann ein solcher Tagesplan eine Grundlage für eine auf Dauer automatisch generierte, individuelle Tagesübersicht darstellen, die eine Schnittstelle zur Erinnerung an Alltägliches bieten kann. Obwohl es hier um eine digitale Tagesplanung geht, soll die Eingabe von Standardterminen auch haptisch erfolgen können, zum Beispiel über Terminbausteine, die aneinandergefügt bzw einfach in der richtigen Reihenfolge auf ein Brett gepinnt und in Folge ausgelesen und digitalisiert werden. Die Daten des digitalen Terminplaners können zukünftig sowohl für den Bewegungsmuster- als auch den Kontextaware-Prototyp als Grundlage dienen.

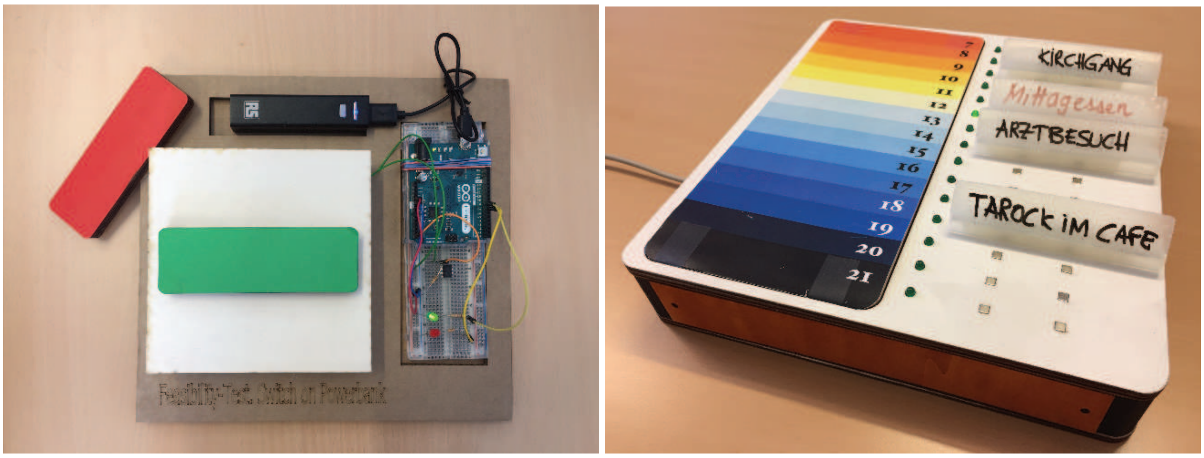


Abb. 3: Machbarkeitsstudie und Prototyp des Tagesplaners

3.4 Bonus: Kompass

Der Kompass ist ein kleines Device, das beispielsweise am Schlüsselbund montiert oder als Armbanduhr verwendet werden kann und immer Richtung nach Hause deutet. Hierbei wird allerdings nicht einfach die richtige Himmelsrichtung angezeigt, sondern der Weg, der zu gehen ist, basierend auf einer zugrundeliegenden Landkarte oder einem Stadtplan.

Abb. 4: Skizze der Handhabung und Funktion des Kompasses.

4 ACKNOWLEDGEMENT

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5 LITERATUR

Sam Norton, Fiona E. Matthews, Deborah E. Barnes, Kristine Yaffe, and Carol Brayne. 2014. Potential for primary prevention of Alzheimer's disease: an analysis of population-based data. 13, 8 (2014), 788–794. http://www.sciencedirect.com/science/article/pii/S147444221470136X

Statistik Austria: http://www.statistik.at/web_de/statistiken/menschen_und_gesellschaft/bevoelkerung/demographische_prognosen/bevoelkerungsprognosen/027308.html, zuletzt besucht am 02. Februar 2018.

http://www.zentrum-der-gesundheit.de/gesund-durch-spazieren-gehen-ia.html

Sabine Höfler, Theresa Bengough, Petra Winkler und Robert Griebler (eds.): „Österreichischer Demenzbericht 2014“, Bundesministerium für Gesundheit und Sozialministerium, Wien, 2015.

Dorner, Thomas; Rieder, Anita; Stein, Viktoria K. (2011): Besser Leben mit Demenz. Medizinische Leitlinie für die integrierte Versorgung Demenzerkrankter: Netzwerk aktiv. 1. Aufl., Competence Center Intgrierte Versorgung, Wiener Gebietskrankenkasse, Wien

SafeMotion, Homepage der Fa. iLogs: http://www.ilogs.com/de/safemotion-de

TCA – Teleconsult Austria, Website: http://www.tca-nd.at/

Eleanor Bantry Whitea, Paul Montgomery: "Dementia, walking outdoors and getting lost: incidence, risk factors and consequences from dementia-related police missing-person reports", Aging & Mental Health, 2015, Vol. 19, No. 3, 224-230

Stanford Centre for Longevity: http://longevity3.stanford.edu/blog/2013/10/10/10102013-gps-for-wandering-dog-walker-shows-dementia-challenge/

Agro-Cities as a Way to Counteract Urban Poverty

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1 ABSTRACT

Monterusciello represents a case of urban poverty induced by a natural disaster: the bradyseism of 1983 which shocked and drastically changed the lives of citizens residing in the historic center of Pozzuoli. The political and technical response to the natural disaster emerged through the realization of a new town providing housing for displaced persons. Monterusciello was designed as a new town alternative to the construction models of the late 70s and early 80s: in here, there are no high-density buildings or a lack of public spaces. This new town had high ambitions in terms of planning the new housing settlement, inspired by a classical forma urbis and a human scale architecture. Despite the intellectual and political effort to find an effective solution to a collective drama, which affected most of Pozzuoli's population, many things did not work. The current public administration is making an ambitious attempt to face and solve the many open issue linked to this serious context of urban poverty. The city of Pozzuoli (Metropolitan area of Napoli) is the only city on South-Europe that succeeded to get, in the first round of the extremely competitive call for proposal, the EU financing named UIA (Urban Innovative Action). The project has the courage to propose ground-breaking solutions for very serious and persisting problems linked to urban poverty in the Monterusciello neighborhood. Innovation is embedded in applying the methodology of the permaculture to regenerate the public land available in between buildings of Monterusciello. Thirty hectares of Municipal open areas will be transformed into farmland, developed the innovative techniques of permaculture in order to spearhead an economic process and urban growth as a means to combat poverty. This Urban Agriculture led regeneration is based on a solid participatory planning process that aims to solve the many existing problems on the ground through learning and training actions (schools and youngster as priority target groups), experimentation of production chains at km zero, use of innovative and ecologic techniques in producing goods, design of cooperativistic a business model for the financial sustainability, relevant investment in advanced design of available public land and space, with a special focus on urban landscape related questions.

This paper is presenting the urban regeneration adopted strategy in terms of ongoing and experimental planning practices, built up governance relations and creation of a sustainable (economic, socio-cultural; and environmental) development narrative for present and future development in Monterusciello.

Keywords: agro-cities, urban poverty, Pozzuoli, open areas, governance

2 A NEW TOWN DESIGNED AND REALIZED AS RESPONSE TO A CATASTROPHIC EVENT

Monterusciello is a foundation city, built between 1983 and 1986, a unique case in Italy, born shortly to respond to an emergency and almost totally public property regarding open areas, residential buildings and common ground.

Monterusciello is a district of the municipality of Pozzuoli that is, today and from its foundation, the most important center of the Campi Flegrei, a role due to its size and demographic dimension, geographical position. In the second half of the twenty century the City of Pozzuoli was hit by two important bradyseismic phenomena that led to the birth of new parts of city, far from the original historical center, with the aim of reducing the demographic weight of an area considered high seismic risk.

Bradyseism is not an extraordinary event destined to disappear, but has a cyclical pattern and can recur at any moment. An important bradyseism crisis occurred in 1983 and led to the birth of the districts of Monterusciello to welcome the inhabitants evicted from the so-called Zone A, the historical center. When the bradyseism events of 1983 caused the relocation of 20,000 inhabitants from the high-risk historic city centre of Pozzuoli to Monterusciello, this action caused the most extensive urban expansion action within the Comune, effectively building a „new town" 5 kilometres to the north of the city. This action, which led to the very swift construction of a permanent new settlement called „Monterusciello 2" (in completion to

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Monterusciello 1, a development originally started in the framework of Council Houses – Law no. 167/62), allowed for a rapid build-up of around 5,000 flats to accommodate the relocated population. Monterusciello faces today many important challenges, evident from an analysis of the basic statistics of the district. The MAC Project focuses on the Monterusciello neighbourhood of Pozzuoli, an area of approx. 100 ha with a maximum elevation of about 120m. The intervention site is rather flat, and has been historically an agrarian landscape, until the events of the ’80s.

This intervention was part of a larger project: considering the cyclicity of the bradyseismic phenomenon, the creation of the Monterusciello new town should set an answer to the relation between the city and its geological singularity. The same architect Agostino Renna, the designer of Monterusciello, defines the neighbourhood as "a definite part of a city", showing in these words the intention of recognising the area as an autonomous identity. Renna was inspired in the design of this new town by the ancient Greek city of Priene.

Hence, the design idea was far from the logic of creating a classic social housing settlement, but it has been thought as a new town that could become the reference point for the urbanised countryside of the western area of the province of Naples, currently the Metropolitan Area. Monterusciello is therefore conceived as a new-town, yet today it is experienced as the periphery. In the suburbs that we are used to reading today dominate the blocks, as in the nearest and well-known Scampia.

In Monterusciello it was decided to pay more and more attention to the scale of urban-rural territory: the buildings are arranged following the natural slope of the ground so that everyone can be directed to the sea, each building lot has a courtyard or green space, many primary public facilities were provided for both neighbourhood and sub-municipal services; the planovolumetric project based on a series of longitudinal axes linking the most representative locations in the neighbourhood. Although the planners’ objectives during the neighbourhoods’ design was to "welcome and reassure" the new inhabitants, the residents of Monterusciello never fully accepted this new condition. They have always been looking at the neighbourhood as a temporary passage and not as a definitive accommodation.

3 A CHALLENGING URBAN ACTION: MONTERUSCIELLO’S SIGNIFICATIVE FIGURES

Monterusciello faces today a few important challenges, evident from an analysis of the basic statistics of the district. From the point of view of demographics, Monterusciello had in the 2011 census a total number of 22,778 inhabitants, 28.4% of the total population of Pozzuoli (80,357 inhabitants – ISTAT). The district has been growing in population between 1991-2001 (+5,94% increase), but has plateaued in recent years, with only a 0.43% increase in population between the censuses of 2001 and 2011. In fact, the demographic trend most apparent in the project site is very pronounced aging of the population, with the median age growing higher between censuses

Between 1991-2001, youth (aged 0-15) have decreased with 33%, and the population of 65 years and over has doubled, which raises concerns for the future capacity of the local inhabitants to both make a living and care for an increasing number of elderly people.

In reference to the education level of the citizens in the MAC pilot area, the clear majority (96%) have high-school diplomas or lower learning cycle studies, while a percentage of 11% do not have studies. The proposal of Monterusciello Agro City and the opportunity to work in local agriculture could be highly beneficial to the target users, especially the ones which otherwise have limited opportunities as qualified workers in other domains.

The participation of the Monterusciello inhabitants to the workforce (rate of activity) is of 45%, of the total inhabitants aged 15 and over. With a total of 4,957 employed inhabitants, the rate of employment was, for 2011, just 26%, lower than the figures of the region. However, the unemployment rate (the „job seekers” from the total workforce) is rather low as well, of 13% in total (ISTAT, 2011), which can indicate local disinterest to actively seek a job, an aspect often encountered in disenfranchised neighbourhoods. There is a strong disparity between employment of the male workforce (39%) and employment of female inhabitants (14%).

Local opportunities are, indeed, limited – this is apparent both from the Expert Study Visit conducted on-site, and from the statistics. The Monterusciello resident population which is commuting daily into the commune was of 6,330 inhabitants, while the population commuting outside of the commune was of 2,432 inhabitants.

In total, 45% of the population aged 15 and over commutes daily, a strong indication for the need to develop local opportunities for Monterusciellans, since the neighbourhood is deprived of the normal living-related activities and facilities which represent the core of communities.

In what concerns the built environment, in 2011 there were a total number of 959 buildings, of which 739 residential buildings and 8 abandoned/not in use. It is to note that, between 2001 and 2011, the number of buildings with other uses than housing has surged, indicating a slow diversification of activities in the area, in part due to the vocational school for the hotel industry which is present on-site. The existing housing units, due to being built very rapidly and under pressure, and being meant for a median use of 25 years (temporary use of lightweight prefabricated edifices) are currently in poor conditions due to the lack of maintenance, materials degrading, improper use of dwellings or alterations by inhabitants. One of the major issues of the neighbourhood is that many dwellings are rented, by inhabitants which otherwise could not afford any investments in the building stock, and that the investment needed to transform the buildings into proper dwellings respecting today's building codes and regulations exceeds the capacity of the Pozzuoli Municipality. However, investments are being done starting with a group of 5-6 building blocks in the area, and the MAC project could contribute to the visibility of the issue as well as the expanding of opportunities for a large-scale urban renovation project.

Currently, the MAC Project area of Monterusciello retains its original semi-temporary relocation characterising in what concerns the built environment, meaning that beyond the residential prefabricated units built in the '80s and the later additions, only a few fundamental services have been brought to the neighbourhood: a town hall (municipio), schools including a vocational school for the HORECA industry, a bank, a post office, a Carabinieri and a Fire Brigade station, and an indoor sports arena. The many areas where public edifices should have been built or public spaces should have been landscaped have been left as „urban wastelands", including some derelict structures which were built but never used (such as the Market). These open unused spaces make the object of the MAC Project; in total, their surface reaches 538,900 sqm, or approximately 54 hectares. To put the number into perspective, this huge area could mean for each of the 22,000 inhabitants, a „green living room" of 24 sqm of their own. The potential of this rather flat-surfaced, good soil quality, agriculture-prone urban area for a community lacking in amenities, opportunities and jobs is key if Monterusciello is to have a go at successfully implementing the concept of sustainable development.

4 ENVISAGED SOLUTIONS

A planning process for urban poverty reduction is going to be triggered by available public land in Monterusciello. These currently, and partially, abandoned plots of land are going to become the places for the development of urban agriculture based projects. These projects should relaunch the local economy and start to decrease the current local unemployment levels through the involvement of the residents in their implementation.

The proposed solutions aim at achieving the following aims:

- To set up an "AGRO-URBAN Center" as a visible point of the public governing institutions in Monterusciello. This point is the place for coordinating and designing specific actions in the neighbourhood and for keeping an effective daily dialogue with residents, thus introducing a „mediation level" as a part of organizational innovation within the public administration.
- To start a transformation process of the vacant public land suitable for agricultural use through the application of permaculture methodology which, while not untried within Europe before, is innovative through the approach and context of the „new town" suburb;
- Conception of a local cooperativistic approach to the development of a new local and sustainable economy based on UA led by permaculture approach (training courses, open laboratories) – creating an innovative self-sustaining system able to endogenously develop in the medium and long-term;
- Promotion of ecological cultivation processes and constructions;
- Support to creation and growth of start-ups based on km 0 and ecologic agro-business;
- Re-designing and re-qualifying the urban spaces: architectural and urban interventions will provide areas for events, food market, and walkways, constructing the new landscape for an "agro-city" and

creating a new forma urbis through social, technological and agricultural, economic and governance innovation.

5 SUSTAINABILITY IN THE MAC APPROACH

Monterusciello Agro City proposes a model of development which, although applied and tested in a very specific context, could represent a sound and highly transferrable methodology – provided it will validate the expected results of the project. Most regeneration projects which do not prove sustainable on the longer term fail to achieve their goals mainly because:

(1) they provide an out-of-context solution which cannot be integrated with the actual vocation of the urban landscape;

(2) they leverage too much on external investment and exogenous development initiatives instead of capitalizing on the potentialities within the area itself;

(3) they fail to involve the stakeholders and gain local ownership, in which case the action is perceived as an outsider initiative and does not „take off" at local level.

The Monterusciello district, or „new town", was built on originally agricultural land, an area which together with the neighbouring lands such as Licola started to emerge in the 70's as a tourist attraction due to the landscape quality, before the bradyseism of the 1983 claimed the land for emergency constructions. The vocation of the landscape in and surrounding Monterusciello (the vast 50 empty hectares within the built-up area), can hence be fit for vineyards, orchards and intensive urban permaculture farming, due to the high fertility of the soil. In this sense, the MAC project, through its interventions, can finally integrate the city within the territory and help mend the bond between context/landscape and town, after more than 30 years.

Moreover, from a social, cultural and economic standpoint, the district has all the characteristics of a deprived and segregated neighbourhood: lack of local economic and social opportunities, high workforce unemployment, disenfranchisement of the inhabitants due to low ownership and poor upkeeping of the urban environment, virtually no territorial linkages other than the daily commuting of a large part of the active population.

There is a clear need for a project which will change the local paradigm for Monterusciello, investing and creating a new, sustainable model of development by empowering the local community. The MAC project proposes an approach which is articulating urban landscape building, social innovation, partnership and economic development in order to regenerate a historically deprived area; the action plan is synergic, meaning that the external investment provided as co-financing by the UIA for this project is used in an integrated manner, and all investment actions are transversal to the main three pillars of the project: networking/capacity building, landscape/regeneration and entrepreneurship/local economy.

Regarding the physical investments, i.e. the redevelopment of 30 hectares as permacultural productive urban landscape and developing the urban design and micro-architecture fittings which will allow the spaces to be used and enjoyed by the residents, the main sustainability aspects are related to how these spaces will function and will integrate with the existing urban tissue, in practice. The project gives a lot of importance to creating the necessary functional links between the seemingly disparate empty plots, and an important role here will be played by proper signage, a new specific identity of the sites and the pathways and bicycle lanes connecting the pilot areas. Free access to these very large areas which have been historically fenced off and out of the reach of residents will create an impact at the local level and will prompt usage, which in turn can be beneficial for the residents from multiple points of view (green therapy, spaces for socializing and meeting, outdoor sports, etc). Environmental sustainability is attained by using an experimental model, a mix of permaculture and bio-intensive techniques, linking the productive part to a marketing circuit which uses agricultural waste. The two laboratories developed through MAC (Permaculture and Ethical production/Rural Marketing) will organise a circular production system. The urban design and landscaping process will be conducted using eco-sustainable materials and recycled/recyclable products, contributing to a positive impact on the environment. Finally, in what concerns the local economy and entrepreneurial opportunities, Monterusciello Agro City focuses on both creating the supply and demand of bio agricultural products and by-products, as well as training the future entrepreneurs and researchers which will ensure that the initiative will develop locally. Sustainability and local rooting are ensured through proper selection and training of individuals in three key areas (related to permaculture, ethical production and marketing, innovation business and start-up), through development of entrepreneurial skills in workshops and incubators, and through development of competitiveness with the help of a bonification system (scholarships and awards).

The economic model of development proposed, relying on PPPP (public-private-people-partnership) is sustainable, albeit in the longer-term alternatives to public ownership of the farmland and buildings for laboratories, the Agro-Urban Center and the Business Incubator will need to be sought. The partnership has strategically focused all these functions in a single public property structure, which is currently in a state of neglect. The Piazza Mercato building, also known as Piazza de Curtis, has been identified as Agro-Urban Center. The municipal administration has recently cleared the premises, illegally occupied for residential use. The intended destination for the covered spaces provides for social, commercial, artisanal use. This space is an unmissable opportunity to accommodate the expectations of the local community and the municipal administration forecasts. Moreover, it represents the most suitable solution for the type of function that it will have to host inside it during the implementation of the MAC project and for what it will continue to represent for the residents of the neighborhood even after.

One of the main barriers to overcome with respect to sustainability is the question of ownership; legal ownership, of the housing units and the land itself, but also psychological and social ownership of the new spaces created through the MAC Project. Monterusciello is a perfect example of the Broken Windows Theory – a city that is not maintained fails to step up and maintain itself. For the MAC to be sustainable, it needs to break this cycle and involve the residents in the regeneration process, especially for the urban design, furniture and micro-architectural elements projects, to ensure their use, a proper process of co-design should be implemented. For these reasons, the municipal administration has promoted the establishment of an Agro-Urbana Consulta, an organ aimed at proposing support indications for the participatory activities envisaged by the MAC project - Monterusciello Agro-City, representing the project stakeholders, formed by all citizens who will show their interest to take part with a specific request. The collaboration between the members of the Consulta Agro-Urbana, the Municipal Administration and the MAC Partnership is inspired by the following values and general principles: mutual trust, publicity and transparency, responsibility, equal opportunities and the fight against discrimination, informality. MAC is not a one-time investment, but a lengthy and complex process of regeneration, and as such will rely crucially on the initiative continuing and growing past the project's lifetime. The most important results of the initiative can be reaped on the medium term, hence ensuring sustainability should be regarded as the most important aspect in implementation, apart from the innovative experimentation percourse itself. As the residents' involvement is a big part of making MAC „take root", the next steps of the project should be strongly focused on gaining local buy-in and embedding the initiative in the local civic fabric.

Permaculture differs from the traditional agricultural practices due to its systemic, integrative approach to sustainable food production systems embedded into the social and cultural lifestyles of the community. It is a practice of expanded focus, consisting of 'consciously designed landscapes which mimic the patterns and relationships found in nature, while yielding an abundance of food, fibre and energy for the provision of local needs ', being as much a form of process innovation as well as organizational innovation. Traditional intensive agriculture, even in urban and periurban areas, has numerous drawbacks and ecological risks related to climate impact, soil, water, air, biodiversity and landscape effects. Permaculture is a more sustainable approach which factors in responsible farming as a circular system, reusing its by-products. When assessing new urban activities with extensive land-use – such as redeveloping 30 hectares of urban space – there are always trade-offs to consider; urban agriculture development comes against potential other uses of land, such as social housing, productive units and so on. In the Monterusciello case, due to the availability of other land options and reduced need for competing urban functions, the trade-off is a positive one. Monterusciello does not face the risks of urban permaculture which are a reality in most big cities, namely the soil contamination and lack of proper conditions (excessive shade, wind tunnels) – it is thus a logical approach to valorising extensive urban assets. The permaculture approach of Monterusciello Agro City has numerous potentialities. The most obvious of the physical and environmental ones are related to the improvement of the micro-climate, strengthening the urban-rural links, rooting the new town in its surroundings through proper zoning of the productive areas in the city, and strengthening the resilience of the city.

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6 CONCLUSIONS

The Monterusciello Agro City (MAC) is not just a project promoting urban regeneration of a neighborhood using urban agriculture as a driver. It is a complex approach to the requalification and further development of a new town built in response to a catastrophic event, about 20,000 people were moved from the ancient city of Pozzuoli into the new town of Monterusciello. The displacement of an entire community, specialized in commercial and marine activities, in an internal area, predominantly agricultural, rapidly urbanized.

Working with key stakeholders and enlarging the decision makers arena is the first and the most important challenge that partners have to face in order to reduce conflicts and getting consensus around the planning process. It is essential to re-create a constructive dialogue between the institutions and the citizens: This is the fulcrum around which all other initiatives have to rotate. Over the years, dialogue between residents and institutions has severely tilted for several reasons. The most difficult task of the MAC will be to rebuild that confidence in the local population that will allow the project's partners to develop the proposed solutions. The various problems that are now being addressed through the MAC have been settling for a too long time. These are the problems that made the idea of a new town, which proposed an urban model in support of a high standard of living, to become one of the many urban suburbs. A suburb plagued by

- high levels of unemployment,
- serious housing problems, especially in flats,
- and poor services in the area,
- a number of abandoned public areas and spaces.

The families who had the opportunity, once the emergency ended, to return living in other areas of the city, immediately moved. Currently, the most disadvantaged part of the population continues to stay in Monterusciello. Problematic social conditions are combined with a difficult urban environment, for the character of emptiness, anonymity, and decay of the common spaces. A further level of "physical spatial poverty" is represented by the realized but still un-used buildings and spaces, which are slowly and inexorably going towards degradation. Monterusciello is now an "in between" settlements, it has the structure and the critical mass to be a development pole in the Naples's Metropolitan Area, but at the same time it is still in the situation of being a dormitory neighbourhood.

Starting with the above in mind, it is clear that the implementation challenges of the UIA Monterusciello Agro City will be plenty, with the most important ones revolving around fostering the growth of the network and the set-up and running of a proper open governance framework for supporting the local innovations. Co-designing and co-implementation have been two pillars of the consortium's strategy for implementation, yet they may prove difficult due to the long period of citizen-government alienation and subsequent lack of trust at local level.

7 REFERENCES

AA. VV. (2008), Città pubbliche Linee guida per la riqualificazione urbana, Mondadori.
AYMONINO A. (2006), Spazi pubblici contemporanei Architettura a volume zero, Skira, Milano.
BISOGNI S. POLESELLO G. (1993), L'architettura del limite, Clean, Napoli.
ELISEI, P. (2017), The MAC Project journal no.1, http://www.uia-initiative.eu/sites/default/files/2017-12/FINAL%20VERSION_Pozzuoli.pdf
ESCALONA F., FRANCESE D. (1987), Monteruscello. L'impianto urbano e gli edifici pubblici, con introduzione di Uberto Siola e scritti di Agostino Renna, Progetto Pozzuoli, Quaderni di documentazione, n. 3, Giannini, Napoli.
FUCELLA R. (1995), L'abitare come problema della città. Metodologie di analisi e procedure sperimentali, Alinea, Firenze.
GALLUCCI P. (2012), La composizione di Monterusciello, tratto da www.esempidiarchitettura.it.
GASPARRINI C. a cura di (1999), Il progetto urbano una frontiera ambigua tra Urbanistica e Architettura, Liguori Editore, Napoli.
GERUNDO R., DI MAGGIO F. (2007). Monteruscello: Periferia di Stato? PLANUM. Vol. on line: pag. 1-14.
GIAMMINELLI R.(1987), Il centro antico di Pozzuoli. Rione Terra e Borgo, Sergio Civita Editore, Napoli.
GIEDION S. (1961), Breviario di architettura, a cura di Carlo Olmo, Garzanti, Milano.
GIGLIA A. (1997), Crisi e ricostruzione di uno spazio urbano dopo il bradisismo a Pozzuoli: una ricerca antropologica su Monterusciello, Guerini Studio, Milano.
JACOBS J. (2009), Vita e morte delle grandi città. Saggio sulle metropoli americane, Piccola biblioteca Einaudi.
KOOLHAAS R., Delirious New York, Electa, Milano.
LOPEZ R. (2016), Monterusciello: Ritorno al futuro. Una struttura critico/tematica per leggere le periferie in AA.VV., Progetti per l'Europa - architetture e ricerche in ambito internazionale di giovani ricercatori, a cura di Mariateresa Giammetti, Napoli, D'Arco Edizioni.
PAGANO L.(2001), Periferie di Napoli, Electa, Napoli.

PAGANO L. (2012), Rimontaggio di un pensiero sulla conoscenza dell'architettura, CLEAN edizioni, Napoli.
RENNA A. (1980), L'architettura della città nell'esperienza olandese: struttura e caratteristiche delle nuove parti urbane in AA.VV., Funzione e senso. Architettura-Casa-Città. Olanda 1870-1940, Napoli, Società Editrice Napoletana.
RENNA A. con Italo Ferraro, Ludovico Fusco, Enzo Mendicino, Francesco Domenico Moccia, Napoli: prospettive per l'architettura del Centro storico in «Edilizia popolare» n. 111, 1973, pp. 103-130, in particolare la tavola tra p. 128 e p.129., 1980
ROSSI A. (1985), L'architettura della città, Milano
SIGNORELLI A. (1996), Antropologia urbana. Introduzione alla ricerca in Italia, Guerini Studio, Milano
SECCHI B., Progetto di suolo, in Casabella, n.520-521, 1986, pp.19-2
SECCHI B., Testo pubblicato in Casabella: Architettura come modificazione, n.498/9, Electa Periodici, gennaio-febbraio 1984
La città di fondazione. Il quartiere di Monteruscello. 1° vol. in «Napoli, Architettura e Città», Napoli, ESI Edizioni, 1995.
Le città immaginate: un viaggio in Italia nove progetti per nove città in «Catalogo della mostra della 17. Triennale di Milano tenutasi dal 7/2 al 17/5 1987», Milano, Electa, 1987.

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Planning for Urban Quality in Station Area Development, Bijwasan, New Delhi

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1 ABSTRACT

Transport nodes play an important role in the urban functions of the city. In the present context when cities continue to sprawl outskirts or expand in the sky, coupled with problems of urbanization, such as congestion and degeneration of city cores, station areas become an oppurtunity district for a transformative land use planning. The european cities tapped this potential by planning the renaissance of the station buildings and the surrounding area as a part of infrastructure augmentation exercise back in the 20th century. This not only led to the revitalisation of the cities through strategic real estate projects but also reinfornced the urban and transport functions of the railway station. The paper in this regard aims to explore the planning discisions and spatial efforts taken in the creation of successful urban spaces around railway stations in Europe. The policy of Redevelopment of Railway Stations in India which aims to create world class railway stations by improving the consumer facilities and the commercial viability provides a pretext for the study conducted. It takes into consideration a new typology of development in India, i.e. the modernization of railway stations and the urban planning that should complement such an infrastructure development. The objective of study is thus, to understand the challenges, oppurtunities and prerequisites to inform the planning process of such a developement. The study proceeds by analysing the urban spatial grids around the selected casestudies and thus draws conclusions for the site of Bijwasan Railway Station Redeveopment in New Delhi, India. It aims to highlight the importance of creating a place out of a transport node in the urban dyanamics of city.

Keywords: urban quality, good urban space, station area planning, railway stations, infrastructure

2 INTRODUCTION

The redevelopment of railway stations gained impetus in the end of 20th century, with many European cities planning the renaissance of the station buildings and the surrounding area, as a part of infrastructure augmentation exercise. Along with this new development came the opportunity to revitalize the cities by planning strategic real estate projects in the station areas, and hence, reinforcing the urban and transport functions of the stations (Bertolini, 1996). The paper in this regard tries to find solutions to integrate the station nodes with urban places, in the context of India.

Railway stations are seen as the face and symbol of the city. Milano Central (Milan), Gare du Nord (Paris) or Chhatrapati Shivaji Terminus (Mumbai) are major place making elements in the city and tend to become the identity because of the massive number of passengers they cater to- 320,000, 700,000 and 636,000 respectively (ItaliaRail, n.d.; Lemmin-Woolfrey, 2015; Mehta, 2013). The importance of railway station thus, expands from merely being a mobility service to a gathering node and hence, an engine of economic development (Bertolini, 1996).

The policy of Redevelopment of Railway Stations in India, introduced in 2016, keeps this importance as the crucial point of the proposed development. It focuses on improving in station facilities and generating the non-tariff revenue through land use development like retail, office space, restaurants and hospitality through a Public- Private Partnership model (Ernst & Young, 2016). This will not only lead to infrastructure and transit ridership improvement, but also towards regeneration of the surrounding urban areas.

This phenomenon, however, makes such projects a complex one with the project acting as a growth pole for the development proliferating around (Pol, 2005). An integrated development of the transport node and urban place is envisioned but becomes a fragile urban planning exercise in this regard (Trip, 2007). While the redevelopment can lead to the regeneration of the city cores or the influence areas, it is vital to plan for such a development, understand its challenges and potentials, to follow a strategic growth trajectory.

This thus, becomes the focus of the research. It is a single site-oriented study, which focusses on the station area development for Bijwasan, a railway station located in New Delhi, which is set for redevelopment under the policy.

As per the Project Information Memorandum, the passengers handled by the station in a day equated to around 47,500 in 2015 and is projected to be approximately 70,400 in 2025 and 127,300 in 2050 (Ernst & Young, 2016). The other successful stations in Europe like Euro-Lille and Part Dieu, Lyon in France which went through a redevelopment and station area planning have 58,000 and 90,000 daily passenger riders, respectively while Berlin Suedkreuz is expected to have 89,000 passengers once completed (Loukaitou-Sideris, et al., 2017).

The prevailing site context promise to elevate the station as a premier multi modal transit hub in the region, the first of its kind in India. At the same time, availability of significant masses of underdeveloped land offers a potential for development in the station area.

However, the planning and development of Bijwasan and its adjacent areas also have some challenges. Institutional/ organizational challenges include the various governance tiers involved as stakeholders and the division of discision making involved. Some challenges being perceptual involve how to shift the car dependency and modal split. Other challenges are physical, which include how to integrate a modern built fabric with the existing one and avoid the barrier effect. Lastly, a few are strategy oriented and financial: How to attract investors, developers and how to implement a Public Private Partnership Model?

Nevertheless, planning for station area development is not a new phenomenon in the European Cities and thus, has created a great pool of knowledge to extract lessons applicable in the Indian context.

3 RESEARCH STRATEGY

The research is centered arrount the key questions of station area planning and its different approaches in practice and in theory between different countries and regions. More precisely, it focusses on two research problems, what makes station area a good urban space? And how to plan the neighbourhood of the railway station based on the principles of a good urban space?

While this research explores issues and opportunities that impact the transit station and regional development in India, it is also required to identify and evaluate contextual issues which may be specific to a circumstance. The research program will, in part, use a comparative case study approach to assist in the understanding of ‘in practice’ railway station and local land use planning, for example, Euro-Lille (France) and Utrecht (Netherlands).

To understand the stations and adjacent local, state and territory government perspectives and decision-making on railway stations and regional land use planning relationships, process, and outcomes, the data is also collected through interviews with stakeholders.

The aim is to provide an explanation that how some redevelopment efforts turned out to be successful places. ‘Good Urban Space’ in the study is taken to mean as an urban setting with vibrant environment related in part to the influence of the urban grid configuration on movement (Hillier, 1996). The analysis relates it to the level of pedestrian movement found in and around the terminus, for creating it a significant pedestrian ‘place’ in the city. The understanding of ‘place’ is further refined by Hillier's concept of a ‘live center’, where the urban grid is intensified and its effect on movement subsequently influences the intensification of activities (Hillier, 2000). The analysis is concerned with assessing spatial factors that promote good levels of pedestrian movement or rather ‘natural movement’ (Hillier, 1993). Observation data will be used couple with Space syntax methods, set of computer techniques developed at the Bartlett School of Architecture, University College London, to understand the spatial effect of their current urban settings.

4 BIJWASAN-STATION REDEVELOPMENT EFFORTS

Bijwasan is an existing station on Delhi-Rewari line of Indian Railways network in the National Capital Region of Delhi near Dwarka. The need for redevelopment of Bijwasan arose as the existing five major terminals of Delhi, i.e., New Delhi Railway Station, Old Delhi Railway Station, Hazrat Nizamuddin Railway Station, Delhi Sarai Rohilla and Anand Vihar station, have already reached their saturation for train handling and passenger management due to infrastructure constraints. The impetus is further given to the project due to the favourable site location, excellent connectivity and the prospect to develop Dwarka as a sub-smart city. A Special Purpose Company (SPC) named as ‘Indian Railway Stations Development Corporation Limited’ (IRSDC) was incorporated in 2012 with permission to commence the business, specifically for development/redevelopment of stations. It was assigned eight railway stations all over India with Bijwasan being one of them.

The Project Site is in South-West of Delhi, within Planning Zone (Division) 'K-II' of the National Capital Territory, as per the Delhi Development Authority. It lies in close of proximity to Sector-21 Metro Station (served by Airport express and Blue Line metro lines) on the West and a proposed ISBT coming up in Dwarka. It is also in the proximity to India Gandhi International Airport in the East.

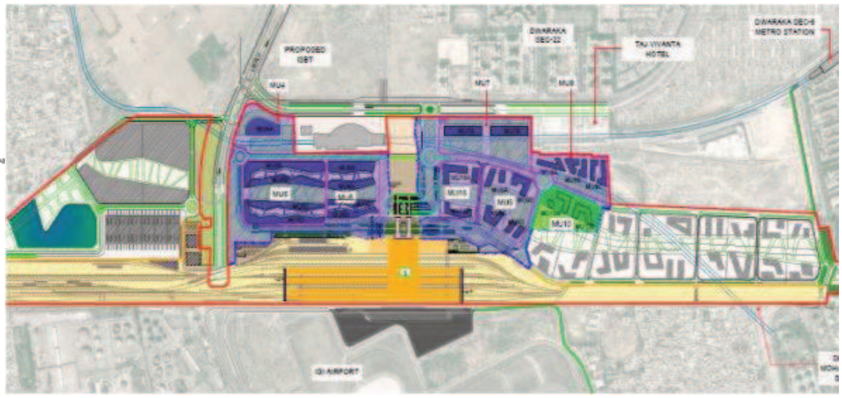
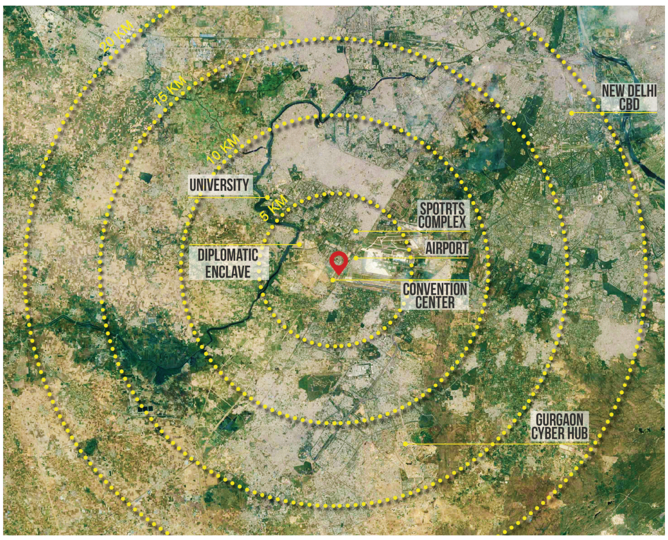


Fig. 1: Location of Bijwasan in Dwarka, New Delhi; Fig. 2: Masterplan for Bijwasan Station Area Redevelopment. Source: PIM, Bijwasan, IRSDC

The master plan prepared for the identified area of redevelopment of 146 Ha includes offices, retail and hospitality planned in the area along with provisions to make it a Transport Central Square. The developer shall develop the entire project including the station redevelopment and commercial development on preferably Develop, build, fiance, Operate and Transfer (DBFOT) format. The developer shall be responsible for station facility operations during development/redevelopment and for a fixed period post construction, after which the station operations shall revert to Indian Railways. The commercial area is envisaged to be operated by the developer for a concession period of 45 years (including construction period).

4.1 Site Context

Being on the suburbs of Delhi and Gurgaon, it places the site at an important level regionally. Delhi, being the capital city, yields the site a political and locational advantage, while Gurgaon growing at a rapid pace and being the face of development in the region makes Dwarka the next pocket of probable growth. It is approximately 12 kms from Gurgaon Cyber hub, which houses major Information Technology (IT) companies and attracts a huge workforce. It is approx. 17 kilometers from Connaught Place which the central business district of Bew Delhi.The site is proximate to Sports facilities and Guru Gobind Singh Indraprastha University and is adjacent to the planned Convention Center. The site is also 3.5 kilometers away from the upcoming Diplomatic Enclave in Sector 24, Dwarka.



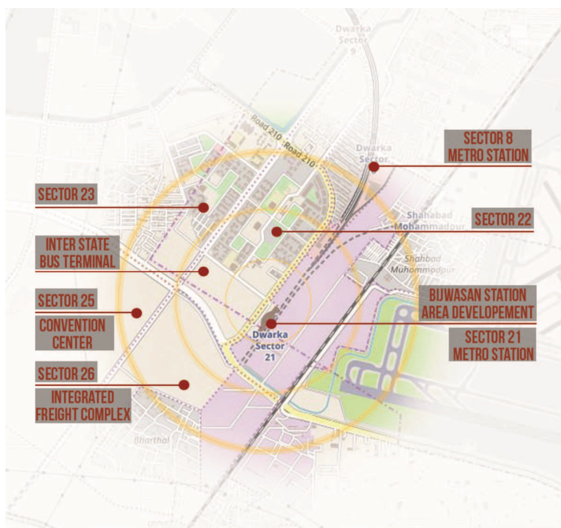


Fig. 3: Regional Context of the Study Area; Fig. 4: Local Context of the Study Area.

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The study area in the local context of within 1500 meters contains the 'planned development' zone as per the Zonal Developement Plan (K-II) 2021. The adjacent sectors include sector 22, 23, 25 and 26. The area can be accessed by two metro stations of Sector 8 and Sector 21. The master planning of Bijwasan Railway Station Redevelopment spans across sector 21 and 26. The remaining part of sector 26 is planned to be an Integrated Fright Complex and the adjacent sector 25 will be locating the upcoming International Convention Center. The major residential pockets remain in Sector 22 and Sector 23 which are planned sectors and Pochanpur colony in the North which is an already built up area.

4.2 Existing Conditions

The existing streets and block analysis shows the mix of planned regular sized blocks along with large irregular shaped blocks. There are blocks in the North West which show irregularity because of numerous small streets cutting through them which also create discontinuous connections. The existing built form analysis show that the North west becomes a medium density residential area with a need for potential reurbanization. There is a need for architectural improvements at major roads.

The 3-5 stories built up currently is the highest with 54 % followed by above 7 stories built up at 32%, 5-7 stories at 10% and low density residential at 4%. However, most of the medium density is present in Pochanpur village which is also identified for reurbanisation.

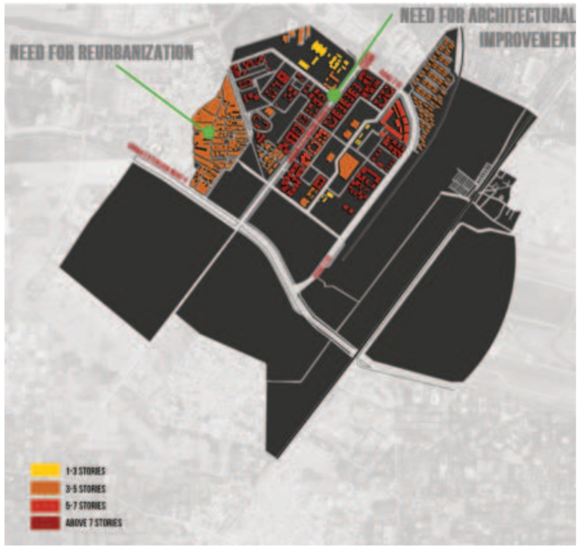
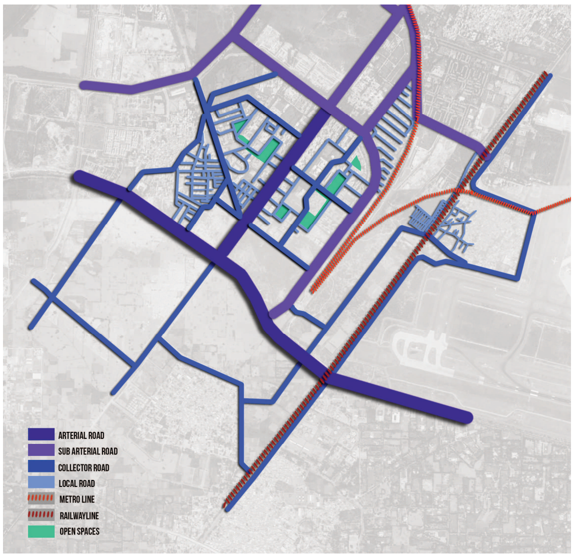


Fig. 5: Street Block Analysis of the Study Area; Fig. 6: Built form Analysis of the Study Area.



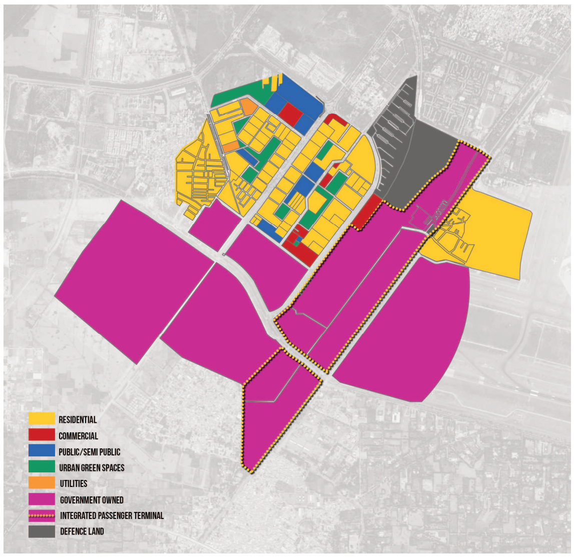


Fig. 7: Streets and Open Space Network of the Study Area; Fig. 8: Land Use Analysis of the Study Area.

Although the area is accessible by vehicular roads but there is serious absence of pedestrian and bike connections. This gives an idea of the high car dependency in the region which can be a threat to the future development. There is also a disconnected system of green open spaces. The newly planned areas show regularity in street distribution but the already built up zones show a high number of disconnected connections. The land use distribution shows the high percentage (59%) of government owned land followed by residential at 24%. Although, the percentage of commercial land use seems under developed at the moment at just 2%.

5 STATION AREA PLANNING IN EUROPE

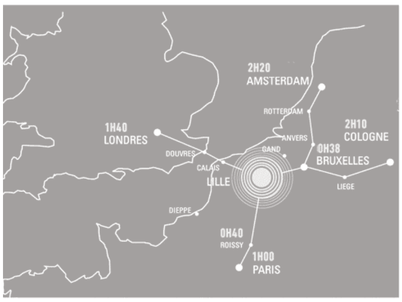
Bijwasan Station Area Redevelopment is an anchor project for the government, new of its kind. Though the project only focusses on the in-station facilities and improvements, its vital to look at its affect on the urban scale. Europe, having started with this development in 1980s, with the coming of high speed train, sets many parameters to to be studied. The casestudies were chosen keeping in mind:

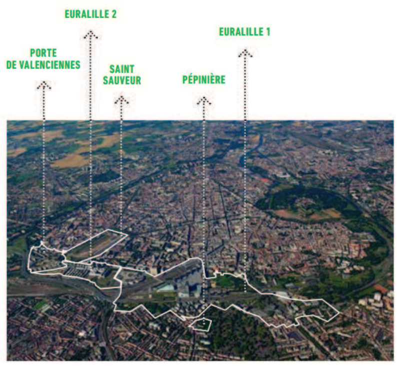
- The Redevelopment efforts had the term ‘Station Area Planning’ and took into regard that the development focused beyond the terminus area.
- There was an availability of significant areas of developable land around the stations.
- The areas were redeveloped to handle a comparable size of daily transit riders.

Based on this, two casestudies were chosen to be studied in detail- Lille in France and Utrecht in Netherlands. While Euralille in Lille was one of the first projects to be implemented in this regard, Utrecht is a very recent development. Both the cases show the regeneration of the terminus areas over the years and transformation of the transport nodes to vibrant urban places. The following table gives a comparison of the casestudies with Bijwasan.

	Lille, France	Utrecht, Netherlands	Bijwasan, New Delhi
Area of Development	222 acres (Euralille 1) +150 acres	225 acres	360 acres
Daily Transit Users	1,20,000	2,85,000	1,38,000 (projected)
Land Uses	Retail, office, Hospitality, Residential, Government offices	Retail, Hospitality, Civic	Office, Retail, Hospitality
Year of Development	(Euralille-1)1986-1994	2006-2016 (Vision document till 2030)	2016 -
Stakeholders Involved	Euralille-Metropole (City), SNCF(Primary Rail Operators), OMA &Rem Koolhas (architects) and Société publique locale (PPP)	Klepierre (City), NS(Primary Rail Operators) ProRail(part of NS) and Jaarbeurs.	Indian Rail Station Development Corporation (RLDA+ IRCON), PPP with private company.(Not yet selected)

Table 1: Comparitive Analysis of the Casestudies and Study Area





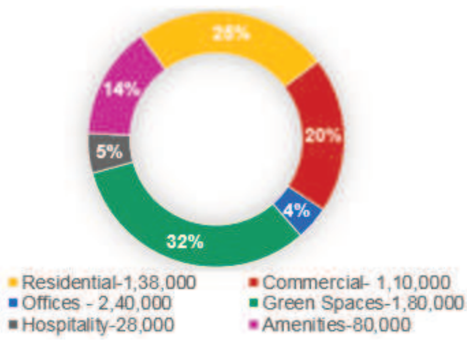


Fig. 9: Location of Lille at Important Crossborders (Source: Eidlin, 2015); Fig. 10: Location of Euralille 1 Project (Source: SPL, France; Fig. 11: Land Use Breakup of Euralille 1 in sq.m

5.1 Lille, France

Lille is one of the largest cities in north of France, sitting at the border of Belgium and Netherlands. When France, Belgium, the Netherlands, and Germany originally decided to jointly develop the North

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European Train a Grande Vitesse (TGV) network in 1987, the city considered the high speed train as an oppurtunity for catalising growth (Jong). The new station was soon located near the historic center at the cleared up military lands. This resulted in the Euralille Project. The new Lille Europe station was located only 400 metres from the current station, and the station area was transformed completely, to make optimal use of this opportunity. Architect Rem Koolhaas was assigned to design an urban plan for the station and the station area of 222 acres who envisioned to create new urban space in the station area.

5.2 Utrecht, Netherlands

Utrecht is the fourth largest city in the mid-western part of the Netherlands. Due to its central location, it serves as an importtransport hub for both, road and rail. The masterplan to renovate the station area was introduced in 2006 and the construction was almost complete between 2008 to 2016 (Loukaitou-Sideris, Peters, Colton, & Eidlin, 2017). Working on a clear vision of “connect, restore and give identity to the area”, the masterplan was aimed at creating a mixed use area that would connect the historic city centre to the neighbourhood of Lombok with many Turkish and Moroccon immigrants which otherwise, were segregated by the rail tracks.

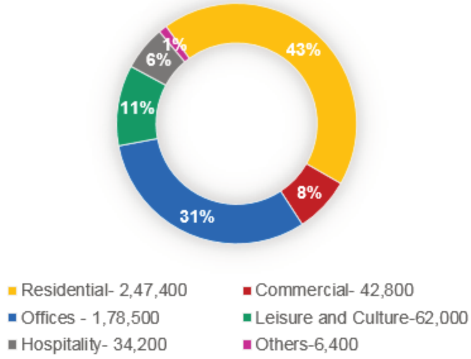


Fig. 12: Location of Utrecht (Source: Ditewig,2003); Fig. 13: Vision of the Project (Source: CU2030); Fig. 14: Land Use Breakup of Utrecht Centraal Station Area in sq.m

The planning process was divided into two sets of investigation- to make a plan and to execute a plan. Other important feature of the masterplan was the three elements- Rasterkaart, Programmakaart and Openbare Ruimtekaart. A clear zoning of public and private building zones and their interactions was planned through ‘Rasterkart’. The intended land uses along with the scale of development was specified in ‘Programmakaart’ and the open space network, allocation of public spaces was defined in the ‘Openbare Ruimtekaart’.

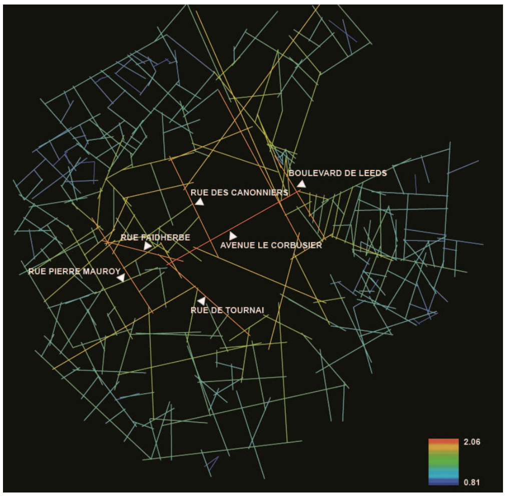
6 CONFIGURATIONAL ANALYSIS OF THE STATION AREAS

Using Hillier’s configurational analysis, the study focussed on finding how well the station area embeds in the surrounding spatial network. The objective is to distinguish the consistencies found in the spatial characteristics that relate to vibrant as well as blighted urban conditions in the station areas and hence affect the pedestrian movements. According to Hillier, the way in which the urban grids evolve is accounted for to a great extent by the fundamental mechanism of natural movement, which is the proportion of movement determined by the architecture of the grids itself (Hillier, 1993). A dynamic relation between the evolving urban grid, its natural movement patterns and the developing pattern of land use develops over time. Spaces that become the busy focuses of urban life are most likely to be accessible for both to-movement and through-movement. Through the 'movement economy' process, land use and building density, which follow scales of movement in the grid, adapt to and multiply the movement economy effects, creating vital environments of mixed urban activities (Hillier, 1996). Based on this proposition, the pattern of spatial grid configuration can then be used to explain the current urban condition of the selcted casestudies, as well as the potential of the Bijwasan Redevelopment project.

For this purpose of analysis, axial models are studied in which lines are coloured in accordance with their integration values, with the intention of giving an immediate and intuitive illustration of the urban spatial patterns. The Axial map covers the whole area and depicts longest and fewest straight lines in the urban grid. The axial analysis, the syntactic measure shows the global spatial structure from red for the 'shallowest' or most integrated lines through the spectrum to blue for the 'deepest' or most segregated lines in the area. The modelling area was chosen as a 15 minute walking radius or 1.5 kilometers approximately.

6.1 Lille Station Area

The axial analysis of Lille station area and its catchment is shown in the fig.15, Focussing on the immediate surroundings, the station is located next to the most integrated line in the system, Avenue De Corbusier. The other important integrators, which further strengthen this line from all around are Boulevard De Leeds, Rue des Canonniers, Rue Faidherbe, Rue Pierre Mauroy and Rue de Tournai. All these integrators however, run towards the station building, they do not continue the other side of the tracks. Hence, we see a comapritively weaker link on the North East, because of no linkages. Converging it with the planning area of Euralille I, it can be commented that the masterplanning did create areas which were well connected and hence may attract increased pedestrian activity, land use and thus, vibrancy.



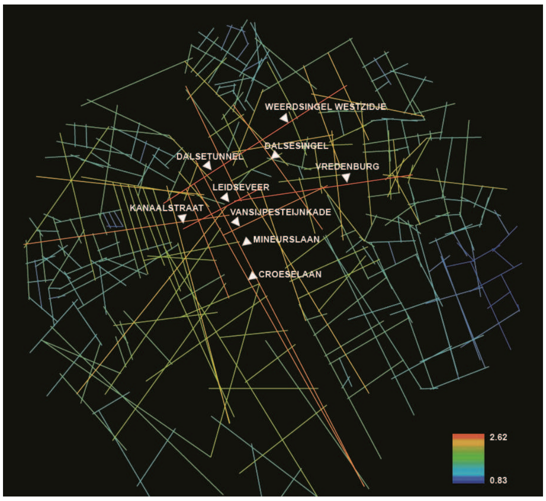


Fig. 15: Axial Analysis of Euralille 1; Fig. 16: Axial Analysis of Utrecht Centraal

6.2 Utrecht Station Area

The fig.16 shows the axial analysis done for the area around Utrecht Centraal. The station is adjacent to the integrated core formed by Leidseveer, Vredenburg and Vansijpesteijnkade. An important fact that comes to fore is that all these three integrators have bike and pedestrian pathways and hence become important pedestrian collectors. The vision of the master plan is seen coming to reality with the sides of track, i.e. the old city center and Lombok neighbourhood getting connected by another integrator, the Dalsetunnel. It can be observed that the integrators are much more widespread in the case of Utrecht Centraal Station area and hence there are very less ‘deep spaces’.

Although both the casestudies have a difference in the number of integrators, typology of formation of integrated core and urban enclaves, both showcase that station building lies adjacent to major integrators. The areas around the station building not only have the absoulute absence of disconnected axial lines and deep spaces, they area rather a part of an itegrated system.

6.3 Bijwasan Station Area

The configurational analysis of the underdeveloped area of Bijwasan Station is useful to plan for integrated cores as per the casestudies. In the present scenario, it can be observed that in the South West, the lines are sparser and form a linear core which does not construct sub areas. There’s a phenomenon of ‘Line Integration’ which is a characteristic of less developed urban structures. In the North and North east, the lines are denser which create identifiable sub areas. The residential pockets in the area come out as the most segregated spaces. However, Pochanpur village is shows higher amounts of integration, another characteristic of a spatial structure of village.

At this stage of development, one can observe a disconnected structure of urban grid with most lines being least connected.

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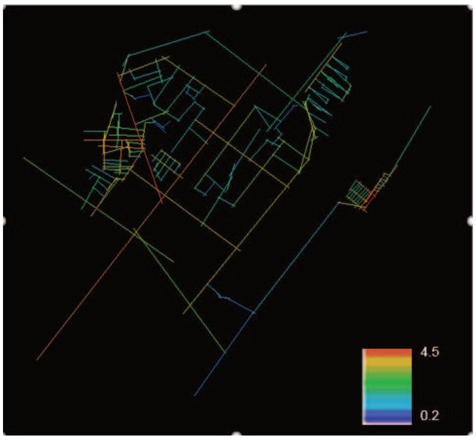

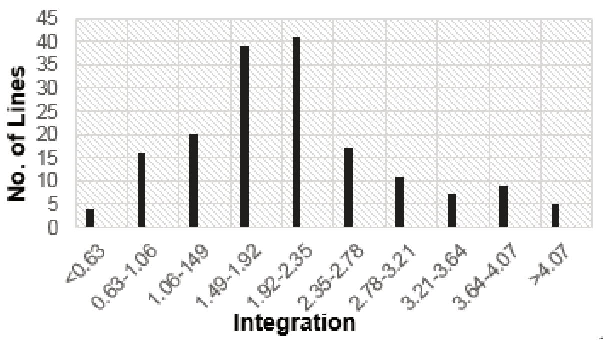

Fig. 17: Axial Analysis of the Study Area; Fig. 18: Histogram showing No. of Axial Lines vs Integration Values

7 CONCLUSION

The subject of the study is taking into consideration a new typology of development in India, i.e. the modernization of railway stations and the urban planning that should complement such an infrastructure development. While the site context holds a high potential for the success of the planned redevelopement, a few aspects on the urban spatial context were found missing. As observed in the two casestudies, the city was a stakeholder along with the Transport Undertaking and private companies, which is not there in the case of Bijwasan, owing to a lack of integrated approach due to institutional segregation. While the planned 360 acres lie in the Railway land, the nearby areas are a municipal land, both being dealt by separate departments. Although a challenge, it is also prerequisite for the project, as noted by the interviewees.

The configurational analysis clearly shows the importance of integrators for a vibrant environment and increased pedestrian activity. The site, which has a surrounding rural context, will have a changed face after completion. Introducing pedestrian connections is not only important for the spatial integration in the urban grid, it is also important to prevent social segregation which might follow due to stark built environments. Any intervention must aim at inclusivity of these communities.

The presence of public land uses in the walkable radius is an oppurtunity for the project and developing pedestrian and bike connection can stitch these spaces along with the adjacent station areas to produce a wider catchment zone and integrated core.

The succcess of Bijwasan Railway Station as a tranport hub is envisioned, however, creating an urban space will add value to the development and can become a torchbearer for other such infrastructure augmentation projects.

8 REFERENCES

BERTOLINI, L: Nodes and Places: Complexities of Railway Station Redevelopment. European Planning Studies, 4(3), 331-345,1996.

ERNST & YOUNG: Development of Bijwasan Railway Station, New Delhi. Delhi: Indian Railway Station Development Corporation. New Delhi, 2016.

HILLIER, B.: Specifically Architecture Theory. The Harvard Architectural Review, 9, 9-27, 1993.

HILLIER, B.: Space is the Machine. Great Britain: Cambridge University Press.1996.

HILLIER, B.: Centrality as a Process: accounting for attraction inequalities in deformed grids. Urban Design International, 3/4, 104-127, 2000.

JONG, M. d.: Lille Europe: A Success Story?, n.d.

LOUKAITOU-SIDERIS, A., Peters, D., Colton, P., & Eidlin, E.: A Comparative Analysis of High-Speed Rail Station Development into Destination and Multi-Use Facilities: The Case of San Jose Diridon. Mineta Transportation Institute. San Jose, 2017.

PILLAI, S.: Capital chaos: Delhi’s traffic has slowed down and doubled time spent on roads. Delhi: Hindustan Times. New Delhi, 2016.

POL, P.: HST Stations and Urban Dynamics: Experiences from Four European Cities. In F. Bruinsma, E. Pels, H. Priemus, P. Rietveld, & B. v. Wee (Ed.), Railway stations and urban dynamics (pp. 59-78). Amsterdam: Physica-Verlag, 2005.

TRIP, J.: What Makes a City?: Planning for "quality of Place" : the Case of High-speed Train Station Area Redevelopment. IOS Press. Delft, 2007.

Urban Parterre Modelling UPM: Lifting the Cadastral Map to the Third Dimension

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Fig. 1: The Urban Parterre Model. © Kodydek/Psenner.

1 ABSTRACT

As conventional cadastral maps only show building perimeters, they contain no information about the city's internal structure – about the complex interplay of architecture and its socio-economical use. Thus, urban planning seems to spare little thought for what really takes place inside the buildings lining a street, although we perfectly know that the potentials of ground floor use and the structure of the correlating public street space are directly related.

The **Urban Parterre Modelling UPM**-method refers to the city's "parterre" as a holistic urban system: it covers both built-up and non-built-up areas. Thus street, ground floor and courtyard are treated as entity, so that their interrelations can come to light. Technically the method represents the merging of a common 3D-city-model and a Comprehensive Ground Plan Survey CGPS – a researching technique used in the 1960s until the late 1990s (throughout Europe, but mostly in Italy, France and Switzerland).

Keywords: StadtParterre, Urban Parterre Model, SD cadastral map, urban research, Vienna

2 INTRODUCTION

A clearly new urban research method has been developed and tested in a pilot study by means of an in-depth exploration of a typical historical street in Vienna. In September 2015, a new four years research program was financed by the Austrian Science Fund (Austria's central funding organization for basic research, FWF) and launched at the Department of Urban Design at Vienna University of Technology (under the lead of Angelika Psenner). Within this operational framework a variety of different street-level environments in Vienna are being examined by mainly addressing the following research questions: What are the (historical) interrelations between public space and the life inside buildings? How does this micro system influence urban life and especially pedestrian behaviour?

The urban parterre is thus being investigated in terms of an exemplary neighbourhood in an inner district – within the so called Gürtel – an archetypal GZ area totally rebuilt in the late 19th century. It covers three adjacent roads (A, B and C) and altogether expands a length of almost one kilometre[1]. Preliminary research was informed by an in-depth theoretical and historical approach, covering the following subjects: *impact of*

[1] For data protection reasons – since plan data for individual buildings in Austria is considered to be private – detailed information about the Viennese *StadtParterre* (urban parterre) in question are anonymized, when disseminated.

urban planning and *architecture* (elaborate study on the unique architectural type of the 'Viennese GZ townhouse; cf. Psenner 2012a) and *of relevant legislation codes*[2].

In order to better read the streets' position within the larger urban fabric, the *biography of the street* was extensively researched, including detailed information on layout (topography and urban planning), architectural development (historical and current building plans on the selected lots) and over time use structure development of ground floor and basement premises. Trading documents, business licenses and tax regulations are evaluated in order to enable the modelling as well as the drafting of *house-biographies* for each single building in the chosen field.

Given this methodological perspective the paper is therefore addressing the following issues:

- How to create the UPM – un utterly precise 3D-model – of a sample of the Viennese StadtParterre (urban parterre)?
- In what does the UPM differ from standard city models?
- What are the key challenges in managing and processing the necessary data?

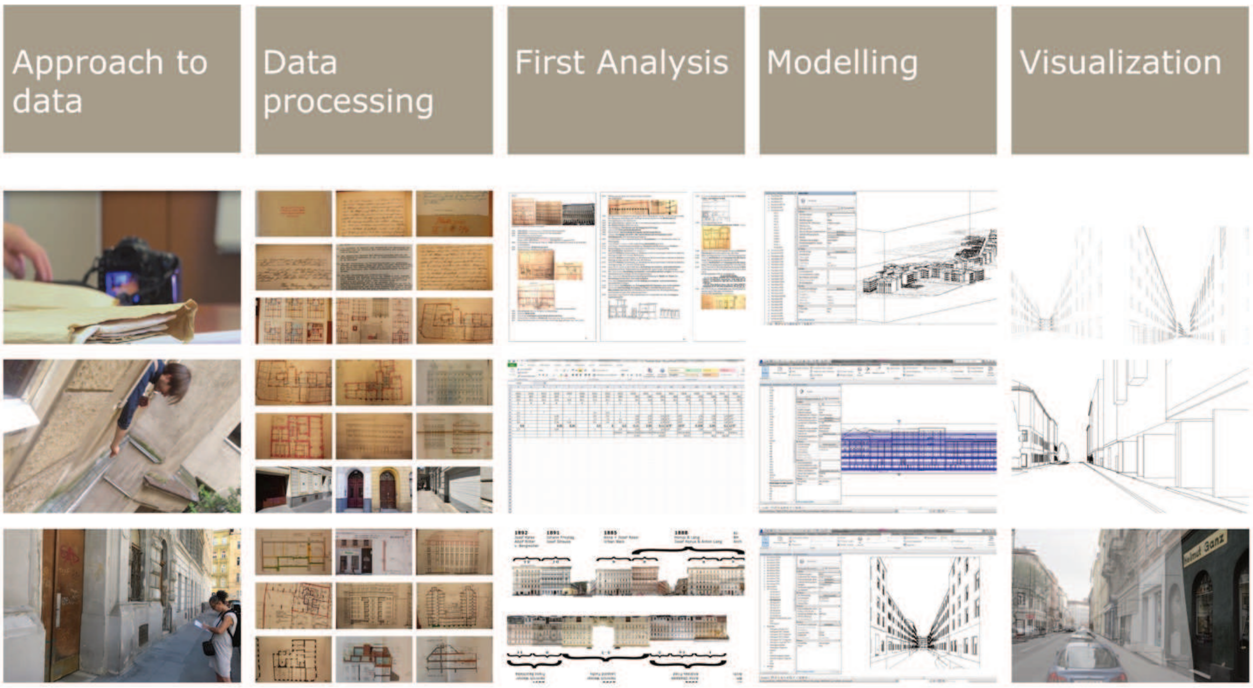

Fig 2: The Urban Parterre Modelling Method. © Kodydek/Looman/Psenner

3 METHOD

3.1 The Two-Dimensional Comprehensive Ground Plan Survey (CGPS)

Originally, the two-dimensional Comprehensive Ground Plan (CGP) Survey derives from studies on the relationship between urban morphology and building typology, like the ones by Saverio Muratori in Venice and by Gianfranco Caniggia in Florence and Como (cf. Muratori 1960 and Caniggia 1963).

Several such morphological studies were subsequently conducted by Swiss architects and historians: in the 1960s, architects in the canton of Tessin initiated an inventory that was continued at the Swiss Federal Institute of Technology (ETH) in Zurich in the 1970s[3] further progress in the field was made with a comprehensive survey of Zurich's urban centre under the lead of Margareta Peters (cf. Peters, 1990 and 1999).

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[2] Building regulations, commercial code, public health care and road traffic regulations, tax incentives, urban planning, etc. (cf. Psenner 2012, 2014a, 2014b, 2017).

[3] CGPSs are available for most Swiss towns and cities; manly covering the historical city centres; amongst others: Bellinzona, Lucerne, Bern, Solothurn, Biel, Zurzach, Lelandron, Baden, Wil SG, Zurich (old town and industry quarter).

A conventional cadastral map (Mehrzweckkarte MZK) provides no sufficient information about ground floor plans and the structure of urban interiors, whereas a Comprehensive Ground Plan (CGP) sets buildings in relation to public space and their topographic environment. By placing the ground floor plan of each single building in the urban fabric side by side, the interrelation between the interior life of individual buildings and the public street space surrounding them is being visualized. Thus, the CGP is accurately useful to examine the relationship between buildings, streets and courtyards. Beside the ground floor a CGP often covers the basement and a standard upper floor, some also include a typological register, specifying the particular building type (Muratori 1960; Caniggia 1963; Malfroy 1986, Fortier 1989; Peters 1999).

3.2 New approach: Three-Dimensional Urban Parterre Model (3D-UPM)

The Urban Parterre Model (UPM) might be defined as a *three-dimensional* CGP. The making of which can be described as follows: A baseline set of data is provided by the existing digital cadastral map MZK, which documents detailed land use for the entire municipal area of Vienna. It is a fundamental tool, a matrix that is filled in with ground level plans of individual buildings – covering both historical floor plans and documented building uses, as well as most recent conversion records[4], so as to reflect the morphological evolution of the *StadtParterre*. All plans are then verified on site and, if necessary, adapted and amended, in particular with regard to actual building uses.

Given the importance of ceiling and building heights[5] on one side, and the city's topogrphy in the other, one of the study's primary objectives is to provide a <u>three-dimensional model of the urban parterre</u>. To do so, the CGP-method was developed further into what is called *UPM* (Urban Parterre Modelling). This 3D representation of the data – the modelling is done with Autodesk Revit®[6] – now enables profound analysis of the links between buildings' interior and exterior spaces. Subject to the UPM the following matters are discussed: Where *is*, or *was*, the basement or courtyard directly connected to ground floor use? How do these interior connections affect the entire parterre function? The introduction of 3D and the information about the use structure are the major differences to the former CGP-Survey-method.[7]

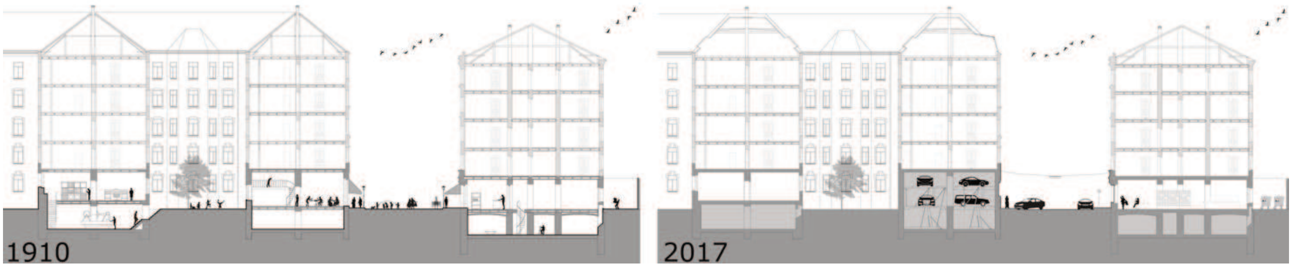

Fig 3: The UPM facilitates morphological analysis and conclusions regarding the actual use-structure and the use-potential of the *StadtParterre* by visualizing the spatial and functional interrelation between ground floor, court yard and street. © Kodydek/Psenner 2017

The UPM depicts the buildings' *ground floor* which is rendered in every detail, while for the *standard upper floor* and *basement* a set of structural – not detailed and not verified on site – data provides sufficient information. Where the adjoining levels (basement and first upper floor) are directly connected with the ground floor by stairs, doorways or (freight) elevators, they are treated as extensions to the ground floor and

[4] Plans are kept on file in the database of the Vienna Municipal Building Authority Department. Unlike in other countries (e.g. Italy and Switzerland), detailed plan data for individual buildings, which contain precisely the information needed here, are considered private under data protection laws in Austria. Which is why all research and findings have to be anonymised in the present paper.

[5] Building height is the factor that determines the extent and type of shading of the street space and lower floors. In relation to street width, GZ buildings are rather tall, which leads to disadvantageous daylighting conditions particularly on the ground floor. The typical Viennese multiple-storey apartment building has exceptional ceiling heights (3.20 to 4,95 m), which allows for specific and highly flexible types of use. (Psenner 2012, 2014a)

[6] Revit® is a standalone application that includes architectural design, MEP and structural engineering, and construction features. The program was developed as a specific Building Information Modelling (BIM) tool which facilitates a coordinated and consistent model-based approach. It supports easily controllable transparency and fade-in/-out effects based on flexible keys for all objects. Cf. Clayton 2014.

[7] The Ponticelli/Naples ZGA includes axonometric plans, which, however, only show building skins (Fioravanti quoted in: Caniggia 1986, 336).

therefore represented in detail again. The particularly sound 3D-representation of the UPM also includes general information on ground floor use (by means of colour codes). Thus, it produces precisely the information needed for analysing and defining the building's connection to public space and the *StadtParterres'* internal coherence. Furthermore, with rendering the alley's geometric profile (street width and building size) the daylighting conditions on the ground floor and street level are clearly depicted.

In this sense the UPM represents a special type of 3D urban model, with precise detail data and a ground-level perspective. As known, standard 3D urban models mostly provide a bird's eye view and do not contain the information needed for a ground-level investigation.

3.3 The Urban Parterre Modelling Method

In the pilot study (2012-2014) the modelling had to be outsourced due to budget reasons; whereas in the ongoing research project (2015-2019), an in-house 3D modelling position is provided. Thus, the process was adjusted and fitted for the actual research goal. By identifying weaknesses along the process the method is undergoing an continuous evaluation process and thus improved progressively.[8]

Due to its high level of detail the UPM fundamentally differentiates from current city models created with City-GML. The LoD Charta was used as point of reference in the modelling process. Yet, the Charta may not be applied fully as the current classification does not offer an adequate category: LoD4[9] – which would be the nearest – differs insofar that in UPM the façade is being handled in its urban structural not in its textural significance. Keeping in consideration that the authors' interest lies within the urban design perspective, little importance was attached to an accurate modelling of façade-textures.[10] After a significant revision of the UPM-method in March 2017 the LoD4 standard is now being applied on every single floor level – initially it was used on ground floor and basement level only.

The realization of the UPM is carried out in five major steps: approach to data and data gathering; data processing; first analysis (preparing and formatting of data; modelling and visualization.

STAGE	TASK	EQUIPMENT
Approach to data and data gathering	In depth archive research at Vienna Building Authority MA37; extensive on-site field trips	Digital Camera (Sony Alpha. 6000+)
Data processing	Organize data	Microsoft Word, Microsoft Excel
First analysis; preparing and formatting of data	Information extraction; house biographies	Microsoft Word, Microsoft Excel
Modelling	3D-UPM	Autodesk Revit
Visualization	Analysis of the studied object; Comprehensive ground floor study	Autodesk Revit, Adobe Illustrator, Adobe Photoshop

Table 1: Stages of methodology.

The key for the modelling process is precise and detailed information about every single building and their relation to public space. Data is gathered in different archives: Vienna building authority (which holds most of the documents and plans, as well as many handwritten manuscripts), Vienna Museum, District Museum, Austrian National Library (ONB) and Wiener Stadt- und Landesarchiv. Repeated extensive on-site field trips veritably add to the approach.

The building authority archives hold rich information on every single lot in the city; each one has its own dossier, containing detailed documentation on the building process: application plans, construction permits and documented uses of most of the ground floor premises. Therefore, the building authority archives play a vital role in the approach to data. In an in-depth archive research, every single document is being photographed and digitalized. The dossier volumes vary in size depending on the building activity over the years and on whether constructions were applied for and recorded. As a matter of fact properties in streets in the outer districts of Vienna seem to be less well-documented, here the dossiers prove to be rather thin.

[8] For example: in the beginning the systematic 3D modelling of the historic structure and the current situation was undertaken simultaneously, which turned out to be rather time consuming; hence the modelling of the historic status is now being performed and finished before applying the changes and adapting it – by using the "phase" tool.

[9] LoD4: The building's geometrically detailed outer shell and interior is represented by detailed surfaces and roof shapes. All kind of surfaces and additional movable and non-movable building elements (e.g. balconies, chimneys, stucco, ledges, etc.) may be represented with greater detail as semantic objects.

[10] If it proves to be decisive to have precisely visualised façades, the current model can be easily adapted to this.

The historical *maps* – some of which are in real poor condition (see fig.2) – carry a wide range of information such as site plans, sections, floor plans and relevant details. In order to get accurate reproductions, serial pictures of the historic maps are taken, ranging from an overview picture of the whole map to a zoomed in picture of the specific plans. Being the solid base of information for the modelling process, the taken images must not be distorted or blurred; so that key information such as height-level measurements, dimensions of various building parts, annotations and any kind of handwriting are perfectly visible and readable. (Photocopying is not feasible in this stage of data-gathering, because of the bad condition of most plans and because of the large data-amount (big data).

Repeated on-site field trip investigations are necessary in order to verify ambiguity and uncertainties arising on the fact most of the time the archive dossiers do not dispose the (now common) inventory plans.[11] Therefore, mismatches between historic plans and actual as-built constructions are to be found rather frequent.[12] The actual nowadays buildings are being photographed as well; which proves to be rather helpful for additional information and control. And in order to study the buildings on an urban design level (i.e. permeability of the façade structure) the single house-pictures are merged to form a continuous strip of street-façade-panoramas.

All collected (archive and on-site) data is then unified and organised in an accurate way. This big-data management proves to be rather laborious: firstly, the information is divided by street, every single lot has its own folder, containing the building authority archives information as well as the on-site material. Then this data is being evaluated and prepared for the modelling process.

For creating the UPM the following data is being used:

- the cadastral map (MZK)
- spot elevation data (MZK)
- historical plans (building authority and other archives)
- on-site photographs
- 3D libraries (used as the basic elements for the model).

The 3D modelling is set on reference to the official cadastral map MZK, which contains all base-line information; such as street width, outlines of the houses. In consequence this macro-information is being combined with data concerning the micro-structure on edifice-level. The model’s high level of detail standard is being ensured by thoroughly incorporating differentiated information derived from the historical building plans:

(a) exact building height

(b) differing room heights (the historic Viennese townhouse shows varying storey heights: normally the ground floor is the highest, from bottom to top the storey height decreases remarkably; cf. Psenner 2012 and 2014a)

(c) roof type, shape of historical roof formations and more resent rooftop conversions

(d) level of the ground floor in reference to the topographical level (cf. Psenner 2017b)

(e) façade: basic structural elements such as windows, doors and essential tectonic details

(f) inner connections to adjacent floors (cellar, basement and upper level): stairs, trap doors, (freight) elevators

(g) outer connections to open space: accessibility courtyards; alley doors.

[11] Nearly always (minor) differences between a historic application plan and the as-built construction are detected; as many decisions are to be taken on-site, when problems arise while construction is going on. Nowadays building authorities generally ask for an official “notification of competition”, which must include a so-called “Bestandsplan” (inventory plan).

[12] Due to the large number of buildings being surveyed, the impossibility to enter those private houses and the given time and financial resources, follow up measurements in every single building is beyond question. For that reason, the MZK, the existing plan documentation and the on-site verifications are used to iteratively approximate the precise form.

4 ANALYSIS

4.1 Dealing with big data

The exemplary *StadtParterre* being investigated is in inner district is an archetypal GZ area developed in the late 19th century. The UPM covers three adjacent roads (A, B and C) and altogether expands a length of almost one kilometre. The street stretch formed by A and B is 810 meters long; it counts 56 houses. Street C – which is an orthogonal side street to the previous – measures 144 meters with an additional 14 houses.[13] This adds up to a total model length of 952 meters and a total of 70 buildings.

The modelling is done with Autodesk Revit®, a programme chosen for its coordinated and consistent model-based approach. It allows integrating CAD data, such as the digital cadastral map MZK. The 3D elements – called Families – were selected from Revit® libraries and other open source databases such as *Revitcity*. Some site-specific elements, such as certain wall constructions, were created in Revit without using the 'family' option.

Due to the study's historic and analytical approach two sets of models are created per each single building: one that depicts the built environment around 1910, and a second one showing the today status. When all modelling is completed, the single buildings are linked (referenced) to the global topografical model, which has ben elaborated from the digital cadastral map (MZK) via AutoCAD® and then imported into Revit®. With the 'plan regions' tool and by defining cut planes at different heights the programme allows to envision specific areas in order to produce the visualization needed (e.g. for Souterrain and spilt levels, which are quite present in the research area). This facilitates a precise analysis of the interconnection of different *StadtParterre* spheres over time: ground floor and adjacent rooms in basement or first floor. As two different UPM-phases are being produced – 1910 and current situation – the seminal time factor is taken in.

The information of the afore mentioned house biographies is being processed by including the various use categorizations of all single ground floor premises and by utilizing a special colour code: *green* representing semi-public use (with high use frequency and direct connection to the public street space); *orange:* production, *yellow:* living, *grey:* storage and *blue:* garages. The Revit® tool *"Rooms"* is uses to marked this reference within the building model based on room-bounding elements. Thus, the model offers highly detailed, multi-dimensional information. Which also explains why throughout the development of the methodology data managing had become a number one feature.

Fig 4. UPM showing the use structure analysis for historic status – around 1910. © Psenner 2017

The model allows to create section views through every single building, thus revealing precise insight on varying storey heights, on structural information, and on the vertical and horizontal interconnectedness of the *StadtParterre*, which as we know has to be seen as a holistic urban system.

[13] The street C shows a high percentage of ground floor retrofitting into garages and was chosen for exactly this reason.

4.2 Applicability

In the academic winter term 2017 the UPM method was introduced to the teaching curriculum of the Urban Design Department at TU Wien. It proves to be rather suitable for teaching as the master students quickly adjust to the programme. Consequently, they do not only acquire a new research skill, but also are then able to get into urban analysis and planning within short time.
Accordingly, two more streets are being investigated with in the research project-both situated in outer Gründerzeit districts: one measuring 269 meters and including 24 houses and the second one measuring 327 meters and including 30 houses.

Fig 5. UPM used in teaching: a street in an outer district (still a Gründerzeit area) was being modelled by master students and consequently analysed according to various research questions. Here the UPM perfectly reflects the slope und thus incorporates a possible topographical approach © Gafriller/Jamak/Salgueiro/Wachholder/Psenner 2018

Fig 6. Section views of the StadtParterre of the 1910-status and the current status; while the historic StadtParterre functioned as a uniform, inter-connected structure, the exchange between the various zones is no longer given today. © Kodydek/Psenner 2018

5 CONCLUSION

The complex micro-analytical possibilities of the Urban Parterre Model UPM allows to document vacancies and other issues relating to street-use in selected neighbourhoods and to analyse the contributing economic, traffic and social factors. Systematic 3D modelling of the built-up environment and taking inventory of historical, current, and potential ground-floor uses thus will provide a basis to put Vienna's street-level environment in a long-term development perspective as a practical guideline for future interventions in various neighbourhoods and for the (re-)designing of individual street complexes.[14]

From an international research perspective, another innovative asset of the project is the three-dimensionality of the comprehensive model. Successful regulatory measures in urban planning, administration, and economic policies depend on sound and detailed knowledge of the actual architectural structure as well as the current actual – and potential – use of the street-level environment. Urban Parterre Model provides this information in easily accessible and locally contextualized form. Thus, the potential of the street-level environment can be clearly identified to inform urban planning.

UPM is a ground-breaking method that can provide data that is highly utilizable for urban research (and planning), including in particular computer-based simulations. The UPM including the historical analysis of

[14] In order to develop a sustainable solution to the various problems that afflict the Vienna street-level environment, it will be necessary to employ a systemic view of urban structures. One objective of this study is an in-depth analysis and representation of these interrelations.

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the overtime transforming relationship within the different areas of the StadtParterre system will be a sound basis for further in-depth analysis. The benefits that may be expected from this approach include that

- the UPM method visualizes the (historical) interrelation between street space and ground floor use over time and identifies existing discrepancies between private use of the street space and the public interest in having other (and yet unavailable) offerings of the street-level environment;
- reliable planning and implementation of concrete improvement of the urban street-level environment will be possible.

In any case, the application possibilities go far beyond the situation delineated in this present study, as the UPM will be usable not only in an urban context, but also in suburban or rural settings, for example, to study and address in regional planning terms certain architecture-related aspects and conditions of the problem of vacancies in rural areas (small towns, rural communes, and villages). Once fully developed, the analytical UPM approach may also be applied to any other critical StadtParterre situation in urban peripheries or shrinking city situations.

6 ACKNOWLEDGEMENTS

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7 REFERENCES

CANIGGIA, Gianfranco: Lettura di una cittá: Como. Rome: Centro Studi di Storia Urbanistica. 1963

CANIGGIA, Gianfranco: "Lettura di Firenze – Strukturanalyse der Stadt Florenz". In Malfroy/ Caniggia: Die morphologische Betrachtungsweise von Stadt und Territorium. Zürich: ETH, Lehrstuhl f. Städtebaugesch. 1986

FORTIER, Bruno: La Métropole Imaginaire: Un atlas de Paris. Brussels: Pierre Mardaga. 1989

GIL, Ana: "Virtual reconstruction of monastic Lisbon: case studies". In: 13th International Conference on Urban History, European Association for Urban History. Finland, 2016. (https://www.researchgate.net/publication/308166287_From_the_city_scale_to_the_building_scale_Virtual_reconstruction_of_monastic_Lisbon) accessed 27.02.2018

MALFROY, Sylvain and Caniggia, Gianfranco: „Die morphologische Betrachtungsweise von Stadt und Territorium". Zürich: ETH, Lehrstuhl f. Städtebaugeschichte. 1986

MURATORI, Saverio: Studi per un operante storia urbana di Venezia. Roma: Istituto Poligrafico e Zecca dello Stato, Liberaria dello Stato. 1960

MURTEIRA, Helena: Myth and Reason: Lisbon's image before and after the 1755 earthquake. Review paper presented at The Image of the City transformed: 15th–18th Century. Antwerp: Faculty of Design Sciences, University of Antwerp, Artesis University College. 2013

PETERS, Margareta: „Stadtgrundriss als Arbeitsinstrument: dem Mittelalter auf der Spur". In: Hochparterre 1990/4, 30-31 (http://dx.doi.org/10.5169/seals-119191) accessed 27.02.2018. 1990a

PETERS, Margareta: „Elektronische Erfassung eines Industriequartiers: zusammenhängende Grundrissaufnahme in Zürich, ein Experiment". In: Schweizer Ingenieur und Architekt, Vol.117, 779-784. 1999b

PSENNER, Angelika: „Integrative Diversität zu ebener Erd'? Das Entwicklungspotenzial der stadträumlichen Struktur des Wiener Gründerzeit-Parterres", in: Sozialwissenschaftliche Studiengesellschaft (ed.), SWS Rundschau, Heft 2/2011, 195–218. 2011

PSENNER, Angelika: „Mixed Building Use Promotes Mixed Urbanity: Insights from Historical Use-neutral Architecture", in: M. Schenk, V.V. Popovich, P. Zeile, P. Elisei (eds.) REAL CORP 2012, RE-MIXING THE CITY - Toward Sustainability and Resilience? Wien, 2012, 463-473. 2012. (http://www.corp.at/archive/CORP2012_18.pdf); accessed 27.02.2018.

PSENNER, Angelika: Das Wiener Gründerzeit-Parterre: Eine analytische Bestandsaufnahme. Pilotstudie (Abschlussbericht der Studie). Vienna: TU Vienna, Dept. for Urban Design. 2014a; (http://publik.tuwien.ac.at/files/PubDat_240533.pdf); accessed 27.02.2018

PSENNER, Angelika: „Don't Even Think Of Parking Here. Wiener Straßenraum: Verhandlung von Nutzungsrechten und Nutzungsansprüchen", in: Ingo H. Warnke und Beatrix Busse (eds.), Place-Making in urbanen Diskursen – Interdisziplinäre Beiträge zur Stadtforschung,, Boston/Berlin: de Gruyter, 121-147. 2014b

PSENNER, Angelika: „Fakten zum Wiener Gründerzeit-Parterre und seinen Nutzungschancen" in: E. Raith, FB Städtebau, TU Wien (ed.): Mission Mikrourbanismus. Kurze Nacht der Stadterneuerung IV, Vienna, 110-118. 2015

PSENNER, Angelika: „Funktionen des „Ebenerds" – StadtParterre reloaded" in: Österreichische Gesellschaft für Architektur ÖGFA (ed): Umbau, Vienna: Birkhäuser/De Gruyter, 70-83. 2017

PSENNER, Angelika: „Evaluating the organisation of urban space: the lost Viennese "Gewölb" is a highly decisive factor for the functioning of public space", in: The Public Sector 2018.1; Assessing the spatial and policy contribution of economic (e)valuation. Impacts of economic valuation on policies and spatial planning. 2018a

PSENNER, Angelika: “Spatial Representation of Vienna’s Street-Level Environment – Urban Parterre Mapping (UPM)”, in: Murteira, H./Forte, M.: Digital Cities In-between History and Archaeology. Oxford University Press. 2018b
RUEGG, Arthur (ed.): Materialien zur Studie Bern. 4. Jahreskurs 1974/75. Zurich: ETH/Schnebli/Hofer. 1975
WHYTE, William H.: The Social Logic of Small Urban Spaces. NYC: Project for Public Spaces. 2016 (orig.: 1980)
WÜSTENROT STIFTUNG (ed.): Herausforderung Erdgeschoss - Ground floor interface. Berlin: Jovis. 2014

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Wie kommt die Smart City in die Stadt?

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1 KURZFASSUNG

Smart-City-Initativen sind in verschiedenen europäischen Ländern Bestandteil der Entwicklungsstrategien von Städten geworden. Das Land Österreich nimmt dabei eine besondere Stellung ein, da bereits 2007 der Klima- und Energiefonds europaweit als einer der ersten Fördergeber seine Smart-Cities-Initiative aufsetzte.

Diese ist auf die Entwicklung von Strategien, Technologien und Lösungen ausgerichtet, mit der Absicht Städten den Übergang zu einer energieeffizienten, klimaverträglichen und leistbaren Planung zu ermöglichen. Mittlerweile hat sich das Programm auf die Umsetzung der praktischen Realisierung der „Smart Cities Demo" gerichtet, um intelligente, grüne Technologien in einer „Zero Emission City" oder „Zero Emission Urban Region" einzurichten.

Die Frage, die innerhalb der Präsentation behandelt werden soll, ist, inwieweit die Förderungen im Rahmen der Smart-City-Initiativen sich von bisherigen Programmen in Österreich und auch Deutschland unterscheiden? Gibt es spezielle Smart-Cities-Förderungen oder handelt es sich nicht um bekannte Programmarten, die unter einem neuen Namen firmieren? Eine grundsätzliche Frage soll auch aufgerissen werden, welche Rolle die Smart City im Rahmen der Stadtentwicklungsplanung einnehmen kann.

Keywords: Smart Cities, Förderungen, Stadtentwickung, Living Labs, Reallabore

2 EINFÜHRUNG IN DIE THEMATIK

Nachhaltig, resiliente oder ökologisch sind Merkmale für Städte, die seit mehreren Jahren als wenig definierte Containerbegriffe in unterschiedlicher Weise durch Medien, die Städte selbst und auch Fachplaner genutzt werden. Die Absicht der Verwendung ist bei allen vergleichbar. Es ist der Versuch, einen ressourcensparenden und zukunftsweisenden Planungsansatz der Städte zu beschreiben (Anthopoulos 2017). Im Zusammenhang mit dem Thema der zukünftigen urbanen Entwicklung verwenden Städte zunehmend häufiger den Begriff der „Smart City", womit die Aspekte der Nachhaltigkeit um ein intelligentes und modernes Image erweitert werden. Die Themen in der „smarten" Stadt sind zumeist technikbasiert und beschäftigen sich besonders mit energierelevanten oder datenbasierten Herausforderungen. Eines der übergeordneten Ziele vieler Städte ist die Vermeidung von CO2-Emissionen sowohl öffentlicher als auch privater Gebäude. Der Versuch der Einhaltung von angestrebten Zielen der Einsparung wird daher besonders im Bereich der Sanierung von Gebäuden, Quartieren oder Netzstrukturen verfolgt. Die Mobilität spielt zumeist in den Planungen der Städte ein selbstständiges Thema. Nimmt man den Fokus auf den Energieaspekt im Rahmen der Smart-City-Planungen heraus, dann wird offensichtlich, dass besonders dieser Faktor autark behandelt wurde, jedoch im Rahmen der Stadtentwicklungsplanung zumeist wenig Beachtung fand. Da die Intention der Smart-City-Planungen nicht nur durch Energieversorger oder technikbasierte Unternehmen geschieht, liegt die Möglichkeit der Umsetzung bei Stadtpolitik und -verwaltung. Denn besonders sie verfügen vermeintlich über diejenigen Instrumente, die notwendig wären, um die Smart City mit den Zielen der Stadtentwicklung zu verbinden und in die tatsächliche Planung in einer Stadt umzusetzen.

Beides, also die Stadtentwicklung durch oder mit der Smart City, betrifft nicht nur die physische Planung in der Stadt, sondern auch die Prozesse der Planung sowie die Einbindung der Bürger in selbige. Dass dies auch bereits Förderungen betrifft, zeigt die Förderlinie der FP7-ICT (specific Programme „Cooperation": Information and communication technologies) der Europäischen Union. Diese hat die Definition der Smart City dahingehend erweitert, dass die Stadt als eine Planungs- und Aktionsebene dienen soll, bei der die Nutzer die zukünftigen Entwicklungen steuern und sie im Sinne von Co-Creation-Prozessen mitgestalten (Schaffers et al. 2011). Es zeigt sich allerdings, dass zwischen dem, was die Smart City beabsichtigt und dem, wie sie in bestehende Strukturen der Stadtplanung zu implementieren versucht, eine Diskrepanz besteht – nicht nur zwischen einem technikbasierten vs. einem planungsbezogenen Zugang, sondern auch in der Art der Implementierung in die Stadt. Um sich diesem Punkten anzunähern, liegt der inhaltliche Schwerpunkt dieses Papers auf der folgenden Fragestellung: Wie können auf der Handlungsebene der Stadt oder von Stadtquartieren Projekte der Smart City umgesetzt werden und welche Rolle spielen dabei Förderungen? Die

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Fragestellung des Beitrages konzentriert sich auf die Umsetzung von Smart-City-Projekten und auf die Forschungsförderung im österreichischen Kontext.

3 PLANERISCHE HERAUSFORDERUNG DER SMART CITY

Wie beschrieben liegt ein programmatischer Themenschwerpunkt von Smart-City-Projekten in Österreich aktuell in der Einsparung und Reduktion des Energiebedarfes von Städten sowie dem verstärkten Einsatz regenerativer Energiequellen. Hintergrund dieser Schwerpunktsetzung ist die Erfüllung der Klimaziele (z. B. UN-Klimakonferenz Paris 2015).

Grundlage für die Investition in neue Projekte sollte stets eine sorgfältige Bestandsaufnahme sein. Eine konkrete Zieldefinition sowie ein Soll-Ist-Vergleich ermöglichen eine nachträgliche, fundierte Wirkungsabschätzung der getroffenen Maßnahmen. Projekte müssen kohärent zur Gesamtstrategie sein, nach einer Risikoabschätzung priorisiert und anschließend in Maßnahmenplänen konkretisiert werden (vgl. Günthner et al. 2017).

Einsparen von Energie als Themenbereich zur gesellschaftlichen Vermittlung der Ziele der Smart City erscheint für die meisten Bürger oder Bewohner bis zu einem gewissen Grad nachvollziehbar und plausibel, solange es sich dabei um ein einzelnes (vielleicht eigenes) Gebäude handelt. So ist es einleuchtend, dass sie durch technische Eingriffe, beispielsweise der Optimierung der Energieerzeugungsanlagen oder durch thermische Sanierung, sowie durch eigenes Verhalten bereits einen Beitrag zur Einsparung von Energie und in weiterer Folge von CO2 leisten können. Die Vermittlung fällt dann auch leicht, da es durch die konkreten Werte der kWh faktisch auch in einem wirtschaftlich nachvollziehbaren Rahmen ist.

Eine Herausforderung in der Vermittlung ist der Maßstabssprung auf die Ebene des Quartiers oder der gesamten Stadt. Denn die Nachvollziehbarkeit der Maßnahmen unterscheidet sich darin, dass es sich um einzelne Projekte handelt, die dann häufig als Leuchtturmprojekte deklariert werden oder um gesamtstädtische Strategien.

Die Absicht der sogenannten Leuchtturmprojekte liegt vor allem in der Umsetzung eines Bauprojektes, z. B. eines öffentlichen Gebäudes oder ein energetisch optimierten Wohngebiets, aber es kann sich auch um die Herstellung eines öffentlichen Raumes, wie einen Platz, handeln. Die punktuell angelegten Maßnahmen unterliegen dabei zwei Herausforderungen, damit sie im Sinne der Smart City erfahren werden können:

Wie sind die Projekte im Gesamtkonzept einer Smart City Entwicklung einzuordnen und wie differenzieren sie sich von Projekten, die bisher umgesetzt wurden? Die darauffolgende Frage muss sich damit beschäftigen, wie die einzelnen Projekte sich in die Gesamtstrategie der Smart City einfügen.

Die Problematik in der Umsetzung und Vermittlung ist unwesentlich komplexer als die eines Einzelprojektes. Ob nun Strategie der öffentlichen Räume, Klima- oder Verkehrsstrategie, sie alle vereinen ein eher diffuses Bild, was vor allem mehr von einer Absicht der Erfüllung als von der konkreten Umsetzung getrieben ist.

In diesen Fällen ist der direkte Nutzen einem Bewohner eher schwer zu vermitteln. Dies liegt an der Ungewissheit im Hinblick auf den zeitlichen Rahmen der Umsetzung, aber auch an der eher komplexen Darstellung eines Mehrwertes, beispielsweise wirtschaftlich.

Damit die Umsetzung einer Smart-City-Planung nachvollziehbarer wird und den Bürger persönlicher anspricht, ist es sinnvoller, einzelne Stadtteile oder Quartiere als Fokusbereiche auszuwählen. So versucht die Stadt Salzburg, im nördlichen Stadtteil Itzling die Ideen der Smart City zu konzentrieren, indem dort sichtbar unterschiedliche Projekte gebündelt werden. Diese reichen beispielsweise von der Optimierung von rad- und fußläufigen Verbindungen über die energetische Optimierung einer Nachkriegssiedlung bis hin zur Idee eines CO2-neutralen Stadtteiles. Bemerkenswert ist ebenso, dass auch andere Initiativen und Strategien, die in dem Stadtteil stattfinden, sich zu einem gesamtplanerischen Ansatz zusammenfügen können. Problematisch in der Umsetzung ist weniger das Fehlen von Ideen und Konzepten, sondern vielmehr die Koordination aus einer Hand. Durch diese räumliche Konzentration kann der Bürger in seinem direkten Lebensumfeld erfahren, wie die Ziele der Smart City umgesetzt werden, und kann sich mit diesen identifizieren, sie ebenso kritisieren, aber auch selbst beeinflussen. Eine Herausforderung bei der Kommunikation ist vielmehr das Branding durch die „Smart City“, denn häufig handelt es sich um Projekte, die im herkömmlichen Sinne unter dem Themengebiet der Stadterneuerung bzw. Sanierung oder des Stadtumbaus laufen könnten.

Allerdings wird die Frage der Umsetzung und Akzeptanz der Smart-City-Idee nicht nur bei der planerischen Ebene der Stadt oder des Quartiers beeinflusst, sondern auch bei der Entwicklung eines Forschungsbereiches bzw. der Weiterentwicklung von Forschungslinien wird der Umsetzungsgedanke beeinflusst und auch inhaltlich gesteuert.

4 DER WEG ZUR FÖRDERUNG DER SMART CITY IN ÖSTERREICH

Die zwei aktuellen und zentralen Förderungsprogramme mit einem Bezug zu Smart City in Österreich sind zum einen „Stadt der Zukunft“ und zum anderen die Smart-Cities-Initiative „Smart City Demo“. Das Programm „Stadt der Zukunft“ des BMVIT wurde 2013 mit der ersten Ausschreibung gestartet. Inklusive der 4. Ausschreibung im Jahr 2016 wurden 107 Projekte mit einem Gesamtvolumen von 26,8 Mio. Euro gefördert. Für die 5. Ausschreibung im Jahr 2017 stand ein Fördervolumen von 6 Mio. Euro zur Verfügung (Österreichische Forschungsförderungsgesellschaft, 2018). Das Programm fokussiert sich auf Technologien bzw. technologische Teilsystem als Beitrag für Smart-Cities-Entwicklungen. Die Bandbreite der Inhalte der geförderten Projekte spannt sich unter anderem von Technologien und Geschäftsprozessen für urbane Energiesysteme über energieorientierte Stadtplanung und Gestaltung sowie Innovationen für die grüne Stadt bis hin zu Demonstrationsgebäuden und -siedlungen. Primäre Zielgruppe dieses Programms sind Technologieakteure und Forschungsinstitutionen. Eine fallweise Kooperation mit Kommunen ist möglich, wird jedoch kaum vollzogen.

Die Smart-Cities-Initiative „Smart City Demo“ des Klima- und Energiefonds unter der Präsidie des BMLFUW und dem BMVIT startete mit dem 1. Call im Jahr 2010. Bis ins Jahr 2017 wurden 109 Projekte mit einem Gesamtvolumen von circa 44,2 Mio. Euro gefördert. Nur knapp 25 % der Projekte betrafen groß angelegte Demonstrationsprojekte. Gemäß Systemanspruch des Programms steht eine Fokussierung auf umfassende Stadtkonzepte, Strategien und Demonstrationsvorhaben im Vordergrund mit Städten und Forschungsinstitutionen als primärer Zielgruppe. Energie und Mobilitätsaspekte stehen im Vordergrund, eine Fokussierung auf Einzeltechnologien ist nicht erwünscht (Klima- und Energiefonds, 2018). Betrachtet man die Ziele gemäß § 1 sowie die Aufgaben gemäß § 3 des Bundesgesetzes über die Errichtung des Klima- und Energiefonds – Klima- und Energiefondsgesetz BGbl. I Nr. 40/2007 –, wird die Schwerpunktlegung auf Energiethemen, die Absicherung und der Ausbau der Technologieführerschaft Österreichs sowie die Forcierung von Projekten zur Unterstützung der Marktdurchdringung von klimarelevanten und nachhaltigen Energietechnologien deutlich (Österreichische Bundesregierung, 2007). Dies spiegelt sich in den durchgeführten Demonstrationsvorhaben wieder, die zwar einen Anspruch an einen integrierten Handlungsansatz durch die Kombination verschiedener Handlungsfelder (z. B. Gebäude, Energie, urbane Mobilität, Kommunikation & Information etc.) auf einer dem Gebäude übergeordneten Maßstabsebene stellen, dieser jedoch in den Vorhaben kaum verwirklicht werden kann. Das Thema Energie beherrscht die Projekte, andere Handlungsfelder werden oft stiefmütterlich behandelt.

5 DISKUSSION UND LÖSUNGSANSÄTZE

Die gegenwärtige Art, wie in Österreich die Smart City durch Förderungen thematisch gesteuert und durch die Planungspraxis umgesetzt wird, zeigt, dass zu sehr in einzelnen Projekten gedacht wird, was aufgrund der Umsetzbarkeit und Repräsentation auch nachvollziehbar ist. Die Problematik der Entwicklung und Realisierung einer gesamtstädtischen Strategie unterscheidet sich dabei nicht von anderen planerischen Strategien. Es bleiben solche, solange eine Roadmap fehlt, die zeigt wie mittels verschiedener Schritte eine Realisierung erfolgen kann.

Es gilt zu diskutieren, ob die Interpretation des Konzeptes der Smart City den Status eines städtebaulichen Leitbilds besitzen kann und welchen Einfluss dieses für die Stadt haben kann. Unabhängig, ob die Smart City im europäischen Kontext der Stadtentwicklung als Leitbild oder als Planungsziel wirken soll, besitzt sie die gleichen Erfordernisse wie ein Leitbild, denn es sollte in jedem Fall „auch die zu Entscheidungen berufene (zum Beispiel kommunale) Politik erreichen“ (Jonas 2017:321). Dies bedeutet, dass erst dann, wenn Lokalpolitik gemeinsam mit örtlichen Verwaltungsorganen zusammenarbeiten, ähnlich wie bei anderen Planungsprozessen die Implementierung erfolgreich sein kann.

Eine offene Fragestellung bleibt die Art der Vermittlung und in gewissem Rahmen auch Überzeugung der Bewohner der Städte. Die Entwicklungen der vergangenen Jahre haben deutlich gezeigt: Smart Cities taugen derzeit als relevantes Branding im Standortwettbewerb der Städte. Die Skepsis gegenüber der Smart City wird auch bedingt durch die Dominanz von global agierenden Technologieanbietern in der Diskussion um die Entwicklung der Smart Cities, die ihr urbanes Produktportfolio propagieren . Ein aktueller Punkt, der zu Diskussionen und Kritik führt, ist das Thema des Smart Meters. Dessen Einführung ist technisch, z. B. zur Steuerung der Energienachfrage, durchaus nachvollziehbar. Aus Sicht des Verbrauchers ergeben sich dadurch jedoch Bedenken bezüglich der Privatsphäre, unter anderem durch die Möglichkeit der Nutzung von Verbraucherdaten durch Dritte. (Jakubowski, 2014)

Eine Hürde, die es im Prozess zu überwinden gilt, ist die Kombination verschiedener Themenbereiche. Es zeigt sich beispielsweise, dass die Sanierung eines Gebäudekomplexes bzw. eines Quartieres weniger eine rein technische Frage ist. Vielmehr liegt der Schlüssel eines erfolgreichen Projektes darin, dass durch strukturierte Information und Beteiligung der Bewohner eine Akzeptanz und ein Verständnis für die Maßnahme geschaffen werden müssen. Ebenso scheint es die Vermittlung zu vereinfachen, wenn mit der Sanierung auch andere Eingriffe und Verbesserungen am Gebäude oder im Wohnumfeld durchgeführt werden. Zusammenfassend bedeutet dies für die einzelnen Fachdisziplinen, wie den Städtebau, die Architektur oder die Energietechnik, die immerwährende Forderung nach einem interdisziplinären Haltung und einer integralen Planung, die in realisierten Smart-City-Demoprojekten in Österreich zwar oftmals propagiert, jedoch selten nachhaltig verfolgt werden.

Einen Ansatzm der sowohl aus Sicht der Forschung, als auch in Verbindung mit der Praxis zielführend sein kann, stellen die Living Labs bzw. die Reallabore dar. Neben dem Lernen mit- und voneinander in einer nachhaltigen Umgebung können die Labs dafür sorgen, Innovationen zu schaffen, um neue Produkte, Prozesse oder Organsiationsformen zu entwicklen (Evans & Karvonen, 2011). Die Innovationen können sich dabei auf technologische oder auch soziale Aspekte konzentrieren (Holst, 2012). In diesen Pilotprojekten oder Modellquartieren besteht die Möglichkeit, Konzepte und Technologien in einem überschaubaren und reversiblen Rahmen auszuprobieren sowie deren Auswirkungen zu überprüfen. Dies trägt nicht nur zu einer offenen Innovationskultur bei, sondern ermöglicht auch die frühe Einbindung der Zivilgesellschaft. Von Seiten des Bundes und der Länder sollten derartige Reallabore angeregt bzw. unterstützt werden und die Möglichkeiten einer erhöhten Fehlertoleranz geschaffen werden (vgl. Günthner et al. 2017).

Wie das bereits angeführte Beispiel zeigt, werden wie in der Planung der Smart City auch in Living Labs die beiden Aspekte, technisch wie sozial, miteinander kombiniert. Eine Frage im Rahmen einer Planung eines Smart-City-Labs ist weniger, ob es sich um ein räumlich abgegrenztes Labor handelt oder um ein thematisch fixiertes. Beides ist in Österreich anhand des Projektes der Seestadt Aspern im Prinzip erfolgt.

Wichtig wäre es, ein Umfeld für die Reallabore zu schaffen, damit diese in einer übersichtlichen Maßstabsebene, beispielsweise dem Stadtquartier, umsetzbar wären. Durch die Fokussierung auf ein Quartier ist es möglich, sich lokal mit den vorhandenen Problemen, etwa Sanierungsrückstand, aber auch Defiziten im öffentlichen Raum oder fehlenden Infrastruktureinrichtungen, zu beschäftigen. Dies würde bei der Entwicklung einer städtischen Gesamtstrategie helfen, Schwerpunkte zu setzen.

Darüber hinaus sollten die Kommunalverwaltungen beim Management solcher Projekte durch Bund und Länder unterstützt bzw. entlastet werden. Forschungsinstutionen können die Aufgabe des systematischen Monitorings, der Begleitung, Evaluierung sowie Vernetzung und Verwertung übernehmen und so die Kommunen wissenschaftlich unterstützen (vgl. Günthner et al. 2017). Städte und Gemeinden sind oftmals Träger der kommunalen Planungshoheit, Eigentümer eines großen Bestandes an Gebäuden sowie Auftraggeber und erster Ansprechpartner für Wirtschaft und Zivilgesellschaft im Aufbau von Smart Cities. Der Zugang zu Entscheidungsträgern kann nur mit Hilfe der Kommunen gewährt werden. Dabei ist darauf zu achten, dass es einen schrittweisen stattfindenden Personal- und Know-how-Transfer aus Technologieunternehmen in die Städte gibt (Jakubowski, 2014).

Eine Möglichkeit aus Sicht der Forschungsförderung wäre es, vergleichbar dem urbanen Mobilitätslabor, die Arten der Reallabore zu fördern. Diese sollten sich weniger auf einen Themenbereich wie die Mobilität richten, sondern vielmehr auf städtische Quartiersstrukturen, die sich regelmäßig wiederholen. Die Vorteile eines Gründerzeitquartieres gegenüber den Nachteilen einer Nachkriegssiedlung im Hinblick auf beispielsweise die städtebaulichen Strukturen oder die Bausubstanz sind in der Planungspraxis deutlich, aber wie gestalten sich die Pros und Contras in einer gemischt genutzten und über Jahrzehnte gewachsenen Struktur?

6 QUELLEN

Anthopoulos, Leonidas G. (2017): Understanding Smart Cities: A Tool for Smart Government or an Industrial Trick? Cham, s.l.: Springer International Publishing (Public Administration and Information Technology, 22). Online verfügbar unter http://dx.doi.org/10.1007/978-3-319-57015-0.

Evans, J., & Karvonen, A. : Living laboratories for sustainability: Exploring the politics and pistemology of urban transition 2011. In H. Bulkeley, V. C. Broto,M. Hodson, & S. Marvin (Eds.), Cities and low carbon transitions (pp. 26–141). London: Routledge.

Günthner, Stephan; Schweitzer, Eva; Jakubowski, Peter (Hg.): Smart City Charta. Digitale Transformation in den Kommunen nachhaltig gestalten. Bundesinstitut für Bau-, Stadt- und Raumforschung. Stand Mai 2017. Bonn: Bundesinstitut für Bau- Stadt und Raumforschung. Online verfügbar unter http://www.bbsr.bund.de/BBSR/DE/Veroeffentlichungen/Sonderveroeffentlichungen/2017/smart-city-charta-dl.pdf?__blob=publicationFile&v=2.

Holst, M. :The living lab methodology handbook. 2012

Klima- und Energiefonds : Smart-Cities-Initiative des Klimafonds. Online verfügbar unter http://www.smartcities.at/foerderung/smart-cities-initiative-des-klimafonds-/, 2018 zuletzt geprüft am 02.04.2018.

Jakubowski, P.: Auf dem Weg zu Smart Cities. In BBSR-Analysen KOMPAKT 04/2014, Bundesinstitut für Bau-, Stadt-, und Raumforschungs im Bundesamt für Bauwesen und Raumordnung, Bonn

Jonas, Carsten: Stadtplanerische und städtebauliche Leitbilder seit der Mitte des 19. Jahrhunderts. Ein Überblick 2017.

Schaffers, H., Komninos, N., Pallot, M., Trousse, B., Nilsson, M., & Oliveira, A.: Smart cities and the future internet: towards cooperation frameworks for open innovation, the future internet. 2011 Lecture Notes in Computer Science, 6656,pp 431–446.

Österreichische Bundesregierung : Bundesgesetz über die Errichtung des Klima- und Energiefonds – Klima- und Energiefondsgesetz (KLI.EN-FondsG), 2007. Online verfügbar unter https://www.ris.bka.gv.at/GeltendeFassung.wxe?Abfrage=Bundesnormen&Gesetzesnummer=20005371, zuletzt geprüft am 02.04.2018.

Österreichische Forschungsförderungsgesellschaft: Stadt der Zukunft - Das Programm 2018. Online verfügbar unter https://www.ffg.at/programme/stadt-der-zukunft, zuletzt geprüft am 02.04.2018.

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Sustainability Assessment of Urban Water Infrastructure Systems with Special Focus on the Urban Water-Energy Nexus

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1 ABSTRACT

The growing population in cities (United Nations 2011) increases the pressure on water and energy resources. Additionally, water and energy uses are interrelated in manifold ways: for example, water is used in the energy sector for cooling purposes and energy is used for wastewater treatment (Jägerskog et al. 2014). The pressure on resources and their interlinkages are calling not only for a more efficient use of resources but for integrated and more sustainable solutions making, in some cases, reuse indispensable. Facing those challenges, various innovative infrastructure systems have been developed. The appropriate solutions strongly depend on the particular context and must be chosen carefully to shape the respective urban water-energy nexus in a more sustainable way. When implementing new systems the following questions should be considered: What is their particular effect on resource efficiency? Which further impacts on the sustainability performance of the urban water system do they cause? Further research especially on methodological approaches is needed to get answers to those questions.

Therefore, in this study a methodology for sustainability assessment of new alternative water and sanitation systems (NASS) was developed with a special focus on the urban water-energy nexus using as a case study a city district in Chillán, Chile. The technologies for new alternative water and sanitation systems to be compared were chosen in close interaction with the local stakeholders. Moreover, regionally adapted sustainability indicators were developed on the basis of the Integrative Concept of Sustainable Development (ICoS) of the German Helmholtz Association (Kopfmüller et al. 2001). In a first step, a preliminary set of indicators was developed from a scientific perspective based on crucial aspects with regard to the sustainability performance of different water infrastructure systems. In a second step, the indicators were further developed together with local and regional stakeholders.

Keywords: water-energy nexus, sustainability assessment, reuse, water infrastructures, urban planning

2 INTRODUCTION

More than half of the world's population is currently living in cities. Due to UN prognosis this figure will raise by 2.6 billion up to 2050 and cities will have to absorb all the occurring population growth in the coming decades (United Nations 2011). The high population concentration in cities, especially in big cities, leads to a strong pressure on resources to assure among others water and energy supply. Water management systems worldwide have to meet important requirements related to challenges as demographic change, climate change, rising resource prices and increasing situations of water scarcity. Especially more flexibility and reuse options are required compared to the traditional linear water/urban drainage systems.

Therefore, new alternative water and sanitation systems (NASS) have been developed working on a decentralized (household level) or semi-centralized (city district level) scale treating the often separated sectors stormwater, drinking water supply and wastewater disposal in an integrative way. Those resource oriented infrastructure systems are based on separated collection and selective treatment of different flows. They aim at reuse of energy, material and water flows within the catchment and at providing a cost efficient alternative or supplement to existing systems. Another important objective is high flexibility to cope with both rapidly growing population in cities and shrinking population (mostly in rural areas) (see DWA 2008 for more information). Those new sanitation systems have been implemented in several pilot projects at different scales mostly in central and northern Europe but also in other parts of the world, e.g. in China (Albold 2014, Nolde 2013, Bieker et al. 2010).

Water and energy are closely interrelated. Urban water services cause high energy consumption as e.g. conventional wastewater treatment but also water uses at household level, especially warm water production are very energy intensive. In the last ten years the scientific debate about the water-energy nexus has intensified and various assessment approaches have been developed. From the 'energy for water' perspective looking at the energy demand related with water services the focus of most assessment approaches is on resource efficiency, mainly on energy intensities, and on environmental impacts (Nair et al. 2014; Kenway et al. 2011). This is also the fact in optimisation approaches to find the best feasible solution for planning, design and operation of water systems where according to Vakilifard et al. (2018) the importance of spatial aspects is mostly not taken into account. Even more striking is, however, that social and cultural aspects are mostly not included in assessment approaches in the water-energy nexus field, although the term "sustainability" is often used.

There are, however, also approaches for a comprehensive sustainability assessment of water systems. Nevertheless, the very common separation into economic, ecological and social assessment criteria (Dehoust et al. 2015; Ma et al. 2015) has serious shortcomings: Multiple social primary goods that are essential for sustainability assessment are overlapping these criteria and cannot be addressed with a pillar approach. Therefore, an integrative sustainability concept was developed by the Helmholtz Association (Kopfmüller et al. 2001) - the Integrative Concept of Sustainable Development (ICoS). This concept is based on three constitutive elements: 1) inter- and intragenerational justice, 2) a global perspective regarding goals and strategies and 3) an enlightened anthropocentric approach (for more details about the structure of the concept see Kopfmüller et al. 2001). For the operationalization, these three elements were transferred into three general sustainability goals. Based on these, substantial sustainability rules were established defining minimum requirements for sustainable development as shown in table 1.

General sustainability goals		
Securing human existence	Maintaining society's productive potential	Preserving society's options for development and action
Substantial sustainability rules		
Protection of human health	Sustainable use of renewable resources	Equal access of all people to information education and occupation
Ensuring satisfaction of basic needs	Sustainable use of non-renewable resources	Participation in societal decision-making processes
Autonomous subsistence based on income from own work	Sustainable use of the environment as a sink for waste and emissions	Conservation of cultural heritage and cultural diversity
Just distribution of chances for using natural resources	Avoiding technical risks with potentially catastrophic impacts	Conservation of the cultural function of nature
Reduction of extreme income or wealth inequalities	Sustainable development of man-made, human and knowledge capital	Conservation of social resources (e.g. tolerance or solidarity)

Table 1: Structure of the Integrative Concept of Sustainable Development (ICoS), general goals and minimum sustainability requirements.

ICoS also defines instrumental sustainability rules concerning the transformation process. Those are, however, not included in the core assessment in this study as they mostly refer to regions or nations as evaluation object and not to technologies. The substantial as well as the instrumental sustainability rules are defined in a very general way and have to be contextualized in every case. Thus, according to ICoS sustainability indicators are developed specifically for every application case combining on one hand a scientific normative perspective and on the other hand a problem oriented approach involving stakeholders. In this study, a methodology for holistic sustainability assessment is developed based on ICoS. It is applied for the comparison of a conventional centralized water system with an innovative semi-centralized water system using a city district of Chillán, Chile, as a case study. The first step is the development of sustainability indicators, discussed in section 3. As in literature about new alternative water and sanitation systems, they are often compared to the conventional centralized system without explaining the reasons for the technological choice of the innovative systems, special regard was given to transparent technology choice in this study as presented in section 4.

3 DEVELOPMENT OF SUSTAINABILITY INDICATORS

The development of sustainability indicators was realized in several steps as described in section 3.1. Detailed explanation of the single indicators and the results obtained from the expert interviews are presented in section 3.2.

3.1 Methodological approach

As a first step in the development of sustainability indicators, a thorough literature analysis including research on new alternative water and sanitation systems (Remy 2010; Hillenbrand 2009; Bieker et al. 2010; Makropoulos et al. 2008; Sapkota et al. 2016 etc.), research on the urban water-energy nexus (Jägerskog et al. 2013; Perrone et al. 2011; Kenway 2013 etc.) as well as studies focussing on sustainability assessment of water services in the Latin American context (Lehn et al. 2012; Kosow et al. 2013) was realized. Well-established sustainability indicators were collected but also key parameters used in different assessment approaches were included. The whole process of developing sustainability indicators is shown in figure 1.

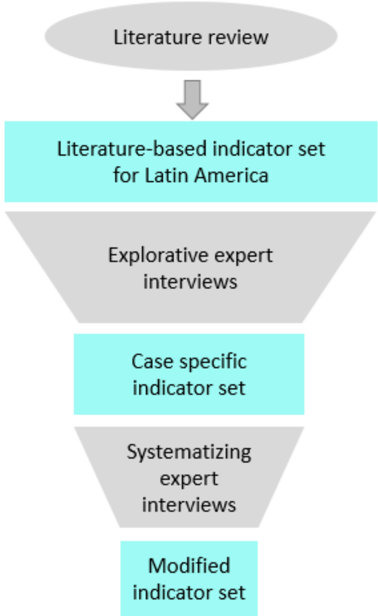

Fig. 1: Development of sustainability indicators including scientific perspective and local expert knowledge in several steps.

As the assessment methodology is intended to serve as basis for decision support, assessment and comparison of different water infrastructure systems shall be possible without implementation of pilot projects within the same region. Hence, the aim is to allow for a prospective assessment without having real experiences and performance data under the framework conditions in which the decision shall be taken. This was taken into account in the development of the sustainability indicator set. As far as possible such indicators were chosen to which performance data can be obtained through modelling of material and energy flows occurring in the different infrastructure systems (or directly from literature on pilot projects in other parts of the world in which case the different framework conditions have to be taken into account when transferring information). This was fairly easy to realize for some rules or topics of ICoS and more difficult for others. As the methodology for sustainability assessment is developed using case studies in Latin America, this was also the regional framework for the first indicator development.

According to Kopfmüller et al. (2001) sustainability indicators have to fulfil numerous scientific, functional, practical and stakeholder driven requirements that were considered in this study. In order to assure that indicators adequately represent the problems and challenges perceived in the society, cooperation with local and regional experts and citizens in the development of indicators is necessary. This was realized in several steps as shown in figure 1. First, explorative semi-structured interviews were conducted. Based on the exploration of perspectives on sustainability challenges regarding the urban water-energy nexus and the perceived potential of innovative water infrastructure systems with reuse options the first literature based set of indicators was modified to obtain a case specific indicator set.

In a second step, systematizing expert interviews as categorized by Bogner and Menz (2009) based on the case specific indicator set as a detailed interview structure followed. In all interviews the position of the interviewer as well from a professional perspective but also the cognitive interest were revealed in order to provide the interviewees with an information basis to allow for opinion making about the interviewer as postulated by Bogner and Menz (2009). In the systematizing interviews, the case specific set was discussed in detail with regional experts in order to get their estimation of the single indicators. The sustainability rules

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of ICoS were presented as topics as the term is easier to handle. Many criteria play a role to evaluate the suitability and quality of indicators (see Kopfmüller et al. 2001). In this study, relevance was identified as one important criterion for the evaluation of the indicators by stakeholders as it indicates to what degree the proposed indicator represents the sustainability challenges perceived in the society. Besides that, indicators have to fulfil practical requirements. Among those the applicability was identified as most important addressing data availability, periodic updating and reasonable effort for data acquisition.

The central criteria relevance and applicability allowed for a guided and structured discussion of the proposed indicators. This was realized in bilateral meetings with academic or research oriented experts. These were chosen as interview partners after a first test discussion within an expert workshop showed the difficulty to discuss sustainability indicators (being very far from the daily work life) with professionals from local and regional administration without comprehensive preparation of the topic. The workshop results were also included in the interpretation of the results but show a lower information level than the results from the bilateral meetings.

A detailed joint discussion of the sustainability indicators with experts from local and regional key institutions has to be conducted with more profound preparation which was not possible in the framework of the conducted field work. This will be realized in a second research stay. First, bilateral meetings to exchange on sustainability indicators and second a round table to discuss jointly will take place. Furthermore, the inclusion of affected citizens is very important. In this case, instead of detailed sustainability indicators more general sustainability challenges (based on the ICoS rules) would have to be used as a basis for the discussion. The results can then be included in order to identify up to which degree the developed sustainability indicator set overlaps with the sustainability problems perceived by the citizens and where no overlap exists which means that indicators address challenges that are not perceived as problems in the society or which problems exist that are not sufficiently covered by the sustainability indicators. In the ideal approach, those deficits have to be addressed again in a circular way by developing additional indicators and modifying the existing ones.

3.2 Resulting sustainability indicator set

The expert interviews showed that stakeholders evaluated relevance and applicability quite heterogenously. In table 1-3 a detailed explanation of the regionally developed indicators and the reasons for their development based on literature and explorative expert interviews is given. The results from the systematizing interviews concerning the relevance of the indicator and the applicability are presented in the last four columns. Relevance and applicability are listed in the table as tendency shown in the interview results. The range of the corresponding answers is indicated by the colour (green in case of quite similar answers; yellow in case of more differing answers; red in case of very diverging answers). Additional information gained from the systematizing expert interviews is presented in additional columns.

Table 2 shows the indicators developed on the individual level concerning the general sustainability goal “Securing human existence”. The first indicator concerning the first topic “protection of human health” is the *concentration of faecal coliforms [MPN/100 ml] in the receiving water bodies upstream and downstream of the discharge points of the corresponding treatment plants*. This indicator was developed based on considerations about the direct link between waterborne diseases and missing or insufficient sanitation systems (WWAP and UNESCO 2015). According to the interviews this indicator seems to be quite relevant as it was stated that this path presents the principal contact to human beings as many illegal connections exist to use the river water for irrigation or filling of swimming pools. The answers were quite similar regarding relevance as indicated by the green colour. It was however also pointed out that in the application the productive activities in the area have to be taken into account to consider their contribution to possible contaminations and especially to distinguish different contamination sources. Moreover, it was commented that the distance upstream and downstream to the discharge point have to be defined very carefully based on available data. The applicability was estimated with a tendency towards medium but the answers differed within a wide range between low and high applicability as indicated by the red colour.

SECURING HUMAN EXISTENCE						
Topic	**Indicator**	**Reason for development of indicator**	**Rele-vance**	**Additional information on relevance**	**Applica-bility**	**Comment regarding application**
Protection of human health	Concentration of faecal coliforms [MPN/100 ml] in receiving water bodies upstream and downstream of discharge points of the corresponding treatment plants	Many severe waterborne diseases are directly linked to insufficient sanitation systems	high	Presents an important exposure pathway for human beings as there are many illegal connections for irrigation and swimming pools;	medium	Productive activities (potential contamination sources) to be considered; lack of data probable (no upstream control is prescribed)
	Concentration of faecal coliforms [MPN/100 ml] in effluents of the specific treatment plants	Additionally to first indicator because easier to apply	high		high	Is measured according to the regulation (DS 90)
	Concentration of faecal coliforms [MPN/100ml] in shallow aquifers possibly influenced by wastewater influence (sewage leakage etc.)	Groundwater often influenced by sewer leakage; high number of private dug wells used for garden irrigation	high	In some sectors pit latrines exist contaminating groundwater but groundwater is not widely used but through scattered private dug wells	medium	Lack of data because no monitoring of faecal coliforms in groundwater takes place;
	Average temperature difference between urban zone and rural environment in summer months (day and night temperatures) [°C]	Given the climatic conditions in the region heat stress can present a health problem	Low	No high density of houses but wide streets and a lot of urban green; heat is not perceived as a problem as people are used to it;	medium	
Ensuring satisfaction of basic needs	Interruptions of the respective supply systems (hours per year)	Constant stable water supply is essential for good sustainability performance	High	Supply interruptions seldom in current centralized system but possibly more frequent in the future; innovative systems might be prone to frequent interruptions;	High	No data on innovative semi-centralized systems in Chile
	Interruptions of the respective discharge and disposal systems (hours per year)	Non-reliable functioning of the disposal system can provoke health issues	High	Unlikely to happen in centralized system; higher risk (less control) in semi-centralized system;	High	No data on NASS in Chile, differences (level of maintenance…) to be considered when transferring information from European pilot projects

Table 2: Sustainability indicators regarding the general sustainability goal “Securing human existence”.

MAINTAINING SOCIETY'S PRODUCTIVE POTENTIAL						
Topic	**Indicator**	**Reason for development of indicator**	**Rele-vance**	**Additional information on relevance**	**Applica-bility**	**Comment regarding application**
Sustainable use of renewable resources	Ratio of total water demand to renewable water resources in the basin of the Rio Chillán	Well-established indicator (water exploitation index, WEI); aim: scale up effects of NASS to basin level to see impact of residential savings on general water situation (vs. e.g. agriculture)	High	Might become more important in the future due to rising water demand and declining water resource availability	Medium	Data on groundwater resources and also on updated water demand might be difficult to obtain
	Ratio of water extracted from Rio Chillán to flows in Rio Chillán	Greater level of detail in the assessment like the specific impact of residential uses on superficial water resources and information on seasonal fluctuations	High		Medium	Water rights no suitable information basis for water demand but actual extraction not measured, only extraction point is monitored;
Sustainable use of non-renewable resources	Energy demand for operation of urban water system based on non-renewable resources per supplied inhabitant	Urban water infrastructure systems have a high energy demand especially on the household level which is also included here;	High	Indicator has educational bearing as it shows the benefits of the innovative systems	High	Seasons of the year and corresponding water sources have to be taken into account in the analysis;
	Possible coverage of nutrient demand in subcuenca of the Rio Chillán by use of WW residues as fertilizer (%)	NASS might present higher potential to use sanitation residues as fertilizer to substitute mineral fertilizer due to the higher quality of the sludge that can be achieved in semi-centralized systems.	Medium	Presents new business case, small farmers to be prioritized; use of sludge restricted to forestry, fruit growing, floriculture;	Medium	Data on the sludge from ESSBIO is necessary as use potential depends on quality; data on use of fertilizers available
Sustainable use of the environment as a sink for waste and emissions	Conc. of parameters defined in Chilean regulation *Decreto 90* at corresp. discharge points into environment	Bunch of parameters as starting point to be further narrowed down; parameters regularly monitored; discharge points defined in broad way to include all discharge points in the different systems	High		Medium	Groundwater should be included in assessment; greywater should comply with regulation for irrigation uses (under development)
	Anthropogenic pollutants from sanitation residues (sewage sludge, blackwater digestate) per specific quantity of nutrients	Sludges with different qualities; possible pollution referred to nutrients which should control amount of sludge applied;	Medium	Currently, sludge deposition only allowed in forests	Low	Emerging pollutants probably not measured, only data on heavy metals available

Table 3: Sustainability indicators regarding the general sustainability goal "Maintaining society's productive potential".

With regard to the topic "Sustainable use of the environment as a sink for waste and emissions" (see table 3) the assessment presents some challenges. On the one hand, the first indicator is rather a bunch of indicators: it was discussed as *concentrations of parameters defined in the Chilean regulation 'Decreto 90' at the corresponding discharge points into the environment (WWTP effluent or greywater used for irrigation…)*. The reason to choose those parameters defined in the regulation for waste water treatment plants as a starting point was the fact that those parameters are regularly monitored and well-established as quality criteria. However, the high number of parameters has to be narrowed down in the course of the project. On the other hand, the discharge points were defined in a very broad way in order to include all different discharge points where emissions into the environment might occur in different water systems. In innovative semi-centralized systems these might include green areas where contaminated irrigation water is applied or leakage from the blackwater treatment. Therefore, in the comparison of different infrastructure systems the different impacts linked to the different contamination paths (soil, aquatic environment, direct human contact etc.) have to be taken into account. Thus, it is not possible to define one single threshold value or sustainability target value for the different paths that occur in the different systems. This makes a simple comparison of the performance of the systems in this topic difficult.

PRESERVING SOCIETY'S OPTIONS FOR DEVELOPMENT AND ACTION						
Topic	**Indicator**	**Reason for development of indicator**	**Rele-vance**	**Additional information on relevance**	**Applic a-bility**	**Comment regarding application**
Participation in societal decision-making processes	Percentage of planning processes including stakeholder participation	Cannot be measured prior to implementation; purely used as background information	High	Stakeholder participation required and requested in such water infrastructure projects especially as residential uses are concerned;	Low/ mediu m	Survey on knowledge of potential users about different water systems necessary (without knowledge no informed decision making possible)
Conservation of the cultural function of nature	Concentration of faecal coliforms [MPN/100 ml] in the receiving water bodies used for bathing upstream and downstream of the discharge points of the corresponding treatment plants	Rivers are used for bathing	High	People use river for bathing despite low water quality due to lack of knowledge	Mediu m	Unclear which areas are used for bathing; monitoring of faecal coliforms only in official bathing zones;
	Days of the year during which the flow in the river Chillán is below the environmental flow	Included as indicator to assess impact of water withdrawals for anthropogenic uses on the river quality (assessed as cultural value for humans)	High	Tourists only care if river falls dry and residents care a little more but not much;	Low	Reduced residential water uses might have only small impact on water with-drawals ("saved" water used for other purposes);

Table 4: Sustainability indicators regarding the general sustainability goal "Preserving society's options for development and action".

The topic "Participation in societal decision-making processes" is also influenced by the water infrastructure systems (see table 4). Depending on the framework conditions the existence of centralized service systems can lead to a poor power position of the individual users towards big institutions or companies. Therefore, in some situations the gain of power is one reason to think of semi-centralized systems as it is assumed that in a semi-centralized system the individual user has more influence on the operation of the system than in centralized systems. Although the gain of power of the individual user is no motivation for innovative semi-centralized systems in the study area Chillán participation is still an important issue to be taken into account as there might be indirect effects of infrastructure systems on participation issues. However, these cannot be measured prior to implementation. Therefore, a simplified indicator being the *Percentage of planning* *processes including stakeholder participation* has been included in order to serve as background information because no information on the different impacts of the compared systems can be obtained without implementation. It was confirmed in the interviews that such water infrastructure projects absolutely required participation especially as residential uses were addressed and that participation was in general highly requested. It was, however, pointed out that a high number of environmental conflicts showed that in decision processes information was taking place instead of participation. Another interesting aspect that was pronounced was the need to do a survey on the level of knowledge of potential users in order to know whether or to which level e.g. people buying a house are aware of different water systems and their implications which would be a prerequisite for informed participation in decision-making processes.

With regard to the topic "Just distribution of chances for using natural resources" no indicators have been developed so far as the precise city district could not be determined by the time of the interviews. City districts with different levels of income might require a different approach in the design of the corresponding indicators. Therefore, although this topic is influenced by the type of water infrastructure system the indicators will be developed later in the study which is still in progress.

The last of the sustainability topics discussed based on ICoS that is influenced by water infrastructure systems is the "Conservation of the cultural function of nature". The first indicator developed to that topic was concretized to bathing zones based on stakeholder feedback. It was then defined as *concentration of faecal coliforms [MPN/100 ml] in the receiving water bodies [used for bathing] upstream and downstream of the discharge points of the corresponding treatment plants*. But it was also mentioned that unofficial bathing zones exist which should be taken into account but where it might be difficult to obtain data.

In summary, 7 of the 15 sustainbility topics were considered important for the implementation of innovative water systems in the respective region. Usually 1-2 indicators were defined for each topic, one exception is 'human health' with 4 indicators. This emphasises the relevance of human health with regard to the water-related technologies.

4 SELECTION OF TECHNOLOGICAL COMPONENTS

In this study, special regard was given to a transparent choice of the technologies which are implemented in the new alternative water and sanitation system (NASS). First, potential technological components were identified from a thorough literature analysis about existing pilot projects which aim at a more sustainable design of the urban water-energy nexus and second, out of that compilation appropriate technological components for the local context were selected based on evaluation of the particular components by local stakeholders as described in section 4.1. The result of the technology choice which is the system design that will be modelled and compared to the conventional centralized system is presented in section 4.2.

4.1 Evaluation process

Special regard is given to the choice of the technology components which are included into the NASS compared to the conventional centralized system. First, components that are implemented within pilot projects (mostly in Europe) have been collected. The semi-centralized innovative system shall guarantee high standards with regard to supply security and professionalism. Decentralized components, however, may represent considerable hygiene risks due to lack of maintenance etc. (Bieker and Cornel 2016). Household based solutions like compost toilets and urine-separation toilets according to some authors (Bieker et al. 2010) present problems in densely populated urban areas due to hygiene, maintenance and disposal of output products. Those components were, therefore, not included in the collection.

In order to compare water infrastructure systems generally suitable for the case study area, the resulting collection of potentially feasible technologies was then evaluated by local and regional experts. Besides a general evaluation of each possible component the respective incentives and barriers were inquired. Therefore the interviewees were invited not to stick too strictly to currently existing limitations e.g. legal restrictions but also to suggest ideas going beyond that. A visualization of possible technological components and the respective water streams was used to structure the answers and evaluations given by the interviewees as shown in figure 2.

The technology evaluation was first planned for a joint expert workshop in Chillán. Due to a low number of participants the evaluation was then continued in bilateral meetings between the researcher and one or more experts from one institution in the premises of the respective institution in order to make the participation as easy as possible.

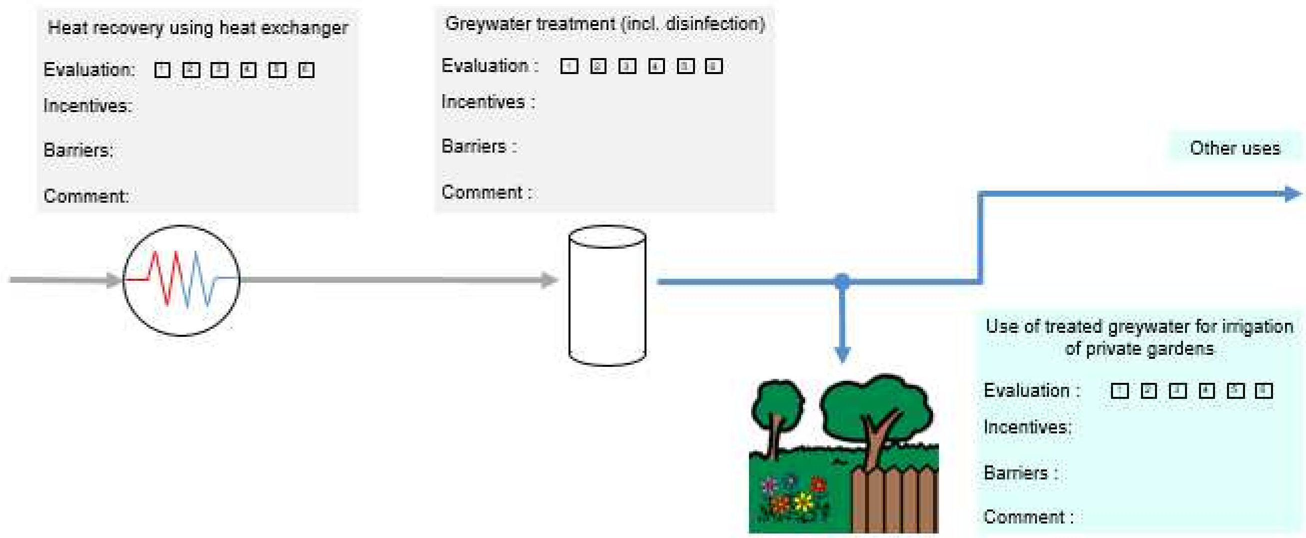

Fig. 2: Section of visualization of system components and possible flows which was used for evaluation with experts.

4.2 Resulting system design

The results of the interviews showed very diverging opinions on different technologies.

Collection of stormwater is already implemented in areas where no stormwater collector exists and is even mandatory in those areas. However it was pointed out that depending on the use of that water the sanitation company would have to treat a higher volume of wastewater compared to the metered supplied drinking water. Furthermore, the seasonal variations have to be taken into account when designing a use concept (as there is almost no precipitation during summer). Based on that, the most favoured use of rainwater is toilet flushing where it is preferred over treated greywater because implementation seemed easier to the respondents. Due to lack of rain in summer, use for irrigation would be restricted to a very short period or huge storage capacities would be required and was therefore evaluated as poorly feasible. The use of rainwater for laundry was also seen as problematic because of seasonal quality fluctuations (smoke contamination in winter and pollen in spring).

Greywater treatment including disinfection to allow for reuse of the water is seen mostly as favourable. However, some interviewees are also critical because the price for drinking water is considered to be quiet low compared to the investment needed for the greywater treatment. Furthermore, the maintenance requirements and the legal framework are seen as potential barriers for greywater reuse. One interesting issue can be found when looking at the different answers: The sanitation company is named as potential barrier by one interviewee but the sanitation company's representative himself assumes the operation of a greywater system to be a potential new business case that might be interesting for his company in some new areas. This contradiction can be interpreted as a hint to a mentality or tendency of searching barriers and hindering aspects in the field of responsibility of other stakeholders. But it also underlines that the question, who operates such a system is seen as very important. One important use of treated greywater is toilet flushing in times of insufficient rainwater. Another important use is irrigation. However, there is no consensus on whether a use for the irrigation of the private gardens of the house owners is preferable or whether irrigation of public green areas by the municipality should be preferred. In this context the question of ownership and beneficiary has to be addressed. For example in a case where private house owners pay for the greywater treatment but the municipality benefits through the use for irrigation of public green areas a remuneration would have to be paid. Referring to the existing legal framework it was pointed out that a regulation for greywater reuse is in progress which only allows use for toilet flushing and for irrigation of private gardens. A strong cultural barrier was seen for the use of treated greywater for laundry.

Concerning the use of greywater not only as material but also as an energy resource, heat recovery from warm greywater (using a heat exchanger) was discussed and is clearly seen as promising. However, the costs for the installation are seen as a barrier. Therefore, a cost benefit analysis is required. It is pointed out that use of the recovered thermal energy not only for warm water production but especially an integration with the heating system would be promising as the heat demand in winter is high and is causing considerable air pollution because wood stoves are a widespread technology. Furthermore, a combination with solar thermal systems which are already a well-established technology in Chile is proposed by a majority of the respondents.

Solar thermal heating systems were assessed positively by the interviewed experts. It was commented that they function very well in summer but have a limited potential in winter. Therefore, a combination with heat recovery from warm greywater was proposed. Additionally, it was highlighted that subsidies for solar thermal exists but only for social housing. Therefore, in other houses the costs for the installation are seen as a possible barrier. An interviewed architect pointed out that solar thermal systems were no purchase criterion and were therefore no longer implemented in new houses.

Another technical option to reduce the energy demand that was evaluated together with the experts is technical adiabatic cooling to substitute conventional air conditioning (AC). Although this was seen as interesting to save energy and related costs in general, it was pointed out that, as it is a new technology, lack of knowledge and maintenance might be a problem in the Chilean context and that the use of AC is not very widespread in Chillán anyway. Furthermore, the general level of insulation is not very high and radiators usually don’t exist. Therefore, the conditions for a proper functioning of technical adiabatic cooling systems were doubted. The only use option that was mentioned as possibly promising was the use in buildings, especially in public buildings. In this case the use of treated greywater for technical adiabatic cooling was seen as a good option as rainwater is not available in the summer period and drinking water should not be wasted for cooling purposes. Given the strong barriers assigned to that component and the fact that the case study is a residential district it will not be integrated in the design of the new infrastructure system that is to be compared to the conventional system.

Adiabatic cooling through evaporation from green facades and green roofs was also discussed. It was mostly seen as problematic because strengthening of the roofs and regular maintenance would be required both causing high costs. In addition to that, a cultural barrier was mentioned because people are not familiar with the technology and might fear problems with mould formation. Furthermore, the interviews on sustainability indicators showed consensus that heat island effect is not a problem in Chillán. Therefore, green roofs or green facades will not be part of the new infrastructure system that will be modelled and evaluated in the further course of this project.

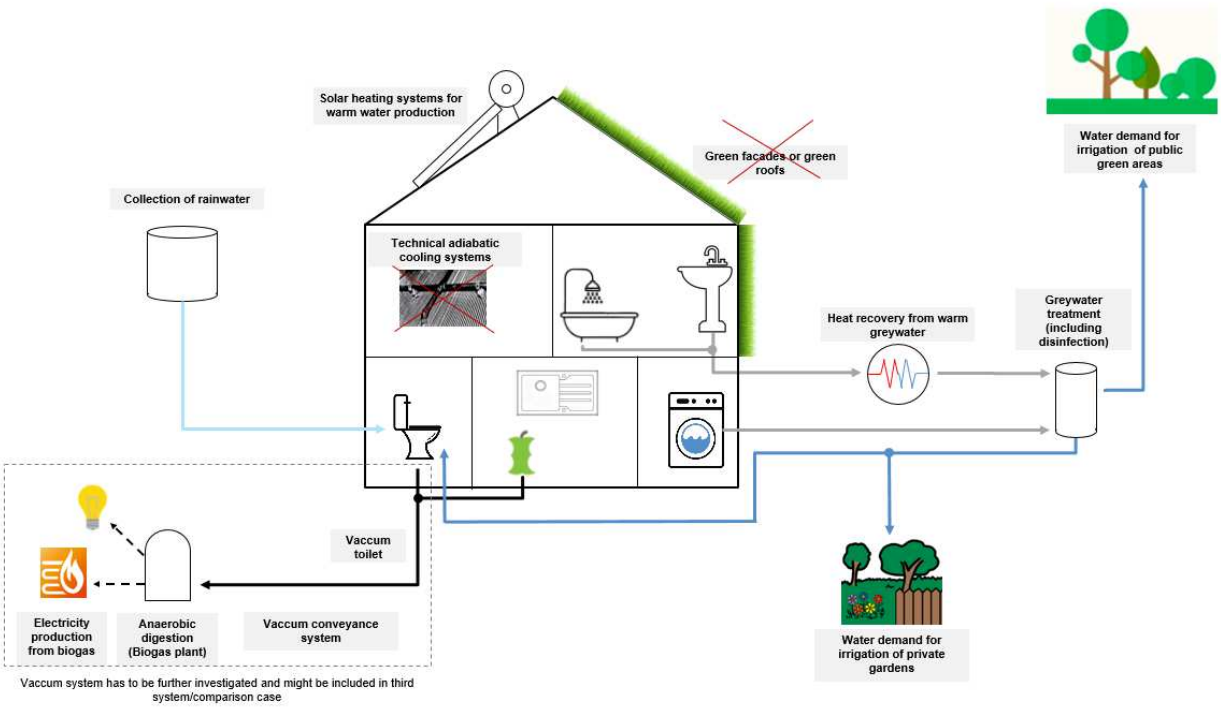

Fig. 3: Resulting system design of the innovative semi-centralized system that will be modelled.

For the disposal of the remaining blackwater stream a vacuum system was evaluated in a discussion with the experts. The experts were asked for their evaluation of a vacuum toilet and a vacuum conveyance system separately in order to get a more detailed image on the existing barriers which might e.g. be technical in case of the vacuum pipe and pump but cultural in case of the vacuum toilet. The other components that were discussed were the anaerobic treatment of the concentrated blackwater and the use of the herewith produced biogas for electricity production. The answers showed two clearly different poles. Some interviewees rated the whole vacuum system as unfeasible mainly due to strong cultural barriers but also due to legal and institutional barriers arguing that the sanitation company had the concession for the wastewater disposal. Other respondents assigned a high potential to the vacuum system. They pointed out that the high water savings would be a strong incentive and that there would be interest from agriculture to use the digestate as fertilizer but commented that lack of knowledge might be problematic. As many and strong barriers were named for the vacuum system it will not be included into the innovative system to be modelled, first. But as some experts on the other hand attributed a high potential to the vacuum system it will have to be further investigated whether it should be included in a third system as additional comparison.

Figure 3 shows the innovative system which will be modelled and compared to the conventional centralized system based on the results of the expert interviews.

5 CONCLUSION AND OUTLOOK

Aim of this study is to compare the sustainability performance of different water infrastructure systems in the respective local context. For this purpose, different water infrastructures to potentially improve the sustainability performance were chosen. Furthermore, sustainability indicators were developed upon which the technology components should be compared. Both steps considered the expertise and judgements of local stakeholders.

Important infrastructure components are among others the reuse of heat from warm grey water using a heat exchanger and the reuse of the greywater itself after treatment and disinfection. Stormwater collection and use for toilet flushing is also seen as very promising. Not considered as a technological option were for example green facades what might be a consequence of the fact that the heat island effect does not play an important role in the regional setting. The most relevant sustainability indicators according to local experts are addressing the fields of human health and of the sustainable use of renewable and non-renewable resources. Stakeholders had very different opinions on relevance and applicability of the indicators. The reasons for the different perspectives will be further analysed in an upcoming workshop.

In a next step, the application of the chosen technologies shall be modelled with the software SIMBA#. The results on the respective sustainability performance of the different systems shall be compared without implementing them in order to allow for prospective sustainability assessment as a contribution to well-informed decision making. Where possible, target values for the resulting indicators will be defined and a distance-to-target analysis for the different water infrastructure systems shall be carried out. The sustainability assessment shall combine the quantitative values received from the modelling with semi-quantitative data on the system performance obtained from local stakeholders. The results from sustainability assessment will finally be interpreted and visualized allowing the use for decision support.

With regard to the development of sustainability indicators, the inclusion of affected citizens is also very important. In this case, the discussion could be based on more general sustainability challenges with regard to the water-energy nexus instead of detailed indicators. By comparing those to the expert's sustainability indicators, additional fields of actions (which are not covered by the indicator set) could be identified.

6 REFERENCES

Albold, A. (2014): Flintenbreite. OtterWasser GmbH. Lübeck, 07/2014.

Bieker, S.; Cornel, P.; Wagner, M. (2010): Semicentralised supply and treatment systems: integrated infrastructure solutions for fast growing urban areas. In: Water science and technology: a journal of the International Association on Water Pollution Research 61 (11), S. 2905–2913. DOI: 10.2166/wst.2010.189.

Bieker, S.; Cornel, P. (2016): SEMIZENTRAL: Flexibilität durch innovative Verfahren. In: Thomas Kluge und Engelbert Schramm (Hg.): Wasser 2050. Mehr Nachhaltigkeit durch Systemlösungen. München: oekom, S. 123–130.

Bogner, A.; Menz, Wolfgang (2009): Das theoriegenerierende Experteninterview. Erkenntnisinteresse, Wissensformen, Interaktion. In: A. Bogner, B. Littig und W. Menz (Hg.): Experteninterviews. Theorien, Methoden, Anwendungsfelder (3. Aufl.): VS Verlag für Sozialwissenschaften.

Dehoust, G.; Gsell, M.; Möck, A.; Sutter, J. (2015): Demonstrationsvorhaben Stadtquartier Jenfelder Au. Kopplung von regenerativer Energiegewinnung mit innovativer Stadtentwässerung (KREIS). Arbeitspaket 4: Ökologie und Nachhaltigkeit. Öko-Institut e. V. Berlin/Darmstadt.

Deutsche Vereinigung für Wasserwirtschaft, Abwasser und Abfall e.V. (DWA) (2008): Neuartige Sanitärsysteme. 2008. Aufl. Hennef (DWA-Themen).

Hillenbrand, T. (2009): Analyse und Bewertung neuer urbaner Wasserinfrastruktursysteme. Zugl.: Karlsruhe, Univ., Diss-, 2009. Karlsruhe: Verl. Siedlungswasserwirtschaft (Schriftenreihe SWW Karlsruhe, 134).

Jägerskog, A.; Clausen, T. J.; Holmgren, T.; Lexén, K. (Hg.) (2014): Energy and Water: The Vital Link for a Sustainable Future. Stockholm International Water Institute (SIWI). Stockholm (Report Nr. 33).

Jägerskog, A.; Clausen, T. J.; Lexén, K.; Holmgren, T. (2013): Cooperation for a water wise world-partnerships for sustainable development. In: Report 32, SIWI, Stockholm.

Kenway, S. J.; Lant, P. A.; Priestley, A.; Daniels, P. (2011): The connection between water and energy in cities: a review. In: Water Science & Technology 63 (9), S. 1983. DOI: 10.2166/wst.2011.070.

Kenway, S. J. (2013): The Water-Energy Nexus and Urban Metabolism-Connections in Cities. In: Urban Water Security Research Alliance: Brisbane.

Kopfmüller, J.; Brandl, V.; Jörissen, J.; Paetau, M.; Banse, G.; Coenen, R.; Grunwald, A. (2001): Nachhaltige Entwicklung integrativ betrachtet. Konstitutive Elemente, Regeln, Indikatoren. Berlin: Ed. Sigma (Global zukunftsfähige Entwicklung, 1).

Kosow, H.; León, C.; Schütze, M. (2013): Escenarios para el futuro - Lima y Callao 2040. Escenarios CIB, storylines & simulación LiWatool.

Lehn, H.; McPhee, J.; Vogdt, J.; Schleenstein, G.; Simon, L.; Strauch, G. et al. (2012): Risks and Opportunities for Sustainable Management of Water Resources and Services in Santiago de Chile. In: Dirk Heinrichs, Kerstin Krellenberg, Bernd Hansjürgens und Francisco Martínez (Hg.): Risk Habitat Megacity. Berlin, Heidelberg: Springer Berlin Heidelberg, S. 251–278.

Ma, X.; Xue, X.; González-Mejía, A.; Garland, J.; Cashdollar, J. (2015): Sustainable Water Systems for the City of Tomorrow – A Conceptual Framework. In: Sustainability 7 (9), S. 12071–12105. DOI: 10.3390/su70912071.

Makropoulos, C.K.; Natsis, K.; Liu, S.; Mittas, K.; BUTLER, D. (2008): Decision support for sustainable option selection in integrated urban water management. In: Environmental Modelling & Software 23 (12), S. 1448–1460. DOI: 10.1016/j.envsoft.2008.04.010.

Nair, S.; George, B.; Malano, H. M.; Arora, M.; Nawarathna, B. (2014): Water–energy–greenhouse gas nexus of urban water systems: Review of concepts, state-of-art and methods. In: Resources, Conservation and Recycling 89, S. 1–10. DOI: 10.1016/j.resconrec.2014.05.007.

Nolde, E. (2013): Grauwasser, ein unverzichtbarer Baustein der Energiewende. In: fbr-Schriftenreihe Band 16. Energetische Nutzung von Regenwasser, Band 16: Energetische Nutzung von Regenwasser (2013), S. 133–147.

Perrone, D.; Murphy, J.; Hornberger, G. M. (2011): Gaining perspective on the water-energy nexus at the community scale. In: Environmental science & technology 45 (10), S. 4228–4234. DOI: 10.1021/es103230n.

Remy, C. (2010): Life cycle assessment of conventional and source separation systems for urban wastewater management. Dissertation. TU Berlin, Berlin.

Sapkota, M.; Arora, M.; Malano, H.; Moglia, M.; Sharma, A.; George, B.; Pamminger, F. (2016): An Integrated Framework for Assessment of Hybrid Water Supply Systems. In: Water 8 (1), S. 4. DOI: 10.3390/w8010004.

United Nations, Department of Economic and Social Affairs Population Division (Hg.) (2011): World Urbanization Prospects. The 2011 Revision. ST/ESA/SER.A/322.

United Nations World Water Assessment Programme (WWAP); UNESCO (Hg.) (2015): The United Nations World Water Development Report 2015. Water for a Sustainable World. Paris.

Vakilifard, N.; Anda, M.; Bahri, P. A.; Ho, G. (2018): The role of water-energy nexus in optimising water supply systems – Review of techniques and approaches. In: Renewable and Sustainable Energy Reviews 82, S. 1424–1432. DOI: 10.1016/j.rser.2017.05.125.