Identifying Cultural Ecosystem Services of Urban Green Infrastructure – Report about a Pilot Project undertaken in Lower Austria

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1 ABSTRACT

Access to adequate environmental amenities is fundamental for the sustainability and quality of human life, requiring a better understanding of ecological patterns and processes in the places most people call home. As more people will live in cities than in rural environments, this means that the daily interaction with nature for most people will come from their everyday urban places, including urban green infrastructure. The Lower Austrian "Wohnbauforschung" has funded our pilot project in Laa an der Thaya to investigate ecosystem services of urban green infrastructure. This article focuses on our identification of cultural ecosystem services.

In itself, green infrastructure represents a compendium of ideals, seeking to improve human well-being and living conditions. Included in those ideals are the concepts of ecosystem services, restoration of natural habitats, improving biodiversity, human well-being and adaptation to climate change. One of the most important challenges of the 21st century is to sustain the functions of ecosystems and to support ecosystem services for those issues. Urban green infrastructure is intrinsically a heterogeneous landscape of micro-infrastructure networks set in a culturally-determined ecosystem. Sustaining and co-ordinating the multiple benefits from an urban network of neighbourhood green infrastructure will require an integrated landscape framework, a coherent approach to governance and collaborative adaptive management. Urban green infrastructure is considered more and more as a strong sustainable tool in adressing those challenges[1]. A paradigm shift at multi-scalar levels requires an urban green infrastructure strategy that integrates some of the fundamental concerns of urban citizens in their everyday lives. These include quiet places for contemplation and restoration of their health and well-being, environmental security, and the cultivation and culture of food. In these everyday gestures can the relationship between people and nature be restored.

The value of ecosystem services in the form of urban green infrastructure has become increasingly recognised in the policy agenda (Carpenter et al., 2009), supported by a growing number of studies on their benefits and costs. But the gap to implementation remains to be bridged over. As the ecosystem services of green infrastructure are still not well recognised in Austrian municipal councils, we initiated a place-based approach to the perception of green infrastructure and climate change in Laa an der Thaya. This pilot project aims on the one hand to enhance the understanding of ecosystem service benefits of green infrastructure and on the other to strengthen the potential for the implementation of green. Urban green infrastructure included all public spaces, urban forests and parks. We considered green infrastructure as a network integrating a broad range of quality green places, designed and managed to enhance the character of place, while providing multiple benefits of ecosystem services. Our investigations at selected places represent a place-based scale where it is possible for humans to perceive and understand effects of climate change, as well as the benefits of urban green infrastructure. Within this approach the perceived cultural ecosystem services of the stakeholders were incorporated with a survey of existing ecosystem services (CO_2 storage, rainwater management and urban heat island effects) to estimate the benefits from green infrastructure. This would lead to the intitial development of modules to implement and enhance the urban green infrastructure in Laa.

To overcome the barriers to implement green infrastructure an integrated approach has been developed together with a core stakeholder group. The "cultural services"[2] were investigated in a public participation process, the Moved Planning Process or "MPP" (Rottenbacher 2009), in conjunction with a SWOT analysis to strengthen reflection and appreciation of the natural benefits of urban green infrastructure systems. In a

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[1] see European Calls (e.g. FP7-ENV-2013- Urban biodiversity and green infrastructure) and policies (e.g. European Commission, D. G. Environment (2012). Science for Environment Policy. In-depth report on "The Multifunctionality of Green Infrastructure". http://ec.europa.eu/environment/nature/ecosystems/docs/Green_Infrastructure.pdf

[2] "*Cultural services are primarily regarded as the 'environmental settings, locations or situations that give rise to changes in the physical or mental states of people, and whose character are fundamentally dependent on living processes'. Over millennia these environmental settings have been co-produced by the constant interactions between humans and nature*" (Church et al., 2011; Haines-Young and Potschin, 2013; in: CICES going local).

dialogue about cultural ecosystem services and the multiple benefits of green infrastructure we defined together "special " areas, i.e. areas that are of a particular value, eg. for recreation, as meeting places, but also available places wherein green infrastructure can be implemented.

2 DEFINITIONS

2.1 Urban Green Infrastructure

Green infrastructure is defined as an interconnected network of green space that conserves natural ecosystem values and functions to provide associated benefits to human populations. "The underlying principle of Green Infrastructure is that the same area of land can frequently offer multiple benefits. By enhancing Green Infrastructure, valuable landscape features can be maintained or created, which are not only valuable for biodiversity but also contribute to the delivery of ecosystem services such as the provision of clean water, productive soil, attractive recreational areas as well as climate change mitigation and adaptation. In addition, Green Infrastructure can sometimes be a cost-effective alternative or be complementary to grey infrastructure and intensive land use change." (31.7.12: http://ec.europa.eu/environment/nature/ecosystems)

Different studies and reports present a variety of definitions of green infrastructure. These definitions differ in their emphasis on the various components, features and characteristics of green infrastructure. Some definitions stress the importance of biodiversity conservation, through the role in connecting ecological networks and contributing to landscape scale conservation. Others focus on the functionality of green infrastructure and stress its importance in providing ecosystem services, comparing its role to man made infrastructure such as engineered drainage systems and flood defences. In other context, the emphasis is on the benefits of green infrastructure to communities in enhancing the built environment and providing a resource for recreation, supporting human health and improving quality of life.

Urban green infrastructure is primarily set within a human ecosystem that is defined by gradients of "nature", and its 'domesticated' ecosystem functions, services and biodiversity. This matrix represents the relationship between humans and nature whose cultural landscape is a unique signature of ecosystem services. Furthermore, humans privilege certain green infrastructure forms and processes over others, to maximise benefits possibly at the expense of ecosystem functions and intrinsic values. In negotiating a framework to recognise the potential for socio-cultural adaptations, we require a dialogue to explore the relationship between people and their urban nature. This is to reach a more durable stewardship of natural processes that would manage trade-offs among ecosystem services. The green infrastructure paradigm in urban areas requires the restoration of natural processes and functions to a meaningful degree, relative to the location, type and scale of the problem (Convention on Biodiversity, 2000). Urban green infrastructure can neither be a "return to the wild" nor the dissembling objection that nature is simply a cultural artefact. Instead urban green infrastructure should provide a significant restoration of natural processes to a meaningful performance of urban ecosystem services starting with a dialogue about their cultural ecosystem services.

2.2 Ecosystem services

Ecosystem Services ("ESS") derive from ecological processes or functions that are essential for human wellbeing and have a value to individuals or society at large. The terms ecosystem function and ecosystem service have been used interchangeably, creating confusion that still exists. Ecosystem function is defined as the "capacity or capability of the ecosystem to do something that is potentially useful to people" (Costanza et al., 1997). The capacity to deliver a service exists independently of whether anyone wants that service. This capacity becomes a service when benefits can be identified. "Put simply using ecosystem-based approaches means working with nature for human well-being."[3]

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[3] In May 2011, the European Commission adopted the Biodiversity Strategy which aims to halt the loss of biodiversity in the EU by 2020. Target 2 of this Strategy states that "by 2020, ecosystems and their services are maintained and enhanced by establishing green infrastructure and restoring at least 15% of degraded ecosystems. To achieve this target three closely related actions are foreseen:

- Improve knowledge of ecosystems and their services in the EU (Action 5)
- Development of a Green infrastructure Strategy (Action 6)
- Ensure no net loss of biodiversity and ecosystem services (Action 7)"

We consider that the sustainable use of ecosystem services, delivered in the form of urban green infrastructure, is a cost-effective solution in mitigating the anthropogenic impacts of urban regions.
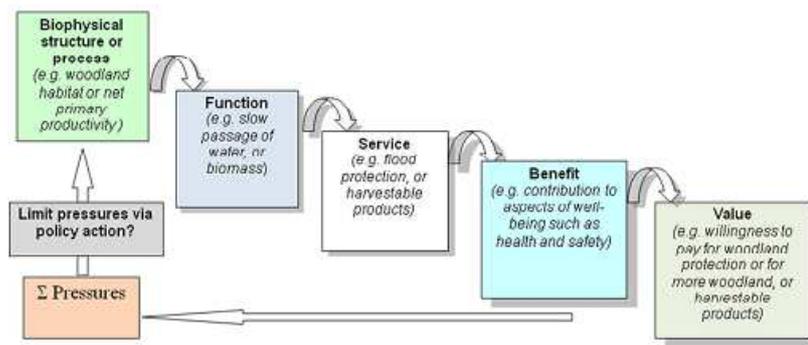

Fig.1 The ecosystem service cascade model, showing the relationship between biophysical structures and processes, functions, services, and benefits as well as values for human well-being (Potschin and Haines-Young, 2011)

2.2.1 Valuing ecosystem services of urban green infrastructure

For an integrated cultural ecosystem services approach it is particularly important to assess local knowledge and place-based values in conjunction with biophysical parameters associated with the range of ecosystem services available. In urban centres, where humans with their cultural diversity are an integral ecosystem component, such services are indispensable to the quality of urban life. However these services have been the most impacted from degradation.

Integrating cultural ecosystem services into decision making and planning processes incorporates different societal concepts of world views, meanings and attachment to place and include values associated with place. The concept of values (natural character values of green infrastructure and character values of place e.g. identification and attachment) describes the process of evaluation by which people and their communities attach importance or significance to a natural process or natural resource within their neighbourhood or locality. Character values of place are defined by place quality parameters (design analysis) and by the attachment to place. The dynamic relationship between the biophysical and cultural worlds play a role in facilitating place making[4] and place meaning.[5] People come to identify with nature and place within an integrated process. Personal knowledge about place derived from experiences is incorporated into the cultural framework dealing with social relationships, circumstances, patterns and other codes of conduct. These structures and social realities are reconstructed, confirmed and extended with everyday experiences with place. Simultaneously the modalities of perception orientate individual feelings, emotions and thinking patterns. The capacities for environmental concern in the context of place making lie in how we perceive, feel, discover and invent place, and how we integrate our concern into to everyday actions.

There have been investigations concerning the role of cultural values, meanings and place attachment (Höppner et.al.2008), how they determine self-efficacy and outcome-efficacy in place-based participation processes. This then can be further developed to an ongoing adaptation of actions necessary to implement and maintain green infrastructure. These feedbacks can reduce policy resistance as it requires us to see how our actions feed back to shape our environment (Sterman 2008). Adaptive management provides a useful and widely applicable approach:

- can be applied at different scales (regional, national and local) and benefits can be realised over short and long term time periods;
- may be more cost-effective than measures based on hard infrastructure and engineering;
- can integrate local traditions and cultural values.

The TEEB synthesis report (2010) identified aspects of cultural ecosystem services (e.g. spiritual values) as non-use values that are not associated with actual use but stem from people's knowledge that nature exists

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[4] The concept of place making describes the process how the values are manifested in ongoing behavior, engagement and maintenance of place.

[5] Meaning of places represents various phenomena of emotional relationships to places (positive and negative). The range reaches from concepts of rootedness, of belonging, protection, appropriation, the sense of possession and control over a place, of comfort, to humans´experiences with nature and wilderness.

('existence value') or because they wish it to exist for future generations ('bequest value') or for others in present generations ('altruist value'). Generally these are important values and are rarely valued in monetary terms.

2.2.2 Frameworks for classifications- from MA to CICES

As there are a diversity of approaches and multiple classifications, comparisons of assessments are difficult. Often used classification systems are the Millenium Assessment (2005) ("MA") and Common International Classification for Ecosystem Services (2012) ("CICES"). According to the complexity of the topic and the different ideals staying behind it seems reasonable to integrate these classification models within holistic planning frameworks and adaptive management.

A need was recognized to design a "common base" of approach that enables comparison between ESS assessments at different places (Haines-Young and Potschin, 2009). This approach should be specific enough to relate to the several context, while remaining relevant to a multitude of objectives for which frameworks and adaptive implementations can be developed (Nahlik et al., 2011).

CICES in comparison to MA refers to the final outputs from ecosystems. Following common usage in the ESS literature, the classification recognises these outputs to be provisioning, regulating and maintenance, and cultural services, but it does not cover "supporting services" used in the MA. As the supporting services are only indirectly consumed or used, they are treated as part of the underlying structures and processes that characterise ecosystems. CICES was initiated by the European Environment Agency (EEA) and is coordinated by the University of Nottingham (Haines-Young and Potschin[6]). One of the advantages of the CICES approach is that it allows adjustment to local conditions.

The latest CICES classification for cultural ecosystem services was applied to focus areas in Laa using a participation and negotiation process, while integrating the benefits of regulating services.

2.2.3 Cultural Ecosystem Services

All cultural service classes in CICES refer to a bio-physical setting that can provide cultural services. Direct benefits we can derive from cultural services are:

- recreation – physical, social, spiritual and mental well-being;
- nature exploration, contemplation;
- living in an attractive and healthy environment;
- nature education;
- motoric and creative development for children;
- ongoing cognitive recreation, reflection and development (not in CICES).

Benefits for wellbeing are mentioned in the last column of CICES. There also benefits like the satisfaction and mental well-being from outdoor work are mentioned.

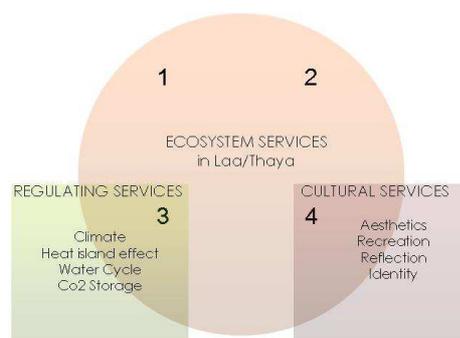Our Investigation in Laa focused on regulating and cutural services.

Fig.2 Focus of work /Regulating- and Cultural Ecosystem Services

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[6] Haines-Young and Potschin are mainly responsible for adaptations of the CICES classifications.

For surveying cultural services we combined the recent classification of CICES-Be[7] (Turkelboom et al. 2013) with insights from environmental studies about human health and well-being in the context of urban green infrastructure and the Moved Planning Process (MPP). Our goal was to enhance the classification, as well as to develop an implementation and management framework, using the dynamics of the community to express their identification with the cultural ecosystem services. We also assessed degraded or missing services in order to identify opportunities for additional green infrastructure.

The relationships between nature, environmental changes and human health are complex because they often can be perceived and experienced indirectly, displaced in space and time. Human health ultimately depends on ecosystem benefits, which are essential for a productive livelihood. The diversity of interactions between climate change, changing conditions for urban vegetation as well as health and well-being is not yet integrated in planning frameworks. Longer hotter summers can cause an increase of greenhouse gases, health effects due to the heat, an increase in energy costs due to the increased demand for air conditioning and a deterioration of the conditions of urban vegetation.

Well-being in residential environments is based on a continuum of available identification and fields for expressions and activities, each dependent on contact with green places in their seasonal rhythms. Well-being also identifies several components for a good life, such as freedom and choice, health, good social relations and personal safety.

Research results about the relationship human-nature suggest that parks and other natural environments play a crucial role in human health and well-being as humans also have psychological, emotional and spiritual needs (Wilson 1984, Frumkin 2001, Wilson 2001). An interesting overview about research and assessment methods on nature experience, cognitive function and mental health is given by Bratman, Hamilton and Daily (2012), who differenciate which elements of the natural environment may have impacts on cognitive function and mental health and what may be the most effective type, duration, and frequency of contact. Nature contact can happen in various forms:

- Stay in a park can reduce stress, the experience of green spaces support recreation and relaxation, stress reduction and mental health.

- Natural environments also have a restorative function. Ulrich (1984) for example, examined that hospital patients with views of trees and nature in front of their windows experience faster healing;

Chiesura (2003) has shown that natural environments with vegetation and water cause relaxation - using this natural elements for calming in urban areas is increasing - as stress is a growing aspect of daily life in towns.

In addition to aesthetic, cognitive, and health benefits, natural features can also bring social benefits, such as a diverse use of open space, which can increase social integration and interaction among neighbors. For example, national and international initiatives for urban community gardening that provide a cogent means to strengthen integration of immigrant communities.[8]

3 STRATEGY

Collaborative adaptive management provides a strategic approach to realise the potential of sustainable ecosystem services in mitigating the impacts from urban settlements and development.

3.1 Collaborative Adaptive Management CAM

The collaborative adaptive management approach is an implementation framework for urban green infrastructure that facilitates and enhances community participation, collaboration, monitoring, natural character assessments, best practice guidelines, conflict resolution and negotiation with policy impediments. It represents a flexible platform for citizen science and support for communities of practice. Adaptive management is a paradigm that assumes urban green infrastructure policies and actions are not static, but are adjusted based on learning from actions affecting ecosystem functions and services. A collaborative adaptive management approach incorporates and links knowledge and credible science with the experience and values of stakeholders for more effective management decision making.

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[7] CICES-Be (Belgium) is a recent development of the CICES framework that provided a more refined categorisation of cultural services that was more amenable to our project in Laa.
[8] see research results on https://communitygarden.org/resources/research/, from 3.3.2014.

According to Sterman (2008), complexity in a world (i.e. ecosystem) that is dynamic, evolving and

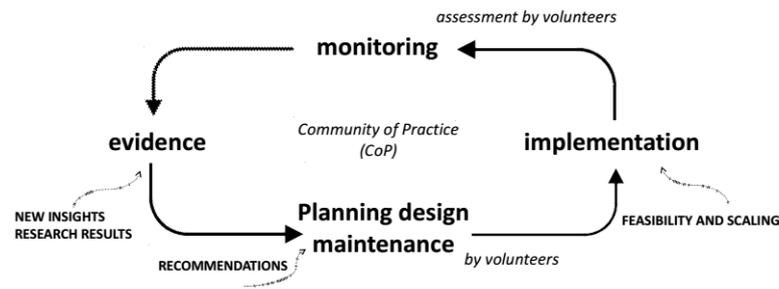**COLLABORATIVE ADAPTIVE MANAGEMENT (CAM) FOR URBAN GI**

Fig.3 CAM Collaborative Adaptive Management to integrate learning and acting

interconnected reduces our ability to discover the impacts of interventions. This hinders the implementation of policies on the basis of evidence.[9] Even when strong evidence is available, common mental models and judgemental bias lead to erroneous but self-confirming inferences:

overconfidence in our judgments (underestimating uncertainty);

wishful thinking (assessing desired outcomes as more likely than undesired outcomes);

confirmation bias (seeking evidence consistent with our preconceptions).

There is a tendency to think in short, causal chains, assuming each effect has a single cause. Ignoring or not recognising feedbacks in policy design can lead to policy resistance. Given the inherent ecological and social uncertainty in complex urban decision making, adaptive management recognises that it is not always possible, a priori, to identify the "best" management alternative. Therefore, an experimental approach is warranted, and learning about the system becomes a deliberate goal. In the Laa project we try to increase public knowledge by initiating an iterative learning process or 'spiral' through the reflection of cultural ecosystem services. This then will be embedded in a collaborative adaptive management program.

3.2 Communities of Practice

The concept of communities of practice ("CoP") is based on social learning theories and practices to address complex systems and challenging environmental issues. There is a dynamic connection between identity and practice. Developing a practice requires the formation of a community whose members can engage with one another. They deal with shared interests as well as with the group dynamic of shared practice, and the effects of belonging to the group through the way they engage in action with one another and relate to one another. The challenge is to foster CoP development with existing neighbouhood groups in Laa.

In this sense, the formation of a community of practice is also the negotiation of identities:

- Identity as negotiated experience. We define who we are by the ways we experience ourselves through participation.
- Identity as community membership. We define who we are by the familiar and the unfamiliar.
- Identity as a learning trajectory. We define who we are by where we have been and where we are going.
- Identity as a relation between the local and the global. We define who we are by negotiating local ways of belonging to broader constellations and of manifesting broader discourses (Wenger 2010).

We investigated methods of stakeholder and community participation using the Moved Planning Process (MPP) combined with targeted focus group interviews, along with participatory mapping of community and place character values. These initiatives are designed to link local perceptions of place to environmental values, providing an important contribution of local knowledge. Similarly the aim is to raise awareness of the

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[9] "Creating a healthy, sustainable future requires a fundamental shift in the way we generate, learn from, and act on evidence about the delayed and distal effects of our technologies, policies, and institutions. Deep change in mental models arises when evidence not only alters our decisions within the context of existing frames, but also feeds back to alter our mental models. An iterative learning process in which we replace a reductionist, narrow, short-run, static view of the world with a holistic, broad, long-term, dynamic view, reinventing our policies and institutions accordingly." (Sterman 2008).

green infrastructure policy, as well as opportunities for implementation and innovation. These investigation methods also provide insights into attachment to place in conjunction with green infrastructure functions, spatial structures and services. The place- and people-based approach is used to directly investigate local knowledge and local perceptions of individuals and groups, collecting and sharing narratives. Based on the concept that places can retain a position of significance for individuals because they are repositories of personalised memories and centres of everyday routines, we assume they are distinguished by the uniqueness of personal place attachments. At the same time, collective sentiments too can accord meaning to place. Social places are similarly textured by layers of everyday meanings and representations of narratives. When personalised and collectivised meanings intersect, place meanings are augmented, by:

- Developing place meanings as a successor of inventive interplays between time and setting, varying with individuals and the conditions in which they find themselves, as well as with groups of individuals.

- Identifying places through their character and personality that distinguish them from other places. People identify with a place, to feel a sense of belonging and attachment to it (Manzo 2005).

Each community develops its practice by sharing and developing the knowledge of the participants. Elements of a practice include its repertoire of tools, methods and stories as well as activities related to learning and innovation (Wenger 2010).

The MPP also supported the dynamics of existing neighbourhood groups. Walking as a group was undertaken at selected sites to help express emotional relationships (attachment to place), to use the dynamic of mutual experiencing of meanings within the group. We walked together through the places and conducted different place/nature experience questionnaires. As imagination and understanding emerge from our embodied experiences, the walk of the group, the bodily movement and interaction integrate recurring patterns of perception and develop new ones (Rottenbacher 2009). The coexistence of shared grasping and deciphering contain already prearrangements about the shared "lebensraum", and can lead to monitoring and maintaining activities.

The results were developed into insights about:

Invisible Parameters of Place Values	Visible Parameters of Place Values
(investigated by questionaires, narratives, MPP) Place identity Sense of place/spiritual places Place attachment of individuals Community attachment	(investigated by questionaires, narratives, MPP) Architectural Analysis of Place Natural Character of Place

Tab.1 Differentiation of visible and invisible parameters of place values

4 INVESTIGATION IN LAA

To reach the public on several levels we started with a press conference and developed a TV video about ecosystem services in Laa, writing as well in the local newspapers and starting to work together with the town renewal initiative. There we built a core stakeholder group consisting of interested parties from the public and employees of the municipality.

The following steps were:

- We investigated cultural ecosystem services together with affected people, integrated perceptions and defined shared values together with the core stakeholder group.

- We related our expert knowledge with the everyday knowledge of the neighborhood groups during the assessments and reviewed it together with the core stakeholder group.

- We developed modules for implementaions according to the different local built qualities and the existing impediments with neighborhood groups.

4.1 Investigation of cultural ecosystem services together with stakeholders

Based on the mentioned SWOT analysis and the resulting values attached to it the interview guide was developed, which was reflected together with the neigboorhood groups in the selected areas. This reflection

included an inventory of the ecosystem services as well as perceptions of natural processes and functions and how climate change in the cultural city landscape is currently observable. The questions in the interview guide dealt for example with: the accessibility of the amenities, the security, sustainable available services, how often those amenities are used, who else uses them, how are qualities of natural services experienced (also questions about noise, temperature, smell, dust), where are degraded services and about social and cultural qualities. Spiritual places were investigated as personal or shared "Kraftplätze" beside religiously occupied places.

The interview guide was presented to the neighborhood groups, where the individual participants were asked to move around the place for experiencing place and answering the questions. Afterwards, all were invited to walk together to show each other mutually their perceptions and meanings. In a further evaluation process the results and surveys by experts have been merged. Natural character values were attached by the core stakeholder group and external experts according to together predefined criteria and selected indicators.

Selected place	Green Infrastructure and Natural Character	Existence	Health/Well-Being	Security	Social Relations	Meaning Of Place
	Sealed/degraded environment plaster-sealing-pot plants plaster and water-bound areas as well as minimal greenery (grass, annuals) also use of perennials + natives trees along streets parks urban forests	good air good drinking water good food free of noise free of light	physical health mental /spiritual health	differentiation: personal security accessibility amenity sustainability facilities	definition of different qualities for meeting places, retreat places, gardening maintenance, places together	differentiation of: historical meanings, aesthetic valuation naming of places and narratives

Tab.2 Example for classification of place character values

4.2 Merging expert knowledge with local knowledge

The concept that expert knowledge has to be merged with the everyday knowledge of the residents to develop sustainable local solutions, takes into account how people identify with place and nature. To support the CAM and CoP strategy this identification process is crucial for an ongoing stewardship. Personal knowledge of the place is derived from perceptions and experiences and incorporated in the given cultural framework and the social relations and rules. These social realities of the communities can be reconstructed, be confirmed or rejected and expanded. The capacity for expansion, e.g. a paradigm shift to use urban green infrastructure, lie in how we attach meanings to the places that constitute our identities (Manzo 2005).

Main meanings and character values that could be agreed to are:

Many public green areas in Laa bring the countryside into the city and are easily accessible from almost all population groups, such as the green belt along the "Mühlbach"- the "jungle" (also spiritual place), and "Thaya Park", the "Schubert and Schiller Park", the Castle Square, Church Park, the paths through the "Wehr"gardens, and the place at the tower (also spiritual place), these generate identity and character, bring the landscape into the city, provide a good connection for recreation and cause cooling and a pleasant microclimate. The city is trying to close a green belt around new settlement areas and to achieve an attractive corridor throughout those areas which was attached a high value.

As degraded areas mainly the commercial centres, big sealed parking areas, some new dwelling areas were identified as "non" places, with nearly no character and natural character values.

In Laa several initiatives started feeding into the CAM and CoP concept, like planting communities for trees, tree sponsorships, neighborhood groups planting and maintaining street amenity beds, swales and rainwater storing ponds in the commercial area, and initiatives of schools.

4.3 Participatory mapping and identifying places to implement green infrastructure

The identified place character values were related to the map of Laa to support the process of building the CAM as an ongoing implementation framework:

Fig. 4: Place character values

Based on this map we developed place-related proposals for interventions in accordance with the requirements of the various sites.

Fig. 5: Example for proposed implementations according to previously investigated place values

5 CONCLUSION AND OUTLOOK

An integrated cultural ecosystem services approach experiences several challenges in reflecting place-based values together with stakeholders. The process of evaluation by which single individuals and communities attach importance to a cultural service and natural process can create a dynamic impulse for groups to immediately seek to enhance the amenity of places. These measures have to be embedded in a planning framework that considers costs and time for implementation to maintain the community momentum.

A further decision criteria will be the calculation of existing ecosystem services (CO_2 storage, rainwater management and urban heat island effects). A number of factors have been identified so far, which can support or hinder a successful implementation of urban green infrastructure in Laa an der Thaya.

Impeding factors:

- One major barrier is the differing priorities and points of view amongst stakeholders and the resultant competing interests and fears. For example the groundwater level in some areas still changes quite unpredictably, therefore the implementation of rainwater management modules will be difficult. Though there are enough data uncertainties in performance and cost still are strong. Further "trust building" activities are needed.

- A guideline to select techniques and support the policy goal of the council is missing, this will be developed and negotiated with the council and further experts.

- Fragmented responsibilities and the lack of integrated management will not be resolved yet, as it is only possible to work on the level of the council, one main impediment we experienced was the lack of coordination of the energy and water infrastructure- e.g. often the hole street was used for the infrastructure and no place could be identified for planting trees.

- Lack of funding and effective market incentives- in Laa neighborhood groups started to organise events for collecting money for green infrastructure implementations.

- Practitioners and authorities require a demonstration of successful implementation in their own communities before they are willing to adopt any of the ecosystem service tools available.

Enabling Factors:

- Special meanings, relationships play a strong role in valuing cultural ecosystem services benefits as well as certain groups and individuals overtook a dynamic role in communicating and acting.

At the moment Laa has about 80 volunteers planting and maintaining public places.

6 ACKNOWLEDGEMENT

7 REFERENCES

BRATMAN, G.N. HAMILTON, J.P. & G.C. DAILY: The impacts of nature experience on human cognitive function and mental health. in: annals of the New York Academy of Sciences. Issue: The Year in Ecology and Conservation Biology. 2012

CARPENTER, S.R., Mooney, H.A., Capistrano, A.J. et al.: Science for managing ecosystem services: beyond the Millennium Ecosystem Assessment. Proceedings of national Academy of Science USA 106:1305-1312. 2009.

CHIESURA, A.: The role of urban parks for the sustainable city. in: Landscape and Urban Planning 68, 129-138. 2004.

CONSTANZA, R. D'ARGE R., De GROOT R., FARBER S., GRASSO M., HANNON B., et al. (1997). The value of the world's ecosystem services and natural capital. Nature 387:253–260.

CHURCH et al., 2011; Haines-Young and Potschin, 2013; in: CICES going local. 2013.

FRUMKIN, H.: Beyond Toxicity Human Health and the Natural Environment. American Journal of Preventative Medicine, 20, 234–240. 2001.

HÖPPNER, C. et al. What Drives People's Willingness to Discuss Local Landscape Development? In: Landscape Research, Vol 33, Issue 5 2008 Recovering Landscape As A Cultural Practice. 2008:

MANZO, L.C.: For better or worse: Exploring multiple dimensions of place meaning. Journal of Environmental Psychology 25 (2005) 67-86. 2005.

NAHLIK, A.M., Kentula M.E., Fennessy M. S. and Lander D.H.: Where is the consensus? A proposed foundation for moving ecosystem service concepts into practice. Ecological Economics, 77, 27–35. 2011

ROTTENBACHER, C. : Moved Planning Process. Shared experience leads to common agreement in the planning process. Südwestdeutscher Verlag für Hochschulschriften. 2009.

STERMAN, J.D.: Risk Communication on Climate: Mental Models and Mass Balance. Science 322: 532-533. 2008.

TEEB - The Economics of Ecosystems and Biodiversity for Local and Regional Policy Makers. 2010.

TURKELBOOM, F., et al.: CICES going local: Ecosystem services classification adapted for a highly populated country. 2013.

ULRICH, R.S.: View through a window may influence recovery from surgery. Science 224:420–421. 1984.

WILSON, E. O.: Biophilia. Cambridge, MA.: Harvard University Press. 1984.

WILSON, E. O.: The Ecological Footprint. Vital Speeches, 67, 274–281. 2001.