Assessing the potential of roadmapping methodologies to enable cooperative institutions for managing the commons

The case of Nature Based Solutions for urban climate change adaptation

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BOOK OF ABSTRACT

I. SESSION DESCRIPTION

ID: B10c

Implementation of the ecosystem services concept for urban planning and development

Hosts:

	Title	Name	Organisation
Host:	Mr.	Karsten Grunewald	Leibniz Institute of Ecological Urban and Regional Development
Co-host(s):		Olaf Bastian, Jiri Louda, Lennart Kümper-Schlake	

Abstract:

Urban ecosystem services (UES) are a basic prerequisite for the quality of life in cities. UES are consumed by people both directly and indirectly, they provide benefits for humans, and thus there is a strong demand for them, consciously or unconsciously.
For the future well-being of citizens, the quality and functions of urban ecosystems need to be improved and environmental benefits maximized. This requires the integration of urban planning and development with environmental objectives such as urban biodiversity management, ecosystem resilience, adaptation to climate change, public participation in decision-making, and environmental education and awareness. Major challenges are related not only to the assessment and valuation of UES, their spatial distribution, tradeoffs, and synergies of multiple services at the citywide scale, but especially to improve the implementation of the ecosystem services (ES) concept into the practice of urban planning, management and development.

Goals and objectives of the session:

Making the monetary and non-monetary value of urban green spaces visible through accounting ecosystem services could be a chance to consider external costs connected with the degradation of ecosystems. A better understanding of cross-scale dependencies between different ES is needed to get a clearer picture of UES flows as well as options and challenges for their safeguarding depending on scales of responsibilities and policy actions. A crucial question is how to use the ES concept to improve urban planning and to steer and manage urban development processes so as to be able to minimize or avoid negative socio-economic and environmental impacts of urbanization, and that socially integrative cities can develop in an environmentally friendly and financially viable way in order to provide favorable living conditions for the population.
Contributions are welcome which address current state, knowledge, experiences, indicators, tools but also deficits and challenges in terms of the ES concept and its practical application in urban planning and development, particularly to:
- Show proven and new solutions to maintain and enhance ES in cities;
- Develop and test action strategies and instruments for ES, biodiversity and green infrastructure in cities;:
- Show innovative ES-based approaches to reduce environmental threats such as soil sealing and urban sprawl;
- Test the integration of ecosystems and ES into the environmental economic accounting;
- Gain knowledge for improving the implementation process.

Planned output / Deliverables:

Special Issue?

Related to ESP Working Group/National Network:

Biome Working Groups: 10 – Urban systems

II. SESSION PROGRAM

Date of session:Tuesday, 16 October 2018
Time of session: 8:45 – 18:00

Time	First name	Surname	Organization	Title of presentation
8:45–9:00	Karsten	Grunewald	IOER Dresden	Introduction to Session B10c
9:00–9:15	Carla-Leanne	Washbourne	University College London	Urban green infrastructure: Knowledge and decision-making
9:15–9:30	Denisa Lavinia	Badiu	University of Bucharest	From “red” to green? Urban green infrastructure planning in a post-socialist city
9:30–9:45	Liliia	Sulkarnaeva	University of Tyumen	The current state of knowledge on urban ecosystem services in Russia
9:45–10:00	André	Mascarenhas	Humboldt-Universität zu Berlin	Linkages between green and blue infrastructure and ecosystem services in city planning: An analysis of selected cities in Europe and the United States
10:00–10:15	Pavel	Cudlin	Global Change Research Institute	How to estimate the relevance of new city plan for positive effect on the ecosystem service provision?
11:30–11:45	Claudia	Dworczyk	Leibniz Universität Hannover	Mapping and assessment of urban ecosystem services in the urban regions of Rostock and Munich
11:45–12:00	Laurence	Jones	Centre for Ecology & Hydrology	Choice of data for urban natural capital can greatly affect estimates of economic value

Time	First name	Surname	Organization	Title of presentation
12:00–12:15	Maria	Viota	University of the Basque Country	Capacity of the green infrastructure to regulate the heat island effect in the city of Bilbao
12:15–12:30	David	Lameiras	Universidade de Aveiro	Assessing the potential of road mapping methodologies to enable cooperative institutions for managing the commons: the case of Nature Based Solutions for urban climate change adaptation
12:30–12:45	Daniele	La Rosa	University of Catania	A Green Infrastructure strategy to reduce seismic vulnerability and energy demand of cities
12:45–13:00	Discussion: ES assessment for new city planning – from knowledge to decision-making			
14:30–14:45	Martin	Schlaepfer	University of Geneva	Quantifying the contributions of native and non-native trees to a city's biodiversity and ecosystem services
14:45–15:00	Susanne	Raum	Imperial College London	Achieving impact from ecosystem assessment and ecosystem services valuation of urban greenspace: The case of i-Tree Eco in Great Britain
15:00–15:15	Daria	Sikorska	European Regional Centre for Ecohydrology of the Polish Academy of Sciences	The effect of invasive species on recreational ecosystem services in urban ecosystems

Time	First name	Surname	Organization	Title of presentation
15:15-15:30	Graciela M.	Rusch	Norwegian Institute for Nature Research	Assessing socio-ecological complexity of pollinating services in urban landscapes
15:30-16:30	Discussion: Mapping and Assessment of urban Ecosystem Services for planning purposes - Examples from different perspectives			
16:30-16:45	Javier Babi	Almenar	Luxembourg Institute of Science & Technology	A system dynamics model of urban forests to assess ES trade-offs and synergies in biophysical and monetary units
16:45-17:00	Anne-Kathrin	Schneider	Technische Universität Braunschweig	Assessing the ecological potential of private gardens in GIS-based web application for citizens and planners
17:00-17:15	Oliver	Hoelzinger	University of Birmingham & Consultancy for Environmental Economics & Policy (CEEP)	Implementing environmental values into planning practice: The Natural Capital Planning Tool (NCPT)
17:15-17:45	Discussion: Urban planning with ES - tools and design			
17:45-18:00				

Date of session: Wednesday, 17 October 2018
Time of session: 8:45 - 10:15

Time	First name	Surname	Organization	Title of presentation
8:45-9:00	Peter	Roebeling	University of Aveiro	Systemic decision support tool to assess the multiple impacts of nature-based solutions for urban global change adaptation

Time	First name	Surname	Organization	Title of presentation
9:00-9:15	Silvia	Ronchi	Politecnico di Milano	The design of a local green infrastructure for integrating ES in planning process: the case study of Rescaldina Municipality (Milan Metropolitan city, Italy)
9:15-9:30	Olaf	Bastian	Environmental Office, City of Dresden	Opportunities and weaknesses of the ecosystem services concept in urban planning, management and development
9:30-9:45	Wrap-up of session B10c (Jiri Louda, Karsten Grunewald, Olaf Bastian)			
9:45-10:00	Final discussion, next steps			
10:00-10:15				

III. ABSTRACTS

The abstracts appear in alphabetic order based on the last name of the first author. The first author is the presenting author unless indicated otherwise.

1. *Type of submission:* ***Abstract***

B. Biome Working Group sessions:B10c Implementation of the ecosystem services concept for urban planning and development

A system dynamics model of urban forests to assess ES trade-offs and synergies in biophysical and monetary units

First author: Javier Babí Almenar, Benedetto Rugani

Other author(s): Claudio Petucco

Affiliation, Country: Luxembourg Institute of Science & Technology, Luxembourg

Enhancing urban ecosystem services through the implementation of nature-based solutions (NBS) in cities can support a further integration of environmental objectives into urban planning. However, how to implement NBS to reduce the distance between urban planning and practical urban sustainable management and development remains an open question. In this study, we use a system dynamics framework to analyse the contribution of NBS, specifically urban forests, to address environmental urban challenges. An initial model of urban forest was developed to study i) regulation of temperature and humidity; ii) regulation

of chemical conditions; and iii) provision of materials by respectively modelling changes in physiological equivalent temperature, carbon sequestration, and exploitable above ground biomass. The economic benefits (in terms of these services) and costs were then computed under several management and development scenarios representing alternative management types (i.e. trimming, harvesting) and built densities (i.e. low to high built density). As part of the modelling framework, several other ecosystem services, biophysical indicators, and their main socio-environmental factors and processes are identified and related to key urban challenges. The tested model shows the potential of urban forests' for supplying ecosystem services and identifies different trade-offs on the regulation of chemical conditions and temperature depending on the intensities of wood harvesting and urban conditions (e.g. urban vs periurban), which together with the consideration of costs inform about economic benefits or loss. The use of a system dynamics approach applied to the modelling of NBS shows to be a valuable decision support solution to allow understanding how the concept of ecosystem services can be valuable for the planning and management of green spaces.

Keywords: System Dynamics; MIMES; Nature-based Solutions; Ecosystem Services; Monetary Valuation

2. *Type of submission:* ***Abstract***

B. Biome Working Group sessions:B10c Implementation of the ecosystem services concept for urban planning and development

From "red" to green? Urban green infrastructure planning in a post-socialist city

First author: Denisa Badiu
Other author(s): Cristian Ioja, Diana Onose, Mihai Nita, Raffaele Lafortezza
Affiliation, Country: Centre for Environmental Research and Impact Studies, University of Bucharest, Romania

Promoting green infrastructure for ecosystem services provision in urban environments is considered an effective approach to achieve resilience and meet sustainability goals.Countries with a post-Socialist history are still struggling to increase the amount of green spaces in cities and to integrate the concept of ecosystem services in policy development.Bucharest is an example of a city that has undergone considerable transformation during the Socialist period (1948-1989) and after. Before 1989 the drivers of urban transformation were mainly related to public land management, whereas after the fall of the Socialist regime, private development prevailed. Our study aims to analyze the shift in the amount, distribution and access of green spaces and urban ecosystem services in Bucharest as a consequence of the transition from a centralized planning system to a

market-based system. We used historical maps and aerial images to determine spatial-temporal changes in the structure of Bucharest`s urban parks and their surrounding areas. To determine the influence of planning approaches on green spaces, we analyzed the legislative framework from the Socialist period (labeled as "red") and post-Socialist period. Our results showed that the fall of the Socialist regime represented an important institutional change affecting urban green spaces, not just in terms of their surface and distribution but also in terms of access for different social groups.Our findings provide valuable knowledge on the evolutionary urban processes and sustainability approaches of post-Socialist cities and important insights for improving planning efforts and ensuring an equal and just access to urban ecosystem services.

Keywords: Planning system, Urban ecosystem services, Urban parks, Socialist regime, Eastern Europe

3. *Type of submission:* ***Abstract***

B. Biome Working Group sessions:B10c Implementation of the ecosystem services concept for urban planning and development

MODEVAL-URBA Program : Development of an urban sustainability evaluation tool at the territorial scale.

First author: Emmanuel Ballot
Affiliation, Country: ENAS: école nationale d'architecture de Strasbourg, France

The NESTERR2 research program is a continuation of the NEST tool (Neighborhood Evaluation for Sustainable Territories). NEST is a quantitative environmental assessment of development operations from the early stages of the project. It is a plugin, powered by the 3D modeling software Sketchup. However, this tool had important limitations. NESTTERR2 uses several indicators: total primary energy, climate change, modal share of occupied assets, urban sprawl, quality serving the territory, median income per unit of consumption, functional mix, and rent cost for social housing. NESTERR2 aims, in a nutshell:

- To create the NESTERR2 tool and develop the associated methodology to enable the monitoring of these indicators and decision-making on their basis, in particular on the factors related to the environment and quality of life: density, vegetation, mobility, energy.

- To highlight the quantitative sustainability indicators relevant to the different scales of the study, from the "Building" to the "Territory," through to the "Neighborhood" and "City".
- To apply all the elements developed in the project to actual development operations (in new-build and in rehabilitation) at the scale of the Eurometropolis of Strasbourg in order to guarantee their operational status.
- To allow the Strasbourg Eurometropolis to have quantitative and objective elements for the definition of its management strategy according to its objectives in terms of sustainability.
- To create a simulation platform to project and compare the qualitative aspects of the different operations proposals.

Finally, the Eurometropolis will be able to use NESTTERR2 to evaluate development plans up to 2030 under the prism of environmental, social and economic performance.

Keywords: urban sustainability evaluation tool

4. *Type of submission:* ***Abstract***

B. Biome Working Group sessions:B10c Implementation of the ecosystem services concept for urban planning and development

Opportunities and weaknesses of the ecosystem services concept in urban planning, management and development

First author: Olaf Bastian, Patrycia Brzoska

Other author(s): Karsten Grunewald, Ralf-Uwe Syrbe

Affiliation, Country: Capital City of Dresden (Saxony, Germany), Environmental Office, Leibniz Institute of Ecological Urban and Regional Development (IOER) in Dresden,Germany

The practical application of the ecosystem services (ES) concept in cities is still limited, and its role is being judged ambivalently. On the one hand, there is consensus that ES assessments may make values of nature more visible and contribute to more sophisticated decision-making and planning. On the other hand, critical voices argue that existing tools are sufficient, and additional concepts would increase complexity and costs. We identify three dimensions of current or possible applications of the ES concept in cities, and we specify it on examples from Dresden (Germany), mainly on the current transboundary German-Czech project BIDELIN (The value of ecosystem services, biodiversity and blue-green infrastructures in cities, exemplified by Dresden, Liberec and Děčín).

1. The regulatory and planning dimension:

Existing laws or regulations and landscape planning address the maintenance of biodiversity and ES – mostly without explicitly using this term. The concept "compact city in the green network" the city of Dresden is favoring, integrates green infrastructure (as carrier of many ES) into the grey infrastructure to create close proximity of ES supply and demand. By participatory planning approaches, e.g. in a current city park project in Dresden, stakeholders can select priority ES.

2. The economic dimension

includes values (benefits/costs) of ecosystems or green spaces. We show that the proceeds of timber sales represent only 2,6 % of an ES bundle supplied by the Dresden municipal forest.

3. The educational dimension

comprises knowledge transfer and public relations work to optimize decision-making, enhance environmentally-friendly behavior and to improve the acceptance of nature conservation.

Keywords: landscape planning, green infrastructure, forests, acceptance, education

5. *Type of submission:* ***Abstract***

B. Biome Working Group sessions:B10c Implementation of the ecosystem services concept for urban planning and development

Mapping and assessment of urban ecosystem services in the urban regions of Rostock and Munich

First author: Claudia Dworczyk

Other author(s): Malte Hinsch, Benjamin Burkhard

Affiliation, Country: Institute of Physical Geography & Landscape Ecology, Leibniz Universität Hannover, Germany

The capacity of an ecosystem to provide services is determined by the biotic and abiotic characteristics as well as the spatial structure of an area, which are influenced by human activities. These anthropogenic influences (e.g. soil sealing, fragmentations of landscapes, buildings) are particularly visible in cities and limit the provision of almost all ecosystem

services (ES). Many cities witnessing ongoing population growth, urban densification and urban sprawl, which, in turn, lead to a reduction of green and unbuilt spaces – the main contributors of urban ES. Cities are, due to their high population densities, areas of high ES demand. Therefore they need healthy ecosystems to deliver multiple ES to ensure human health and well-being. However, the importance of ES are rarely really considered in urban and regional planning decisions. The OESKKIP project tests the ES approach's capacity for integration into urban and regional planning in the urban regions of Rostock and Munich. In first workshops, the ES concept was communicated and discussed together with actors of the municipal administrations. Our contribution presents and discusses initial results and ES maps conducted by participatory spatial surveys and assessments (e.g. expert-based ES Matrix-Method). The results reveal gradients of ES supply between urban, peri-urban and adjacent rural areas in both study regions.

Keywords: urban ecosystem services, ecosystem service mapping and assessment, participatory assessments, Matrix-Method

6. *Type of submission:* ***Abstract***

B. Biome Working Group sessions:B10c Implementation of the ecosystem services concept for urban planning and development

Implementing Environmental Values into Planning Practice: The Natural Capital Planning Tool (NCPT)

First author: Oliver Hoelzinger
Other author(s): Jonathan, Alister Scott Sadler
Affiliation, Country: School for Geography, Earth and Environmental Sciences, University of Birmingham, United Kingdom

The NCPT is a decision support tool co-created by academics, planning practitioners and relevant stakeholders. Designed as a fit-for-purpose Excel tool, the NCPT can be applied by non-specialists and in a comparatively short period of time; acknowledging the time- and resource constrains planners and developers face in everyday practice. The NCPT is the culmination of five years of research and involves a multi-criteria decision analysis of the likely impacts of proposed plans and developments of any size on Natural Capital and the ecosystem services it provides. The tool development involved more than 50 experts assessing the impacts of land-use changes across selected ecosystem services indicators. The NCPT development was demand-driven from the outset with a focus on maximising impact on planning processes and outcomes; now involving over 30 built environment agencies and stakeholders. Extensive consultations, collaboration and testing with our

project partners made sure that the NCPT was oven ready, thereby closing the 'implementation gap' between science and practice. The NCPT was extensively tested by our case study partnership from local government and industry which subsequently increased from seven to 17 partners during the project and include mayor cities like London and Birmingham, two National Parks, and our industry partners Tarmac and Skanska. We believe that the NCPT enables developers and planners to have an informed conversation on 'environmental net-gain' as called for in the UK Government's 25 Year Environment Plan (2018), the Industrial Strategy (2017) and the NPPF (2018 consultation draft). The scores obtained enable a discussion about both, the location and design of a proposed development - thus adding value to the current tools that are in existence. The NCPT was developed for England but it is also planned to make it available in other countries. For the NCPT, case studies and more information visit www.NCPTool.com.

Keywords: Planning, Development, Natural Capital, Ecosystem Services, Green Infrastructure

7. Type of submission: ***Abstract***

B. Biome Working Group sessions:B10c Implementation of the ecosystem services concept for urban planning and development

Choice of data for urban natural capital can greatly affect estimates of economic value

First author: Laurence Jones
Other author(s): Philip Cryle, Dan Morton, Amy Thomas, Alice Fitch, Ian Dickie
Affiliation, Country: Centre for Ecology & Hydrology, United Kingdom

Quantifying ecosystem services, and calculating an economic value for the service involves integrating numerous datasets, which each come with their own uncertainty. This is particularly the case for urban ES, where the fine-scale nature of the data needed adds particular challenges. Often there are more than one modelling or mapping approach which is possible, or more than one source of data to characterise the natural capital. Relatively little attention has been paid so far to the effect of selecting one data source over another, on the final calculations of economic value.In this study we analyse the effect of choosing three different spatial datasets for urban tree cover, on the ecosystem service 'noise regulation by trees'. All three datasets represent the spatial cover of trees in Greater Manchester, UK, which used as input to a spatial modelling approach designed to estimate areas where trees provide a noise-mitigation service. The resulting calculations of benefit vary by a factor of 3. The variation is due in part to the differences in area of woodland, but also to the differences in shape and type of woodland patch that are represented in each dataset, and the resulting effect this has on spatial calculations of the service provided. This

highlights the need to carefully consider potential sources of variation associated with the choice of natural capital data in urban areas, particularly for services where spatial context is important in service delivery, where service delivery is not necessarily linearly related with area.

Keywords: urban ES, noise regulation, natural capital accounts, urban trees

8. *Type of submission:* ***Abstract***

B. Biome Working Group sessions:B10c Implementation of the ecosystem services concept for urban planning and development

A Green Infrastructure strategy to reduce seismic vulnerability and energy demand of cities

First author: Daniele La Rosa, Riccardo Privitera

Affiliation, Country: Department of Civil Engineering and Architecture, University of Catania, Italy

Historically, urbanization processes in Italy resulted in built environments with high level of seismic vulnerability, low energy efficiency and common lack of green spaces. The latter represent the main providers of ecosystem services in cities and play a relevant role in reducing the effects of climate change by regulation of microclimate and urban heat islands that are responsible of building energy consumption. Despite their importance in providing ecosystem services, the implementation of a green infrastructure has to challenge limited financial resources for the public acquisition of private plots.This paper proposes a strategy for implementing an urban green infrastructure aimed at generating a double positive effect on cities by triggering seismic and energetic retrofitting of the existing urban fabric. This is achieved through a transfer of development rights program: landowners get economic incentives to adopt seismic retrofitting interventions and, at the same time, public administrations implement the green infrastructure in the portion areas transferred to municipality. The energy efficiency of buildings closer to the green infrastructure therefore benefit from the cooling effects of the new greenery. The strategy is tested under different scenarios of acquisition of private land by public administrations in the metropolitan area of Catania (Italy).

Keywords: Green Infrastructure; Seismic retrofitting; energy retrofitting; ecosystem services; urban planning

ESP EUROPE
2018 REGIONAL CONFERENCE
Ecosystem services in a changing world: moving from theory to practice
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9. *Type of submission:* ***Abstract***

B. Biome Working Group sessions:B10c Implementation of the ecosystem services concept for urban planning and development

Assessing the potential of roadmapping methodologies to enable cooperative institutions for managing the commons: the case of Nature Based Solutions for urban climate change adaptation

First author: David Lameiras

Other author(s): Peter Roebeling, Martin Lehmann, Teresa Fidélis, Elke den Ouden, Rianne Valkenburg

Affiliation, Country: CESAM – Department of Environment and Planning, University of Aveiro, Portugal

According to the European Commission's working definition of Nature Based Solutions (NBS), these are diverse solutions inspired and supported by nature, delivering co-benefits in the triple bottom line. Properly implemented, NBS work as modular vehicles for ecosystem services (ES). To test the effectiveness of NBS in urban climate resilience strategies and to mainstream them towards a 2050 scenario, the H2020 UNaLab project provides cities across the world with know-how, tools, technical assistance and network support.To address the challenge's complexity, UNaLab calls for the participation of diverse stakeholders in prospective planning exercises following the Roadmapping Methodology (RM). Previously, researchers and practitioners have affirmed the capacity of the RM to increase participation, develop ownership, and make more just decision-making processes. These features are relevant when stakeholders aim to give place to commonly shared ES in their city – i.e. urban commons. The present research studies the potential of the RM to enable stakeholder cooperation beyond the planning stage and, thus, providing an alternative approach to taking ownership of and managing the urban commons.A literature review framed the conceptualization of urban ES as urban commons, and allowed a clear understanding of the RM principles and modes of implementation. Then, surveys and interviews with UNaLab RM practitioners allowed to assess the actual implementation of the RM and its potential for cooperative engagement and democratic community development. Results show that good practices, such as the importance of soft-skills for facilitation to enable stakeholder participation and visual media to support sense-making, and areas of opportunity such as a methodic approach to address biases in stakeholder selection and allowing participants to

influence the RM activities to locally-attune them, are relevant to enable the potential of the RM to deploy collective action for managing urban commons created by NBS.

Keywords: nature-based solutions, roadmapping methodology, urban ecosystem services, urban commons, democratization

10. Type of submission: ***Abstract***

B. Biome Working Group sessions:B10c Implementation of the ecosystem services concept for urban planning and development

Linkages between Green and Blue Infrastructure and Ecosystem Services in city planning: An analysis of selected cities in Europe and the United States

First author: André Mascarenhas

Other author(s): Manuel Wolff, Dagmar Haase, Sandra Naumann, McKenna Davis, Lina Roeschel, Francesc Baró, Johannes Langemeyer, David N. Barton, Erik Gomez-Baggethun, Magdalena Biernacka, Jakub Kronenberg, Kinga Krauze, Timon McPhearson, Kristina Tysk, Sara Borgström, Erik Andersson

Affiliation, Country: Humboldt-Universität zu Berlin, Germany

Green and Blue Infrastructure (GBI) plays a critical role in providing benefits to people in urban areas, hence having the potential to improve health and quality of life while safeguarding biodiversity in cities. However, several enabling factors have to be considered if GBI is to achieve its full potential as inclusive and equitable providers of benefits to people. Planning policies guiding regional and urban development towards the promotion of GBI can be regarded as one such composite factor. Yet knowledge on how exactly is GBI integrated in planning policies is still limited. In this research we analyse how is GBI integrated in city planning, specifically focusing on the linkages between GBI and ecosystem services (ES). This is achieved through a content analysis of policy documents that guide urban development in five cities in Europe and one in the United States (Barcelona, Halle, Łódź, Oslo, Stockholm and New York). These cities represent different planning cultures and policy contexts, as well as markedly distinct urban development pathways (e.g. post-socialist or transition vs. 'western' models). They also differ with regard to how they deal with GBI in their official documents. Based on our analysis, we discuss learning opportunities across city cases for GBI-ES integration in planning policies, as well as the role of context in these complex social-ecological systems

Keywords:green and blue infrastructure, ecosystem services, city planning, urban development, social-ecological systems

ESP EUROPE
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Ecosystem services in a changing world: moving from theory to practice
SAN SEBASTIÁN, SPAIN
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11. Type of submission: ***Abstract***

B. Biome Working Group sessions:B10c Implementation of the ecosystem services concept for urban planning and development

How to estimate the relevance of new city plan for positive effect on the ecosystem service provision?

First author: Pavel Cudlín

Other author(s): Jiří Louda, Vilém Pechanec, Jan Macháč, Lenka Štěrbová, Kristýna Rybová Ahmed Alhuseen, Jan Purkyt

Affiliation, Country: Global Change ResearchInstitute CAS, Czech Republic

The developing cities deteriorate themselves their life environment, e.g. by intensification of urbanization inside cities, urban sprawl and accompanying soil sealing. In addition, the predicted consequences of global change are bringing a lot of hardly quantified impacts on the ecosystem service provision, especially concerning climate regulation and habitat services. Urban planning could be one of the fundamental instruments of the regulation of these negative processes, if ecosystem services are taken into account. Based on our findings in Liberec city (North Bohemia), performed in the frame of German-Czech Interreg project BIDELIN, city inhabitants are looking for close-to-nature sites near their residence. They are often implicitly aware of many (but not all) services provided by urban green infrastructure (e.g. climate regulation, recreation etc.) which contributes to their well-being. According to our opinion, the consideration of the relevance of new city plan for positive effect on the biodiversity and ecosystem service provision should be supported by the comparison of the rate of selected important ecosystem service provision, e.g. climate regulation and carbon sequestration. The rate of selected ecosystem service provision and biodiversity quality were analyzed and compared between current and prepared new urban plans on the basis of values estimated for individual natural and non-natural habitats at the scale 1:10 000. Though a survey focused on preferences of inhabitants towards urban green structures confirmed that city inhabitants prefer the development of urban forests and parks, the trends of urban planning in the city, resulting from the comparative analysis of city plans, did not provide convincing results on the improvement of ecosystem service provision. We conclude that the concept of ecosystem services should be taken into account within the urban planning processes not only due to environmental reasons but also to reflect the preferences of inhabitants.

Keywords: Ecosystem services, urban planning, green infrastructure, biodiversity, city plan

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12. Type of submission: ***Abstract***

B. Biome Working Group sessions:B10c Implementation of the ecosystem services concept for urban planning and development

Achieving impact from ecosystem assessment and ecosystem services valuation of urban greenspace: The case of i-Tree Eco in Great Britain

First author: Susanne Raum

Other author(s): Kate Hand (Forest Research), Dr Kieron Doick (Forest Research), Dr Clare Hall (Forest Research), Dr Liz O'Brien (Forest Research), Dr David Edwards (Forest Research)

Affiliation, Country: Imperial College London, Centre for Environmental Policy, United Kingdom

Numerous tools have been developed to assist environmental decision-making, but there has been little examination of whether these tools achieve this aim, particularly for urban environments. This study aimed to evaluate the use of the i-Tree Eco tool in Great Britain, developed to support urban tree management. Using a documentary review, an online survey, and case study interviews, we examined impacts across five impact areas and further identified what factors either inhibited or supported achievement of impact. Being the first published evaluation of the i-Tree tool, it revealed that the i-Tree Eco studies helped to increase knowledge of urban tree populations and awareness of the benefits they provide. While there was often broad use of i-Tree Eco findings in various internal reports, external forums, discussions of wider policies and plans, and direct changes relating to improved management of the urban forest, increased funding or new dedicated tree policies were less frequent. The study also looked at the barriers that may have limited realisation of some of these desired impacts, the main being lack of champions, policy drivers and resources, problems with knowledge exchange, high staff turn-over and organisational re-structuring, as well as negative views of trees. Overall, i-Tree Eco studies can be a valuable tool to improve the management of urban trees when planned as one step in a longer process of engagement with stakeholders and development of new management plans and policies. Understanding, from inception of the i-Tree Eco studies, how best to communicate and utilise the data and results following completion is perhaps the most important lesson for i-Tree Eco project teams.

Keywords: ecosystem services, urban forest, decision-making, impact, evaluation, i-Tree; valuation

13. Type of submission: ***Abstract***

B. Biome Working Group sessions:B10c Implementation of the ecosystem services concept for urban planning and development

Systemic decision support tool to assess the multiple impacts of nature-based solutions for urban global change adaptation

First author: P.C. Roebeling

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Global change presents urgent challenges for cities in the 21st century. Cities, therefore, need to deal with urban/industrial expansion and challenges related to flooding, water/air pollution, urban heating, real-estate devaluation and gentrification. These challenges impact on economic activities, human health and quality of life and, hence, global change adaptation is crucial for cities of the future. There is emerging evidence that nature-based solutions (NBS), designed to bring more nature and natural features and processes to cities, can provide effective solutions to these multiple challenges. However, there is a need to provide a solid evidence base on the impacts, costs and (co-) benefits of NBS and NBS strategies. This study develops and applies an innovative systemic decision support tool (SDST) for the planning and management of NBS strategies for urban adaptation to global change at the landscape scale. The SDST integrates data and information from disciplinary models into a spatially explicit system at the landscape scale, to assess the direct and indirect impacts of NBS strategies on flooding and water pollution (e.g. MIKE), urban heating and air pollution (e.g. WRF-CHEM), urban sprawl, real estate values and gentrification (e.g. SULD), and associated costs and benefits (using integrated assessment). Based on comprehensive, validated and local information, the SDST empowers communities and facilitates informed decision-making by cities.Results show that, depending on the scale and locations of implementation, NBS provide expected local direct impacts and benefits. Indirect impacts, associated with urban contraction, densification and gentrification, may however offset (e.g. urban heating) or enhance (e.g. real-estate valuation) some of these local direct impacts while providing benefits at the city scale (e.g. air quality). Hence, the SDST is a powerful tool for participatory planning that enables stakeholders to visualize and discuss potential environmental, economic and social impacts of NBS strategies in the face of global change.

Keywords: global change; nature-based solutions; direct and indirect impact, costs and benefits; systems-based approach; decision support

14. Type of submission: ***Abstract***

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The design of a Local Green Infrastructure for integrating ES in Planning process: the case study of Rescaldina Municipality (Milan Metropolitan city, Italy)

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The integration of Ecosystem Service (ES) thinking into spatial planning is an open challenge necessary to improve the environmental management and the natural capital conservation.Even if significant improvement were made on the technical point of view (mapping and assessment ES), the practices of ES integration in Planning (and in Strategic Environmental Assessment - SEA) are still in its infancy. The complexity of the topic has limited the integration in the decision-making process.The abstract aims to present a practical experience on how ES approach was considered for the new edition of an Urban Plan in Rescaldina Municipality (northern part of Milan metropolitan city, Lombardy region, Italy). The process of integration starts with ES mapping and assessment showing the state and trends of ES provision and supporting policy makers in the definition of the best development strategies for the futures of the municipality. ES mapping was considered for design a Local Green Infrastructure (LGI) combining ecological aspects, rural landscape and recreation activities. The LGI was included in the SEA to address and support Planning process avoiding ES decline and ensuring their conservation, protection and enhancement. The LGI strategy guides the entire planning process orienting the adoption of nature-based solutions and linking social, economic and environmental factors. The use of a strategy (LGI) in common between planning and SEA process has influenced policymakers using an ES approach for sustainable Land use management. The methodology used in the case study could be replicable and feasible in other contexts. Considering that ES maintenance and or restoration depends on their rank in the planning process, the design of Green infrastructures could be regarded as a key element to guide assessment and valuation of ES in decision-making.

Keywords: Green infrastructure, Spatial planning, ES mapping, SEA

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15. Type of submission: ***Abstract***

B. Biome Working Group sessions:B10c Implementation of the ecosystem services concept for urban planning and development

Assessing socio-ecological complexity of pollinating services in urban landscapes

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Although the benefits generated by pollinators are most often perceived as exclusively relevant for agriculture, pollination provides many additional services. We address several challenges with ecosystem service assessment for supporting local decision making in an urban setting with an intricate and highly heterogeneous landscape matrix of biodiversity attributes. Pollinating bees in Oslo, Norway, generate multiple ecosystem services: i.e., support and maintenance of both functional and aesthetically pleasing flowering vegetation, conservation of native red-listed species, honey production and the recreational opportunities associated with beekeeping, knowledge sharing and learning about pollination as an insight into other ecological processes, and maintaining the potential for providing pollination service for future generations. We explore the methodological challenges that surround mapping and assessing pollination-related ES, benefit and value indicators for informing decisions made by municipal authorities, beekeeper groups and other relevant actors. We present results from investigations of pollinators and their interactions with the spatio-temporal distribution of flower resources in an urban landscape, based on different methodologies and levels of detail. These methodologies include mapping floral resources through expert-based assessment of habitat suitability, field surveys of flower resources, analyses of pollen collected from foraging honeybees, which we have subsequently compared with different methods for surveying of pollinating insects to estimate the capacity of urban habitats to support bees and pollination services. We discuss the role of the various assessments in supporting decisions about pollination related ecosystem services (e.g. awareness raising about biodiversity conservation problems, knowledge sharing about pollinators, pollination and species interactions, product labelling, hive stocking capacity, gardening practices and precautionary zones, urban landscape management

Keywords: urban planning, pollination, bee keeping, native biodiversity conservation

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B. Biome Working Group sessions:B10c Implementation of the ecosystem services concept for urban planning and development

Quantifying the contributions of native and non-native trees to a city's biodiversity and ecosystem services

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Urban trees are appreciated for their intrinsic value and their contributions to human well-being. There is a persistent debate in the scientific literature and strategic planning documents regarding the relative merits of native versus non-native trees in urban settings, but no study to date has quantified their contributions measured in terms of biodiversity and ecosystem services. Here, a database of 54'620 non-forest trees was used to quantify the contributions of native and non-native trees to biodiversity (species richness), three regulating ecosystem services and three cultural ecosystem services in the metropolitan area of Geneva, Switzerland. As a group, non-native trees made up 87% of tree species and 44% of individuals. They also provided a majority (55-79%) of cultural ecosystem services, except, of course, towards the cultural value of "nativeness". Non-native trees were composed disproportionally of large evergreen trees. As a result, non-native trees contributed, on average, greater (55-62%) regulating services such as water interception, micro-pollutant cleansing, and micro-climatic cooling. By contrast, native trees were composed disproportionally of deciduous hardwoods. As a result, native trees sequestered, on average, more carbon than non-native trees. Our results illustrate that in Geneva non-native trees contribute a majority of local species richness and ecosystem services. We predict that contributions of non-native trees to biodiversity and ecosystem services will increase relative to native trees as a result of climate change and urban heat island effects.

Keywords: Non-native, exotic, urban, biodiversity, mapping, IPBES

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B. Biome Working Group sessions:B10c Implementation of the ecosystem services concept for urban planning and development

Assessing the ecological potential of private gardens in GIS-based web application for citizens and planners

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Private gardens can make up large parts of urban green. In contrast to public green spaces, planning and management occurs locally depending on the owner and independently on planning and management strategies of municipalities. To assess ecosystem services of urban green, information about management and structure of private gardens can only be gained by questioning the owners. We developed a GIS-based web application to easily get information about private gardens and to simultaneously provide information about ecologically sustainable management of gardens and the value of enhancing ecosystem services. Potentials for carbon storage, cooling, buffering heavy rainfall events and biodiversity enhancement are shown, as well as the importance of the garden for the connectivity of urban green. We aim at (i) improving our database to assess urban ESS in order to communicate with local stakeholders/municipalities, and (ii) to point out the value of private green and its management on the spatial distribution of ESS and green infrastructure for both, garden owners and municipalities.

Keywords: private gardens, GIS-based web application, green infrastructure, connectivity, citizens

18. *Type of submission:* **Invited speaker abstract**

B. Biome Working Group sessions:B10c Implementation of the ecosystem services concept for urban planning and development

Formal and informal green spaces as a source of recreational ecosystem services in cities – management implications

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Provision of healthy environment able to sustain ecosystem services for growing population of cities has become a challenge for spatial planners due to conflicting views and land use alternatives. Natural ecosystems, characterised by higher biodiversity and biomass production, are reported to surpass the human-made ecosystems, in resilience to anthropogenic impact or acting as a seed bank. However they became scarce in majority of urbanscapes. Therefore preservation of remnants of existing vegetation needs to complement human made green infrastructure and hybrid solutions since early stages of city planning. Among remnants of natural vegetation, those located in river valleys are the most crucial element of blue-green system, as they meet the critical assumptions of life sustaining systems: they allow to link different green and blue elements into one network, sustain biomass production under climate change, allow for better climate regulation etc. The study examines one of the 22 rivers of the typical industrial Eastern European City – Lodz, Central Poland. The remnants of the former riverine vegetation still exist along the river course as both formal, and informal green spaces and are planned to serve as a backbone for integrated revitalization of the City district. Thus various sections of the river (regulated, underground, semi-natural) were investigated with respect to their capability to provide recreational ecosystem services. The study, built upon vegetation inventory, remotely-sensed and social data found that the remnants of the natural floodplain vegetation state less than 5% of the total vegetation, but are an essential source to build future restoration upon. The river valley significantly stand outs from the surrounding landscape in terms of biomass production (as indicated by NDVI values), providing opportunities for building a resilient blue-green network in the city, also meeting a growing need, as indicated by the citizens, to provide higher share of green spaces in the city.

Keywords: green infrastracture, urban river, floodplain, river restoration, resilience

19. *Type of submission:* **Invited speaker abstract**

B. Biome Working Group sessions: B10c Implementation of the ecosystem services concept for urban planning and development

The effect of invasive species on recreational ecosystem services in urban ecosystems

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One of the most important ecosystem services (ES) the residents can derive from the city's green spaces is the recreation. Recently a growing interest in natural ecosystems in cities has been noted and seeking for wilderness by the residents has gained more and more attention. One of the major problems in preserving ecologically valuable areas in cities is the presence of invasive species, which were initially introduced as ornamental plants and started to spread uncontrollably. At the same time there is lacking data on the effect of such invasions on the quality of residents recreation. We studied natural riparian forests located in the central part of Warsaw, strongly invaded by Acer negundo – one of the major invasive tree species in Central Europe. The strip of vegetation, 20km long has been preserved within the embankments on the Vistula River, and despite being located in the city centre is characterized by high ecological value. The area has become easily accessible by the public as a walking route was constructed along the whole forest. In this study we conducted sampling in homogenous sites of a forest stand. As an indicator of the recreation value we used the density of walking routes, as a measure of the use of the area by the users. We recorded all formal and informal tracks used by the public and recorded the number of people at the entrances and calculated the densities of invasive maple. For the average number of 220 users recorded daily the density of the forest stand and tree species diversity are the important factors. The presence of Acer negundo is not however related to the intensity of how people use the space. Therefore directing the majority of the visitor's traffic onto the areas strongly invaded but voiding the more ecologically valuable sites, will provide recreation possibilities and access to wilderness but with minimal impact on the valuable ecosystems.

Keywords: recreation, Vistula, green infrastracture, natural ecosystems, vegetation

20. *Type of submission:* **Abstract**

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The current state ofknowledge on urban ecosystem services in Russia

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At the United Nations Conference on Housing and Sustainable Urban Development - Habitat III, held in Quito (Ecuador) in October 2016 a new urban development program was adopted to achieve sustainable development goal No. 11 - "make cities inclusive, safe, resilient and sustainable". This program brings together the best proposals to form truly comfortable and safe urban environment. Research report No. 16 “Urban Ecosystems and Resource Management” declared the key role of ecosystem services and named urban planning a main tool for managing the urban environment. At the same time, more and more scientific publications are devoted specifically to the study of urban ecosystem services, which makes this area of research one of the main frontiers of modern science.In 2016 Russian President assign Russian government to develop an action plan aimed at strengthening Russia's position for the formation of international environmental agenda and discussion of issues related to the creation of a system of compensation (payments) for ecosystem services, focusing at Russia’s position as an environmental donor (Pr-140GS, p.1 d, dated December 26, 2016). Transitional state of Russian cities between industrial and post-industrial stage form an urgent need to revise existing approaches to their planning. In this context, along with a high concentration of the population in cities (over 100,000,000 people live in cities in Russia), accumulated environmental damage, urban ecosystem services assessment investigation seems necessary for Russian cities.The purpose of this research is to analyze the scientific papers devoted to the study and assessment of ecosystem services of urban ecosystems, as well as the existing prerequisites for the introduction and adaptation of an assessment of ecosystem services in the process of Russian urban planning.

Keywords: urban environment, ecosystem services, urban ecosystem services, assessment of urban ecosystem services, Russian cities

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Capacity of the green infrastructure to regulate the heat island effect in the city of Bilbao (Basque Country)

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Ecosystem services provided by urban green spaces are acknowledged for playing a major role in urban sustainability. These services actively contribute to achieve more resilient cities and assure the welfare of a vast number of people in the context of global change. In the Iberian Peninsula, the adaptation to climate warming is an urgent need with special focus to highly urbanized areas where the increase in temperatures may compromise people's wellbeing and quality of life.In this study we assessed the relationship between the green infrastructure and the urban heat island effect. We collected a set of environmental and biophysical variables from public information sources and compared their values in different locations, urban and periurban, in the city of Bilbao (Biscay, Basque Country).The green infrastructure was identified by means of leaf area index (LAI), as a measure of the green biomass and the maximum daytime land surface temperatures (LSTs) was used as an input for the Urban Heat Island (UHI). We performed spatial and multivariate analyses and found an inverse relationship between maximum temperatures and the vegetal biomass of green infrastructure associated to these areas. Morever, the degree of impervious (non-permeable) surfaces resulted to be a major factor contributing to cool the city. These results provide a basis for further research in relation to the processes that drive the contribution of urban ecosystems to adaptation against climate warming. Risks associated to the increase in temperatures and the heat island effect should not be obviated by urban planners due to their effects on people's health. As a consequence, attention should be paid to urban green spaces design from an integrative approach, taking into account quality, distribution and accessibility of these areas, to provide access to them for all people.

Keywords: Ecosystem services, well-being, urban heat island effect, leaf area index

22. *Type of submission:* **Abstract**

B. Biome Working Group sessions:B10c Implementation of the ecosystem services concept for urban planning and development

Urban green infrastructure: knowledge and decision-making

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There is a pressing global need for robust understanding of how green urban spaces might be planned, developed and maintained to greatest benefit for all. The call for 'safe, inclusive, accessible, green, and quality public spaces' encapsulated in UN-Habitat's New Urban Agenda and within SDG 11 will impact upon current planning and policy considerations relating to public space generally and green space specifically. Urban green space can provide critical ecosystem services to large and growing urban populations. The importance of a strong, technical knowledge base around the engineering, physical and social science of the urban environment cannot be understated. However, in order to plan, develop and maintain high-quality urban green spaces it is also important to understand if and how this knowledge, and other kinds of knowledge, are being or could be leveraged to greatest practical effect. This work uses the framing of 'green infrastructure', to engage with and elucidate aspects of the knowledge contributions to contemporary urban environmental decision-making in the design, development and management of urban green spaces. The five case study cities are London and Birmingham in the UK, Johannesburg, Durban and Cape Town in South Africa.This study is based upon analysis of academic papers, technical reports and policy documents, semi-structured interviews and site visits with academics, practitioners (planners, engineers, environmental consultants), policy-makers and local community actors. The main areas of inquiry are: theory and practice (definitions and understandings of green infrastructure), knowledge and skills (the actual and perceived knowledge base for green infrastructure implementation) and governance, policy and decision-making (the contemporary operating space for decision-making). While the study is not intended to be directly comparative between countries, a city comparison is presented. Common themes are investigated around sufficiency of knowledge base and knowledge sharing, financing, legacy and maintenance challenges and personal and professional perceptions affecting green infrastructure use.

Keywords:Urban ecosystem services, Green infrastructure, Knowledge systems, Decision-making