BOOK OF ABSTRACTS

I. SESSION DESCRIPTION

ID: B10f

Urban form and ecosystem delivering capacity – relations and implications for urban planning and governance

Hosts:

	Name	Organisation	E-mail
Host:	Stefano Salata Anton Shkaruba	Politecnico di Milano Estonian University of Life Sciences	stefano.salata@polimi.it anton.shkaruba@emu.ee
Co-host(s):	Anna Laura Pisello Enrico De Angelis Kalev Sepp Ruthi Veibiakkim	University of Perugia Politecnico di Milano Estonian University of Life Sciences Estonian University of Life Sciences	anna.pisello@unipg.it enrico.deangelis@polimi.it kalev.sepp@emu.ee ruthi.veibiakkim@emu.ee

Abstract:

The pressing need for the development of climate-resilient and liveable cities requries a comprehensive overhaul of urban design parameters. This includes such characteristics as density, land-use mix, connectivity, accessibility, and the quality and quantity of green spaces, alongside a shift in energy production methods, the enhancement of natural capital at the district level, as well as a major revision of objectives and techniques for the management of urban green and blue infrastructure. This holistic approach aims at fostering Environmental Well-being (EW) in cities, with a focus on climate change mitigation and adaptation, as well as just and inclusive character of urban space.An integral part of this paradigm shift involves incorporating ecosystem performance-based design techniques. They prioritize citizens' vulnerability and exposure to climate risks, while also considering the varying preferences of citizens regarding urban green

and blue infrastructure and its components. It is important therefore, in addition to ecosystem services also to acknowledge the role of ecosystem disservices (EDS) – functions and properties of ecosystems that cause discomfort to citizens. While ecosystems provide valuable services, such as clean air, water and noice suppression, the presence of EDS can detract from urban livability and health through such factors as allergens, falling deadwood, stain on surfaces, fears of dark and/or unmanaged green spaces, unwanted biodiversity, mosquitos, barriers and accessibility issues associate with nature protected areas etc etc. EDS are extremely context-specific and value-laden, even when compared to ecosystem services. Therefore, effective management of EDS requires a nuanced understanding of the views and vulnerabilities of various social, age, gender and other groups regarding urban nature. It also requires consideration of the acceptability and feasibility of design and management solutions under various socio-economic and biophysical factors.

The EW paradigm can be practically applied to urban planning and design within this perspective. Rethinking of the current urban form of cities towards a more adaptive one for mitigating climate change and ensuring the acceptability and accessibility of urban green and blue infrastructure is currently at the center of scientific and academic debates. To effectively address the human-centric perspective, urban adaptation to climate change should be optimized by ecosystem performance-based design techniques (i.e., criteria or parameters) focused on citizens' vulnerability and exposure. Likewise, EDS need to be understood and addressed while designing inclusive urban space and prescribing management strategies for urban green and blue infrastructure.

Goals and objectives of the session:

The session aims to address contemporary challenges in developing ecosystemically-compatible and inclusive projects at the district scale (Salata, 2019; Skryhan and Shkaruba, 2022) through a systematic investigation of urban systems at the block level, and involving the identification and analysis of ecosystem disservices (EDS) at any relevant planning levels. These criteria apply to both existing parts of cities and new transformation areas, aligning with the ambitious targets set by the UN Sustainable Development Goals (SDGs) for sustainable city and community development (United Nations, 2015).

In this session, urban form, ecosystem delivery capacity, and EDS will be approached in a holistic and integrated manner, considering socio-ecological systems that encompass mobility, public space, the built environment, ecology, well-being, and social cohesion. The focus will be on designing new urban organizational units to regenerate contemporary cities in an adaptive and resilient manner while ensuring their inclusive character, especially for vulnerable groups.

Key topics of inquiry will include methodological approaches, field and analytical techniques for understanding the interplay between urban form, associated socio-cultural systems, and ecosystem properties and functions at the district scale. This interplay results in a variety of

ecosystem services and disservices. The session's objective is therefore to review relevant observation, mapping, monitoring, and evaluation techniques, as well as planning and management practices that support urban design and governance solutions for more climate-aware, liveable and and inclusive cities. Additionally, the session will explore how EDS can facilitate citizen engagement in urban and spatial planning processes. Finally, it will examine the utility of participatory GIS and living labs in identifying and evaluating ecosystem services versus ecosystem disservices, offering insights into innovative approaches to addressing urban challenges.

Planned output / Deliverables:

The session aims to attract contributions that advance the understanding the interplay of between urban form, associated socio-cultural systems, and ecosystem properties and functions (including such as ES and EDS) and demonstrate how this approach can enrich spatial and urban planning. By addressing citizens' concerns regarding undesirable aspects of urban nature and integrating these considerations into planning and governance processes, the session seeks to foster a more harmonious relationship between urban environments and their inhabitants.

Building on the outcomes of the session and the quality of contributions received, the organizers plan to develop an overview paper or propose a special issue to an international peer-reviewed journal. This initiative aims to disseminate the insights gained from the session to a broader audience, thereby contributing to ongoing discourse and informing future research and practice in urban planning and governance.

Session format:

The session shall feature talks of 10 minutes with 5 minutes discussion, followed by a moderated discussion (preferably in small breakout-groups) on cross-cutting issues and future steps.

Two thematic session streams will be organized around two main topics of discussion. One will focus on EDS identification and analysis, while the second will explore the urban form in relation to ecosystem delivery capacity at the district scale. An overarching topic of both streams concerns implications for climate-aware and inclusive planning.

II. SESSION PROGRAM

Room: Expert Street 2

Date of session: 21st of November 2024
Time of session: 11:00 – 15:30

Timetable Speakers

Time	First name	Surname	Organization	Title of presentation
11:00 11:10	Giedrius	Dabasinskas	Vytautas Magnus University	Spatial and Temporal Changes in Supply and Demand for Ecosystem Services in Response to Urbanization: A Case Study in Vilnius, Lithuania
11:15 11:25	Pham Trung	Kien	Université Gustave Eiffel	Integrating ecosystem disservices into urban food garden planning: management strategies based on food–water–soil nexus perspective
11:30 11:40	Sabrina	Lai	University of Cagliari	The Influence of Urban Form on Regulating Urban Ecosystem Services
11:45 11:55	Beatrice	Mosso	Politecnico di Milano	Climate Adaptation in Normative Planning
12:00 12:10	Click here to enter text.	Click here to enter text.	University of Camerino	Wild boars, feral dogs, ticks and mites: ecosystem disservices are entering our cities. A comparison between the compact urban fabric of historic centers within city walls, the modern sprawl
12:15 12:25	Ruthi	Veibiakkim	Estonian University of Life Sciences	Integrating Ecosystem Disservices into urban planning and design: a systematic review to identify gaps and directions for the future
Lunch Break				
13:30 13:40	Anton	Shkaruba	Estonian University of Life Sciences	Ecosystem Disservices as a tool for community engagement to the planning process

Time	First name	Surname	Organization	Title of presentation
13:45 13:55	Ruthi	Veibiakkim	Estonian University of Life Sciences	Understanding Ecosystem Disservices: a cross-Eurasian perspective
14:00 14:10	Abhishek Kumar	Verma	Forest Research Institute, Dehradun, India	Community Preferences and Perceptions of Urban Trees for Maximizing Ecosystem Services: A Survey-Based Study in Varanasi, India
14:15 14:25	Janneke	van Oorschot		Optimizing green and grey infrastructure planning for sustainable urban development
14:30 14:40	Marcin	Spyra	University of Ostrava y	Ecosystem Services Trade-offs in Peri-urban Landscapes: Drivers, Governance Obstacles and Improvements
14:45 14:55	Shamik	Chakraborty	Hosei University	Emerging patterns of urban sustainability through urban blue/green spaces: Navigating problems and prospects through empirical cases
15:00 15:10	Beatriz	Fernández de Manuel	University of the Basque Country	MuGIP: an Index to assess multifunctionality of nature-based solutions in a World Heritage City
15:15 15:30	Organizers			WRAP UP

III. ABSTRACTS

The first author is the presenting author unless indicated otherwise.

1. Spatial and Temporal Changes in Supply and Demand for Ecosystem Services in Response to Urbanization: A Case Study in Vilnius, Lithuania

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Intensification of urbanization is changing the supply capacities and demand levels of ecosystem services (ESs), and their mismatch has become a major problem for the sustainable development of urban areas. In this study, spatiotemporal changes of three ecosystem services (food provision, C sequestration, recreation) were quantified and imbalances between their supply and demand were identified in Vilnius County (Lithuania) in 2000–2020. The most significant land use transformation was the increase in forest and urbanized land at the expense of agricultural land. The lowest supply and the highest demand for food, carbon sequestration, and outdoor recreation were in the urban center. The urban land ratio had a negative impact on the provision of ecosystems' services during the study period, most notably affecting food supply. Urbanization indicators—population density and urban land area—showed a negative relationship with the provision of ecosystem services. The balance of supply and demand changed during the 2000–2020 period—the growth of suburbs led to the distance of the supply areas from the city, and the area of the intense demand increased. The results of the study highlight the importance of spatial scale in determining the impact of urbanization on ecosystem functions.

Keywords: ecosystem services, suburbanization, urban sprawl, land cover change

2. Integrating ecosystem disservices into urban food garden planning: management strategies based on food-water-soil nexus perspective

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Addressing the multifaceted challenges of urbanisation usually involves a variety of interdisciplinary strategies and solutions across different sectors. Among them, nexus approaches have been being developed and starting to be examined in scholarly works or small-scale experiments. However, while the ecosystem perspective is essential for sustainable resource management and receives growing interest, it is not well connected to the nexus assessment. Earlier research has been working on the integration of ecosystem services in nexus approaches, but none has addressed the lack of ecosystem disservices (EDS) for better objective decision-making. The lack of clarity is rooted in the entanglement of ecosystem services and disservices for human well-being, despite they are viewed as equally important for urban ecosystem planning. Focusing on the urban food gardens (UFGs), this study clarifies the interlinked relationships between the food-water-soil nexus and EDS derived from UFG systems. From this perspective, we argue the strong role of EDS in UFGs management and illustrate a clearer picture incorporating the food-water-soil nexus concept.

Keywords: urban food gardens, urban resource assessment, food water soil nexus, urban resilience, ecosystem disservices

3. The Influence of Urban Form on Regulating Urban Ecosystem Services: An Empirical Analysis from Cagliari, Italy

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In urban contexts, the provision of regulating ecosystem services (RES), such as regulation of climate, heat, and flood, is of high significance to ensure the local communities' safety, health, and wellbeing.

This study seeks therefore to analyze the relationships between the provision of the three above mentioned RES and the characteristics of urban areas. By taking the Italian city of Cagliari as the study area, RES's interplay with the spatial configuration of green spaces and of the built environment is assessed. Green areas are classed based on vegetation height, whereas the built environment and socioeconomic characteristics here considered refer to size of buildings, share of sealed land, residential density, and education level of the residents.

The spatial assessments of the three RES and of the analysis of the physical and socioeconomic features are carried out at the census tract level and feed into an inferential model, whose estimates provide information on direction and strength of the relationships.

Treed areas showed no significant impact on carbon storage and a positive influence on temperature mitigation; larger shrubby areas lead to higher supplies of carbon storage and flood control; higher shares of sealed soils are unsurprisingly associated with lower provisions of the three RES. On these results, policy implications aimed at improving urban RES supply are finally identified.

This study was carried out: i. within the RETURN Extended Partnership and received funding from the EU Next-GenerationEU (National Recovery and Resilience Plan – NRRP, M4C2I1.3 – D.D. 1243/2022, PE0000005); ii. with the financial support under the NRRP, M4C2I1.1, Call for tender 1409/2022 by the Italian Ministry of University and Research (MUR), funded by the EU – NextGenerationEU – Project Title "Definition of a guidelines handbook to implement climate neutrality by improving ecosystem service effectiveness in rural and urban areas" – CUP F53D23010760001– Grant Assignment Decree 1378/2023 by MUR.

Keywords: urban ecosystem services, regulating ecosystem services, urban form, urban green areas, spatially-explicit assessments

4. Climate Adaptation in Normative Planning. A Perfomance Based Design approach for Ecosystem Zoning in Varese city (Italy).

First authors(s): Beatrice Mosso
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The global poly-crisis we are witnessing, driven by political instability and ongoing wars, inflation, energy crises, high levels of inequality and poverty, and technological innovation, is closely linked to cities, where these effects are amplified and multiplied as the world's most densely populated areas.

The study of ecosystem services and their benefits for living beings' health, previously confined to an in-depth theoretical understanding, experiences the pressing need to be integrated in the regulatory aspects of the implementation process, able to shape a climate-adaptive planning, capable of preventing mitigating the catastrophic effects of climate change in urban environments.

Within these premises, the research proposal carried out by the Department of Architecture and Urban Studies (DAStU), related to the revision of the Municipality of Varese's General Territorial Plan, develops an in-depth analysis dedicated to identifying the performance of the city to cope with climate change effects and investigating its vulnerability to intense rain phenomena.

The scientific activity represent an opportunity to innovatively shape the decision-making process by introducing an experimental planning tool, the Ecosystem Zoning. This allows a new categorization of the municipal territory based on the biophysical performance of each regulated parcel while employing a semi-automatic classification of a composite ecosystem services map composed by habitat quality, sediment delivery, urban cooling and stormwater retention.

Each ecosystem framework shaping the zoning is characterized by different ecosystem delivery capacities, allowing the definition of site-specific and tailored interventions to maintain or enhance the existing ES supply directly affecting the urban regeneration and transformation

processes. The integration of research findings within the broader context of urban planning enriches our understanding of the intricate relationship between ES, climate change effects and urban planning, aligning the research with global efforts to create resilient, ecologically conscious cities that prioritise the well-being of both inhabitants and the natural environment.

Keywords: Resilient planning, ecosystem zoning, extreme weather events, adaptive capacity, antifragility

5. Ecosystem Disservices as a tool for community engagement to the planning process

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Ecosystem Disservices (EDS) are functions and properties of ecosystems delivering discomfort to citizens. In cities they can be at least as important for citizens as ecosystem services (ES), and even more noticeable at times, as many EDS can be seriously disturbing in urban contexts. This further leads to the call for the solutions whereas ES as well as EDS are integrated in planning designs delivering comfortable urban environment to citizens, and ensuring their co-existence with ecosystems and biodiversity.

Understanding the potential of EDS as a communication tool for sustainable urban governance, in the ongoing Horizon Europe BetterLife project we came up with and EDS-based tool for community engagement to the planning process, which is a part of BetterLife toolkit for supporting socially-engaged life sciences research (https://www.better-life-digital.eu/toolkit/). The tool includes three steps: (1) measuring perceptions of urban nature by citizens using quantitive or qualitative sociological tools (depending on the capacity of the analytical group), (2) implementation of citizens' perceptions into spatial planning designs by deploying a decision-making tree guiding decision-making logic for different EDS types, and (3) integration of citizens's perceptions, spatial planning designs, and governance policies through co-creation sessions with multiple stakeholder groups.

The core part of the tool, the EDS decision-making tree, has been tested in multiple geographical, socio-ecological and managerial contexts, whereas the decision-making logics have been discussed both for the cases demonstrating the failure to preserve urban

ecosystems, as well as successful ones. This included 3 cases in Belarus and 3 in Estonia, with further ones being developed in Italy. As yet, case studies demonstrate the validity of the decision-making tree and the EDS categorisation used for it in a variety of contexts. The first trials outside Europe (India, Mongolia) suggest that they may require fine-tuning, while the overall structure is likely to remain valid.

Keywords: Ecosystem disservices, urban planning, socially-engaging research, liveable cities, stakeholder involvement

6. Wild boars, feral dogs, ticks and mites: ecosystem disservices are entering our cities. A comparison between the compact urban fabric of historic centers within city walls, the modern sprawl and other urban forms.

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In history, city walls served to protect not only from enemies, but also from the wild nature that constantly threatened to enter the urban environment. During time, those walls have been demolished or crossed over, and the city boundaries are increasingly less recognizable and marked, regardless cities are actually growing or shrinking. Urban expansion has incorporated agricultural and semi-natural areas, grabbed land and left at the same time many residual areas in total abandonment. Green and blue infrastructures are deliberately introduced today within urban areas as ecological corridors to bring in certain kinds of ecosystem services and mitigate the harmful effects of pollution and climate change. However, when planning the urban change, cost-benefit analyses are rarely carried out regarding ecosystem services acquired and potential disadvantages. Could the shape of the city, and especially its border, play a role in keeping away, far outside the urban environment, those ecosystem disservices that are now not only evident to all but also studied by scientists?

Through the analysis of case studies and examples from various Italian cities with different history, shape and spatial configuration, some answers are proposed. In particular, we discuss how imposing a well-defined limit on the city is a way not only to stop land take, but also to limit certain ecosystem disservices whose spread is today driven by climate change, which we would like to mitigate just through green and blue infrastructures in the city. Without having to

give up natural elements, this contribution though highlights how most of ecosystem services on which the city depends are actually found and provided far outside the urban context. It also points out how, to ensure those ecosystem services typically provided within urban contexts, we can actually adopt very different strategies, possibly avoiding anyway the worst tendencies towards abandonment or wilderness.

Keywords: ecosystem disservices, urban form, city walls, climate change, ecological corridors.

7. Integrating Ecosystem Disservices into urban planning and design: a systematic review to identify gaps and directions for the future

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Ecosystem Disservices (EDS) are functions and properties of ecosystems that negatively affect human well-being. While the concept of ecosystem services (ES) has long guided urban planning and design toward fostering sustainable, resilient, and livable cities, EDS is often overlooked, despite their impact on quality of life. Nevertheless, there is a significant gap in comprehensive understanding of the development of urban planning designs that address ecosystem disservices. To bridge this gap, this study comes up with a systematic review focused on analyzing EDS and their integration into urban planning process.

The systematic review draws on existing literature and data on city planning and design. The literature searches were conducted in the Web of Science (WoS) database (n=7698), and through a systematic screening procedure; 59 papers were selected for an in-depth qualitative analysis. The focus was on papers that addressed EDS in inclusive urban planning process. First, all significant ecosystem disservices in urban areas have been identified. Second, public perceptions and expectations of urban green infrastructure and city design that addressed their needs for a good quality of life have been synthesized. Third, recommendations for inclusive urban planning designs that can mitigate EDS and meet public needs have been made.

Preliminary findings highlighted the need for planning and management practices that incorporate EDS into planning frameworks. Most EDS addressed in the papers were from urban

green spaces, primarily in Europe. Innovative strategies to tackle EDS included wildlife corridors, flood-resilient buildings, landscape barriers, and the integration of blue spaces to minimize urban pressure on the environment and biodiversity while improving quality of life. This study can serve as a baseline for urban planners and policymakers in making informed decisions on land use, urban planning, and policy formulation to safeguard the well-being of urban populations, particularly vulnerable groups.

Keywords: Ecosystem disservices, urban planning, environmental policy making, resilient cities, green and blue infrastructure

8. Understanding Ecosystem Disservices: a cross-Eurasian perspective

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Ecosystem Disservices (EDS) include all ecosystem functions and processes that negatively impact quality of life. This study aims to understand the diversity of EDS and their drivers across Eurasia, with its broad gradient of biogeophysical and socio-cultural contexts, as well as how this is reflected in relevant policies, planning and management practices.

This paper utilizes a comparative qualitative analysis, gathering data from local mass media, social networks, policy statements as well as urban planning and management grey literature. The study includes cities of České Budějovice, Ostrava (Czechia), Mahilioŭ (Belarus), Can Tho (Vietnam), Delhi, and Chennai (India). Information was collected for each city, according to EDS types, each assigned a score ranging from 0 to 4. A score of 0 indicates that EDS does not occur (or not perceived as EDS) in the region, while scores of 2 to 4 reflect varying levels of societal concern or impact, with 4 indicating significant disturbance causing economic losses or human health impacts. The study also examines relevant policy and management responses.

Findings reveal that mosquito-borne diseases, floods, algal blooms, viral transmission from animals, allergies from plants, waste in green areas, and crimes associated with urban parks are the most prevalent EDS in Asian cities. In contrast, risks of aging trees and branches falling,

poor conditions of unpaved paths and alleys in green spaces, unmanaged vegetation, invasive species, floods, and transportation and pedestrian connectivity issues due to green and blue spaces are the common EDS in European cities, which imply that EDS vary significantly, reflecting regional differences in environmental challenges and societal impacts. These contrasting EDS profiles also suggest that local environmental management strategies and policies need to be tailored to address specific regional challenges effectively, highlighting the importance of understanding local contexts and priorities in designing sustainable urban development and environmental policies.

Keywords: Ecosystem disservices, Qualitative Analysis, Environmental Policy, Sustainability, Urban green and blue infrastructure

9. Community Preferences and Perceptions of Urban Trees for Maximizing Ecosystem Services: A Survey-Based Study in Varanasi, India

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The aim of the study was to investigate community preferences and perception regarding urban trees, focusing on identifying the ecosystem services most valued by residents of Varanasi, Uttar Pradesh, India. Rapid urbanization has significant impacts on human well-being and the environment, often leading to a decrease in air quality, loss of green spaces, and biodiversity decline. Urban forestry has emerged as a promising solution to counter these detrimental effects by positive ecosystem services.

To understand this, we used the Best Worst Scaling method to prioritize ecosystem services and traits provided by trees which are more suitable for urban planting. Our findings indicate a strong preference for trees that provide oxygen, highlighting the community's concern for air quality and environmental health. Trees with medicinal properties were the second most preferred, reflecting thankfulness for health benefits and traditional uses. Trees of religious significance also garnered considerable preference, indicating the cultural and spiritual values associated with urban forestry. We also used Likert-scale method to assess the perception of people regarding urban forests. The overall perception of urban forestry among the community was positive, suggesting strong public support for initiatives aimed at increasing urban green

spaces in view of their ecosystem services to the urban population. Notably, a substantial portion of our responses came from students, offering a unique perspective on urban forestry preferences.

The findings from this study are valuable for policymakers and urban planners so that they can incorporate those species which are more preferable and accepted by the local people for better coherence between trees and people. This alliance of urban forest and urban residents can foster more effective and inclusive practices that can enhance urban environment, ecosystem services and resonate with residents' values and needs.

Keywords: Urban forestry, Urban greening, Urban Planning, Urban Policy, Climate Change

10. Optimizing green and grey infrastructure planning for sustainable urban development

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The anticipated increase of 2.5 billion in the urban population by 2050 poses significant environmental challenges. While various studies examine environmental impacts individually, integrated approaches are rare. This study introduces a spatially explicit model to assess urbanization's effects on ecosystem services (green infrastructure availability, cooling, stormwater retention) and the environmental impact of building construction (material demand, greenhouse gas emissions, land use). Applied to the Netherlands from 2018 to 2050, our results show that integrating green infrastructure development with building construction could increase green areas by up to 5% and stabilize or increase ecosystem service provisioning. Dense building construction with green infrastructure development is generally more beneficial across the Netherlands, reducing resource use and enhancing ecosystem services. Conversely, sparse construction with green infrastructure is more advantageous for newly built areas. These findings offer insights into the environmental consequences of urbanization, guiding sustainable urban planning practices.

Keywords: ecosystem services, urban planning, spatial analysis, building materials, circular economy

11. Ecosystem Services Trade-offs in Peri-urban Landscapes: Drivers, Governance Obstacles and Improvements

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Trade-offs in ecosystem services (ES) manifest when the enhancement of one service leads to the diminishing of another. These trade-offs pose a notable challenge, impacting the sustainability of particular socio-ecological systems peri-urban landscapes (PULs). This issue arises from the dynamic processes associated with peri-urbanization, posing threats to natural ecosystems and their services in peri-urban areas. Additionally, the escalating demand for ecosystem services in PULs contributes to these trade-offs. Policy making and planning concerning ecosystem ES trade-offs in PULs should prioritize the promotion of a balance between conflicting services and foster synergies among them. However, it is noteworthy that ES trade-offs in PULs are not given high priority on policy and planning agendas. Knowledge regarding policy development and planning for ES trade-offs in PULs often remains concealed within specific country and regional case studies. Consequently, this research seeks to characterize the ES trade-offs in the selected PUL case studies, with the objective of identifying potential commonalities among them. Furthermore, the study aims to identify: (i) the factors driving ES trade-offs, (ii) challenges pertaining to how policy-making and planning address ES trade-offs in PULs, and (iii) recommendations for enhancing governance practices to better manage peri-urban ES trade-offs. We designed a semi-quantitative survey and collected information about 23 different case studies, located across the world. Answers from this survey were analyzed with the help of Principal Component Analysis approach. The results showed that the most common trade-off occurred between “cultural and provisioning” and “regulating and provisioning” ES. It was found that urban development is the basic driver behind emerging of the examined trade-offs. To tackle this issue at the governance level, the study recommends establishing mechanisms to facilitate collaboration among stakeholders. This should be accompanied by robust dissemination efforts and the promotion of awareness among actors regarding the fundamental concepts of ES and PULs.

Keywords: awareness; conflict; planning; principal component analysis; similarity patterns

12. Emerging patterns of urban sustainability through urban blue/green spaces: Navigating problems and prospects through empirical cases

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While it is well noted that our present world has become increasingly urban, with the majority of the population living in urban areas; probing the sustainability components in urban areas is still in its infancy. Urban areas are also often crosscut important biodiversity areas including protected areas, that are key to maintaining ecosystem and human health. Urban areas today, thus, are at a crossroads between both ecosystem degradation and sustainability. These are given by unsustainable resource use, social conflicts, and negative human developments such as poor health quality on one hand, while by potential refugia for biodiversity, and spaces that support multiple ecosystem services and human well-being components on the other hand. The present paper carries out a literature review revealing key socio-ecological components that are emerging under the umbrella of urban ecology while citing key examples from empirical research in Japan, and the Philippines. The paper suggests that understanding, interpreting, and enhancing the urban socioecological components that are ecologically multi-functional such as urban blue/ green spaces can be catalysts in pushing urban socio-ecology towards sustainability with multiple human well-being components. The study is especially useful in drawing attention to reducing further deterioration of urban ecosystems that provide multiple ecosystem services and are bound especially by livelihood-based values and cultural values.

Keywords: Urban ecology, urban blue/green space, urban socio-ecological system