BOOK OF ABSTRACTS

This Book of Abstracts provides a comprehensive overview of the session content and is structured into three main sections:

I. Session Description – an introduction to each session, including its objectives and expected outputs
II. Session Program – a detailed schedule for each session, including speakers and timing
III. List of Abstracts – a complete compilation of all accepted abstracts

I. SESSION DESCRIPTION

ID: T5a

Empirical evidence and models for ecosystem services research in urban environments

Hosts:

	Name	Organisation	E-mail
Host (s):	Joeri Morpurgo	Leiden University/ HAS Green Academy	j.morpurgo@cml.leidenuniv.nl
Co-host(s):	Roy Remme Paulo van Breugel	Leiden University HAS Green Academy	r.p.remme@cml.leidenuniv.nl P.vanBreugel@has.nl

Abstract:

Cities are at the forefront of the challenges and opportunities for achieving nature- and people-positive ecosystems. As cities continue to expand and densify, understanding and better integrating ecosystem services into planning and decision-making becomes essential for ensuring long-term human well-being, biodiversity resilience, and sustainable urban development. A broad array of research approaches is needed to support such understanding and integration, ranging from conceptual, to empirical, and modelling approaches and spanning quantitative and qualitative perspectives.

To support urban planning, the majority of ecosystem service studies rely on models. Yet, urban ecosystem service models that are both robust across contexts and broadly validated are lacking. This session, Empirical evidence and models for ecosystem services research in urban environments, will focus on advancing knowledge of data, methods, and empirical evidence for assessing ecosystem services in cities. We invite researchers with novel methods for gathering and using field, sensor or other empirical data(sets) to model and understand urban ecosystem services. In particular, we are interested in studies that suggest new avenues of sampling, modelling and thinking to support and validate urban ecosystem services modelling.

In general, the session aims to critically evaluate the current state of the art, from biophysical quantification to socio-cultural valuation, to identify persistent gaps limiting accurate modelling, and to explore how models can inform urban policy, planning, and governance processes and contribute to tangible decision-making. Gaps addressed may include I) optimization of existing ecosystem service models based on new data, II) development of models for underrepresented ecosystem services, III) extending and enhancing existing ecosystem service models, IV) novel methods to gather data used to model ecosystem services, V) the integration of heterogeneous datasets, collected at different times and locations, to assess multiple ecosystem services in a single framework, VI) quantification of uncertainty in ecosystem services, VII) strengthening generalizability and cross-model integration for ecosystem service assessments across different contexts and services, VIII) bridging the gap between models and practical implementation in policy and planning.

Goals and objectives of the session:

Key objectives include: examining innovative data sources (including remote sensing, citizen science, sensor networks, street view imagery) in relationship to urban ecosystem service assessment; exploring methodological advances for capturing trade-offs and synergies in ecosystem services and values; identifying barriers to accurate model ecosystem services in the urban environment and advancing the practical application of ecosystem service models in urban planning and policy.

Planned output / Deliverables:

The planned outcome for the session is a short paper indication the state-of-the-art data, methods and knowledge regarding urban ecosystem services, highlighting strengths and weaknesses in each of those aspects. Ideally, this would result in a paper that sets the research-agenda for the next 5-10 years based on the expertise in the room and beyond.

Session format:

Aim for a session format where we'll first have some presentations and then a brainstorm based on the presentation & the session goal, as a start for a paper.

Related to ESP Working Group:

TWG 5 - Modeling ES

II. SESSION PROGRAM

Room: A3
Date of session: Friday 22, May 2026
Time of session: 14:00–15:30

Timetable speakers:

Time	First name	Surname	Organization	Title of presentation
14:00-14:15	Joe	Douglas	UK Centre for Ecology & Hydrology	Mental health benefits of urban green space are shaped by green space attributes, visitor characteristics, and the activities they undertake
14:15-14:30	Mohammad Reza	Ansari	Institute of Environmental Planning, Leibniz University Hannover	Urbanization, Informality, and Ecosystem Services in the Global South: Landscape Fragmentation and Habitat Quality in Kabul (2000–2022)
14:30-14:45	Monika	Lebiedziń ka	Wrocław University of Environmental and Life Sciences	Visual attention patterns as a proxy for Landscape Services: A comparative eye-tracking study of social media photographs and panoramas
14:45-15:00	Emmanuel Nii Attram	Taye	Centre for Biodiversity Conservation Research, University of Ghana	Demographic determinants of the perceptions and value of ecosystems services of an urban wetland: prospects for conservation policy and practice
15:00-15:15	Lindsi	Seegmiller	Lund University, Department of Environmental and Geosciences	Connectedness, scale, and multifunctionality of nature-based solutions across functional urban areas.

15:15-15:30	Dumitru-Mircea	Dușcu	University of Bucharest	Spatial distribution of regulating ecosystem services provided by urban green infrastructure in Bucharest, Romania

III. ABSTRACTS

The first author is the presenting author unless indicated otherwise

1. Mental health benefits of urban green space are shaped by green space attributes, visitor characteristics, and the activities they undertake

***First author*:** Joe Douglas
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Access to green spaces is limited in urban areas and has proven benefits for the mental health and well-being of residents. However, there remains a paucity of evidence as to how these benefits vary based on a) the attributes of visited sites, b) the characteristics of visitors, and c) the activities undertaken during each visit. To address these evidence gaps, we analysed 10,749 responses to the Adults' People and Nature Survey (PaNS) for England. PaNS is a national survey which gathers information on the location and self-reported mental health benefit of a recent green space visit, providing a unique opportunity to use big data to assess urban ecosystem services. By comparing visit locations with spatial data from other sources, we were able to model the mental health benefit of urban green space visits against the physical attributes of visited sites, as well as the characteristics and activities of visitors. Our results show that people living with a long-term health condition experienced greater benefit compared to other visitors. Women benefitted more than men, and benefit varied between age groups – with those aged 40-54 years experiencing the greatest improvement. Larger green spaces and longer visits were associated with greater well-being. Our model also indicates significant positive relationships between reported mental health benefit and the following visit activities: watching wildlife, picnicking, running/cycling, and walking. We identified significant interactions between age and gender, and between visit duration and site area, which supports the conceptual framework that well-being benefits of green space access arise from a web of interrelating factors. Our findings highlight the need for policy makers and planners to ensure urban residents have access to many types of green area to meet their diverse use requirements and mental health needs.

Keywords: mental well-being, green infrastructure, blue space, cities, one health

2. Urbanization, Informality, and Ecosystem Services in the Global South: Landscape Fragmentation and Habitat Quality in Kabul (2000–2022)

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Since the early 2000s, research on ecosystem services (ES) has advanced significantly, establishing a robust understanding of how urbnization impacts ecological functions. However, the majority of this literature is grounded in the Global North, where urban areas are often conceptualized as homogenous, planned entities. This perspective is increasingly difficult to translate to the Global South, where urbanization is distinct, rapid, and characterized by high levels of informality. Despite the widespread presence of these settlements, the specific effects of informal urbanization on ES remain largely unexplored, creating a gap in effective policy implementation.

This study addresses this disparity by analyzing landscape structure transformations in Kabul—where approximately 70% of the urban fabric consists of informal settlements—between 2000 and 2022. Our analysis of landscape metrics reveals a significant fragmentation of the urban environment over this twenty-two-year period. Specifically, the landscape has become increasingly disjointed, evidenced by a surge in the Number of Patches (NP) by approximately 1.4 times (from roughly 37,700 to over 53,000), while the Mean Patch Size reduced by approximately 30% (from 2.73 to 1.91 hectares). Building on this, we classified the study area into formal and informal settlements to determine how their distinct expansion patterns drive this fragmentation. Furthermore, we employed a Habitat Quality model to assess how these structural changes have differentially impacted biodiversity. These findings suggest that sustainable ecosystem management in the Global South requires planning strategies that explicitly account for the distinct ecological footprints of informal settlements, rather than relying on uniform models derived from formal contexts.

Keywords: Ecosystem Services, Global South, Habitat Quality, Informal Settlements, Landscape Fragmentation.

3. Visual attention patterns as a proxy for Landscape Services: A comparative eye-tracking study of social media photographs and panoramas

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Photographs shared on social media increasingly serve as indicators of collective landscape preferences, reflecting both aesthetic judgments and patterns of space use. They also enable the identification of the intensity of landscape service use in specific landscape types. However, these analyses need to be supported by methods of direct measurement of human perception, such as eye tracking, based on the actual participation of the subjects. The research is based on photographs from frequently documented locations published on Instagram in the urban landscapes of two Polish cities and on panoramic photographs taken in the same areas. The selected images are characterized by high visual complexity and repetitiveness of motifs in social media, while the panoramas allow for a broader exploration of the landscape and analysis of the structure of visual attention over time. Eye-tracking technology was used in combination with Likert scale self-assessment questionnaires to measure actual visual interest in individual landscape components. The analysis focused on the number and duration of fixations within defined areas of interest (AOI), the order in which elements were perceived, scanning paths, and heat maps depicting the intensity of visual exploration of the landscape. The diverse structure of the research group allows for the identification of differences in temporal perception patterns among participants. Preliminary results indicate that fixation duration and spatial distribution of gaze correspond to recurring compositional elements present in photographs on social media, particularly in areas where natural and anthropogenic elements intersect.

Keywords: Eye tracking, landscape services, perception

4. Demographic determinants of the perceptions and value of ecosystems services of an urban wetland: prospects for conservation policy and practice

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The Densu Delta Ramsar site, a critical wetland ecosystem in coastal Ghana, provides a diverse array of ecosystem services (ES) that support local livelihoods, cultural identity, and ecological resilience. Despite the benefits derived from the wetland, it remains vulnerable to diverse threats and disturbances mostly because its value is not directly known. This study investigates how demographic factors shape perceptions and valuations of provisioning, regulating, cultural, supporting, and employment-related ES. Using data from structured questionnaires, we applied generalized linear regression models to identify the

demographic predictors that best explain variation in ES valuation. Contingent valuation methods, Willingness to Pay (WTP) and Willingness to Accept Compensation (WTA), were used as proxies for ES valuation. A significant majority of respondents (82%) derived some form of benefit from the Densu wetland ($X^2 = 180$, df = 1, $p < 0.001$). Benefits included food (38%), livelihood (27%), salt (19%), recreation (12%), and water (4%). Clear intersectional patterns emerged: for instance, women and youth prioritize provisioning services linked to daily sustenance, while older and more educated respondents emphasize regulating and cultural services. Ethnicity was the most influential factor for cultural services ($F = 72.93$, $R^2 = 0.3$, $p < 0.0001$), indicating strong cultural differentiation. Majority of respondents (69%) expressed a willingness to pay for ecosystem services, while 52% were willing to accept compensation. WTP amounts ranged from 0.39 USD to 39.06 USD while WTA amounts ranged from 156.25 USD to 39,062.5 USD. These insights underscore the need for differentiated conservation messaging and inclusive policy design that reflects the lived realities and priorities of diverse community segments. We conclude by proposing a demographic-informed framework for stakeholder engagement and co-management at Ramsar sites.

Keywords: Ecosystem services, urban wetland, Ramsar, socio-economic valuation, contingent valuation

5. Connectedness, scale, and multifunctionality of nature-based solutions across functional urban areas.

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Urban nature-based solutions (NBS) are increasingly recognized as essential multifunctional ecosystem service providers for sustainable and resilient cities. While the role of NBS in supporting and delivering ecosystem services is widely recognized, the extent to which their spatial connectedness influences these services across scales and urban contexts is insufficiently explored in the literature, but recognized by NGOs and governance organizations. This study examines the relationship between NBS connectedness and benefits for biodiversity, climate, and community well-being across 12 functional urban areas (FUA) in Europe and the Americas, spanning three spatial scales. Spatial connectivity metrics were used to examine how NBS connectedness relates to their measured benefits. Results indicate the density of the built-up area had a stronger influence on climate benefits than connectedness did. However, even when this is taken into account, higher NBS connectedness is associated with improved climate and community well-being indicators, especially at smaller scales. For biodiversity, higher NBS connectedness was associated with smaller measurements of our biodiversity indicator. This relationship may be due to the specific biodiversity indicator used and the limitations of current urban biodiversity proxies. The results of this study highlight the importance of considering connectedness and scale in NBS design and planning, the trade-offs and synergies of multifunctional NBS planning, and how intentional NBS placement can improve the provision of multiple ecosystem services.

Keywords: Nature-based solutions, connectivity, multifunctionality, urban climate adaptation, biodiversity

6. Spatial distribution of regulating ecosystem services provided by urban green infrastructure in Bucharest, Romania

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Urban green infrastructure (UGI) is critical for population health and well-being, providing key regulating ecosystem services (RES) such as air quality improvement, noise attenuation, and urban heat mitigation. In rapidly developing cities, increasing population density often reduces and degrades green spaces, underscoring the need for effective UGI management to maximize societal benefits. This study evaluates and maps RES provided by UGI in Bucharest, with emphasis on the contributions of vegetation and urban trees.

RES potential was assessed using two complementary approaches: (1) a Public Participation Geographic Information System (PPGIS) survey implemented via Maptionnaire to capture residents' spatial preferences, and (2) i-Tree Canopy (ITC) modeling to quantify land-cover-based RES supply. PPGIS enabled respondents to delineate relevant areas on the municipal map, while ITC generated 10,000 stratified sample points across six land-cover classes (water, trees, buildings, roads, herbaceous vegetation, and bare ground). Kernel density mapping in ArcGIS supported visualization of RES distribution and identification of spatial concordance or mismatch between demand and supply. PPGIS results showed that 816 respondents mapped 1,291 areas of perceived RES importance, including noise reduction (371 areas), air quality improvement (521), and temperature regulation (399). The integrated mapping outputs provide a spatial evidence base to inform green space planning, guide UGI creation and conservation, and support sustainable urban development, climate adaptation, and urban environmental quality enhancement.

Keywords: Regulating ecosystem services, PPGIS, i-Tree Canopy, Urban green infrastructure, Land cover