

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: X17

Integrating Ecosystem Services Across Landscapes

Hosts:

	Name	Organisation	E-mail
Host (s):	Iskra Konovska	FSD	iskra.konovska@fsd.nl

Abstract:

This session brings together interdisciplinary contributions on the assessment, management, and governance of ecosystem services across urban, peri-urban, and forest landscapes. It addresses the growing need to integrate ecological, social, and spatial perspectives in the face of urbanization, climate change, and land-use pressures.

The session includes a range of methodological approaches, such as spatial modelling, participatory assessments, and ecosystem service mapping, applied to topics including nature-based solutions, urban flood management, forest conservation, and multifunctional land use. Several contributions focus on how ecosystem services can support planning and decision-making in complex socio-ecological systems. In addition to biophysical assessments, the session highlights the importance of social dimensions, including stakeholder perceptions, policy implementation, and communication of environmental issues. Case studies from diverse geographic contexts provide insights into how ecosystem services can enhance resilience and inform sustainable development strategies.

Overall, the session aims to foster exchange on practical and innovative approaches for integrating ecosystem services into policy and management across different landscape contexts.

Goals and objectives of the session:

This session aims to present innovative methods for assessing, mapping, and integrating ecosystem services into planning practices

Planned output / Deliverables:

The session will deliver key insights on methods and applications of ecosystem services across landscapes, highlighting best practices and common challenges.

Session format:

The Standard session

Related to ESP Working Group:

Other

II. SESSION PROGRAM

Room: B2

Date of session: Friday, 22 May 2026

Time of session: 11:00 – 12:30

Timetable speakers:

Time	Name	Surname	Organization	Title of presentation
11:00-11:09	Andre	Benedini	Politecnico di Milano	A Multi-Regime Ecosystem-Services Framework for Urban Flood Risk Management: a case study in Varese, Italy
11:09-11:18	Hojung	Yoon	Department of Sustainability and Planning, Aalborg University, Denmark	Urbanization Pathways and Nature-based Solution Performance: A Comparative Study of Denmark and South Korea
11:18-11:27	Tereza	Prášilová	Charles University, Faculty of Humanities	Pollinator Decline in Czech Media: An Analysis of Security Framing
11:27-11:36	Hristina	Prodanova	National Institute of Geophysics, Geodesy and Geography - Bulgarian Academy of Sciences (NIGGG-BAS)	The old good landscape maps: New interpretations enabling ecosystem services assessment of conservation potential at a national scale
11:36-11:45	André	Fonseca	2BForest Lda	Financing Ecosystem Services Certification in the Magic Mountains – Arouca, Portugal
11:45-11:54	Seda	ÖRÜCÜ	Süleyman Demirel University	MODELING CULTURAL ECOSYSTEM SERVICE VALUES IN A PROTECTED LANDSCAPE USING A PARTICIPATORY SOLVES APPROACH
11:54-12:03	Andrej	Bončina	University of Ljubljana	How to define priority areas for providing forest ecosystem services (FES): a novel approach for the spatially explicit assessment of FES
12:03-12:12	Maria	Perevochtchikova	El Colegio de México AC	Towards Forest Conservation in the Urban Periphery: A Study on the Socio-Ecological Effects of the Altépetl Bienestar Program in Mexico City
12:12-12:21	Martin	Bermudez-Urdaneta	Universidad EAN	An interdisciplinary approach to imagine an environmental history of Bogotá: trajectories of urban and regional socioecological systems in

high mountains and plateaus of
Colombian Andes

12:21-12:30 Muhammad Khan
Asif

Department of Forestry &
Wildlife Management, The
University of Haripur, Haripur
Khyber Pakhtunkhwa 22620,
Pakistan

Status of Ecosystem Services
Provision in the Chir Pine Forest of
Shimla Hill, Abbottabad

III. LIST OF ABSTRACTS

The first author is the presenting author unless indicated otherwise

1. A Multi-Regime Ecosystem-Services Framework for Urban Flood Risk Management: a case study in Varese, Italy

First author: Andrea Benedini

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Urban flood risk management (UFRM) is shifting beyond single-hazard, single-model approaches toward multifunctional and transdisciplinary strategies that deliver benefits across rainfall regimes (light, moderate, extreme). Yet a key bottleneck persists: stormwater assessments are often fragmented across event types and disciplines, limiting translation into spatially explicit planning priorities, especially in space-constrained cities. This study applies an ecosystem services (ES) framing of water cycle and flow mitigation (WCFM) to develop a regime-integrated indicator set for UFRM. The approach aligns storm-regime processes with the CICES classification and frames assessment around demanding, supplying, and benefiting areas along connected drainage systems.

WCFM is represented as three interacting capacities: runoff regulation under light rainfall, peak-flow regulation and drainage-network failure prevention under moderate rainfall, and buffering and attenuation under extreme events. The approach is implemented in Varese (Northern Italy) through an integrated modelling chain linking surface and subsurface interactions among land use, soils, and drainage infrastructure. A curve-number runoff assessment supports the light-rain component, EPA-SWMM simulates network performance and node failures under moderate storms, and HEC-RAS estimates inundation and flood damages under extreme events. Outputs are aggregated to urban drainage units and translated into three regime-specific indicators (runoff coefficient, node-failure density, flood damages). Indicators are normalised and combined into a WCFM demand index. A complementary WCFM supply index represents locally accessible regulating capacity, and residual demand is derived as the mismatch between demand and supply within connected drainage areas.

Application to Varese shows WCFM priorities are regime-dependent: areas prioritised for frequent-storm runoff control do not systematically coincide with locations dominated by moderate-storm failures or extreme-event damages. Residual demand identifies neighbourhoods where needs persist because supply is insufficient or poorly positioned relative to hydrological connectivity. The main contribution is a demand-supply framework and composite indicator set that can be applied in urban planning to prioritise and sequence multifunctional UFRM measures across rainfall regimes.

Keywords: Demand-supply analysis, Water cycle and flow mitigation index, Ecosystem Services, Rainfall regimes, Residual demand index


2. Urbanization Pathways and Nature-based Solution Performance: A Comparative Study of Denmark and South Korea

First author: Hojung Yoon

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Nature-based Solutions (NbS) have become a critical strategy for mitigating environmental stress and enhancing climate resilience, biodiversity, public well-being, and societal benefits. However, NbS performance varies across urban contexts, underscoring the need for comparable approaches to assess ecosystem service transitions under different urbanization pathways.

This study compares Denmark and South Korea as contrasting cases characterized by dispersed and high-density urban structures, respectively, to examine how NbS interventions can compensate for ecosystem service degradation across different urbanization pathways. Using 98 municipalities in Denmark and 31 municipalities in Gyeonggi Province, South Korea, we integrate longitudinal population dynamics and land-use/land-cover (LULC) patterns to classify urbanization pathways and select representative cities within each pathway for scenario-based NbS performance assessment.

Longitudinal population dynamics were examined using the Global Human Settlement Layer (GHS-POP and GHS-SMOD) to construct time-series ratios of city–town–rural populations from 1970 to 2030. LULC patterns were derived from Sentinel-2 data (2017–2023) and classified into five categories —built-up, grass, trees, water, and others—then aggregated at the municipal scale to characterize urban structural change.

Longitudinal population dynamics and LULC patterns were integrated to identify representative urbanization pathways in each country, and the performance of NbS is evaluated using ecosystem service indicators. Climate and water regulating, cultural, and supporting services are quantified using LULC-based metrics. NbS performance is assessed under four urbanization scenarios: Business-as-Usual (BAU), Ecological Conservation (EC), Ecological Restoration (ER), and Urban Transformation and Development (UTD). BAU assumes continuation of observed trends; EC preserves existing green and blue spaces; ER restores impervious surfaces to ecological land cover; and UTD combines urban growth with expanded green and blue infrastructure. Ecosystem service changes are quantified as relative differences from the BAU baseline, enabling comparative evaluation across urban contexts in Denmark and South Korea.

Keywords: Urbanization Pathways, Nature-based Solutions, Ecosystem Services, Longitudinal Population dynamics, Land Use and Land Cover

3. Pollinator Decline in Czech Media: An Analysis of Security Framing

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The decline of insect pollinators has become a prominent theme in public discussions of the biodiversity crisis, with widely noted ecological and economic consequences. For most of the public, the issue is encountered through media narratives that foreground particular species, attach specific implications, and signal urgency. Drawing on the securitization theory of the Copenhagen School, this paper examines how Czech mainstream media construct insect and pollinator decline and whether these constructions involve securitizing speech acts, including urgent or alarmist rhetoric and claims of existential threat. We present preliminary findings from a qualitative media analysis of Czech national outlets. The corpus comprises approximately 90 news articles from the most widely read Czech outlets published between 2019 and 2024. Articles were analysed for (1) dominant thematic framings of consequences (e.g., impacts on agriculture, economic impacts, biodiversity loss), (2) the referent object—who or what is positioned as most affected (e.g., food security, nature), and (3) the presence and form of securitizing speech acts.

Preliminary results suggest distinct differences in how honeybees, wild pollinators, and insects in general are portrayed. Honeybee declines are disproportionately linked to crop failure, with food security often being positioned as the primary concern. In contrast, wild pollinators receive less attention in this context and are more often connected to the biodiversity crisis. The most alarmist language is used when discussing the overall decline of insects, often connecting it to the matter of human survival. Taken together, these patterns suggest uneven securitising framings that may steer public concern and policy attention in different directions – for example, where food security is emphasised towards managed pollinators. These findings will inform the next phase of the project, which will develop a survey to assess Czech public perceptions of insect pollinator decline, using the thematic frames identified.

Keywords: pollinator decline, securitization, media analysis, biodiversity crisis, Czechia


4. The old good landscape maps: New interpretations enabling ecosystem services assessment of conservation potential at a national scale

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The ecosystem services (ES) approach has been widely accepted in environmental policies and management as an adequate platform that can serve as a link between nature and society. Many ES are influenced by the landscape structure. Thus, national-scale landscape mapping can potentially contribute to nature conservation management. However, there are no attempts to directly link the ES assessment with the landscape units at a national level. In this paper, we propose an approach for the transformation of paper copy information from old landscape maps to enable the assessment of ES conservation potential at the national landscape scale. The conceptual scheme of the approach contains three main elements: (i) data acquisition; (ii) landscape and ES assessment data processing; and (iii) mapping of ES potential at a landscape level. The results reveal the landscape heterogeneity based on landscape classification and mapping at a national level and the ES conservation potential based on the analyses of the Natural Heritage (NH) in the country to provide ES. The assessment of ES conservation potential using the national scale landscape mapping allows us to analyze the spatial relationships between the landscapes with high conservation value and the existing nature protection network. The conceptual scheme of the study demonstrates how the results of the ES potential provided by the NH at a national level can be combined with the landscape units from the traditional landscape classification schemes to produce various spatial and statistical metrics that reveal how the national system of protected areas coincides with the areas of high ES conservation value.

Keywords: Bulgaria, digitization, GIS, landscape classification, landscape heterogeneity, mapping, nature conservation, spatial data

5. Financing Ecosystem Services Certification in the Magic Mountains – Arouca, Portugal

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High in Portugal's Magic Mountains, where the Arouca Geopark preserves ancient wonders like the "Pedras Parideiras", a small landowner faced a life-changing dilemma. His 24.5-hectare property, located in the steep banks of the Paiva River – home to the world-renowned "Passadiços do Paiva" walkways, was rich in ecological value but poor in economic return. The land offered little hope, since timber harvesting was made almost impossible under strict Natura 2000 rules.

In 2018, the owner joined the 2BForest certification group (M152), determined to avoid abandoning his land. By 2021, that decision culminated in Portugal's first FSC® Ecosystem Services certificate—awarded for biodiversity conservation, carbon restoration and recreational services.

The theory of change involves replacing exotic plantations with native oak species, protecting riparian corridors and managing fuel loads to reduce wildfire risk. With support from sponsors through 2BForest's ES_SPONSOR project, people acted—and nature responded. Between 2020 and 2025, carbon stocks rose from roughly 3,676 t to 4,003 t, notwithstanding the wildfires that devastated the region in 2024 and 2025 and that had a negative impact on biodiversity, as proven by eDNA sampling. Nonetheless, visitors kept coming—over 391,000 in five years—drawn by landscapes that tell stories of abundant freshwater and fire resilience.

Behind the scenes, 2BForest guided the landowner through FSC certification using its proprietary platform – ForestSIM (www.2bforest.pt/forestsims/). This online tool streamlines inventory registration, compliance management, FSC checks, map printing, and ecosystem service modeling. Its communication power gave sponsors clarity and managers the confidence to act on well-informed decisions.

Today, this case study—awarded within the "Solidário FSC" campaign—proves that technology, culture, and conservation can converge in forestry. A land once destined for neglect now thrives as a carbon sink, a biodiversity haven, and a gateway to Portugal's most magical mountains.


Keywords: Biodiversity, Carbon sequestration, Ecosystem services, ForestSIM, Sustainable management

6. Modeling Cultural Ecosystem Service Values In A Protected Landscape Using A Participatory Solves Approach

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Cultural ecosystem services (CES) are crucial for understanding how humans relate to nature, particularly in protected landscapes where conservation areas are connected to nearby settlements. Despite their significance, the intangible and socially constructed characteristics of cultural ecosystem services frequently restrict their systematic incorporation into spatial planning, conservation, and management. This study evaluates the social significance of cultural ecosystem services within a protected landscape featuring adjacent settlements and analyzes how these values differ across various landscape infrastructure categories. A participatory and spatially explicit assessment framework was employed, integrating the Social Values for Ecosystem Services (SolVES) model with Participatory Geographic Information Systems (PGIS). Social value data were collected from various stakeholder groups within and surrounding Kızıldağ National Park through PGIS-based surveys and subsequently integrated into the SolVES modeling environment. This methodology facilitated the creation of quantitative indicators and spatial representations of cultural ecosystem services. Comparative analyses were performed to examine differences in social value patterns across various landscape infrastructure typologies and land-use characteristics within the protected landscape and its neighboring settlements. The results demonstrate significant variations in the societal value of cultural ecosystem services linked to different landscape infrastructure types, underscoring the impact of spatial configuration and management context on perceived cultural advantages. Furthermore, the incorporation of participatory and stakeholder-driven inputs markedly improved the model's sensitivity, enabling the detection of value patterns that are not discernible through biophysical indicators alone. The findings demonstrate the potential of participatory SolVES-based assessments to support integrated planning and management in protected landscapes with surrounding settlements. By explicitly linking social values to spatial landscape characteristics, the study provides a transferable methodological framework for incorporating cultural ecosystem services into conservation governance and evidence-informed decision-making.

Keywords: Cultural ecosystem services; SolVES; participatory GIS; protected landscapes

7. How to define priority areas for providing forest ecosystem services (FES): a novel approach for the spatially explicit assessment of FES

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Defining priority areas for promoting desired ecosystem services by adapted management activities is crucial for operationalisation of multi-valued management. In the frame of the IFORPLAN (ForestValue2) project, a novel approach for the assessment of forest ecosystem services (FES) and defining priority areas for selected FES at landscape and regional spatial scale was developed. The method was created by researchers from four countries (Estonia, Finland, Poland and Slovenia) and their study regions. The procedure considers both potential (the capacity of a forest landscape to provide FES, regardless of currently utilization) and demand (the need for specific FES by society, stakeholder groups or individuals). The procedure comprises three steps: i) defining spatially explicit indicators for FES potential and demand separately; ii) weighting each indicator using multi-criteria decision analysis with the fuzzy Best-Worst Method, which incorporates national experts' preferences; iii) mapping (i.e. creating detail GIS comprising layers of all indicators using grid of a 10 x 10 m) and defining priority areas that reflect synergies and trade-offs between FES. The research initiative was focused on three main FES: timber production, recreation, nature conservation. The set of indicators was developed (29 altogether), and weights for selected indicators were defined by experts in a participatory manner in each of participating country. Significant differences in weighted indicators were found between countries, driven by ecological conditions, cultural values and governance frameworks. The novel approach provides a holistic and robust framework for FES assessment and defining priority areas as a basis to guide harmonized forest management that provides desired FES. The procedure, the list of spatially explicit indicators, and examples of priority areas of FES potential and demand will be presented and discussed.

Keywords: Priority area, multi-functional forestry, potential, demand, indicator

8. Towards Forest Conservation in the Urban Periphery: A Study on the Socio-Ecological Effects of the Altépetl Bienestar Program in Mexico City


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Peri-urban forests at the edge of megacities face pressures from urban expansion, climate change, and environmental degradation, which undermine their capacity to provide critical ecosystem services (ES). In response, ES-based compensation schemes have been implemented worldwide, including both federal and local programs applied in Mexico. Since 2019, Mexico



City has operated the Altépetl Bienestar program to promote environmental (specifically, forest) conservation with community well-being across its Conservation Land (CL). This study assesses the socio-ecological effects of the program's forestry component using the Socio-Ecological Systems framework through a mixed-methods approach that combines spatial analysis of deforestation with qualitative insights from semi-structured interviews conducted with brigade members, forestry technicians, and government officials. Perceptions and experiences were examined at the personal, community, forest, and landscape levels, alongside reported problems and challenges. Findings indicate that deforestation—previously one of the main drivers of land-use change in the CL—decreased by 47.95% during the 2019–2024 period, dropping from an annual average of 229.25 to 119.33 hectares. Only 24% of this deforestation occurred within areas covered by the program. Semi-structured interviews reveal general positive impacts on individual well-being, social cohesion, local capacity-building, and forest stewardship, with spatial variation across CL subregions. Problems stem from both institutional constraints within the program and broader land use and climate change pressures. Among the main challenges are the advance of urbanization, security concerns, and lack of institutional coordination. This interdisciplinary evaluation provides a nuanced understanding of conservation policy impacts by integrating ecological data with social insights. The findings underscore the Altépetl Bienestar model's value in bolstering peri-urban forest resilience and can inform land use policy and conservation strategies. Lessons from this case can guide similar social-ecological interventions in other urban and peri-urban contexts.

Keywords: Socio-Ecological Systems; Peri-Urban Landscapes; Ecosystem Services; Land Use Change; Environmental Policy; Program Evaluation.

9. An interdisciplinary approach to imagine an environmental history of Bogotá: trajectories of urban and regional socioecological systems in high mountains and plateaus of Colombian Andes

First author: Martin Bermudez-Urdaneta

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We present the ongoing process of creative – research on Bogotá environmental history located at Northeastern Andes, a Colombian region known as the Altiplano Cundiboyacense. We built a list of 50 charismatic entities, including biological species and emblematic natural sites of Bogotá to reflect on our local identities around nature, urban city and its rural surrounding region, ecosystems supporting its Andean/mountain city/nature identity. We propose a list of 50 charismatic species and sites to understand our current environment and give perspective to local and regional territorial public policies. The scientific/artistic process that we present about this sum of personal but also disciplinary biases about Bogotá and its biodiversity, has been a fertile transdisciplinary dialogue on culture and nature in public land use policies for a city/region of eleven million inhabitants. This central metropolitan Altiplano, has a spatial metropolitan scale that hampers simple modelling and narrow viewpoints: we tackle this by including citizen science, dialogues with modern, colonial and indigenous art and archaeological collections in order to widen our historic perspective.

The interdisciplinary search to understand the environmental history of Bogotá has involved imagining trajectories of regional socioecological systems in the very long term. Although small spatial scales are preferred in socio-ecological production landscapes, choosing a long-term temporal scale (a millennium or several centuries) also implies adopting a large spatial scale: going from Bogotá to the Cundiboyacense Altiplano (high-plateau). Thus, the environmental history of regions and ecosystem complexes also becomes a shared history between forms of land occupation. The need to project past trajectories of several centuries forces us to select study areas with regional spatial scales, which are reflected in changes in landscapes that open the gaze from the natural to the political, and also speak of a redistribution of habitat between native, introduced, naturalized, adapted, banished, or extinct species.

Keywords: Socioecological systems - long-term trajectories, Charismatic species, iconic views/sites, urban ecosystem services, cultural ecosystem services


10. Status of Ecosystem Services Provision in the Chir Pine Forest of Shimla Hill, Abbottabad

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This study investigates the biomass, soil erosion, and soil fertility dynamics within a delineated area of a Chir Pine forest in the Shimla Hills, utilizing 15 sampling plots, each with a radius of 17.84 meters and a sampling intensity of 11.192%. Comprehensive data collection involved measuring the required variables for allometric equations. Results indicate a mean



diameter value recorded 43.046 cm, a mean height value recorded of 15.853 m, while substantial variability in biomass among plots, with 7187.513 kg/ha mean value of AGB which ranging from 827.13 kg/ha to 15,500.19 kg/ha, BGB mean value calculated as 1868.753 kg/ha, ranging from 215.053 kg/ha to 4030.049 kg/ha. Total Biomass is calculated as 9056.266 kg/ha, and total carbon is calculated as 4256.445 kg/ha, and corresponding CO₂ sequestration ranges from 1,792.76 kg/ha to 33,595.91 kg/ha. Notably, plot 6 exhibited the highest biomass and carbon sequestration, attributed to its mature tree population, while plot 15 recorded the lowest due to younger trees. Soil erosion was monitored monthly using erosion pins over ten months, providing insight into the impacts of seasonal climatic variations. Soil erosion data highlighted the susceptibility of certain plots to erosion during intense rainfall events, particularly in April, when plot 2 experienced 1.5 cm of soil loss due to heavy rain with hail and less ground cover at that time. Furthermore, soil samples were analyzed for nitrogen, phosphorus, and potassium at different depths, utilizing an IoT-based Soil Fertility Detector Device. Soil fertility analysis revealed that nutrient concentrations generally increased with depth, with significant variations across plots. Additionally, the mean concentrations of nitrogen, phosphorus, and potassium at the 0-30 cm depth were 75.667 mg/kg, 26.467 mg/kg, and 37.533 mg/kg, respectively. Descriptive statistics highlight the diversity of tree sizes and ages, emphasizing the role of mature forests in carbon sequestration and the necessity for targeted soil management to enhance soil fertility and mitigate erosion, thus providing a foundation for sustainable forest management and conservation in the Shimla hills region.

Keywords: Ecosystem Services, Chir Pine Forest, Above Ground Biomass, Below Ground Biomass, Carbon Stock, Soil Fertility, Erosion, Internet of Things, Volume Table, Forest Fire, Pakistan