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: X13

Nature-based Solutions for resilient landscapes: enhancing ecosystem services for climate adaptation and societal well-being

Hosts:

	Name	Organisation	E-mail
Host (s):	Amir Rezvani	KTH, Royal Institute of Technology, Stockholm, Sweden	rezvani@kth.se
Co-host(s):	Zahra Kalantari	KTH Royal Institute of Technology, Stockholm, Sweden	zahrak@kth.se
	Lan Wang-Erlandsson	Stockholm Resilience Centre, Stockholm University, Sweden	lan.wang@su.se
	Carla Sofia Santos Ferreira	Polytechnic University of Coimbra, Applied Research Institute, Coimbra, Portugal	carla.ferreira@ipc.pt

Abstract:

Nature-based solutions (NBS) are increasingly recognized as transformative strategies for enhancing climate resilience, restoring ecosystems, and providing multifaceted benefits to both human populations and natural environments. By harnessing ecosystem services, NBS, including wetlands, floodplains, restored streams, and green infrastructure, can effectively mitigate the impacts of floods and droughts, improve water quality, enhance biodiversity, and support human well-being. The implementation of NBS directly contributes to the objectives outlined in the European Green Deal, the United Nations Sustainable Development Goals, and global commitments to climate adaptation.

This session will bring together researchers, practitioners, and policymakers to exchange evidence, frameworks, and case studies on how NBS deliver ecosystem services and strengthen resilient, nature- and people-positive landscapes that benefit both nature and people. Contributions are encouraged that investigate the hydrological, ecological, and socio-economic performance of NBS, as well as the trade-offs and synergies among various ecosystem services, alongside governance, policy, and financial mechanisms that facilitate scaling up these initiatives.

Goals and objectives of the session:

- Present empirical evidence demonstrating the efficacy of Nature-Based Solutions (NBS) in the provision of ecosystem services.

- Develop innovative frameworks, tools, and participatory methodologies for the design and monitoring of NBS.
- Investigate trade-offs, synergies, and equity considerations associated with the provision of ecosystem services.
- Emphasize governance, policy, and financial mechanisms that facilitate the implementation and scaling of NBS.
- Promote dialogue among scientific, practical, and policy-oriented communities to enhance the integration of NBS into land and water management practices.

Planned output / Deliverables:

Cross-sector dialogue and networking across disciplines and stakeholder groups.

- Identification of emerging research gaps and policy-relevant insights for mainstreaming NBS.
- Potential follow-up collaborations on comparative case studies or synthesis papers.

Session format:

A 90-minute session combining short oral presentations (speed talks) and an interactive discussion to stimulate cross-sector dialogue and knowledge exchange.

Related to ESP Working Group:

Others

II. SESSION PROGRAM

Room: A3
Date of session: Thursday 21, May 2026
Time of session: 09:00 – 12:30

Timetable speakers:

Time	First name	Surname	Organization	Title of presentation
09:00-09:10	Christopher	Wittmann	Deltares & Wageningen University	Spatio-temporal dynamics of Nature-based Solutions: implications for climate-adaptive ecosystem services
09:11-09:21	Fabienne	Horneman	Ca'Foscari University of Venice & CMCC Foundation - Euro-Mediterranean Center on Climate Change	Ecosystem service-based risk assessment modelling for transformative climate adaptation in coastal areas
09:22-09:32	Karolina	Królikowska	Wroclaw University of Environmental and Life Sciences	How to avoid maladaptation in urban/regional climate adaptation plans? A critical assessment of NbS
09:33-09:43	Andrew	Ikingura	University of Life Sciences in Lublin; Lublin, Poland	Lublin rain gardens as integrated spatial and socio-ecological interventions for urban resilience

09:44-09:54	Amir	Rezvani	Environmental Science and Engineering (SEED), KTH Royal Institute of Technology, Stockholm, Sweden	Strategic placement of nature-based solutions for ecosystem service delivery through landscape connectivity and participatory decision support
09:55-10:05	Xianglong	Tang	Eindhoven University of Technology, The Netherlands	A Semantic Decision-Support Framework to Prioritise Nature-Based Solutions for Older Adults' Walking under Heat and Pluvial Flooding
10:06-10:16	Ian Mark Q.	Nacaya	USTP-IGIS	Ecosystem-Based Adaptation as Adaptive Infrastructure: Reframing Disaster Recovery Governance in Climate-Vulnerable River Basin Systems
10:17-10:27	Zorica	Srđević	University of Novi Sad, Novi Sad, Serbia	Communicating Nature-Based Water Purification and Ecosystem Services through a Vertical Flow Wetland Demonstrator
10:27-10:30	Quick chair transition & wrap-up			

II. SESSION DESCRIPTION

ID: T14e

Learning from implemented Nature-based Solutions: safeguarding ecosystem services with nature- and people- positive outcomes

Hosts:

	Name	Organisation	E-mail
Host (s):	Shiri Zemah-Shamir	School of Sustainability, Reichman University	shiri.zemahshamir@runi.ac.il
Co-host(s):	Maria-Carmen Garcia-Mateo	MCG Research and Innovation Sustainability Architecture Urban Planning. Principal Investigator in the RIA HE GoDigiBioS	maricarmengarcia.archt@gmail.com
	Rocío Pineda-Martos	University of Seville, School of Agricultural Engineering (ETSIA-USe)	rpineda@us.es

	Senka Ždero	University of Novi Sad, Faculty of Agriculture, Department of Water management	senkazdero@gmail.com
	Francesco Sica	Department of Architecture and Design, Sapienza University of Rome, Italy	francesco.sica@uniroma1.it
	Zorica Srđević	University of Novi Sad. Department of Water Management	zorica.srdjevic@polj.uns.ac.rs

Abstract:

Nature-based Solutions (NbS) are increasingly implemented as strategies to address climate change, biodiversity loss, circularity challenges, and socio-economic pressures, while sustaining critical ecosystem services, and supporting a nature- and people-positive transition. Yet their effectiveness depends on the processes related to real-world conditions, including how they are designed, implemented, monitored, and maintained, especially in the long term, as well as on how co-benefits and trade-offs, both ecological, social, and economic, are assessed. Understanding successes and shortcomings in practice is essential for strengthening the implementation of NbS and ensuring its wider uptake.

This session invites contributions on NbS implementation across diverse ecosystems, with particular interest in lessons transferable to small and medium-sized islands (SMIs), highlighting how such practices can deliver nature-positive outcomes and people-positive benefits for sustainable, transformative changes; contributors are encouraged to indicate links to Ecosystem Services Partnership (ESP) Europe thematic streams (notably Streams 3, 1, and 5). We welcome case studies, comparative analyses, and methodological insights that:

- Evaluate cost-effectiveness and benefit aspects of NbS concerning their viability and adoption ;
- Investigate co-benefits and mutual trade-offs in the context of defining NbS taxonomy values;
- Identify barriers and enabling conditions and strategies for implementation in SMIs;
- Present monitoring frameworks based also on participatory approaches and innovative governance systems.

The session is organized in connection with the COST Action CA21158 SMILES on Enhancing Small-Medium Islands Resilience by Securing the Sustainability of Ecosystem Services (https://cost-smiles.eu/), which applies participatory methods, such as the Delphi process, to consolidate insights on NbS implementation in islands. By learning from implemented NbS in islands and beyond, the session aims to build a stronger evidence base and provide actionable recommendations that reinforce nature-positive ecosystems and people-positive outcomes from the perspective of sustainable, transformative scenarios.

Goals and objectives of the session:

This session will provide a platform for sharing insights and advancing knowledge into experiences from implemented NbS, with particular attention to how effective, feasible, and socially accepted they are in practice, and their effect on ecosystem services. The focus is on understanding how NbS can deliver both nature-positive and people-positive outcomes, especially in SMIs, while also drawing lessons from other regions. By connecting these insights to the ESP thematic streams (notably Streams 1, 3, and 5) and to the COST Action SMILES, the session seeks to consolidate evidence and advance practical knowledge for the wider NbS community.

The session will also serve as an interactive step in the third round of the SMILES Delphi process, engaging participants in refining consensus and validating earlier findings.

Planned output / Deliverables:

- A policy brief summarizing the session's findings, with recommendations for policymakers, planners, and practitioners on enabling conditions, barriers, and co-benefits and ecosystem services of NbS.
- A guidance note for practitioners, highlighting strategies for the design, monitoring, and governance of NbS, related to ecosystem services, relevant to both island and non-island applications.
- A conference post for social media to share the key outcomes through SMILES channels, extending outreach beyond the session.
- The finalization of the SMILES Delphi paper, integrating the third-round results and insights generated during the session (with acknowledgment for the ESP conference).

Related to ESP Working Group:

TWG 14 – Application of ES in Planning & Management

Time	First name	Surname	Organization	Title of presentation
11:00-11:10	Hai-Ying	Liu	NILU	Learning from Implemented Urban Nature-based Solutions: Post-Implementation Stewardship, Ecosystem Service and Transformative Capacity in the NatureScape Transformation Labs
11:11-11:21	Oksana	Pelyukh	Ukrainian National Forestry University, Ukraine	Urban community gardens as transformative nature-based solutions in turbulent times in Ukraine
11:22-11:32	Caterina	Giudi	The Euro-Mediterranean Center on Climate Change (CMCC)	Mainstreaming Nature-based Solutions into Policy Frameworks across Different Landscapes: A Perspective from Living Labs
11:33-11:43	George	Zaimes	Democritus University of Thrace, Greece	Employing new technologies to improve the effectiveness of nature-based solutions
11:44-11:54	Peter	Davids	Faculty of Spatial Planning, TU Dortmund University	NBS, communities and cultural-historical narratives; towards a co-evolutionary approach for NBS implementation
11:55-12:30	Final short synthesis & closing			

III. LIST OF ABSTRACTS

The first author is the presenting author unless indicated otherwise

1. Spatio-temporal dynamics of Nature-based Solutions: implications for climate-adaptive ecosystem services

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Other author(s): Albrecht Weerts, Jarmo de Vries, Ellis Penning
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Nature-based Solutions (NbS) are increasingly promoted to enhance climate resilience and deliver ecosystem services such as flood mitigation and drought buffering. However, their effectiveness often depends on where they are implemented and which time horizon is evaluated. Current evaluations, typically based on hydrological models, rarely consider how spatial placement within a catchment or temporal factors such as forest age influence outcomes. This knowledge gap limits our ability to design NbS that maximize benefits across landscapes and over time.
We use hydrological modeling to assess the performance of NbS under varying spatial configurations and temporal conditions. We explore how these dimensions affect the distribution of surface, groundwater, and soil water across the landscape, identifying opportunities, constraints, and potential trade-offs for ecosystem service delivery. Our findings provide a framework for assessing NbS effectiveness across spatial and temporal scales to inform strategies that reduce climate risks and enhance long-term resilience.

Keywords: Nature-based Solutions, Climate adaptation, Hydrological modeling, Spatial scale, Temporal dynamics

2. Ecosystem service-based risk assessment modelling for transformative climate adaptation in coastal areas

***First author*:** Fabienne Horneman
***Other author(s)*:** Ignacio Gatti, Elisa Furlan, Jacopo Furlanetto, Andrea Critto, Silvia Torresan
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Rising climate change impacts and extreme events pose severe threats to coastal ecosystems, which, as highlighted by the IPCC, demand a transition from incremental to transformative adaptation. Nature-Based Solutions (NBSs) are increasingly embedded in policies for climate adaptation, due to their capacity to mitigate risks or buffer against shocks. However, empirical evidence on NBS performance under the long-term influence of climate change and large-scale interventions is limited. Consequently, transformative risk modelling approaches that integrate response and adaptation measures provide a pipeline for evaluating both the risks posed by accelerating climate change and the effectiveness of transformative pathways at the landscape scale.

The Horizon 2020 REST-COAST project aimed to demonstrate how upscaled coastal restoration can identify climate adaptation pathways. This study utilizes a Bayesian Decision Network (BDN) that can simulate NBSs and support decision-making to evaluate the performance of large-scale restoration in the Venice Lagoon (Italy). Specifically, it examines wetlands' ability to enhance ecosystem services and reduce risks under current and future climate conditions. The model consists of nodes representing key variables - including total water level, wave height, saltmarsh vegetation and elevation - and arcs allowing for the explicit modelling of how future climate and restoration could affect ecosystem services, i.e., wave attenuation, sedimentation, carbon accumulation and nutrient uptake. The developed BDNs integrates observational and modelling data from 2020 to 2024 and validated against pilot-level monitoring, to simulate the effectiveness of restoration scenarios under current conditions before incorporating mid- to long-term RCP4.5 and 8.5 "what-if" climate scenarios to evaluate the impact of restoration upscaling to achieve increased adaptation benefits.

Further developments will expand REST-COAST findings by investigating the land-sea interface in the COAST-SCAPES project, that will assess cross-sectoral interactions, synergies-tradeoffs, up- and outscaling climate-resilient adaptation through an integrated, landscape-scale approach.

***Keywords*:** Risk assessment; transformative adaptation; landscape-scale; ecosystem services; nature-based solutions

3. How to Avoid Maladaptation in Urban and Regional Climate Adaptation Plans? A Critical Assessment of Nature-Based Solutions

***First author*:** Karolina Królikowska
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Urban and regional climate adaptation plans increasingly rely on Nature-Based Solutions (NBS), yet their rapid mainstreaming has revealed a widening gap between intended benefits and on-the-ground outcomes. This presentation examines how maladaptation emerges when NBS are planned, communicated, or implemented uncritically, drawing on a comparative analysis of recent adaptation plans and insights gathered from community-level events accompanying their development. The study identifies recurring patterns of ineffective or counterproductive practices, including greenwashing strategies such as ornamental flower meadows and green walls installed primarily for branding rather than ecological or climatic function. Further examples include poorly engineered rain gardens that fail to infiltrate water, the occurrence of invasive species as a result of rewilding initiatives, and misguided tree-planting schemes where unsuitable species exacerbate water stress, infrastructure conflicts, or are not resistant to urban pollution and drought. Importantly, the analysis also reveals how maladaptation can arise from overlooked trade-offs and synergies in ecosystem-service provision. For example, increasing green cover may enhance thermal comfort while unintentionally elevating water consumption or maintenance burdens; similarly, flood-mitigation wetlands may compete with recreational needs or generate disservices such as allergenic vegetation or mosquito habitat if not properly designed.
The research employs a mixed qualitative approach combining (1) content analysis of municipal and regional adaptation plans, (2) a review of narratives implemented in community-level engagement events and climate focused campaigns. Coding focused on ecological appropriateness, risk of maladaptation, decision-making processes, and the coherence between communicated goals and technical design.
By integrating ecological functionality, long-term maintenance requirements, and social acceptance, the analysis demonstrates how seemingly sustainable interventions can create new vulnerabilities or reinforce existing ones. The presentation concludes that avoiding maladaptation requires strengthening ecological expertise, embedding place-based community knowledge, moving beyond symbolic NBS deployments, and establishing monitoring systems that verify long-term performance.

***Keywords*:** maladaptation, urban and regional climate adaptation planning, greenwashing, climate resilience

4. Lublin rain gardens as integrated spatial and socio-ecological interventions for urban resilience

***First author*:** Andrew Ikingura
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Nature-based solutions (NBS) are increasingly adopted in different cities as cost-effective strategies for strengthening ecosystem service provision in areas facing intensifying environmental pressures. Within this broader framework, rain gardens play a significant role as small-scale NBS interventions which support stormwater regulation, biodiversity enhancement, and microclimate regulation. This study examines four rain gardens in Lublin, Poland, as an early contribution to the NatureScape project's broader ambition which is to assess NBS performance in the post-implementation phase. The assessment focuses on spatial observation, socio-ecological indicators, and initial user interactions to examine how these features function in the post-implementation phase.
Preliminary findings indicate that the rain gardens offer measurable ecological benefits, particularly in stormwater management, supporting vegetation dynamics and temperature regulation within the immediate surroundings, but their capacity to deliver wider benefits is influenced by contextual factors such as site selection, design, maintenance arrangements, and public awareness. For the case of social indicators, initial observations revealed that the rain gardens tend to attract public interest while still facing

challenges related to limited community engagement and low public awareness of their intended function. These findings underscore the need for participatory processes that strengthen communication among city authorities, local stakeholders, and residents. Enhanced collaboration could support more inclusive decision-making, reduce management challenges, and ensure that NBS are integrated into long-term urban planning strategies.
By reflecting on Lublin rain gardens within the early phase of NatureScape project, this study highlights the importance of aligning ecological goals with governance and social considerations. The preliminary findings of this research contribute to the ongoing discussions on how empirical evidence, stakeholder engagement, and adaptive governance can support the effective implementation and upscaling of NBS in diverse urban settings.

Keywords: Nature-Based Solutions, rain gardens, urban resilience, stakeholder engagement, ecosystem services

5. Strategic placement of nature-based solutions for ecosystem service delivery through landscape connectivity and participatory decision support

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Nature-based solutions (NBS), such as constructed wetlands, are increasingly promoted to enhance climate resilience, improve water quality, and deliver multiple ecosystem services at the landscape scale. However, their effectiveness strongly depends on where they are implemented within catchments, and uncertainties in site selection continue to limit large-scale uptake. This study presents a holistic, stakeholder-informed framework for strategic NBS placement that integrates landscape connectivity modelling with participatory multi-criteria decision analysis.
The framework combines hydrological and sediment connectivity modelling with spatial analysis of water storage potential, land use, and upstream-downstream interactions to identify candidate wetland locations. These biophysical indicators are then integrated with stakeholder-defined priorities using an analytic hierarchy process and multi-criteria decision analysis, producing spatially explicit suitability maps for multiple ecosystem services, including flood regulation, water retention, sediment and nutrient retention, and biodiversity support.
The approach is demonstrated in two contrasting catchments in central Sweden draining into Lake Mälaren, characterized by differing land use, soil properties, and hydrological responses. Results show that high-priority NBS locations emerge where hydrological and geomorphological connectivity converge, and that combining connectivity-based modelling with stakeholder input enables identification of multifunctional solutions while explicitly addressing trade-offs among ecosystem services. The framework also highlights spatial gaps where additional interventions may be needed, particularly in peri-urban and agricultural areas.
By linking process-based modelling with participatory decision support, this study provides a transferable and scalable methodology for prioritizing NBS in catchment planning. The framework supports more transparent, evidence-based, and context-sensitive implementation of NBS, contributing to resilient landscapes and informed ecosystem service management under climate change.

Keywords: Nature-based solutions, ecosystem services, wetland placement, landscape connectivity, participatory decision support

6. A Semantic Decision-Support Framework to Prioritise Nature-Based Solutions for Older Adults' Walking under Heat and Pluvial Flooding

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Climate change is intensifying heatwaves and extreme rainfall. Older adults are particularly vulnerable to both urban heat stress and pluvial flooding, yet walking environments are seldom evaluated at the link level for joint exposure to these hazards along their daily routes. This limits planners' ability to target nature-based solutions (NbS) where they can deliver the greatest benefits for age-friendly walking. This study develops a semantic decision-support framework to prioritise link-level locations for NbS that support older adults' walking under multi-hazard weather stress. The framework is implemented as a lightweight domain ontology and knowledge graph (KG) that represents street links, hazard scenarios, NbS measures, and link-level indicators from which composite scores are derived. A linked-data pipeline, guided by the ontology, transforms multi-source data and cross-tool outputs into RDF to populate the KG, supporting evidence retrieval via SPARQL and rule-based inference to classify links as intervention candidates under heat, pluvial flooding, and combined-risk conditions, thereby enabling reproducible ranking and scenario comparison.
To demonstrate usability, we applied the framework to the Tempel neighborhood (the Netherlands), where the KG is instantiated with (i) walking-frequency indicators from a route choice model calibrated on the national travel survey data; (ii) hazard exposure metrics, including Physiological Equivalent Temperature (PET) for heat stress and inundation depth for pluvial flooding, modelled in Tygron software under extreme weather scenarios; and (iii) NbS design alternatives, such as green roofs, street trees, and open-water features. The proposed semantic framework aims to support planners and decision-makers by prioritizing links for age-friendly walking and comparing NbS scenarios in terms of multi-hazard mitigation and ecosystem-service co-benefits, with a scalable and transparent basis for broader deployment.

Keywords: decision support, older adults, nature-based solutions, semantic knowledge graph, ecosystem services

7. Ecosystem-Based Adaptation as Adaptive Infrastructure: Reframing Disaster Recovery Governance in Climate-Vulnerable River Basin System

***First author*:** Ian Mark Nacaya
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Ecosystem-based adaptation (EbA) is increasingly promoted as a cost-effective and sustainable strategy for reducing climate-induced disaster risks while delivering multiple ecosystem services. Yet despite its growing prominence in policy discourse, EbA remains weakly embedded within disaster risk governance systems, particularly in post-disaster rehabilitation and recovery. This paper advances a synthesis framework that reframes EbA as adaptive infrastructure, a governance function that should be institutionalized within recovery systems rather than treated as a stand-alone environmental intervention. The analysis draws on empirical findings from a community-level assessment of disaster rehabilitation and recovery performance among Barangay (Village) Disaster Risk Reduction and Management Committees (BDRRMCs) in the Tagoloan River Basin, Southern Philippines. Integrating insights from ecosystem services science, disaster risk governance, and institutional performance analysis, the paper examines why EbA interventions in river basin contexts often remain fragmented and unsustained.
The synthesis identifies four systemic governance constraints limiting the institutionalization of EbA in recovery systems: weak policy recognition of ecosystems as risk-regulating assets; fragmentation between environmental management, disaster risk reduction, and development planning domains; limited ecosystem services literacy among frontline decision-making institutions; and misalignment between ecological processes and administratively bounded recovery mandates. These constraints mirror observed gaps in barangay-level recovery planning, resource mobilization, and long-term risk reduction. By repositioning EbA as adaptive infrastructure governed through integrated policy and multi-level institutional coordination, the paper contributes a governance-oriented conceptual lens relevant to ESP debates on institutions, accountability, and policy coherence. It offers transferable entry points for mainstreaming ecosystem services into disaster recovery governance, advancing long-term resilience in climate-exposed river basin systems.

***Keywords*:** Ecosystem-based adaptation (EbA); adaptive infrastructure; ecosystem services; disaster recovery governance; DRR.

8. Communicating Nature-Based Water Purification and Ecosystem Services through a Vertical Flow Wetland Demonstrator

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The Vertical Flow (VF) Wetland Demonstrator presents a compact, nature-based solution for sustainable water purification, highlighting the effectiveness of engineered vertical flow wetlands in treating wastewater. The demonstrator has been developed within the Restore4Life EU-financed project and serves both as a functional treatment system and an educational tool, illustrating how natural physical, chemical, and biological processes can be integrated into low-energy, low-maintenance water management strategies with additional ecological and landscape benefits. In the system, influent water is applied intermittently to the surface and percolates vertically through a layered filter medium composed of sand and gravel. During downward flow, suspended solids are removed through physical filtration, while dissolved pollutants are degraded by microbial biofilms as well as reduced via adsorption and ion exchange. Microbial biofilms developing on the substrate drive key biochemical processes, including organic matter degradation, nitrification and denitrification. The vertical configuration creates both aerobic and anoxic zones, enhancing removal efficiency within a compact footprint.

To avoid hygienic hazards, it is advised to apply artificial greywater for the VF wetland demonstrator. Sampling of the treated water can be done at the outlet to quantitative assess of treatment performance. Different parameters can be measured to evaluate system efficiency and demonstrate ecological engineering principles relevant to decentralized wastewater treatment in rural and urban contexts.

Beyond its technical performance, the demonstrator has strong educational value. Its transparent structure allows direct observation of flow paths and treatment processes, while supporting hands-on learning through sampling, monitoring, and data analysis, while illustrating key wetland ecosystem services such water purification and nutrient retention. All related educational materials— technical documentation, design calculations, and learning resources — are available through the Restore4Life education platform (http://education.restore4life.eu), which addresses ten thematic topics related to wetlands. Overall, the demonstrator effectively communicates the viability, scalability, and educational potential of NbS for sustainable water management.

Keywords: wetland, treatment, vertical flow, nature based solution, Restore4Life

9. Learning from Implemented Urban Nature-based Solutions: Post-Implementation Stewardship, Ecosystem Service and Transformative Capacity in the NatureScape Transformation Labs

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Urban Nature-based Solutions (NBS) are widely implemented to support climate adaptation, biodiversity, and human well-being in European cities. Yet growing evidence shows that their long-term performance and transformative potential depend less on initial design than on post-implementation stewardship, including maintenance practices, governance stability, and sustained community engagement. Despite its importance, this phase remains insufficiently examined in NBS research and practice.

The EU Biodiversa+ funded NatureScape project addresses this gap through Transformation Labs (T-Labs) embedded in seven European cities: Oslo, Dublin, Riga, Milan, Lisbon, Lublin, and St. Gallen. These living laboratories enable comparative, place-based learning on how ecological functions, social benefits, and governance arrangements evolve over time within implemented urban NBS.

Using mixed methods, including site observations, surveys, interviews, workshops, citizen science, and geo-based tools, we apply a shared indicator framework to assess ecological conditions (vegetation health, soil moisture, pollinator presence), social dynamics (participation patterns, motivations, social cohesion), and governance factors (role clarity, maintenance continuity, institutional support). Insights from sites such as Oslo's Linderud Gård and community gardens in Riga and St. Gallen reveal both enabling conditions and persistent constraints. While the community garden supports biodiversity, social interaction, and reported improvements in well-being, ecosystem service delivery is constrained by unclear role distribution, limited maintenance capacity, and missing basic infrastructure. These organisational and material shortcomings directly affect vegetation condition, soil quality, and the continuity of community stewardship.

Across all T-Labs, early findings indicate that post-implementation stewardship is a decisive factor in safeguarding ecosystem services and sustaining people-positive outcomes. Strengthening governance reliability, institutional embeddedness, collaborative approaches, and locally anchored responsibility enhances both ecological performance and the long-term viability of NBS. By foregrounding stewardship as a key mechanism of learning and transformation, the NatureScape T-Labs provide actionable insights into how implemented NBS can move beyond project-based interventions towards durable, equitable, and transformative urban systems.

Keywords: Nature-based Solutions; Post-implementation Stewardship; Urban Ecosystem Services; Social Cohesion and Governance; Transformative Change

10. Urban community gardens as transformative nature-based solutions in turbulent times in Ukraine

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Many countries are experiencing turbulent times, driven by social, political, and economic crises. In addition to the tremendous socio-economic challenges posed by the COVID-19 outbreak, the large-scale Russian invasion of Ukraine has had far-reaching geopolitical, environmental, economic and social consequences. Such turbulence threatens progress toward the Sustainable Development Goals by 2030. In this context, urban community gardens (UCGs) can be understood as nature-based solutions (NBS) that simultaneously address ecological, social, and governance-related challenges in urban environments. The aim of this study is to explore the contribution of publicly accessible UCGs in adressing the significant context-specific challenges in urban development in Ukraine. For this purpose, two interview manuals with 15 questions each were developed for interviews with (1) key informants, including current and former garden coordinators on the history, triggers, purpose and social needs to establish the UCG, mobilisation of resources etc. and (2) gardeners, engineers and volunteers, addressing their motivations and expectations for joining/setting up the UCG; decision-making, perceived benefits from joining and responsibilities, including the personal impact of their involvement; current treats and opportunities; visions for the future; networking etc. The interviews were conducted face-to-face with 76 respondents engaged in various greening activities across 25 urban and rural community gardens. Results indicate that greening plays a crucial role in fostering recovery and healing on both personal and communal levels. However, challenges persist, such as logistical constraints and resource shortages. Other obstacles identified in scaling up nature-based recovery efforts include institutional gaps, resource constraints, reliance on champions' efforts to activate communities, challenges faced by both non-displaced and internally displaced individuals, and a knowledge deficit. Findings highlight how UCGs, as NBS, can contribute to transformative change by reshaping local governance arrangements, strengthening social inclusion, and enhancing community resilience under conditions of prolonged crisis.

Keywords: urban resilience, social inclusion, community participation, greening activities, interviews

11. Nature-based Solutions into Policy Frameworks across Different Landscapes: A Perspective from Living Labs

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Nature-based solutions (NBS) are currently mostly being financed through public funding as a market for them does not exist yet. Invest4Nature is an EU-funded project that improves the knowledge of NBS' economic and financial performance with the aim of fostering their upscaling, investments and market uptake. Five existing NBS cases (including Norway, Denmark, Poland, Austria and Portugal), covering urban, rural, mountainous, and coastal landscapes from across Europe, different challenges, and typology of NBS, are the key elements of the project. Various stakeholders are involved in co-creating solutions, including new evaluation and financing approaches as well as tools, considering NBS in different areas. This study reviews the policy framework for NBS implementation by considering different policy domains and landscapes. First, at the global level, the study investigates to what extent NBS are integrated into the international policy frameworks for disaster risk reduction, climate adaptation and biodiversity loss, and into the sustainable finance and the corporate sustainability-related policies. Second, the analysis provides an in-depth assessment of NBS by focusing on the current EU policy frameworks (such as the EU Biodiversity Strategy for 2030, the Strategy on Adaptation to Climate Change, and the Forest Strategy) and the current EU Sustainable Finance policy framework (including the EU Taxonomy of sustainable economic activities), and the level of support it provides to incentivize investment flows in NBS. The study considers local perspectives of the potential enabling factors and gaps of mainstreaming NBS in policy in the Living Labs. The findings show that NBS are integrated across all the different EU-level policy domains which cover all different landscapes. However, Living Labs faces political, environmental, social, governmental, technological, economic, legal, and psychological challenges influencing NBS implementation. The findings provide the basis of the recommendations on further advancing the NBS integration in policies and their implementation at multiple levels.

Keywords: Nature-based solutions, policy frameworks, sustainable finance, Living Labs, landscapes

12. Employing new technologies to improve the effectiveness of nature-based solutions

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Nature-based solutions (NbS) have been brought to the forefront to mitigate climate change and promote environmental sustainability in urban, rural and natural ecosystems. The basic idea is to mimic nature to alleviate or lessen climate change impacts, disaster risks, while enhancing food and water security, biodiversity loss and human health. NbS are actions to protect, restore or sustainably manage human-modified or natural environments while addressing societal changes and human welfare. The Green Deal has been established to mitigate climate change impacts, urbanization and agricultural pressures on natural resources in the European Union. Through the Green Deal millions of euros are spent on NbS with the results unfortunately, not meeting the intended goals. Ecosystems continue to degrade while urban environments continue to worsen. This clearly indicates that changes need to be made in NbS implementation. Targeted approaches in the placement of NbS should improve effectiveness and efficiency. In many cases their implementation has been either random or not based on detailed spatially and/or temporally datasets. The utilization of new technologies to develop detailed datasets can provide science-based information to allow the more targeted and effective placement of NbS. The GERi lab has successfully implemented two-case studies. The first case study uses new monitoring techniques to pinpoint the areas with the most stream bank erosion and deposition. These highlight the priority locations for erosion/deposition mitigation NbS that should improve their effectiveness because of their systematic placement. The optimal place for a litter trap in an urban stream was the aim for the second case study. Modern and inventive tools were used to collect a variety of data that would allow to choose the location that would be ideal for the litter trap. The placement of the litter trap in the specific location maximized the collection of stream litter thus providing environmental benefits cost-effectively.

Keywords: nature-based solutions, targeted approaches, new technologies, erosion, litter, climate resilience, biodiversity.

13. NBS, communities and cultural-historical narratives; towards a co-evolutionary approach for NBS implementation

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Nature-based Solutions (NBS) are increasingly promoted as key instruments in addressing climate adaptation, biodiversity loss, and societal well-being. The implementation of NBS, however, reveals that these processes are rarely linear or purely technical. Instead, NBS implementation unfolds through dynamic interactions among landowners and local actors, ecological systems, governance frameworks, making its evolutions complex, context-dependent, and often unpredictable. Therefore, this research introduces a more radical perspective on NBS implementation, which we term a co-evolutionary approach to NBS implementation. We argue that a co-evolutionary perspective recognises the implementation of NBS as evolving governance processes catalysed by: 1). the object of NBS considered for implementation, 2). the planning process identifying risk and location 3). the involvement with landowners and local community, and 4). the observance of local cultural-historical practises. Based on semi-structured interviews and field site observations in multiple case studies from European countries, we argue that a co-evolutionary approach to NBS implementation is alive to the adaptability, flexibility, plurality and complexity that comes with the NBS implementation by communities and considering communal values. This way this contribution promotes a framework for understanding implementation as an open-ended and transformative process rather than a process leading to fixed solutions.

Keywords: Nature-based Solutions, co-evolutionary governance, implementation, cultural-historical practises, communities