

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: T14g

Nature-based solutions for transformative change: Advancing Knowledge and Practice

Hosts:

	Name	Organisation	E-mail
Host (s):	Diana Dushkova	Helmholtz Centre for Environmental Research - UFZ, Leipzig, Germany	diana.dushkova@ufz.de
Co-host(s):	Dagmar Haase	Humboldt University Berlin, Germany; Helmholtz Centre for Environmental Research - UFZ, Leipzig, Germany	dagmar.haase@ufz.de

Abstract:

Ecosystem services are increasingly under pressure as ecosystems are transformed by climate change, urban expansion, intensified land use, and pollution-related impacts. These pressures lead to habitat fragmentation, the spread of invasive species, and the expansion of managed landscapes, particularly in urban environments. Given that nature is essential for supporting human life and well-being, global initiatives such as IPBES, IUCN, CBD, IPCC, and ICLEI emphasize the need for systemic, rights-based, transformative actions to address the interconnected challenges of biodiversity loss, climate change, and sustainable development. These initiatives also highlight the importance of aligning climate, biodiversity, and development agendas, supporting local and regional governments in implementing transformative projects, and fostering rights-based, inclusive approaches that enhance resilience and human well-being.

This transformation entails a comprehensive restructuring of technological, economic, and social systems. It involves shifts in norms, paradigms, objectives, and values to secure ecosystem conservation and sustainable use, enhance human quality of life, and support sustainable development. But also changes in governance, economic systems, and societal structures are necessary, including the adoption of inclusive decision-making, sustainable financing mechanisms, and policies that integrate biodiversity conservation, climate resilience, and social equity across multiple scales. The interconnections between ecosystems, biodiversity, and climate underline the need for integrated approaches that simultaneously address the triple planetary crises and societal challenges. Nature-Based Solutions (NBS) are increasingly recognized by science and policy as critical tools in this context, delivering multiple co-benefits for biodiversity, climate adaptation, and social resilience. Yet, their effectiveness, trade-offs, and potential to drive transformative change have not been fully uncovered.

To address this gap, the session will explore how NBS can advance transformative change in Europe and other regions of the world, with emphasis on:

- Implementing NBS in ways that drive systemic change, achieving biodiversity conservation, climate adaptation, and ecosystem resilience.
- Showcasing case studies and strategies that illustrate how NBS contribute to transformative sustainability solutions for climate and ecological challenges.

- Approaches to ensure that NBS are contextualized and support long-term, transformative improvements in ecosystem service integrity.
- NBS solutions that combine ecological outcomes with inclusivity, equity, and justice, thereby transforming social and environmental governance.
- Governance mechanisms, participatory processes, social innovations, and other tools that enable transformative outcomes at local, regional, and larger scales.
- Engaging various stakeholder groups, including civil society, in NBS co-creation and knowledge co-production to foster transformative implementation and decision-making.

We invite scientists, practitioners, policymakers, and community representatives to share their experiences, frameworks, conceptual and practical approaches, social innovations, and practical strategies. The session will provide a collaborative space to identify actionable pathways for advancing transformative change for nature and people in Europe and beyond.

Goals and objectives of the session:

The session aims to explore and advance the role of NBS in driving transformative change for biodiversity, climate, and human well-being. Its objectives are to:

1. Examine how NBS can contribute to systemic, sustainable, and socially equitable transformations in ecosystems and communities.
2. Showcase case studies, strategies, and social innovations that illustrate the effectiveness and co-benefits of NBS for biodiversity, climate adaptation, and resilience.
3. Discuss approaches to ensure NBS are context-specific, support long-term ecosystem service integrity, and integrate inclusivity, equity, and justice.
4. Highlight governance mechanisms, participatory processes, social innovations, and other tools that enable transformative outcomes across local, regional, and larger scales.
5. Facilitate knowledge exchange and collaborative dialogue among scientists, practitioners, policymakers, and civil society, to identify actionable pathways for implementing transformative NBS.

Planned output / Deliverables:

We plan to co-produce a discussion paper with the session’s contributors, drawing on the insights and outcomes generated during the session.

Related to ESP Working Group:

[TWG 14 – Application of ES in Planning & Management](#)

II. SESSION PROGRAM

Room: A2

Date of session: Tuesday, 19 May 2026

Time of session: 11:00 – 17:30

Timetable speakers/session chairs: Diana Dushkova & Dagmar Haase

Time	First name	Surname	Organization	Title of presentation
Round 1: Transformative Pathways, Innovation & Scaling of NBS (from vision to systemic change)				
11:00-12:40				
11:00-11:10	Diana Dagmar	Dushkova Haase	Helmholtz Centre for Environmental Research – UFZ Leipzig, Germany; Humboldt University Berlin, Germany	Introductory note by session chairs: Framing Nature-Based Solutions for Transformative Change: Insights and Pathways
11:12-11:24	Manuel	Wolff	Humboldt University Berlin, Germany	Vibes, vibrations, and tensions of urban transformation: Rethinking ambivalent human-nature-relationship dynamics through NBS
11:26-11:36	Gloria	Mozzi	Euro-Mediterranean Centre for Climate Change (CMCC), Italy	Co-innovation labs for transformative NBS: Comparative lessons from five European regions

Time	First name	Surname	Organization	Title of presentation
11:38-11:48	Barbara	Sowińska-Świerkosz	University of Life Sciences in Lublin, Poland	NatureScape project: Transformation Labs as spatial and socio-ecological catalysts for transformative urban resilience
11:50-11:58	Anton	Shkaruba	Erda Research Technology Education (RTE), the Netherlands	Beyond pilot projects: conditions enabling the expansion of green and blue infrastructure for systemic transformation
12:00-12:10	Ulla	Mörtberg	KTH Royal Institute of Technology, Sweden	NBS in municipal planning – what to transform and how?
12:12-12:22	Kirsty	Blackstock	James Hutton Institute, UK	Recognising the roles of economic sectors in mainstreaming NBS – insights from EU communities of practice
12:23-12:40	Discussion (1st round)			

Round 2: Evidence, Assessment & Applied Case Studies (methods, empirical research, and real-world applications)
14:00-15:40

14:00-14:10	Solmaz Khazaei	Moughani	KTH Royal Institute of Technology, Sweden	Evidence-driven PolSAR–AI flood mapping to support flood-resilient NBS: The 2025 Ille-et-Vilaine Flood, France
14:12-14:22	Max	López-Maciel	University of Aveiro	Spatial differentiation in assessing the adoption and diffusion potential of urban NBS: a case study for green roofs in Eindhoven (Netherlands)
14:24-14:34	Mina	Di Marino	Norwegian University of Life Sciences, Norway	Climate resilient development and the role of NBS in the Oslofjord Region
14:36-14:46	Sebastian	Candiago	University of Bayreuth, Germany	Winemakers' perspectives on ecosystem-based adaptation for climate-resilient viticulture
14:48-14:58	Jane	da Mosto	We are here Venice ETS, Italy	Why restoring the health of the lagoon system is crucial for Venice, and how it can be revived
15:00-15:10	Andrzej	Długoński	Warsaw University of Life Sciences, Poland	Proecological solutions for restoring neglected cemeteries in Western Peru (Barranca, South America)
15:12-15:24	Zeynep	Sergi Marim	Istanbul Technical University, Turkey	Perception of ecosystem services provided by NBS to address tourism-related challenges in coastal cities: Aveiro (PT) and Seferihisar (TR)
15:25-15:40	Discussion (2nd round)			

Session 3: Synthesis, Knowledge Gaps & Forward Pathways (reflection, gaps, and future directions)
16:00-17:50

16:00-16:10	Sara	Camilleri	Ecostack Innovations, Malta	The biodiversity-climate-health nexus within cities: A Systematic Review
16:12-16:22	Claudia	Romelli	Politecnico di Milano	Supporting biodiversity and NBS with the New European Bauhaus: strategic insights from Central Europe
16:24-16:34	Jarumi	Kato Huerta	University of Trento, Italy	Bridging NBS and ecosystem restoration: Pathways for European cities
16:36-16:46	Mairéad	O'Donnell	Trinity College Dublin, Ireland	Future novel ecologies: exploring multispecies futures in urban places through a co-design workshop
16:48-16:58	Sebastian	Brocco	University of Innsbruck, Austria	Modelling NBS in forests at regional scale: a stakeholder-driven approach

Time	First name	Surname	Organization	Title of presentation
17:00-17:10	David	Camacho-Caballero	Universitat Autònoma de Barcelona (UAB), Spain	Bridging local and global vulnerabilities for an integrated ecosystem service assessment of NBS
17:12-17:22	Jurre	de Vries	Rijkswaterstaat, the Netherlands	Bridging the pilot paradox: mainstreaming NBS along the North Sea Region coastal areas
17:24-17:34	Loan	Diep	New York University, USA	Reflective synthesis on evidence gaps in urban NBS research and pathways forward
17:35-17:50	Discussion (final round)			

III. LIST OF ABSTRACTS

The first author is the presenting author unless indicated otherwise

1. Framing Nature-Based Solutions for Transformative Change: Insights and Pathways

First author: Diana Dushkova

Other author(s): Dagmar Haase

Affiliation: Helmholtz Centre for Environmental Research - UFZ, Department of Conservation Biology and Social-Ecological Systems

Contact: diana.dushkova@ufz.de, kodiana@mail.ru

Nature-based solutions (NBS) have emerged as a promising framework (both as a concept and practical approach) for simultaneously addressing multiple societal challenges by restoring, conserving, and sustainably managing ecosystems, while delivering co-benefits for biodiversity, climate adaptation and mitigation, and human well-being. Recent scientific literature highlights that although NBS are widely promoted, their transformative potential as an imperative for addressing the triple planetary crisis and as a means of realizing their benefits is not automatic. Outcomes depend on how NBS are designed, governed, financed, and embedded within broader ecological, social, political, and economic systems. Poorly implemented NBS can reinforce existing inequalities and power imbalances or deliver short-term benefits without addressing the underlying drivers of environmental degradation and socio-economic injustice. In contrast, when grounded in approaches that promote participation, inclusivity, and justice, NBS can catalyse systemic change by reshaping governance arrangements, shifting dominant practices and values, fostering social innovation, and strengthening local capacities. When embedded in enabling policy frameworks that mainstream NBS within development strategies, supported by inclusive governance and sustained financing, such approaches can address the root causes of climate change and biodiversity loss across scales.

Building on outcomes from NBS-related research and implementation projects, this introductory note positions NBS as leverage points for transformative sustainability pathways, illustrating how they can move beyond incremental interventions to support long-term ecological integrity, social equity, and resilience across diverse contexts. By showcasing empirical case studies, it highlights the forms of transformative change NBS can enable.

Bringing together recent advances (e.g., typologies of transformative change through NBS) and remaining gaps (e.g., indicators and metrics of transformation), we invite participants to critically reflect on trade-offs, synergies, and enabling conditions, and to identify actionable pathways for scaling up and mainstreaming NBS in support of just and sustainable futures for nature and people.

Keywords: Nature-based solutions, transformative change, co-creation, sustainability, resilience

2. Vibes, vibrations and tensions of urban transformation: Rethinking ambivalent human-nature-relationship dynamics through nature-based solutions

First author: Manuel Wolff

Other author(s): Dagmar Haase, Annegret Haase

Affiliation: Humboldt Universität zu Berlin

Contact: manuel.wolff@hu-berlin.de

For about a decade now, nature-based solutions (NBS) have been promoted as an integrated response to biodiversity loss, climate change, and social inequality. However, depending on how they are shaped and implemented, NBS themselves can have highly ambivalent outcomes. While they can strengthen ecological resilience and support social cohesion, they may also activate conflicting perceptions of, and interests in, nature. For some groups, nature represents a domain of care and restoration; for others, it symbolises threat, disorder or constraints on human autonomy. The implementation of NBS may

lead to general improvements but may also (re)inforce inequities and undermine planned sustainable outcomes. These conflicting interests and perceptions interact with local, regional, national and supranational governance arrangements, power asymmetries, existing inequities and unequal opportunities for participation. This assemblage determines how NBS are perceived and operate: as an improvement to quality of life and a source of empowerment, or as exclusionary and anxiety-provoking. NBS may gain traction when pro-environmental norms are publicly endorsed, but it will face resistance when narratives promoting pro-growth and unsustainable developments and strategies become the predominant response to today's crisis-prone context, the uncertainties of the future, and the increasingly fragmented and polarised discourse. Against this backdrop, the paper explores the ambivalences of the shaping and implementation of NBS between humans, nature, hope and crisis focusing on the urban realm. It examines the transformative environmental, economic and social shifts that either facilitate or threaten sustainable and equitable urban futures. Building on the authors' expertise, we first conceptualise the above described ambivalences. We illustrate our argument, second, using examples from different research projects. Third, we critically discuss NBS ambivalences and ways to engaging productively with them, addressing conflicts, and enabling long-term system integrity, human well-being, and resilience in times of transformation and crisis.

Keywords: Nature-based Solutions (NBS), NBS ambivalences, transformation, crisis, urban realm

3. Co-innovation labs for transformative Nature-based Solutions: Comparative lessons from five European regions

First author: Gloria Mozzi

Other author(s): Giada, Bastanzi, Maria Katherina, dal Barco, Fulvio, Biddau, Lisa, Blix Germundsson, Alessandro, Bosso, Arianna, Cecchi, Irene, Diti, Lisa, Ferrari

Affiliation: Euro-Mediterranean Centre for Climate Change (CMCC), Institute for Climate Resilience, Venice, Italy

Contact: gloria.mozzi@cmcc.it

Nature-based solutions (NbS) are increasingly recognised as critical instruments for addressing climate risks, biodiversity loss, and social inequalities. Yet, their potential to drive transformative change depends on how they are governed, contextualised, and embedded in regional decision-making. This contribution presents insights from five regional co-innovation labs implemented within the ARCADIA project across continental Europe: Emilia-Romagna (Italy), Lower Austria (Austria), Zagreb and Krapina-Zagorje (Croatia), Skåne (Sweden), and Funen (Denmark). The labs functioned as structured science–policy–community interfaces supporting the co-design of climate adaptation pathways through NbS and green–blue infrastructure.

Drawing on a comparative cross-regional analysis, we synthesise lessons on how science-based practices can be integrated into participatory NbS processes while grounding them in justice and long-term resilience. Results indicate that effective NbS co-creation depends on recognising multifunctional benefits, including ecosystem services and human well-being, as well as on early mapping of political, institutional, socio-cultural, and knowledge-related barriers and enabling conditions. Structured and early-planned stakeholder engagement emerged as critical for integrating community knowledge, addressing social preferences, and ensuring inclusivity, particularly for marginalised groups.

The analysis further illustrates how different governance approaches interact in practice. Structural approaches embed NbS within planning and policy frameworks to challenge path dependencies on grey infrastructure; systemic approaches leverage nature-based enterprises, hybrid green–blue–grey solutions, and cross-sectoral coordination; and enabling approaches focus on capacity building, empowerment, and agency at regional and local levels.

Overall, this work presents transferable lessons from co-innovation labs on how NbS can enhance the integrity of ecosystem services while supporting inclusive, transformative climate-resilience strategies in Europe.

Keywords: Co-innovation laboratories, transformative change, environmental justice, participatory governance

4. NatureScape project Transformation Labs as spatial and socio-ecological catalysts for transformative urban resilience

First author: Barbara Sowińska-Świerkosz

Other author(s): Andrew Ikingura, Hai-Ying Liu, Elina Dace

Affiliation: Department of Hydrobiology and Ecosystems Protection, University of Life Sciences in Lublin, Lublin, Poland

Contact: barbara.swierkosz@up.edu.pl

Nature-based solutions (NbS) are increasingly recognized as key strategies to address urban pressures by enhancing biodiversity, supporting climate adaptation, and improving quality of life. Small-scale urban NbS also provide multiple ecosystem services while serving as platforms to explore their contributions to broader urban resilience. The NatureScape project builds on this perspective by engaging with NbS in seven European cities (Oslo, Lublin, Dublin, Lisbon, Milan, Riga and St. Gallen), as anchor points for establishing Transformation Labs (T-Labs). These T-Labs are conceived as place-based socio-ecological learning environments that connect spatial interventions with social innovation and participatory governance. The process of T-Labs establishment follows a structured framework comprising recreating a shared mission, defining locally relevant thematic priorities, appointing facilitators, mapping stakeholders, conducting workshops, signing letters of intent, site familiarization, and forming collaborative spaces for dialogue and learning. Between 2025 and 2026, a series of online and in-person activities engaging stakeholders enabled the initial establishment of T-Labs in seven cities. Early findings indicate that selecting a T-Lab priority theme—ranging from biodiversity enhancement and human well-being to community involvement and transformational governance—is critical. These themes influence stakeholder composition, engagement levels, and the type of relationships (formal, partnership-based, supportive, informal, or conflictual), shaping the social dynamics necessary for transformative outcomes. By linking spatial interventions with social innovation and participatory governance, NatureScape T-Labs demonstrate how localized NbS can catalyze systemic, sustainable, and equitable urban transformations. This approach provides transferable insights for designing and implementing context-sensitive NbS that support long-term ecosystem integrity, co-benefits for communities, and actionable pathways for urban resilience. The findings offer valuable lessons for scientists, practitioners, policymakers, and civil society seeking to harness NbS as catalysts for transformative change.

Acknowledgement: This research was funded by Biodiversa+, the European Biodiversity Partnership, in the context of the [NatureScape] project under the 2023-2024 BiodivNBS joint call. It was co-funded by the European Commission (GA No. 101052342) and the following funding organisations: [RCN - Research Council of Norway, Norway, GA No. 356404], [SNSF - Swiss National Science Foundation, Switzerland], [EPA - Environmental Protection Agency, Ireland], [NCN - National Science Centre, Poland, No. 2024/06/Y/ST10/00129], [FCT - Fundação para a Ciência e a Tecnologia, I.P., Portugal], [LCS - Latvian Council of Science, Latvia, No. ES RTD/2025/09], [MUR - Ministry of Universities and Research, Italy].

Keywords: nature-based solutions; urban resilience; stakeholder engagement; urban labs

5. Beyond Pilot Projects: Conditions Enabling the Expansion of Green and Blue Infrastructure for Systemic Transformation

First author: Anton Shkaruba

Other author(s): Hanna Skryhan, Marcin Spyra, Justyna Rubaszek, Tereza Rumanová, Mária Bihuňová, Nadiya Maksymenko, Eva Semančíková, Jóna László

Affiliation: Estonian University of Life Sciences, Environmental Protection and Landscape Management

Contact: anton.shkaruba@emu.ee

Nature-based solutions are widely recognized as catalysts for climate resilience, yet their capacity to drive transformative change depends on whether innovations can move beyond initial pilot environments. This contribution investigates conditions that enable the transfer and broader uptake of Green and Blue Infrastructure (GBI) practices in socio-political contexts where institutional legacies, governance cultures, and civic participation differ substantially from EU countries. Drawing on insights from six completed GBI interventions implemented in five EU Member States, the study engages practitioners, municipal officials, and academic experts from Belarus, Russia, and Ukraine in facilitated workshops to explore how these innovations might travel and evolve when confronted with new administrative realities.

The qualitative assessment examines how workshop participants interpret the purpose and value of GBI, how responsibilities for long-term implementation and maintenance are assigned, and how perceived risks and uncertainties are negotiated. The discussions showed that successful adaptation of GBI approaches requires more than technical replication: it depends on municipal leadership capable of championing innovation, institutional learning supported by accessible evidence and training, and regulatory flexibility allowing experimentation without undermining accountability. Clear communication strategies were repeatedly highlighted as essential for aligning expectations, countering misconceptions about maintenance costs, and cultivating public trust.

Participants also pointed to systemic challenges complicating transformative uptake, including entrenched bureaucratic routines, fragmented funding pathways, limited experience with participatory planning, and integrity risks associated with procurement and land-use decisions. Despite these barriers, locally driven initiatives and community-based coalitions emerged as promising entry points for advancing nature-based solutions even within centralized governance arrangements. By articulating how context shapes GBI diffusion, this study provides guidance for researchers and practitioners seeking to align nature-based solutions with transformative agendas. It demonstrates that advancing knowledge and practice requires attention to socio-technical dynamics as much as ecological design, ensuring innovation pathways remain adaptive, inclusive, and responsive to place.

Keywords: Green and Blue Infrastructure, Nature-based solutions, Innovation diffusion, Urban governance

6. Nature-based solutions in municipal planning – what to transform and how?

First author: Ulla Mörtberg

Other author(s): Sigvard Bast, et al.

Affiliation: KTH Royal Institute of Technology, Stockholm, Sweden

Contact: mortberg@kth.se

Sustainable metropolitan development requires integrating energy-efficient urban growth with the promotion of ecosystem services (ES) and biodiversity (BD). Nature-based solutions (NBS) offer a promising approach to reconcile these objectives. However, their implementation remains fragmented and poorly embedded within municipal and regional spatial planning, which plays a critical role in shaping urban landscapes. Overcoming this gap demands a transformative shift in planning systems to address emerging environmental and societal challenges holistically. This study examines how current spatial planning in Sweden—focusing on the fast-growing Stockholm metropolitan region—engages with ES and BD. The aim is twofold: to identify challenges and opportunities in present-day planning at various governance levels, and to collaboratively explore new pathways for integrating sustainability more effectively into urban development.

A qualitative case study was conducted involving interviews with municipal and regional planners, alongside focus group discussions with stakeholders from three municipalities representing urban to peri-urban contexts. The research explored perceptions of ES and BD, planning strategies, knowledge translation into practice, coordination across planning levels, and examples of both success and failure.

Findings reveal a fragmented planning landscape, with ES and BD addressed through overlapping but largely disconnected geographies: legally protected areas; knowledge-designated but unprotected zones; urban spaces with small-scale NBS; and broader green infrastructure plans with weak ties to formal spatial planning. Although policy ambitions are high, actual implementation is often reactive and constrained by economic pressures, leading to the loss of NBS opportunities during later planning stages. Proactive, long-term collaboration within individual municipalities emerges as a key success factor. To move forward, planning must adopt a more integrated landscape perspective, bridging siloed approaches and fostering a cohesive, proactive, nature-based planning framework that jointly addresses core sustainability goals.

Keywords: Nature-based solutions, municipal planning, integrated landscape perspective

7. Recognising the Roles of Economic Sectors in mainstreaming Nature-based Solutions – insights from EU communities of practice

First author: Kirsty Blackstock

Other author(s): Anna Bérczi-Siket, Fanni Nyiro, Alhassan Ibrahim, Esther Carmen, Rebecca Gray, Sebastian Birk

Affiliation: James Hutton Institute

Contact: kirsty.blackstock@hutton.ac.uk

Embedding Nature-based Solutions (NbS) into governance requires better science-policy-practice interfaces. The presentation will summarise learning from our four-year MERLIN project (Mainstreaming Ecological Restoration of freshwater-related ecosystems in a Landscape context: INnovation, upscaling and transformation) focused on longitudinal engagement of strategic economic sector representatives (Agriculture, Hydropower, Insurance, Inland Navigation, Peat Extraction and Water Supply and Sanitation). This focus was designed to mainstream freshwater NbS and complement bottom-up engagement across 18 case studies and we will reflect on the challenges of engaging with powerful stakeholders. The process aimed to co-develop actionable pathways, creating six individual sectoral strategies (Bérczi-Siket et al., 2025) and a cross-sectoral routemap for EU and MS policy units (Blackstock et al., 2025). We explored how sectors are enrolled in NbS implementation and identified several strategic planning processes (Water Dialogues for River Basin Management Plans, CAP strategic plans, forthcoming Nature Restoration Plans) to illustrate who, when and how to include economic sectors into planning and implementation of NbS. Analysing roles highlighted those co-creating ecosystem services and those benefitting from these services, alongside enablers and blockers, with 19 different economic sectors identified in total. Framing these analyses using a systemic framework (Carmen et al. 2025) consolidated the practical yet reflexive approach to encouraging transformative change.

Home - MERLIN project

Bérczi-Siket, A., Blackstock, K. and Nyírő, F. (2025). Focus Sectoral Strategies for mainstreaming freshwater restoration. EU H2020 research and innovation project. <https://projectmerlin.eu/deliverables.htm>
Blackstock K.L., Bérczi-Siket, A., Nyírő, F., Gray, R., Matthews, K.B., Wardell-Johnson, D., Kelly, K., Waylen, N., Neary, C., Provan, N., Kok, S, Kainer, P, Scricciu, Puiu, I, Ionescu, C, Hering D. and Birk, S. (2025) Cross-Sectoral Routemap for Mainstreaming Freshwater Nature-based Solutions in Europe. <https://project-merlin.eu/deliverables.html>
Carmen, E., Ibrahim, A., Blackstock, K., & Waylen, K. (2024). A transformations framework for mainstreaming a nature-based solutions approach. *Nature-Based Solutions*, 6, 100199. <https://doi.org/10.1016/j.nbsj.2024.100199>

Keywords: Economic Sectors, Communities of Practice, Policy Coherence, Roles, Enabling Institutions

8. Evidence-Driven PolSAR–AI Flood Mapping to Support Flood-Resilient Nature-Based Solutions: The 2025 Ille-et-Vilaine Flood, France

First author: Solmaz Khazaei

Other author(s): Zahra Kalantari, Liangchao Zou, Fernando Jaramillo, Carla Sofia Santos Ferreira, Khabat Khosravi

Affiliation: Department of Sustainable Development, Environmental Science and Engineering (SEED), KTH Royal Institute of Technology

Contact: Solmazkm@kth.se

Nature-based solutions (NBS), including floodplain restoration, wetland rehabilitation, and riparian green corridors, offer sustainable and climate-adaptive pathways for flood risk reduction, but their effective implementation depends on robust, evidence-based flood mapping. This study introduces a PolSAR–AI framework for high resolution flood detection and mapping employing Nested-UNet segmentation to deliver precise inundation extents from the Ille-et-Vilaine flood event (27 January–1 February 2025) driven by Storm Ivo in western France. The flood impacted approximately 16,300 ha, primarily within the Vilaine River basin (Rennes, Redon, Bruz, Guichen, Guipry-Messac), with water levels unseen for 40 years, leading to agricultural losses and evacuation of 1,000 residents. Leveraging Copernicus Emergency Management Service (CEMS) activation, PolSAR satellite data, and high-resolution hydrological observations, our method achieved high classification accuracy (Accuracy: 0.910; Precision: 0.914; Recall: 0.909). By mapping inundation directly on floodplains, natural wetlands, and riparian systems, this approach identifies priority areas where NBS can strengthen water retention, dissipate peak discharge, and restore hydraulic connectivity. Potential NBS interventions include Floodplain reconnection along lower Vilaine to increase storage capacity, Wetland restoration in Seiche tributaries to improve flow regulation and water quality. Green-blue corridors through Rennes peri-urban zones to reduce urban runoff and heat stress and Hybrid green-gray solutions at constriction points to protect exposed settlements Our results empower policymakers with evidence-based spatial decision-support for NBS planning aligned with the European Green Deal and UN SDGs, contributing to resilient, nature- and people-positive landscape transformation.

Keywords: Nature-Based Solutions; PolSAR; Nested-UNet; Vilaine River Basin; Climate Adaptation

9. Spatial differentiation in assessing the adoption and diffusion potential of urban nature-based solutions: a case study for green roofs in Eindhoven (Netherlands)

First author: Max Lopez-Maciél

Other author(s): Peter, Roebeling, Fabio A. Matos, Rick Llewelyn, Elisabete Figueiredo, Luuk Postmes, Mayke Van Dinter

Affiliation: University of Aveiro

Contact: max@ua.pt

Green roofs are relevant nature-based solutions (NBS) that help cities to cope with climate change by reducing urban heat, managing stormwater, and supporting biodiversity. Albeit evidence on the benefits from green roofs are increasingly recognized and quantified, their adoption and diffusion remains limited. Several studies have identified the constraints to the adoption of NBS at the city level, though no studies have assessed differences in adoption and diffusion of NBS across neighborhoods. Hence, the objective of this study is to assess and analyze the adoption and diffusion potential of NBS by private house/property owners across neighborhoods, with a case study for green roofs in the City of Eindhoven (Netherlands). To this end, an online survey was performed (N=1,012) and results analyzed at the city and neighborhood level using the Adoption and Diffusion Outcome Prediction Tool (ADOPT) model. Results at the city level show that the Peak Adoption Level (PAL) is ~3% and the Time to Peak Adoption Level (TPAL) is ~17 years. Results at the neighborhood level, however, reveal strong spatial differentiation – with PALs ranging between ~1.5% and ~10% and TPALs ranging between 13 and 19 years across neighborhoods. Spatial sensitivity analysis shows that the PAL can be increased most by improving environmental costs & benefits (between 0.3%-point and 7.5%-point increase in adoption) and the TPAL by enhancing relevant skills & knowledge (between 1.7 and 2.4 year reduction in time to adoption) while, again, noting strong differences between neighborhoods. These findings underscore the need to move beyond generic policies and, instead, develop

neighborhood-specific policies that address neighborhood-specific constraints that are essential to promote adoption and diffusion of NBS. By combining adoption modelling with spatial sensitivity analysis, this study provides a robust basis for defining targeted policies that can strengthen urban climate resilience and inform broader NBS implementation strategies.

Keywords: Adoption, diffusion, nature-based solutions, green roofs, urban resilience

10. Climate Resilient Development and the Role of Nature-Based Solutions in the Oslofjord Region

First author: Mina Di Marino

Other author(s): Matthew Cashmore, Siri Eriksen

Affiliation: Norwegian University of Life Sciences

Contact: mina.di.marino@nmbu.no

Recent assessments (IPCC, 2023) stress the urgent need for transformational development to address climate change, biodiversity loss, and resource degradation. Growth-driven development accelerates land use change, emissions, and ecological decline, narrowing the window for sustainable futures. The IPCC's Climate Resilient Development (CRD) concept integrates mitigation and adaptation, highlighting urban development's role in shaping emissions and resilience. Nature-Based Solutions (NBS), such as green roofs, permeable surfaces, and restored wetlands, use ecosystems to address societal challenges, reduce emissions, and enhance local resilience. Embedding NBS into urban planning aligns ecological restoration with climate goals, advancing sustainable and climate-resilient pathways.

This study examines the implementation of Climate Resilient Development (CRD) and Nature-Based Solutions (NBS) through an analysis of planning documents in Norway's Follo region, located south and southeast of Oslo. This work is part of the Co-CRED project funded by the Research Council of Norway. The municipal land use planning processes—ranging from strategic to detailed planning—of the six municipalities within the region, home to 150,000 inhabitants, have been analyzed.

The thematic analysis explores the discourses and measures related to CRD and NBS through case study analysis across six municipalities, identifying similarities while highlighting innovative approaches. The study discusses NBS in depth and identifies key challenges and opportunities for addressing climate change and biodiversity loss.

The findings highlight that the six municipalities demonstrate some awareness of climate change mitigation, adaptation, and certain NBS measures. However, climate resilience is underdeveloped or only implicitly addressed in land use plans.

National, regional, and local interactions significantly influence CRD and NBS outcomes, but inclusive and adaptive planning practices are needed to overcome barriers and advance these initiatives.

Keywords: Climate Resilience, Nature-Based Solutions, Oslo fjord, biodiversity

11. Winemakers' perspectives on ecosystem-based adaptation for climate-resilient viticulture

First author: Sebastian Candiago

Other author(s): Samuel Halter, Thomas Koellner

Affiliation: Professorship of Ecological Services, Bayreuth Center of Ecology and Environmental Research (BayCEER), University of Bayreuth, Germany

Contact: sebastian.candiago@uni-bayreuth.de

The transformation of agricultural systems is pivotal for ensuring their resilience, biodiversity and sustainable food security. Traditional vineyard landscapes provide multiple benefits to nature and society in Europe, but the impacts of the climate crisis threaten them. Ecosystem-based adaptation strategies (EBA) have the potential to mitigate climate change effects and enhance provision of benefits in agroecosystems. However, research into the attitudes of winemakers towards the use of EBA is scarce. This study explores the perspectives on a set of EBA of winemakers in the traditional German wine-growing region of Franconia. A Q-sort study was conducted with 29 winemakers to assess their inclination towards a set of EBA and their capacity to enhance the provision of ecosystem services in a changing climate, allowing the individuation of five different perspectives. Franconian winemakers prioritize the use of greening measures that improve water holding capacity and decrease soil erosion in case of extreme weather events. They also support the use of rootstocks that can tolerate drought and heat ensuring grape production under warmer climates. Their views are less unanimous about the benefits of using resistant varieties and agroforestry practices in vineyards (e.g., habitat provision, pest control, aesthetic values). The

increase of resilience of Franconian viticulture using EBA emerges as a unifying theme with perspectives that are driven by different socio-economic factors. For instance, younger winemakers are willing to take risks and test innovative EBA practices that provide multiple benefits supporting the transition to agroecology, while estates that prioritize wine quality view ecological improvement from EBA as a useful co-benefit, but the focus is on grape production. Based on our results, we propose possible ways forward to strengthen collaborative governance, learning, and experimentation in Franconia, with the aim of harnessing EBA to increase the resilience of Franconian viticulture while providing multiple ecological benefits.

Keywords: climate resilience, viticulture, nature-based solutions, adaptive capacity, Q-sort

12. Why restoring the health of the lagoon system is crucial for Venice and how it can be revived

First author: Jane da Mosto

Affiliation: We are here Venice ETS

Contact: jane@weareherevenice.org

The millennial history of Venice, encompassing its distinctive heritage together with the rich biodiversity and coastal protection afforded by the surrounding lagoon, represents a prime example of a socio-ecological system built according to the precursors of ecosystem services, as signified now. Recent history, however, evidences a disruption of that symbiosis between territorial development and natural capital. Port activities and large infrastructures have caused extensive erosion, deeper waters and loss of salt marsh.

We are here Venice ETS, an environmental non-profit with a mission to ensure Venice remains a living city, has been working to shift attention to the condition of the lagoon and develop scalable solutions for recreating, repairing and maintaining Venice's wetlands. Efforts have accelerated with support from the Horizon 2020 WaterLANDS initiative (GA: 101036484). As one of six action sites, it is managing tasks at multiple levels to achieve effective stakeholder engagement and growing community awareness concerning the role of the salt marsh for the health of the lagoon, its values for society, contribution to protecting Venice and climate change mitigation. Nature based solutions have been designed and are being implemented on two reconstructed marshes in the central lagoon. Engagement activities are characterised by creative approaches and exchange of knowledge that contribute to governance through raised expectations.

An articulated monitoring system is being developed to track and manage morphological trends, topography, sediment dynamics, vegetation changes, birds and invertebrates with specific reference to ecological functionality and ecosystem services. Cross-comparison is also carried out at a reference natural marsh subjected to similar forcings. The purpose is to refine understanding of the determinants of resilience in the modern lagoon context, create tools for adaptive management integrated with local knowledge and ensure participative decision making while providing the parameters necessary to demonstrate the ecosystem services that underpin upscaling through public private partnerships.

Keywords: Coastal lagoon, Venice, Transformative change, Adaptive management, Nature based solutions

13. Pro-ecological solutions for restoring neglected cemeteries in Western Peru (Barranca, South America)

First author: Andrzej Długoński

Other author(s): Justyna Marchewka, Lukasz Majchrzak, Luz Arelis Moreno Quispe, Plinio Guillen Aracon

Affiliation: Department of Landscape Architecture, Institute of Environmental Engineering, WULS-SGGW, Poland

Contact: andrzej_dlugonski@sggw.edu.pl

The aim of the research is to demonstrate a proecological approach for the design of undiscovered cemeteries to improve the maintenance of neglected urban spaces that serve recreational functions. The research used a multi-mixed method approach based on site vision, terrain analysis, and hypsometry using RS and DJI drone flight, as well as a survey and interviews with local residents and authorities conducted in 2024 and 2025. The first results of this work indicate that the use of segetal vegetation and succulents, as well as ecological surfaces and equipment made from local materials found in the Andean landscape (such as gravel surfaces, wooden benches, baskets, poles, and mixed-metal lanterns), can significantly reduce the risk of drought and the lack of watering, which is a pressing problem in this part of the country due to periodic water shortages and the subtropical climate change (sand floods destroying historical landscape, El Niño effect). A new way of thinking about these cultural places also involves attention to aesthetic function, as noted by local residents of the Barranca region who participated in the survey. The results of our research can be applied more broadly in other regions of America and third-world countries, where the quality of life remains a secondary concern. Third-world countries need to develop tourism in regions such as Machu Picchu, which is considered one of the New Seven Wonders of the Modern World. It is worth paying attention to the cultural heritage and history of neglected places, such as historic cemeteries, so that the recreation trend known in Europe can be countered there on new principles, at the expense of efforts and financing

in a new version based on the developing long-term NBS for proecological designing and wise responsible maintenance of cultural greenery serving recreational function for different social groups in the future.

Keywords: cultural green infrastructure, climate change, recreation, different social groups

14. Perception of Ecosystem Services Provided by Nature-Based Solutions (Nbs) to Address Tourism-Related Challenges in Coastal Cities: Aveiro (Pt) And Seferihisar (Tr)

First author: Zeynep Şergi Marım

Affiliation: Istanbul Technical University

Contact: marım22@itu.edu.tr

Tourism facilitates the economic growth of coastal areas while also increasing pressures and vulnerability of such areas. Seasonal increases in visitor numbers lead to various problems, including inadequate infrastructure, excessive water use, waste management problems, ecosystem degradation, and deterioration of cultural heritage. While Nature-Based Solutions (NBS) are recognized as solutions to many fundamental urban challenges, they have not been well explored in terms of tourism pressures. In urban areas, NBS implementations often prioritize factors such as time, cost, and performance. NBS implementation offers multiple benefits by reducing tourism pressures and simultaneously increasing tourism attractiveness. This objective of this study is to assess the stakeholders' perception on ecosystem services provided by Nature-Based Solutions (NBS) to mitigate tourism-related pressures in coastal cities. This study presents a methodological approach to examine the role of ecosystem services provided by NBS in mitigating tourism-related pressures. This provides cities with the opportunity to identify NBS options that can help address the prevailing problems in their communities. The data obtained will enable the identification of the most effective NBS to address tourism pressures experienced by local communities.

Keywords: Nature-based solutions, sustainable tourism, coastal settlements, participatory approach, perception-based analysis

15. The biodiversity-climate-health nexus within cities: A Systematic Review

First author: Sara F. Camilleri

Other author(s): Milutin, Stojanovic, Thea Wübbelmann, Christopher Raymond, Timon McPhearson, Mark D.C. Mansoldo, Benjamin Mifsud Scicluna, Elena Mannich, Anna Giulia Castaldo

Affiliation: Ecostack Innovations, 2100, Kordin Business Incubation Centre, Paola, Malta

Contact: sara.camilleri@ecostackinnovations.com

Globally, biodiversity loss and climate change impacts are rising, and public health is increasingly affected. This review investigates how solutions addressing these multiple challenges involving biodiversity, climate, and health are conceptualised and implemented within urban contexts, and what barriers and enablers shape their uptake, drawing on a systematic review of 251 peer-reviewed articles. Our results show that only one-third of the interventions identified from biodiversity–climate–health (BCH) nexus articles address all three components of the nexus, suggesting a limited operationalisation of fully integrated approaches in practice. Nature-based solutions (Nbs), especially for public and urban spaces (e.g. street-tree networks that cool neighbourhoods), emerge as the most frequently cited and implemented BCH solutions.

Our results further indicate a structural preference for sectoral interventions that are more readily implemented, measured, and funded within existing urban governance systems, as opposed to more systemic solutions—such as participatory planning approaches and knowledge and social capacity building—which require sustained cross-sectoral collaboration. Within urban contexts, technologies such as modelling, monitoring, and decision-support tools, alongside green and blue infrastructure, are identified as key enabling factors influencing the uptake of integrated biodiversity, climate, and health solutions. Conversely, funding limitations and institutional complexity frequently constrain long-term implementation, monitoring, and maintenance.

Additionally, only one-third of studies in our database explicitly refer to principles associated with transformative governance, indicating a persistent gap between aspirational Nbs discourse and lessons emerging from real-world implementation. Overall, our findings highlight a limited evidence base for fully integrated biodiversity–climate–health

solutions, with many implemented NbS reflecting choices driven by feasibility and governance constraints rather than their broader integrative potential, with implications for achieving transformative change.

Keywords: NbS, Biodiversity, Climate, Health, Nexus

16. Supporting biodiversity and nature-based solutions with the New European Bauhaus: strategic insights from Central Europe

First author: Claudia Romelli

Affiliation: Poliedra - Politecnico di Milano

Contact: claudia.romelli@polimi.it

Urban ecosystems across Europe are undergoing profound transformations driven by climate change, urbanisation, and long-standing pressures from land use change, pollution, and resource-intensive development patterns. These dynamics increasingly undermine biodiversity and the capacity of urban and peri-urban ecosystems to deliver essential ecosystem services. In response, recent scientific and policy debates emphasise the need for versatile and multifunctional approaches that reconnect ecological integrity, social well-being, and sustainable urban development. Nature-Based Solutions (NBS) have emerged as a central mechanism in this transition, yet their transformative potential depends on how effectively they are embedded within governance frameworks and socio-economic systems.

This contribution presents the Central Europe Strategy for a New European Bauhaus (NEB)-based Urban Biodiverse Transition, developed within the URBIO BAUHAUS project funded by the Interreg Central Europe programme. The strategy conceptualises the NEB initiative as an enabling framework for NBS implementation, activating the initiative's core values—sustainability, inclusion, and aesthetics—to maintain and enhance biodiversity and to promote ecological regeneration in urban contexts. It provides strategic guidance across four interrelated domains: collaborative governance for nature, nature-positive urban design, regenerative urban economies, and community-driven urban futures.

The strategy is grounded in policy analysis, stakeholder engagement, and empirical insights from four pilot cities in Central Europe, where NBS are being co-designed and tested through living lab approaches. Reflections on governance arrangements, design processes, and enabling conditions emerging from these pilots provide insights into opportunities and constraints for applying the strategy as a guiding framework. In this way, the contribution discusses the potential and challenges of advancing biodiversity-positive, inclusive, and aesthetically grounded urban transitions through NBS.

Keywords: nature-based solutions, New European Bauhaus, Central Europe, urban transition

17. Bridging Nature-Based Solutions and ecosystem restoration: Pathways for European cities

First author: Jarumi Kato Huerta

Other author(s): Oriol García Antúnez, Eugenia Castelazzi, Natalie Gulsrud, Christopher Raymond, Loan Diep, Timon McPhearson, Chiara Cortinovia, Davide Geneletti

Affiliation: University of Trento

Contact: jarumi.katohuerta@unitn.it

Restoration of urban ecosystems is critical to achieving biodiversity, climate, and social sustainability goals, yet its implementation in complex urban environments remains challenging. While Nature-based Solutions (NbS) have gained momentum, they often prioritise social functions over ecological recovery, sometimes resulting in "green mimicry", whereby spaces appear green but lack functional ecological value. Conversely, traditional restoration science often lacks participatory and multifunctional governance frameworks that enable NbS to succeed in densely populated areas.

This paper presents a framework for mutual learning between NbS and ecological restoration to address these limitations. We identify two main pathways spanning topics on design, governance, and monitoring. Hence, NbS can gain from restoration's focus on ecological quality and long-term recovery. Conversely, restoration can boost its social legitimacy by adopting the inclusive, multifunctional, and co-designed traits of NbS.

To operationalise this framework, we analyse evidence from the European Roadmap for Urban NbS developed by the NATURA Project, which includes empirical findings from 21 urban case studies. Findings indicate that biodiversity is currently treated as a secondary co-benefit in most European cities, with a predominance of interventions aimed at creating new ecosystems rather than restoring and managing existing ones. Furthermore, monitoring remains mainly limited to short-term project cycles (2–5 years), often neglecting long-term ecological functioning.

We conclude that achieving the targets set by the EU Nature Restoration Regulation requires deliberate integration of these agendas. By aligning NbS implementation with legally binding biodiversity targets and governance innovations, including civic stewardship and participatory design, cities can foster more resilient and socially equitable urban ecosystems.

Keywords: urban nature restoration, nature-based solutions, nature restoration regulation

18. Future novel ecologies: exploring multispecies futures in urban places through a co-design workshop

First author: Mairéad O'Donnell

Affiliation: Trinity College Dublin

Contact: odonnm12@tcd.ie

Transforming complex adaptive social-ecological systems, such as urban areas, requires collaboration with stakeholders to address multifaceted challenges. Co-design is a participatory decision-making process during which diverse knowledge and perspectives inform transformative solutions. As urban wilding gains momentum as a strategy for reimagining green space, co-design provides a way to collaboratively explore the values, conflicts, and possibilities that arise when planning for multispecies cohabitation. Urban wilding is an increasingly prominent approach to urban green space design, which emphasises the cohabitation of human and non-human species to foster biodiversity and ecological resilience. To integrate non-human perspectives into urban ecology practice, researchers from the participatory science project NovelEco developed the Future Novel Ecologies co-design workshop, which utilised multispecies methods to incorporate non-human perspectives into the design process. This paper outlines the workshop methodology for planning and conducting a workshop effectively, reflects on the workshop's effectiveness in fostering collaborative visioning, and suggests adaptations for implementation in alternative settings. Further, the integration of the workshop's methods into learning environments is discussed to reflect on how they can equip educators, students, and other stakeholders with tools that help reimagine urban ecologies. Insights are also provided about the value of municipalities, planning agencies, and local community groups adopting this workshop to enhance participatory planning and collaborative urban governance. This ecology-with-cities approach advances new inclusive, adaptive urban transformation frameworks by bridging participatory design and ecological, multispecies thinking.

Keywords: Co-Design, Social-Ecological Systems, Multispecies Participation, Urban Wilding, Collaboration

19. Modelling Nature-based Solutions in forests at regional scale: a stakeholder-driven approach

First author: Sebastian Brocco

Other author(s): Tist Liekens, Laura Barraclough, Georg Leitinger, Ulrike Tappeiner

Affiliation: University of Innsbruck

Contact: sebastian.brocco@uibk.ac.at

The implementation of Nature-Based Solutions (NbS) in forest management requires the application of diverse, spatially explicit management systems. Creating NbS application scenarios requires deep understanding of local contexts, which can only be achieved through active stakeholder engagement. We developed a participatory-modelling workflow that integrates stakeholder knowledge with process-based ecological modelling to assess the effects of different NbS on forests in Tyrol (Austria) and South Tyrol (Italy).

In the first phase, stakeholder participation (through workshops and interviews) enabled the identification of critical gaps in ecosystem service provision and the co-design of NbS scenarios to address these deficiencies. Subsequently, we employed iLand, a landscape-scale forest growth model, to simulate the impacts of management practices and climate change on individual forest stands. iLand was applied to virtual landscapes representative of the entire region, capturing the diversity of forest types and ecotones. The results were then upscaled to the regional level using machine learning techniques, which allowed us to project the long-term structural evolution of forests, as well as the co-benefits and trade-offs between ecosystem services.

This hybrid approach facilitated the creation of detailed, bottom-up projections tailored to the local specificities of Tyrolean and South Tyrolean forests. Preliminary findings reveal how differences in legislation and management practices between the two regions influence forest structure and ecosystem service provision. Notably, some stakeholder-proposed NbS did not yield the expected benefits for ecosystem services, highlighting the need for adaptive management strategies.

The results will be shared with stakeholders as feedback, enabling the refinement of NbS scenarios and fostering collaborative decision-making for sustainable forest management. This study demonstrates the value of integrating local knowledge with advanced modelling to support evidence-based NbS implementation at the regional scale.

Keywords: Ecological Modeling; Stakeholder Engagement; Forest Management; Nature-Based Solutions

20. Bridging local and global vulnerabilities for an integrated ecosystem service assessment of nature-based solutions

First author: David Camacho-Caballero

Other author(s): Johannes Langemeyer, Ricard Segura-Barrero, Gael Vervoort, David N. Barton, Gara Villalba

Affiliation: Institute of Environmental Science and Technology (ICTA), Universitat Autònoma de Barcelona (UAB)

Contact: davidalejandro.camacho@uab.cat

Nature-based solutions (NBS) can address socio-ecological challenges in urban environments, such as climate change adaptation and biodiversity conservation. However, NBS assessments often focus on local ecosystem service benefits while overlooking broader, cross-scale impacts that may undermine long-term sustainability. To address this gap, this paper presents and tests an integrated assessment framework to evaluate cross-scale NBS impacts by examining how NBS alter social-ecological vulnerabilities through both local ecosystem service provision and the generation of unintended effects. To achieve this, the assessment considers two spatial scales. Local-scale vulnerabilities are assessed using spatial indicators related to key ecosystem services, including heat regulation, runoff mitigation, habitat provision, air quality regulation, and opportunities for human–nature interaction. Broader-scale vulnerabilities are evaluated by linking life-cycle impacts of NBS to Earth system boundaries, thereby accounting for global pressures associated with material and energy use. Stakeholder weighting is used to reflect societal priorities and support inclusive decision-making.

The framework is applied to green roof planning in Oslo, comparing alternative implementation scenarios. Results show that while green roofs can reduce local vulnerabilities by enhancing regulating and cultural ecosystem services, large-scale deployment may increase global vulnerabilities related to climate change and biogeochemical flows. Consequently, maximizing green roofs was not the most effective strategy. Instead, green-roof implementation of 68% maximizes desired impacts while minimizing undesired ones.

Our approach provides a novel local-to-global integrated framework to examine cross-scale trade-offs and synergies of NBS, supporting more reflexive and transformative NBS planning.

Keywords: Nature-based solutions, Urban vulnerability, Urban greening, Earth system boundaries, Cross-scale

21. Bridging the pilot paradox: mainstreaming Nature-based Solutions along the North Sea Region coastal areas

First author: Jurre de Vries

Other author(s): Geert van der Meulen, Lisa van Well, Vana Tsimopoulou, Chiu Cheng, Berry Gersonius

Affiliation: Rijkswaterstaat

Contact: jurre.de.vries@rws.nl

Nature-based Solutions (NbS) are considered essential components of future coastal systems to drive transformative change and sustainably address present-day challenges, such as human pressures and climate change. Worldwide, much research and many NbS pilot projects have demonstrated promising outcomes, but the systemic mainstreaming of NBS remains limited. To bridge this ‘pilot paradox’, governmental and societal partners from France, Belgium, the Netherlands, Germany, Denmark and Sweden, including coastal management authorities, have joined forces in the Interreg North Sea Region project Manabas Coast.

Manabas Coast investigates the barriers and enablers for mainstreaming NbS across diverse national and geographical contexts. Several cases are executed in practice to explore how NbS pilots can contribute to systemic transformation. We have used interactive co-creation workshops to develop a shared understanding of NbS mainstreaming, employing approaches such as the ‘Theory of Change’, the ‘Circle of Influence’, and SWOT (‘Strength-Weaknesses-Opportunities-Threats’) analysis. Inspired by regime transition theory, and the Geel’s Multi-Level-Perspective, we developed a framework for comparing various strategies for NBS mainstreaming and identifying success factors across different governance and social contexts.

The analysis highlights that the Manabas partners can leverage their unique roles and local jurisdictions to catalyze transformative change through NbS in multiple ways. Pilots often focus on strengthening the evidence-base and advancing the understanding of natural systems while engaging local stakeholders. Both types of activities are valuable; however, to achieve systemic uptake, activities addressing societal aspects, governance and institutional embedding are equally important, although sometimes receiving less attention. NbS pilots usually use success metrics that do not necessarily align with the metrics of success relevant for NbS mainstreaming. Aligning pilot success factors with broader indicators of societal and governing impact is critical to bridge the gap of the pilot paradox.

Keywords: Nature-based Solutions, transformative change, systems thinking, pilot paradox

22. Reflective Synthesis on Evidence Gaps in Urban Nature-based Solutions Research and Pathways Forward

First author: Loan Diep

Other author(s): Timon McPhearson

Affiliation: New York University

Contact: loan.diep@nyu.edu

Research on urban Nature-based Solutions (NbS) has expanded rapidly over the past decade, generating a growing body of theoretical advances, conceptual frameworks, and empirical case studies aimed at supporting sustainable urban planning and management. Despite these advances, important research gaps remain. NbS research often prioritises certain approaches, for example technical performance over a single issue, offering limited insight into how evidence can be used within real planning and governance processes. As a result, such research frequently falls short of providing the contextual, grounded, and politically actionable knowledge that decision-makers require when navigating trade-offs, institutional constraints, and competing priorities. These limitations contribute to blind spots in practice. Planners and city officials are often left without guidance on how to integrate diverse forms of knowledge, address power asymmetries, or adapt ecosystem services framings across scales and governance contexts. Drawing on findings from the NATURA Global Roadmap for Urban Nature-based Solutions, this session presents cases from Europe and other world regions where research and practice have successfully informed one another. The cases highlight research designs characterised by iterative learning and feedback between research and planning, co-produced knowledge, and the active role of boundary-spanning institutions and intermediaries. Together, these examples illustrate how NbS research can become more usable in planning and management, and how stronger research–practice collaborations can support transformative urban change.

Keywords: Nature-Based Solutions; Cities; Urban Planning; Transformative Change; Evidence