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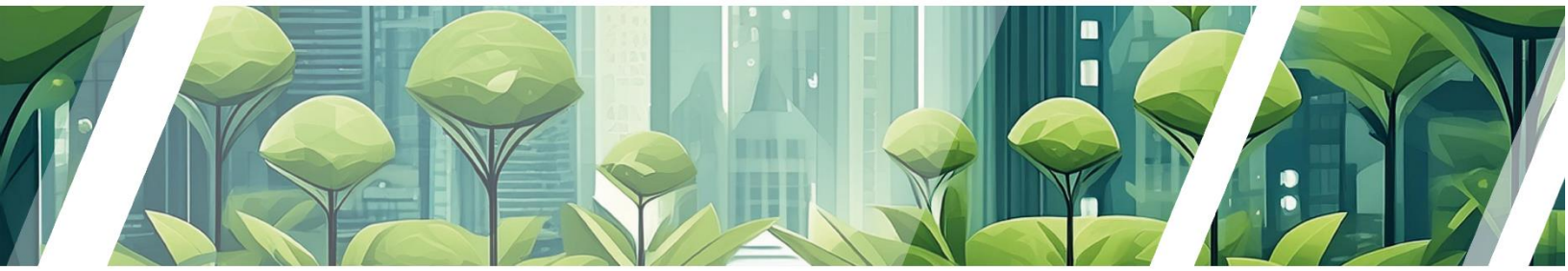

NATURE IN THE CITY ANNUAL EVENT

Harnessing Nature-Based Solutions for Resilient and Sustainable Cities

11 and 12 December 2024 | Sciences Po, Paris

BOOK OF ABSTRACTS

Session 1 A: Exploring the diverse perspectives on nature-based solutions: A cross-disciplinary and cross-cultural analysis

"Matching Solutions with Problems. Linking Problem-Solving Capacities to the Implementation of Nature-Based Solutions in Cities."

Roberto Rodríguez R. (Sciences Po), César Rentería (CIDE)

Nature-based solutions (NBS) are designed to address societal challenges by harnessing ecosystem services, offering co-benefits in areas such as climate adaptation, biodiversity, and human well-being. Despite growing global recognition, NBS are not yet widely adopted in urban settings. One major barrier to their implementation is a lack of technical and institutional capacities, which often leads to a continued preference for traditional gray infrastructure. Moreover, the benefits of NBS, such as improved air quality or cooling effects, are often unequally distributed. One example are poorer neighborhoods experiencing fewer advantages and even potential harms such as gentrification and displacement.

This paper explores how enhancing problem-solving capacities can bridge these gaps and facilitate the successful implementation of NBS. By successful implementation, we mean the NBS-related actions that are actually implemented and do not create negative spillovers. Problem-solving capacities, which include problem definition, stakeholder engagement, cross-sectoral collaboration, and technical expertise, are critical for ensuring that NBS actions are not only implemented but do so without producing negative spillovers. While some aspects of these capacities are already present in the literature on NBS, there is still room to enhance a more systematic understanding of the public sector's capacities for successfully implementing NBS. Through a systematic literature review, this research explores the role of problem-solving capacities in bridging the gap between the potential of NBS and their practical application in urban areas. The study examines existing frameworks and identifies key areas for improvement, aiming to enhance the understanding of how public sector capacities can be developed to support the widespread and successful adoption of NBS.

Keywords: *problem-solving, policy capacities, implementation, urban policy, nature-based solutions*

“Co-Creating Dakar’s Greenbelt and Blue-Green Infrastructure Network”

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Dakar, the capital of Senegal, is located at the western tip of the narrow Cap-Vert Peninsula, which juts 50-kilometers into the Atlantic Ocean. Since 1950, its metropolitan population has expanded from roughly 200,000 people to nearly 3.5 million today, degrading ecosystem services as it connects with once disparate towns and threatens to form a conurbation with the major inland cities of Thies and Mbour. New and proposed megaprojects at the urban fringe are potential

drivers of unsustainable development in all directions. To purposely direct growth and protect natural resources, an international, multidisciplinary team is creating a greenbelt with an integrated blue-green infrastructure network as part of the United Nation's Generation Restoration Cities program to reimagine a sustainable future for this metropolis.

While serving as an important tool for rapidly growing cities, greenbelts have a checkered performance record. Beginning with the Prophet Mohammed's edict to protect the trees around Medina, they were later popularized by Ebenezer Howard in 1898 and have since spread worldwide. During the Scramble for Africa, this land-use strategy was used maliciously by the British Empire to separate colonists from the unjustly subjugated. Greenbelts have also failed to evolve in other areas, raising housing costs and leading to leapfrog development. However, when embraced by the local community, they offer many socio-ecological benefits.

This paper will address: What are the best strategies for developing a greenbelt? How can these strategies be contextualized to meet Dakar's realities? The paper will also discuss designing Nature-based Solutions (NbS) at scale, the advantages and disadvantages of planning and implementing NbS in cities, and draw upon case studies on existing greenbelts. Additionally, it will tackle methods for citizen participation, environmental justice, and proactive approaches to improve informal settlements in a nation's capital set to graduate from the UN classification as a Least Developed Country.

Keywords: *Greenbelt, Sustainable Development, Nature-based Solutions (NbS), Least Developed Country (LDC), Green Infrastructure (GI), Megaprojects, Mega-eco Projects, Informal Settlements, Citizen Participation, Urban Heat Island (UHI), United Nations Environment Programme (UNEP), Generation Restoration Cities*

"The Nature-Positive City: Establishing a Conceptual Foundation for Urban Ecological Conservation and Regeneration."

Tadashi Matsumoto (OECD), Marie Hanagata (OECD), Celia Zuberec (OECD), Mónica Velarde Miranda (OECD)

As cities confront the dual crises of climate change and biodiversity loss, they face an imperative to redefine their relationship with nature. The concept of nature-positive cities (NPCs) presents an opportunity to integrate ecological restoration and biodiversity conservation into urban development. This paper aims to establish a conceptual foundation for the NPC through three parts. The first will provide guiding principles, the second, illustrative case studies, and the third, key considerations for policymakers to foster a sustainable and equitable transition to NPCs. Part one stems from the fact that there is no universally accepted definition of an NPC. This paper seeks to fill this gap by outlining the origins of the NPC concept before proposing a definition that sets out science-based targets and benchmarks, includes an explicit link to the SDGs, and that considers the social, cultural, and economic value of nature in cities. To promote the adoption of this framework, its principles and approaches must be clearly defined and actionable. The second part draws on a global overview of NPCs in OECD countries. It will show the potential of such an approach to navigate trade-offs and generate synergies across competing environmental goals, as well as between social, economic, and environmental issues. In particular, this paper attempts to illustrate how NPCs can generate a productive nexus between climate mitigation and adaptation, reconcile the trade-offs between urban development and biodiversity conservation, and expand on the role of nature-based solutions (NBS) in addressing social inequities and fostering inclusive urban regeneration. This paper's third and final section proposes key considerations for policymakers and researchers to accelerate the transition towards NPCs. It highlights the need for a long-term vision, clear policy targets and indicators, and place-based strategies. In doing so, it aims to ensure that NPC initiatives are politically, socially, environmentally, and financially viable.

Key words: *Nature-Positive Cities, Biodiversity Conservation, Urban Ecological Restoration, Nature-Based Solutions, Sustainable Development Goals (SDGs), Sustainable Urban Development*

Session 1 B: Exploring the diverse perspectives on nature-based solutions: A cross-disciplinary and cross-cultural analysis

“Decolonizing Nature-based Solutions: A Cross-Cultural Perspective”

Priscila Franco Steier (ICLEI Europe)

This paper embarks on a transformative journey to integrate decolonial approaches into Nature-based Solutions (NbS) professional education, emphasizing cross-cultural perspectives. It explores indigenous, local, and marginalized knowledge systems, challenging the colonial frameworks that have historically shaped our interactions with nature. Drawing inspiration from Antonio Bispo dos Santos and other decolonial activists, the research advocates for a shift towards "buen vivir" — living well together in a community that includes the Earth and all its beings. The study is guided by decolonial theory and critical pedagogy, engaging with the philosophical constructs of black diasporic and indigenous thinkers. It contrasts the holistic understanding of human-environment interconnectedness found in indigenous worldviews with the compartmentalized perspective often present in modern western epistemology. Central to this framework is the contra-colonial concept of "biointeraction," recognizing the interdependence between all living beings and nature. Methodologically, the research employs a qualitative approach, drawing on literature review and the author's experiences with Brazilian indigenous communities, including quilombolas and traditional fishing groups. It highlights indigenous practices like controlled burns and agroforestry as valuable contributions to NbS. The key messages underscore the necessity of genuine collaboration and power-sharing in integrating indigenous knowledge into NbS education and practice. The paper calls for creating academic and professional spaces where indigenous knowledge holders are recognized as experts, fostering diverse and innovative sustainability solutions. Ultimately, the paper urges educators, institutions, and policymakers to embrace decolonized and inclusive NbS education, cultivating professionals equipped to lead with empathy and a commitment to planetary health and

justice.

Keywords: *decolonization, nature-based solutions, indigenous knowledge, professional education, biointeraction.*

“Reverse Economies of Scale: Integrating Community-Centric Investments in Urban Nature-Based Solutions”

Brandon Staats (University of Cambridge)

This paper explores the application of the Reverse Economies of Scale (REOS) framework to enhance the deployment of nature-based solutions (NBS) at the community level in urban environments. REOS synthesizes multiple theoretical frameworks—Socio-Ecological Systems Framework (SESF), Systems Theory, New Institutional Economics (NIE), and Participatory Planning—advocating that smaller, localized interventions are more effective, efficient, sustainable, and resilient. Integrating these disciplines facilitates precise systems mapping and participatory governance, enabling NBS to be tailored to the specific social, ecological, cultural, and economic contexts of urban communities. This approach ensures that interventions are designed with a deep understanding of local dynamics and leverage points, maximizing the potential for NBS to improve community development and align with the Sustainable Development Goals (SDGs). The research questions are: 1) “How do small-scale, community-driven investments under REOS enhance the effectiveness and sustainability of NBS compared to large-scale interventions?”; 2) “What mechanisms within REOS, such as systems mapping and participatory governance, support the resilience and adaptability of NBS?”. By articulating how REOS integrates these frameworks, this paper demonstrates the critical role of localized, community-focused planning in implementing NBS, which not only supports ecological enhancements but also fosters substantial social and economic benefits.

Keywords: *Urban Climate Adaptation, Nature-Based Solutions, Reverse Economies of Scale, Community-Centric Investments, Systems Thinking, Participatory Governance, Sustainable Development Goals.*

“Beyond Urban Grayscale: Critical Conditions for Realizing Circular Water Nature-Based Solutions in Cities”

Tsatsou Alexandra (National Technical University of Athens), Frantzeskaki Niki (Utrecht University), Malamis Simos (National Technical University of Athens)

Climate change impacts in cities reveal the failures of urban development and management focused on sectoral interventions. Addressing floods, heatwaves, water scarcity, and wildfires, while promoting nature-positive cities that enhance biodiversity, wellbeing, and social justice, is a key challenge. Nature-based Solutions (NBS) have been recognized as powerful tools in both urban planning and environmental engineering. Supported by the necessary technical basis, NBS have entered the field of circular economy, able to reclaim water from non-conventional sources, and enhance urban greening, biodiversity, and water availability. As drivers of social, environmental, institutional and technological innovation, circular water NBS reshape how we design and manage cities, and how we experience and interact with natural elements, emphasizing the need for evidence-based practices to inspire and guide future urban pathways. This work positions water and NBS as the heart of climate resilient futures in cities and proposes a framework for mainstreaming circular water NBS, structured around three main axes: New meanings for water circularity and nature in cities: Circular water NBS guiding urban communities toward regenerative futures and enhancing resilience to climate change. New approaches for mainstreaming circular water NBS: Knowledge exchange, institutional readiness, and policymaking as key elements of fostering transformative pathways and nature-positive practices in cities. New praxes for climate resilience: Circular water NBS innovation demonstrated across various contexts, highlighting the collaboration of urban actors in planning, designing, implementing, operating, and maintaining these solutions. This work synthesizes primary research to propose a holistic framework for realizing circular water NBS in cities. It combines findings from a literature review, policy and bibliometric analysis, and case studies in Europe. Creating vibrant cities beyond the grayscale requires more than blueprints of green spaces and water elements, and circular water NBS can act as powerful catalysts for this vision.

Keywords: *nature-based solutions, water, circular economy, climate resilience, cities*

Session 2 A: Bridging the gap: Integrating nature-based solutions in global climate governance and local adaptation strategies

"Challenges to Implementing Nature-based Solutions in the European Union: Investigating Governance and Finance Barriers"

Valeria de los Casares (ETH Zurich), Marc Ringel (Sciences Po)

Nature-based solutions (NBS) have become integral to climate policy strategies, particularly in climate adaptation, due to their multiple economic, social and environmental benefits. Despite the European Union's strong adoption and promotion of NBS, diffusion varies widely among Member States. This study assesses the current EU strategies and national integration of NBS, identifying governance and financial barriers to their implementation. We combine policy review with 19 expert interviews to explore these challenges. The findings aim to clarify the "how" and "why" behind implementation issues, providing insights to enhance the effectiveness and uptake of NBS in Europe. We find that NBS are not systematically integrated into key policy planning tools. They face a multi-barrier structure consisting of governance and financing barriers. We put forward five policy recommendations to promote the uptake of NBS, including: development of common evaluation and accounting frameworks, building skills and encouraging collaboration, exploring innovative financial instruments, engaging with the private sector and developing an integrated approach to NBS in policy strategies.

Keywords: *Nature-based solutions (NBS), Climate-change adaptation and mitigation, Policy integration, Environmental governance, Sustainable urban planning.*

"Is Biodiversity Mainstreaming In Flood Policy? Rise And Institutionalization Of Nature-Based Solutions In France And The US"

Joana Guerrin (INRAE France)

The concept of Nature-based Solutions (NbS) has increasingly been developed in the Conservation and Climate Policy arenas for the past 10 years at the international level. Pushed and developed by organizations such as the International Union for the Conservation of Nature (IUCN) in Europe, or The Nature Conservancy (TNC) in the US, this concept has also been institutionalized in very different national and local settings. But how is this concept actually unfolding at local levels, in very different institutional settings such as France and the US ? Does the institutionalization of Nature-based Solutions enable mainstream biodiversity in other policy sectors such as flood risk policies? This research, realized through a Franco-American collaboration, attempts to analyze the genealogy of the concept at the international level, its role within global climate and environmental policy, and how it has been unfolding at national and local levels in France and the US. With a specific focus on flood policy, the paper will highlight differences and similarities in how NbS are defined, institutionalized, and implemented in practice. The data come from semi-structured interviews with actors in France and the US (public authorities, private companies, local stakeholders) from flood policy and environmental conservation sectors at different levels (national/federal, regional/State, city) realized between 2021 and 2024. The theoretical framework of the paper is grounded in political sociology, and tackles in particular multi-level governance analysis framework as well as environmental policy analysis.

Keywords : *France, US, floods, nature-based solutions*

“ARTISAN project: Empowering territories with Nature-based Solutions for Climate change adaptation”

Marion Poncet (French committee of IUCN)

France, like many countries, faces increasing climate-related risks such as cyclones, droughts, and floods. These challenges are compounded by ecosystem vulnerability due to human activities like urbanization, deforestation, and pollution. The resulting environmental degradation impacts biodiversity, human health, and essential ecosystem services. In response, the Life ARTISAN project was developed to enhance territorial resilience through Nature-based Solutions (NbS). Launched in 2020, this eight-year project is coordinated by the French Biodiversity Agency

(OFB) and 60% funded by the European Commission, with additional support from the French State. Life ARTISAN involves 28 partners, including government agencies, research institutions, NGOs, and local authorities. It features 10 pilot sites, 14 regional networks, and 7 national thematic work groups, promoting NbS across diverse ecosystems including urban areas, coastal regions, wetlands, forests, and agricultural landscapes. A key aspect of the project is producing resources for local representatives and stakeholders to facilitate NbS implementation. By addressing barriers and drivers of NbS adoption, Life ARTISAN aims to help communities adapt to climate change impacts. As the French committee of the International Union for Conservation of Nature (IUCN), we ensure proper use of the NbS definition and international standards. We develop tools to promote NbS and build national networks for knowledge sharing. This collaborative approach is crucial for achieving long-term sustainability and resilience of ecosystems and communities in the face of climate change. By fostering multi-scale reflection and providing practical guidance, Life ARTISAN contributes to a more resilient and biodiversity-rich future for France.

Keywords: *Nature-based Solutions,,Climate resilience, Biodiversity conservation, Life ARTISAN project*

Session 2 B: Bridging the gap: Integrating nature-based solutions in global climate governance and local adaptation strategies

“Mapping Urban Needs for Nature-Based Solutions: A Block-Scale Evaluation Framework for Locally Grounded NBS Strategies”

Nicolas Guillo (Ecoresil), Chloé Mecqinion (Groupe Huit)

In developing cities, the successful integration of Nature-Based Solutions (NBS) into policy agendas often depends on local authorities’ ability to secure international funding. However, aligning the climate ambitions of global donors with local development priorities can be challenging. To fill this gap, Groupe Huit and Ecoresil have developed an innovative methodology to support decision-making in NBS prioritization. At the heart of this approach is the recognition of the

imperative need to quantify the multifaceted benefits of NBS, encompassing climate resilience, ecosystemic restoration, and socio-economic progress. Our methodology enhances current practices through a four-step process: (i) the participatory weighting of objectives—this process ensures the NBS strategies align with local needs and preferences, fosters stakeholder buy-in, and helps identify funding opportunities (ii) a spatial evaluation of urban challenges, using Open Data GIS datasets and local inputs to assess the "need for NBS" at a block scale, (iii) an index-based calculation of NBS benefits, integrating the concept of ecosystem services and their capacity to address specific urban challenges, and (iv) the design of a user-friendly decision-making tool for final prioritization—shaped as a non-aggregated multicriteria analysis of NBS profiles in terms of benefits, implementation and maintenance costs, operational feasibility, and carbon sequestration potential—to facilitate dialogue and co-construction. This paper demonstrates the replicability of our NBS prioritization methodology, which remains highly adaptable to specific contexts by integrating micro-scale urban challenges and stakeholder engagement at key stages. Successful applications in Kinshasa and Bamako illustrate its potential as a strategic model for NBS planning in cities worldwide.

Keywords : *Nature-based solutions; Benefit evaluation; cartography analysis and prioritization*

"Towards Water-Sensitive Urban Planning: Integrating Nature-Based Solutions through a Participatory Approach in Sleman, Indonesia"

Xhesika Hoxha (University of Applied Science Cologne), Zahraa Salem Aswad Alobaidy (University of Applied Science Cologne), Juan David Mercado Leal (University of Applied Science Cologne), Anna Wilk-Pham (Technical University of Berlin), Bisma Setiyadi (Kota Kita Foundation, Surakarta, Indonesia)

This paper explores the integration of Nature-based Solutions (NbS) to address water-related challenges in urban and peri-urban areas, using Sariharjo village in Indonesia as a case study. It investigates how NbS can be applied to promote a just transition towards sustainability, focusing on key challenges, opportunities, and

the importance of community-driven participatory planning in identifying and prioritizing these solutions.
The study applies the Social-Ecological-Technological System (SETS) framework to understand the interactions between social, ecological, and technological components that influence ecosystem services, especially in urban water management. A series of participatory workshops were held in Sariharjo, involving multi-stakeholders in co-creating water-sensitive visions and building scenarios for their neighborhoods. These workshops emphasized the involvement of local communities in transitioning towards water-sensitive urban planning, helping to identify water-related issues and setting short- and medium-term goals for NbS implementation. The workshops facilitated the identification of pilot sites for the practical application of water-sensitive urban planning measures. In addition, key strategies and action plans for implementation were developed. Furthermore, a conceptual master plan for Rejodani I and Rejodani II was co-created, integrating water-sensitive design principles to guide sustainable urban development.
The findings highlight the effectiveness of community-driven approaches in improving the resilience of urban water systems by combining traditional and innovative practices. The study emphasizes the importance of environmental justice in NbS decision-making, ensuring equitable distribution of benefits among all stakeholders. In conclusion, the paper advocates for prioritizing NbS in inclusive urban planning, particularly in the Global South, where rapid urbanization and climate change cause severe threats to urban water systems. Sariharjo case study provides valuable insights for other cities seeking to implement similar strategies to enhance resilience and promote inclusive, sustainable urban water management.

Keywords: *nature-based solutions, water-sensitive urban planning, multi-stakeholder engagement, participatory approach, urban water resilience, Indonesia*

“Local Voices, Global Goals: Participatory Planning to Localize the Nature-based Solutions in the Management of UNESCO Heritage Sites”

Iuliia Eremenko (University of Warsaw)

Successful local adaptation of the United Nations' 2030 Sustainable Development Goals (SDGs) often requires innovative thinking and flexibility, allowing for the development of practices that can evolve in response to emerging data and changing circumstances. World Heritage cities of historical significance may face particularly pronounced challenges in balancing the preservation of their historical landscapes with sustainable development goals. In this context, participatory planning can significantly aid in transitioning from theory to practice. This study focuses on how participatory planning can contribute to the establishment of a local framework for both the implementation of the SDGs and specifically nature-based solutions (NBS) in the city, as well as the optimization of resource management, through the efforts of city administrations in World Heritage cities. This study examines the World Heritage sites of Stralsund, Germany, and Toruń, Poland, as case studies for comparative analysis. Both of these Hanseatic cities have preserved their medieval structures, and their entire historical centers are designated as World Cultural Heritage sites. Empirically, the research was based on three types of data collection methods: qualitative analysis of key documents that facilitate the pursuit of the SDGs in urban planning; semi-structured interviews with key actors, including officials from different tiers of administration, who jointly develop the Site Management Plan; and the collection of participant observations taking place at Toruń's Revitalization Committee meetings. The two cities studied demonstrated different approaches to integrating NBS and climate adaptation within the city through various institutions and documents. In the context of Toruń, the Revitalization Committee emerges as a key actor contributing substantially to the formulation of the Site Management Plan and the integration of SDGs, despite not being initially designated for this function. Meanwhile, in Stralsund, the Site Management Plan is a very technical document that did not initially envisage citizen participation in decision-making regarding the possibility of implementing NBS.

Keywords: *participatory planning; Revitalization Committee; Sustainable Development Goals; UNESCO; World Heritage Cities; World Heritage Management Plan*

Session 3 A: From theory to practice: Case studies of the governance of daily implementation of urban greening policies and nature-based solutions for climate adaptation in cities across the globe

"Knowledge Systems for Planning Nature-Based Solutions in U.S. Cities"

Sara Meerow (Arizona State University), Consolata Macharia (Arizona State University), Shaylynn Trego (Arizona State University), Saeideh Sobhaninia (Arizona State University)

Cities across the U.S. are increasingly investing in nature-based solutions or green infrastructure (GI) to address climate risks such as flooding and extreme heat and to provide other resilience and sustainability co-benefits. While vegetated GI, such as bioswales, rain gardens, and street trees are widely promoted as a critical and multifunctional form of infrastructure, previous research suggests that in practice GI is not strategically planned to maximize equity or multifunctionality. It is still unclear why these challenges persist and how data and tools might help transform GI governance. Knowledge systems are the social institutions, information, and processes that shape infrastructure, and there is growing recognition that knowledge systems must be transformed for future resilience. This is particularly true for GI, which challenges current infrastructure planning approaches in many ways. US GI knowledge systems have several shortcomings that threaten the impact and equity of investments. GI planning often focuses on one or a few functions, while ignoring others. The decision-making processes for determining which GI functions are prioritized and where GI gets sited are not well understood. This is an important knowledge gap because research shows that there are tradeoffs between GI functions, designs, and locations, but these remain under-examined. GI impacts are also localized, so GI spatial planning has environmental justice implications. This study unpacks current GI spatial planning knowledge systems in cities across the US, including key actors, information sources, and decision-making processes. Focusing especially on GI for stormwater and heat mitigation, we conduct semi-structured interviews with GI decision-makers in three diverse US cities: Detroit, Michigan, Phoenix, Arizona, and Boulder, Colorado.

To increase the generalizability of the case study findings, we also survey GI planners in a stratified random sample of 240 U.S. cities. The research can support the design of more effective governance institutions or useful decision-support tools.

Keywords: *Resilience, Green Infrastructure, Nature Based Solutions*

“Building dialogue spaces for climate adaptation in a agri-urban area: a case study on the Plateau de Saclay”

Dorian Spaak (Terre et Cité), Alexia Beaujeux (Terre et Cité)

Our paper and presentation is a case study on the Plateau de Saclay, an agricultural and natural area with exceptionally fertile land, long protected from urban sprawl by its topography. It has gradually emerged as a world-class innovation and research cluster, leading to significant urban development projects. In addition, it is home to hundreds of thousands of people who aspire to a balanced life on the fringes of the Paris metropolis. In this urban development context, that led to a net loss of agricultural land, we are witnessing a reshaping of the agricultural landscape towards more sustainable growing practices, climate adaptation practices, and innovative cooperations between research and farmers leading to NBS project. This phenomenon has - for the past 20 years - largely been fostered by Terre & Cité.To present the ongoing collective projects on the Plateau, we study the history of Terre & Cité, founded in 2001 by two farmers with the intuition that the future of local agriculture had to be written with all the other stakeholders. This co-construction process has led the emergence of a specific zoning and its affiliated action plan and governance body: the Natural, Agricultural and Forest Protection Zone (ZPNAF), enforced by the Greater Paris Act of 2010. Initially conceived as a necessary compromise, this tool is now seen as an opportunity for new co-oporations to emerge, and for taking into account the precious societal functions of nature and agriculture in the area’s urbanization process. We will be looking at how these tools can contribute to the preservation of agricultural and natural areas, but also support the deployment of NBS. Finally, we will focus on two NBS projects that are currently being implemented using this ‘agri-urban’ dialogue space, explaining the paths that led to their emergence: hedgerows planting and human urine use.

Keywords : *agriculture, suburban area, hedges, biodiversity*

“Exploring Mycelium in Urban Water Management Trough Autopoietic Processes and Holistic Perspectives: Insights from the Polish City of Łódź”

Francesca Berni (Politecnico di Milano - DAStU), Irene Bianchi (Politecnico di Milano - DAStU), Giambattista
Zaccariotto (Oslo School of Architecture and Design)

The urban landscape of the Polish city of Łódź, meaning "boat" as it floats on clay and sandy soils, is shaped by the textile industry that flourished in Tsarist Russia with great factories presently decommissioned and reprogrammed. The ongoing city restructuring is confronted with increasing water issues such as pollution, flooding, and drought exacerbated by climate change. These issues call for a shift in planning towards a new form of cultural cooperation "with" nature that moves beyond extractive, linear approaches. However, from an artistic perspective, the premise is that sustainability is a functional measure, not an aesthetic property, which leads to the challenge of how to achieve beauty within an ethically planned water cycle. The study presents initial findings from Łódź (PL), one of the three experimental laboratories of the Horizon Europe Project PALIMPSEST. The Polish pilot is testing with co-design processes that incorporate mycelium into urban water ecosystems, trying to reimagine nature-city relations (also) through a design intervention. The research explores the potential roles and benefits of mycelium in urban water management, particularly through the lens of autopoietic processes, which emphasize the self-sustaining nature of ecosystems. Moreover, this bioremediation can play a critical role in cleaning contaminated water bodies: how can we, as humans, mediate its interplay with the urban environment while integrating public space and the health of water ecosystems? This exploration seeks to manifest water in physical space, starting also from the question: how do we materialize water as a medium to make the connection between local landscape and communities vital again? This inquiry represents a tangible process that fosters collaboration between visible and less visible entities. Integrating mycelium applications into this framework can enhance the value of water's role in shaping a new urban natural landscape. Coherently with this premise, a series of

explicatory drawings support the argument underlying the comprehension process of the environmental and spatial potentialities of water-mycelium-humans interplay in the River Lamos context.

Keywords**:** *Environmental degradation, Waterscape, Co-creation, Autopoiesis, Interconnectedness*

“From Theory to Practice: Assessment of Regional Barriers to Urban Nature-Based Solutions”

Loan Diep (Urban Systems Lab, The New School), Timon McPhearson (Urban Systems Lab, The New School)

Urban Nature-Based Solutions (NBS) hold significant potential for addressing climate adaptation, biodiversity loss, and human health and well-being in cities, but their implementation faces critical barriers. These challenges are often context-specific, and influenced by governance frameworks, financial constraints, and knowledge systems. The NATURA project, “Global Roadmap for Urban Nature-Based Solutions,” has conducted a global analysis of urban NBS knowledge across seven regions: US-Canada, Latin America and the Caribbean, Europe, Sub-Saharan Africa, the Middle East and North Africa, Asia, and Oceania. By assessing the state of knowledge in research, policy, planning, and implementation of NBS, this initiative seeks to bridge the gap between theory and practice. Examining case studies from cities in each region helps point out the socio-political, economic, and environmental factors that influence the success or failure of urban NBS projects. Each regional team selected 20-25 case studies that represent NBS practices in their region, based on selected criteria such as project type, scale, societal challenges addressed, and leading actors. The findings reveal common barriers: weak policy frameworks, limited financial incentives, lack of monitoring and evaluation strategies, poor engagement with key actors, and inadequate integration of indigenous and local knowledge. Regional comparisons underscore the need for adaptive, and context-specific measures rather than mainstreamed solutions. The “Global Roadmap” highlights major knowledge gaps in regions including the Middle East and North Africa, where public access to data is limited, and in parts of Africa and Asia, where grassroots projects, including in informal settlements, remain under-documented. These barriers often stem from the type

of actors and funding involved, pointing to the need for improved knowledge sharing. Recommendations include promoting financial innovation and fostering collaboration across sectors and levels of governance. This global analysis provides actionable insights to guide NBS research and practice, providing a pathway to scale NBS in urban contexts globally.

Keywords: *nature-based solutions; urban; review; knowledge; practice*

Session 3 B: From theory to practice: Case studies of the governance of daily implementation of urban greening policies and nature-based solutions for climate adaptation in cities across the globe

"Building local Nature-based Solutions projects with co-benefits for the environment, society, and biodiversity"

Philip Roche (INRAE, AMU, UMR RECOVER), Martine Hossaert (CNRS, Institute for Ecology and Environment), Xavier Le Roux (INRAE, Microbial Ecology Laboratory), Laetitia Cuypers (INRAE, PEPR Support Service Unit), Guillaume Marchand (CNRS, Institute for Ecology and Environment), Charlotte Pillon (INRAE, PEPR Support Service)

Ecosystem Services (ES) and Nature-Based Solutions (NBS) are related concepts that only partially overlap. The NBS approach includes operational considerations to preserve biodiversity and long-term benefits for humans and nature, which are not included in the ES approach. While the ES framework is formulated as the flow of benefits from nature to society, the NBS approach promotes co-benefits for the environment,society, and biodiversity. The NBS approach also focuses on actions to propose solutions based on biodiversity and ecological processes, while ES research is more oriented on evaluating the benefits coming from ecosystems. Interdisciplinarity, coupled with social, economic and biodiversity co-benefits appear to be essential to NBS large scale implementation. We aim here to present an ambitious research program on Nature-Based Solutions(NBS) called SOLU-

BIOD, which will bring together the French research community to address a comprehensive range of questions related to NBS. Co-piloted by CNRS and INRAE, this program, with a budget of over 44 million euros over nine years (2023-2032), originates from a French government investment plan. It aims to be transformative in tackling the challenges of implementing innovative NBS in various territories. The SOLU-BIOD program's activities are structured around seven strategic projects and research calls. One of these projects is a network of eleven living labs(LL), geographically spread across mainland France and overseas territories, focusing on the program's four priority socio- ecosystems: urban, coastal, agricultural, and protected areas. We are currently setting up these living labs for a four-year period. At the end of these experiments, we hope to disseminate effective, replicable practices for setting up NBS in areas with similar challenges and environments and to identify the most beneficial ES for local communities. LLs appear to be an excellent way of exploring and evaluating systemic Nature-Based Solutions in territories through the co-construction of dialogue and studies between scientists and stakeholders.

Keywords: Nature-based solutions, NBS, program, SOLU-BIOD, transformative

“Restoration of the Rocuant-Andalién Wetland System: Nature-Based Solutions for Flood Risk Reduction and Habitat Recovery for Birds”

Carolina Rojas Quezada (Instituto de Estudios Urbanos y Territoriales, Centro de Desarrollo Urbano Sustentable CEDEUS)

This study addresses the restoration of the Rocuant-Andalién wetland in the Biobío Region, Chile, utilizing Nature-Based Solutions (NBS) for flood risk mitigation and bird habitat recovery. The Rocuant-Andalién wetland, a critical corridor for migratory birds, faces challenges due to extensive private ownership, which has impeded public protection efforts. Supported by the AFI Air Flyways America Initiative, our project investigates the effectiveness of NBS in urban flood control and biodiversity preservation. Key research questions explore the socio-environmental benefits of NBS and their role in enhancing resilience against natural disasters in vulnerable communities. Methods include cartographic analysis, hydrological modeling, and community engagement to prioritize restoration areas. Results indicate that NBS improve flood mitigation capacity and

create recreational spaces, contributing to sustainable urban planning and biodiversity conservation.

Keywords**:** *Nature-Based Solutions, Wetlands, Flood Risk Reduction, Habitat Restoration, Urban Resilience*

“Challenges and Opportunities of Nature-based Solutions for Transportation Infrastructure Resilience: A Survey of Massachusetts Municipalities”

Marta Vicarelli (University of Massachusetts Amherst), Eleni Christofa (University of Massachusetts Amherst) Chengbo Ai (University of Massachusetts Amherst, Amherst), Michael Knodler (University of Massachusetts Amherst), Camille Barchers (University of Massachusetts Amherst)

We performed a survey study of Massachusetts municipalities to shed light on the challenges and opportunities to strengthen the climate resilience of municipal transportation infrastructure, with a focus on Nature-based Solutions (NbS). Massachusetts is the most populous state in New England, a region experiencing rapid atmospheric warming, increasing frequency of extreme precipitation and wind events, and accelerating sea-level rise with significant socio-economic impacts. We examined the NbS already adopted by municipalities and the ones that they hope to adopt in the future. We also investigated the barriers that prevent or delay the implementation of NbS including constraints in municipal resources, coordination and governance failures, and difficulties in accessing data. The online survey was disseminated to all Massachusetts 351 municipalities with the support of the Massachusetts Municipal Association (MMA), the University of Massachusetts Transportation Center and numerous regional planning agencies. We received 246 responses from 115 municipalities. More than 95% of respondents reported having observed impacts of climate change on the transportation infrastructure of their municipality. Municipalities have started planning and developing numerous types of climate resilience strategies including new planning initiatives, engineering solutions, and NbS. Our study provides a detailed catalog of the NbS adopted by more than 70% of municipalities. All municipalities reported facing major barriers. Limited staffing capacity and grant- writing capacity (90% of respondents) seem to compromise the ability of municipalities to finance NbS and fund compliance with new regulations. Resource constraints and

lack of technical expertise are major bottlenecks for smaller and poorer municipalities. Their inability to secure grants appears to generate severe, long-term climate justice issues, exacerbating inequalities between wealthier communities and underserved communities. The results of this study may inform climate resilience policy across the United States of America toward a just and inclusive climate adaptation future.

Keywords: *Climate change, Extreme events, Resilience, Nature-based Solutions, Implementation barriers, Social Justice*

“Evidence of Dryland Nature-based Solutions for Climate Adaptation in Arid Urban Regions: A Case Study from Windhoek, Namibia”

Gaby Hansen (Namibian University of Science and Technology), Christina Breed (University of Pretoria)

Nature-based Solutions (NbS) have emerged as a key approach to addressing global climate challenges by promoting ecosystem management. However, research on NbS in Africa, particularly in the arid regions of Sub-Saharan Africa, remains limited. These regions, characterized by dryland ecosystems, present distinct challenges and opportunities for NbS implementation. This study aims to explore and document the existing evidence of NbS in addressing climate challenges and enhancing climate adaptation in urban arid regions of Namibia. Using a case study design, qualitative methods were employed, including structured observations, photographs, and semi-structured interviews with stakeholders from four projects in Windhoek. Nine representatives, including community members and experts, were interviewed, alongside informal conversations during site visits.

The research focuses on two main aspects: evidence of NbS implementation and climate adaptation. It examines perceptions, opportunities, and challenges in integrating Dryland Nature-based Solutions (DNbS), an experimental approach suited to arid regions. Preliminary findings reveal that DNbS can enhance climate adaptation strategies, improving urban ecosystem resilience and fostering stakeholder engagement. However, challenges persist, such as a limited understanding of dryland ecosystems, slow integration into policy frameworks,

and financial constraints. Addressing these barriers requires increased awareness campaigns, co-creation workshops, stronger policy advocacy, and innovative financing mechanisms. This study offers insights for policymakers, urban planners, and communities to accelerate DNbS implementation in arid regions, contributing to climate adaptation planning.

Keywords: *Arid regions, Dryland Nature-based Solutions (DNbS), Climate adaptation, Implementation, Stakeholder engagement.*

Session 4 A: Nature-based solutions as a tool for disaster risk reduction, post-disaster risk recovery and humanitarian crisis

“Empowering Quito's local stakeholders with the concept of Nature-based Solutions (NbS) for disaster risk reduction (DRR). The case of the ‘quebradas’”

Tannya Pico (Pontificia Universidad Católica del Ecuador and ISOCARP Institute), Alexander Jachnow (University of Namibia)

In response to the intensifying impacts of climate change, cities worldwide are increasingly adopting innovative strategies to enhance resilience. One approach gaining significant attention is Nature-based Solutions (NbS), which harnesses the potential of natural systems to address both environmental and societal challenges. Although NbS has developed as a comprehensive framework, substantial gaps persist in how this concept can potentially empower communities for disaster risk reduction (DRR) in the context of climate change. This research explores the implementation of NbS through the lens of absorptive capacities (ACAPs), focusing on Quito, Ecuador, and its ravines ("quebradas") as a case study. The primary objectives are twofold: to identify key factors for NbS knowledge absorption and to examine how this knowledge can empower communities for climate adaptation. Quito faces

increasing vulnerability to climate change. Rising temperatures, altered precipitation patterns, and more frequent extreme weather events, such as floods and landslides, pose severe risks to infrastructure, ecosystems, and livelihoods. The "quebradas" serve as natural drainage systems, buffering the city against heavy rainfall and reducing risks of flash floods and soil erosion. Restoring and maintaining these natural features strengthens Quito's resilience to climate-related disasters, improves water management, and creates sustainable green spaces. Empowering local stakeholders with NbS knowledge is essential for enhancing Quito's resilience. By integrating "quebradas" into the NbS framework and focusing on disaster mitigation, this research highlights the potential of bottom-up initiatives in urban planning for climate adaptation. Transdisciplinary collaboration and community-driven strategies enable the co-creation of adaptive measures tailored to Quito's unique environmental and socio-economic conditions. Enhancing local knowledge of NbS and DRR is key to fostering sustainable, collaborative governance and ensuring equitable climate resilience strategies for the city.

Keywords: *Nature-based Solutions, absorptive capacities, disaster risk reduction, bottom-up initiatives, climate resilience, urban nature, ravines*

“Parks Of Survival: Urban Gardens As Spaces For Disaster And Food Resilience”

Bediz Yilmaz (Mersin University)

The paper is based on the author's experiences as an urban farmer in Istanbul and an independent researcher in urban studies. It looks at how urban gardens can help communities prepare for disasters and ensure food security. The paper looks at the need for urban food systems to be able to cope with crises like earthquakes, floods, droughts, wars, economic crises or pandemics and proposes to gear up the urban parks as resilience hubs. The idea is that urban parks should be designed and kitted out in a way that helps cities and their residents cope with different risks and challenges. It will look at two specific examples: a) Piyalepaşa Orchard: A historic market garden in Istanbul that has survived for 500 years, providing essential produce amidst urban development pressures. b) Antakya Park: It was initially underused, but it became a community space after the earthquakes in February 2023. The author played a

big part in transforming it into an ecological park that serves local families and children. The paper suggests that urban gardens and parks should be included in city planning to help communities cope with multiple crises and looks at the idea of "Parks of Survival", showing how green spaces can help cities in the Global South prepare for and cope with disasters. For this, they need to acquire certain aspects: ecological infrastructures (water filtering system, solar power system, raised beds, composting system, compost toilet, mulching, non-irrigated grass from rhizomatic plants, rain-water collection systems...); ecological abilities (root cellar, sun oven, rocket stove, simple water filtering, basic gardening and seed saving, rainwater collection...). In the Global South, where cities lack green infrastructure, urban parks and gardens of all sorts need to be designed to face the upcoming disasters ; besides, the neighborhood population needs to be equipped with the needed skills.

Keywords: *Disaster, resilience, ecological parks, survival, gardens.*

“Shifting Approaches to Flood Risk Management: A North-South Comparison of Nature-Based Solutions in Boston and Buenos Aires”

Francesca Ferlicca (Lambert Mellon Postdoctoral fellow, Urban School, Sciences Po Paris), Cassandre Rey-Thibault, Bruno Latour (Postdoctoral fellow, CEE, Sciences Po)

Cities worldwide are reconceptualizing their approach to flood risk management as climate change intensifies precipitation patterns and threatens coastal areas. This study examines how two coastal cities—Boston (USA) and Buenos Aires (Argentina)—are reshaping their understanding of flood risk and implementing nature-based solutions (NBS) in distinctly socio-economic and institutional contexts. Drawing on Kian Goh's concept of "urban ecologies" and critical geography literature, we investigate how these cities' approaches to flood risk reflect the complex interplay between social, ecological, and infrastructural systems.

Our methodology employs a comparative case study approach, combining comprehensive document analysis of municipal flood management strategies with key informant interviews of urban planners, environmental experts, and

community stakeholders in both cities. We examine three key questions: How is climate change influencing the conceptualization of flood risk in these urban contexts? What role can nature-based solutions play in flood mitigation? How do approaches to flood risk and NBS implementation differ between a Global North and South context? Our analysis reveals contrasting trajectories in flood risk management. Boston's "Climate Ready" initiative exemplifies a comprehensive NBS approach, integrating living shorelines and urban wetlands into existing and planned infrastructure. The city benefits from robust institutional capacity and significant financial resources, enabling experimental "living lab" approaches to flood management. Conversely, Buenos Aires, while increasingly interested in NBS, faces greater implementation challenges. The city's flood management remains largely dependent on traditional infrastructure, with NBS projects often limited by resource constraints and competing development priorities.

We identify three key barriers to NBS implementation: epistemic (limited local knowledge about NBS effectiveness), organizational (insufficient expertise and maintenance capacity), and regulatory (rigid risk assessment frameworks). However, both cities show evidence of emerging "hybrid solutions" that combine traditional infrastructure with NBS elements. Buenos Aires's Maldonado Stream restoration project and Boston's harbor coastal resilience initiatives demonstrate how cities are adapting NBS approaches to their specific contexts. This research advances our understanding of urban flood risk management in several ways. First, it reveals how the conceptualization and implementation of NBS vary significantly between Global North and South contexts, despite similar climate threats. Second, it demonstrates how existing infrastructure legacies and institutional capacities shape cities' ability to transition toward nature-based approaches. Finally, it suggests that successful flood risk management requires flexible, context-specific approaches that can effectively integrate NBS while addressing local socio-economic realities.

Keywords: *comparative urban planning; environmental risk, flooding; climate adaptation*

Session 4 B: Nature-based solutions as a tool for disaster risk reduction, post-disaster risk recovery and humanitarian crisis

“Investing in Nature-based Solutions (NbS) for Disaster Risk Reduction and Post-disaster Recovery”

Liezl de Villiers (Environmental Manager Overstrand Municipality), Ursula Wellmann (Manager Biodiversity and Nature at ICLEI – Local Governments for Sustainability)

The African continent is classified as the most vulnerable to increasing climate change impact, facing severe consequences from rising temperatures, rainfall variability, and extreme weather events. Severe weather-related disasters are impacting water and food availability, adding pressures on many African countries, exacerbating environmental, economic, and social challenges. Additionally, human-induced ecosystem degradation and biodiversity loss further reduce the provision of ecosystem services on which communities rely. The Onrus, South Africa, peatland case study highlights the potential of nature-based solutions (NbS) in mitigating climate change impacts and minimizing damage, particularly in addressing flooding. The peatland's deterioration, driven by a number of factors and coupled with a devastating fire in 2019 led to significant ecological and socio-economic impacts, culminating in the loss of a portion of the peatland during the floods of 2023. The case study emphasizes the importance of dedicated resources and political buy-in for the restoration of affected areas. It underscores the significance of intact peatlands as carbon sinks for climate change mitigation. Leveraging NbS, particularly in urban areas, is identified as a cost-effective solution with positive impacts on air quality, water resource management, estuarine and marine health, and flood attenuation. The challenges in implementing NbS are attributed to the lack of information on their value. Furthermore, the case study demonstrates the value of preventative action, highlighting the cost-effectiveness of ecological/green infrastructure compared to the economic impacts of replacing grey infrastructure due to extreme weather events. The impacts of restoration activities and NbS implementation directly benefit communities. Accordingly, equitable processes and participatory decision-making at both local and national levels are essential, as validated by the Onrus case. Ultimately, the Onrus case

study provides recommendations for replicating these strategies at the urban scale and urges local governments to increase investments in NbS to effectively mitigate the impacts of climate change.

Keywords: *Nature-based solutions (NbS), Onrus, peatland, restoration, climate change*

“Housing and Flooding - Exploring the Weaknesses and Opportunities of Private, Public, and Social Rental Housing in Relation to Flood Hazards in Niguarda, Milan”

Kieran James (Politecnico di Milano)

As Europe increasingly feels the impacts of climate change, environmental management and adaptation become increasingly important to mitigate the growing risks posed to people and infrastructure. This paper looks at the connections between flooding and housing, particularly public housing. Public housing tends to house marginalized and vulnerable residents (often a requirement to access housing services). These socio-economic vulnerabilities combine with environmental vulnerabilities when housing is placed in flood zones creating complex risks that need to be appropriately handled. The purpose of this paper is to highlight the specific risks and needs of tenants impacted by flooding and to promote housing actors’ inclusion in flood mitigation projects. The neighborhood of Niguarda in the north of Milan is focused on as a case study. The research conducted included interviews with local stakeholders, analysis of flood responses in Italy (focused on the major Emilia-Romagna flood of 2023), and review of academic and popular sources as not all information has been studied academically. The case study area experiences chronic flooding from the buried Seveso River which impacts a large amount of public housing. The floods have consistently caused tangible and intangible damage to the residents and have increased issues for public housing managers who already face a severe lack of resources. While current mitigation projects (water storage tanks) are underway the long-term solution is increasing soil permeability in the basin. Residents should be engaged in this process so that their local knowledge and needs are considered and their risk awareness is increased. A long-term strategic planning process is

proposed with housing managers incorporated as facilitators of local steering committees. The proposed process takes advantage of the intersecting social and environmental issues present to develop a framework to involve marginalized residents in inclusive nature based solutions to increase community resilience and reduce urban flood risks.

Keywords: *Flooding, Climate Resilience, Public Housing, Tenant Rights, Nature-based Solutions*

“Exploring Multifunctional Nature-Based Solutions for Sustainable Stormwater Management.”

Svetlana Khromova (Universitat Autónoma de Barcelona), Gara Villalba Méndez (Institute of Environmental Science and Technology (ICTA-UAB), Giulia Benati (University of Rome La Sapienza), Matthew Eckelman (Northeastern University), Pablo Herreros Cantis (Basque Center for Climate Change), Svea Busse (Institute of Environmental Science and Technology (ICTA-UAB), Johannes Langemeyer (Institute of Environmental Science and Technology (ICTA-UAB)

This research investigates the dynamics of stormwater-related urban hazards in response to the growing challenges of climate change and urbanization. Using Barcelona’s hydrological systems as a case study, the work addresses key issues including environmental injustice, high-intensity rainfall events, limited sewer capacities, and the prevalence of impervious surfaces. Barcelona, a rapidly developing coastal city with a combined sewer system, faces significant urban drainage challenges, notably pluvial flooding and combined sewer overflows (CSOs). The study advocates for the implementation of Nature-Based Solutions (NBS) tailored to urban challenges, aiming to bridge the gap between existing water management practices and the need for enhanced environmental resilience. Emphasis is placed on integrating detailed risk assessments with strategic NBS planning to address evolving urban water management needs and promote societal well-being. The research utilizes a Social-Ecological-Technological Systems (SETS) framework to analyze the interactions between these domains. A novel approach is introduced, integrating SETS vulnerability, hazard, and exposure factors to generate a spatial risk score, offering deeper

insights into the impacts of water-related hazards on urban communities. Additionally, NBS scenarios and site potential maps are developed to identify feasible implementation areas, considering social, ecological, and technological indicators. The study also evaluates the mitigation potential of NBS and its role in reducing vulnerability while providing co-benefits. The findings underscore the importance of prioritizing NBS in urban water management to enhance resilience against climate-induced challenges.

Keywords: *Nature-Based Solutions, Social-Ecological-Technological Systems (SETS), stormwater-related urban hazards*

Session 5: Inclusive nature-based solutions: planning for climate resilience with marginalized communities and informal settlements in the Global South

"Is NBS Truly Participative: Role of Local Communities in Implementing Nature-based Solutions"

Arvind Lakshmisha and Harini Nagendra (School of Climate Change and Sustainability, Azim Premji University, Bangalore, India)

We are living in the Anthropocene, the era of record-breaking temperatures coupled with extreme climate events such as intense rainfall and flooding in every part of the world. These events have exacerbated the social and economic inequality severely hampering the achievement of SDGs especially in the global South. Nature-based solutions (NBS) as an approach has gained prominence to abate the distributive impacts of climate change by providing multi-fold and multi-sectoral benefits especially in cities of the global South. Though there is growing awareness about the utility of NBS for cities, there are concerns regarding participation and inclusion of local communities and governments in implementing and managing NBS. These concerns are fuelled by limitations due structural and institutional barriers, which is highlighted by increasing research both in peer-reviewed and gray literature. In this paper, we analyze 120 case studies of NBS in cities of global South, documented in two databases (Urban Natural Atlas and Oppla) to identify the different modes of participation that are

followed in implementing diverse NBS across the countries of the global South. Further, we also highlight the lack of empowerment and co-creation of NBS with local communities, across the continents, even though two-third of documented NBS cases are aligned towards either national, or lower-level (regional and local) policies indicating the importance of policy mechanisms for driving their implementation. We observe three distinct modes of institutional arrangements for implementing NBS, namely, government led, non-government led and NBS implemented through collaborative arrangements. We find that the type of institutional arrangement influences not only the modes of participation but also the goals of NBS, which ranges from climate resilience, biodiversity support and ecosystem restoration—along with social goals of creating public spaces. These findings from the database will be substantiated by findings from our own case studies of NBS in informal settlements especially around green and blue infrastructure in the cities of the global South.

Keywords: *Nature-based Solutions, green and blue infrastructure, informal settlements*

“Nature below the city: Critically reflecting on Managed Aquifer Recharge as a nature-based solution to water stress in growing African cities.”

Anna Taylor (University of Cape Town)

As African cities grow, climate patterns shift, and public infrastructure deficits persist, the incidence and extent of urban water stress increases. Using aquifers as storage facilities for times of drought is being promoted across the African continent as a climate-resilient development option. To increase the volume of groundwater available for abstraction in dry periods, the rate of recharge is accelerated through human intervention by injecting water into an aquifer via boreholes or establishing retention ponds in strategic locations and channeling water from elsewhere to enhance recharge. These Managed Aquifer Recharge (MAR) schemes bring together green, blue and gray infrastructure to enhance natural water flows and storage capacities for the purpose of making water more readily available for human uses. This involves complex treatment infrastructures and processes, both for the water to be artificially recharged and for the abstracted water before use. However, often the aquifers and subterranean ecosystems being

altered are poorly understood. And the schemes introduce new governance complexities relating to the sourcing, transfer, treatment and costing of water between various entities. Exploring experiences of Manager Aquifer Recharge in the cities of Cape Town, South Africa, and Windhoek, Namibia, this paper critically reflects on what is involved in ensuring that MAR schemes are ecologically and socio-economically sustainable and equitable as potential 'nature-based solutions' to increasing water stress in African cities where populations are growing, and the climate is changing.

Keywords: *managed aquifer recharge; water stress; climate adaptation; southern Africa; cities*

"Exploring the Potential of NBSs in Informal Settlements Upgrading: A Transformative Approach to Climate Change in Sub-Saharan Africa."

Garret Gantner (University of the Witwatersrand)

The tying of nature-based solutions (NbS) in the Global North to monetary valuation in order to foster private sector engagement risks perpetuating, or even exacerbating, the worldviews, values, and power structures that have both propelled climate change and instilled perceptions of a human–nature binary. This raises concerns about both the transformative potential and possible redistributive justice in NbS. A significant portion of future urban expansion will occur in the Global South, where development trends often aim to replicate the approaches of more affluent Global North cities. The separation between urban environments and natural conditions in these locations tends to be less distinct than in the Global North, with traditional knowledge systems better recognizing interconnectedness and holding natural functions as more than resources, but as part of a value system. NbS approaches which engage with different types of knowledges and are inclusive of a variety of worldviews may therefore be more likely to be incorporated into policy and practice, and more likely to facilitate transformative change. This paper examines various cases in Sub-Saharan Africa which utilize inclusive planning and design strategies for improving informal settlements through NbS. It discusses how a theoretical framework of participatory design can be harnessed to enhance NbS by drawing upon local and traditional knowledge and employing collaborative approaches that are both inclusive and

redistributive. Typically, these methods manifest as small-scale initiatives within a broader, impactful strategy, potentially serving as a decolonized perspective on NbS in these specific contexts. The paper seeks to demonstrate how an inclusive and transformative approach to NbS in informal settlement upgrading in Sub-Saharan Africa not only positively impacts the life of marginalized communities, but has also the potential to generate key lessons, build new value systems, and reveal more effective transformative pathways from which the Global North could also benefit.

Keywords: Nature-based solutions (NbS); inclusive design; Sub-Saharan Africa;

“Understanding the Aspiration-demand Gap to Develop Inclusive Nature-based Solutions in Cities of Sub-Saharan Africa.”

Willi Bauer (University Erlangen-Nürnberg, Germany), Katharina Rochell (Utrecht University, Netherlands)

In January 2024, Lilongwe City Council launched the annual tree-planting season to restore the city's vegetative cover. A month later, Lilongwe City Council enforced the city's bylaws and slashed maize fields, leading to a public outcry due to its timing amidst a national food crisis. In August 2024, the city reaffirmed the ban on maize cultivation while encouraging horticultural practices. Not all forms of nature fit notions of urbanity, whilst not all forms of urbanized nature address residents’ demands. This presentation unpacks this “aspiration-demand mismatch” of urban Nature-based Solutions (NbS) by tracing distinctions between nature in the city and nature for the city in Lilongwe, Malawi. Through this, we seek to broaden the understanding of the integration of NbS in urban development visions, as well as their support and contestations. We do this by analyzing two empirical vignettes on maize and trees, based on qualitative research conducted between 2022 and 2024, utilizing concepts from the urban political ecology and southern urban theory. The research
identifies three crucial aspects of the aspiration-demand mismatch of note for the implementation of inclusive urban NbS in Malawi and wider contexts. First, performativity in the governance of urbanized and urban nature is crucial and embedded in the complex and nuanced urban histories and heterogeneous understandings of urbanity. Second, NbS in Lilongwe are closely intertwined with

modernist city-making, which emphasizes aesthetics and is widely accepted by government actors and residents. Third, urban and urbanised forms of nature provide different ecosystem services, which can result in unmet demands and, consequently, an increased risk of socioeconomic precarity. Based on our findings, we argue that it is imperative to understand and harness the potential of aspirational greening to promote adapted urban NbS that meet civic and public interests, whilst carefully striking a balance to address livelihood-related demands of the urban majority.

Keywords: *urban Nature-based Solutions; governance; urban livelihoods; aspiration-demand mismatch; Sub-Saharan Africa; Malawi*

Session 6: Nature future frameworks and imaginaries : harnessing data innovation for climate change risk assessment and preparedness in the face of uncertainty and building alternative visions and scenarios for the management of nature in cities

An intersectional climate justice framework for evaluating Nature-based Solutions

D.MacCarthy , J.Willems, M.Giezen (University of Amsterdam)

The concept of nature-based solutions (NbS) has been widely embraced by both research and practice to address contemporary urban challenges. NbS are hailed for their multiple benefits and their effectiveness to alleviate and respond to the risks presented by climate change. Yet, scholarship is increasingly contesting the term and its underlying principles and values. This paper argues that NbS do not benefit those that most need the benefits of NbS, highlighting how NbS practice can fail to engage with existing inequities and in some cases reproduces social and environmental inequalities. To effect more just NbS, research and practice have turned to insights

from intersectional climate justice literature (e.g. Amorim-Maia et al., 2022) and multispecies justice (e.g. Tschakert et al., 2020) that move beyond measuring climate vulnerability as solely mortality rates and income and property losses, to instead engendering a relational conception of power which interrogates the dynamics and patterns underpinning the processes of NbS in relation to climate risk and hazards and questions human exceptionalism. We present a novel intersectional and multispecies framework that puts three fundamental principles at the heart of NbS practice: politics of ethics and care, the promotion of cross-identity climate action, and place-making. Their impacts will be considered vis-à-vis marginalised communities and ecosystems. In operationalizing this framework, over the coming year, we will develop a comparative research approach that compares NbS practices in Amsterdam, Brussels and Bucharest through a mixed methods approach of Q-sorting and semi structured interviews, combined with GIS spatial mapping. Through this approach we derive new assemblages of data that recharacterize the impacts of NbS on multiply marginalized people and more-than humans. Moreover, we intentionally engage with the theoretical paradoxes of intersectionality that require a rejection of categorisation, but at the same time, point to the relational power structures that create uneven impacts to communities and multispecies environments that are subjected to increased vulnerabilities.

“Modeling and Analyzing Cooling Trajectories for Heat Island Mitigation in Commercial Spaces.”

Rita Akiki (Cifre Phd At Lab’urba, Gustave Eiffel University And Nhood Service France), Bruno Barroca (Lab’uba, Gustave Eiffel University), Emilie Sampson (Nhood Service France).

Rising global temperatures, especially in urban areas, significantly impact vulnerable populations. Urban heat islands, intensified by the city and public spaces designs, worsen during heatwaves, as seen in France's deadly 2003 heatwave. In 2022 alone, 33 days of heat waves caused 11,000 deaths. With heat waves projected to double by 2050, managing urban heat is critical. Shopping centers, especially in dense urban areas, hold potential for addressing these climate challenges. Traditionally car-focused, with vast asphalt parking lots, they now face pressure to adapt to climate change, densification, and evolving

regulations. This study investigates the analysis and modeling of cooling trajectories aimed at mitigating heat islands within commercial spaces. The central research question addresses how these cooling trajectories can be effectively analyzed and modeled in the context of commercial center restructuring. It is grounded in Urban Systems Theory, which views cities as interconnected systems with commercial centers as integral subsystems and explores the heat island effect and various cooling strategies. A comparative approach is used to examine different case studies, revealing similarities, differences, and causal relationships among cooling strategies. The goal is to identify different trajectories of cooling projects, detailing their development, key turning points, and influencing factors. and to demonstrate that cooling strategies offer additional benefits beyond temperature reduction, such as economic savings, lower carbon emissions, and improved social outcomes. In conclusion, this study wants to provide a comprehensive framework for analyzing and modeling
cooling strategies in commercial spaces, emphasizing the importance of systemic analysis and comparative evaluation.

Keywords: *Cooling trajectories, Cooling strategies, Urban Heat Island, Commercial spaces, Comparative evaluation*.

“Advancing an Analytical Framework to Assess Values and Meanings Mobilized in Imaginaries and Techniques of Futuring for Urban Nature.”

Fiona Kinniburgh (Institute of Social Sciences, University of Lisbon), Olivia Binaa, Johannes Stripple (Department of Political Science, Lund University), Andresa Lêdo Marques (Institute of Social Sciences, University of Lisbon), Lisette van Beek (Department of Political Science, Lund University) , Holly Marriott Webb (Department of Geography, Trinity College Dublin) , Anna Davies (Department of Geography, Trinity College Dublin)

As the need for “transformative change” grows, interest in nature-based solutions (NBS) to address complex urban challenges is increasing. However, there is a gap in understanding which, and whose, values and meanings of nature are being mobilized or excluded in imaginaries related to NBS, and

urban nature beyond NBS. Limited attention has been given to how imaginaries of nature are produced through various “techniques of futuring” (ToF) — practices that shape visions of desirable futures and pathways to achieve them. Conceptual tools for systematically analyzing the diverse values and meanings of nature in imaginaries and ToF related to NBS in urban contexts and landscapes are underdeveloped. This paper proposes an analytical framework for identifying and studying imaginaries and ToF relating to “naturescapes” — assemblages of NBS within a landscape whose character is the result of the action and interaction of natural and societal factors. Our analytical framework proposes a typology that addresses the values and meanings attributed to urban nature and human-nature relations, building upon the IPBES Values Assessment, in which three specific values of nature are identified: intrinsic, relational, and instrumental (“nature for nature”, “nature as culture”, and “nature for society”, respectively). We explore dimensions of justice and agency by highlighting which and whose values are discussed in literature relating to values of urban nature, and the potential for other-than-human perspectives to contribute to shifting worldviews to enable transformative change. In the final section, we map and compare different ToF — such as modeling or artistic practices — which could be used to create imaginaries of urban nature and categorize these approaches. We conclude by discussing how the application of our analytical framework can be applied to future empirical analyses of NBS imaginaries — particularly in the project’s study of twelve case cities across Europe, the United States, and Latin America — and beyond.

Keywords: *Nature-based futures, Naturescapes, Human-nature relationships, Urban imaginaries,*
Techniques of futuring