2025

ABSTRACT BOOK

The 4th SURE World Conference

July 16–19, 2025 – Istanbul, Türkiye

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The 4th SURE World Conference

"Cities Under Global Social Transformations:
Embracing Change for a Greener Future"

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Who is behind urban tree sponsoring and why? Lessons from a spatial analysis of public engagement in a tree planting programme about intrinsic motivations for participation

Dagmar Haase

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Abstract

For those living in urban areas, street trees offer a range of benefits, including clean air, cooling and recreational space. Their spatial distribution of donor trees in cities represents a key area of focus within the field of distributive environmental justice but also, and this is nicely related to the session call, of possible nature-mindedness of urban dwellers. While previous studies have examined urban green space and urban tree canopy cover, there is still a knowledge gap on intrinsic values behind participatory tree planting programmes in cities, namely related to individual economic, social, cultural, and motivational barriers that cities face in planting and maintaining trees.

Therefore, this study examines the spatial distribution of trees planted through the "Strong Trees" sponsorship programme in the city of Leipzig, with a particular focus on the relationship between the trees' spatial distribution and individual socio-demographic patterns. A combined regression and cluster analysis revealed that the proportion of assigned tree sponsors is extraordinal high in central Leipzig compared to the periphery. We found a negative correlation between assigned sponsorships, net income, recreational area, average age, and households with children. Conversely, a positive correlation was observed between the possession of a high school degree and tree sponsorship.

This study establishes a link between the spatial distribution of tree sponsorships and socio-demographic but also individual variables of a city, proposing that tree sponsorship programmes may serve to offset limited access to urban green, particularly in areas characterised by high levels of education, values for nature as such, average to low income, and far too little green. The clustering uncovers that tree sponsoring is more than high income and charity for the public. Further studies can use these findings as a starting point to explore more deeply the individual motivations, but also the preconditions, behind urban citizens' decisions to become sponsors.

Key Words: tree sponsoring, human-nature interaction, values

Urban human-nature partnerships – a positive vision for posthuman cities

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Abstract

As we live in an urban century and an era of exceeding planetary boundaries, we need positive visions beyond anthropocentric worldviews of human-nature relations. To understand and strengthen collective and individual actors and their relational capacities to listen to non-human nature´s voice and respond to it in a mode of human-nature resonance, urban ecology research needs concepts, case studies and methodological innovations, which place non-human nature as equal to humans.

In this presentation, we will introduce our ongoing book project that is confirmed to be published in the beginning of 2027 open access by Edward Elgar Publishing: "Urban human-nature partnerships – From the Anthropocene to the Ecocene", edited by the presenter. In our talk, we will give insights into the conceptual grounding of the book and its academic and artistic contributions fostering a better understanding of human-nature partnerships.

We will reflect about:

- System knowledge: Systemic causes of muted human voices (e.g. stressful urban lives, injustice, extinction of nature experience) and anthropocentric concepts constraining posthuman cities

- Target knowledge: The development of a future vision that nourishes posthuman cities based on related concepts such as planetary health (diet), the ecological just city, degrowth, moral imaginaries or decolonial futures
- Transformation knowledge: The talk will address the role of practices of internal transitions (e.g. mindfulness, embodiment, spirituality) as well as strategies for external transitions (e.g. legal adaptions, urban design affordances, urban planning transformations)

The overall aim of the presentation will be to foster discussions how urban ecology research can and should deepen research and practices informed by ecocentric worldviews and to strengthen a network of like-minded people.

Key Words: human-nature connection, sustainability transformation, paradigm shift

Applying Nature-Based Solutions to Create Coolıng Spaces for the Elderly in Tımes of Energy Poverty

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Abstract

Currently, inhabitants of cities face several demographic, environmental, security and economic challenges. In this article, we address the possibilities of mitigating the impacts of energy poverty and climate change on the senior population. As a result of climate change, residents are exposed to long-term increases in temperatures. The senior population is one of the most vulnerable groups, especially during heat waves. Currently, the most frequently applied technical solution is air conditioning. However, seniors are also often threatened by energy poverty and the inability to pay increased costs. A possible solution is to create places called "cooling space", where the temperature is reduced thanks to the application of nature-based solutions. Residents can enjoy them without restrictions and wait out periods of high daily temperatures in a suitable environment.

For the senior population, the distance of 500 meters may be unattainable without negative effects on health. Today's concept of 3-30-300 improves this situation, but it is not entirely sufficient. For cooling spaces to be functional, their location must allow safe access on foot from the place of residence and a longer stay in this space during high temperatures. For the location of cooling spaces, it is necessary to look for places directly in the existing structures of housing estates. This article focuses on the territory of the Czech Republic, where, from the point of view of spatial planning legislation, educational facilities - schools, kindergartens - are an integral part of residential complexes. Schools are often limitedly accessible during the summer holidays.

A case study was prepared, which shows the possibilities of using school areas for the construction of cooling spaces using NBS applications. The entire concept shows the possibilities of improving the comfort of residents, using the school area during the summer months and at the same time applying suitable nature-based solutions. However, in order for the system to be functional, it is necessary to achieve political consensus for opening school areas to the public and for supporting the targeted construction of cooling spaces on school premises.

Key Words: nature-based solutions, coolng space, elderly people, school area, energy povert

Development of a participative approach to co-design, co-create and co-implement urban green infrastructure

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Abstract

Cities are facing a number of challenges resulting both from inner and outer development processes. Many of these challenges are addressed by measures connected with solutions based on green infrastructure in different scales. Decision making processes connected with introducing greenery into urban space require participation of stakeholders including inhabitants. The ways of this public involvement depend on the character of green projects and they evolve following the development of social needs and awareness on the role and importance of nature in the quality of life. Also the awareness raising is evolving as the knowledge on new methods of analysis and assessment of nature based solutions (NbS) is developing and simultaneously the level of public perception and appreciation of the importance of green infrastructure in cities is growing.

The experience gained in several projects concerning implementation of green solutions in urban areas shows the variety of measures and tools for attracting individual groups of inhabitants to participation in processes concerning green regeneration of their cities.

The participative approach has been being evolving from project to project according to needs and challenges like e.g. climate change, health effects, attractive space for various activities of children, women, and also according to the specificity of the role and functions of greenery (i.e. the approach based on ecosystem services analysis and assessment).

This evolution is shown in the form of practical examples and cases implemented in three projects in the framework of INTERREG Programme for Central Europe: LUMAT (2016-2019), SALUTE4CE (2019-2022) and CICADA4CE (2024 – 2026).

Key Words: green infrastructure, participation, NBS

Roma (Romani/Gypsy) urban neighbourhoods in Bulgaria - access to primary education facilities

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Abstract

Bulgaria is a country of a relatively significant share of Roma, especially in regional aspect. Although the official data states that the Roma represent around 3-4 % of the total population, the so-called expert assessment provides that the actual share of this community could be around 12-13 % of the total population, making it the largest minority ethnic group in the country. The study of the Roma communities requires multifaceted approach, employing various research methods in from sociology, ethnology, cultural and ethnic studies, demography, and geography. The study reveals the differences between the Roma neighbourhoods in Bulgarian urban settlements in terms of access to kindergartens and primary schools, as part of the overall spatial segregation of such ghettoized urban areas. Access to primary education facilities is considered crucial for the integration of the Roma population, preceding its integration at higher levels such as the labour market. The walking distance of 600 m to a primary school and kindergarten has been used for the generation of isolines, using the ORC tool in QGIS. Based on the share of each studied Roma neighbourhood falling within that distance, 3 types of access has been established – full, medium, and poor. The study shows that some 55 % of the Roma neighbourhoods in Bulgarian cities/towns have poor access to primary schools and kindergartens, while in some 14 % of the cases full access is observed, but is too often combined with the formation of segregated schools, which represents a problem by itself. As a rule, Roma neighbourhoods in larger cities exhibit a better access to educational facilities compared to those in small towns.

Key Words: Roma, spatial segregation, ghettoized urban structures, Bulgari

The integration of technological, social, behavioural and other innovations in addressing climate change utilizing living labs

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Abstract

Climate change presents a very complex challenge affecting the whole spectrum of urban development and life aspects. The cities as social ecosystems are also complex, diverse, dynamic, and to a great extent stochastic systems depending on multi-actors' decision making. Searching for proper solutions in response to the climate change challenge in cities requires awareness of these specifics when developing not only particular solutions, but place- and evidence-based strategies that reflect positive and negative synergies between potential interventions based on social, environmental, economic, behavioural, technical, and technological innovations in a multi-stakeholder environment.

The traditional approaches where experts had developed solutions then tested and implemented these solutions in model cases, do not allow to reflect properly the specifics of particular cities and places as a base for the development of effective and efficient solutions involving relevant stakeholders, capitalising their tacit knowledge, their creative and implementation capacities, to propose adequate measure to support positive synergies between different solutions or to avoid, to adapt, to mitigate, or to compensate potentially negative effects of particular solutions. This is especially important now, as we shift from greening city approaches to smart and green urban transformation, where ecosystem services interact with core innovative economic sectors, forming a new urban ecology linked to a new urban economy and society.

This contributions displays evolutionary approaches, tested in three European projects - CICADA4CE Interreg CE project (2024 – 2026), BeReady Interreg Danube Region project (2024-2026) and STARTUP Horizon project (2025-2027) addressing the smart green transformation using the concept of urban living labs as innovative ecosystems for the development, testing and implementation of the solutions on the way to adaptive self-learning and self-organising communities which are the part of broader network allowing the transfer of know-how, best practices and lessons learned. The broader use of synergies between governance initiatives, R&D activities, participative engagement of civil society representatives and private sector in the combination with different kind of innovations including artistic performance embedded in the place and evidence bases strategies are demonstrating

very effective and efficient responses to climate change challenges already in the first phases of the projects implementation.

Key Words: Spatial Planning, Smart Green Urban Transformation, Urban Living Labs, Place-Based Strategies, Multi-Stakeholder Innovation, Climate Change Adaptation, Self-Learning Communities

Beyond Human-Centric Design: Towards a Pluriverse Approach in Urban Design

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Abstract

Despite significant scientific progress in ecology and conservation, the planet grapples with a multifaceted crisis encompassing climate change, ecosystem decline, and alarming biodiversity loss. Addressing these global challenges necessitates a fundamental shift in our prevailing worldviews, urging the serious consideration of envisioning realities that goes beyond the logic of unchecked natural resource exploitation. This requires not only a change in our external actions but also a cultivation of our inner consciousness towards a deeper connection with the natural world. The field of design, currently undergoing a transformative "more-than-human turn," holds immense potential in fostering alternative worldviews. This paradigm shift introduces a pluriverse approach to the conceptualization and creation of urban spaces, emphasizing mindful speculations that acknowledge the intrinsic value and agency of non-human entities. This paper presents a series of practical experiments conducted within this critical design space. These experiments employ mindfulness pedagogy through classroom brainstorming sessions and immersive nature trail walks within our urban environment and its surrounding landscape. It aims to cultivate a habit of "prototype keeping"—a mindful engagement with natural interactions that is pivotal throughout the learning process.

The pedagogical framework underpinning this research integrates more-than-human engagements grounded in two key aspects of design thinking: "making-with care," which emphasizes building consciousness towards oneself and with non-human stakeholders, and "thinking with technologies," which explores how technological tools can facilitate and enhance these engagements. Students actively strive to create empathetic understanding while working with these dual aspects, informing the development of their speculative design interventions.

These interventions manifest in diverse forms, including interactive graphics, illustrated books, comic strips, and system design proposals, all serving as mediums to explore and articulate the intricate engagement between human and non-human stakeholders within a selected urban neighbourhood by their own. By fostering this deeper understanding and integration, this pedagogical paper contributes to the crucial and ongoing journey toward envisioning and enacting truly posthuman cities, where urban environments prioritize integrated well-being and help to flourish inner consciousness towards more than human world.

Key Words: more-than-human; pedagogy; speculative design; consciousness; empathy

Shamanic journeying across the pluriverse: creating interconnected relationships for healing in urban spaces of disconnection

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Abstract

This contribution explores shamanic ritual work and (self-)healing practices using trance-states, also referred to as 'shamanic journeying', to integrate the wisdom of non-human voices into participatory policies and pedagogies for individual, community, and planetary healing (Bakawa Country 2015; Núñez 2019). Through chanting, rattling or drumming, the shamanic practitioner induces trance-states to enter expanded states of consciousness beyond space and time to journey to 'non-ordinary' realities that make up the co-existing ways of experimenting reality in the shamanic pluriverse (MacKinnon 2012; Querejazo 2016). (Self-) healing and inquiry practices such as shamanic journeying enable (a) embodied experiences of interconnectedness with all that is (i.e. including the ancestral elements of fire, water, earth and air, as well as the plant and animal realms), (b) connecting with ancient wisdom for guidance from ancestral spirits and guides, ultimately (c) creating a more intentional and balanced relationship with self and everything around us in 'ordinary' reality. This contribution argues for the need to honour and learn about the emotional and spiritual realms of the natural world for a harmonious coexistence and to include non-human voices in urban decision-making. Practices such as shamanic journeying teach us to live and act from a place of love, intention, and respect, rather than fear, domination, and separation (Farmer 2022; Don Ruiz 2019). By learning to build and cultivate relationships with the land, spirit, nature, and each other across the pluriverse, especially in urban spaces of disconnection, we can heal and transform the interconnected systems of relationships with self, our communities and everything around us (Ullrich et al. 2022).

Key Words: shamanic journeying; interconnectedness; healing; pluriverse; more-than-human relations

Exploring the potential of urban acupuncture in envisioning and implementing posthuman cities

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Abstract

Vast transformation is needed to address the dire consequences of overconsumption and climate change in the Anthropocene. By defining urban acupuncture (UA) and examining its implementation we can explore the potential of the concept in furthering posthuman cities (i.e. non-human centered urban alternatives which are more ecologically cognizant). The concept can be seen as both a heuristic and planning concept. Derived from traditional Chinese medicine it refers to planning actions which stimulate a city's nervous system via micro interventions with the intention to have a catalytic effect on the urban fabric as a whole (McGuirk 2014).

In early implementation, urban acupuncture was not focused on ecological sustainability but rather on urban regeneration. It has since developed further to include sustainability, climate change and urban greening initiatives (Apostolou, 2015; Balicka et al., 2021; Lastra & Pojani, 2018). While the concept is abstract it has experienced contemporary implementation via inexpensive, easily implementable, bottom-up initiatives in urban spaces associated to physical (i.e., creation of playgrounds, housing rehabilitation, "plug-in" housing) and social interventions (i.e., addressing social dissonance and alienation, derelict spaces, crime). UA can and has been used to implement biophilic cities, as they offer several benefits to not only humans but also insects and animals.

From 2019 to 2022 the author contributed to the "SALUTE4CE" project led by the Institute for Ecology of Industrial Areas (IETU) where she began her journey applying the urban acupuncture concept. Urban environmental acupuncture (UEA) was used to implement nature-based solutions and address barriers toward nature-based solution implementation i.e. low city budgets, a lack of space in dense urban areas and the need to react swiftly toward climate change impacts such as extreme heat and flooding.

This presentation will provide an overview of UA as a means to envision posthuman cities (i.e. both collectively and individually), lessons learned while implementing UA (barriers, benefits and uses of the concept) and suggestions for future research. Questions will be presented to foster a discussion around the topic to improve futher implementation.

Key Words: urban acupuncture, posthuman cities, urban planning, urban greening

Decolonizing the Urban Imagination: A Quest for Pluriversal Habitats

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Abstract

Philosopher Susan Griffin (1996) posited that human societies are bounded by two things - one being the requirements of the natural world and the other, our collective imagination. This resonates deeply within the burgeoning urban landscapes of the Global South. As these cities become home to increasingly diverse populations, a painful dissonance emerges between the often-colonially informed and homogenous visions of urban designers – architects, planners, economists, policymakers – and the multiplicity of needs and aspirations held by the inhabitants whose lives are contained in and profoundly shaped by these urban environments. Even with the best intentions, urban practitioners grapple with a crisis of imagination, constrained by centuries of racial, caste, patriarchal, and epistemic colonization which limit their ability to envision radically alternative ways of building and, fundamentally, of being. This study seeks to transcend conventional and often exclusionary visions of urbanity and open up decolonial pathways to a pluriverse of imaginations of human and non-human habitat and modes of inhabitation.

Recognizing our own positionality as an urban practitioners – an architect, urban designers, and educators – this paper captures a methodological experimentation of how urban designers can actively decolonize their perspectives by engaging directly with the realm of collective imagination. Drawing on the fields of participatory design, futures studies and ethnography, as modes of engagement and spatial design as a practice-based mode of sensemaking, this research constitutes an intentional instigation, sharing, and harvesting of collective and relational imaginaries of the built environment. The methodologies reveal a juxtaposition of introspective auto-ethnographic narratives with collaborative ethnographic explorations.

These explorations delve into the lived experiences and perspectives of the inhabitants of Shivram Karanth Layout, a newly developing urban neighbourhood of Bangalore, India and home to one of the authors. Parallelly, this paper will trace the authors' personal and professional evolution over the project, in decolonizing the self through a conscious seeing of the multiple ways of being human and more-than-human within our shared world.
Finally, it reflects both human and more-than-human entities within the ecosystem and draws out memories and imaginations of a place in transition.

Key Words: Imagination, Pluriverse, More-than-human, Decolonial, Habitats, Urban Desig

Beyond the dichotomy between nature and humans in cities: Wilderness and rewilding cities as co-beneficiary strategies

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Abstract

Today, cities are the most important living space for people. But cities are also becoming increasingly important for wild and human-controlled flora and fauna. Current national and international research shows that urban areas become significant niches for species that are searching for refuge from habitat disturbances, especially through urbanization, intensive farming and monotonously afforested areas. Trade, transport and migration also unintentionally bring new species into cities, which become established and, in some cases, spread invasively. Nature conservation close to our cities on the one hand and rapid urbanization and the advance of urban life into previously unsettled areas on the other also bring a new proximity between wilderness and humans, which is highly ambivalent, if you think only of the recent jumps in vectors, such as Corona, Mpox or Ebola. What is more, rarely do people associate wilderness and rewilding with cities, despite the huge potential for both to boost biodiversity and ecosystem services in our cities.

The talk will bring some relevant and empirically tested arguments for a positive co-existence of people and wildlife in cities, embedded in a broader picture of ecosystem services and human-wildlife interactions and perceptions in urban environments. I argue that wilderness and rewilding are flexible, low-cost, hands-off, extensive management approaches to biodiversity conservation and human well-being in cities under climate change. What is more, I will proof that urban design that supports biodiversity can be an effective accelerator of public health and wellbeing. Last but not least, urban rewilding can provide new ways to engage city residents with nature, including both monitoring and stewardship.

Key Words: Rewilding, wilderness, cities, co-benefits

Alli Kawsay (Buen vivir) in the indigenous movements of Colombia - Ecuador, political-economic practices as a global model, in defense of the rights of Mother Nature in the global south

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Abstract

From the decolonial theory, the indigenous economies, are part of the other/other economies, are part of the economies that take care of nature, establish other patterns of human relations with circularity, respect:; besides it involves this type of economy the communality, the environmental dimension, family and the education as practice of decolonization, of humanization.

This type of economy is part of the post-colonial studies, because it establishes patterns of analyzing alternative economies that can reestablish links of respect to nature, as bets of resilience in the middle of the climate change, key to change of economy in the middle of the climate change, diverse authors emphasize it; Arturo Escobar, Aram Ziai.

The purpose of this research is to present the urgency of listening to indigenous epistemologies of Sumak Kawsay (in kichwa language: Buen vivir-Buen vivir) and also to accompany the care/defense of the biodiversity-rich indigenous territories of the Andean region. As a research question: What characteristics do the economies have from the philosophy of the Alli kawsay - Buen vivir as successful experiences of economic redistribution and its contributions to the global economy in the middle of the anthropocene to safeguard life on the planet?

At present, the strengthening of green economy strategies, a fairer economy, sustainable with nature and with the capacity to be a model in the distribution of wealth, stands out. In practice, it recognizes minga, (community work), inclusive development, development in respect for nature of importance in the midst of the manifestations of climate change.

Buen vivir-alli Kawsay (In kichwa indigenous language), is part of the epistemology of resistance, which in the practice of indigenous communities implies addressing the dimension/interrelationship: spiritual dimension, economic dimension (clean practices-sustainable economies), political dimension (defense of the territory) ancestral, family dimension, cultural, environmental.

This model is a more just way of distributing wealth and income, which is part of the economies of resistance.

This ethnographic research has been carried in the last 7 years, in Republics of Colombia and Ecuador, in Indigenous Regional Council of Cauca CRIC, and The Indigenous Confederation of Ecuador CONAIE. Theoretical references: epistemology of indigenous communities

Key Words: ethnicity, urgent call, anthropocene, proper right

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Enhancing urban biodiversity by wilderness

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Abstract

Dare urban wilderness means offering a place to unplanned nature in urban life. Most city dwellers today are largely alienated from wilderness, yet fascinated by it, by wild animals and wild plants. Many want to learn more about wildlife in the city, gain understanding, but also contribute to its protection and preservation. Urban wildernesses are ideal learning places, where we can learn from and with nature, and also about how wild urban nature sets up and accompanies the living space created for humans. Urban wilderness is perceived by urban dwellers and conservationists, is an opportunity and a challenge and focuses on biodiversity and experiencing nature. The presentation answers important current questions about the ecological and socio-cultural argumentation on urban wilderness, its structure, ecological performance, human behaviours and the protection of wild nature in the city.

It will be showed how urban wilderness is perceived by urban dwellers, how wildernesses contribute to urban biodiversity and what is still hindering in improving urban biodiversity by implementing urban wildernesses. The ecological evaluation shows that wildernesses can be targeted implemented in any scale and into any urban patterns. But everything must start with recognition and acceptance of urban wild and accompanied by good understanding based on education and emotionally approaches together.

Good examples will be presented as learning objects to get further used in urban design, planning and development. These show that urban wilderness can only be secure in societal contexts and by recognition of people using it. This makes implementation depending from regional, sciential, cultural and local factors.

Key Words: urban wilderness, biodiversity, management, peoples perception to nature and wild

Urban Ecology in Asia: A Systematic Review on Patterns, Practices & Challenges

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Abstract

Across the world urban expansion synchronizes with increasing research effort, aimed at understanding the socio-ecological implications of the human-induced landscape changes. The Global South covers over 60% of the world's terrestrial surface rich in biodiversity but faces unprecedented urban expansion. As Asia is a typical representative of the Global South, we synthesized scientific literature to understand the state of urban ecological knowledge in this rapidly urbanizing continent from 1920-2024. We retrieved 2025 relevant papers following the PRISMA protocol. Our analysis revealed geographic, ecological and taxonomic knowledge gaps. We found that studies were conducted in 69% of Asian countries, 49% of which were conducted in China. Almost all the studies were conducted locally within a single country (99%), indicating the scarcity of international research collaboration among Asian urban ecologists. In contrast, richer countries (indicated by GDP) and threatened ecoregions were significantly more studied across this continent. the publication rate on the topic was slow (<10 papers/year) until 2003 when an exponential growth started, producing 340 published papers in 2023.Moreover we assembled information on urban ecology studies focusing on seven taxonomic kingdoms, with Animalia and Plantae being the most studied so far. The main focus of urban ecology in Asia seems to be applied and pattern-based studies given that human dimensions followed by community ecology and landscape ecology were the three most commonly investigated fields. The results of this study provide valuable datasets on urban landscapes and urban ecological research efforts in Asia that should spawn attention among researchers, conservation practitioners, policymakers, urban planners and other stakeholders.

Key Words: Asia; Systematic Review; Urban Ecology; Biodiversity; Research bias

Urban Nature and Inclusive Planning: Managing ecosystem services, disservices and urban challenges

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Abstract

Inclusive urban planning focuses on creating equitable and accessible urban spaces that address a range of societal and environmental challenges. Rooted in social inclusiveness, this approach ensures equal access to resources and opportunities, while emphasizing active participation from end-users/residents/citizens in the planning process given it's the place they live in. Despite increasing interest in urban nature and citizen involvement, there is a lack of comprehensive literature on methodologies, objectives and outcomes related to managing ecosystem services (ES) and disservices (EDS) in planning contexts. This study aims to fill this gap by providing insights into identifying and managing the positive and negative experiences (ES/EDS) in inclusive urban spaces, with the overarching goal of addressing residents' needs and enhancing their wellbeing.

This study employs an evidence-based systematic review and qualitative synthesis methodology, drawing from existing literature on inclusive urban planning. An extensive search in the Scopus database (n=4737), and a structured screening procedure using the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) flow diagram resulted in 73 papers selected for in-depth analysis. The review focuses on studies that addressed residents' perceptions and their inclusion, including vulnerable groups, in planning processes. Additionally, papers exploring ES and EDS related to urban planning were examined. Three key areas are analyzed: first, diverse residents' perceptions of urban nature, second: urban nature dimension in terms of methodologies, objective and outcomes, and third, how literature provides solutions for maintaining a balance between ES and EDS in inclusive urban spaces.

Preliminary findings highlight the importance of integrating residents' knowledge and ecological understanding into urban planning and management frameworks. Effective planning practices must incorporate local knowledge to better address the needs of communities and foster more inclusive decision-making processes, while ecological understanding ensures sustainable management of resources within cities. Our analysis also suggests that perception of urban nature varied across cultures, geographies, genders and age groups. This study offers a valuable baseline for urban planners and policymakers, providing evidence to inform land use decisions, urban policy development, and planning strategies that prioritize both resident wellbeing and ecosystem sustainability.

Key Words: Urban nature, Inclusive urban planning, human wellbeing, public participation, sustainable cities

Urban Gardens as a Potential Hub for Biodiversity? Comparing Urban and Rural Gardens in Terms of Their (Biodiversity-Friendly) Design

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Abstract

Private gardens can make a valuable contribution to both human well-being and biodiversity—especially in urban areas, where natural habitats are typically scarce. Despite their importance, little is known about how private gardens are used and designed across different settlement types.

This paper aims to identify the structural characteristics of private gardens and investigate whether these differ between large cities, medium-sized and small towns, and rural communities. We analyzed data collected via the free citizen science app GardenUp, available to iOS users in Germany. Garden owners (n = 557) were asked to provide information on various garden features, such as the size of different garden areas and the number of trees and shrubs.

These data were used to calculate key indicators, including bird- and insect-friendly areas, recreational spaces, vegetable garden areas, and the degree of impervious surfaces. ANOVA results show that urban gardens are significantly smaller than those in towns and rural areas in absolute terms ($p < 0.001$): on average, urban gardens cover 439 m², town gardens 626 m², and rural gardens 850 m². However, when adjusting for garden size, there are few significant differences between urban and rural gardens. In fact, in relative terms, garden structures are remarkably similar across locations. For example, the average degree of imperviousness across all gardens is just under 30%, and about a quarter of the garden area is designed to support insects—regardless of the setting.

Our findings suggest that private gardens have considerable potential to enhance biodiversity—even in densely populated areas. It should be noted, however, that our sample is not representative, due in part to self-selection bias among participants. A validation of the data is planned for 2025.

Key Words: Private Gardens, Design, Biodiversity, Citizen Science

One Single Living and Integrated Natural Entity: Governance and planning tensions in protecting Birrarung river in the inner-city reach (Naarm-Melbourne, Australia)

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Abstract

Birrarung, also known as the Yarra River, located in Victoria, Australia, flows for 242 kilometers from the upper reaches of Mount Baw Baw down through the heart of modern day Melbourne city, out to Port Philip Bay. Birrarung is known to the First Nations Wurundjeri people as the 'river of mists and shadows', they are the custodians of the river since thousands of years. Colonization and development of the greater Melbourne area have led to the straightening and deterioration of the river quality and functioning. In 2017, The Yarra River Protection (Wilip-gin Birrarung murron) Act was passed. This Act enshrines the legal recognition of the river as one single living and integrated natural entity, and led to the establishment of the Birrarung Council to speak as the voice of the river. This governance arrangement enables the foregrounding of Traditional Owner knowledges, cultures and values, to guide governance and planning with, for and along Birrarung. Under the Act, the Yarra River Strategic Plan was developed in 2022. The 10 year Strategic Plan, coordinated by the Victoria State Government and Melbourne Water, sets up a strategic plan in collaboration with the Traditional Owners which places Birrarung at the heart of forward-looking land-use planning and decision making. This plan intends to meet diverse priorities including the safeguarding of a healthy river and lands, the embrace of diverse cultural meanings, and the improvement of quality parklands for a growing population. We investigate how priorities and values held by different constituencies may lead to trade-offs in governance arrangements and planning choices in the inner-city reach of Birrarung. Importantly, we view these trade-offs through a justice lens to unpack the implications of trade-offs for achieving just, sustainable and inclusive city outcomes (Stijnen et al., 2024). Hereby we aim to shed led on the diverse perceptions and experiences of trade-offs in the translation from the Strategy into tangible governance and planning arrangements. Overall, we highlight the trade-offs and tensions around the protection of Birrarung as one single living and integrated natural entity in the inner city reach, and the justice implications for planning and governance choices.

Key Words: urban river, protection, collaborative governance, planning, tensions

Minimalist Living in Dense Cities: The Ecological and Social Impacts of the Tiny House Movement

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Abstract

Alternative lifestyles have gained increasing interest in response to the challenges of rapid urbanization, environmental degradation, and limited housing affordability in large cities. The tiny house movement—characterized by compact dwellings designed for minimalist living—has emerged as a promising solution for individuals seeking sustainability, affordability, and autonomy. This study investigates the ecological and social impacts of tiny houses within the urban context of Turkey. Drawing from field observations and interviews with tiny house users, the research highlights the environmental benefits of these dwellings, including reduced energy consumption, smaller carbon footprints, and environmentally conscious waste and water management systems. The findings also indicate that tiny houses support deeper human-nature connections and foster personal awareness of ecological responsibility.

On the social front, tiny house living offers a more flexible and community-oriented lifestyle, encouraging self-sufficiency and challenging dominant norms of consumption and ownership. In densely populated Turkish cities, they provide a cost-effective and alternative residential option in response to rising housing prices and spatial constraints. However, current zoning and construction regulations in Turkey present considerable legal and administrative barriers to the widespread adoption of this model. These obstacles often leave tiny house users in legal limbo, limiting the potential of this lifestyle to contribute to sustainable urban transformation.

This paper concludes that while tiny houses offer notable ecological and social advantages, their integration into Turkey's urban fabric requires comprehensive policy reforms, clearer legal frameworks, and broader public awareness. Ultimately, the study suggests that tiny houses could play a vital role in shaping future sustainable urban living paradigms in Turkey and beyond.

Key Words: Urban sustainability, minimalist living, Eco-friendly housing, tiny house, ecolojical and social impacts, Türkiye

Rewilding the High Density but Low Accessible Urban Area: The Research on Beijing Capital Core Area

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Abstract

Urban rewilding has multiple benefits in terms of enhancing urban biodiversity conservation, promoting human-nature perception, and saving on city greening maintenance cost. However, most of the current studies are located in urban fringe areas or low-density urban areas, resulting in insufficient attention from urban planners and policy makers, which hinders scientific and replicable urban rewilding practices. Taking Beijing's Capital Functional Core Area (CFA) as research objective, this study explores how urban rewilding can be transformed from a promising scientific topic into a practical approach for effective urban ecological planning and design. The study aims to elevate the decorative urban landscape green spaces into citizens' perceptions and connections with rewilded nature. Firstly, based on the appropriate rewilding potential zone assessment index, 70 sample sites were scored according to their naturalness and remoteness, and the rewilding potential zone classification was obtained. Secondly, 151 valid questionnaires were collected from urban planning and design practitioners. In-depth interviews were conducted with 15 planners to analyses the planning pathways and policy mechanisms of urban rewilding. Finally, based on the scenario simulation method, three sample sites with different degrees of rewilding was carried out. Interviews were conducted with the people surrounding the three sample sites to collect the real assessment of users on the rewilding scenarios. The further subsequent management, operation and maintenance options were exploered, as well. This research shows that urban decision-makers and planners play a crucial role in the location, scale and quality of ecological spaces, and that scientific principles and research findings on urban rewilding can be translated into effective practical approach of urban rewilding through scientific planning.

Key Words: urban rewilding; high density urban area; nature based solution; urban ecosystem service; eco-city planning and management

Non-remembrance Cemeteries? An example of local stakeholders' engagement to protect and restore the cultural landscape of Peru (South America)

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Abstract

Many undervalued GI sites worldwide, including the old post-Columbian cemetery in Barranca, Peru, are only supported positively by local stakeholders. Although the burials date back to the early 19th Century, the historic cemetery is incredibly neglected and disturbing to officials due to its location in the representative space of the dense city center. Part of the old cemetery has already been removed without informing the families of the dead, and the area has been handed over to a developer for housing and services. The new inhabitants of Barranca do not feel connected to the city's and region's history and identity. Some people who visit the cemetery look for families, but the town representative painted the last "traces of history" on the burials with white paint from the previous year. So, the families of the dead ones write by hand names and dates of death people to reverse this lousy process of losing memory and the history of the place. Such actions prevent the administrator from immediately liquidating graves or closing the cemetery. What is left of the cemetery is still being saved by those with loved ones here. The local organization that feels connected to the site currently covers the costs of protection, upkeep, and care. Based on the pilot study from 2024 that includes RS analyses and local interviews and meetings with stakeholders, we see that the local organizations, as well as families of death, need the help of scientists to discuss the matter locally and mainly in the urban ecology forum. It seems to me that this could be a good way to reverse this erroneous thinking about "a cemetery without an identity" if the matter is very local in nature, especially if some good practices or suggestions could be developed based on the knowledge and experience of landscape architects, urban ecologists, and urban planners. Developing strong standards for cemeteries in Central and Western Europe would involve local community groups operating in South America and develop land use management guidelines. Promoting the topic internationally will prevent such historic sites from being completely destroyed and new uncontrolled urbanism processes.

Key Words: Cultural greenery, integration of citizens, passive recreation, Remote Sensing, nature protection

“Leaving space for wildness” in metropolitan region in China

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Abstract

"Leaving space for wildness," as a critical initiative for maintaining biodiversity within national territorial space, holds significant importance in supporting the construction of ecologically sustainable and high-quality metropolitan regions. However, current metropolitan planning systems have not sufficiently addressed this issue, and it is particularly crucial to emphasize this aspect in the advancement of the ecological civilization system.

This study adopts a historical perspective to examine the development of various types of natural ecological spaces in Chinese metropolitan areas over the past 30 years, focusing on both the overall metropolitan region and the urban core. It analyzes the increasingly prominent coexistence pattern between natural protected areas and built-up areas across metropolitan regions, as well as the evolution in core urban areas from emphasizing the coordinated expansion of green spaces and built-up areas to the focused development of large suburban parks that incorporate ecological conservation zones. These findings collectively reveal the gradually strengthening trend of natural wilderness preservation in contemporary metropolitan areas.

Furthermore, the study explores and envisions metropolitan planning under the framework of the ecological civilization system, addressing aspects such as conceptual adjustments, system development, and mechanism optimization. It advocates for the exploration of systematic space for wildness within metropolitan planning frameworks, promoting the development of relevant governance tools to support the future emergence of a new metropolitan form characterized by "urban-wilderness coexistence." The increasing emergence of wilderness areas in metropolitan regions will also bring new opportunities and challenges to residents' lives. How to better integrate future wilderness areas with high-density residential living requires more attention and discussion.

Key Words: metropolitan region; biodiversity; wildness; coexistence

Examining Wildlife-Related Emergency Call Data in Top 10 Romanian Cities

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Abstract

Human–wildlife interactions (HWIs) are frequently shaped by habitat destruction and degradation. However, they can also be influenced by making urban environments appealing to wildlife. Documenting HWI is essential for environmental urban strategies and management decisions, considering complex stakeholders and wildlife needs. In cities, the concurrence between ecosystem services and development targets, including balancing the HWI, is vital to maintain people's safety and wildlife survival. We evaluated patterns of HWI in the top 10 Romanian urban areas (including Bucharest) using data from emergency calls (ECs) placed by inhabitants. We used information from the Romanian National Emergency Call System 112, which consisted of (1) wildlife species, (2) spatial location, (3) date and time, and (4) a short description of the emergency. Of the 10 analyzed cities, all documented ECs on HWI between 2015 and 2020, with roe deer, snakes, wild boars, foxes, and brown bears being the most frequently mentioned species. Over the analyzed period, we recorded a stationary trend in HWI-related ECs in most urban areas. We mapped the large-scale distribution of HWI by species and type of interactions to capture variations at the city level. We observed a limited reaction from the inhabitants of big cities, which was opposite to the results from small and medium-sized cities. Over 60% of the ECs were related to humans in danger, mostly associated with snakes, brown bears, and wild boars. Although common in all cities, the ECs on dead/injured animals or traffic accidents were lower in number and underestimated compared to the problem dimension. Although useful, evaluating HWIs using ECs in big cities might be difficult due to the limited knowledge of inhabitants on how to manage them. Also, the institutional framework's complexity makes analyzing all inhabitants' reactions more difficult.

Key Words: Urban ecosystem, human-wildlife interactions, brown bear, wildlife, emergency calls

Addressing societal challenges with nature-based solutions – the perspective of local decision makers

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Abstract

The challenges faced by city managers have become increasingly complex. While researchers have proposed various approaches to address these challenges, many of these solutions have yet to be implemented on a global scale or even at the city level. Among these, the Nature-Based Solutions (NBS) approach appears promising in theory and has proven effective in several case studies. However, for broader adoption of the NBS approach, local decision-makers must be receptive to it.

In our study, we assessed the perception of Romanian urban decision-makers regarding the NBS approach and the likelihood of its adoption when addressing specific urban challenges. The results, based on responses from 124 representatives of local authorities revealed a certain reluctance among city leaders to employ NBS for tackling socio-economic challenges. Conversely, when confronted with environmental or health-related challenges, the inclination towards NBS increases—though often in combination with business-as-usual approaches.
Results show that the counties' administrative centres would rely more on NBS approaches than the other city categories if faced with some socio-economic challenges such as: high insecurity levels, economic regression, rise of unemployment or demographic ageing. The only environmental challenges to which these types of city will react through NBS approaches is river floodings. Medium sized cities are considering NBS approaches more than the other cities if faced with heavy rain floods, almost at the same extent as the small sized cities.
Our findings indicate that while there is some recognition of the benefits of NBS, local decision-makers remain more inclined towards traditional solutions, as these represent a more familiar and less risky course of action.

Key Words: Societal challenges, Nature-based solutions, local decision makers

Barriers and drivers in using nature-based solutions for inclusive climate actions

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Abstract

Nature-based solutions are increasingly being used as instrument for improving urban sustainability in general and climate resilience in particular. One aspect which is important to follow is the manner in which they provide not only effective solutions but also equitable ones. Through the involvement of all relevant stakeholders' cities should aim towards inclusive climate actions which adapt NBS to both the local climate needs and planning restrictions.

This study was conducted within the framework of the Driving Urban Transition project GreenINC, where we performed a survey in the five European cities which are case studies of the project. The questionnaire had four main components: identification and ranking of the relevant climate risks at local level, the most suitable nature-based solutions, the key barriers and drivers influencing inclusive climate actions and the identification of mechanisms of response.

The findings provide valuable results beyond the project needs, providing guidance and reflexion for urban planning and management, highlighting the need for co-designed and inclusive measures to tackle climate risks at local level.

This research is conducted within the framework of the Driving Urban Transition - GREEN-INC project (GRowing Effective & Equitable Nature-based Solutions through INClusive Climate Actions: a European research project with 6 universities and 5 partner cities), which seeks to advance effective and just NbS solutions through inclusive climate action. GREEN-INC aims to help European cities to implement Inclusive Climate Actions that result in a more just delivery and design of Nature-based Solutions by incorporating fairness and distributing NbS impacts as equitably as possible.

Long–term trends in surface thermal environment and its potential drivers along the urban development gradients in rapidly urbanizing regions of China

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Abstract

The world has witnessed widespread changes in urban climate in recent decades. The thermal environment in cities has undergone rapidly deterioration, with frequent heatwaves and high intensity of urban heat island. Urban areas are experiencing extensive expansion and intensive warming, accompanied by the deterioration of environmental quality and increased health risks. It is worth further exploring how does new–type urbanization drive urban landscape transformation to improve urban thermal environment. However, the complex effect of global climate change and human activity on the thermal environment evolution under different stages of urbanization remains unclear. In this study, land surface temperature (LST) and a newly-proposed surface urban heat island intensity (SUHII) were used to reveal the thermal environment and its evolution during 2002–2020 in the Yangtze River Delta (YRD), a rapidly urbanizing region in eastern China. The potential drivers of LST evolution were detected with random forest algorithm. We found that the thermal environment in the YRD had undergone deterioration trends, with the fastest warming trend observed in urban new towns (2.30 °C/decade). Although the urban cores had the highest LST, 15.91 % of urban cores exhibited a cooling trend, especially in cities with higher urbanization levels, which was caused by restored vegetation through urban renewal. Population density had the highest positive contributions in urban cores (21.08 %), while anthropogenic heat emissions accounted 21.87 % of the warming trend in urban new towns. Appropriate urban renewal and green infrastructure construction are effective strategies to alleviate the thermal environmental risks in highly urbanized areas.

Key Words: Heat island intensity, Land surface temperature, Urban-rural difference, Urbanization, Urban renewal, Yangtze River Delta

Enhance the sustainability of Romanian cities by optimizing land use efficiency and promoting the utilization of short supply chains

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Abstract

A sustainable city aims to efficiently manage resources while balancing economic development, environmental protection, and social well-being. This concept of urban sustainability is primarily based on efficient land use and short supply chains. By developing a tool utilizing data from the COPERNICUS Land Monitoring Service (CLMS), and Copernicus Atmosphere Monitoring Service(CAMS), Climate Change Services(C3S) programs and Food Security projects at the European level, such as Urban Atlas (2006-2018), vegetation indicators (seasonal trajectory, phenology, productivity parameters), and water indicators (rivers and lakes water quality), efficient urban planning can be achieved to maximize land use and short supply chains.

The tool evaluated the top ten cities in Romania from 2006 to 2022, highlighting the benefits of efficient land use and short supply chains: enhancing economic sustainability, reducing environmental impact, and improving well-being. This approach underscores the importance of local resources in supporting the local economy and reducing the carbon footprint by promoting initiatives and policies that favor local producers and suppliers. The ECOsystem for Population dynamics (ECO-P) tool integrates aggregation functions to relate population dynamics with food production systems and drinking water supply. Strategic measures are prioritized for each city to enhance sustainability. Evaluating past and present dynamics in both land use and climate changes allows us to establish a reference level for the cities evaluated, as well as testing scenarios of proximity and/or distance from it for better planning or to highlight the impact of new projects. The results are highly relevant to support the implementation of Urban Policy and to implement the ambitions related to adaptation and mitigation to climate change.

Key Words: sustainable city, short supply chain, Copernicus, land use, well-being, climate change

A Preliminary Study on Social Challenges and Nature-Based Solution Strategies in the Urban Fringe Areas of Taipei Metropolitan Area: A Stakeholder Perspective

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Abstract

Taipei Metropolitan Area (TMA) is facing signature urbanization even though the urban fringe area in the TMA continues to provide essential ecosystem services because of the unique basin topography of the TMA. It is imperative to propose a green infrastructure plan to enhance the ecosystem service for this area. Research is increasingly integrating Nature-Based Solutions (NBS) into national and local planning frameworks internationally; however, there is a lack of such research in Taiwan. Therefore, the study employed a mixed-methods approach to examine local societal challenges and NbS strategies from a stakeholder perspective in the urban fringe of the TMA, explicitly focusing on Xindian, Tamsui, and Bali-Wugu areas. Firstly, the literature review identified societal challenges in the urban fringe areas. It is categorized into nine challenges: climate change, water resource management, natural disasters, biodiversity, food security, air quality, local regeneration, participatory governance, and health and well-being. Subsequently, 150 questionnaires (50 from each area) were distributed to ascertain the societal challenges faced in these urban fringe regions. Finally, 16 local community leaders and stakeholders were conducted in-depth interviews to obtain nuanced insights into local challenges and potential NbS strategies. The findings revealed four prevalent challenges across the three study areas in the future: "air pollution (68 of 150)", "quick urbanization (67 of 150)", "biodiversity loss (54 of 150)", and "heatwave and air temperature increasing (54 of 150)." Furthermore, tailored NbS recommendations were provided for each area: the Xindian region was advised to reevaluate urban planning and restore forested areas; the Tamsui region was encouraged to pursue ecological agriculture, forest restoration, and wind-adaptive design; and the Bali-Wugu area was prompted to focus on the restoration of rivers and riparian zones, the transformation of cemetery parks, and the implementation of ecological engineering for soil and water conservation. This study collected the specific societal challenges and NbS strategies in the urban fringe area of the TMA by stakeholder participation approach, which can conduct the NbS concept within the Taiwanese context. Future research will incorporate emergy assessment methods to develop an ecological energy system and evaluate the effectiveness of various NbS strategies in urban fringe areas.

Key Words: nature-based solutions, stakeholder engagement, urbanization, policy mainstreaming, societal challenges

Inter-, multi-, and trans-disciplinary methodologies to valorise the outputs of nature-based solutions' co-creation: how can tailored empowerment program contribute?

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Abstract

To address the complex and multifaceted challenges faced by cities, nature-based solutions (NBS) should not only consider key design principles but also be developed in an inter-, multi-, and trans-disciplinary manner. Therefore, NBS require collaboration across various disciplines and sectors, as well as the engagement of multiple stakeholders. To facilitate this process, a set of methodologies is needed to ensure that it is inclusive and contributes to a just sustainability transition. Among these are various user-driven methodologies that involve research and policy aimed at generating innovations through stakeholder involvement: Living Lab, Transition Lab, Resilience Lab, Sustainability Transition Lab, collaborative adaptive management, community-based natural resource management, ecosystem-based management, etc. These methodologies combine top-down and bottom-up approaches, where scientific knowledge is integrated with local knowledge and participation. However, they have some limitations (e.g., lack of stakeholder involvement, strong control by powerful entities, etc.). Their primary focus is often on the environmental aspects of sustainability, with social and economic dimensions frequently overlooked. Moreover, these methodologies rely heavily on scientific evidence and predominantly use informing as a strategy in participatory processes, rather than effectively engaging and empowering local stakeholders. As a result, due to insufficient participation, scientific knowledge is often not fully utilized or integrated into the local context, preventing outcomes from driving meaningful behavioral change and supporting a transition to sustainability. In contrast, the Tailored Empowerment Program (TEP) can significantly contribute to inter-, multi-, and cross-disciplinary methodologies aimed at valorizing the outputs of NBS co-creation by fostering a collaborative, locally driven approach that combines diverse knowledge systems. NBS are most effective when implemented as interconnected networks of urban green infrastructure and incorporated into the TEP as its activities. This presentation explains the TEP concept as a pathway for sustainability transition that integrates nature's and people's resources/capacities, scientific evidence, and local knowledge through co-creation and knowledge co-production. It also demonstrates how TEP facilitates multi-actor collaboration leading to community empowerment by providing practical guidance and tools for TEP implementation. Therefore, TEP helps ensure that the co-created NBS are sustainable, contextually relevant, and aligned with community priorities/visions, thus enabling a just transition towards sustainability and resilience.

Innovative Solutions for Water Scarcity: Preliminary Findings from the Living Lab Brașov

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Abstract

Living Lab Brașov is a platform for engaging local stakeholders to address climate change concerns and develop tailored solutions for water scarcity, created in the Horizon project Carmine - Climate-Resilient Development Pathways in Metropolitan Regions of Europe. By involving public organizations, private companies, academia, and citizens, it aims to manage innovation processes openly and collaboratively and build inclusive and functional nature-based solutions to address climate change, especially water scarcity.

The goal is to design procedures that support vision planning and foster mutual learning among all stakeholders considering climate change adaptation actions.

The stakeholders involved in Living Lab Brașov encompass all components of the Quadruple Helix, ensuring comprehensive spatial and domain coverage. This includes urban, rural, and metropolitan stakeholders from various sectors, such as public administration, social assurance, health, education, environmental protection, nature conservation, farming, forestry, water management, and research. Vulnerable groups are also considered, including older people, youth, and individuals living and working in rural areas.

The preliminary results from the living lab confirmed that drought is a significant challenge in the Brașov Metropolitan Area. Following the workshop and separate meetings with vulnerable groups, the following issues were identified:

- 26 Risks associated with the drought (the most frequent: Limiting access to drinking water (including for vulnerable groups) because of water availability, price, and quality (including the risk of water rationing); Increasing living costs (including food, water, energy); Decrease in the profitability of agricultural activities (including costs)).
- 17 Drivers that trigger the risks (the most frequent: Low level of education and awareness of the population regarding hazards; Water losses from the network)
- 25 Measures: (the most essential and urgent Improving the monitoring of natural resources; Awareness of authorities and users about water management; Promoting

water saving; Increasing the capacity of stocking water resources; Protecting wetlands and water bodies).

The findings prove the high relevance of participatory practices in developing efficient solutions for mitigation and adaptation to climate change.

Key Words: living lab, water scarcity, stakeholder

SMART technologies in green roof management

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Abstract

he report examines modern approaches to the development of roof greening in Russia using SMART monitoring and management technologies. The author analyzes the problems of modern cities, such as flooding, global warming and reduction of green areas, and offers solutions through the introduction of green roofs.

The main focus is on the ecosystem services of roof greening: reducing the urban heat island, increasing the energy efficiency of buildings up to 20%, managing surface runoff and creating biodiversity. Data on global experience is provided, especially in Germany, the market leader with 85 million m2 of green roofs.

The Russian market is characterized by certain limitations: lack of data on functioning in various climatic regions, insufficient government support and the predominance of the aesthetic component over the practical. The report describes in detail the types of roof greening according to national standart (extensive, semi-intensive and intensive), their technical characteristics and loads.

Particular attention is paid to the development of SMART monitoring systems, including rainwater management, irrigation and fertilizer control systems, heated tiles and light control. The results of studies of the effectiveness of green roofs in various regions of Russia are presented, showing the ability to retain up to 64% of precipitation during heavy rainfall and hold water for up to 6 hours.

The report concludes with a description of plans for the development of a network of green roofs laboratories throughout Russia for further research and development of smart systems based on the collected data, aimed at improving the energy efficiency of buildings and reducing the risk of flooding in cities.

Key Words: Green roof, water management, monitoring system

Scaling Nature-Based Solutions in Germany: A Tool for Evaluating Climate Resilience and Health Benefits

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Abstract

As climate change intensifies, urban areas face rising temperatures and increasing health risks, particularly threatening vulnerable populations. Nature-based Solutions (NbS) offer a promising strategy for climate adaptation and human well-being. However, their implementation remains slow due to financial and policy barriers. The project "Value of Green Urban Spaces III" (Stadtgrün wertschätzen III) is developing a tool for assessing the climate adaptation potential and health benefits of NbS - such as green roofs, green facades, green areas and street trees - across all 193 German cities with populations exceeding 50,000 inhabitants.

The assessment tool will integrate urban climate modeling, socio-demographic analysis, and large-scale survey data to account for geographical and climatic variations, appreciation for urban green and health outcomes. Since high-resolution climate simulations for all cities are impossible due to resource and time constraints, the study uses the approach of urban standard typologies (UST). Applying machine learning algorithms to the results of microclimate simulations of all USTs under varying meteorological and greening conditions with the software PALM-4U will allow to project the results to a wider range of urban conditions. The key focus of this research is the modeling of climate-health interactions to assess heat-related health risks and economic impacts. By comparing scenarios with additional NbS implementation and the status quo of these German cities, the benefits of NbS interventions in reducing heat stress and productivity losses will be quantified and monetized.

The result will be a data-driven information and decision-support tool for urban climate adaptation for policymakers, urban planners, and stakeholders as well as interested citizens. With this publicly available tool, users can interactively discover the parts of their city with the greatest need for action and what impact additional urban greenery would have. The findings will support the integration of ecosystem service assessment of NbS into municipal planning to improve climate resilience and human health in different urban contexts.

Key Words: climate resilience; ecosystem services; nature-based solutions; urban planning; PALM-4U; health benefits

Exposure Ecology Drives a Unified Understanding of the Nexus of (Urban) Natural Ecosystem, Ecological Exposure, and Health

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Abstract

The intersection of ecosystem science, exposure science, and health research has fostered the gradual integration of these disciplines, emphasizing the profound impact of ecological exposure on human well-being. Unlike traditional environmental health studies that focus on negative exposures (e.g., pollution, toxins), recent advancements have highlighted the positive health benefits of exposure to natural ecosystems. This shift marks a fundamental transition in the eco-environment & health field, moving beyond mitigating harm to proactively enhancing health outcomes. However, despite increasing evidence supporting the health-promoting effects of ecological exposure, a unified conceptual framework that systematically integrates the nexus of ecosystems, exposure, and health remains absent. To address this gap, we propose a novel framework—**Exposure Ecology (EE)**—which provides a comprehensive structure for understanding ecological exposure and its health implications. The EE framework classifies ecological exposure into four domains: subject-reality, object-reality, subject-virtual, and object-virtual, encompassing both physical and virtual interactions with natural environments. This coordinate-based framework enables the systematic categorization of existing studies, identifying research gaps and guiding future investigations. By reviewing the latest empirical and theoretical advancements, we analyze the mechanisms through which ecological exposure influences health outcomes. These pathways include risk reduction (minimizing harmful environmental stressors), restorative effects (enhancing psychological and physiological recovery), health promotion (boosting immune function, cognitive performance, and social well-being), and potential harm (e.g., vector-borne diseases, allergens). Furthermore, we explore the theoretical underpinnings of EE, discuss its alignment with exposure science, ecology, and environmental psychology, and examine its implications for public health and urban planning. Ultimately, this EE-driven study deepens our understanding of the intricate relationships between ecosystems and health, offering a structured framework for future research and policy development. By integrating ecological exposure into health strategies, EE provides a robust foundation for achieving Sustainable Development Goals (SDGs), particularly those related to good health and well-being (SDG 3) and sustainable cities and communities (SDG 11). Our findings emphasize the need for interdisciplinary collaboration to maximize the health benefits of ecological exposure while mitigating potential risks, ensuring a more resilient and health-supportive environment for urban and natural landscapes alike.

Key Words: Exposure Ecology; Ecological Exposure; Human Health; Natural Ecosystem; Urban Ecology

What Drives the Cooling Dynamics of Urban Vegetation via Evapotranspiration and Shading Under Extreme Heat?

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Abstract

Urban vegetation's evapotranspiration (ECoV) and shading (SCoV) cooling effects help mitigate the urban heat island effect and reduce heat exposure risks. However, the challenge of decoupling ECoV and SCoV, along with the lack of focus on extreme heat impacts, has limited the understanding of their combined cooling mechanisms. Here, we use a high-resolution mesoscale model to separately quantify the spatiotemporal dynamics of ECoV and SCoV under normal summer and extreme heat conditions, revealing the mechanisms driving differences in cooling potential. Using Shanghai as a case study, our results indicate that: (1) Extreme heat enhance daytime cooling capacity, prolonging and intensifying the midday peaks of ECoV and SCoV. However, they simultaneously suppress nighttime SCoV cooling efficiency, weaken the synergy between ECoV and SCoV, and even shift their interaction into an antagonistic effect after sunset. (2) Meteorological factors primarily govern the diurnal variations of ECoV and SCoV. Lower temperatures (<30°C), lower atmospheric pressure, and higher wind speeds enhance evapotranspiration and surface heat exchange, thereby strengthening vegetation’s cooling effect. (3) Heatwaves disrupt the spatial clustering of daytime cooling efficiency, amplify the heat retention effect of dense canopies (LAI > 4), and increase the temperature sensitivity of sparse vegetation (LAI < 0.5). They also intensify the positive influence of canopy height on cooling and the suppressive effect of impervious surfaces, exacerbating the spatial heterogeneity of urban vegetation’s cooling potential. These findings highlight the importance of incorporating meteorological factors into urban planning strategies and emphasize that optimizing vegetation density and vertical structure is key to maximizing urban cooling benefits.

Key Words: Urban vegetation, Extreme heat, evapotranspiration cooling, shading cooling

Urban ecological-social driving mechanisms of mosquito-borne diseases

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Abstract

Climate change and rapid urbanization affect the spatiotemporal interactions between human and mosquitoes by changing the spatial structure of urban landscapes, leading to an increasing risk of mosquito-borne diseases. Based on the framework of landscape epidemiology, this study reveals how spatial characteristics of the urban landscape affect the spatial epidemic risk of a mosquito-borne disease, dengue fever (DF) through the ecological and social pathways in Hangzhou, China. We collect multiple datasets including urban biodiversity, land use/cover patterns (LULC), social gathering places (SGPs) and socioeconomic conditions by field work, societal questionnaires, remote sensing and statistical yearbooks. Then we apply a geographically weighted zero-inflated Poisson regression, general additive regression and structural equation model to analyze the landscape-mosquito-human relationships in the city. The results showed that (1) dengue risk was positively associated with shrub and grass richness, but negatively associated with tree richness in urban green spaces; (2) the preferences of visitors to vegetated areas and water bodies overlapped with the locations where mosquitoes were frequently present; (3) the top-down regulatory of natural enemies was missing in the mosquito control; (4) landscape patterns involving LULC and SGPs played a more important role in DF epidemic than the socioeconomic conditions; and (5) the total area of built-up area had the greatest effect to DF risk. Furthermore, property price, the density of entertainment and services could better explain the spatial variation of DF risk in Hangzhou. Based on this study, we further propose landscape prevention and control strategies for mosquito-borne diseases across different spatial scales in cities.

Key Words: Dengue fever; landscape epidemiology; urban park; green space; social gathering places

Green spaces provide substantial but unequal urban cooling globally

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Abstract

Heat extremes are projected to increasingly threaten human well-being, with growing disparities in exposure across different regions. Countries in the Global South are particularly vulnerable, facing both higher exposure to heat extremes and limited capacity for adaptation. While much focus has been given to the challenges of cooling indoor environments, less attention has been paid to the capacity of urban areas to mitigate outdoor heat stress. In this study, we examine the global inequality in urban green spaces, which play a crucial role in alleviating outdoor heat stress. By analyzing satellite-derived data on land surface temperature and urban green space area, we quantify the cooling capacity of green spaces during warm seasons in nearly 500 cities worldwide, each with a population of over 1 million. Our findings reveal a striking disparity, with cities in the Global South showing roughly 1.5 times lower cooling capacity compared to their counterparts in the Global North (2.5 ± 1.0 °C vs. 3.6 ± 1.7 °C). This gap is also reflected in the cooling benefits experienced by individual urban residents, where the average cooling adaptation benefit in the Global South is 2.2 ± 0.9 °C, compared to 3.4 ± 1.7 °C in the Global North. This inequality is primarily driven by differences in the quantity and quality of urban green spaces, shaped by both socioeconomic and natural factors. Our analysis suggests significant potential for reducing global disparities in outdoor cooling adaptation by expanding and improving urban green infrastructure in the Global South, ultimately enhancing resilience to heat extremes.

Key Words: climate inequity, climate mitigation, heat extreme, urban greenery cooling effect

Welcoming water in cities with floodable parks

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Abstract

Cities are socio-political and economic centers which attract more than 50% of the population. By 2050, 66% of the population will live in cities. Urban sprawl is a common phenomenon in developed and developing countries, leading to the transformation of floodplains, the deforestation of natural habitats and the sealing of the soil surface. Cities have not been built to withstand the current global change (more frequent and intense precipitation, longer droughts, higher temperatures and heatwaves of long duration). Only recently some cities across the world are taking initiatives to redesign their urban plans and integrate climate-resilient elements such as Nature-based Solutions. This redesign requires the expertise of different disciplines, from landscape architects and local authorities to citizens. One new Nature-based Solution which addresses many of the issues caused by the global change is urban floodable parks. Urban floodable parks are recreational spaces which allow its temporary flooding to convey and store urban runoff from extreme rain events thanks to the infiltration of the surrounding greenery. This is a holistic solution since it can help the cities to increase their resilience towards current and future flood events, but also to drought and increased temperature. The research of the benefits delivered by this solution is deeply intertwined with the communication and collaboration between academia, municipalities, water companies and nature management organizations. In this presentation, insights and experiences related to the interdisciplinarity of the research will be offered, focusing on the design and methodology required for the study of these new urban solution.

Key Words: climate change; floods; urban development; floodable parks; interdisciplinarity

How Aquatic Nature-based solutions and their characteristics affect macroinvertebrate communities in European urban aquatic ecosystems?

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Abstract

Aquatic habitats in cities provide numerous ecosystem services, such as contributing to flood control, human well-being and adapting cities to ongoing climate change. These include ponds and streams as tools to deal with different impacts of urbanization, and can be considered aquatic nature-based solutions (aquaNbS). Also, by providing important habitats, urban aquaNbS support macroinvertebrate communities, commonly used as bioindicators of a system's ecological integrity. However, there is a knowledge gap on how environmental drivers, from large scale climate to small scale aquaNbS characteristics, influence macroinvertebrate communities, especially in urban areas. Thus, aiming at overcoming such knowledge gap, we characterize macroinvertebrate composition in urban aquaNbS within a climate gradient in four cities in Portugal, Belgium, Poland and Finland. In each city 12 sites were selected considering the major types of aquaNbS, i.e. habitat (stream or pond) and water permanence (permanent or temporary). Macroinvertebrates community composition was then modelled with multiple environmental drivers, including climate, vegetation, aquaNbS characteristics and local water parameters. Results have shown that at the European level communities were mainly

driven by the type of aquaNbS (stream vs pond) and their bottom material, and by climate, related to water residence time in aquaNbS. At the city level, communities were, again, mainly driven by the type of aquaNbS, followed by several city specific drivers: water (water temperature, oxygen, water residence time), aquaNbS (bottom material, water depth) and vegetation (Normalized Vegetation Index) related variables. As shown, given the importance of both, climate and local factors, there is a good potential to boost urban biodiversity using aquaNbS in cities, by ensuring the presence of a wide range of aquatic habitats. Importantly, we recommend considering the influence of such environmental drivers whenever macroinvertebrates are used for water quality evaluation. Understanding the type and spatial scale at which environmental drivers of communities, including aquaNbS characteristics, work is critical to improve the construction, restoration and management of aquaNbS. Furthermore, considering that climate seasonality influences communities, this should be considered when projecting or restoring aquaNbS, especially under the effects of ongoing climate change.

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Key Words: Aquatic insect, Aquatic Nature-based solutions, Climate change, Blue urban infrastructure

Climate and biodiversity smart cities with nature-based solutions

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Abstract

Cities increasingly want to be climate-smart and develop strategies and programs to adapt to climate change. Nature-based solutions (NbS) are one way to increase climate resilience and at the same time provide multiple benefits. NbS are also thought to support biodiversity. We studied the programmes and strategies for adaptation and mitigation of climate change in five European cities: Antwerp, Berlin, Helsinki, Lisbon and Poznan. We analysed how much NbS are proposed in the programmes as part of the climate-smart solutions and how biodiversity is integrated into the programmes. We found that although NbS have been established in urban climate programs, there are little if any interlinkages to the benefits they bring to biodiversity and non-human species. Biodiversity was seen as an obvious outcome of implementing nature-based solutions without any concrete actions how to take it into consideration. There were no actions to preserve biodiversity from negative impacts of climate changes. Cities are lacking clear goal of how urban nature and green spaces should adapt to climate change. Urban green and water areas are harnessed as part of climate resilience, but at the same time care must be taken to ensure their adaptation and sustainability so that their biodiversity values are not lost due to poor planning and maintenance. Based on our results, there is a great need to monitor and assess the negative and positive impacts of climate change adaptation programmes on urban biodiversity. In my presentation, I will highlight practical solutions to enhance both climate and biodiversity goals in cities.

Key Words: Climate adaptation, policy, Europe, biodiversity

Diversity of aquatic autotrophs in urban nature-based solutions

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Abstract

Aquatic Nature-Based Solutions (aquaNBS) in urban environments are designed to address complex environmental and societal challenges by integrating blue-green infrastructure as a sustainable alternative to conventional grey infrastructure. This approach optimises multiple ecosystem services, including the provision of recreational spaces, pollution mitigation, water retention, biodiversity enhancement, and climate change adaptation. As part of a pan-European project across five European cities, we employed a comprehensive framework to examine the interactions among the social, ecological and technological dimensions of aquaNBS. The presented study focused on the ecological aspects, including interrelationships among planktonic microorganisms, aquatic vegetation, and key environmental parameters, such as hydrological and morphological characteristics, as well as physicochemical properties of water and sediments, within urban ponds and streams. The study sites exhibited limited temporal or spatial heterogeneity in biodiversity patterns, as reflected in the alpha and beta diversity indices. Our findings revealed significant variability in physicochemical and hydrological parameters across the study sites, as well as between lotic (stream) and lentic (pond) aquatic NBS. Stable water isotope analyses ($\delta^{2}H$ and $\delta^{18}O$) provided insights into the influence of hydroclimatic factors on ecosystem dynamics, relating to observed variations in aquatic biotic communities. However, the relationships between biodiversity metrics and environmental parameters were generally not very strong, with seasonal and spatial variations influencing observed trends in biodiversity indices.

This research was conducted within the BiNatUr project, funded through the Biodiversa and Water JPI joint call under the BiodivRestore ERA-NET Cofund (GAN°101003777) and co-financed by the National Science Centre (Poland; UMO-2021/03/Y/NZ8/00100) and the Federal Ministry of Education and Research (Germany; BMBF No. 16WL015).

Key Words: eDNA, macrophytes, water isotopes, water quality, NBS

Efficient monitoring to support implementation and management of urban aquatic nature-based solutions

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Abstract

Urban aquatic nature-based solutions (aquaBNS), such as small ponds, infiltration basins and stream restoration measures, provide support to biodiversity and associated ecosystem functions and services, which help future-proof cities to global change. To improve their planning, building, management or restoration, several challenges occur. This presentation aims at framing such challenges while providing ways to overcome them.

Challenges can be caused by the small size of these aquatic freshwater habitats. Small habitats are many times not mapped, remaining mostly unaccounted, thus greatly underestimating their value to biodiversity support and provision of ecosystem functions and services. The small size also causes challenges related to their characterization, because many methods aimed at measuring aquatic biodiversity of these freshwater habitat as designed for large water bodies, thus standardization of methods for smaller areas is lacking. Urban aquatic nature-based solutions functioning is influenced by multiple environmental drivers, including pollution (e.g. chemical, noise, light), microclimate changes, and changes in hydrology, which frequently co-occur. These are likely influence biodiversity and associated ecosystem functions and services in a non-linear and synergistic way, but these relationships and associated thresholds remain major knowledge gaps.

There is a strong need to monitor biodiversity and ecological quality of urban aquaNBS. In the BiNatur project we implemented multi-monitoring approach to reveal how well small-scale water areas support local biodiversity. We found that despite many urban related stressors these sites can support biodiversity. Aiming at overcoming the abovementioned challenges we argue that there is a strong need for the development of standard methods, use of dedicated earth observation methods, support of stakeholder engagement methods enabling co-creation of approaches, citizen science projects and tools such as ecological indicators, isotopic analysis, machine learning based statistical analysis and eDNA. Using these methods can enhance the adoption of aquatic nature-based solutions in cities, helping to adapt urban areas to the ongoing global changes.

Key Words: urban habitats; aquatic nature-based solutions; ecosystem services; research and implementation challenges;

Flood modeling as the basis of urban blue-green infrastructure

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Abstract

With the continual rise in global temperatures, increasing urbanization, deforestation, and greenhouse gas emissions, the frequency and intensity of urban flood events are projected to increase significantly. This creates a pressing need to develop sustainable stormwater management solutions, particularly in urban areas with high proportions of impervious surfaces. One such solution is the implementation of blue-green infrastructure (BGI), which enhances the natural water cycle and contributes to flood mitigation.

This study presents a practical methodology for selecting and dimensioning BGI elements based on the identification of flood-susceptible areas through hydrodynamic modeling. The research was conducted in the city of Vologda (Russia), where areas susceptible to flood were identified, and their inundation volumes were calculated pixel by pixel using GIS tools.

Based on the computed flood volumes and available urban space, typical BGI elements such as rain gardens, bioswales, and dry detention basins were selected and dimensioned. The methodology allows for quantitative spatial planning of BGI, bridging hydrological analysis with landscape design and enabling precise selection of BGI types and volumes required for flood control.

The modeling and design methodology demonstrated in this work shows that flood-susceptible areas identified through 2D hydrodynamic simulations provide an excellent basis for the spatial planning and technical specification of blue-green infrastructure. The proposed approach can be used as a framework for integrating hydrological modeling with sustainable landscape planning. It provides a replicable solution for data-informed flood management and climate adaptation in cities, especially relevant in contexts with increasing rainfall and underdeveloped stormwater infrastructure. The proposed methodology can be applied in other urban areas, forming the basis for sustainable water-sensitive urban development.

Key Words: flood risk assessment, stormwater management, blue-green infrastructure

Diversification of macrophytes within aquatic nature-based solutions developing across European cities

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Abstract

This research, part of the BiNatUr project, investigates macrophyte richness in aquatic NBS in five European cities: Antwerp, Helsinki, Berlin, Poznan, and Lisbon. The study involved 120 sites, with each city contributing 12 sites representing restored or constructed ponds and streams in both altered and natural states. Surveys conducted used 10-meter quadrats to assess the abundance of macrophytes, which were identified to species level. The analysis included emergent, submerged, and floating plants, using Ellenberg indicator values (EIV) and biodeiversity metrics.

A total of 103 aquatic plant species were identified, with significant variability in species richness and abundance among the cities. The differentiation of macrophyte communities across countries follows a geographic and climatic gradient, with Lisbon (Portugal) showing the most distinct composition. Water temporal availability was recognised as one of the key factors influencing macrophyte community composition of urban aquaNBS. Temporary water bodies had lower species richness and abundance compared to permanent ones, with the Jaccard index indicating distinct macrophyte communities in temporary ecosystems. This shows the vulnerability of temporary aquatic habitats to biodiversity loss. Detrended Correspondence Analysis (DCA) highlighted significant differences in macrophyte community structures, with Lisbon showing a unique species composition.

The study underscores the diversity of macrophytes in urban aquatic NBS across Europe, emphasizing their value as biodiversity hotspots in urban settings. This research provides new and valuable insight into the factors influencing the diversification of macrophytes in urban aquatic NBS across European cities. It emphasises the value of various urban aquatic NBS in maintaining and enhancing biodiversity in cities. Despite their relatively small size and the surrounding urban modifications, a high diversity of aquatic plants was recorded in streams and ponds across all countries, highlighting their role as biodiversity hotspots in urban areas. These findings contributing to the understanding of aquatic ecosystems under high stress in cities and informing conservation and urban planning initiatives.

Key Words: macrophytes, biodiversity, Ellenberg indicator values (EIV), aquaNBS

Nature based solutions to urban runoff support high biodiversity

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Abstract

Traditional way to handle urban water runoff has been underground pipes or concrete channels. Accumulating rainwater has been seen as threat to people and waste that must be treated and hidden from sight. Modern nature-based solutions (NBS), however, are founded on the idea that water in cities is not only a problem but a valuable resource. We studied nature-based methods to handle rainwater, urban run off and pluvial floods to determinate their efficiency and how different management practices affect biodiversity.

Our study area was the boreal cities of Helsinki and Vantaa, we choose six constructed brooks and six ponds, each with an intensively managed site and one running wilder. Submerged and riparian plants and zoobenthos on these sites were studied with standardized methods.

Altogether we found 199 plant species, a fairly high number in comparison to ditches in agricultural areas as reference, 128 species in another study. There was high variation among sites, 16 to 57 species. The mean for managed sites was 56 species whereas in more wild sites only 33, contrary to our original assumption. The explanation is, that in managed sites there was more space for annual plants, weeds and ruderal species, while in less managed sites the vegetation was more closed with clonally growing natural wetland and aquatic species.

In zoobenthos we found altogether 115 taxa, 11 to 26 per site, which compares quite favorably to 46 taxa in agricultural ditches. In the managed sites the mean number was 17 whereas in more wild sites 21. The number of individuals counted varied also highly from few hundreds to several thousands. In the managed sites the mean number was 967 whereas in more wild sites 1575.

In conclusion nature base solutions to urban runoff and more relaxed site management appear to support high biodiversity, especially so if compared to underground pipes or concrete channels with practically zero biodiversity. Brooks and ponds are also cheaper to construct and enjoyed by people

Key Words: nbs, zoobenthos, plants, runoff, water

Green Roofs for Microclimate Improvement and Energy Efficiency in Cold-Arid Regions

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Abstract

Urbanization and climate change have intensified the urban heat island (UHI) effect, leading to higher energy consumption in buildings, especially in cold and arid climates. Among various sustainable architectural interventions, green roofs offer substantial benefits by moderating microclimatic conditions, enhancing thermal comfort, and reducing energy demands. This study evaluates the impact of green roofs under two scenarios—one with vegetation cover (grass) and the other without—on urban microclimates using ENVI-met. Furthermore, it examines their influence on residential energy consumption through simulations in DesignBuilder, specifically considering the climatic conditions of Tabriz, Iran. The methodology consists of high-resolution microclimatic simulations to assess parameters such as ambient temperature, mean radiant temperature, and the Predicted Mean Vote (PMV) index. Additionally, energy performance modeling quantifies variations in cooling and heating loads between green and conventional roofs. The results indicate that green roofs with vegetation significantly lower ambient temperatures and improve thermal comfort compared to bare roofs. ENVI-met simulations demonstrate that vegetation on roofs reduces ambient temperature by an average of 1.397°C. More critically, during the hottest month of the year, buildings with green roofs experience up to a 40% reduction in cooling energy consumption compared to those with conventional roofing systems. These findings highlight the effectiveness of green roofs as a climate adaptation strategy, playing a crucial role in urban resilience, mitigating heat stress, and enhancing energy efficiency. By integrating green infrastructure into urban planning, cities in arid and cold regions can achieve significant environmental and economic benefits while addressing the adverse effects of climate change

Key Words: Green roofs, Microclimate, Energy efficiency, Urban heat island, Cold-arid climate

Involving citizens to plan the city - from theory to practice

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Abstract

Current approaches indicate that in the future cities should rely on smart and green planning, integrating sustainable development principles for the benefit of the population. Citizen engagement in urban planning contributes to addressing real urban challenges and shaping public acceptance of change. In theory, urban planning should include at least one stage that addresses public participation, either directly or indirectly, to ensure that community needs are considered and to reinforce the bottom-up approach. Ideally, there should be continuous collaboration between citizens and authorities to identify community- and city-level challenges and opportunities. In practice, however, many strategies are developed with little to no public involvement. This study aims to assess the extent and manner of citizen involvement in the Romanian urban planning process.

The main research method employed was qualitative document analysis, specifically content analysis of over 200 urban sustainable development strategies of cities across Romania. The analysis involved applying a structured protocol containing items related to whether, how, and when public participation was conducted, the participatory practices utilized, the categories of stakeholders involved, the thematic areas addressed within the participatory process, and whether vulnerable groups were explicitly mentioned or involved.

The findings indicate that public participation is most visible in the social and economic sectors, with key domains including utilities, transportation, education, and healthcare. The most frequently raised issues by citizens include the lack of employment opportunities, deficiencies in transportation and utility infrastructure, as well as shortcomings in the healthcare system. From a stakeholder perspective, the most actively engaged groups are the general public and non-governmental organizations (NGOs). The results are particularly relevant for highlighting the sectors where citizen involvement is significant, in comparison to the areas prioritized in policy documents.

Key Words: citizen planning, urban planning, public participation, document analysis

The importance of green areas in cities: using homing pigeons to assess urban heat variability in Rome

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Abstract

In this study, we used a novel approach to investigate the variation of air temperature in the city of Rome. We equipped a total of 13 homing pigeons (Columba livia) with data loggers to sample air temperature during flights over the city in the summers of 2023 and 2024. The data logger recorded the spatial position of the pigeons during their homing routes using a GPS and also recorded time and date, elevation of flight and flight speed. A landcover map created using Sentinel 2 images with a resolution of 10 meters was used to intersect and extract the GPS information about the type of landcover the pigeons were overflying. Three types of land cover were considered: artificial, grass vegetation and woody vegetation.

To investigate the relationships between air temperature against the variables recorded by the data loggers and land cover types we used a Generalized Additive Mixed Model (GAMM) with a normal distribution. The model included “temperature” as the response variable, with the interaction between time of day and land cover type as fixed effects. Additionally, we included the size of the green areas overflown by the pigeons as an additional covariate, and “day” as a random effect to account for variation due to weather conditions.

The model showed that air temperature over artificial areas was significantly higher than over vegetated areas during the first part of the day, reaching a constant value from 12pm to 4pm. In contrast, air temperature over woody and grass covered areas showed a slower increase, reaching values similar to artificial areas with a three-hour delay. Furthermore, a significant decline in air temperature was observed in areas with larger woody landcover.

These findings align with previous studies and reinforce the general understanding that urban green areas, particularly covered by trees, provide a significant cooling effect, especially during summer in Mediterranean regions.

To our knowledge, this is the first study that uses animals to investigate variations in temperature in an urban ecosystem and provides information on the air column temperature rather than on ground temperature, which is typically used in most studies found in literature.

Key Words: Ecology, Urban ecology, Datalogger, Biologging, Ornithology

Modernist Large Housing Estates in Central Europe as Hotspots of Urban Biodiversity

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Abstract

Modernist large housing estates (MLHE) built in Central and Eastern Europe after World War II are characterized by a large share of greenery, which is poorly recognized. Our study aimed to determine the contribution of MLHEs to urban floral biodiversity using empirical field study. We conducted our research in Poznań/PL, where MLHEs were established during the period of real socialism, and Salzburg/A, representing continuous market economy conditions. We inventoried the spontaneous vascular flora, considering the architectural layout and the maintenance practices. The analysis focused on the composition of the flora, as well as the taxonomic, biological, and autecological traits of the plant species. We also compared the findings with similar studies on urban parks in both cities, enabling us to evaluate the contribution of MLHEs to urban biodiversity.
The results showed that the green spaces within MLHEs demonstrated high plant richness and diversity. The architectural patterns of vegetation and gardening practices were identified as the most significant factors influencing them. After implementing certain biodiversity-enhancing modifications, we concluded that this part of urban green could serve as a viable operational model. We formulated recommendations for ecological design principles in the greenery planning and management of multi-family housing estates for urban planners and greenery architects. Urban planners are encouraged to focus on introducing green spaces, enabling the flow of water, matter, and energy.
Our study demonstrates the potential to integrate aesthetic appeal with ecological sensitivity in the planning and arranging and maintaining urban green spaces, which is increasingly recognized as a vital component of biophilic urban development.

Key Words: biophilic urbanism, floral biodiversity, housing estates, spontaneous flora

Biodiversity of urban domestic gardens

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Abstract

The preservation of biodiversity is becoming an increasingly important concern. Cities are often not considered, and in cities, urban gardens are not. The focus of interest and efforts to protect and preserve biodiversity are natural forests and wetlands, followed by historical cultural landscapes. What is sometimes overlooked is the great structural diversity that cities offer plants and animals as a habitat, which leads to great biodiversity, especially in comparison to the intensively farmed surrounding areas. In cities, people live together with a reduced but diverse and species-rich nature. This offers an opportunity to get to know it, appreciate it and protect it, even outside of the cities. The most important and most frequently visited open spaces with natural features in cities are public and private gardens. At the same time, they are also the most species-rich habitats and meeting places for (urban) people and nature. Scientists are still trying to research this biodiversity and are still experiencing surprises about which species live together with us humans in which way. A little less intensive care already leads to an increase in the species diversity of plants, which people can enjoy. Cities are hot spots of biodiversity, especially in their gardens, with great potential to bring people closer to nature.

A exemplary study shows how to measure biodiversity by indicators in urban domestic gardens.It also shows the main management influences on garden biodiversity and the preferences for them. This will allow to improve biodiversity in gardens targeted.. The results explain the high diversity of native plants in urban domestic gardens.

Key Words: biodiversity, urban domestic gardens, idicators, habitat, patterns, management

Non-linear responses of ecological indicators to urban environmental drivers across Europe

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Abstract

Increasing urban sustainability and resilience requires deep understanding on how environmental drivers shape cities, specifically when quantifying biodiversity, ecosystem change and the underlying mechanisms of those changes. Doing so is complex because in cities multiple drivers work simultaneously at both broad and local spatial scales and with different intensities. In this context, understanding the separate contribution of individual environmental drivers while accounting for the effects of all others remains challenging. Ecological indicators such as lichens are used to measure these drivers impacts at the ecosystem level and provide valuable information for urban policy, planning and design. Lichen responses interpretation is nevertheless complex, as these drivers act together in cities. Furthermore, while lichen responses are often nonlinear, studies typically ignore such complexities. This not only hinders our ability to disentangle the individual effect of each driver but also prevents evaluating the effectiveness of policies to mitigate their impact.

Here, we used a continental lichen biodiversity dataset and a machine-learning approach to disentangle the individual effect of the prevailing drivers on urban lichens. Particularly, we aimed at identifying the intensity/direction of the effect of single drivers across cities and determining, for each driver, the presence of threshold-like responses shaping lichen biodiversity.

We sampled epiphytic lichen biodiversity in seven European cities, from which taxonomic and functional metrics were calculated. Environmental drivers related to temperature, water availability and anthropic pressure were modeled to explain lichen metrics with Random Forest, to account for the potential collinearity and non-linear responses.

Overall, temperature and water availability were the most important drivers for urban lichen biodiversity, followed by anthropic pressure, mainly related to urbanization. Partial dependence responses revealed thresholds of lichen biodiversity change along the environmental gradient considered. Our results strongly support the application of lichens diversity as a tool to better plan urban policies, revealing tipping-points which are fundamental to establish environmental safety thresholds and envelopes of environmental conditions until or after which these can be applied. We highlight that future use of ecological indicators aimed at environmental evaluation in urban areas must consider tipping points in its interpretation.

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SFRH/BD/149323/2019)

Key Words: Urban ecosystems; Biodiversity metrics; Climate; Anthropic pressure; Random Forest; Policy guiding.

Biodiverse Urban Waterfront

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Abstract

Amsterdam faces the challenge of restoring 600 km of quay walls by 2050. Yet a comprehensive understanding of aquatic biodiversity in urban waterways remains lacking, especially how to enhance ecological value in restoration plans.

Current community theory suggests that biodiversity in urban environments is primarily driven by anthropogenic factors, rather than natural processes (Swan et al., 2021, Ecosphere). In contrast, Humboldt's early work (Humboldt and Bonpland 1805) proposed that environmental conditions govern biodiversity. This discrepancy requires an integrated understanding of how abiotic factors and human-driven dynamics jointly influence urban biodiversity. Therefore, this research aims to unravel the impact of these combined drivers on benthic macrofaunal and macrophyte biodiversity in urban waterways.

The research follows three key steps:

- **Spatial Analysis** of current aquatic biodiversity.
- **Experimental Verification** of the spatial analysis.
- **Experimental Sampling** and **classification** of macrofauna and macrophytes in urban waterways.

The spatial analysis will be based on publicly available datasets of macrofauna and macrophytes. These datasets will be analyzed for alpha, beta, and gamma biodiversity, as well as community similarities. By mapping these parameters, we aim to identify shifts in ecological traits and delineate boundaries of benthic macrofauna communities. Moreover, the analysis will trace the influence of urban areas on benthic and macrophyte communities within urban waterways.

Following the data analysis, an experimental campaign will be conducted. The experimental setup will involve the deployment of Hester Dendy sampler plates coupled with artificial plant substrates. A specially explicit sampling design across the city and surrounding areas allows for a detailed analysis of changes in community composition and dispersal patterns.

The final phase of the research will focus on understanding benthic macrofauna dispersal within urban aquatic environments. Using a community theory framework and land use and landscape analysis, waterways will be classified and experimentally sampled in the same manner as the spatial analysis.
In addition to assessing ecosystem structure, we aim to quantify ecosystem functioning by deploying oxygen sensors to quantify photosynthesis and respiration in these waterways. This approach will allow to link ecosystem structure and functioning in urban waterbodies, aiding the restoration of urban aquatic biodiversity.

Key Words: Macrofauna, Spatial, Dispersal, Aquatic, Biodiversity

Governance of Urban Fruit Trees in Balıkesir, Türkiye: A Step Towards (Un)Sustainability

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Abstract

Urban Fruit Trees (UFT) provide ecosystem services such as increasing green areas in cities and producing alternative food for city dwellers among others. UFRs are very common in Turkish cities compared to some other countries and these trees are widely used as a food source. The issues of who planted these trees, which are in both private and public areas, how they are maintained and who collects fruits according to which rules are not regulated systematically. In general, academic studies on UFTs are almost non-existent. Therefore, the status of UFTs, its legal regulations and management issues are woth studying academically. This study focuses on the status of UFTs, its prevalence, frequency of use, the health and environmental problems it causes and its management in Balıkesir province, in Türkiye. For this purpose, observations were made in public and private areas in the city over several years and semi-structured interviews were conducted with municipal officials. In addition, face-to-face interviews were conducted with some people who planted, maintained and collected the UFT. These interviews were analyzed with various content analysis methods. The results showed that UFTs are quite common in both public and private areas throughout the city. These trees are often maintained by volunteers, and municipal authorities do not get involved in the work related to these trees. In fact, municipal bylaws prohibit fruit collection from urban green areas. Municipalities have inadequate regulations regarding urban fruit trees. The discussions around UFTs are based on environmental impacts, public health, access to public space and rights of use. UFTs have the potential to be used in increasing urban green areas, meeting urban food needs, preventing urban poverty and ensuring urban sustainability. Unregulated UFTs on the other hand contribute to the unsustainable city management.

Key Words: Urban Fruit Trees, Ecosystem services, Sustainable cities, Urban resilience.

Assessing urban biodiversity using citizen science data to inform urban planning and biodiversity conservation

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Abstract

Targeted surveys of urban biodiversity are usually limited to protected areas and selected groups of organisms. Due to the high costs involved for city-wide assessment and monitoring, systematic data is mostly lacking for cities. In contrast, there is a boom in opportunistic citizen science data, which is becoming increasingly available, especially for urban areas. With appropriate validation and curation, this data can represent an innovative and valuable resource for urban biodiversity assessment, monitoring and conservation.

Based on citizen science data collected at the museum Haus der Natur, this study evaluates different landscape classes on a multi-taxonomic level in the urban and peri-urban area of the city of Salzburg. We investigated the biodiversity of nine taxonomic groups on the level of landscape types, which were calculated as hexagonal grid cells using a hierarchical cluster analysis. In addition to the absolute number of species, the relative species richness of the differently urbanised landscape classes was calculated as a complementary biodiversity indicator.

The results are astonishing and show that under certain conditions especially suburban areas can harbour a particularly high species richness for certain taxonomic groups.

In the course of the presentation, the innovative methods of the study will be presented, as they can also be applied to other cities. It will be discussed what needs to be considered when selecting citizen science data for urban biodiversity monitoring and conservation. There will also be a brief outlook on the ecological conclusions of the study regarding their implications for urban planning strategies that actively promote biodiversity.

Key Words: Urban Ecology, urban biodiversity, citizen science, multi-taxonomic, landscape analysis

Urban biodiversity: State of the science and future directions

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Abstract

Since the 1990s, recognition of urban biodiversity research has increased steadily. Knowledge of how ecological communities respond to urban pressures can assist in addressing global questions related to biodiversity. To assess the state of this research field in meeting this aim, members of the Urban Biodiversity Network (UrBioNet) conducted a systematic review of the urban biodiversity literature published since 1990. We obtained data from 1209 studies that sampled ecological communities representing 12 taxonomic groups. While advances have been made in the field over the last 30 years, we found that urban biodiversity research has primarily been conducted in single cities within the Palearctic and Nearctic realms, within forest remnants and residential locations, and predominantly surveys plants and birds, with significant gaps in research within the Global South and little integration of multi-species and multi-trophic interactions. Sample sizes remain limited in spatial and temporal scope, but citizen science and remote sensing resources have broadened these efforts. Analytical approaches still rely on taxonomic diversity to describe urban plant and animal communities, with increasing numbers of integrated phylogenetic and trait-based analyses. Despite the implementation of nature-based solutions across the world's cities, only 5% of studies link biodiversity to ecosystem function and services, pointing to substantial gaps in our understanding of such solutions. This talk will provide suggestions for future urban biodiversity research that encompasses a greater diversity of taxonomic groups and urban systems, focusing on biodiversity hotspots. Implementing such research would enable researchers to move forward in an equitable and multidisciplinary way to tackle the complex issues facing global urban biodiversity.

Key Words: Biodiversity, publication trends, sampling methods, systematic review

Sustainable Gardening Behavior in Urban and Rural Contexts: A Study of Private Gardens Across Settlement Types in Germany

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Abstract

Private gardens can make a valuable contribution to both human well-being and biodiversity - especially in urban areas. However, this potential depends on the behavior of garden owners, whose actions are largely unregulated. Furthermore, little is known about how private gardeners actually behave, as gardens are part of the private sphere.

This paper aims to identify how sustainably private garden owners act, and whether it varies between large cities, medium-sized and small towns, and rural communities. We focus on behavior across all three dimensions of sustainability: enviornmental, social, and economic.

We collected data via the free citizen science app GardenUp, available to iOS users in Germany. Garden owners (n = 434) answered questions about their gardening practices. Environmental sustainability was assessed through 38 questions across three thematic blocks: promoting wildlife, supporting plant diversity, and protecting resources. Social sustainability was captured through 22 questions in two categories: being physically active and enhancing health and well-being. Economic sustainability was approximated via 10 questions under the heading saving money and time.

We used descriptive statistics and ANOVAs to examine variation across settlement types. Some sustainable behaviors were carried out in almost all gardens (89.9% of respondents had insect-friendly perennials), other behaviors were hardly carried out (11.3% had clay trough/puddles). We found significant differences ($p < 0.05$) particularly in the domains of promoting wildlife and saving money and time. For example, garden owners in rural areas were more likely to implement wildlife-friendly measures such as building stone or deadwood piles or incorporating dry stone walls. They also more often conserved water and energy.

Our findings indicate that private gardens can foster sustainable behavior in all dimensions and settings. However, our sample is not representative due to potential self-selection bias. A validation of the data is planned for 2025.

Key Words: Gardens, Dimensions of Sustainability, Citizen Science

Research on the Design Pattern and Network Development of Urban Microhabitat Based on Nature-based Solutions (NbS): A Case Study of Habitat Gardens in Changning District, Shanghai

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Abstract

Background & Aims: Habitat gardens, as a grassroots implementation of Nature-based Solutions (NbS), provide multiple environmental, social, and economic benefits in high-density urban areas of Shanghai. They address critical issues of biodiversity conservation and climate adaptation, and have been formally integrated into several government policies, and highlighted during the United Nations Biodiversity Conference (COP 15). Before large-scale replication through policy, standardizing habitat gardens within the NbS framework is essential to enhance urban ecosystems through the principle of "working with nature," thereby supporting Goal 12 of the Kunming-Montreal Global Biodiversity Framework.

Methods: This paper synthesizes the theoretical framework of NbS and examines the practice of habitat gardens in Changning District, Shanghai. It systematically analyzes the design and operation modes as well as the network construction methods of urban microhabitats, explores the accomplishments and limitations of habitat gardens, and proposes futures scientific research and practical directions for urban microhabitats in high-density urban areas, guided by the national urban biodiversity conservation strategies.

Results: The habitat garden initiative in Changning District, Shanghai explored three key innovations: 1. Strengthened networking scale effect among scattered microhabitats in dense urban areas. 2. Established a model with community governance and active resident participation. 3. A collaborative partnership which benefits all stakeholders. However, challenges remain, including inconsistent biodiversity monitoring, overly focused on residential neighborhoods' green spaces, and inadequate funding plans. As the Kunming-Montreal Global Biodiversity Framework continues to advance, restorations of both urban habitats and ecological networks will become increasingly vital.

Suggestion & Perspectives: Guided by the NbS framework and principles, Cities should establish a cross-departmental and inclusive governance platform to provide support for urban microhabitats and ecological networks. Aim to increase the appeal of NbS and urban biodiversity conservation, three measurements should be implemented, including improving scientific monitoring systems, expanding design patterns across various climate zones, and developing diverse funding mechanisms.

Key Words: micro green space; NbS; microhabitat; habitat garden

From the tropical rainforest to the Mexican desert: Unveiling the role of spatial heterogeneity and urban management type in the conservation of urban biodiversity.

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Abstract

Cities in tropical and subtropical regions are vulnerable to loss of biodiversity and related ecosystem services due to water scarcity, rapid urbanisation and global climate change. At LPAS (Sustainable Anthropic Landscapes Laboratory, Mexico) we conduct research focused on understanding how to design sustainable cities with nature-based approaches in wet and dry urban landscapes. The aim of our presentation is to showcase the research we are doing in urban and peri-urban environments in the state of San Luis Potosi (Mexico). In the first part of our talk, we highlighted the use of multi-taxonomic assessments (birds and invertebrates) to understand how different types of urban management reveal contrasting patterns. While for butterflies and birds the maintenance of large intra-urban parks (> 100 ha) was shown to be important for the conservation of species in cities, this was not the case for terrestrial fauna (ants and beetles). For this groups, we highlight that abandoned urban areas are an important refuge for species native to arid zones. The second part of our presentation focuses on the study of the diversity and structure of medically important mosquitoes in peri- and intra-urban environments in 5 cities of the state of San Luis Potosi, which vary in size and population density. Our main results indicate that urban spatial heterogeneity is an important driver of the dynamics of medically important species in the region. Finally, we conclude that the integration of analytical tools such as remote sensing and the use of artificial intelligence, through the inclusion of inter- and multidisciplinary approaches, is key to understanding urban patterns and therefore to designing sustainable urban landscapes.

Key Words: Urban landscapes, multitaxa approach, urban habitats, ecology of diseases, spatial analysis

How background noise influences escape behaviours on urban birds: A case study in Oviedo (Spain)

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Abstract

The rapid expansion of cities during the 20th century has given rise to environments that differ significantly from their natural surroundings. This has modified certain species to become wildly adapted to urban environments, an adaptation that entails a change in behavior. While the behavioral differences between urban and rural populations have been extensively documented, the underlying factors driving these changes remain less explored. Considering that one of the well-established characteristic of urban areas is the higher level of noise compared to distant suburbs, this study aims to investigate whether urban noise plays a significant role in shaping these behavioral differences. Using the rock pigeon (Columba livia, Gmelin 1789) as a model species and the city of Oviedo (Asturias, Spain) as a test, 18 points were chosen in the city, choosing centric and surrounding areas with different levels of urbanization. In each point, 12 pigeons were studied, measuring their AD (alert distance) and FID (flight initiation distance) when escaping from a human that approached them, and also measuring the background noise at each moment. The results show a clear correlation between both variables (AD and FID) and background noise. However, linear mixed effect tests done to isolate the effect of background noise from the effect of the place itself show that there is a significative effect of changes in background noise towards explaining the changes in AD, but no significative effect when analyzing FID. This means that C. livia individuals do care about the amount of noise when becoming alert of their surroundings but not when fleeing. This discovery sheds light on what factors of urbanization influence bird behavior and in which ways, an important step on achieving sustainable development within cities that minimizes problems between humans and animals.

Key Words: Urbanization, urban ecosystems, animal behavior, abiotic factors, escape responses, ambient noise

How Does China Integrate Biodiversity Conservation into Urban Master Plans of mega and large cities?- A Terminological Framework and Policy Analysis

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Abstract

In accordance with the "Kunming-Montreal Global Biodiversity Framework" and the National Biodiversity Strategy and Action Plan (NBSAP, 2023–2030), China intends to integrate biodiversity conservation into its sustainable development framework through territorial spatial planning reforms, This study investigates the integration mechanisms of the urban master plans for 22 megacities and large cities (population ≥ 500,0000) in China, via policy text analysis, terminological standardization, and case-based validation.

The study constructs a structured terminology database for biodiversity conservation in the urban master plans, categorized into four domains: Core Conservation Objects Category, Boundary-Controlled Areas Category, Ecological Connectivity Function Category, and Conservation Action Strategies Category. By mapping term occurrences across planning goals and sub-goals, the study evaluates the institutional positioning of biodiversity conservation in urban master plans and quantifies the transmission of policy objectives and integration of spatial strategies. Within the 22 selected case cities, 10 of them have issued Local Biodiversity Strategy and Action Plans (LBSAPs). The relationship between urban master plans and LBSAPs is also analyzed.

The study demonstrates that while most cities have included biodiversity conservation in their planning frameworks, significant disparities exist in implementation depth, actionable measures, and inter-policy coherence. Many cities restrict conservation to general goal statements without detailed implementation pathways or measurable indicators, leading to fragmented policy translation. The study offers grounded recommendations to enhance conservation efficacy in urban spatial planning, emphasizing the refinement of indicator systems, strengthened policy enforcement mechanisms, and cross-sectoral collaboration. These insights aim to bridge the gap between strategic intent and operational practice, ensuring that biodiversity conservation is systematically embedded in urban development trajectories to address ecological challenges effectively.

Key Words: Biodiversity Conservation; Territorial Spatial Planning; Urban Master Plans; Terminology System; Policy Integration

Biotic predictors improve range modeling for flagship species in biodiversity conservation planning

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Abstract

Species distribution simulation can identify the key habitats for species protection, which is helpful for the rational utilization of land resources, improves the efficiency of protection, and is of great significance to conservation planning. Species distribution is usually affected by bioclimatic, abiotic and biotic factors, but in existing studies on species distribution simulation for primates, biotic factors are usually not included in the prediction variables. In order to evaluate the role of biotic factors in the simulation of species distribution models for primates, this study took Yunlong County, Yunnan Province in China as an example, and used the distribution of 29 plant species that the Yunnan snub-nosed monkeys, an important flagship species in Yunlong County, feed on as biotic variables, and climate, topography, water bodies, roads, land use types, and settlement distribution as bioclimatic and abiotic variables. Based on the Maxent model, the potential distribution range of the Yunnan snub-nosed monkey was simulated, and two types of models were evaluated: abiotic models and combined models (including bioclimatic, abiotic, and biotic factors). The results of the two scenarios were compared. The study showed that the model incorporating the distribution of food plant species as a biotic variable produced a more accurate representation of the potential distribution range of Yunnan snub-nosed monkeys, compared to the model without this factor. The study suggests the role of food variable in the distribution of animals and can identify the important areas for biodiversity conservation more precisely, which is helpful to optimize biodiversity conservation planning and ecological network planning in such biodiversity hotspot areas.

Key Words: MaxEnt model; biotic factor; Yunnan snub-nosed monkey; biodiversity conservation planning

A Case Study on the Ecological Urban Strategy in Urban-Scale Development: Focusing on the New Town Projects in South Korea

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Abstract

Urban development can be regarded as an opposite concept to ecosystem conservation. However, in regions where development pressure exists due to increasing demand for space utilization, systematic urban development through appropriate planning can prevent reckless development and, as a result, can be a means to minimize ecosystem destruction. In this sense, the cases of new town planning in South Korea, which have been developed at high density, can provide many implications for the concept of an ecological city. In the early days, while new town projects in South Korea were planned with a focus on fast and economically efficient urban development, recent cases are pursuing the creation of an eco-friendly space even at high density urban area. This study conducted a case study on new town projects in South Korea planned after 2000. In particular, the case was analyzed focusing on cases in which ecological cities were put forward as major concepts, such as Songsan Green City, Busan Eco Delta City, and Sejong City. Among the various ecological environment strategies applied to the case cities, this study focused on the proposed ecological design strategy at the urban level, not at the scale of a complex or village level. In addition, a meaningful case was found not only in physical space planning but also in terms of governance in the process of planning a city. Through the results of this study, it is expected to provide various implications for future new town development projects in terms of harmony between urban development and ecological environment.

Key Words: New town project, ecological city, urban scale, governance, ecological strategy

Urban biodiversity and its relation to ecosystem services: A review for Germany

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Abstract

Although the various benefits of nature to humans in urban areas are increasingly known, the role of biodiversity in the provision of ecosystem services (ES) remains unclear. This knowledge is critical to understand how biodiversity and human well-being could be harmonised, especially in urban areas where people's contact with nature can be limited. Furthermore, green areas are often planned considering essentially human needs, often neglecting biodiversity considerations. We argue that insufficient knowledge on the relationships between biodiversity and ES is a major challenge for implementing biodiversity into urban planning and design. In this study, we use Germany as a case study to address this knowledge gap. Through a literature review of scientific and grey literature, we assessed what is the state of knowledge about the relationship between biodiversity and ES in urban areas for Germany, where a large majority of the population is urban. We addressed questions including how relationships between biodiversity and ES are defined in the literature, how well

different aspects of biodiversity such as functional diversity, and different ES categories are represented in the literature, or which indicators are used to define biodiversity-ES relationships. The research was conducted as part of the German Biodiversity Assessment (“Faktencheck Artenvielfalt”). Our review showed that empirical evidence on the relationships between biodiversity and ES in urban areas in Germany is scarce. Furthermore, as most studies have been conducted in larger cities with more than 250,000 inhabitants, knowledge about small and medium-sized cities is even more limited. We discuss the existing knowledge gaps and provide recommendations for research and policy to better support biodiversity - ES relationships in urban areas, and hence urban planning and design.

Key Words: biodiversity, ecosystem services, nature’s contributions to people, nature-based solutions, review, Germany, urban areas

Integrating Public and Manager Perspectives in Urban Biodiversity Conservation: A Case Study of Xiamen, China and Salzburg, Austria

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Abstract

Urban nature supports biodiversity and provides well-being for residents. However, challenges such as rapid urbanization and a growing population have accelerated habitat fragmentation and biodiversity loss. In cities, nature is profoundly influenced by human activities, making effective management essential for biodiversity conservation.

In our study, both managers and the public were involved in the effective management process. We took Xiamen, a highly urbanized forest city, as the case study, with urban forests chosen as the study site. Salzburg, a European city known for fostering green spaces and biodiversity, served as the control group. The study sought to understand residents' perceptions of urban nature and biodiversity, as well as the management measures taken by managers to conserve biodiversity.

The investigation was conducted in 2024 and included field surveys, questionnaires on residents' perceptions, and key interviews with managers. Residents' perceptions were assessed from two perspectives: 1) their preferences for urban nature and 2) their understanding of biodiversity. Meanwhile, biodiversity management measures implemented by managers were evaluated across five aspects: 1) policies, 2) species strategies, 3) gardener training, 4) public participation, and 5) scientific research and collaboration.

Some of the study results are presented: 1) Residents preferred urban nature that was well-managed and visually "tidy", while showing a lower preference for spontaneously growing nature; 2) Residents generally expressed willingness to participate in biodiversity conservation, but most of them lacked knowledge about biodiversity; 3) Managers prioritized ornamental gardening but paid less attention to biodiversity management, and 4) Managers with a higher level of biodiversity knowledge placed greater emphasis on biodiversity conservation in their practices and were more proactive in implementing strategies that enhanced local biodiversity. However, both cities faced a common challenge: the lack of communication between residents and managers on biodiversity conservation. Based on the results, targeted suggestions for enhancing the integrated management practices were also offered by the study.

Key Words: Urban biodiversity, perception, management, urban forest, urban nature

Spatiotemporal Characteristics and Perception Benefits of Avian Acoustic Signatures Along Urban Noise Gradients

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Abstract

With the accelerating pace of global urbanization, the continuous expansion of urban spaces is leading to the fragmentation and loss of natural habitats, posing an increasingly severe threat to biodiversity. As one of the most indicative groups in urban ecosystems, birds not only play vital roles in maintaining ecological functions but also hold significant importance in reflecting urban ecological health status. Based on this, this study focuses on: 1) the spatiotemporal patterns of avian distribution along urban noise gradients, and 2) the perception benefit mechanisms of avian acoustic diversity.

This study identified avian species through passive acoustic monitoring data and simulated bird vocalization soundscapes across different sonotopes to investigate the impact of low, moderate, and high abundance on perception benefits.

The research first employed false-color spectrograms and BirdNet to analyze the spatiotemporal patterns of avian distribution. Furthermore, 7 study sites were categorized into several "sonotope" classes using the Jaccard similarity index. Within each sonotope class, the nine bird species with the highest mean encounter frequencies were identified. Clean bird vocalizations from the xeno-canto database were used to simulate low, moderate, and high abundance acoustic environments, enabling laboratory-based investigation of how different abundance levels influence human perception.

The preliminary findings indicate: (1) Urban soundscapes exhibit distinct spatiotemporal variability; for instance, Zhongshan Park is dominated by insect activity during nighttime hours, while Dongtan Wetland shows significant mallard and magpie activity. (2) Avian species composition demonstrates strong correlation with vegetation typology. For example, Zhongshan Park, Botanical Garden, and the campus constitute a single sonotope, while Zhang-Ma Wetland and Pujiang frog habitat form another distinct sonotope. (3) Bird vocalization perceptual preferences influence perceptual benefits, exhibiting a regulatory effect on electrodermal recovery benefits, thereby impacting the physiological and psychological restorative effects of urban green spaces on the public.

This study integrates bioacoustic ecology and environmental psychology methodologies to explore synergistic pathways that incorporate biodiversity conservation and human wellbeing enhancement in urban planning and management, providing significant theoretical and practical implications for constructing urban ecosystems where humans and birds harmoniously coexist.

Key Words: Urban noise; Avian acoustic signatures; Soundscape ecology; Perceptual benefits; Human-bird coexistence; Acoustic monitoring; Biodiversity

Applying riparian forest restoration and agroforestal techniques as nature-based-solutions for more sustainable cities

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Abstract

In cities, Nature-Based Solutions(NbS) have been increasingly cited in scientific literature and government policies worldwide as an alternative to addressing global environmental challenges. Within this context, on June 11, 2021, the Araucária Project team won the Challenge Campus 2030(Edition 2). A total of 680 teams and 1997 participants from 79 countries took part in this challenge, organized by Agorize in partnership with the United Nations Regional Information Centre(UNRIC) and the Agence Universitaire de la Francophonie(AUF). The main objective of the winning project is to promote sustainability by introducing new perspectives on landscape planning that incorporate NbS. The project was launched on April 12, 2022, and since then, we have been implementing the first prototype at the Sao Paulo State University(UNESP) campus. Key initiatives include creating a network of cycling paths to improve connectivity between main areas of the campus, expanding the agroforest area to increase organic production, and restoring 10 hectares of riparian forest along the nearby river. The experience of developing the Araucária Project highlights the potential of science to generate real-world impact beyond theoretical knowledge and academic publications. Aligned with the 2030 Agenda and the UN Decade on Ecosystem Restoration, the Araucária Project has proven to be fundamental in this process.By integrating knowledge from urban ecology and forest restoration, the project has been successfully applied NbS and tested their potential to enhance urban resilience and reduce disaster risk. We hope to expand this experience to other institutions and cities, fostering broader applications of NbS for sustainable urban development.

Key Words: Green infrastructure, urban sustainability, NbS, urban resilience, urban planning

A Study on Non-Structural Disaster Reduction for Flood Resilience and Stormwater Management—Establishing an Adaptive Transformation Framework for Flood-Resilient Cities

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Abstract

Heavy rainfall brought by typhoons and torrential rain has been constantly reaching new heights. Not only it brings floods to cities which destroy infrastructure, also it causes epidemics, food crises, and even some catastrophic damages. Water has become a global issue that all nations must face. Located in a disaster-prone area, in order to survive, Taiwan is obliged to find ways to cope with water, as well as integrate approaches of water resources management. Therefore, possibility of coexistence between urban and natural hazards should be built up in response to fundamental nature environment dynamics so that human will be able to survive in this ever-changing and competitive environment. Structural measure and non-structural measures are equally important. Unfortunately, neither urban area nor local environmental system can be optimally managed through centralized control. The concept of "resilient city" needs to be introduced to enhance urban adaptability to floods. Based on resilience, this study tries to combine urban resilience and stromwater management to explore possible strategies through urban planning in Taiwan. Regarding the governance structure of flood management in other counties, a flood resilience urban adaptive transformation framework is constructed. This framework interweaves different spatial scales—watersheds, cities, and communities—with various resilience capacities, including reform, adaptation, and absorption. It outlines nine key objectives, such as promoting decentralized rainwater management, enhancing community-based disaster mitigation capabilities, and strengthening public-private sector collaboration. Through non-structural disaster reduction measures, cities can more effectively respond to extreme climate challenges, ensuring long-term safety and sustainable development for both the environment and residents. It is hoped that this framework can serve as a reference for adaptive transformation in regional and urban development in the future.

Key Words: stormwater management, flood, resilience, urban planning, urban design, non-structural mitigation

An Analysis of Climate Change Discourses at National and Regional Levels from a Planning Perspective: The Case of Turkey

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Abstract

Climate change has been a subject of scientific inquiry since the early 19th century (IPCC, 1990). It was first acknowledged as a global issue at the First World Climate Conference in 1979, where the need for international cooperation was emphasized. Since then, climate-related policies have been developed internationally, largely led by developed countries (Gupta, 2010). Although developing countries adopted these policies later (Ravindranath et al., 2002), there is now a global consensus that national frameworks must include strategies to combat climate change for a sustainable future. In this context, spatial planning—as a state tool for guiding settlement development—is increasingly expected to adopt a climate-sensitive perspective. Developing countries tend to be more vulnerable to the adverse impacts of climate change, and their adaptation processes progress more slowly (Beg et al., 2002). This study is motivated by the need to examine climate-focused public policies—particularly those rooted in spatial planning—within the context of developing countries. The aim is to assess how climate change is addressed in Turkey's planning policies, how national strategies are reflected in regional planning practices, and how spatial planning contributes to regional resilience.

The research was conducted in three stages. First, Turkey's climate commitments in international agreements were reviewed and linked to national strategy documents, action plans, and the current development plan. Second, to assess the legal dimension of national strategies, planning-related legislation was analyzed, including Zoning Law No. 3194, the Regulation on Spatial Plans, and the Coastal Law No. 3621, among others. A legal mapping of climate-related provisions was developed. Third, the integration of national climate policies into practice was evaluated through an analysis of 26 NUTS-2 regional plans, and regional climate strategy profiles were created.

Using content analysis, the study focused on the term "climate change" and related concepts such as erosion, drought, flood, and sea level rise. These were examined within legal texts and their relation to planning. Findings reveal the need for a more integrated, multi-scalar approach to climate planning. In Turkey, national strategies remain weakly integrated into planning processes, and legal gaps hinder the translation of climate goals into practice.

Key Words: Climate change, sustainability, legal mapping, public policy, planning

Relevance of soils for nature-based solutions in urban ecosystems

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Abstract

Soils are the basis of life for humans and other organisms and at last for the whole ecosystem. Despite this fact, this non-renewable resource is being destroyed worldwide, whereby humans degrade this basis of life more and more, especially through urbanisation.

For several years the concept of Ecosystem Services is intended to help contain the worldwide destruction of ecosystems by recording and evaluating the services provided by nature and their loss, and thus making them visible to decision-makers. The environmental medium soil, in which different spheres of the ecosystem overlap and various interactions and processes take place, offers essential contributions to Ecosystem Services. In many studies, however, these various contributions are only insufficiently considered, so that the manifold services of soils remain hidden. This applies equally to the relevance of soils for nature-based solutions in cities and urban regions.

The important role of soils and their functions in the landscape budget and the need for preventive protection and sustainable land use are generally accepted, already legally secured in some European countries, and in part implemented in assessment guidelines for the evaluation of soil functions.

Soils represent an important part of a society's natural capital, in which multiple soil functions exist and from which equally multiple benefits accrue to society. This "dividend" continuously flows to people. High pressure on natural capital, which can be described in terms of the example with anthropogenic soil degradation and thus the loss of fertile soils, causes this dividend to decrease significantly. On the one hand protective mechanisms are necessary to preserve natural capital. On the other hand, soils provide a variety of basic functions for specific and practical nature-based solutions. This applies in particular to the urban water balance and urban biodiversity.

The presentation will show how the method of spatial soil function assessment can be used to diagnose soils that are particularly valuable for the implementation of nature-based solutions in urban ecosystems.

Key Words: urban soils, nature-based solutions

Green Relief in the Heat: Evaluating Urban Park Accessibility as a Nature-based Solution for Heatwave Resilience in Karşıyaka, İzmir

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Abstract

Heatwaves have become increasingly frequent and intense climate hazards, particularly affecting urban areas. In cities like İzmir, rising temperatures during heatwaves pose serious risks to public health and the environment. One effective approach to mitigate these impacts is through the enhancement of green spaces. Parks and tree-covered areas play a critical role in reducing the urban heat island effect by providing shade, lowering surface temperatures, and improving air quality. These cooling effects are essential for increasing urban resilience to extreme heat events.

This study evaluates the accessibility of green spaces—specifically parks with at least 50% canopy cover—as a means of heatwave relief in the Karşıyaka District of İzmir. The focus is on whether highly exposed urban populations can access these tree-dense parks during heat events. Urban heat islands formed during the extreme heatwave on July 26, 2023, were mapped using Landsat 8 satellite imagery, combined with building and population data. Parks larger than 500 m² and with over 50% canopy cover were identified as potential cooling areas. Accessibility was assessed by analyzing the number of people and buildings within a 300-meter walking distance of these parks.

The results indicate that 95% of buildings in the district are located in high and extreme heat hotspots, exposing approximately 352,231 people—328,840 in high heat zones and 23,391 in extreme hotspots. The study identified 21 parks meeting the canopy threshold, but these are not evenly distributed across the district. Within a 300-meter radius of these parks are 7,785 buildings, housing around 120,483 people, 91% of whom are still exposed to high or extreme heat.

The findings suggest that the limited number and uneven distribution of tree-dense parks restrict access to cooling spaces for a significant portion of the population. To enhance Karşıyaka's resilience to future heatwaves, the study proposes increasing tree cover in existing parks and expanding the overall green network. These strategies could significantly improve the district's adaptive capacity and offer more equitable access to heat relief.

Key Words: Heatwave, climate change adaptation, green infrastructure, cooling effect, canopy cover

Analysing daily mismatch in urban cooling supply and demand at daytime and nighttime

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Abstract

As urbanisation transforms landscapes and climate change intensifies, urban inhabitants face increasing ecological and social challenges, including heat stress. Green-blue infrastructure (GBI) has been identified as a sustainable strategy for urban heat mitigation, and researchers have analysed the temperature regulation services provided by GBI in cities, precisely the supply, demand, and mismatch of urban cooling. However, previous studies quantifying the mismatch between cooling supply and demand have largely overlooked temporal dynamics. Specifically, both population distribution and temperatures differ markedly between day and night, and temperatures vary by day, necessitating analyses with a high temporal resolution.

This study presents a method to quantify urban cooling supply and demand for day and night, and at a daily resolution, using the city of Can Tho, Vietnam, as a case study. We used a biophysical model to derive city-wide daytime and nighttime temperatures as cooling supply, applied heat stress thresholds to assess daytime and nighttime cooling demand, and then calculated cooling mismatches between supply and demand to generate potential heat stress maps. These maps were later overlaid with daytime and nighttime population distribution data to evaluate heat stress exposure across the study area.

Our findings reveal day-night variations in urban cooling supply, demand and population distribution, driving fluctuations in heat stress exposure. Spatially, heat exposure is concentrated in the city centre, which is densely built-up and has limited access to large green areas. The nighttime exposure shifts more dramatically than the daytime, particularly in low-density built-up areas. In 2023, there were 293 days during which more than 90% of the total population was exposed to daytime heat stress but at night, this number dropped to 100 days, mostly in April and May. These results highlight the need for spatially and temporally explicit GBI planning strategies to enhance urban resilience to heat stress.

Key Words: Urban green-blue infrastructure, Cooling supply-demand, Heat stress, Temporal dynamics

Nonlinear effects of local climate zones interacting with urban functional zones on urban heat islands

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Abstract

Urban renewal plays a pivotal role in mitigating heat island effects by optimizing functional layouts and land-use structures to enhance thermal environments. Previous studies have primarily analyzed urban heat island (UHI) characteristics using isolated Local Climate Zones (LCZs) or Urban Functional Zones (UFZs) at varying scales, leading to limited comparability of findings due to scale effects and overlooking their interactive mechanisms. This study addresses these gaps by examining 31 major Chinese cities, where LCZ and UFZ were systematically delineated at a unified neighborhood scale using multi-source geospatial data. By integrating land surface temperature inversion, the Relative Heat Island Intensity (RHII) index, and employing the Kruskal-Wallis H test alongside spatial statistical methods, we uncover nonlinear response patterns of heat island intensity to LCZ, UFZ, and their synergistic interactions. The results reveal the following: (1) Both LCZ and UFZ effectively capture thermal heterogeneity within identical neighborhood units. Compact mid-rise, low-rise, and large low-rise LCZs exhibited elevated RHII values (e.g., 2.54°C), while open high-rise, mid-rise, and heavy industrial LCZs displayed lower values. For UFZs, commercial, industrial, and public transport zones showed higher RHII, whereas airports, educational/research, and ecological zones demonstrated reduced intensities. LCZ outperformed UFZ in characterizing heat island variability, with greater inter-class divergence and smaller intra-class fluctuations. (2) RHII was co-driven by LCZ and UFZ through nonlinear interactions. Cross-classified combinations expanded the heat island intensity range to −2.58°C–4.94°C, exceeding individual extremes of LCZ (2.54°C) and UFZ (1.41°C). High-RHII LCZ-UFZ pairs (e.g., compact low-rise zones combined with industrial areas) amplified heat island intensity to 3.62°C, surpassing standalone maxima. Conversely, low-RHII combinations (e.g., open high-rise zones paired with ecological areas) formed localized cold islands, reaching a minimum of −2.6°C. This study pioneers the quantification of LCZ-UFZ interactions under unified spatial units, revealing nonlinear superposition mechanisms that challenge conventional single-category approaches. The findings provide a scientific foundation for integrating morphological and functional synergies into urban renewal strategies, offering targeted solutions for heat island mitigation.

Key Words: Urban heat island; Local Climate Zones (LCZ); Urban Functional Zones (UFZ); Nonlinear interactions; Urban renewal

NBS for for better climate adaptation in the face of the flood risk: the case of the Greater Bay Area in China

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Abstract

Scholars have repeatedly cautioned that cities across China's Greater Bay Area (GBA) face severe, systematically underestimated flood risks. To address this gap, we propose a scenario-based Strategic Environmental Assessment (SEA) framework to evaluate three adaptation strategies under climate change: 1) a conventional urban development approach (non-Nature-based Solutions, non-NbS); 2) NbS 1.0, prioritizing arable land conservation for food security; and 3) NbS 2.0, enforcing stringent ecological protection regulations.

The analysis employs a two-stage methodology. First, land use patterns for 2030 and 2050 are projected using the patch-generating land use simulation (PLUS) model, which accounts for spatial development policies, environmental constraints, and socioeconomic trends. Second, these projections are integrated with sea-level flood extents under IPCC's RCP 2.6 (low emission) and RCP 8.5 (high emission) scenarios to quantify impacts on critical ecosystems (e.g., wetlands, forests) and urban areas. The study identifies methodological improvements for future research, including incorporating 2020 GDP data and dyke infrastructure effects on flood mapping.

Key findings demonstrate that NbS strategies significantly reduce regional flood exposure, particularly under RCP 8.5:

- **Metropolitan divergence**: NbS 2.0 reduces built-area flood risk by 18-22% in Shenzhen, Hong Kong, and Macao, while NbS 1.0 shows negligible impact (<5% risk reduction).
- **Multi-city efficacy**: Both NbS versions achieve 12-25% risk reduction in Dongguan, Guangzhou, Huizhou, Jiangmen, Zhuhai, Zhaoqing, and Zhongshan, with NbS 2.0 outperforming NbS 1.0 by 8-10 percentage points across both timelines.
- **Temporal trade-offs**: Foshan exhibits contrasting results—NbS 2.0 reduces risk by 15% in 2050 versus 9% in 2030, suggesting strategy effectiveness correlates with long-term ecological maturation.

This study quantifies how NbS strategies differentially mitigate flood risks across space, time, and emission scenarios. The framework enables policymakers to 1) prioritize NbS 2.0 in high-density coastal cities, 2) adopt hybrid NbS approaches in mid-sized cities, and 3) schedule phased implementations where ecological strategies require longer-term benefits. By linking land-use planning with climate projections, the analysis provides actionable pathways for enhancing the GBA's flood resilience while balancing developmental and ecological priorities.

Key Words: flood risk management, nature based solutions, scenarios analysis

Integrated urban green and blue infrastructure network to mitigate surface urban heat island effect

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Abstract

Urban heat island (UHI) effect has been shown to be exacerbated by climate change and rapid urbanization globally. The challenge lies in effectively utilizing nature-based solutions to mitigate UHI. Urban green and blue infrastructure, as a type of nature-based solution, plays a significant role in reducing the UHI effect. However, the integration of urban green and blue infrastructure into a cohesive network for effective UHI mitigation remain unclear. In this presentation, I will first discuss the individual mitigation effects of green and blue infrastructure on UHI by evaluating their mitigation effects quantified by sets of indices, including the maximum local cooling intensity, maximum cooling distance, maximum cooling area, and cooling efficiency. Then, to investigate the interactive effects of urban green, blue, and grey infrastructures on UHI utilizing geographical weighted regression analysis. Subsequently, I will explore strategies for tradeoff between urban green, blue, and grey infrastructures to target surface temperatures reductions at 0.5℃, 1.0℃, and 1.5℃, respectively in urban areas while considering the spatial patterns of green-blue-grey infrastructure at the city scale. Finally, an integrated network of green (including pocket urban green spaces, urban parks, urban green corridors) and blue (such as, urban rivers, urban lakes, small surface water bodies) infrastructure will be proposed across the entire city of Shanghai to achieve the goals of mitigating UHI.

The findings presented here can provide valuable insights by quantifying the mitigation effects of urban green and blue infrastructures on urban heat island effect, thereby supporting comprehensive urban landscape planning and design to enhance urban sustainability and resilience to climate change.

Key Words: Green space, blue space, infrastructure network, urban heat island effect, nature-based solutio

Exploring the impact of urban green space morphology on heat health risks： A case study of Milan

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Abstract

Global climate change has led to frequent extreme high temperature events, particularly in densely populated large cities with severe urban heat islands. Urban green spaces play an increasingly important role in fostering a healthy living environment. Urban green spaces can effectively mitigate urban thermal environment problems and respond to the increasingly severe threat of high temperature heat waves to public health. This study explores the impact mechanism of urban green morphology on thermal health risks to reduce thermal health risks and promote the healthy and sustainable development of cities.

Taking Milan as a case study, this research collects data on urban green space morphology and retrieves land surface temperature (LST) using Landsat remote sensing imagery. It then analyzes the spatiotemporal relationship between green space morphology (greening degree, fragmentation, connectivity, aggregation, and shape) and heat wave high temperature, incorporating mediating factors such as socioeconomic and demographic structures. Finally, the "green space morphology-heat wave high temperature" model is constructed using the structural equation model (SEM) method to qualitatively and quantitatively analyze the high temperature spatial pattern of 9 regions in Milan, identify the specific impact path, regulatory effect and intervention threshold of each element of green space morphology on thermal health risks, and draw a map of Milan's high, medium and low thermal health risk levels.

Based on the characteristics and distribution of green space morphological elements at various levels of thermal health risk, targeted space optimization strategies are proposed.
In high-risk areas for thermal health, green infrastructure is arranged in strips to form urban ventilation corridors in combination with building layout and streets. Green roofs and sunshade facilities are arranged in medium-risk areas for thermal health. In low-risk areas for thermal health, the opening hours of public buildings can be extended, and space can be vacated to build new parks and green spaces. This provides scientific guidance to support decision-makers in coping with the risks of high-temperature heat wave disasters and enhancing urban resilience and climate adaptation planning.

Key Words: Green space morphology; High temperature; Heat health risk; Structural equation model; Climate adaptation

Who are these trees for? Quantifying the relationship between climate regulation benefits of green infrastructure and number of urban users

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Abstract

Over the past decades, intense urbanization processes have led to a significant reduction in green and open spaces in cities, diminishing the potential of urban environments to mitigate the negative effects of climate change. Urban heat islands and global warming pose serious hazards to human health. As the urban population continues to grow, an increasing number of people will be exposed to heat-related illnesses.

Green infrastructure is the primary provider of ecosystem services in cities and plays a crucial role in regulating the urban microclimate and mitigating the urban heat island effect. The amount, location, and spatial configuration of green infrastructure are key factors for planners and designers aiming to maximize its climate regulation potential and thereby extend related benefits to the greatest number of residents and city users.

Various factors and constraints influence the cooling potential of green infrastructure and how these effects can benefit both the physical elements of the urban environment (e.g., streets, sidewalks, squares, parks) and the people who use these spaces daily.

This paper investigates these factors by proposing a method to quantify the potential benefits and beneficiaries of new green infrastructure scenarios for climate regulation. First, greening scenarios are designed and simulated using the UMEP model. Second, the potential beneficiaries of these scenarios are assessed through a GIS-based dynamic density analysis of the most relevant urban functions and activities, which serve as proxies for the number of people moving through the city to reach these destinations.

The case study focuses on the city of Catania in southern Italy, characterized by a hot, dry Mediterranean climate and recently affected by intensified periods of extreme heat.

Results show that the temperature reductions achieved through the greening scenarios, while spatially limited, can extend beyond the modified areas depending on tree placement and street morphology. These findings demonstrate how greening scenarios can be strategically designed to maximize the benefits of urban trees throughout the day.

Key Words: climate simulation, density, urban planning

Urban green spaces provide unequal cooling benefits across diverse neighborhoods in Switzerland

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Abstract

As climate change accelerates, disparities in heat exposure are emerging as a critical public health concern—even in affluent, mountainous countries like Switzerland. Urban greenspaces are key to mitigating the urban heat island effect, improving livability, and promoting health, yet their cooling benefits may not be equitably distributed.

This study explores socio-demographic inequalities in both heat exposure across municipalities, and cooling services at the individual level for over 7 million residents in Switzerland. Heat exposure is assessed at the municipality level using a multidimensional framework that integrates land surface temperature (30 m), projected air temperature (100 m), frequency of heat warning days, and heatwave probability. Meanwhile, cooling services are estimated at the individual residential level using the urban-corrected Soil-Canopy-Observation of Photosynthesis and Energy Fluxes (u-SCOPE) model. This model uses hourly reanalysis climate data, 1 m-resolution tree canopy maps, leaf area index, and habitat data to calculate greenspace-derived cooling at 10 m resolution during extreme heat events.

Municipality-level analysis reveals that wealthier areas are often more heat-exposed due to their location in densely urbanized lowland regions. Yet municipalities with higher proportions of residents receiving social assistance or with greater shares of foreign nationals experience consistently greater heat exposure across all indicators. While the 65+ population generally resides in cooler municipalities, those aged 80 and above are slightly more exposed.

At the individual level, we find obvious disparities in access to greenspace cooling. Foreign residents, individuals aged 80+, and people in the lowest socio-economic quartile receive significantly less residential cooling during heat extremes. Among foreign nationals, the type of residence permit matters, individuals with short-term permits (e.g., permit L) have the lowest access to cooling, while those with longer-term or permanent permits benefit from substantially better conditions.

These findings challenge the assumption that national wealth ensures universal climate resilience. They underscore the need for localized, demographically sensitive urban landscape planning strategies that target both intra-urban inequalities and vulnerable populations, particularly the elderly and migrants, in order to build effective, equitable climate resilience.

Key Words: urban green space, cooling benefits, heat exposure, inequalities

Unlocking Green Potential: Urban Vacant Land and Nature-Based Solutions for Climate Resilience in Latin American Cities

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Abstract

Latin American Cities (LAC) are facing the effects of climate change in a context of increasing social inequality and disparity conditions, which altogether, makes LAC hot-spots of vulnerability. Alongside these challenges the phenomenon of Urban Vacant Land (UVL) is present in many of these cities where it accounts an important portion of land. For example, In Portoviejo, Ecuador, UVL range from 30% in expansion areas to 3% in informal settlements; on the other hand, in Cuenca, Ecuador, UVL sum up to 25,5% of all urban lots, of whom 21.63% is in high risk of flooding or landslide. UVL refers to unused or abandoned urban land and urban wild green spaces, irrespective of ownership, excluding protected areas and existing green infrastructure. Its presence is often linked to deficiencies in urban planning and typically carries a negative connotation. Nevertheless, UVL, if repurposed correctly can potentially improve cities capacity to address climate and social related challenges altogether. Studies have shown that repurposed UVL around the world can provide climate change mitigation through enhancing green infrastructure and ecosystem services, climate change adaptation and resilience through heat island effect control and storm-water attenuation, conserving and improving biodiversity in ecosystems by providing new habitat, promote reconnection of citizens to nature and serve community needs and contribute to community development.

Nevertheless, while many LAC are already implementing NBS to reduce climate vulnerability, mitigate Climate Change and protect biodiversity while addressing social challenges, a significant gap between goals and actual uptake persist. Leveraging the abundance of UVL in LAC can provide readily available space for implementing NBS within the urban environment, facilitating a broader and more impactful adoption of these solutions.

This research investigates how to enable cities to effectively implement NBS, focusing on: (1) fostering experience and knowledge sharing among stakeholders, (2) developing appropriate policy guidelines and instruments, and (3) generating specific knowledge to address challenges in NBS implementation, especially within UVL.

Key Words: Urban Vacant Land, Nature-Based Solutions, Climate Change Adaptation, Climate Change Mitigation, Biodiversity Gain, Latin American Cities.

The human climate niche

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Abstract

All species have an environmental niche, and despite technological advances, humans are unlikely to be an exception. Here, we demonstrate that for millennia, human populations have resided in the same narrow part of the climatic envelope available on the globe, characterized by a major mode around ∼11 °C to 15 °C mean annual temperature (MAT). Supporting the fundamental nature of this temperature niche, current production of crops and livestock is largely limited to the same conditions, and the same optimum has been found for agricultural and nonagricultural economic output of countries through analyses of year-to-year variation. We show that in a business-as-usual climate change scenario, the geographical position of this temperature niche is projected to shift more over the coming 50 y than it has moved since 6000 BP. Populations will not simply track the shifting climate, as adaptation in situ may address some of the challenges, and many other factors affect decisions to migrate. Nevertheless, in the absence of migration, one third of the global population is projected to experience a MAT >29 °C currently found in only 0.8% of the Earth's land surface, mostly concentrated in the Sahara. As the potentially most affected regions are among the poorest in the world, where adaptive capacity is low, enhancing human development in those areas should be a priority alongside climate mitigation. The human climate niche concept is also useful for estimating climate change impact on humanities in a non monetary term. By end-of-century (2080–2100), current policies leading to around 2.7 °C global warming could leave one-third of people outside the niche. Reducing global warming from 2.7 to 1.5 °C results in a ~5-fold decrease in the population exposed to unprecedented heat.

Key Words: climate warming, climate migration, climate change, climate niche

Co-benefits of sponge cities for their mainstreaming

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Abstract

Sponge cities are the talk of the town as a response to increasing climate change and prolonged drought in much of the world, particularly in urban areas. The sponge city integrates flood control and drainage, and it can effectively relieve the pressure of urban flooding, namely prevent floods and other natural disasters while storing water for periodical droughts with water shortage. Green-blue elements just as swales, tree-drains, green roofs and facades help to evaporate, store and infiltrate the rainwater, which strongly reduces the outflow and saves water in the system.

The benefits of water-sensitive surfaces are scientifically well-documented and can be implemented in virtually any urban design. However, to date there are few truly successful examples of sponge cities in practice, and sponge city related conversions and surface changes in cities play a minor role - sealing continues and the focus is on individual lighthouse projects. In addition, cities identified a wide range of challenges - technical, physical, regulatory, financial, community and institutional - as barriers to Sponge City implementation.

This presentation is dedicated to the multiple co-benefits associated with the Sponge City, ranging from air cooling, air pollution control, quality of life and health to the preservation and enhancement of urban biodiversity. Recognising these co-benefits and factoring them into the cost and effort of implementing a Sponge City can definitely be beneficial when mainstreaming this important water sensitive measure.

In my presentation, I would like to highlight the co-benefits of implementing Sponge City, illustrated by my own research examples, and argue that Sponge City can be designed in existing built-up areas and housing estates and does not at all require new urban districts as sometimes argued.

Key Words: sponge city, water-sensitive design, co-benefits, mainstreaming

Development of a Toolbox for the Design and Sustainability Impact Assessment of Bioswales Using Digital Tools: A Case Study of Breitscheidstrasse, Stuttgart

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Abstract

Modern cities are increasingly facing the consequences of climate change and urbanization, including stormwater runoff, flooding, and a lack of green permeable surfaces. Bioswales, as a component of Sustainable Drainage Systems (SuDS), represent an environmentally sustainable solution for managing rainwater, while simultaneously promoting biodiversity and improving the quality of the urban environment.

This study presents the development and testing of a specialized toolbox for bioswales' design and sustainability impact assessment, utilizing digital modeling tools (Autodesk Civil 3D and InfoDrainage). The research includes a project in which various SuDS elements were initially evaluated using the ecosystem services concept, to determine their ecological, social, and functional contributions. Based on this analysis, bioswales were identified as the most suitable solution for the urban context under consideration.

The toolbox was applied to a real site — Breitscheidstrasse in Stuttgart, where the bioswale design was developed according to site-specific characteristics (such as topography, soil type, and drainage requirements) and the project’s goals, such as reducing runoff and increasing urban resilience.

Simulation results conducted in InfoDrainage demonstrated that the implementation of bioswales significantly reduces surface runoff volumes under simulated storm conditions (35 mm/h rainfall intensity over six hours) and provides additional social and ecological benefits. The developed toolbox includes key performance indicators (KPIs) such as water retention volume, infiltration characteristics, peak flow reduction, landscape integration, and sustainability potential.

The proposed approach can be adapted to different urban contexts and serves as a practical guide for professionals in the field of sustainable stormwater management. The study demonstrates how digital technologies can support the transition to water-sensitive cities, combining engineering precision with principles of sustainable urban planning. It outlines key design parameters, sustainability indicators, and a replicable methodology for integrating bioswales into urban stormwater infrastructure.

The study contributes to the development of water-sensitive cities by offering a practical tool for integrating nature-based solutions into urban stormwater systems. The storm simulation demonstrates the effectiveness of one SuDS element — bioswales — in a real urban context.

Key Words: Bioswales, Sustainable Drainage Systems (SuDS), Water-sensitive cities, Urban stormwater management, Digital tools, InfoDrainage, Civil 3D, Toolbox, Ecosystem services, Runoff reduction, Infiltration rates, Urban resilience, Nature-based solutions (NBS), Sustainability assessment Urban resilience, Nature-based solutions (NBS), Sustainability assessment

Integrating AI and Multivariate Analysis for Urban Water Quality Management: A Case Study from San Joaquin Valley

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Abstract

Urban centers play a crucial role in managing ecological crises through sustainable practices, especially in the realm of water resource management. As cities expand, they exert significant pressures on local ecosystems, making urban ecology central to achieving sustainability. This study presents an integrated approach using artificial intelligence (AI) and multivariate data analysis to predict and enhance water quality in the San Joaquin River (SJR), California—a vital urban resource affected by both urban and agricultural demands. Employing a comprehensive dataset, the research applies advanced machine learning techniques, including elastic net, logistic regression, and support vector machines, complemented by explainable AI (XAI) methodologies to transparently interpret the predictive models. These tools assess water quality parameters across SJR stations, which are crucial for the sustainability of urban ecosystems. Discriminant analysis further validates the significance of these results. Specifically, our models identify physicochemical parameters such as dissolved oxygen levels and turbidity as predictive indicators of water quality, which are essential for targeted management strategies in urban settings. The use of XAI-SHAP enhances the transparency and interpretability of the AI models, making the findings accessible for urban planners and environmental agencies. Managing these water quality parameters is essential for urban planners and developers who need to ensure that infrastructure developments do not negatively impact water resources. This approach not only aids in precise water quality monitoring but also supports strategic decision-making processes to maintain the river within safe ecological thresholds. By integrating technological innovations with environmental management, this research advances the discourse on urban ecology and contributes actionable insights for sustainable urban development. Our findings highlight the importance of adopting AI-driven solutions to manage the complex dynamics of urban ecosystems effectively.

Key Words: Urban Ecology, Water Quality, Artificial Intelligence, Multivariate Analysis, Sustainability, Explainable AI

Do stakeholder preferences really matter in blue-green infrastructure planning?

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Abstract

This research investigates whether stakeholder preferences are truly critical in planning blue-green infrastructure (BGI) and explores the necessity of local reference elicitation processes. Planning BGI requires a multi-disciplinary approach to address co-benefits and diverse expertises. Geographic Information Systems (GIS) combined with Multi-Criteria Decision Analysis (MCDA) models enable the visualization of site performance across multiple objectives, spatial datasets, and weighted criteria. However, these models are subject to input uncertainties, including stakeholder preferences, which can be influenced by background and bias. Preferential uncertainties include intra-criteria (reflecting site performance for individual objectives, represented by value functions) and inter-criteria (reflecting the relative importance of different objectives). Another source of uncertainty is model uncertainty, relating to simplified representation of reality in model structure, such as the aggregation rule used to obtain the final suitability scores.

This research employs uncertainty analysis (UA) and sensitivity analysis (SA) to explore preferential and model uncertainties in GIS-MCDA. The goal is to assess overall stability, identify influential input parameters that impact the variability of BGI suitability maps, reduce uncertainty through improved parameter calibration or data resolution, and evaluate the necessity of detailed elicitation of stakeholder preferences. Uncertainty maps illustrate the variability in suitability scores, while sensitivity maps highlight the parameters with the greatest influence on the results.

The main goal of this research is to emphasize the importance of conducting a robust and transparent process for eliciting stakeholders' preferences. This analysis will clarify whether stakeholder preferences significantly impact the outcomes, highlighting the need for their active participation when their input strongly influences the results. The insights gained will support municipalities in strategic BGI planning by clarifying the effects of weighting decisions, prioritizing key datasets, and refining stakeholder engagement processes. This study ultimately contributes to developing reliable decision-support tools for water-resilient urban planning.

Key Words: Sensitivity Analysis; Planning Support System; GIS-MCDA; Stakeholder preferences; Blue-green infrastructure

Urban Flood Exposure and Disaster Risk in Alsancak, İzmir: Insights from a 500-Year Flood Scenario and Nature-based Adaptation Strategies

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Abstract

In recent years, the frequency and intensity of fluvial floods have increased significantly due to climate change, which has intensified extreme rainfall events. This trend poses growing risks to densely populated and highly urbanized areas, making urban flood risk a critical consideration in city planning and disaster risk management.

This study examines the impacts of flooding caused by the Meles Stream in the Alsancak District of Konak, one of the most densely built-up areas in İzmir. It aims to answer the question: "How many buildings and what percentage of the vulnerable population are exposed to a 500-year flood event occurring over a 24-hour period?" To assess potential exposure, a 500-year flood scenario was modeled using the HEC-RAS 2D flood simulation tool.

The results show that floodwaters extend across 35.24 hectares, advancing from the river channel into the urban core. Approximately 70% of Alsancak's population (14,621 people) is exposed to flooding, including 4,466 individuals identified as part of vulnerable population groups. Additionally, 72% of the district's 2,560 buildings are affected. These impacts pose serious risks to daily life, infrastructure, and public safety.

Given the scale of exposure, the findings highlight the urgent need for localized adaptation strategies. To improve flood resilience in Alsancak, the study recommends the implementation of site-specific Nature-based Solutions (NbS) at multiple scales. Potential NbS strategies include the restoration of riparian zones, integration of permeable surfaces, creation of urban wetlands, and expansion of green corridors. These measures can reduce surface runoff, slow floodwater progression, and increase infiltration, thereby mitigating flood risks while contributing to long-term climate adaptation.

Key Words: Fluvial flooding, vulnerability, sensitive populations, Nature-based Solutions

Pathways for transformation in urban stormwater management – learning from existing experiences in Banská Bystrica (Slovakia)

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Abstract

Sustainable Drainage Systems (SuDS) are solutions that use and mimic the site's natural processes (infiltration, evapotranspiration, filtration, retention, reuse) for the handling of stormwater. Their implementation is argued to constitute a crucial strategy to address the unsustainability of conventional stormwater management practices. Their potential to bring about change depends, however, on the socio-technical approaches used for their implementation. A need exists for changes in the knowledge, mindset and felt powerfulness of stakeholders, along with in the prevailing governance system and the technical considerations made. Despite the importance of these changes, the engagement of researchers in socio-technical analyses of the SuDS phenomenon remains limited. In the case of Slovakia, to the knowledge of the authors of this study, no socio-technical analyses of the SuDS phenomenon have been carried out to date.

The aim of this study is to assess socio-economic conditions facilitating and hindering SuDS implementation in a medium-sized Slovak city. The city of Banská Bystrica serves as a case study. For this purpose, interviews with key professionals in the public and private sectors were conducted between March and July 2024. An online questionnaire was simultaneously carried out targeted at residents.

Findings show numerous system lock-ins preventing the widespread implementation of SuDS in Banská Bystrica. Shortages in financial resources/support, lack of awareness on the topic, and power plays between the interests of different stakeholders seem to be particularly hindering the transformation process. Limited felt capability to contribute to change was also expressed by most interviewees and surveyed residents. The most promising windows of opportunity for change appear to be the increasing emergence of motivated stakeholders and individuals with a progressive mindset and of new laws and funding schemes. SuDS are the preferred stormwater management option not only for many professionals in the public and private sectors in the city, but also for most urban residents surveyed. This is despite the limited knowledge about sustainable stormwater management practices expressed by most of the latter. To drive change and make SuDS implementation widespread, the following strategies appear particularly important: raising awareness and providing further economic and technical support for the implementation of SuDS.

Key Words: Sustainable Drainage Systems (SuDS); socio-economic factors; change; Banská Bystrica

Can we support strategic implementation of Blue-Green Infrastructure? Scaling and systematic user evaluation of Spatial Suitability Analysis Tool (SSANTO)

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Abstract

To create a truly water sensitive city, strategic planning of Blue-Green Infrastructure needs to capture the full potential of benefits (e.g., water management, urban cooling, recreation) while fitting seamlessly in urban landscapes, contested for space. Spatial Suitability Analysis Tool (SSANTO) uses GIS based Multi-Criteria Decision Analysis (MCDA) to support strategic planning. It creates intuitive suitability maps for BGI implementation by combining "objective" spatial information with "subjective" stakeholder preferences about the relative importance of objectives (e.g. "reduce flooding" vs "increase recreational value").

SSANTO was first conceived in Melbourne in 2019 and has since been redeveloped, used and tested in diverse case studies around the world, including Australia, Canada, Colombia, United Kingdom and Switzerland. As SSANTO's user community is growing, it was deployed as an open access online tool in spring 2025, after significant improvements and testing.

As all Planning Support Systems, SSANTO faces the challenge of overcoming the "implementation gap", the divide between high perceived usefulness and low implementation. As SSANTO's user community expands, potentially accelerating after online publication, this research aims to evaluate its "quality" from three perspectives: usability, correctness and utility (cite). A scale-up approach was developed to reach a first pool of municipal users in Quebec, Canada: (i) internal evaluation of the tool based on criteria related to innovation scale-up factors, (ii) experimental (hands-on) sessions with municipal users in two case study cities followed by feedback questionnaires, (iii) large-scale dissemination webinar, followed by the release of the tool online and subsequent surveys.

We gather qualitative and quantitative user data through three survey interventions, one before, one during and one after use. We ask all new SSANTO users to fill out these surveys in return for their use of the tool. We will analyse the survey results through the PSS evaluation framework. This structured

evaluation will help us to identify and leverage the tool's strengths and identify barriers that prevent uptake. This information will (1) serve as starting points for continues improvement and development of SSANTO going forward and (2) provide invaluable knowledge for PSS research to close the implementation gap.

Key Words: Blue-Green Infrastructure, Planning Support Systems, GIS-MCDA, Water Sensitive City

Transforming Urban Water Management: The Icyano Index as a Guiding Tool for Adaptive Treatment

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Abstract

Managing freshwater systems is increasingly challenging for global water utilities as cyanobacterial blooms rise in frequency and intensity. In response, we developed a water quality index, known as Icyano, that employs conventional measurements to assess toxic cyanobacterial hazards and guide the selection of appropriate treatment technologies. The Icyano index is founded on three critical parameters: chlorophyll-a concentration, cyanobacterial cell count, and total nitrogen content. Our study indicates that reservoirs achieving favorable Icyano scores consistently rely on direct filtration technology, suggesting that such systems maintain higher water quality levels. Conversely, reservoirs with medium Icyano classifications predominantly use a combination of pre-treatment units followed by direct filtration to manage deteriorating water quality. In cases where reservoirs are classified as bad or very bad, water treatment plants are compelled to adopt more intensive approaches, either by integrating pre-treatment with direct filtration or by employing a complete cycle treatment technology.

The findings suggest that conventional direct filtration may fall short of current water quality guidelines when water bodies experience adverse conditions, primarily driven by increases in toxic cyanobacterial blooms. Accordingly, water treatment managers should consider transitioning from direct filtration to incorporating pre-treatment measures as the Icyano index rises. Our results underscore the importance of recalibrating financial priorities toward advanced and adaptive water treatment solutions. This approach not only enhances water quality but also fosters the resilience and efficiency of urban water systems, ensuring their capacity to deliver safe, high-quality water amid rapidly evolving environmental challenges and climate change impacts. Ultimately, embracing the Icyano index secures sustainable urban water futures.

Key Words: Urban Water Management, Cyanobacterial Blooms, Icyano Index, Adaptive Water Treatment

The Role of Urban Soil Health in Enhancing Blue-Green Infrastructure and Nature-Based Solutions

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Abstract

As cities worldwide invest in sustainable infrastructure to combat climate change and improve urban livability, the foundational role of soil is too often neglected. Urban soil health is a critical factor in the success of Blue-Green Infrastructure (BGI) and Nature-Based Solutions (NBS). Contaminated, compacted, or degraded soils limit the ability of urban green spaces to support vegetation, regulate water, and enhance biodiversity. Without healthy soils, urban trees struggle to establish, rain gardens fail to retain stormwater effectively, and green roofs underperform in mitigating urban heat. This presentation explores how soil properties influence the effectiveness of BGI, from stormwater management in bioswales to carbon sequestration in urban forests.

Key challenges, including heavy metal contamination, soil compaction, and declining organic matter, pose significant barriers to the success of NBS. Addressing these issues requires soil remediation strategies such as engineered soils, compost amendments, and biochar applications to enhance urban soil functionality. Case studies from various urban sustainability projects demonstrate the importance of integrating soil health assessments into city planning. Examples include initiatives where bioswales with specially designed soils have significantly improved stormwater retention and reduced runoff pollution, projects where increasing soil permeability has helped mitigate urban flooding, and efforts to restore degraded vacant lots through targeted amendments, resulting in enhanced vegetation growth and community benefits.

By prioritizing urban soil restoration, cities can create more resilient landscapes, improve public health, and enhance climate adaptation strategies. This talk calls for a multidisciplinary approach—bridging soil science, urban planning, and environmental policy—to develop more effective and lasting solutions. Recognizing urban soils as a foundational element of BGI is essential for designing truly sustainable and livable cities.

Key Words: Urban Soil; Soil Health; Stormwater Management; Contamination; Remediation

From city to countryside: unraveling the long-term complex effects of urbanization on vegetation growth in China

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Abstract

The urban environment is the "natural laboratory" of the global ecosystem, and it has complicated effects on vegetation growth, including direct effects (land use transformations) and indirect effects (climatic environment changes). However, the long-term responses of vegetation to urbanization and its associated controlling factors across different spatial scales, from pixels to regions, remains unknown. Here, we unraveled the dual influence of urbanization on vegetation growth and its potential drivers along the urban development gradients in China with satellite observations of leaf area index (LAI) during 2000-2020. The results showed that 65.68% of pixels in whole China exhibited an increasing trend in vegetation growth, with prominent greening (as indicated by LAI increases) in rural background areas (0.198/10a), significant greening in urban core areas (0.0343/10a), and significant browning in suburban areas (-0.0391/10a). As the process of urbanization intensified, the relationship between urbanization and vegetation growth became increasingly complex, transitioning from linear to non-linear interaction. The overall direct effects of Chinese cities were negative and increased annually. Meanwhile, the positive indirect effects of urban environments on vegetation growth initially declined and then recovered. Cities with high urbanization level (urbanization rate, ULp > 70%) had higher indirect effects (0.24%) and growth offsets (0.98%) than that with moderate (ULp = 60% - 70%) and low urbanization levels (ULp < 60%) (0.18%, 0.10%). In economically developed cities, land use changes from construction to vegetation, influenced by urban policies and management strategies, positively impacted urban greening. Overall, more urbanized cities (ULp > 70%) experienced vegetation growth enhancement due to more intense land use changes, whereas less urbanized cities (ULp < 70%) showed the opposite trends. Understanding the direct and indirect effects of urbanization on vegetation growth is crucial for devising effective urban planning and environmental conservation policies. It can help guide future urbanization processes and minimize adverse effects on the natural environment.

Key Words: Vegetation growth, Urban-rural gradients, Urbanization, Direct and indirect effects, LAI, China

Building Resilient Cities with Inclusive Nature-Based Solutions to Facilitate a Just Sustainability Transition

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Abstract

In recent decades, nature-based solutions (NBS) have gained recognition as a practical approach to addressing sustainability, resilience, and urban planning challenges, integrating principles from ecosystem-based approaches, ecosystem protection, and blue-green infrastructure (BGI). There is a strong evidence of NBS effectiveness in addressing various challenges faced by cities today. By leveraging natural processes and functions of ecosystems, NBS offer cost-effective, multifunctional urban solutions that provide environmental, social, and economic benefits while promoting sustainability and resilience thus contributing to transformative change. However, while much research has focused on the scientific and technological aspects of NBS, less attention has been given to inclusivity and justice in their design and the distribution of their benefits. These aspects are crucial to ensure that NBS are equitably planned and implemented, avoiding the reinforcement of existing inequalities. Based on a literature review and participation in various NBS-related projects (CONNECTING Nature*, RECONECT**, EmpowerUs***), this study demonstrates various types of NBS as inclusive socio-ecological practices since they: 1) address both environmental and social challenges by integrating ecological goals with community needs, 2) engage local communities in the planning and implementation processes, 3) ensure equitable distribution of benefits across diverse groups; 4) are well adapted to specific local contexts, making NBS socially accepted and inclusive, thus contributing to urban resilience. The study proposes guidance for practitioners to design inclusive NBS as socio-ecological practices that support just sustainability transitions. The guidance outlines criteria and requirements for planning, designing, implementing, and monitoring NBS to ensure equity and justice, promoting the principle of "building with nature and people". The proposed guidance is built around four key aspects of inclusivity in NBS co-creation: capacity building, stakeholder involvement, participatory design, and the equitable distribution of benefits. By following this guidance, NBS can foster more inclusive, equitable, and sustainable cities and communities, contributing to social justice and environmental resilience.

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**EU H2020 project “RECONECT: Nature-based solutions for hydro-meteorological risk reduction” (no.776866)

***EU H-Europe project “EmpowerUs: Socio-economic Empowerment of coastal communities as users of the sea to ensure sustainable coastal development” (no.101059957)

Key Words: Nature-Based Solutions, inclusivity, resilience, justice, sustainability transition, co-creation

Promoting Urban Blue-Green Infrastructure and Nature-Based Solutions: socio-ecological practices for planning and design of sustainable and resilient cities

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Abstract

Urban blue-green infrastructure (UBGI) and nature-based solutions (NBS) have gained recognition as key strategies for integrating nature into urban planning and design to enhance sustainability and resilience. They represent a shift toward addressing urban societal challenges by enabling ecosystems to recover and provide benefits to both people and nature. UBGI consists of an interconnected network of natural and designed landscape components, including water bodies and green and open spaces (both natural and specifically designed and managed) at the city scale. NBS are defined as actions to protect, manage, and restore natural ecosystems to address societal challenges, providing benefits to human well-being and biodiversity. When integrated within UBGI and aligned with an urban sustainability agenda, NBS can play a key role in transforming cities toward sustainability. However, challenges remain in differentiating NBS from other ecological practices and ensuring their implementation follows a co-creation approach involving both nature and people and specifically considering the inclusivity and justice aspects. Critical questions include the following: a) How can we overcome challenges in UBGI and NBS implementation for sustainable transformation? b) What socio-ecological practices can support biodiversity-friendly outcomes? c) How can NBS within BGI contribute to transformative change? d) How can we assess the impact of these interventions? This introductory presentation aims to critically analyse the aspects essential for finding appropriate answers to these questions. Particularly, it invites session participants to reflect on the role of inter- and transdisciplinary collaboration among various stakeholders in the planning, design, implementation and maintenance of NBS and BGI. Additionally, based on our projects' experience, we will emphasize and discuss specific opportunities that could further promote BGI and NBS, unlocking their transformative potential through diverse socio-ecological practices.

Key Words: blue-green infrastructure, nature-based solutions, sustainable transformation, resilience, socio-ecological practices, co-creation

Strategic planning of urban agriculture using a multi-criteria spatial analysis tool: case studies in Montreal (Canada) and Utrecht (Netherlands)

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Abstract

Urban agriculture (UA) holds significant potential as a nature-based solution (NBS), offering a variety of benefits that span from food production to climate resilience and enhanced ecosystem services (ES). However, its multifunctionality also poses challenges for effective integration into urban planning processes.

To address this challenge, SSANTO (Spatial Suitability ANalysis Tool) is developed as a multi-criteria spatial analysis tool that facilitates the incorporation of green infrastructures into urban planning. It facilitates the identification of suitable locations by balancing environmental, social and economic priorities. SSANTO enables users to better integrate the multiple benefits and constraints associated with outdoor UA systems such as shared gardens and green roofs into their decision-making, in order to maximize the performance of those infrastructures. The tool also encourages stakeholder participation in the planning process by including their preferences and priorities. This fosters a more inclusive and integrated planning process, where outcomes reflect local realities and the perspectives of those engaged and impacted.

Through case studies in Montreal, Canada, and Utrecht, the Netherlands, the study explores the variability of planning outcomes based on local priorities and constraints, offering insights into the role of UA as a transformative NBS. The study also seeks to provide food for thought regarding the transferability of such support-planning tool to diverse urban settings.

The study contributes to a better understanding of how UA can be leveraged to enhance resilience and well-being in cities if effectively integrated into resilient city frameworks. Ultimately, this work sheds light on how integrating food-producing landscapes into UBGI networks and discussions can contribute to sustainable urban futures and enhance urban sustainability in the face of ongoing climate challenges.

Key Words: Urban agriculture, Nature-based solutions, Multi-criteria spatial analysis, Urban planning

Urban Blue-Green Infrastructure in Moscow, Russia: Strategic Planning for Multiple Benefits

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Abstract
The development ogreen spaces within urban blue-green infrastructure is a global trend and a growing priority for many cities. This becomes especially important in the context of increasing climate change.

In terms of greenery, Moscow ranks among the world's top cities and exceeds the national Russian average by 25%. Green areas occupy almost half of Moscow's territory. This achievement is the result of systematic strategic planning and interdisciplinary collaboration between scientists and practitioners. 90% of city residents have access to parks and squares within walking distance. Multiple studies have confirmed the positive impact of green spaces on residents' quality of life and health. In particular, there is evidence of a 55% reduction in the risk of developing cardiovascular and mental diseases, protection from fine particulate pollution, and mitigation of extreme heat through increased urban temperatures during heat waves.

To support a comprehensive approach to urban greening, considering the existing green zones, the Law on the Green Fund in 2024 was adopted. This Law ensures the protection, regulation, and balanced development of the city's green fund, which includes all components of the green infrastructure. The legislation safeguards a wide range of green spaces: parks, squares, boulevards, courtyards, and seasonal plantings.

The aim paper is to present the current framework of Moscow's green infrastructure as a network of interconnected green areas, and to explore its environmental, scientific, cultural and health-related significance. Key challenges include expanding and improving the green fund under conditions of anthropogenic pollution and maintaining a cohesive network of green spaces that permeates the city. The paper will also highlight the pivotal role of the Moscow Department of Nature Management in advancing the city's environmental agenda and fostering collaboration with the scientific and expert community as well as promoting citizen initiatives. Additionally, it will review recent activities of the Expert Council for the Protection and Use of the Green Fund of Moscow. This Council includes leading experts in ecology, biology, landscape architecture, and municipal management. Finally, the paper will critically reflect on various socio-ecological initiatives and citizen-involvement projects organized to promote participatory planning and development of urban blue-green infrastructure development.
Key Words: Green areas, urban greening, green infrastructure

Co-producing the Citizen-monitoring of Urban Agriculture Biodiversity (CUAB) programme.

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Abstract

Urban agriculture (UA) can offer multifaceted benefits to cities such as water management, increased food security, benefit to human wellbeing, and creating habitat space for biodiversity. Despite this, and despite demand for allotment spaces in the UK, UA faces many challenges to implementation owing to competition for space for housing, start-up costs and negative public perception. Quantifying the relationship between management practices, species richness, and its impact on nature connectedness may offer an avenue for removing these barriers through leveraging biodiverse UA spaces that foster high levels of nature connectedness to increase positive perception. The Citizen-monitoring of Urban Agriculture Biodiversity (CUAB) programme is beginning to investigate this relationship through co-produced citizen science methodology.

With the allotment community in Nottingham UK, CUAB is co-designing a biodiversity and nature connectedness monitoring programme, utilising bespoke training materials and the iNaturalist platform to monitor management and spatial variation in species richness in allotment plots, and its impact on nature connectedness. Through surveys distributed to Nottingham City Council allotment tenants and focus groups held at St Ann's allotments site (the largest in the world) the training requirements for allotment users to conduct simple ecological surveys and submit data via iNaturalist and Microsoft forms were identified. Accessible written and video guides, designed with and staring volunteers from the focus groups, were produced to allow independent citizen science data collection of allotment biodiversity, management practices and nature connectedness. Focus group and material production participation was incentivised through gardening vouchers. In the coming months, the programme will be piloted across Nottingham (results by June 2025), with immediate aims to expand across the UK and Europe. Recruitment will be aided by the production of a Projection Augmented Relief Model (PARM) of St Ann's allotment, a 3D printed model of the site augmented with interactive, digitally projected data.

Key Words: Co-production, Citizen Science, urban agroecology, nature connectedness, UK

Assessment and Analysis of City Parks for the Sustainable Urban Development of Istanbul

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Abstract

Sustainable development is achieving a balance between social and environmental principles, such as socially justifiable and environmental friendly economic development. In 1987 The World Commission on Environment and Development prepares a report called "Our Future", which is now known as the Brundtland Report. According to that report, sustainable development is development that "meets the needs of the present without compromising the ability of future generations to meet their own needs." Urban green spaces, including parks, are a key element for the sustainable development of cities. Nowadays, green areas in cities are becoming increasingly attractive to citizens. They play an important role in improving urban life, promoting social interactions and sustainable urban development. The topic of the importance of city parks in Istanbul is very relevant due to the continued rapid urbanization and population growth from 7,309,190 (1990) to 15,655,923 (2023). Istanbul province includes 39 districts (ilçeleri): 25 are located in Europe (Arnavutköy, Avcılar, Bağcılar, Bahçelievler, Bakırköy, Başakşehir, Bayrampaşa, Beşiktaş, Beylikdüzü, Beyoğlu, Büyükçekmece, Çatalca, Esenler, Esenyurt, Eyüpsultan, Fatih, Gaziosmanpaşa, Güngören, Kağıthane, Küçükçekmece, Sarıyer, Silivri, Şişli, Sultangazi, Zeytinburnu), and 14 are on the Asian continent (Adalar, Ataşehir, Beykoz, Çekmeköy, Kadıköy, Kartal, Maltepe, Pendik, Sancaktepe, Şile, Sultanbeyli, Tuzla, Ümraniye, Üsküdar). Adalar district (Asian part) has the smallest area (11.05 km2) and population (16,325) in Istanbul province.Çatalca District (European part) is the largest in terms of territory (1959.92 km2), and Esenyurt District (978,007 inhabitants) has the largest population (also located on the European continent). The aim of the study is to present the spatial changes of parks in Istanbul by district, using geographic information systems (GIS). This study examines the following city parks in Istanbul: Gülhane, Emirgan, Bebek, Belgrade Forest, Yildiz Park, Polonezköy Nature Park, Nakaştepe National Park (Üsküdar), Göztepe, Ataturk Arboretum, Bentler National Park, Fatih Sultan Mehmet Nature Park (Fatih Forest), etc. The largest share of urban parks is in the districts of Beykoz, Şile, Çekmeköy, Çatalca, and the smallest in Fatih, Beyoğlu, Şişli and Beşiktaş.

Key Words: GIS, Gülhane, Emirgan

A Study on the Park Capacity of Selected Cemeteries in Istanbul

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Abstract

This study investigates the park function potential of selected cemeteries in Istanbul, focusing on their roles beyond traditional burial sites. In a highly urbanized city like Istanbul, cemeteries provide not only burial spaces but also valuable green areas that contribute to ecological balance and offer recreational opportunities for the public. The research evaluates the physical characteristics, green space distribution, biodiversity, and usage patterns of these cemeteries. Field observations, mapping techniques, and surveys were employed to assess whether the infrastructure of these cemeteries is suitable for adaptation into park spaces.

One key aspect discussed is that in some areas of the city, access to cemeteries is easier than access to parks, yet these spaces are underutilized for recreational purposes. Despite the lack or minimal presence of park-like functions, cemeteries, particularly those adjacent to residential areas, have high landscape value due to their proximity to ecological spaces. The study reveals that cemeteries can provide significant ecological services such as air purification, biodiversity support, and temperature regulation, while also serving as places for rest, reflection, and leisure.

Cemeteries are often overlooked in urban planning, yet they have the potential to make meaningful contributions to the quality of life in cities by addressing the need for more green spaces. This analysis highlights the untapped potential of cemeteries to serve as urban parks, offering spaces for public relaxation, leisure activities, and environmental services. The findings provide valuable insights into how cemeteries can be better integrated into the broader urban green space network, offering new opportunities for sustainable urban planning. By recognizing cemeteries' park-like functions, these spaces can contribute to improving ecological sustainability, increasing urban biodiversity, and offering residents and visitors alternative spaces for rest and reflection.

Key Words: Keywords: Cemeteries, park capacity, urban green space, recreation, ecological function, Istanbul

Integrating soil knowledge when improving or restoring ecological functions of urban ecosystems

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Abstract

As soils have often been overlooked in the past in projects aiming to improve or restore ecological functions of urban ecosystems, consensus in academia is growing about the need to recognise not only the finite character of soil as a resource, but also soils' multifaceted role in urban ecosystems and their inherent potential to respond to environmental crises. Several studies and guides exist that outline best practices and project steps when targeting the improvement of ecological functions. However, knowledge is scarce on how to integrate soil aspects into such projects, and how to adapt measures taken to improve soil ecological functions to diverse contexts. This doctoral research project responds to this issue by aiming to (i) better understand how ecological soil knowledge can be integrated into projects aiming at ecosystem function improvement; to (ii) determine which factors impact the choice of implemented measures to improve ecological soil functions; and to (iii) identify barriers to the integration of soil-related issues in such projects. Six sites where parking lots have been transformed to re-establish a certain level of ecosystem functioning have been selected as case studies along two criteria: First, along the post-implementation use type, which was hypothesised to influence choice of measures; and second, using an indicator that was produced to estimate the degree to which soil is considered in the project as a finite resource and an agent that is constitutive to the project outcome. The indicator was constructed by identifying if projects implemented any measures that (a) targeted the re-use of waste materials instead of the import of agricultural soil, or (b) deliberately aimed to manipulate soil conditions integrating knowledge of the soil system. It was deemed that this selection strategy would assure a good diversity of measures taken during the project along the case study sites. This contribution is intended to depict in detail the approach taken to select the case studies and prepare field work, and to share first results that are deduced from field observations and semi-directive interviews undertaken for the various case study sites.

Key Words: Restoration of ecological functions, restorative measures, ecological soil functions, integration of soil ecological knowledge

Urban Parks through the Lens of Ecosystem Services and Blue-Green Infrastructure: Addressing Challenges and Achieving Socio-Ecological Sustainability (The Case of Gorky Park, Moscow, Russia)

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Abstract

Public parks, as essential components of urban blue-green infrastructure (BGI), play a crucial role in fostering sustainable cities. These green spaces act as nature-based solutions (NBS), enhancing ecosystem health and offering numerous benefits for human well-being and urban livability. However, traditional park planning, design, and maintenance often prioritize regulatory standards over societal needs, leaving cultural ecosystem services (CES) underutilized. This study examines CES in Moscow's Gorky Park, analyzing how park infrastructure influences visitor experiences and CES provision.

Through non-participant observation, field documentation, and photographs from various functional park zones, the research identifies visitor activities and factors affecting them. Findings reveal that the park primarily supports recreation, sports, social interaction, and leisure, aligning with its intended purpose. However, other CES related to aesthetic appreciation, cultural heritage, and education are only partially utilized. Demographic trends indicate a strong preference among younger visitors, while older adults (60+) are underrepresented. Gender differences also emerge: men engage mostly in sports, particularly team-based activities, while women prefer walking, relaxation, spending time with children, and picnicking – demonstrating distinct CES preferences.

A significant dependence exists between park infrastructure and CES availability – areas with more amenities attract diverse activities, which can lead to overcrowding and overuse of ecosystem services (ES). With Moscow's environmental policies promoting ES integration into BGI, this study provides actionable insights. Recommendations include balancing multifunctional park design, mitigating user conflicts, and optimizing CES diversity to meet growing urban demands while preserving ecological and social value.

Proposed measures to enhance the park's cultural and sustainability value include: 1) promoting park's cultural heritage through awareness of its historical significance; 2) hosting cultural events to strengthen park's cultural value and its role in promoting local identity, creativity, etc.; 3) expanding ornamental planting to boost aesthetics and biodiversity and positively influence visitors'

psychological well-being; 4) strengthening nature-based education (e.g., workshops, trainings, citizen science); and 5) improving human-wildlife interactions using guided activities and smart technologies to foster environmental awareness. These steps aim to enrich cultural heritage, ecological resilience, and public engagement, thus contributing to sustainability transformation through adaptive park management that harmonizes infrastructure, visitor needs, and sustainable ES delivery.

Key Words: park use; visitors' activities; planning and designing sustainable green areas; nature-based solutions; blue-green infrastructure (BGI); Moscow

Integrating urban biodiversity values in assessments for decision-aiding and design at local scales using ecosystem services; a case study from Milan, Italy

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Abstract

To improve and preserve urban biodiversity, re-naturing measures in cities are key concepts that require enhancements in interactions between society and nature in urban fabrics. In a three-step procedure, this research provides a social impact assessment (SIA) framework for measuring re-naturing co-benefits using ecosystem service (ES) analysis at the local urban scale to optimise local interventions through a decision-making procedure. The methodology builds upon direct interactions with citizens and stakeholders through collaborative sessions to gather perceptions, narratives and core social values in relation to nature and urban biodiversity. In the first step, through a systematic literature review on ES, the research aims to gather and analyse social impact indicators, factors, and measurement methods in urban areas. The information is then classified to present a new categorisation of indicators based on attributes to help planners and decision-makers identify and select the best social impact indicators and measurements in each unique context of assessment. In the second step, building on the new categories of indicators and literature on SIA, a bottom-up SIA methodology is implemented in the case study of Milan (Sorelle Mirabal Garden). Co-creation sessions and a gamified ES selection procedure are critical parts of data collection in this step. The results establish social-ecological dynamics at the local scale and render a clear picture of core social values and the impacts of nature on human lives alongside desires and perceptions about the future. Ultimately, in the third step, by implementing the social-ecological inputs and using dynamic adaptive policy pathways methodology, future scenarios and policy pathways for the Milan case study are determined. Through this step, by relying on nature's future framework scenarios within a 25-year time horizon, possible changes and dynamics of the Milan case study are mapped, and optimal pathways for decision-making are identified. The combination of these three steps provides a replicable, engaging, and cost-effective SIA package using ES for decision-making and policy optimisation for planners and decision-makers. This paper focuses on the results of the second and third steps of this research, presenting pathways for integrating urban biodiversity and nature in planning and policy-making at the local scale.

Key Words: urban biodiversity; social impact assessment; ecosystem services; decision-aiding

Integration of urban biodiversity in design: searching for sustainable and socially acceptable landscape design, planning and management practices

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Abstract

Urban sustainability requires the integration of biodiversity into landscape design, planning, and management to create resilient, multifunctional, and nature-promoting urban environments. Research increasingly underscores that sustainable and resilient cities should go beyond meeting economic and social goals, also prioritizing the creation of nature-oriented landscapes that support ecosystem health and human well-being. Urban green spaces should be accessible and designed according to biodiversity-sensitive principles that balance ecological functions, social acceptance and diverse community interests. This introductory presentation outlines key concept of the session "Integration of urban biodiversity in design: searching for sustainable and socially acceptable landscape design, planning and management practices" to explore innovative approaches to urban landscape planning, design, and management for achieving positive outcomes for both people and nature. We discuss different ecological concepts such as blue-green infrastructure, nature-based solutions, biodiversity and water sensitive design. Key topics for reflection will include: 1) the relationship between urban biodiversity, landscape design, and human health; 2) strategies for the ecological restoration of native ecosystems and wildlife management in cities; and 3) the role of nature-based solutions in addressing current challenges such as biodiversity loss, climate change, pollution, land-use transformation, and 4) fostering inter- and transdisciplinary research and collaboration. Through the examination of various case studies from Northern and Southern hemispheres, we will reflect on the role of citizen engagement in implementing biodiversity-friendly designs and practices to ensure that these sustainable solutions are socially acceptable and community-driven. This introductory presentation aims to facilitate scientific exchange between researchers, practitioners, and stakeholders on how to successfully promote the integration of biodiversity in urban planning and advance innovative strategies for sustainable, socially inclusive, and ecologically resilient urban landscapes.

Key Words: urban biodiversity, landscape design and management, biodiversity-sensitive design, nature-based solutions, co-creation

Habitat composition and urbanization jointly alter bird assemblages in high-density built environments based on citizen science data

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Abstract

Urbanization profoundly transforms landscapes, reshaping habitat structure and influencing biodiversity patterns. In high-density built environments, the spatial structure of green spaces plays a crucial role in maintaining bird diversity. While many studies have explored the effects of habitat structure on bird diversity in urban landscapes, it is still not clearly known how habitat structure shapes bird community assembly progress in urban areas. To answer this, we used citizen science data to investigate how green space composition and configuration, alongside urbanization factors, shape species richness and community structure in 26 neighborhoods within the inner ring of Shanghai, China. We quantified green space structure in neighborhoods using four metrics: the percentage of green space (PLAND), patch density (PD), edge density (ED), and Euclidean nearest-neighbor distance (ENN) between patches. Road density was used as a proxy for urbanization intensity. We used the number of species to calculate species richness. We calculated the phylogenetic community structure metrics for bird assemblages in urban green spaces using the standardized effect size (SES) of mean phylogenetic pairwise distances (MPD), referred to as SES.MPD, which quantifies the phylogenetic relatedness among species within a subdistrict. Likewise, we the SES of mean functional distance (MFD), referred to as SES.MFD. We found that bird species richness increased with the percentage of green spaces in the neighborhoods and decreased with road density. Urban bird assemblages generally comprised species that share more similar traits or evolutionary histories (i.e. functional and/or phylogenetic clustering). Bird assemblages were more clustered in neighborhoods with a low percentage of green spaces and high edge density. These results highlight the critical role of green space coverage in mitigating biodiversity loss. Conservation strategies should prioritize increasing the percentage of green spaces while considering urbanization pressures to enhance biodiversity and ecological resilience in urban environments.

Key Words: breeding bird conservation; citizen science; green space; landscape structure; Shanghai

Understanding avian species richness in Montevideo city, Uruguay

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Abstract

Recent studies indicate that daily contact with nature in cities has a positive impact on the stress, anxiety and depression levels of its citizens. Globally, wild birds in urban landscapes stand out for their diversity and abundance relative to other zoological groups. Thus, they offer a remarkable opportunity to connect people with nature, including learning about and valuing processes and interactions that are typical of the natural world. More than 300 bird species have been recorded in Montevideo city, the capital of Uruguay. However, almost nothing is know about the factors that determine the abundance of these bird species in time and space in this urban ecosystem. Accordingly, in the present study we used e-bird records (https://ebird.org/home) existing for 52 urban spots in Montevideo (ca 100,000 registers), to analyze the relevance of different ecological, geographical and sociological factors on bird richness. We started by using the iNext.4step package in R to estimate the observed and asintotic richness values, given the same weight to all the species regardless their abundance (q=0) or wieghtening the different species by their relative abunance (q=1). Then, we adjusted negative binomial linear regression models using the glmmTMB package (also in R) to modelling species richness. We found that very simple models, including only a couple of factors (the degree of greeness of the circundant matrix and the distance to a river coast), were able to expliain more tan 60% of the overall variance, in both the observed and the asintotic species richness. The implicances of these results are discussed in the context of intregating biodiversity measures on future urban design.

Key Words: urban ecology, avian richness

Incentıves for Urban Planning Practıtıoners to Integrate Biodiversity in their Urban Development Projects

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Abstract

The integration of biodiversity into urban planning has become an international priority, as reflected in Target 12 of the Global Biodiversity Framework, which encourages cities to preserve, expand, and connect green and blue spaces. Although national policies have been developed to align with these international goals, challenges remained in implementation—particularly at the site level of urban development projects. Because of the flexibility in policy application, private sector developers often retained discretion over the extent to which biodiversity was incorporated into their projects. While policy played an important role in shaping urban biodiversity outcomes, recent research suggested that policy alone was not always sufficient.

By examining three different policy contexts, this study explored the relationship between policy strictness and private sector decision-making. This approach offered insight into how strict policies influenced private sector practitioners and whether additional or alternative incentives more effectively encouraged planners to make meaningful, biodiversity-conscious decisions.

Through a comparative analysis of case studies from England, France, and Japan—countries with varying degrees of regulatory enforcement—the study examined how biodiversity policies were applied in practice and identified additional drivers influencing developers' decisions. Data were collected through semi-structured interviews with urban planning practitioners involved in the design of projects that successfully integrated biodiversity. These interviews focused on what motivated project teams in each country to make biodiversity-conscious decisions. By proposing several recommendations, the findings contributed to a deeper understanding of effective policy mechanisms and proposed incentive-based strategies to promote private sector engagement in biodiversity conservation and enhancement within their development projects.

Key Words: Urban ecology, Biodiversity in urban planning, Biodiversity policy, Incentives for biodiversity in development, Biodiversity Net Gain, Sustainability, Ecology in urban planning

The Unmaking and Remaking Urban Natures: Biophilic Thought & Practice for Human-Plant-Habitat Relations

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Abstract

What lessons can the unmaking and remaking of urban natures provide to urban ecologists, designers, and planners? I examine how the process of cultivating plants in urban and urbanizing areas of the United States has grown more complex as the attitudes, values, beliefs, and knowledge of society have shifted towards biophilia since the emergence of the environmental movement in the 1960s and 1970s. Biophilic thought and practice has had a profound impact on human-plant-habitat relations through a process that I call the unmaking and remaking of urban natures. Urban nature is intentionally used in a plural form to demonstrate how the conventional aesthetic of immaculate lawns, shade trees, and bold flowers has given way to a more complex, multifunctional, multicultural mosaic of diverse plant species and habitats, which I define as different types of urban natures. The result is the hybridization of private and public spaces towards more biodiverse landscapes that represent a shift in cultural and social norms towards greater acceptance of alternative interpretations of human-plant-habitat relations. Yet, a key gap exists in the literature that takes a critical look at this cross-scale cultural and social shift from a single definition and vision of urban nature to one emphasizing the pluralistic definitions and visions of urban natures. This presentation delves into this subject matter in three parts: (1) the biophobic triggering event (the disconnection of plants and people called the unmaking of urban natures), (2) the biophilic response (the reconnection of plants and people named as the remaking of urban natures), and (3) three lessons of the unmaking and remaking of urban natures to remember. The first lesson is the unmaking and remaking of urban natures is an alternative way of understanding biophilic and biophobic human-environment relations. Second, the greenness in cities is a complex phenomenon in human-plant-habitat relations with many layers to understand. Finally, the remaking of urban natures moves away from the idea of the museumification and the restoration of nature as the only way to know human-plant-habitat relations.

Key Words: Biophilic design and planning; Designed landscapes; Sustainable landscapes; Landscape sustainability; More than human concerns; Sixth extinction; Plant conscious cultures; Urban and urbanizing areas; United States

Landscape pattern of small urban parks also matters: distribution of 46 small-size parks in Bucharest and its possible implications on connectivity for birds

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Abstract

Medium and small-sized parks are valuable green areas to avian diversity, as they can play the role of stepping stones for many migrants and cater for the breeding needs of some species. While vegetation structure and composition are prime factors that influence bird communities in terms of habitat selection, landscape counts too, since birds will also factor in surrounding land cover when deciding for urban green areas.

Green areas coverage in Bucharest had a decreasing trend for the last years, with smaller parks retaining an even more important role in connecting larger green areas for birds navigating the city. We decided to evaluate the distribution of 46 randomly selected small urban parks (area below 4.5 ha; different selection for each administrative unit - sector), taking into account potential factors of avian species distribution (distance to: roads, waterbodies, big urban parks).

The northern parts of Bucharest (sectors 1, 2 and 6) have forefront values in terms of urban green areas diversity and aggregation of small parks. Out of the studied locations, the 8 green areas selected in sector 6 are on average slightly more distant to roads (64 m) than the other parks. The 14 parks in sector 1 turned out closer to waterbodies (approx. 2017 m), partly due to the higher concentration of lakes in that area. Sectors 1 and 2 display smaller values for the variable distance to big parks (average: 1117 m) when compared to selected green areas in the south-eastern parts of Bucharest, due to the scarcity of small parks in sectors 3 and 4. At landscape scale, sectors 1, 2 and 6 present a more favourable architecture when it comes to migratory connectivity for avian taxa, corelating positively with current local bird species richness maps.

Therefore, the diversity of green spaces, a higher number of small-sized parks and their distribution in relation to landscape features suggest some of the studied patches are probably effective stepping stones. Detailed data on bird communities' composition is needed to correctly assess the quality of those areas and how much each landscape variable influences species distribution in small parks.

Key Words: small urban parks; landscape pattern; connectivity; urban birds

Blackbird's dusk song at the forefront of urban parks soundscapes: Covid-19's bio-acoustic lesson

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Abstract

Urban parks are keystone features of all major cities, fulfilling a number of functions from recreational opportunities and environmental benefits to active biodiversity support. The natural soundscapes of urban parks have been acknowledged as a valuable ecosystem service, with bird song a fundamental part of the acoustic environment. However, these areas frequently feature substantial anthropogenic noise, which impacts both human welfare and low-pitched birds.
Within this framework, we aim to show how restrictions applied during the Covid-19 pandemics altered the song display of a low-pitched, resident bird and can help steer towards better-quality soundscapes in urban parks. Part of a larger project, dusk songs of 10 Blackbird (Turdus merula) males from Cişmigiu Park (Bucharest, Romania) were recorded every March from 2018 to 2022. Background noise level recordings were conducted simultaneously. Pitch values of the song's motif were compared with standard parameters for the species and correlated with background noise levels and legal restrictions applied during the pandemics in Romania. Our findings showed that Blackbird males sang higher-pitched notes in nosier environments (indicator of adaptations to acoustic stress for the years 2018, 2019, 2022). During March 2020, pandemic restrictions reduced noise pollution. The urban Blackbirds recorded had song parameters similar to the regular ones for the species. Results of March 2021 presented a slight increase in song pitch. In terms of anthropogenic noise eduction, remote working during the pandemics cut down on traffic noise pollution. Furthermore, the closing down of park restaurants and music events removed the main sources of loud bass phonic disturbances. Encouraging remote working would take the strain of rush hours from park soundscapes, while limiting the amount of allowed decibels for ambient music and decreasing the number of loud concerts in high-vegetated parks would reduce the inside sources of noise pollution.
Biodiversity loses are reflected in soundscapes. Creating a bird-friendly bioacoustics environment, not only would help design parks with increased natural soundscapes that we can benefit from, we would also be setting urban parks forth as valid stopovers for migratory birds, bridging the gap between societal development and biodiversity conservation.

Key Words: soundscape design, Turdus merula, song adaptations, urban planning

Public Perceptions of Ecosystem Services in Persian Gardens: Insights from AI and Social Media

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Abstract

This study investigates visitor usage patterns and perceptions of ecosystem services in Persian gardens by integrating AI-driven sentiment analysis of social media data with traditional survey validation. Persian gardens, recognized for their historical, cultural, and ecological significance, provide a unique setting for examining the intersection of cultural heritage and environmental benefits. By analyzing reviews from TripAdvisor and Google Maps, visitor comments were classified into four ecosystem service categories—cultural, provisioning, supporting, and regulating—using an AI-powered keyword classification model enhanced by Word2Vec embeddings. Sentiment analysis, conducted through a multilingual BERT model, categorized opinions as positive, neutral, or negative, allowing for a comprehensive assessment of public perception. These AI-derived insights were validated against survey responses, confirming their accuracy in capturing visitor sentiments. Findings indicate that cultural ecosystem services, particularly aesthetic appeal and historical significance, were the most valued by visitors, reflected in predominantly positive sentiments. Provisioning services, ranked second in importance, included access to water, food, and other essential resources, with visitor satisfaction varying based on garden-specific characteristics. Analysis of usage patterns revealed that weekday visits resulted in higher satisfaction due to reduced crowding, while weekends and public holidays exhibited more diverse experiences. Families expressed the highest levels of satisfaction compared to other visitor groups, emphasizing Persian gardens' dual function as cultural heritage sites and recreational spaces. These insights underscore the role of Persian gardens as both ecological and cultural assets, highlighting their importance in heritage conservation. The study demonstrates the effectiveness of AI-driven social media analysis in assessing public perception and provides recommendations for managing visitor experiences, optimizing provisioning services, and preserving the environmental and historical integrity of these iconic landscapes.

Key Words: AI-driven sentiment analysis, Persian gardens, cultural and provisioning services

Green but Not Safe: Assessing Social Disparities in the Security of Urban Parks in Tabriz, Iran

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Abstract

Urban green spaces play a critical role in enhancing the livability and sustainability of cities, offering not only ecological and aesthetic benefits but also serving as vital public areas for recreation, socialization, and wellbeing. However, their usability is deeply influenced by the level of safety perceived and experienced by users. Safety, as a fundamental human and civic right, is essential for ensuring equitable access to these spaces. This study investigates the relationship between social and economic conditions and the perceived safety of urban green spaces in the city of Tabriz, Iran. The research adopts a survey-based approach using online questionnaires to collect data from a diverse population of city residents. Spatial analysis was conducted using ArcGIS, applying tools such as hot spot analysis and Moran's I spatial autocorrelation to identify patterns and clusters of safety perceptions across the city. The findings indicate a strong spatial autocorrelation and a clustered distribution pattern in the perception of safety in green spaces. Furthermore, a clear correlation was identified between socioeconomic indicators and the safety status of parks and green areas. Green spaces located in economically disadvantaged neighborhoods tend to be perceived as unsafe, while those in wealthier districts are generally associated with higher levels of safety. These results highlight the unequal distribution of safety and access in urban environments, pointing to the urgent need for inclusive and socially sensitive urban planning. This research underscores the importance of integrating social equity considerations into the design and governance of urban green spaces to foster just and resilient cities.

Key Words: Green spaces, parks, socio-economic, Tabriz

The Resource Nexus perspectives of urban planetary health

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Abstract

At the middle of this century, over 60% of the global population will live in urban areas, which are experiencing an unprecedented rate of urbanization. Rapid urban growth, combined with global environmental change, is impacting urban human health through environmental degradation, landscape disruption, and air, land, and noise pollution—all factors that directly affect human and ecological well-being. These challenges are further exacerbated by socio-economic inequalities, which influence access to essential resources such as clean water, nutritious food, and green spaces. In response, planetary health offers a suitable framework for addressing both human and environmental health in efforts to develop sustainable cities. By integrating interdisciplinary perspectives, planetary health highlights the interconnectedness of environmental sustainability and human well-being.

This study aims to bridge the gap between urban human demands and the use of natural resources by applying a Resource Nexus approach within the context of urban planetary health to achieve sustainable transformation. To this end, a literature review was conducted to establish a conceptual understanding of how the Resource Nexus can guide improving urban planetary health and support sustainable change. The selected literature was analyzed through a Resource Nexus lens, with particular focus on the ways natural resources are incorporated into planetary health and urban sustainability research.

Findings indicate that all key environmental resources to the Resource Nexus framework—particularly climate, food, land, biodiversity, and water—are critical for advancing urban planetary health. Moreover, the study highlights the importance of governance mechanisms and policy interventions in managing these resources effectively. Furthermore, the analysis reveals that, despite significant challenges, cities have many opportunities to maximize synergies and minimize trade-offs for transformative change. In conclusion, improving urban planetary health in a sustainable way will require shifts at both societal and governance levels within urban settings.

Key Words: Planetary health – Resource Nexus – Urban areas – Sustainable transformation – human and nature wellbeing

Towards Edible Cities: Vertical Farming as a Resource Nexus Solution

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Abstract

As cities confront the intersecting pressures of population growth, climate change, and resource scarcity, Vertical Farming (VF) has emerged as a promising solution for sustainable urban food production. Yet, its adoption presents complex resource trade-offs that require nuanced, systems-based evaluation. In this paper, vertical farms refer to commercial well-insulated, and air-tight food production systems using soilless cultivation techniques such as hydroponics or aeroponics, with the objective to increase local food security. This study evaluates VF through the Resource Nexus (RN) lens, analysing the interdependencies between energy, water, land, and materials. While VF offers advantages such as space efficiency, particularly in dense cities; water conservation; and climate resilience; it also entails high energy demands, material dependencies, and economic feasibility challenges. A Resource Trade-Off Framework (RTF) is introduced in this paper to systematically assess these synergies and constraints, providing mitigation strategies such as circular water systems and hybrid renewable energy solutions. This paper investigates VF as a promising approach to sustainable agriculture, analysed through the framework of the RN. The study delves into the intricate relationships between energy, water, land, space, material and food resources, underscoring both the obstacles and prospects that VF offers in tackling resource-related challenges. Crucially, the paper situates VF within the broader edible cities movement, contributing to the evolving urban ecology discourse that seeks to reimagine cities as productive, resilient, and multifunctional landscapes. By incorporating governance and socioeconomic dimensions, such as planning policies, equity considerations, and public-private collaboration, the study provides a holistic framework for evaluating the sustainability potential of VF in real-world urban ecosystems. Ultimately, this research advances the understanding of VF not only as a technological innovation, but as a strategic component of integrated urban resource management. It supports the co-creation of edible, livable cities where food systems are embedded within sustainable urban design, offering practical insights for scholars, planners, and policymakers working toward greener urban futures.

Key Words: Vertical Farming; Resource Nexus; Sustainability; Land-Use Efficiency

Investigating Water reuse Private and Public Partnerships: A nested analysis focusing on industrial applications

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Abstract

Water availability has decreased, affecting not only domestic use, but also agricultural and industrial activities, which account for 70 and 20 percent of the global water abstractions respectively. Industrial activities specifically face a significant risk through disrupted supply chains and water supply. Multi-governance paradigms, such as Private Public Partnerships (PPP) have been largely advocated in the recent years as an alternative for effective natural resource management, where public, private and third sector actors are actively involved in infrastructure projects and management of natural resources on a regional level. This study examines the barriers and critical factors affecting Water and Sanitation (WS) PPPs in the urban environment and particularly in reusing municipal wastewater in industrial activities. This study employs a nested analysis, utilizing a mixed-method approach that combines large-N econometric analysis with small-N qualitative case studies. Using the selectivity index of critical success factors (CSF) from Munoz-Jofre et al. (2023), we employ a global Ordinal Logistic Regression (OLR) model to assess the determinants of successful WS-PPP implementation. Different variables are used belonging to the following factors: Certainty, Attraction, Convenience, Performance, Leadership, Reliability. Subsequently, we investigate barriers to municipal wastewater reuse in industrial activities through surveys and interviews across three case studies: Japan, Brazil, and Bangladesh. Georgiou et al. (2022) created a barrier categorisation, based on a systematic literature review on municipal wastewater use in industries. Based on their findings, 6 categories were created, namely Economic, Technical, Environmental, Governance, Business and Communication. The aim of this study is therefore to investigate the potential of WS-PPP on a national scale worldwide and to understand if the identified barriers reflect the national outcomes on a regional level. We then develop a sequence of prioritization actions, based on the results in each case study.

Key Words: PPP, case study, water reuse, barriers, drivers, global

Systemic approach to scaling-up green infrastructure and nature-based solutions - insights from the Polish Cities

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Abstract

Urban areas face many environmental, social and economic challenges. To strengthen the competencies of cities in achieving sustainable development, the Polish Ministry of Development Funds and Regional Policy (MDFRP) led, in collaboration with the World Bank, a flagship project of the National Urban Policy 2030 - the Cities' Partnership Initiative (CPI) 2021-2023. Within CPI, ten Polish cities participated in the Green Network Group. The Green Network's leading topics focused on enhancing a systemic approach to green infrastructure (GI) and nature-based solutions (NBS) as tools for tackling urban challenges and improving the quality of life of cities' inhabitants within green space planning, urban regeneration and rehabilitation, and adaptation to climate changes.

Our study presents the Green Network's work and aims to: 1. Reveal key urban challenges to sustainable urban development that the GI and NBS can address; 2. Identify expected key benefits from a strategic development of urban GI and NBS; 3. Indicate barriers in the planning, implementation and maintenance of GI and NBS that hinder their systemic development (legal, organizational, financial); 4. Propose improvements to the systemic approach from the perspective of city administration practitioners.

The findings result from a series of workshops and Municipal Action Plans developed by administration practitioners to address city-specific needs. The results showed that urban challenges are multidimensional, and GI and NBS are recognized as multi-beneficial solutions. Municipalities struggle with legal, organizational, substantial, and financial shortages, but at the same time, they indicate various improvements that are needed to strengthen the systemic approach to GI and NBS upscaling.

Key Words: practitioners' perspective; municipal practices; urban challenges; Poland

Pressure on Urban Green Space in the light of socio-economic features and civil-society engagement: Insights from Moscow

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Abstract

The analysis examines how socioeconomic factors and civil freedoms influence the allocation of green spaces for investment purposes. This research covers the period from 1992 to 2020, focusing on Moscow as a case study in a country with a strong centralized political system.

The planning process may be tricky and untransparent, as in Moscow, despite several government and society organizations participating in the final decision-making. To understand factors influencing the land use dynamic of green areas in Moscow, we correlated the measure of land use changes with selected indicators of socioeconomic conditions and civil society power. The sources of information about land cover were Landsat satellite pictures, analyzed in five-year steps in selected 16 plots within Moscow's borders. We considered changes in five land cover classes, including buildings, bare soils, herbaceous vegetation, forests, and water bodies.

Modelling with socioeconomic parameters found the opposite effects of two predictors: Russia's revenue for petroleum and Moscow's budget income. When the first predictor rises, the probability of development grows; when the second one rises, the investment likelihood decreases. The land development probability is always lower for SPNR areas. The modelling of public activity parameters has shown an influence only of one predictor: the land development probability correlates with the Press Freedom Index (RSF). The reconstruction of the case KrylatskieKholmy allowed gaining insight into actual mechanisms leading to investment in urban green areas.

Overall, the findings indicate that in highly centralized countries, where civil society has a marginal role, the concentration of capital derived from the export of strategic natural resources significantly puts pressure on urban green spaces.

Key Words: Urban green loss, Greenfield investment modeling, Land development, Socioeconomic and political settings

Private allotment gardens in Andalusia: Food-production-related micro-capitalism in urban areas still under the radar

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Abstract

Private allotment gardens began emerging in Andalusia, Spain, following the financial crisis, and their number has steadily increased since then. This paper examines the locations of these private gardens, the motivations behind their establishment, and their legal recognition within public administration and urban planning frameworks. The study seeks to understand why users prefer private allotments over public gardens. Through in-depth interviews and analysis of relevant documents and online sources, the research reveals that landowners and garden managers have identified new business opportunities by revitalizing underused or abandoned land. This approach not only enhances biodiversity but also ensures access to locally grown food.

In Andalusia, 15% of allotment gardens are private, with most located near urban areas. These gardens are typically found on land designated for agricultural use or in areas marked for future urbanization. The primary motivation for establishing private allotments is to generate additional income, often serving as the sole source of livelihood, particularly in cases where other employment options are unavailable. For users, the appeal of private allotments seems closely tied to the freedom of cultivation and direct access to the land.

However, a significant gap remains in terms of territorial, legal, and institutional frameworks that address the growing number of private allotment gardens within urban development policies. As a result, all stakeholders and users operate in a state of uncertainty, existing largely outside of the formal economy. This lack of regulation leaves private allotment gardens in a precarious position, highlighting the need for clearer policies to incorporate these spaces into the official urban planning landscape.

Key Words: urban agriculture; private allotment gardens, urban policy; productive urban landscape; physical planning, Spain

Discussing equity and justice challenges of UGI access and use: pros and cons of analytical lenses

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Abstract

The provision of urban green infrastructure (UGI) and the facilitation of its accessibility and usability are pivotal to the quality of urban life, particularly in the context of climate change. However, a survey of current urban realities reveals numerous challenges, including unequal access, exclusion, and barriers to inclusive and equitable utilisation of UGI. In most cities, there are significant inequalities in the accessibility and usability of UGI for diverse groups of residents, both within the urban landscape and across the city as a whole. It is important to note that the utilisation of UGI is often not determined by the availability of opportunities, but rather by the intersecting barriers and inequalities in access and utilisation. In light of these challenges, the paper aims to explore the equity and justice issues surrounding UGI access and utilisation, and to critically evaluate the strengths and limitations of various analytical lenses. To this end, it synthesises diverse contributions from the authors on the subjects of equity and justice in relation to UGI access and utilisation. Firstly, it will conceptualise equity challenges through various analytical lenses in a contextualised manner, addressing barriers, environmental justice, justice conflicts and crises. Secondly, it will synthesise these conceptual considerations using empirical material from diverse European case study cities. This synthesis will serve two purposes: firstly, to critically illustrate and discuss conceptual entry points to the question of equity and justice challenges; and secondly, to draw lessons regarding the context-sensitive explanatory value and shortcomings of concepts and methods. The study will adopt a comparative study design on the equity and justice challenges of access to and use of UGI.

Key Words: Equity, justice, UGI access and use, pros and cons of analytical lenses

Budgeting for a bundle of ecosystem services and its application in spatial planning

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Abstract

The task of the presentation is to show the vital role of ecosystem service (ES) budgeting in spatial planning in urban areas. In such areas, the competition for resources and ecosystem services is very high; hence, it is necessary to consider not only individual services but, above all, bundles of them. To facilitate the integration of ESs in landscape planning and management in urban areas, it is essential to consider both biophysical and social demand. The example of Poznań city shows management strategies for sustainable space use in the city by leveling out possible trade-offs between the ESs related to green areas. Places in the city were indicated, where maintenance or development of green areas is advisable due to three key ES in Poznań: noise attenuation, pollutant filtration, and temperature lowering. This was achieved by calculating a budget - the ratio of the supply potential and demand - to identify areas with the greatest need for ESs and give clear advice to decision-makers. It is shown that the spatial distribution of biophysical and social demand varied significantly more among ES than the supply potential. This result indicates possible trade-offs, as urban greenery in a given location will not respond equally to the demand for the ES studied. Although many studies show the effectiveness of urban greenery in increasing the level of ES and avoiding environmental problems in cities, only a few studies show how to select locations for activities, considering the present state as well as human and ecological needs. The clue of the presented approach is the mapping of structure–process relationships, which may easily translate into planning practice.

Key Words: urban greenery; ecosystem services; budgeting; spatial planning; Poznań city

Urban Gardens under Transformation: Negotiating Sustainability in Private Green Spaces

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Abstract

Private gardens increasingly gain attention as significant yet often overlooked spaces in urban sustainability transformations. Amidst global social and ecological challenges, such as climate change adaptation, biodiversity loss, and resource conservation, private gardens emerge as meaningful contexts where broader societal sustainability goals intersect with individual practices and values. However, these gardens are not simply passive recipients of sustainability agendas; rather, they constitute complex negotiation spaces where garden owners actively engage with conflicting demands and ambivalent aspirations.

Drawing on qualitative empirical research conducted through garden visits and in-depth interviews with twelve garden owners in Germany, whose gardens were located in both urban and rural areas, this study investigates how garden owners negotiate sustainability goals in their everyday practices and how they deal with related ambivalences and conflicts. Methodologically, the study employs Grounded Theory to systematically analyse these negotiation processes with the goal of developing a conceptual framework to better understand how sustainability-related conflicts are managed at the individual level. The analysis uncovers various tensions arising from competing demands, such as maintaining aesthetic ideals versus fostering biodiversity, achieving ecological responsibility versus maximizing personal comfort, or aligning individual gardening practices with socially established sustainability norms.

The study highlights that garden owners navigate these tensions through diverse strategies, ranging from pragmatic compromises to selective integration or conscious avoidance of particular sustainability practices. Such negotiation processes not only reflect gardeners' personal values and lifestyle choices but also reveal broader societal discourses about responsibility, citizenship, and ecological engagement.

Ultimately, the study argues that understanding these everyday negotiations is crucial for learning how sustainability can realistically be integrated into daily life. Insights gained from private gardens may also be transferable to other contexts, helping to better understand how individuals manage sustainability-related conflicts and contradictions in various areas of living.

Key Words: Private Gardens; Sustainability; Negotiations; Ambivalence; Grounded Theory; Everyday Practices; Qualitative Research

Investigating the effects of green spaces on inner-city gentrification in highly regulated housing markets: A case study of the Augarten park in Vienna, Austria

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Abstract

Vienna is considered one of the most livable and greenest cities in the world. With its long-standing social policy framework and highly regulated housing market, it is also a role model for a just city, in which social inequities are assumed to be marginal. However, recent research has revealed emerging gentrification processes in various neighborhoods across the city, including those surrounding the Augarten park.

The proposed presentation investigates the overlooked relationship between the Augarten – an important inner-city provider of ecosystem services – and the gentrification dynamics in its surrounding areas. By focusing on the supply-side perspectives of real estate agents and investors, this study addresses the following research questions:

RQ1: Which specific upgrading effects of the Augarten are perceived and marketed by supply-side actors, and what other factors may contribute to gentrification in the area?

RQ2: Which opportunities exist to increase and capitalize property value, despite the constraints imposed by a highly regulated housing market?

To explore these questions, a mixed methods approach was employed. First, a spatial analysis of 308 online real estate advertisements was conducted to assess the geographic scope of commercial marketing of the park. Advertisements explicitly mentioning the Augarten (n=128) were then subjected to an inductive content analysis, which included a rhetorical and target group analysis. In the final step, semi-structured interviews with seven estate agents provided fundamental insights into sales strategies and possible profit increases.

Results indicate that the Augarten plays an influential role on the supply side of the housing market. Proximity to the park is highly sought after, translating into location premiums between 10 and 27.5 percent. This makes the park a driver of local gentrification. Despite the limitations of Austrian tenancy law, which caps rents for properties built before 1945, such premiums are still capitalizable for newer properties. Legal conversions of historic tenement houses and rooftop extensions are popular means of enhancing property value in the study area. These practices effectively close ‘green gaps’ (rent gap theory), but also accelerate gentrification processes. A deeper understanding of the interplay between urban green spaces and gentrification in highly regulated housing markets is needed.

Key Words: gentrification, housing, urban green spaces, environmental justice

The Role of the Institutional Environment in Nature-Based Solutions in Developing Countries: A Conceptual Framework

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Abstract

Nature-Based Solutions (NBS) have emerged as transformative strategies to address interconnected environmental, social, and economic challenges in developing countries, including climate change, biodiversity loss, food insecurity, and poverty. These solutions, which involve protecting, managing, and restoring ecosystems, offer co-benefits for human well-being and ecological resilience but face significant barriers due to weak institutional environments. This paper investigates the critical role of formal and informal institutions in shaping the success of NBS initiatives in resource-constrained settings. Through a systematic literature review spanning 2015–2025 and a theoretical synthesis drawing from environmental governance and institutional economics, we analyze how institutional characteristics—such as regulatory frameworks, governance coherence, land tenure systems, community norms, and resource availability—influence NBS implementation. Key challenges include weak policy enforcement, institutional fragmentation, and unclear property rights, which often undermine project scalability, while opportunities arise from community-driven knowledge and local resilience. We propose a conceptual framework that integrates these institutional factors with NBS indicators, such as ecosystem health, social co-benefits, economic viability, stakeholder inclusion, and adaptive management. The framework highlights the need for adaptive governance models and inclusive stakeholder participation to align NBS with local contexts, thereby enhancing their sustainability and impact. Findings underscore that robust institutional environments are essential for leveraging NBS to achieve the United Nations Sustainable Development Goals in developing countries, where vulnerabilities to environmental and socio-economic stressors are pronounced. By addressing institutional barriers and harnessing local strengths, the framework provides a roadmap for policymakers and practitioners to design context-sensitive NBS interventions. Future research should focus on empirical validation of the framework through case studies across diverse developing country contexts to refine its applicability and ensure practical relevance for sustainable development.

Key Words: Nature-Based Solutions, Institutional Environment, Developing Countries, Conceptual Framework.

The “socio-ecological” process of urban heatwave risk

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Abstract

Heatwaves severely impact urban residents’ health. However, current research lacks integration of socio-ecological data, quantification of risk perception-adaptation behaviors, and precise spatial heterogeneity characterization. This study examines Beijing using remote sensing, physiological monitoring, resident behavior questionnaires, and spatial modeling from a socio-ecological coupling perspective. It investigates the formation and spread mechanisms of heat wave risks, measures the pathways of residents’ risk perception and adaptation behaviors, and devises precise strategies to contain thermal risk diffusion and enhance residents' adaptive abilities. The results reveal the following: (1) Heatwaves and urban heat islands synergistically increased heat exposure risk. In Beijing, during heatwaves, the urban heat island intensity rises by 0.58°C, peaking at night. The daytime-night population migration drives the temporal and spatial variation of heat exposure risks. (2) Urban villages, lacking greenery and home to vulnerable groups, is one of the high-risk sensitive areas. Their heat exposure risk was 1.6 times that of regular communities, with local temperatures rising by 1.8℃. (3) Resident adaptation behaviors were mainly triggered by heat exposure consequences, at 5.7 times the intensity of perception-driven triggers. These behaviors were regulated by multiple risks and socio-economic factors. Enhancing perception improves behavioral proactivity and reduces health damage. (4) Prioritizing urban central greenery enhancement and urban village renovation are essential intervention strategies. This study analyzed ecological-human perception differences, urban thermal risk spatial variations, the social-ecological shift in ecological process indicators, and spatial optimization strategies integrating social-ecological processes. It bridges ecological and social processes, promoting sustainable urban development. Furthermore, it deepens the understanding of heat wave risk’s social-ecological coupling mechanism, offering scientific support for urban thermal risk management.

Key Words: Heat-related health risks; Socio-ecological systems; Urban heat island; Risk perception; Climate adaptation

Social-Ecological Mapping of Ecosystem Services in the İlkadım District of Samsun: A Methodological Approach within the Framework of Spatial Planning

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Abstract

Urban ecosystem services are critical components that directly affect the environmental well-being and quality of life of individuals living in cities. These services include functions such as carbon storage, water cycle management, microclimate regulation, biodiversity conservation, provision of aesthetic value, and social cohesion. Planning these services and ensuring their fair spatial distribution constitute the foundation of a sustainable urban vision. This study aims to examine the spatial patterns of ecosystem services through a social-ecological systems approach in İlkadım, one of the most densely populated districts of Samsun, located in Turkey's Black Sea Region. Demographic and spatial data from 61 neighborhoods in İlkadım were analyzed using Geographic Information Systems (GIS), based on data obtained from TÜİK (Turkish Statistical Institute), AFAD (Disaster and Emergency Management Authority), Samsun Metropolitan Municipality, and field studies. The weighted overlay index model was used as the multi-criteria evaluation method. Accordingly, each spatial layer was assigned a weight between 1 and 10. Variables such as population density, proportions of children and women, amount of green space, accessibility, and land use were normalized and compared in terms of social-ecological service demand and the current level of services. Furthermore, spatial distribution of ecosystem service supply, carbon storage and urban heat island effect, noise reduction services, transportation corridors, and accessibility to green areas were also analyzed at the neighborhood level. In addition, the relationship between the level of social-ecological needs and the existing green space was tested with regression analysis and priority neighborhoods that will guide planning were determined. Within this context, the study aims to contribute to sustainability and urban green infrastructure planning from the perspective of spatial justice.

Key Words: Social-Ecological mapping, Urban ecosystem services, Urban ecology

Spatial Isolation and Unequal Access to Urban Environment: Roma Ghettoized Structures in Bulgaria as a Challenge to Green Cities

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Abstract

Sustainable urban development and social inclusion are key aspects of contemporary urban planning, yet marginalized communities, such as the Roma, are often excluded from these processes. This paper explores the spatial isolation of Roma ghettoized structures in Bulgaria and their limited integration into the concept of green cities. One of the core principles of green cities is the development of an accessible green infrastructure for all residents, regardless of their social status. Using tools from Geographic Information Systems (GIS), the study develops a typology of cities based on the degree of Roma residents' access to two main components of the green system: (1) public green spaces, including parks and gardens, and (2) semi-public green areas such as inter-block spaces. The threshold values of the indicators are determined in accordance with national regulations regarding urban green space access. The analysis is based on data from a nationally representative survey conducted under the project “Spatial Models of the Roma Ghettoized Urban Structures in Bulgaria,” funded by the Bulgarian National Science Fund, Ministry of Education and Science. The findings reveal significant inequalities in Roma communities' access to urban infrastructure, public services, and green spaces. The lack of environmental infrastructure—such as inadequate waste collection, limited access to sewage systems, and restricted availability of parks and public green areas—further exacerbates social and spatial segregation. This hinders the integration of Roma neighborhoods into sustainable urban development strategies. The paper argues that green cities cannot be truly sustainable if marginalized communities are excluded. A comprehensive approach is needed—one that improves access to urban infrastructure, fosters the active participation of local communities in urban planning, and integrates Roma neighborhoods into sustainability policies. Overcoming these challenges is essential for building environmentally sustainable and socially just cities

Key Words: Roma ghettoized structures, spatial segregation, green cities, sustainable urban development, urban inequalities, Bulgaria

Towards nature-based planning in metropolitan regions – exploring scenarios for dense and green urban development informed by needs for ecosystem services of current and future citizens

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Abstract

For metropolitan regions to become more sustainable they have to adopt urban development policies that promote urban growth that is both energy and transport effective, while simultaneously integrating nature-based solutions (NBS) that support ecosystem services (ES) and biodiversity (BD). However, since space is limited in urban areas and demands on the landscape are numerous and many times conflicting it is a complex challenge to implement NBS successfully. According to the regional plan for Stockholm, urban densification is to be promoted in already established urban cores throughout the region up to 2060. Simultaneously, the County Administrative Board has launched an action plan for green infrastructure (GI), aiming to strengthen BD and ES. A planning support tool that integrates NBS and visualizes trade-offs and synergies of ES and BD whilst meeting the need of new housing would help planners to develop future urban trajectories of the region with stronger integration of the social-ecological-technological system.

The aim of this study is to explore local and regional impacts on ES for two future scenarios of urban development and compare them with the GI plan to discuss scale problems, spatial mismatches and possibilities for multi-functionality. The study area embraces three neighbouring municipalities in a gradient from urban to peri-urban in Stockholm. The dense scenario simulated urban densification without regard to local greenery, while the green-dense scenario simulated scattered housing units to allow at least 30% canopy coverage within 300 m from residential buildings. ES capacities were estimated for mitigation of heat islands and flood risk, and access to local and regional nature-based recreation. This was compared to the GI plan to estimate overall regional scale impacts on BD. The results showed that dense development had drawbacks from a local ES perspective, while the green-dense scenario left room for local ES but instead spread more in the landscape; impacting regional nature-based recreation and GI. Proportions and location of nature areas related to urban densification versus sprawl need further attention for balancing different types of ES. The methodology is useful for planning support and will enable integration of ES in policy and planning decisions of metropolitan regions.

Key Words: Ecosystem services, green infrastructure, urban development scenarios, planning support tools, planning practice

An integrative framework for urban soundscape analyses

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Abstract

Cities often have dynamic acoustic environments whose complexity remains largely unexplored. These acoustic environments are not only background noise, but complex communication networks that reveal insights into the relationships and interactions between the built environment, green infrastructure and biodiversity. In this talk, we present an integrated concept to understand and predict urban sound environments or city 'soundscapes' and discuss how this approach relates to social-ecological-technological systems. The CitySoundscapes Project led by the Technical University of Munich analyzes and synthesizes urban acoustic data derived from automated acoustic devices as well as acoustic comfort data derived from city residents to give actionable urban planning recommendations for enhancing the urban environment for human health through urban green infrastructure interventions. Specifically, our objective is to identify the optimal structure and distribution of urban green spaces within city landscapes that may serve as effective biodiversity habitats and health resources for residents. Recognizing the multisensory nature of human experience in urban environments, we particularly focus on sounds and soundscapes as indicators of biodiversity, environmental features, and urban stressors for people. We will present on how our research employs an AI-driven acoustic analysis technique capable of distinguishing and classifying urban sound signatures, including anthrophonic, biophonic and geophonic sounds as well as animal species identification. Furthermore, we are building mixed modelling techniques at multiple spatial and temporal scales to predict the application of the data beyond the city of Munich. In summary, our investigation aims to test the potential of soundscapes as a tool for further developing urban environments to meet sustainable development goals.

Key Words: soundscapes, mixed models, biodiversity, restoration, urban planning, sustainable development

The potential of urban green infrastructure for climate resilient cities: an inter-and transdisciplinary approach

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Abstract

Developing coherent networks of urban green infrastructure (UGI) can help address significant urbanisation challenges and is essential for transforming cities into sustainable, climate-resilient environments. However, the development of UGI in growing and densifying cities is challenging due to many competing demands on limited space. To address these challenges, integrative approaches to the planning, implementation and management of UGI are required that smartly combine different environmental, social and economic goals, e.g. of cooling the city, sustainable stormwater management, biodiversity enhancement, promotion of human health and wellbeing and supporting a green economy. While knowledge on UGI has rapidly progressed in recent decades, still most of this research is disciplinary, while systems-oriented, interdisciplinary research in support of the evidence-based development of multifunctional UGI is limited.

Therefore, the Research Training Group "Urban Green Infrastructure" at the Technical University of Munich, was established in 2022, exploring the potential to smartly blend green, blue, and grey infrastructure into multifunctional hybrid solutions. The RTG is based on the concept of social-ecological-technological systems (SETs) to study UGI as well as the interdependencies between these urban subsystems. The consortium consists of researchers from ecology, engineering, health sciences, planning and architecture disciplines. In its first phase, 15 doctoral students and 13 principal investigators have focused on the interrelated themes of transforming urban spaces, improving indoor and outdoor climate and developing more sustainable stormwater management systems in three research clusters. Integration of research currently incorporated via the development of a systems model and common urban labs. The overarching aim is to develop a scenario modelling approach, assessing the potential of UGI to substitute technical infrastructure or to develop combined green-grey solutions. Further the RTG aims to identify governance approaches for implementing these UGI strategies.

In our presentation, we will give an overview of the conceptual approach and discuss recent findings of our RTG to reflect on the potential of the SETs framework for integrative urban research with a focus on urban green infrastructure.

Key Words: Urban Green Infrastructure; Nature-based Solutions; Social-ecological-technical Sytems; Research Training Group

Exploring Urban Biodiversity and Human Well Being through City Soundscapes in Munich

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Abstract

Human experience and interpretation of the environment is a multisensory process, whereby different sensory inputs interact, evoke different emotional responses, and in this way are critical to human wellbeing in urban space. In our project, CitySoundscapes, we focus on sounds and soundscapes, which are indicators of animal diversity (bird calls), environmental features (trees in the wind, flowing water), and urban stressors (traffic, construction). Soundscapes provide a quantifiable link between biodiversity and (positive) mental health effects (wellbeing, restoration) to link conservation with public health. Our goal is to determine how urban greenspaces should be structured in city landscapes to be effective habitats for biodiversity and as health resources for visitors, to develop foundations for biodiversity-based health interventions. We take a transdisciplinary approach involving citizens, civil society organizations, and decision makers from conservation, social services, and the health sector to develop methods to systematically survey and characterize biodiversity (structural plant diversity, bird diversity) and wellbeing (acoustic comfort, restoration) across an urban gradient of building density and greenspace complexity. The project is led by universities (Technical University of Munich, Ludwig-Maximilian University Munich, Technical University of Berlin), the City of Munich's Environment and Climate Protection Department, and conservation groups and we focus on three distinctly structured, typical urban Munich neighbourhoods - Au (dense inner-city), Harlaching ("garden city"), and Neuperlach ("park city") - the project investigates diverse green-space configurations and their impact on human well-being. In this poster, I will present the five working objectives that span ecology and biodiversity research, public health, art-science approaches, and urban planning. Specifically, I will show how we use new methods to capture biodiversity data, people's perceptions, as well as participatory methods to involve people in creative sound interventions and in planning processes.

Key Words: Soundscapes, Urban biodiversity, Wellbeing, Greenspace planning, Transdisciplinary research

The power of the ancestral philosophy of Alli kawsay (Buen Vivir) in the indigenous movements of Colombia - Ecuador vs. the exclusion by the big mining development, contribution to the Rights of Mother Nature from the global south in middle of climate change

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Abstract

The purpose of this research is to present the urgency of listening to indigenous epistemologies of Sumak Kawsay (in kichwa language: Buen vivir-Good Living) and also to accompany the care/defense of the biodiversity-rich indigenous territories of the Andean region. As a research question: How is the anthropocene affecting the indigenous territories and with it the threats of the epistemologies of the Sumak Kawsay/Buen vivir?

This ethnographic research has been carried in the last 7 years, in Republics of Colombia and Ecuador, in Indigenous Regional Council of Cauca CRIC, and The Indigenous Confederation of Ecuador CONAIE. Theoretical references: epistemology of indigenous communities, indigenous intellectuals.

The anthropocene affects considerably the species of flora and fauna, the glaciers, water reserves, páramos understood as places where the water is born for the species. With it the territories Pan Amazonas region of native communities are strongly affected in their cosmovision to know.

Due to its high impact in high mountain areas, climate change affects the melting of glaciers, strong droughts, seasonal changes for food production, water shortages and with this the displacement of animals and indigenous people and with it affects their traditions and cosmovisions due to geographical relocation and spatial - socio-cultural changes.

Ethnographic work is used: interviews, participant observation, and documentary analysis. Key to comment how from the epistemologies, their spirituality's, indigenous cosmovision, the elders (grandparents and grandmothers) announce that if there is no respect for the species on earth comes catastrophe, which from modern science is already evident.

Results: This is considered from the Decolonial theory as an alternative to development or alternative development, based on the epistemological basis of the indigenous movement, the basis of current governments/states. Without a doubt the Sumak Kawsay is difficult to implement or live in praxis in the midst of individualistic societies with accelerated urban growth or in societies structured in fossil fuels, in addition to the radical reactionary anti-movement indigenous right that watches over environmental care.

Key Words: sumak kawsay-Buen vivir, epistemologies, ethnicity, urgent call, anthropocene, proper right.

Examining Middle School Students' Awareness of Sustainable Cities

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Abstract

Urbanization, environmental degradation, and the depletion of natural resources are among the most pressing global challenges of the 21st century. These issues have brought the concept of sustainable cities to the forefront of education, particularly in science curricula. Teaching this concept at the middle school level is vital for developing students' environmental awareness, social responsibility, and systems thinking skills (UNESCO, 2020). In this context, the present study aims to examine middle school students' awareness and understanding of sustainable cities.

The study was conducted with a sample of 300 sixth- and seventh-grade students enrolled in a public middle school. An explanatory sequential mixed-methods design was adopted to gain a comprehensive understanding of the topic. Data were collected through three sources: the Environmental Awareness Scale (Çetin & Yalçınkaya, 2018), student drawings illustrating their vision of a sustainable city, and semi-structured interviews based on these drawings.

Quantitative data from the scale will be analyzed using descriptive statistics to identify general trends, while qualitative data from drawings and interviews will be analyzed through thematic analysis using MAXQDA software. The data analysis process is currently ongoing. However, preliminary findings suggest that students tend to associate sustainable cities mainly with environmental elements, such as green areas, clean air, and renewable energy sources. In contrast, social and economic aspects of sustainability appear less frequently in students' representations.

The study aims to contribute to sustainability-oriented instructional practices by revealing how students conceptualize sustainable urban life at an early educational stage.

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Key Words: Sustainable cities, Environmental awareness, Middle school students

Traces of Istanbul's Ecology and History: A Route for Discovery and Learning in Nature

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Abstract

Urban ecologies provide valuable learning environments across disciplines. With a population of 16 million and a vast area, Istanbul hosts diverse ecological elements. Among them, urban water systems, including the Marmara Sea, Küçükçekmece Lake, Sazlıdere Valley, and Sazlıdere Dam Lake, offer rich opportunities for ecological education. This route enables participants to observe and experience the transformations of an urban ecological area over time.

Along the route, participants explore marine ecosystems along the Marmara Sea coast, brackish water ecosystems at the outflow of Küçükçekmece Lake, and freshwater ecosystems within the lake. They will reflect on the significance of sea and lake shores for urban life. Despite its urban setting, Menekşe Beach on the Marmara Sea coast has been reopened for recreational use after water purification efforts. Easily accessible by public transport, it primarily serves lower and middle-income residents seeking a seaside escape.

Beyond its natural features, Küçükçekmece Lake is also a socially significant space, offering recreational infrastructure such as walking paths, picnic spots, restaurants, and cafés. In contrast, Sazlıdere Valley, another key site, lacks social facilities and functions as a wetland ecosystem. The diversion of stream water for Sazlıdere Dam has significantly reduced water flow, leaving the streambed dry for much of the year. However, the valley is home to Yarımburgaz Caves, a major prehistoric settlement site continuously used since the Pleistocene era. The proximity to a water source made the caves an ideal settlement location. This section of the route combines ecological elements, such as plant species, with cultural and historical significance. Revitalizing this site through education can help restore its place in Istanbul's collective memory.

The final stop, Sazlıdere Dam, is a crucial drinking water reservoir. As Istanbul expands, parks have developed along its shores. This educational route allows students, teachers, and nature enthusiasts to experience ecological features, observe human-environment interactions, and strengthen their connection with nature. The study aims to assess, promote, and encourage broader use of this route for urban ecological conservation, sustainability, and education.

Key Words: Urban ecology, Küçükçekmece Lake, Sazlıdere Valley, Yarımburgaz Caves, Istanbul

The Use of Mountainous Areas for Nature Education in the Context of Sustaınable Development: Case Study of Kozak Plateau

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Abstract

Mountainous areas are important geographical units rich in economic, social and cultural aspects where living beings sustain their lives. Today, however, problems such as the lack of a legal definition of mountain areas, unconscious economic activities and uncontrolled settlements affect the sustainable development process in mountain areas. In this context, it has become an important issue to increase the awareness of mountain communities about the environment, sustainable alternatives, economic and cultural values in the development process.

This research will be carried out in the villages of the Kozak Plateau in the Bergama district of Izmir province in the Aegean region of Turkey. In this research, which will be carried out within the scope of the thesis study, it is aimed to determine the needs of Kozak Plateau villages for sustainable development and nature education potential in the first stage. For this purpose, field work and semi-structured interviews will be carried out. Within the scope of the data obtained, a nature education model will be created and applied training will be carried out. In this study to be carried out in the villages of Kozak Plateau, it is aimed to evaluate the effects of nature education in mountainous areas on the sustainable development of the area in environmental, economic, social and cultural terms.

A SWOT analysis will be carried out with the data obtained from field studies and interviews. This will reveal the strengths and weaknesses of the implementation of nature education for development in mountain areas. The nature education model created with these results will be implemented in the research area as applied training. A pre-test/post-test will be applied to the participants before and after the training. The data obtained will then be analysed using SPSS software to measure the effectiveness of nature education in improving the awareness of communities in mountainous areas. The results of the research will be shared at the conference and the use of a mountainous area for nature education in the context of sustainable development will be evaluated.

Key Words: Mountainous Areas, Sustainable Development, Nature Education, Kozak Plateau

Using a participatory approach to develop a South African low-middle income settlement into a sustainable, regenerative green place

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Abstract

Climate change impacts emphasises the need for environmental justice and participatory spatial transformation, especially in marginalised urban contexts. In response to the need for inclusive and regenerative planning approaches, the study focuses on a participatory pilot project undertaken as part of the National Research Foundation-funded Transformative Green Place-Making study at the North-West University. Community Based Research (CBR) is taken as point of departure to engage youth participants that are not in employment, education or training (NEETs) in co-design for a green future in the community of Khuma low-middle income settlement in the North-West Province in South Africa. Following a focus group discussion on the need and understanding of sustainable and regenerative green places, participatory community mapping was employed to prepare a future green plan for Khuma. The focus was on how underutilised public spaces can be transformed into a green public places that support sustainable and regenerative ecosystem services. The interactive discussion and participatory design activity opened up new and fresh perspectives of the potential of nature-based solutions as catalysts for transforming underutilised spaces that were previously perceived as negative spaces. The findings suggest that, although participants initially had a limited understanding of ecosystem services, nature-based solutions and various other urban green spaces, the participatory process that was followed fostered new environmental knowledge, a sense of ownership, and innovative ideas for affordable contextualised interventions. This vision draws on available community resources and aligns with principles of regenerative sustainability, offering insights for future local-scale interventions that are inclusive, resilient, and ecologically grounded, a gap that is much needed to address when it comes to the implementation of nature-based solutions in a South African low-middle income settlement context.

Key Words: Urban greening, Urban green spaces, Transformative design, low-middle income settlement, South Africa

An Examination of the Functional Use Potentials of Schoolyards as Urban Ecological Spaces During a Possible Istanbul Earthquake – The Case of Zeytinburnu"*

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Abstract

Today, in megacities like Istanbul that face intense urbanization due to excessive population pressure, children are increasingly losing access to natural play areas. Apart from enclosed residential compounds, streets within neighborhoods have become the primary play areas for children. However, due to increased traffic caused by the rise in vehicle ownership and safety concerns of parents, these streets are no longer considered safe play areas. In contrast, schoolyards located within neighborhoods in urban settings are viewed as one of the safest play areas for children due to their proximity to homes and separation from motorized traffic. Especially schoolyards designed with natural elements and child-friendly features positively impact children's education and development. Moreover, school campuses are considered as potential gathering and temporary shelter areas in disaster response planning for a possible Istanbul earthquake. The aim of this study is to examine the potential use of schoolyards as gathering and temporary shelter areas during disaster response processes. This study is prepared within the scope of the TÜBİTAK-1001 project titled "Enhancing the Sustainability of Education During the Disaster Response Process of a Potential Istanbul Earthquake." Within this context, the role of schoolyards in maintaining the four fundamental pillars of disaster response—shelter, nutrition, health, and education—will be analyzed. The study is conducted in three selected school campuses within the Zeytinburnu district of Istanbul. The selection of the school campuses considered factors such as risk levels during a possible earthquake, structural resilience of the schools, their functional usability in the event of a disaster, and representation of different educational levels. The study is based on official documents prepared by public institutions and local authorities, particularly AFAD (Disaster and Emergency Management Authority), and on data obtained through face-to-face interviews with school administrators, teachers, and students at the selected schools. These data were analyzed using content analysis techniques. The results reveal that schoolyards have a significant function as gathering and temporary shelter areas in the disaster response process.

*It has been prepared within the scope of the TÜBİTAK 1001 project numbered 223K220.

Key Words: Schoolyard, Potential Istanbul Earthquake, Response Process, Education

From quantity to quality_new approaches to improve the carbon sink function of street trees in Shanghai metropolis

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Abstract

China's urbanization has developed rapidly during recent decades, and the urban land use and land cover have changed dramatically. Among them, the area of urban green space has increased significantly, which has become an important way to achieve 'double carbon' (carbon peak, and carbon neutralization) goal. It is also a strong support in response to the '4 per 1000' Initiative. However, a large amount of gray infrastructure extrusion, construction waste mixing, and human trampling-induced soil compaction have limited the growth space of tree roots, which has become a key factor impairing the health of trees, thereby reducing their carbon sink function. Therefore, the shift from merely increasing green space quantity to enhancing its quality has emerged as a novel approach to boost the carbon sequestration capacity of trees. In this study, on the one hand, we used PCAD (plane calculation of angle disparity) method and online datasets to compare the annual increment of green biomass of street trees which was significant lower in Shanghai, China than that in Seattle, USA. On the other hand, by simulating the asymmetric situation, we used both in-situ root monitoring system and harvest method and analyzed the root architecture responses and the biomass loss caused by the limitation of root growth space. Finally, we proposed countermeasures to increase the annual increment of green biomass, including soil improvement, adjustment of pruning methods, and reuse of solid waste in Shanghai. The research results provide new ideas and approaches for the improvement of carbon sink capacity of street trees in megacities.

Key Words: carbon sink capacity; PCAD method; constrained growth space of tree roots; root architecture

Water Supply-Demand Balance Analysis and Ecological Restoration Projects Optimization under the Perspective of Ecosystem Service Flow

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Abstract

Water is the fundamental basis for human survival and development, serving as one of the most critical natural resources. In recent decades, global ecosystems have experienced continuous degradation due to the combined impacts of human activities and climate change. Over the past years, extensive ecological restoration projects have been implemented across various regions in China, yielding notable results. However, while these projects have enhanced vegetation coverage, they have also increased additional water consumption, posing significant challenges to water sustainability. Previous studies on ecological restoration project site selection have primarily relied on static comprehensive evaluations, often neglecting the constraints imposed by local water resource conditions. To address this gap, this study focuses on Fugu County, Shaanxi Province, using the Water Security Index (WSI) to assess the balance between water supply and demand under static conditions. Furthermore, a dynamic spatial flow model was developed to simulate the pathways of water ecosystem service flows, enabling an evaluation of water resource equilibrium under dynamic conditions. The findings reveal a pronounced spatial mismatch between water supply and demand in Fugu County, with water supply balance exhibiting an east-high, west-low distribution pattern. From 2005 to 2020, the outflow, inflow, and number of watersheds in Fugu County's sub-basins displayed a fluctuating trend—initially increasing, then decreasing, and subsequently rising again—while demonstrating spatial aggregation characteristics along major river tributaries. The flow of water ecosystem services has effectively alleviated the spatial disparity in water resources, with water-scarce areas primarily located in the county's peripheral zones, whereas regions with higher supply-demand balance are concentrated along the main river basins. Based on the above findings, this study further examines the optimal spatial distribution of various ecological restoration projects and the differentiated implementation strategies under varying water resource conditions in Fugu County. By optimizing resource allocation and adopting adaptive measures such as water-saving technologies, water resource management, and vegetation restoration, ecosystem stability can be enhanced. The results provide a scientific foundation for ecological restoration projects in similar regions.

Key Words: water resources; ecosystem service flow; supply-demand balance; ecological restoration projects; restoration strategy

Optimization of ecosystem services and their relationship with landscape patterns in Shanghai, China

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Abstract

Driven by rapid urbanization and intensified human activities, ecosystem services (ES) in global megacities are under increasing pressure, necessitating the development of effective strategies to harmonize ecological conservation with urban development. This study proposed an integrated framework that combines spatial optimization with explainable machine learning to identify landscape patterns that enhance ES provision. Using Shanghai—a typical megacity facing complex sustainability challenges—as a case study, our approach integrated GIS-based Ordered Weighted Averaging (OWA) for multi-objective spatial planning with XGBoost machine learning enhanced by SHAP analysis to elucidate relationships between landscape patterns and ES performance.

Three key findings are identified. First, peri-urban ecosystems in the Chongming, Baoshan, and Qingpu districts exhibit high ES efficiency, protecting 20% of critical areas sustains 31% of Shanghai's total ES capacity, highlighting the ecological significance of urban-rural transition zones. Second, analysis reveals clear threshold effects in landscape patterns, including tree edge density (ED_Trees >14 m/ha), tree patch connectivity (IJI_Trees <57%), and building cluster compactness (AI_Built <97.9%), which confirms that spatial configuration plays a more important role than simple vegetation coverage in influencing ES. Third, distinct optimization strategies are required: urban centers necessitate interconnected tree networks and dispersed building layouts to enhance microclimate regulation, while suburban areas require clustered woodlands and continuous grassland patches to support biodiversity and flood control.

These findings can provide insights by quantifying the impacts of specific landscape patterns on ES performance. The proposed framework offers practical tools to enable urban planners to transition from passive environmental management towards proactive ecological design. This methodology establishes a transferable model for other megacities striving to attain ecological sustainability via data-driven spatial planning. By bridging landscape pattern analysis with decision-making processes, this research facilitates more scientifically grounded urban governance in rapidly developing regions.

Key Words: Ecosystem services, optimization, landscape patterns, GIS-OWA, XGBoost-SHAP

Revealing Green Inequities: Examining Distribution and Access Disparities to Green Spaces and Ecosystem Services in Latin American Cities

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Abstract

Green spaces play a vital role in the well-being of the world's growing urban population, given their ability to provide them with various ecosystem services related to climate regulation, disaster prevention, and recreational experiences. However, as urban expansion continues to grow globally, the coverage of green spaces has been declining, along with their capability to improve the urban people´s quality of life, compromising the sustainability of cities worldwide. This trend could be more acute in Latin America, where severe urban expansion has occurred due to the concentration of approximately 80% of the population within cities, mostly living in severe poverty, inequality, and informal conditions. Unfortunately, significant knowledge gaps persist in Latin America regarding the current coverage of urban green spaces and their role in the provision of ecosystem services. Likewise, there is a significant concern about the equity with which these spaces and ecosystem services are spatially distributed or are accessible, especially for those experiencing greater social and economic vulnerability. In this study, we present the results of an analysis of inequalities in the distribution and access of different social groups to urban green spaces and their climate regulation capacity in Bogotá, Colombia—a city in northern South America—and also explore how these inequalities may be occurring in other Latin American cities. Our analysis reveals severe asymmetries in both the quantity (coverage) and quality (climate regulation) of green areas, particularly in the downtown and southwest of the city, where the most vulnerable and poor population groups are concentrated. These disparities show considerable variability when examined at various scales. These findings are consistent with previous research conducted in other neotropical cities or predict what may be occurring in those that do not yet have specific information about this situation. These results highlight a worrying situation of environmental injustice that exacerbates the persistent inequalities that still affect the Latin American region. This knowledge will be crucial for promoting strategic urban planning processes that can maintain and increase the green spaces coverage in Latin American cities while reducing the gaps in access to their ecosystem services.

Key Words: Environmental Justice, Green Infrastructure, Climate Regulation, Urban Planning, Poverty, Social Vulnerability