BOOK OF ABSTRACTS

Session 22: Reconnecting cities and peri-urban areas with nature: the role of Nature-based Solutions

symposium

BACK TO THE PROGRAM

This Book of Abstracts provides a comprehensive overview of the session content and is structured into two main sections:
I. Session Description: an introduction to the session
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I. SESSION DESCRIPTION

Hosts:

	Name	Organization
Host	Najla Kamergi	Euro-Mediterranean Water Information System
Co-hosts	Tadej Stepisnik Perdih	National Technical University of Athens
	Lorenzo Oretti	ART-ER
	Elena Allegri	CMCC Foundation
	Thelma Pellicer	OIEAU

Description:

Friday, 6 November 2026 | **8:30 AM - 10:30 AM** | Aubépine 1+2+3

Cities and peri-urban areas are increasingly affected by climate change, biodiversity loss, and rising public health challenges across Europe. In parallel, the EU's Nature Restoration Regulation (NRR) establishes new legally binding targets to restore degraded ecosystems, including urban environments. NbS offer promising pathways to reconnect cities with nature while addressing these interlinked challenges. However, implementing these solutions in urban and peri-urban contexts requires more than ecological design. It demands inclusive governance frameworks, innovative blended finance, community engagement, and social acceptance, particularly in densely populated and socially diverse cities.

The session proposed by CARDIMED and three sister projects (ARCADIA, DesirMED and NATALIE) will explore how cities can implement the NRR by fostering cross-disciplinary dialogue to advance a holistic perspective and provide actionable ideas for practitioners as well as policymakers, all synthesized in a collaboratively developed Policy Brief. By presenting evidence-based and policy-relevant knowledge, this session will explore how cities can design, leverage innovative financing and implement NbS that are environmentally efficient, socially accepted, and institutionally supported.

Speakers who bring interdisciplinary expertise spanning ecology, economics, urban planning, sociology, and data science are invited to present their innovative tools and methodological approaches for implementation, monitoring and evaluation strategies. Submissions demonstrating the effectiveness of NbS in mitigating urban heat, managing stormwater, reducing flood risks and improving biodiversity are welcome. We also seek contributions demonstrating the measurable impacts of urban and peri-urban NbS, including mental health, physical activity, air quality, and overall wellbeing. Speakers showcasing innovative financing schemes and community engagement are welcome to present their governance model.

II. LIST OF ABSTRACTS - ORALS

01. Climate and biodiversity co-benefits at the schoolyard scale: An integrated PALM-based assessment of nature-based mitigation packages at two Swiss cantonal schools

Speaker: Nathalie Baumann[1]
Authors: Anke Domschky[1], Nathalie Baumann[1] and Lukas Schmid[2]
Affiliations: [1]Zürcher Hochschule für Angewandte Wissenschaften - Zurich University of Applied Sciences – Switzerland
[2]Landscale AG – Switzerland

Schools and other public-building campuses are increasingly recognised as critical leverage points for urban climate adaptation and biodiversity recovery, yet integrated assessments that quantitatively link the microclimate effects of nature-based solutions (NbS) with structural biodiversity outcomes at the parcel scale remain rare. Heat-mitigation studies and biodiversity evaluations are typically conducted in parallel rather than jointly weighed, leaving public building owners without an operational basis to prioritise NbS measure packages under tight budget and planning constraints.
We present an integrated co-benefit assessment of four NbS measure packages (MPK 1 to 4: terrace greening, ground-based depaving with climate-adapted planting, shaded outdoor learning spaces, and an existing renovation project) at two cantonal school sites in Winterthur, Switzerland (Kantonsschule Rychenberg and Kantonsschule Im Lee). The study, commissioned by the Building Department of Canton Zurich for planning horizons 2035 and 2060, couples PALM Urban Climate Model simulations quantifying perceived equivalent temperature (PET) reduction with a structured biodiversity assessment along five dimensions: connectivity, age structure, plant inventory, structural diversity, and undisturbed areas. Fauna indicator species are derived from open biodiversity databases (stadtwildtiere.ch, Info Fauna/CSCF); plant recommendations follow a climate-resilient species logic rather than a strict native-species criterion.

Comparative results reveal pronounced trade-offs and convergences between heat-mitigation effectiveness and biodiversity gain. Ground-based depaving combined with climate-adapted planting (MPK 2) emerges as the strongest co-benefit profile, while terrace greening (MPK 1) is competitive only under sufficient substrate depth. An open research question concerns how tree evapotranspiration interacts with cool-air flow regimes at the campus scale.

Beyond the case sites, the framework is transferable to other public-building portfolios and supports living-lab integration via cantonal school curricula. It offers a transparent basis for prioritising NbS investments where climate and biodiversity objectives must be jointly delivered.

Keywords: *Nature-based Solutions* *Urban heat mitigation* *Climate* *Biodiversity co-benefits* *PALM Urban Climate Model* *Biodiversity assessment* *School grounds* *Living labs* *Switzerland*

02. Climate change mitigation for Flood and Drought by Nature-based Solution in Mediterranean regions: the Sicilian demo case of CARDIMED

Speakers: Anacleto Rizzo[1] and Fabio Masi[1]
Authors: Anacleto Rizzo[1], Liviana Sciuto[2], Alessia Rizzo[2], Vincenzo Scavera[2], Feliciana Licciardello[2], Giuseppe Cirelli[2], Gaia Militello,[3] Lara Riguccio[3], Barbara Sarnari[4], Leonardo Magherini[1], Nicola Martinuzzi[1] and Fabio Masi[1]
Affiliations: [1]Iridra S.r.l – Italy
[2]Department of Agriculture, Food and Environment (Di3A), University of Catania – Italy
[3]Municipality of Catania – Italy
[4]Svi.Med. ETS – Italy

Nature-based Solutions (NbS) and related measures, such as Sustainable Drainage Systems (SuDS) and green walls, offer multifunctional strategies for climate adaptation and mitigation, enhancing urban resilience while delivering co-benefits including improved water quality, biodiversity, and amenity. Despite their potential, NbS adoption faces barriers related to planning, knowledge gaps among policymakers and practitioners, local environmental constraints, and integration with existing grey infrastructure. Within this context, the demo cases in Sicily of the Horizon Europe CARDIMED, two pilot interventions – Catania and Ferla – illustrate complementary approaches addressing stormwater management and water reuse.
The Catania demo, located at Tondo Gioeni, addresses recurrent flooding caused by stormwater runoff from a 110-hectare upstream urban basin flowing along Andrea Doria Avenue. The project retrofits Tondo Gioeni areas at a heavily trafficked intersection near Parco Gioeni using a combination of grids, swales, bioretention cells, and infiltration shafts. The intervention covers 4400 m2, integrates Mediterranean drought-tolerant species, and reflects city-specific elements of water and fire. Beyond flood mitigation, the system enhances water quality and urban biodiversity, demonstrating the multifunctional potential of SuDS in dense urban environments.

Complementing flood mitigation, the Ferla project addresses water scarcity through a full-scale living wall for greywater treatment at the Istituto Comprensivo Statale "Valle dell'Anapo" middle school in Ferla. The 30 m^2 system treats approximately 1.3 m^3/day of greywater – about 23% of the school's water demand for toilet flushing. The system was designed as vertical submerged subsurface flow treatment wetlands, i.e. unsaturated and batch-fed. Treated greywater is collected in an underground tank and reused for toilet flushing and irrigation, reducing potable water consumption. Together, the Catania and Ferla pilots illustrate how NbS can be adapted to specific Mediterranean urban challenges. While Catania demonstrates NbS for flood mitigation and multifunctional landscape integration, Ferla showcases innovative greywater reuse through vertical green infrastructure.

Keywords: *Sustainable Water Management* *Circular Economy* *Sponge City* *Sustainable Drainage Systems* *Rain Garden* *Bioretention Cells* *Flood Mitigation* *Nature-based Solutions*

03. Climate Risk Assessment and Future Scenarios: Physical Mitigation Mechanisms of Nature-based Solutions to Reconnect Urban and Peri-Urban Areas

Speakers: Jesús Soler[1] and Sotiria Baki[4]
Authors: Jesús Soler[1], Beniamino Russo[2], Albert Chen[3], Jess Penny[3], Sotiria Baki[4], Theano Iliopoulou[4], Sotirios Moustakas[4] and Christos Makropoulos[4]
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[2]Universitat Politècnica de Catalunya = Polytechnic University of Catalunya – Spain
[3]University of Exeter – United Kingdom
[4]National Technical University of Athens – Greece

To address escalating climate pressures and successfully reconnect with nature, urban and peri-urban areas require robust adaptation strategies. This calls for a deeper understanding of the climate-related hazard mitigation potential of NbS and of their impacts from a holistic perspective. To achieve this, specialized tools and appropriate methodologies for integrating NbS into risk assessment are required. This contribution presents the methodological framework developed by the European project NATALIE to evaluate the performance of NbS.

The core of this methodology is an advanced risk assessment based on the updated IPCC AR6 conceptual framework. Within this approach, NbS are evaluated from a dual perspective: (i) as adaptation measures that reduce hazard intensity and enhance urban resilience, and (ii) as risk receptors with a dynamic vulnerability that evolves as the living system matures. To accurately assess their impact, the methodology relies on a process-based mapping of the physical mitigation mechanisms provided by NbS. By deconstructing each solution into specific natural processes, such as water infiltration, retention, soil stabilisation, and evapotranspiration, we can model and quantify their real capacity to mitigate primary hazards like urban flooding, drought or wildfires, among others. This approach is based on the evaluation of targeted performance indicators and can also account for complex climate dynamics, including compound hazards, and trace their cascading effects across interconnected natural, infrastructural, and socio-economic systems.

Furthermore, the framework integrates high-resolution climate scenarios with physical modelling to move beyond historical data. This enables the optimal design of interventions and provides actionable tools to ensure that green and blue infrastructure generates environmental, social and economic impacts and associated co-benefits.

Keywords: *Risk assessment* *NbS framework* *Physical processes* *Indicators* *Co-benefits* *Impacts*

04. Soil biodiversity and vegetation early responses to unsealing process under a Mediterranean urban area

Speakers: Lola Czuckermand and Véronique Masotti
Authors: Lola Czuckermand, Mathieu Santonja, Solène Brasseur, Mathilde Vallée and Véronique Masotti
Affiliation: Aix- Marseille University – France

Urban areas are facing unresolved challenges in stormwater management, urban heat mitigation, and biodiversity loss due to pollution and habitat fragmentation. Despite worldwide research efforts devoted to the restoration of urban areas, this process in Mediterranean region remains largely understudied, especially in the early stages of restoration process. As part of the H2020 CARDIMED project, a nature-based solution approach was implemented to unseal ~6000 m² of the Aix-Marseille University campus, with the aim of establishing a microforest-like habitat.

We studied three zones: a control zone corresponding to an area that was already vegetated before unsealing; a renatured zone, originally partially impervious, which was heavily altered by excavation and hydrological reworking, and remaining connected to the control zone; finally, an unsealed zone, initially impervious, which was revegetated after unsealing, physically separated from the two other zones by a porous asphalt path. We monitored soil physicochemical and biological parameters biannually, along with the survival and recolonization of spontaneous and planted vegetation.

Across our entire site, we have an average of 15130 endogenous fauna individuals per square meter, and 325 epigeous fauna individuals per pitfall trap. After one year of rehabilitation, the renatured area showed significant fauna recovery. Endogenous fauna abundance, initially lower than in the control zone, reached control-equivalent levels within six months and surpassed them after one year. Epigeous fauna followed a similar trajectory. After one year, plant species diversity converged across all three zones.

During all the experiment, epigeous fauna and vegetation community structures were significantly different across treatments. The soil microbial community structure converge after one year between control and renatured zones. By contrast, the endogenous fauna community structure converged between control and unsealed zones after one year.

These results demonstrate that nature-based urban unsealing can trigger ecological recovery within a single year, even under a water-stressed Mediterranean climate.

Keywords: *Soil fauna* *Soil community* *Urban rewilding* *Plant diversity* *Multitaxa monitoring* *Early recolonization stage*

05. Reconnecting cities with nature without increasing mosquito risk? Assessing the relationship between Nature-based Solutions and Aedes albopictus abundance

Speaker: Juliette Brendlé-Nicolas[1]
Authors: Juliette Brendlé-Nicolas[1], Edwige Martin[1], Laurent Vallon[1], Patricia Luis[1], Aurélien Vigneron[1], Axelle Gentil[1], Marie-André Lavital[1], Gaëtane Deboeuf De Los Rios[1], Thibaud Porphyre[2,3], Nelly Exbrayat[4], Marc Bourgeois[5] and Claire Valiente Moro[1]
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[5]Environnement Ville Société (EVS) – CNRS : UMR5600, Université Lyon – France

Cities and peri-urban areas face growing challenges from climate change, biodiversity loss, and emerging public health risks, including vector-borne diseases. In the meantime, Nature-Based Solutions (NbS) are key to reconnecting urban environments with nature, restoring ecosystem functions and improving human wellbeing. However, they may also inadvertently support favorable conditions for undesired species, such as the Asian tiger mosquito (Aedes albopictus), an important vector of several human diseases. This study investigates to what extent NbS influence *Ae. albopictus* proliferation and identifies the most influential environmental drivers, including meteorological, microclimatic, socio-demographic and landscape variables, in the Lyon metropolitan area (France).

From June to October 2025, adult mosquitoes were sampled weekly using 48 BG-Pro traps deployed across eight urban sites. Overall, 29,519 adult mosquitoes representing 14 species were collected, including 25,200 Ae. albopictus. Concurrently, 182 potential breeding sites and 128 plant species were recorded. Environmental data on microclimate, land cover, meteorology, and sociodemographic characteristics were also compiled from field measurements and public databases.

Preliminary analyses using bivariate negative binomial models show that NbS classification and public/private ownership are not significantly associated with mosquito abundance. In contrast, meteorological variables, including precipitation, temperature, wind, and atmospheric pressure, appear to significantly influence capture rates, although potential non-linear threshold effects remain to be explored. Vegetation structure, mosquito-associated microbiota composition, and socio-demographic factors are currently being integrated into the model parameters. Overall, these findings highlight that NbS are not directly associated with increased *Ae. albopictus* abundance in the Lyon metropolitan area.

These results challenge the assumption that urban greening necessarily promotes mosquito proliferation and emphasize the importance of disentangling the respective roles of vegetation, breeding habitat availability, and climatic drivers. As urban NbS continue to expand, evidence-based evaluations of their ecological and public health outcomes remain essential to support informed planning and governance decisions.

Keywords: *Nature-based Solutions* *Aedes albopictus* *Public health* *Vector distribution* *Urban greening*

06. Roadmap for the co-creation of Nature-based Solutions - results and tensions from urban planning perspective

Speaker: Canto Moniz Gonçalo[1]
Authors: Canto Moniz Gonçalo[1], Alessandra Capuano[2] and Dorotea Ottaviani[2]
Affiliations: [1]Centre for Social Studies, Department of Architecture – Portugal
[2]Sapienza University of Rome DIAP – Italy

Co-creation of Nature-based Solutions involves putting together experts from different fields to engage with local communities under living lab environments. The aim is to address urban challenges, namely the social and climate ones, but also others related to heritage or to urban fragmentation, where nature can play a role towards a more just and transformative transition.

URBiNAT H2020 project (2018-2024) developed a "Roadmap for the co-creation of healthy corridors" as a result of the experience developed in 8 European cities, where the three frontrunners - Porto, Nantes and Sofia, went through the four stages of co-creation: co-diagnosis, co-design, co-implementation and co-monitoring. The roadmap established a flexible and adaptable methodology that supported the interaction between experts, municipal technicians and the local community. This experience was replicated and rethought in the TRANS-lighthouses (TRL) Horizon Project (2023-2026) to co-create NbS, not only in urban contexts, but also in rural, coastal and forest ones. The complexity of working under different contexts led the new project to improve the co-governance structure and to develop a living knowledge lab, where the knowledge was co-produced by the 8 pilots.

The presentation aims to analyse both projects' roadmap comparing the co-creation of NbS in terms of the methodology developed, of the NbS innovative and transformative dimensions and of the collaborative dialogue between actors.

Although co-creation aims to promote happiness and wellbeing among the several actors, it is usually described as a territory of conflict where tensions emerge from different perspectives, different expectations and different responsibilities. In this sense, the presentation will leverage fromform this "experimental environment" of the research-in-action projects to set up recommendations for the co-creation of NBS in everyday urban planning.

Keywords: *Co-creation of NbS* *Roadmap* *Conflict* *Urban planning*

07. Urban and peri-urban NbS potential – a case study from Bulgaria

Speakers: Slaveya Petrova and Ekaterina Valcheva[1]
Authors: Slaveya Petrova, Ekaterina Valcheva and Vladislav Popov
Affiliation: Bulgaria

The concept of nature-based solutions (NbS) is based on the use of natural ecosystem processes and functions to solve societal and environmental problems, while creating additional social, economic and environmental benefits. In the present report, we aimed to demonstrate the potential of green infrastructure to provide a wide range of ecosystem services in urban and peri-urban areas that address some of the most important ecological issues.

Our studies included both soil health and air quality improvement, as well as urban heat island and flood mitigation, involving mosses, lichens, herbs and trees. A methodological approach for the establishment of buffer green patches in the road network surroundings, that can represent strategies to provide ecological and social multifunctionality of urban soils, and thus, increasing their ecosystem services capacity, is presented. The potential of urban forests in countering air pollution was highlighted by three simulated scenarios for PM10, PM2.5 and NO2 removal. Although the dimensions and shapes of urban green infrastructure could vary significantly in different settlements, the integration of NbS in urban areas is important for amplifying the benefits that these green solutions can bring to the urban ecosystem.

Such strategies are discussed from a new point of view that takes into consideration not only the simple introduction of vegetation into the cities, but looks at the vegetation as an active part of the design of urban space to maximize its benefits and to minimize the negative anthropogenic load. Integrating such solutions into local policies and strategic documents can contribute to microclimate improvement, reduce air pollution, support biodiversity and increase the quality of life.

Keywords: *Urban green infrastructure* *Air pollution removal* *Soil remediation* *Ecosystem services*

08. Who benefits from urban Nature-based Solutions (NbS)? Evaluating wellbeing, justice and biodiversity in Swedish and Canadian cases

Speaker: Kaidi Tamm[1]
Authors: Kaidi Tamm[1], Heidi Tuhkanen[1] and Max-Emanuel Müller[2]
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[2]Humboldt-Universität zu Berlin = Humboldt University of Berlin – Germany

NbS are increasingly recognised for their potential to reconnect urban and peri-urban areas with nature while addressing climate resilience, biodiversity loss, and human health and wellbeing. Evidence suggests that NbS can support mental health-relevant outcomes such as stress reduction, emotional restoration, improved mood and attention, social connection and place attachment. NbS can also support physical health by encouraging physical activity and mobility, improving cardiovascular, respiratory, immune and thermoregulation functions, and reducing exposure to environmental hazards such as heat and pollution. However, these benefits are not automatic or evenly distributed. NbS are often evaluated as blue-green infrastructure, while social processes shaping outcomes receive less systematic attention.

This presentation shares insights from the Biodiversa+ project NBS services promoting local biodiversity, wellbeing and scalable solutions (NBSPLUS), focusing on cases in Malmö, Sweden and North River in Canada. The study develops and applies a Social Impact Evaluation and Monitoring Framework for NbS, informed by a review of literature on NbS, blue-green infrastructure and biodiversity-related social impacts in urban and peri-urban contexts. The framework covers physical and mental health and wellbeing, recreation, place attachment, knowledge and learning, social interaction and cohesion, justice, participation, stewardship and empowerment.

Using participant observation, resident surveys, citizen science and stakeholder engagement to establish social and ecological baselines we examine how different groups experience, use and value NbS. Attention is paid to how actual and perceived biodiversity, accessibility, safety, social interaction, place attachment and participation mediate wellbeing outcomes and shape equitable access to benefits. The cases also help identify potential disservices, such as perceived safety concerns or barriers to access.

The presentation shows how social impact assessment can support inclusive, context-sensitive and scalable NbS planning. It argues that NbS should be understood as social-ecological systems whose impacts depend on design, governance, local context, participation, and the relationship between biodiversity and wellbeing.

Keywords: *Nature-based Solutions* *Social impact evaluation* *Health and wellbeing* *Justice* *Biodiversity*