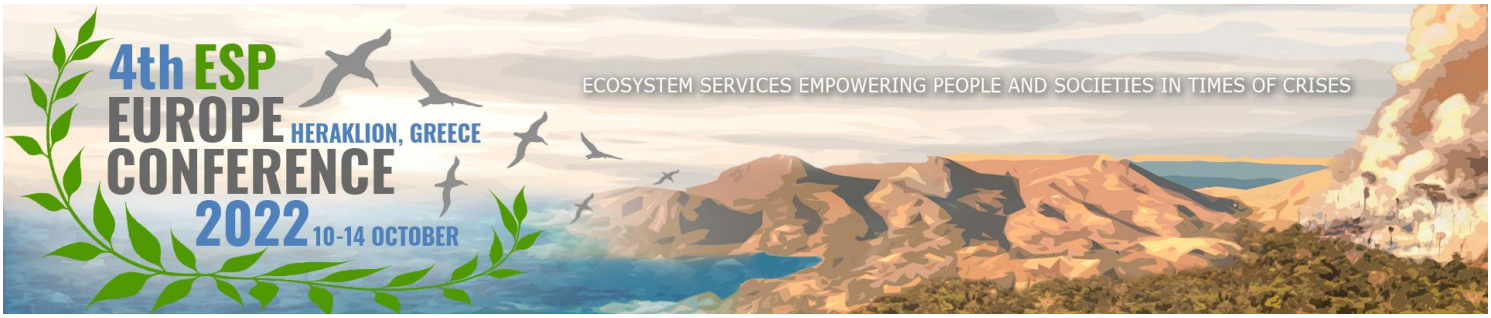


BOOK OF ABSTRACTS

I. SESSION DESCRIPTION

ID: T13a

Linking ecosystem services and Nature-based Solutions for more resilient societies & nature

Hosts:

	Title	Name	Organisation	E-mail
Host:		Emmanuelle Cohen-Shacham,	IUCN Commission on Ecosystem Management; Drew University, USA	minacs@gmail.com
Co-host(s):		Edna Cabecinha	University of Trás-os-Montes and Alto Douro (UTAD), Department of Biology and Environment, CITAB, Portugal; IUCN Commission on Ecosystem Management	edna@utad.pt

Abstract:

Ecosystems and the services they are providing are increasingly affected by biodiversity, climate change, and human health crises. The United Nations have declared 2021-2030 as the Decade for Ecosystem Restoration, recognizing the importance of restoring and rehabilitating degraded ecosystems, as key components for long-term sustainability. In this context, it is crucial to provide managers and policy makers with better knowledge and innovative tools, to help them address societal challenges.
Nature-based Solutions (NbS) are defined as actions to protect, sustainably manage, and restore natural or modified ecosystems, that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits. They incorporate an umbrella of interventions that can be implemented, to address climate change, disaster risk, biodiversity loss and ecosystem degradation, water, and food security, and human health. The Global Standard for NbS, launched in 2020, is a comprehensive operational framework that was developed to design, implement, assess, and upscale stronger NbS. It includes 8 criteria and 28 indicators, that strong NbS are to consider in their planning and implementation, such as multi-stakeholders' participation; incorporation of different types of knowledge; inclusive, transparent, and empowering governance processes; or policy integration. Ecosystem services science and tools can be of great value, for improving NbS implementation, in particular by strengthening the NbS Global Standard's

indicators.

We would like to submit this proposal for a two-parts event that will incorporate a (1) Standard Session and a (2) World Café. During this event, we are aiming at exploring the use of the well-developed ecosystem services science and tools (e.g. biophysical assessment, mapping valuation, or preference valuation), in improving the Global Standard for NbS, to better address societal challenges.

1. During the Standard Session, we welcome the presentation of case-studies or research projects that clearly show the link between NbS and ecosystem services knowledge/tools, in different geographic and ecological contexts.
2. During the World Café, we are interested in discussing specific links and potential use of ecosystem services tools in the 8 criteria of the Global Standard. The planned outcome of this session is a paper specifically focusing on these aspects.

Goals and objectives of the session:

The objectives of this session are to:

- present the Global Standard for NbS, to raise the awareness of the ESP community on NbS implementation and this global tool.
- learn, through presentations of case-studies and relevant studies, on ways that the two concepts can be used and complement each other, to better address global challenges and empower people and societies.

The objectives of the session are congruent with the conference theme of "Ecosystem services empowering people and societies in times of crises".

Planned output / Deliverables:

A summary of the case-studies presented, main discussion points, and ideas for new research collaborations on the link between NbS and ecosystem services and the challenges to adapt to global change. A full scientific manuscript will be prepared on the link between ecosystem services and NbS, with the potential participation of those contributing to the discussion.

Session format:

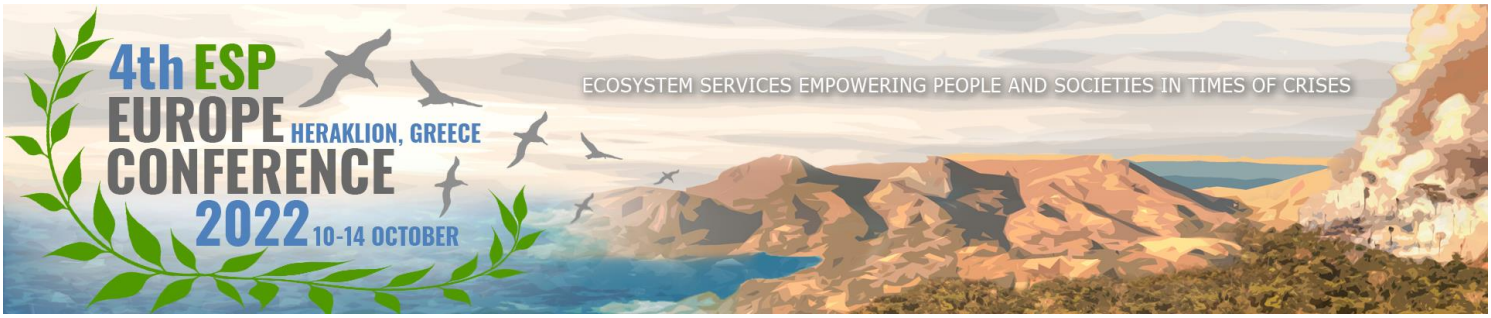
Standard session (presentations)

Voluntary contributions accepted:

Yes, I allow any abstract to be submitted to my session for review

Related to ESP Working Group/National Network:

Thematic Working Groups: TWG 13 – Role of ES in Ecosystem restoration



II. SESSION PROGRAM

Date of session: Tuesday, October 11th
Time of session: 13:30–15:30 and 16:00-17:30

Timetable speakers

Time	First name	Surname	Organization	Title of presentation
13:30	Emmanuelle	Cohen-Shacham	IUCN-CEM, USA	Nature-based Solutions – from definition to implementation
13:45	Edna	Cabecinha	UTAD/CITAB, Portugal IUCN-CEM	Linking Nature-based Solutions and Ecosystem Services to tackle societal challenges
14:00	Alessia	Chelli	School of Social Science, University of Trento, Trento, Italy	Including the spatial and temporal dimension in the economic assessment of urban Nature-based Solutions: Preliminary insights from the literature
14:15	Lucia	Almeida	Facultad de Ciencias, Universidad Nacional Autonoma de Mexico	Nature-based solutions: A tool against the socio-environmental problems of Mexico City
14:30	Selma	Benzekri	VertigoLab	Implementing Nature-based Solutions: socio-economic and business arguments for decision-makers
14:45	Tsiafouli	Maria	Ecology, School of Biology, Aristotle University of Thessaloniki, Greece	*Posidonia oceanica* banquettes as ecosystem service providers and Nature Based Solution
15:00	Fabienne	Horneman	Risk Assessment and Adaptation Strategies Division, Centro Euro-Mediterraneo sui Cambiamenti Climatici, Italy and Università Ca'Foscari Venezia, Italy	Nature-based solutions performance indicators to evaluate ecosystem service provisioning for climate change adaptation: A systematic literature review
15:15-15:30	**Discussion**			
BREAK				
16:00	George	Karwani	Tanzania Agricultural Research Institute (TARI)	Assessment of ecosystem based adaptation strategies on degraded habitats to improve communities livelihood and biodiversity resilience in lake-Natron ecosystem, Tanzania
16:15	Dennis	Roitsch	European Forest Institute, Bonn, Germany	Understanding public perceptions of forests and greenspaces in Europe
16:30	Blal	Adem Esmail	Ruhr University Bochum, Institute of	Applying Geodesign to support local planning towards sustainable urban

Time	First name	Surname	Organization	Title of presentation
			Geography, Universitatsstr. Bochum, Germany	transformation with nature-based solutions (NBS) in the Skarpnäck district, Stockholm, Sweden
16:45	Mónica	Pinto	University of Trás-os-Montes and Alto Douro, CITAB, Vila Real, Portugal	NbS to tackle societal challenges in Green Cities: The Case Study of Vale do Cavalum, Portugal
17:00	Werther Guidi	Nissim	Department of Biotechnology and Biosciences - University of Milano-Bicocca	Integrating ecosystem services into phytoremediation: new insights for a more sustainable management of urban brownfields
17:15-17:30	**Discussion**			

III. ABSTRACTS

Abstracts are ordered based on the session program. The first author is the presenting author unless indicated otherwise.

1a Title: Nature-based Solutions – from definition to implementation

Emmanuelle Cohen-Shacham[1], Edna Cabecinha[1,2]

[1]Commission on Ecosystem Management, International Union for the Conservation of Nature (IUCN)

[2]University of Trás-os-Montes e Alto Douro – Centre for the Research and Technology of Agro-Environmental and Biological Sciences (CITAB), Vila Real, Portugal

In the current Era of exacerbating societal challenges, in particular with the climate, biodiversity and health global crises, it is essential to implement well thought, solutions rapidly and at scale. The United Nations have declared 2021-2030 as Decade for Ecosystem Restoration, recognizing the importance of restoring and rehabilitating degraded ecosystems and landscapes, as key components for long-term sustainability.

In the past eight years, the International Union for the Conservation of Nature (IUCN) has been developing the definitional and operational frameworks for Nature-based Solutions (NbS). NbS are actions to protect, manage and restore natural or modified ecosystems, which address

societal challenges, effectively and adaptively, providing human well-being and biodiversity benefits. Those solutions rely on well-functioning ecosystems that provide services at their highest level. This definition and the 8 NbS principles, served as the basis for developing the Global Standard for NbS. Launched in July 2021, this Standard is implemented around the globe, it has eight criteria and 28 indicators, and it serves to: 1) help different types of stakeholders setting a common basis of understanding for what is/is not NbS; and 2) provide a robust framework, to design, implement, assess, adapt and improve NbS interventions.

During this presentation, we will introduce the IUCN work on NbS, including the latest study where case-studies are implementing the Global Standard. We will invite the presentation of studies that focus on how the tools and science that were developed in the ecosystem services discipline can serve in improving the NbS operational framework, thus better addressing societal challenges.

Keywords: Nature based-Solutions, Global Standard for NbS, Societal challenges

2a Title: Linking Nature-based Solutions and Ecosystem Services to tackle societal challenges in Atlantic landscapes

Edna Cabecinha[1,2], José D. Teixeira[1], André Fonseca[1], Simone Varandas[1], Emmanuelle Cohen-Shacham[2]

[1]University of Trás-os-Montes e Alto Douro - Centre for the Research and Technology of Agro-Environmental and Biological Sciences (CITAB), Vila Real, Portugal

[2]Commission on Ecosystem Management, International Union for the Conservation of Nature (IUCN)

Ecosystems, both aquatic and terrestrial, are affected by serious environmental challenges such as climate change. In the past few years, Nature-based Solutions (NbS) arose worldwide to address a full range of societal challenges, while increasing ecosystems' resilience, guaranteeing the provision of ecosystem services (ES), and benefiting biodiversity. Despite their potential, it is important to identify and address the barriers to this type of intervention. An innovative approach linking NbS and ES to enhance the resilience of ecosystems and biodiversity concerning societal challenges, was tested through ALICE project (https://project-alice.com). The project's primary goal was to promote sustainable investments in NbS and identify how NbS benefit ES delivery and biodiversity conservation across Atlantic landscapes. For this, the project aimed to co-produce, with key stakeholders, a framework design for the development and implementation of NbS at the watershed scale. The Global Standard for NbS

was implemented in the River Paiva watershed, Portugal, in order to define clear parameters for implementing the NbS intervention in the field. This was an essential step, to increase the scale and impact of the NbS intervention, prevent negative outcomes or misuse, and help policymakers and other stakeholders to assess and adaptively improve the interventions' effectiveness.

The engagement of a diversity of stakeholders both at local, regional and national levels in promoting inter-institutional and multi-disciplinary coordination, was fundamental to maximize the NbS' impacts at policy levels and strengthen decision-making. The link between NbS and ES can offer decentralized mechanisms that are managed by and for communities that require collaborative, participatory, and multilevel governance across sectors and procedures. This provides an opportunity to better integrate the agendas of climate action, disaster risk reduction, and biodiversity conservation into a coherent and holistic approach.

With this case-study, we hope to contribute to more effective and integrative management through this multidisciplinary, collaborative approach to implement NbS and improve ES provision and biodiversity under climate change.

ALICE EAPA_261/2016 funded by Atlantic Area: European Regional Development Fund (ERDF) through INTERREG Atlantic Area 2020 Transnational Cooperation Program.

Keywords: Ecosystem Services, Nature based-Solutions, Atlantic Landscapes, Integrated Landscape Management; IUCN Global Standard for NbS

3a Title: Including the spatial and temporal dimension in the economic assessment of urban Nature-based Solutions: Preliminary insights from the literature

Alessia Chelli, Davide Geneletti

School of Social Science, University of Trento, Trento, Italy

The implementation of urban Nature-based solutions (NBS) is recognised as an effective strategy to support climate change adaptation in cities while enhancing social, environmental and economic well-being. Determining their comprehensive values is essential to promote their adoption and support policymakers in comparing different investment alternatives. NBS provide multiple benefits and ecosystem services that are measured in different metrics, and thus require the integration of various assessment approaches. Furthermore, the benefits provided by NBS are distributed differently across space and time, hence their value might

change according to the scales at which the assessment has been conducted, and the beneficiaries included. To appropriately estimate the costs and benefits of NBS, it is therefore important to conduct assessments at different spatial and temporal scales, for instance by comparing the impacts on the site and time of implementation, with those in the surrounding area and the long-term, and identify possible trade-offs.

This study aims to shed light on this issue by performing a review of case studies in both the scientific and the grey literature. We focus on understanding which spatial and temporal dimensions have been addressed and whether they adopted a multi-scale approach in the assessment. Furthermore, we collect and critically analyse, in relation to the different types of NBS, the type of costs and benefits included in the assessment, as well as the specific methods and indicators adopted. The findings of this study are expected to guide future research in identifying the most suitable evaluation framework, encouraging the inclusion of spatial and temporal dynamics to foster a more comprehensive economic assessment of NBS, aiming to better support urban planning decisions.

Keywords: Nature-based solutions; Economic assessment; Spatial and temporal scale

4a Title: Nature-based solutions: A tool against the socio-environmental problems of Mexico City

Lucia Almeida Leñero[1], Julieta Jujnovsky[2], Monse Moysen[2,1]

[1]Facultad de Ciencias, Universidad Autonoma de México

[2]Universidad Autonoma Metropolitana (Azcapotzalco)

In Mexico City (CDMX), there is an urgent need to find solutions to complex socio-environmental problems. Little analyzed alternatives to achieve a sustainable conservation such as Nature-Based Solutions (NbS), are supported by comprehensive scientific data with technical and/or traditional approaches. If these solutions were valued economically, they could be an alternative by internalizing short-term costs and prioritizing long-term investments. Therefore, we seek to support the design and implementation of NbS in a peri-urban watershed of CDMX through economic valuation methods. The three ecosystem services considered are i) water provision, through the replacement cost method, ii) erosion control and soil maintenance, through the contingent valuation method, and iii) scenic beauty, through choice models. The economic value generated by this watershed for the water

provision service, through the value of its production, is $2.12 billion USD per year. The economic value that the population of the CDMX would be willing to pay for the conservation of the watershed in terms of erosion control and soil maintenance amounts to 14 million USD per year. Meanwhile, scenic beauty, where potential visitors are willing to pay to maintain these landscapes, reaches a value of $8.5 million USD per year. Currently, the amount allocated for conservation activities in the watershed is $350 USD per hectare and year. This is much less than what it would cost to lose these services. In this sense, the financial budget should prioritize the NbS in the long run as they are a best option from an economic as well as socio-environmental perspective, for decision-making, in the generation of environmental public policies, and in order not to lose ecosystem services that are fundamental to maintaining the resilience of a megacity like the CDMX.

Keywords: peri-urban watershed, economic valuation, water provision, erosion control and soil maintenance, decision-making

5a Title: Implementing Nature-based Solutions: socio-economic and business arguments for decision-makers

Selma Benzekri, Florine Delesse, Clémentine Anglada, Thomas Binet, Anne-Sophie Pellier, Joana Boares

VertigoLab and BirdLife International

Nature-based Solutions (NbS) are actions to protect, sustainably manage, and restore ecosystems, that simultaneously provide human well-being and biodiversity benefits. Those solutions provide multiple ecosystem services, which make them more relevant than conventional solutions for tackling global societal, climatic, and environmental challenges. NbS represent an alternative to conventional infrastructure which is a major driver of biodiversity loss. Based on a literature review on the economics of Nature-based Solutions (NbS) and their link to ecosystem services, our research on socio-economic features of NbS, and our practical experience of evaluating ecosystem services in a conservation context, we reviewed the socio-economic and business arguments to decision-makers for implementing NbS.

NbS provide socio-economic benefits that are felt by everyone, as well as specific benefits for the private sector. They are cost-effective and generate higher added value in the long term than conventional infrastructure. However, NbS are not yet as widely implemented as expected

because of gaps in socio-economic references on NbS. We identified the following major levers to fill this gap: (1) Increasing knowledge and evidence by training people to evaluate ecosystem services and NbS opportunities; (2) Sharing experience on NbS implementation, and barriers and enabling factors to this; (3) Evaluating the best procurement options and procedures to enable and favour NbS over conventional solutions; (4) Providing advice on investment options to enhance NbS.

In this presentation, we share the knowledge and experience built from our research on the socio-economic features of NbS and the development of tools to measure and assess NbS benefits and costs.

Keywords: Nature-based Solutions, Ecosystem Services, Biodiversity, Socio-economics, Business

6a Title: Posidonia oceanica banquettes as ecosystem service providers and Nature Based Solution

Tsirika Anastasia[1], Mantouza Ahi[2], Michailidis Konstantinos[3], Papadopoulos Nikolaos[3], Karamouchtari Anthi[3], Alvanou Lydia[4] & Tsiafouli Maria[5]

[1] Laboratory of Fish and Fisheries, School of Agriculture, Aristotle University of Thessaloniki, Greece

[2] Consortis, 27 Georgikis Scholis Avenue, PO Box 4316, 57001 Pylaia, Thessaloniki, Greece

[3] Directorate of Innovation and Entrepreneurship Support, Region of Central Macedonia

[4] Axios Delta National Park, Management Unit of Protected Areas of Central Macedonia, N.E.C.C.A.

[5] Department of Ecology, School of Biology, Aristotle University of Thessaloniki, Greece

Posidonia oceanica meadows are significant Mediterranean ecosystems. Throughout the year, their dead biomass accumulates along the adjacent shores, forming wedge structures (banquettes). The latter play an essential role in nutrient dynamics and in beach morphodynamics, protecting from erosion and contributing to the construction and conservation of dunes. Thus, *Posidonia oceanica* provides multiple ecosystem services both in the marine as well as the terrestrial environment.

In this study, elaborated in the framework of the POSBEMED2 project (InterregMED), we used the IUCN «Global Standard for Nature-based Solutions (NbS)» as a tool to evaluate

interventions of Posidonia banquette management in the case study area of Epanomi-Greece (Natura 2000 sites GR1220012/GR1220011). Along the sites' coast there is a gradient in the intensity of use and in specific places, the beach tourism activity, including beach bar facilities, is very high. The gradient of use is expressed by the management practices applied to the accumulated biomass along the shoreline (from non-management to intensive and even permanent removal of the banquettes biomass and their treatment as waste) and is depicted in the form, structure and ecosystem service provision of the banquettes.

For the 8 Criteria of the NbS methodology, the total percentage for Epanomi reached 61% (i.e. adherent). For Criteria "Societal Challenges", "Benefit for Biodiversity and Sustainability" and "Social Consensus", the score was high (>80%), while for "Economic feasibility", "Balance of compensation" and "Adjustable management" the score was low (<45%). Our proposal, for increasing the total score and attaining multiple ecosystem services, includes the modification of the existing management practices and specifically the preservation of banquettes' biomass (non-removal practice), or the temporary removal and repositioning (during autumn). The "key" steps for the proposal's success are awareness/information actions, designation of a responsible authority, improvement in legislation and implementation of monitoring programs.

Keywords: Multiple ecosystem services, *Posidonia oceanica* biomass, coastal management

7a Title: Nature-based solutions performance indicators to evaluate ecosystem service provisioning for climate change adaptation: A systematic literature review

Fabienne Horneman[a,b]; Silvia Torresan[a,b]; Elisa Furlan[a,b]; Andrea Critto[a,b]

[a] Centro Euro-Mediterraneo sui Cambiamenti Climatici | Università Ca' Foscari Venezia. Via della Libertà, 12 - 30175 Venezia (VE), Italia

[b] Department of Environmental Sciences, Informatics and Statistics, University Ca'Foscari Venice, Via Torino 155, I-30172

Coastal zones are among the most vulnerable areas impacted by climate change. Through providing ecosystem services (ESS), coastal habitats and ecosystems play an important role in coastal protection, reducing vulnerability to sea-level rise, coastal erosion, and water quality degradation. The realisation that nature-based solutions (NbS) can prepare coastal ecosystems against climate change hazards has prompted an increasing interest in mainstreaming

ecosystem-based approaches within coastal zone management. NbS' success depends on sufficient scientific knowledge of function performance and benefits. Precise and measurable indicators are essential to monitor the effects and their mitigating influences on climate change. However, what constitutes restoration outcomes, success, and appropriate evaluation is debated. Based on their ability to provide ESS -including climate change regulation, water quality purification, reduction of coastal flood and erosion risk- this research aims to identify suitable indicators to evaluate NbS in terms of ESS and biodiversity gains through a systematic review. Ecosystems, NbS and ESS are strongly related, this review indicates that the main ecosystems associated with the focal ESS are saltmarshes and wetlands, seagrasses, mangroves, and coastal lagoons. NbS frequently attributed to these ecosystems include restoration, transplantation, living shorelines and MPAs. These NbS target specific aspects of climate change hazards and impacts which can be expressed in indicators explaining NbS influence on: e.g. geomorphology, wave and wind climate, sedimentation processes, carbon dynamics, habitat condition and water quality. Evaluating the changes within these indicators can help assess the success of NbS in terms of provisioning ESS, biodiversity gains and climate change adaptation. They will be used within the REST-COAST project to identify technical barriers, successful solutions, and good practices for NbS upscaling and enhanced coastal restoration in the Venice lagoon. The project leading to these results has received funding from the European Union's Horizon2020 research and innovation programme under grant agreement No 101037097.

Keywords: Nature-based solutions, ecosystem services, coastal protection, climate change hazards

1b Title: Assessment of ecosystem based adaptation strategies on degraded habitats to improve communities livelihood and biodiversity resilience in lake-Natron ecosystem, Tanzania

[1]George M. Karwani, [2]Philipo Mashamba

[1]Tanzania Agricultural Research Institute (TARI) - Selian Centre

[2] Nelson Mandela African Institute of Science and Technology (NM_AIST)

The study was developed to make assessments of ecosystem based adaptation strategies on degraded habitats on how it improves the community's livelihoods as well the biodiversity resilience around the Lake Natron ecosystems (LNEs). The LNEs are located in the leeward of

Mount Kilimanjaro in Tanzania, East Africa. The ecosystem accommodates human, wildlife, biodiversity, and it is the breeding site for many birds. The ecosystem experiences low and erratic rains (unpredictable amount, time to start, duration and distribution), also depends on rain-fed agricultural production, which has been at stake i.e., higher risk of crop failure and death of livestock due to the persistence of drought. In order to execute the study, the approach was to use open data kit (ODK), which developed questionnaires to gather the information with tools; LADA- Land Degradation Assessment in Dryland and WOCAT- World Overview of Conservation Approaches and Technologies using. The results show that less than 10% of the population practice EbA. More the results indicated significant at ($p^{<}0.01$) community livelihood improvement as well biodiversity resilience influenced by EbA strategies. Further research study methodology and results will be discussed. The outputs contribute to achieve the Sustainable Development Goals (SDGs), Goal 15, 13 as well SDG 1, and 2. Therefore nature-based solutions should be treated as an integral part of adaptation strategies at local, national, and global levels.

Keywords: Ecosystem, adaptation, habitats, livelihood, biodiversity

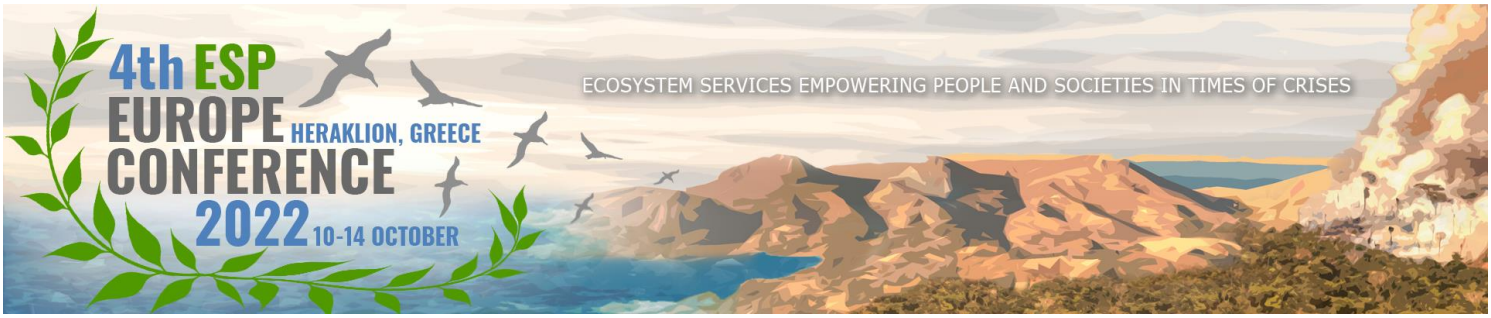
2b Title: Understanding public perceptions of forests and greenspaces in Europe

Dennis Roitsch, Jakob Derks, Rik De Vreese, Jiali Jin, Christoph Rosinger, Chang Wang, Marko Lovrić, Jakub Kronenberg, Helga Pülzl, Liisa Tyrväinen, Katharina Müller, Corina Basnou, Dagmar Haase, Nicola da Schio, & Georg Winkel

European Forest Institute, Bonn, Germany

The demands for forests and greenspaces as nature-based solutions (NbS) to provide ecosystem services have changed significantly in recent years. Reasons for these changes include first-hand experiences of climate change effects, steady urbanization, and the Covid-19 pandemic. For forests to be successful as NbS, it is necessary that planning and decision-making for forests and greenspaces takes the diverse public demands into account.

Using survey data from a representative sample of over 10,000 responses from 33 countries in Europe, we examined how the public perceived different ecosystem services and ecosystem disservices provided by forests. The survey integrated societal perceptions of forest ecosystem services based on the CICES framework and connected them to respondents' socio-economic and demographic characteristics, environmental orientation, and basic human values.



Preliminary results show that regulating and cultural ecosystem services were perceived as more important compared to provisioning ecosystem services. Of all ecosystem disservices, forests and greenspaces being unsafe because of uncontrolled dogs and risk of night-time crime was perceived as most important. When comparing between countries in Europe, several differences in public demands emerged between for example northern, south-eastern, and western regions. Age, gender, education, and environmental orientation were found to particularly influence the public views of ecosystem services as well as disservices. In contrast, the respondents ' place of residence and the location of the forests (in or near the city, or in the countryside) had a limited influence on the perception of ecosystem services.

Our results highlight the importance of adjusting NbS planning and design with societal demands and point to some shortcomings between current forest management priorities and public needs. As a result of this work, actors such as planers, policymakers and foresters should be able to address value-based trade-offs and be able to improve communication with the public.

Keywords: Forest Ecosystem Services, Public perceptions, Basic human values, Environmental orientation, Nature-based Solutions

3b Title: Applying Geodesign to support local planning towards sustainable urban transformation with nature-based solutions (NBS) in the Skarpnäck district, Stockholm, Sweden

1. Adem Esmail, Blal, 2. Sigvard, Bast, 3. Mörtberg, Ulla, 4. Cortinovis, Chiara, 5. Riffat, Maria, 6. Suleiman, Lina, 7. Högström, Johan, 8. Balfors, Berit, 9. Anderson, Carl Cyrus, 10 Kato Huerta, Jarumi 11. Geneletti, Davide, 12. Albert, Christian

1Ruhr University Bochum, Institute of Geography, Universitatsstr. 150, 44805 Bochum, Germany

Planning with nature-based solutions (NBS) is increasingly recognised for its potential to promote sustainable urban transformations. A fundamental requirement remains the meaningful involvement of various legitimate interests in the planning process. Geodesign has been proposed as an effective planning support system for the management of real or perceived 'boundaries'; however, there is little empirical evidence, especially regarding local planning with NBS towards ambitious urban transformations. This study aims to develop and apply a geodesign process to investigate its role in facilitating boundary management among

actors involved in planning and explore its potential to act as a translational tool for knowledge integration, visualization and consensus building, across sectors and spatio-temporal scales. Due to the increasing demand for housing, jobs and services, together with ambitious regional and municipal objectives geared towards biodiversity and social cohesion, the Skarpnäck District in Stockholm, Sweden, offers a great opportunity to undertake a geodesign process for planning with NBS and to evaluate its contribution to boundary management. Two scenarios were considered: a 'BAU scenario', which consists mainly of infill developments that preserve the existing urban structure, and a 'transformative NBS scenario', which enhances ecological corridors and strategic social connections at regional and municipal level. The geodesign process will be realized as a digital and interactive workshop, using touch tables and a specially prepared GIS interface. It will consist of three main phases: (i) exploration of the suitability of different local interventions towards a sustainable urban transformation, (ii) co-design of different alternative local interventions and (iii) negotiation of a final alternative based on its multidimensional impacts, according to the two scenarios. Workshop participants will be recruited directly by the City of Stockholm and will represent different sectors and levels of planning. We here share key lessons learnt during the creation of the digital workshop and related geodesign interface.

Keywords: ecosystem services, biodiversity, green infrastructure, boundary work

4b Title: NbS to tackle societal challenges in Green Cities: The Case Study of Vale do Cavalum, Portugal

Pinto, Mónica[1], Cohen-Shacham, Emmanuelle[2] & Cabecinha, Edna[1,2]

[1]University of Trás-os-Montes and Alto Douro, CITAB, Vila Real, Portugal

[2]IUCN Commission on Ecosystem Management

Green City Accord (GCA) is a European Commission initiative that aims to mobilise European policymakers, to safeguard natural capital and transform cities into greener and healthier environments. More than half of the world's population lives in cities, it's imperative to carefully think and plan their development, while promoting citizens' health and well-being. It's important to restore degraded ecosystems within or outside cities, through the application of NbS, at a local and national level, to address climate change, biodiversity loss, and land degradation, while achieving the objectives of the 2030 Agenda. The Municipality of Penafiel has signed the GCA, highlighting the importance of expanding its green spaces, implementing

NbS to increase ecosystems resilience, and address urban environmental problems such as heat waves, floods, or air and water pollution.

The IUCN Global Standard for NbS was applied to a green urban area in Penafiel for an effective operationalization of the best-practice criteria of NbS implemented. This tool helped to assess NbS implementation efficiency, effectiveness, and sustainability while pointing to areas that needed to be improved to achieve the best outcome for society and nature. The Global Standard's results helped identify the weakness and strengths of the interventions, and the strongest score was the criterion focusing on "Design at scale", because there were strong synergies between society, ecosystem, and economic factors. This was the case regarding nature tourism, not only in the case study area, but at the municipality level as well, identifying complementary interventions and within a 10-year time scale. The weakest criterion was "Economic feasibility" because the cost-effectiveness study is not sturdy enough – the costs and benefits were identified, but those receiving them and how, are not defined. This process was crucial to increase scale and impact of NbS, helping policymakers and stakeholders to assess and adaptively improve the interventions' effectiveness.

Keywords: Ecosystem Services, Nature-based Solutions, Urban green parks, Global Standard for NbS, Integrated management

5b Title: Integrating ecosystem services into phytoremediation: new insights for a more sustainable management of urban brownfields

Werther Guidi Nissim[1], Emily Palm[2] & Massimo Labra[1]

[1]Dipartimento di Biotecnologie e Bioscienze – Università degli Studi di Milano-Bicocca (Italy)

[2]Dipartimento di Scienze e Tecnologie Agrarie, Alimentari, Ambientali e Forestali- Università di Firenze (Italy)

Phytoremediation includes several different techniques potentially efficient to clean-up soil and water from different contaminants. As a biological technique, phytoremediation is considered a nature-based solution (NBS), which can provide a concrete solution to current environmental challenges. One field in which phytoremediation is largely used are urban brownfields formed by different types of wastelands within city areas. In these areas, despite the high potential, several constraints (e.g. low removal/degradation performances by most plant species, low pollutant availability) still result in a very slow and time-consuming

approach that requires years to work. While current ground-research is very active in assess different strategies to increase the overall efficiency of the technique, other applied scientists are also interested in highlighting the role that such long-lasting phytoremediation sites can deliver in terms of ecological services. The current abstract will address the main ecosystem services related to phytoremediation of brownfields including biodiversity, bioenergy, CO2 sequestration, urban climate regulation, physical and psychological health, also highlighting the aspects that need to be further investigated.

POSTERS

P1 Bringing nature back – biodiversity-friendly nature-based solutions in cities (BiNatUr)

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The water cycle is expected to be drastically influenced by climate change across Europe, with critical changes to water quantity, water quality, and seasonal distribution. Urban areas will be subject to reduced water quantity and quality, flash flooding, and soil erosion, among other risks. Nature-based solutions (NBS) are expected to enhance climate and water resilience and provide multiple benefits for society. In many European cities, the implementation of NBS in aquatic ecosystems ("aquaNBS") through the restoration or construction of small water bodies has become an important policy goal. While it is assumed that aquaNBS such as wetlands, stormwater ponds and streams provide multiple ES and enhance local biodiversity, our knowledge of the biodiversity of urban aquaNBS and its linkages with ES provision in cities is limited. The project 'Bringing nature back – biodiversity-friendly nature-based solutions in cities (BiNatUr)' analyses the role of biodiversity and its linkages with ES in urban aquaNBSs, and in the planning, building, restoration, and management of aquaNBS, supporting the transformation to climate-smart, biodiversity-friendly, and sustainable cities. We employ a SETS (social, ecological, and technological systems) framework, a holistic approach for the study of complex and strongly interactive systems, to analyze the complex SET interactions of aquaNBS at three spatial scales in five European cities. Our analyses of 60 aquaticNBS in five cities encompass the European climatic gradient from Mediterranean to boreal regions. BiNatUr focuses on four main research questions: (1) How are biodiversity and ES of aquaNBS mediated by social, ecological, and technological factors, (2) How do factors vary among cities

and regions? (3) How does biodiversity influence regulating-ES provided by aquaNBS? (4) How can urban planning effectively design, manage, and monitor biodiversity and ES of aquaNBS? BiNatUr produces practical guidelines and recommendations on how urban planning can effectively co-design, monitor, and enhance the biodiversity and ES of aquatic NBS.

P2 Title: SEAFOREST LIFE ecosystem services from the conservation of carbon sinks of posidonia meadows

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The project, now in its fourth year of activity, has developed some solutions to deal with the degradation of Posidonia oceanica habitats due to the anchoring of tourist boats in the Mediterranean. The solutions have been applied in 3 national parks: Cliento, Maddalena Archipelago and Asinara.

The protection tools concerned: 1) the definition and implementation of mooring plans; 2) restoration of small degraded sections with planting and sowing; 3) design of sustainable mooring fields; 4) creation of an App for mooring management.

The set of conservation interventions makes it possible to determine, for the purposes of climate change mitigation, the lack of CO2 emissions due to the halting of habitat degradation. A model was therefore developed to estimate the lack of carbon emissions for each new berth built. The calculated contribution concerns any additional berths that may be made in the future

P3 Title: Assessing ecosystem services of urban green infrastructure in the city of Plovdiv (Bulgaria)

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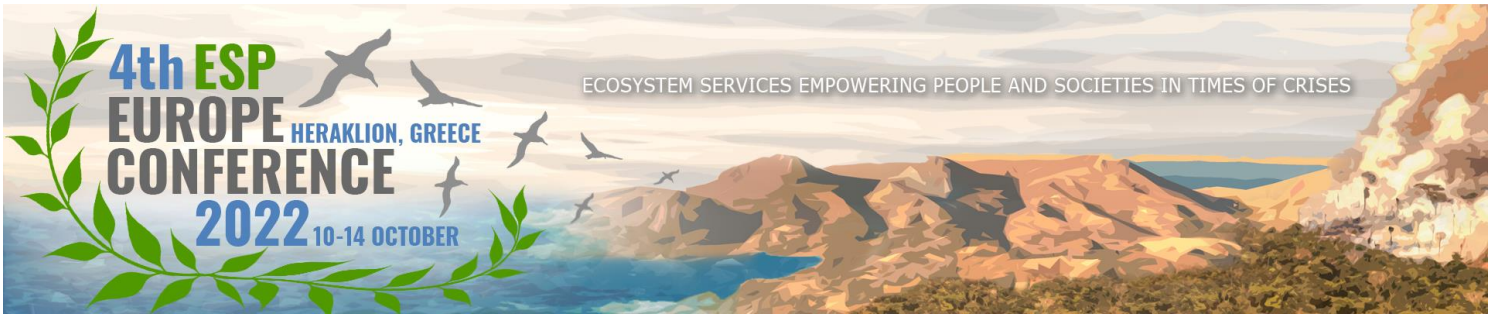

The intensification of urbanization and the increasing demand for resources and energy provoke serious discussion on ensuring better human well-being in the settlements while preventing the increasing loss of biodiversity. Urban landscapes are underestimated in providing a number of benefits for human society through their ecosystem services.

In this paper, an approach to assess the ecosystem services in the city of Plovdiv (Bulgaria) is presented. It includes the identification of urban ecosystem's subtypes based on MAES (Mapping and Assessment of Ecosystem and their Services) guidelines and EUNIS habitat classification, a selection of indicators for ecosystem services evaluation and the creation of maps in GIS. The ecosystem services indicators set for the study were elaborated on the base of the EEA CISES classification by prioritization of the relevant services in urban ecosystems.

Keywords: urban trees, air pollution, carbon sequestration, flood mitigation, health improvement

P4 Title: Local climate regulation in cities as ecosystem service: Proposal of an indicator for Germany as part of the national ecosystem monitoring

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In densely built-up city quarters, urban green spaces contribute to maintaining urban quality of life and human health. Phenomena such as heat stress can be reduced as means of local climatic balancing. In order to make the according ecosystem service climate regulation of urban green infrastructure measurable and thus specifically controllable, a country-wide applicable indicator has been developed.

For the indicator "urban climate regulation", both the supply of climate-regulating services by urban green spaces and the demand for them by the residents are recorded. Based on regularly available nationwide geodata, a specific cooling capacity value is determined for the most important urban surface types, using tree canopy and land cover, and taking into account area sizes and location characteristics.

Overall, 76% of the population in the 165 German cities studied can benefit from high or very high cooling capacities in their close living environment. In 37 cities, even more than 85% are provided with good or very good cooling capacity by green infrastructure. The proposed indicator enables a comparison between the cooling capacity of individual land types, city

districts as well as entire urban areas and can consequently be a professional planning and decision-making basis for resilient urban development.

Besides climate regulation services, further ecosystem services indicators are developed and monitored as part of the research data center of the Leibniz Institute of Ecological Urban and Regional Development (IOER) which is a partner of the national research data infrastructure (NFDI for Biodiversity). The IOER research center provides spatial data, tools, and assessment information on land use, land cover, landscape quality, and biodiversity. For this purpose, ecosystems with their extent, characteristics, and services are assessed quantitatively and cartographically. The contributions are presented here using the example of urban climate regulation service.

Keywords: Climate adaptation, Shadow, Evapotranspiration, Health protection, Monitoring

P5 Title: Distilling the role of Ecosystem services of rural coastal Socio-Ecological systems in contributing to Disaster risk resilience: A Case from Andhra Pradesh, India

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The status of prevailing ecosystem services worldwide is declining, highlighting the emerging need for improving and protecting the ecosystem services towards achieving Sustainable development goals (SDG 15 and SDG 6). Under these changing climatic scenarios and intensified disaster impacts in the present era of Anthropocene, the coastal communities depending on them were forced into poverty traps or forced to change their occupations (mostly non-ecosystem based). The process causes modifications in interactions among the components of the socio-ecological system (SES), thereby leading to transformations and disrupted resilience capacities. This paper explores the role of ecosystem services in strengthening disaster risk in rural coastal communities of the Gowthami-Godavari estuary

region located in the Low-elevation coastal zone of Andhra Pradesh, India. For this purpose, the research identifies multiple components of SES and understands their interactions with ecosystem services using fuzzy cognitive mapping. The analysis further models the system using an online mental modeller software interface. In this study, damaged ecosystem services disrupt the resilience capacities of settlements by altering the state of ecosystem services through modelling simulations.

Keywords: Socio-Ecological systems, Disaster risk resilience, fuzzy cogntive mapping, mental modeler, ecosystem services