BOOK OF ABSTRACTS

I. SESSION DESCRIPTION

ID: T13b

Linking Ecosystem Services and Nature-based Solutions for Transformative Change

Hosts:

	Name	Organisation	E-mail
Host:	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
Co-host(s):	Emmanuelle Cohen-Shacham	IUCN Commission on Ecosystem Management	minacs@gmail.com

Abstract:

The concept of ecosystem services (ES) has gained importance in recent years as a framework for understanding the benefits that nature provides to human well-being. Similarly, nature-based solutions (NbS) have emerged as an innovative approach to address complex societal challenges, biodiversity and human health and wellbeing. This session aims to explore the intersection between ES and NbS, focusing on their potential to drive transformative change towards sustainable development in social-ecological interactions context while meeting human needs.

The NbS implementation can address immediate challenges such as climate change adaptation, disaster risk reduction, and biodiversity conservation and promote long-term resilience and sustainability. By investing in NbS, local communities can enhance ecosystem services, improve human well-being, and build more sustainable and resilient societies.

Linking ecosystem services and NbS holds great potential for transformative change. By explicitly recognizing and quantifying the benefits that nature provides, decision-makers can better integrate the value of ecosystems into policy and planning processes. This can lead to more informed decision-making that prioritizes protecting and restoring critical ecosystems.

In conclusion, linking ecosystem services and nature-based solutions offers a pathway towards transformative change. By recognizing the value of nature and harnessing its power through innovative solutions, society can achieve a more sustainable and resilient future for both people and the planet. In this session, we aim to highlight the importance of integrating ES and NBS into decision-making processes to unlock their full potential and drive transformative change at the local, regional, and global scales.

During this event, we are aiming to explore how NbS can improve the provision of ES and foster transformative change and how the Global Standard for NbS can assess these changes. During the Session, we welcome the presentation of case studies or research projects that show how the link between NbS and ecosystem services knowledge/tools in different geographic and ecological contexts can drive transformative change.

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, ways that the two concepts can be used and complement each other to address global challenges and foster transformative change.

The session's objectives are congruent with the “Ecosystem services, one planet, one health” conference theme, with a special focus on the thematic stream: Ecosystem services and conditions for transformative change.

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 promote transformative 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.

II. SESSION PROGRAM

Room: Success Avenue 1

Date of session: 18th of November 2024
Time of session: 14:00–15:30 & 16:00–17:30

Timetable speakers

Time	First name	Surname	Organization	Title of presentation
14:00	Emmanuelle	Cohen-Shacham	IUCN-CEM, USA	Nature-based Solutions – from definition to implementation
14.15	Edna	Cabecinha	UTAD/CITAB, Portugal IUCN-CEM	Linking Nature-based Solutions and Ecosystem Services to tackle societal challenges
14:30	Titouan	Dubo	IRD, CNRS, Grenoble INP, IGE, Université Grenoble-Alpes, Grenoble, France	Assessment of ecosystem services under future scenarios of the European Nature Restoration Law in the Alps
14:45	Claudia	Carvalho-Santos	Centre of Molecular and Environmental Biology, Minho, Portugal	Trees4Water: Cost-effectiveness of Riparian Forest Buffers in Farmlands to Improve Water Purification
15:00	Philip	Roche	INRAE, AMU, UMR RECOVER, France	Build local Nature-based Solutions projects with co-benefits for the environment, society, and biodiversity
15:15	Mónica Q.	Pinto	UTAD/CITAB, Vila real Portugal	*Integrating Nature-based Solutions and Ecosystem Services to foster Urban Resilience*
15:30	Sien	Kok	Wageningen University and Research	Integrated assessment of river – floodplain management strategies for the Rhine Branches in the Netherlands
15:30–15:45	**Discussion**			
BREAK				
16:00	Phoebe	King	University of East Anglia, UK	From local solutions to catchment-wide management: an investigation of upstream-downstream trade-offs when upscaling nature-based flood risk management
16:15	Livia	Shamir	Stefano Boeri Architetti, Dipartimento di Ricerca	Parco Italia. A project to extend, connect, protect and enhance the network of natural areas in Italy
16:30	Veronika	Strauss	Leibniz Centre for Agricultural Landscape Research	Carbon Farming for Climate Change Mitigation and Ecosystem Services – Potentials and Influencing Factors

Time	First name	Surname	Organization	Title of presentation
16:45	Agata	Cieszewska	Warsaw University of Life Sciences	Ecosystem services in urban housing estates – NbS context
17:00	Alberto	González-García	Univ. Grenoble-Alpes, CNRS, France	Co-benefits of nature-based solutions exceed the costs of implementation
17:15	Robert	Philips	The Royal College of Art, Napier University, British Council	A participatory planning tool to share knowledge and discuss landscape tradeoffs between ecosystem services and to inform implementation of Nature-based Solutions
17:30	Maria João	Cardoso	Environment and Sustainability Unit of Santarém Municipality, Portugal	Perception of the value of riparian ecosystems – a case study of reconversion from heavy techniques to Nature-Based Solutions
17.45	Swantje	Gebhardt	Copernicus Institute of Sustainable Development, Utrecht University	A participatory planning tool to share knowledge and discuss landscape tradeoffs between ecosystem services and to inform implementation of Nature-based Solutions
18.00 – 18.30h	**Discussion**			

III. ABSTRACTS

The first author is the presenting author unless indicated otherwise.

1. Perception of the value of riparian ecosystems – a case study of reconversion from heavy techniques to Nature-Based Solutions

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The ribeira do Canavial, is a tributary of the Tagus river and belongs to the Alviela river basin, saw a business-as-usual investment, that encompassed the impermeabilization of the banks by applying cement and plastic sheeting, becoming an artificialized stream, transforming the natural space into a monofunctional one with loss of Biodiversity.

The reconversion and renaturalization of the stream is a success case in terms of empowering local action in 2024, restoring the natural habitat of native fauna and flora into

a living laboratory, by planting vegetation that are more attractive to pollinators and provide shade in order to reduce evaporation and maintain water flow, which has decreased due to a lack of rainfall caused by Climate Change.

Nature-Based Solutions (NBS) are the fundamental pillar of the stream transformation through Natural Engineering Techniques, which have played a key role in stabilizing, consolidating and shading the banks, combined with the removal of exotic flora (e.g. Arundo donax and Ailanthus altissima), have boosted the recovery of the Riparian Ecosystem.

River rehabilitation reverted the destruction of Ecosystem Services caused by stream artificialization and created a multifunctional site, where agricultural activity is intertwined with the natural environment, with gains in agriculture through the predation of agricultural pests and the increase in pollinators, allowing the local community to benefit from it, stimulating a new perception of the value of ecosystems and human well-being.

This stream integrates the municipal project Rehabilitate Section by Section (RTT) which has already rehabilitated 23 river sections in a decade, with the involvement of the population and reaching more than 6000 meters in length in Santarém Municipality.

RTT integrates public participation as a pillar in the recovery of river ecosystems, using NBS and natural engineering techniques, spreading technical and scientific knowledge about new approaches to coexistence between agriculture and nature, within watercourses.

Keywords: River Rehabilitation, Ecosystem Services, Nature-Based Solutions, Pollinators; Public Participation

2. Trees4Water: Cost-effectiveness of Riparian Forest Buffers in Farmlands to Improve Water Purification

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Riparian forests are commonly related to the provision of several ecosystem services, including water purification and the control of soil erosion. This nature-based-solution acts as filter buffer for the reduction of diffuse pollution, mainly from agricultural activities. Despite several studies addressing the impact of riparian forest scenarios on river water quality improvement, there is a lack of comprehensive analysis regarding the cost-effectiveness of these options. This study aims to assess the cost-effectiveness of riparian

forest scenarios in decreasing the concentrations of suspended sediments, nitrates, and phosphorus to the river, supported by the outputs from the hydrological model SWAT. Using Cávado river basin as a case-study, in NW Portugal, the environmental effectiveness of two scenarios of riparian forests with buffer widths of 2.5m and 5m was calculated in targeted polluted sub-basins, where intensive dairy farming prevails. The SWAT model was effectively calibrated and validated for discharge, sediment, and nutrients to the River Cávado showing a good agreement between observed and simulated values. Costs associated to riparian forests involves several components, including plantation, maintenance and opportunity costs, gathered from several databases, including National Statistics of Portugal and National Forest Federation. The results indicate that incorporating a 5m riparian forest buffer is the most effective scenario to increase water purification, and the least costly pollutant to mitigate is sediment, with around 500€ per mg of reduced sediment in the river. Detailed calculations of opportunity costs offer nuanced insights into the economic implications of converting farmland to riparian forests. Hydrological modelling provides valuable outputs for simulating scenarios to inform cost-effectiveness analyses and transdisciplinary studies, aiding in decisions to enhance water quality and ecological status in river basins. Cost-effectiveness analyses of nature-based-solutions is an important step to the implementation of financing schemes to promote ecosystem services provision for effective transformative change.

Keywords: SWAT, Cávado River basin-PT, Environmental Effectiveness, Nature-based-solutions, Cost-Effectiveness

3. Ecosystem services in urban housing estates – NBS context

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Nature-based solutions (NbS) significantly influence the implementation of Ecosystem Services. In areas with strong exposure to climate change, such as urbanized areas, residents are increasingly faced with problems with heat waves, changes increasing frequency and intensity of extreme weather events as well as torrential rains. All these elements affect the living conditions of residents and are observed not only on the scale of entire cities but also on the local scale - a housing estate. The study examined the benefits that can be realized by various NBSs that can be applied at the scale of a housing estate. This applies to plant landscaping elements, forms of urban gardening, rainwater management solutions as well as solutions related to buildings and technical structures. Based on the literature analysis and own research, parameterization of ecosystem services

for 37 NbS was carried out using quantitative and qualitative methods. The key here was to present NbS from such a perspective that residents saw the need to use it in their housing estates. Each NbS brings specific benefits and effects of the climate change adaptation. The parameterization was not strictly technical in nature, but was selected in a way that highlighted the benefits (i.e. the ES) for the residents. Quantitative parameterization concerned services such as oxygen production, CO2 sequestration, pollution reduction, reduction of stormwater runoff, stormwater retention, while qualitative parameterization was carried out for biodiversity and cultural benefits. The proposed solution was used as part of gaming workshops in 5 housing estates in Warsaw using the serious game 'Neighborhood with climate' (https://coadapt.pl/en/game/). The workshops indicated the residents' preferences in the selection of NBS and, consequently, the implementation of the ES in a housing estate.

Keywords: urban NbS, local ecosystem services, adaptation to the climate change, serious games

4. Assessment of ecosystem services under future scenarios of the European Nature Restoration Law in the Alps

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The European Commission's recent adoption of the Nature Restoration Law aims to restore at least 20% of the degraded ecosystems within the European Union (EU) by 2030. While a recently published impact assessment study highlights the law's general potential for climate change adaptation and biodiversity conservation, its specific outcomes and co-benefits, especially in mountain region such as the Alps, remain unclear. To address this gap, we assessed the potential outcomes of achieving specific targets of the law within the Alpine Space - a region experiencing rapid global change. Specifically, we identified optimal areas for the implementation of the EU Law and evaluated the ecosystem services that the implementation of Nature-based Solutions (NbS) would provide in the Alps if several law targets are met. Finally, we performed a cost benefit analysis taking into account the cost of interventions and their benefits. Our findings emphasize the importance of comprehensively evaluating the multifunctionality of NbS and the diverse benefits of the Nature Restoration Law to guide future decision-making processes.

Keywords: Climate change adaptation ; Nature-based Solutions ; Ecosystem services ; European Alps ; EU policy

5. Co-benefits of nature-based solutions exceed the costs of implementation

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Nature-based solutions' potential for multiple benefits across ecosystems and societies justify their uptake in policy and implementation. This study contributes to closing the gap in quantifying the multiple outcomes of nature-based solutions by evaluating the multifunctionality of 83 nature-based solutions actions in the Alps. We assessed biodiversity co-benefits and the monetary value of four ecosystem services (heatwave mitigation, flood regulation, climate regulation, and landslide protection) provided by these nature-based solutions to their respective beneficiaries. We showcased the diversity of nature-based solutions implemented in the Alps, with forest nature-based solutions having high values for the four ecosystem services, river and wetland nature-based solutions showing high values for biodiversity, and urban nature-based solutions contributing a lower biodiversity value but being highly cost-effective and benefiting a larger population. We estimated a 2.8-to-1 return on investment by considering the total monetary value and the total costs of the nature-based solutions, benefiting a total of 91,324 persons. We highlight the need for integrating biodiversity and multiple ecosystem services for future nature-based solutions funding and implementation, together with their role to mitigate and adapt to climate change.

Keywords: Ecosystem services, nature-based solutions, biodiversity, ecosystem services quantification, monetary valuation

6. From local solutions to catchment-wide management: an investigation of upstream-downstream trade-offs when upscaling nature-based flood risk management

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Natural flood management (NFM) is a nature-based solution that is widely recognised as an option to reduce flooding whilst providing numerous ecosystem services (ES) for society and

the environment (IUCN Criterion1). To address the threat of increasing flood risk posed by climate change, transformational change is required to scale up NFM from localised solutions to widely adopted catchment management. This paper presents a case study of four river catchments in the UK where opportunities are emerging for scaling up NFM in upstream, rural areas to complement downstream flood infrastructure, including SUDs, in urban areas (Criterion2). Implementing NFM at a catchment scale will not only change the appearance of landscapes but also give rise to potential ES trade-offs between the 'providers' of upstream land for flood control and the 'beneficiaries' of reduced flooding downstream (Criterion6). Taking a qualitative approach, we conduct 5 focus groups (n=17

participants) designed to foster discussion and knowledge exchange between upstream farmers and downstream communities (Criterion5). Results reveal that both upstream and downstream participants hold strong affinities to contemporary aesthetics of the rural landscape and express sympathies with tasking farmers to deliver regulating ES (flood regulation) when their traditional vocation is to deliver provisioning ES (food and fibre). Despite the prominence of landscape aesthetics in cultural identity, beneficiaries were willing to prioritise flood risk management (regulating ES over cultural ES) and to pay farmers to deliver NFM (Criterion4). Specifically, beneficiaries had preferences for NFM options that delivered flood attenuation (floodplain storage) and wider ES benefits (native tree planting), such as biodiversity enhancement (Criterion3). Lastly, evidence from this study promotes the application of 3D-catchment visualisations and the opportunity for discussion and knowledge exchange to build social processes that can facilitate greater understanding of catchment-wide community values to underpin and foster transformative change (Criterion8).

Keywords: Climate-change adaptation, catchment-based approach, ecosystem-based adaptation, payment for ecosystem services, social learning

7. Integrated assessment of river - floodplain management strategies for the Rhine Branches in the Netherlands

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The EU is progressively encouraging the uptake of nature-based solutions in aquatic ecosystems including river systems, as seen in e.g. the Water Framework Directive, and the EU Nature Restoration Law. At present, the majority of policy appraisal studies in this domain has a limited scope, focusing on e.g. flood risk mitigation or ecological restoration benefits. Assessment of a wider scope of impacts is essential to gain insight in the various benefits

and trade-offs of implementing nature-based solutions in river – and floodplain management.

In this study, we analyzed the supply of 13 ecosystem servicers (ES) under more conventional versus nature-based river-floodplain management strategies for the Rhine Branches in the Netherlands, designed to target issues like flood risk, drought risk, riverbed incision and ecological restoration. In order to quantify ES supply, we modelled biophysical and hydrological changes (including elevation, land use, land cover, stage-discharge relationships and inundation duration) under the strategies, using a range of tools, and linked these to ES indicators.

Changes in ES supply are connected to changes in hydrological conditions and/ or changes in land use and vegetation management. Our results show that strongly regulated, mono-functional river – and floodplain management has overall lower ES supply than more integrated, nature-based management. Due to the stronger need for land use change when embedding nature-based solutions, there is a trade-off with agricultural production in the floodplains. Our results can inform formulation of management strategies and support stakeholder dialogue in the Rhine branches. At the same time, our approach demonstrates how the ES framework can be used as part of a holistic policy appraisal framework in river-floodplain management – e.g. by serving as a basis for prevalent ex-ante evaluation tools like extended cost-benefit analysis.

Keywords: river-floodplain management, ecosystem services, nature-based solutions, trade-off analysis

8. Integrating Nature-based Solutions and Ecosystem Services to foster Urban Resilience

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Climate change, population growth, and economic development pose significant challenges to socio-ecological systems, particularly in urban areas. Cities must navigate issues such as urban heating, air and water pollution, biodiversity loss, ecosystem degradation, and urban sprawl, which affect economic activities, human health, and overall well-being. Nature-based Solutions (NbS) have emerged as effective strategies to address these challenges by leveraging Ecosystem Services (ES) to enhance human health and well-being. This study mapped and accessed ES in an urban green area (UGAs) in Penafiel City Park within the River

Cavalum Valley (Portugal), to evaluate NbS implementation in supporting ES, and its potential to foster Urban Resilience.

The analysis revealed a diverse distribution of ES across four homogeneous areas in the UGA (A, B, C, and D). Provisioning services, such as wild plants for nutrition and fibres, were prevalent in UGAs A, B, and D. Regulating and maintenance services, including noise attenuation, visual screening, control of erosion rates, and hydrological cycle regulation, were observed in all UGAs, with UGA C showing the highest presence. Cultural services, fostering physical and intellectual interactions with nature, were also significant, particularly in UGAs B and C. The findings highlight the potential of UGAs in Cavalum Valley to contribute to climate change adaptation through several ES. The unevenness in ES presence underscores the need for adapted NbS strategies. UGAs B and C, which exhibit higher levels of cultural, regulating and maintenance services, are particularly effective in enhancing human well-being and addressing urban challenges. In contrast, the absence of specific ES in UGA D indicates the potential for targeted NbS interventions to strengthen its ES capacity.

Integrating NbS in urban planning within the Cavalum Valley can effectively address global change challenges. ES studies are crucial for implementing proper NbS, ensuring that urban green spaces are optimally leveraged to enhance resilience, health, and well-being in urban settings.

Keywords: Nature-based Solutions, Ecosystem Services, Urban Resilience, Urban Green Areas

9. Build local Nature-based Solutions projects with co-benefits for the environment, society, and biodiversity

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

We aim here to present an ambitious research program on Nature-Based Solutions (NBS) called SOLU-BIOD, which will bring together the French research community to address a comprehensive range of questions related to NBS. Co-piloted by CNRS and INRAE, this program, with a budget of over 44 million euros over nine years (2023-2032), originates from a French government investment plan. It aims to be transformative in tackling the challenges of implementing innovative NBS in various territories.

The SOLU-BIOD program's activities are structured around seven strategic projects and research calls. One of these projects is a network of eleven living labs (LL), geographically spread across mainland France and overseas territories, focusing on the program's four priority socio-ecosystems: urban, coastal, agricultural, and protected areas. We are currently setting up these living labs for a four-year period. At the end of these experiments, we hope to disseminate effective, replicable practices for setting up NBS in areas with similar challenges and environments and to identify the most beneficial ES for local communities. LLs appear to be an excellent way of exploring and evaluating systemic Nature-Based Solutions in territories through the co-construction of dialogue and studies between scientists and stakeholders

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

10. Carbon Farming for Climate Change Mitigation and Ecosystem Services – Potentials and Influencing Factors

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Unprecedented challenges imposed by climate change force the agricultural sector to increase its resilience to more frequent and more severe weather extremes. At the same time, agriculture itself must contribute to climate change mitigation. Carbon Farming (CF) is a possible nature-based solution that links climate mitigation to climate adaptation while providing multiple additional Ecosystem Services (ES). However, both the climate change mitigation potential and the ES supply provided by CF measures depend on site-specific and measure-specific factors, which implies uncertainty about the outcome of CF implementation. In addition, most CF measures compete with agricultural crop production in a temporal or spatial manner, which ultimately hinders adoption of CF measures by farmers.

In this talk, we elaborate on the CF measures (1) cover cropping, (2) integration of legumes/perennials into crop rotations, (3) short rotation coppice, (4) silvoarable

agroforestry, (5) afforestation of marginal agricultural land, and (6) partial rewetting of cropland on drained organic soils, highlighting their climate change mitigation potential as well as their impacts on the supply of ES, alongside with factors influencing the magnitude and direction of those impacts.

We further present a concept for mapping effects of CF measures based on site-specific demand for ES as well as opportunity costs, that can be used to identify locations where CF implementation can be expected to yield a high beneficial effect.

Keywords: agriculture, carbon farming, carbon dioxide removal, co-benefits, trade-offs

11. Parco Italia. A project to extend, connect, protect and enhance the network of natural areas in Italy.

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Parco Italia is a national afforestation and reforestation program in urban, peri-urban, and rural areas, aiming to gradually establish a national ecological network by connecting protected areas, national and regional parks, and Natura 2000 sites through restoration interventions along hiking and cycling paths. With the systematic establishment and development of trails such as the Sentiero Italia, promoted by the Italian Alpine Club, and the walking routes promoted by the Italian Touring Club, along with the expansion of buffer zones around the routes and protected natural areas, the semi-abandoned villages in the Inner areas could become outposts throughout the territory for the monitoring and sustainable management of forests. At the same time, through slow mobility and ecotourism, they could become a driver for local economies. To narrow down potential intervention areas, priority afforestation areas have been identified through a national mapping to determine where the restoration of natural ecosystems is most urgent and where Ecosystem Services could have a bigger impact on the local population. A multi-criteria analysis was used to quantify environmental challenges that forest plantations may contribute to address, both in cities (focused on services such as air temperature cooling, mitigation of air pollution, and recreational potential) and in semi-natural areas (focused e.g., on improving ecological connectivity, mitigating hydrogeologic hazards, or restoring riparian corridors). Each criterion has been quantified and scored, providing a first indicator of the places with the most urgent needs for tree planting. The feasibility of tree plantation projects also takes into account social, economic, legislative, or stakeholder-related

constraints. Finally, a bottom-up approach is used to complete the top-down assessment, by taking into account and trying to reconcile the needs and preferences of all local stakeholders, in terms of recreation, traditional uses, and cultural significance of the landscape, coexistence with agricultural or other economic activities.

Keywords: natural areas, parks, urbanism, ecology, ecological corridors, green and blue infrastructures

12. Nature-based Solutions – an operational framework for implementation

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Nature-based Solutions (NbS) have been developed by the International Union for the Conservation of Nature (IUCN) and its Commission on Ecosystem Management as definitional and operational framework for addressing major societal challenges.

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. NbS were designed to address multiple interrelated societal challenges, such as climate change, disaster risk, biodiversity loss and ecosystem degradation, as well as ensuring food security, water security, social and economic and human health.

The NbS definition and their eight principles, served as the basis for developing the Global Standard on NbS, which, with its eight criteria and 28 indicators, can help diverse stakeholders to set a common basis of understanding for what NbS are; and provide a robust framework, to design, implement, assess, adapt and improve NbS interventions.

This first presentation will serve as an introduction to the IUCN/CEM work on NbS to the ES community, and it will set the scene for all following presentations. The ES tools and science used in the following (case) studies can strengthen NbS interventions, while they are incorporated into their planning, implementation and assessment. Improved NbS can better address societal challenges and play a major role in driving transformative change.

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

13. Nature-based Solutions – an operational framework for implementation

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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. An innovative approach linking NbS and ES to enhance the resilience of ecosystems and biodiversity, while addressing several societal challenges, was tested through ALICE project (https://project-alice.com). ALICE primary goal was to promote NbS implementation and identify its benefits to ES delivery and biodiversity conservation across Atlantic landscapes. The project 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 used in the River Paiva watershed, Portugal, to asceses the 8 criteria and indicators in the implementation of NbS intervention in the field. This was an essential step, to upscale scale and increase the impact of the NbS intervention, prevent negative outcomes or misuse, and help policymakers and other stakeholders to assess and adaptively improve the interventions' effectiveness.

A participatory approach with stakeholders at local, regional and national levels in promoting inter-institutional and multi-disciplinary coordination, was fundamental to maximize the NbS' impacts at policy level and strengthen decision-making. The link between NbS and ES can offer an innovative management approach 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.

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