BOOK OF ABSTRACTS

I. SESSION DESCRIPTION

ID: S8a

Integrating ecosystem services science and tools in implementing Nature-based Solutions, to better address global changes

Hosts:

	Name	Organisation	E-mail
Host:	Emmanuelle Cohen-Shacham	IUCN Commission on Ecosystem Management	minacs@gmail.com
	Edna Cabecinha	Universidade de Trás-os-Montes e Alto Douro (UTAD)	ednacabecinha@gmail.com

Abstract:

Global changes impose a significant pressure on ecosystems, whose vulnerability to climate change is increased by other causal factors, such as land use changes, overharvesting, habitat fragmentation, inappropriate management, or invasive species. The worldwide loss of functions, both in terrestrial and aquatic ecosystems, coupled with biodiversity loss, will be catastrophic for our planet and a significant setback towards the achievement of the United Nations Sustainable Development Goals. 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.

Nature-based Solutions (NbS) are actions that protect, restore or sustainably manage ecosystems and the services they provide, to address major societal challenges, simultaneously providing benefits for biodiversity and human well-being. NbS is considered an umbrella concept for interventions (e.g. ecosystem-based adaptation, mitigation and disaster risk reduction, ecosystem restoration, or green and natural infrastructure), that address climate change, disaster risk, biodiversity loss and ecosystem degradation, water and food security, and human health, by increasing the provided ecosystem services as well as the level at which they are provided. NbS are complementary to conservation, they can be implemented in synergy with other types of solutions (e.g. engineering), and it is important for them to be integrated in policy and actions.

The IUCN NbS definitional framework includes 8 principles, among them three important ones, referring to the possibility for NbS to be implemented in synergy with other types of solutions; the need for NbS to be implemented at the larger landscape/seascape scale; and for NbS to be

implemented while being integrated in policy and actions. These principles serve as the foundation for the global standard for NbS, to be launched in June 2020.

During this session, we are aiming at exploring the potential use of the well-developed ecosystem services science and tools (e.g. biophysical assessment, mapping valuation, or preference valuation), in improving the implementation of NbS to better address global challenges. We welcome the presentation of different case-studies or research projects exploring the link between NbS and ecosystem services, in different geographic and ecological contexts.

We will start with a presentation on the NbS framework, including an update on the newly launched global standard for NbS.

Then, 4-5 presentations will be done, presenting some selected methods and results of research projects where the ES was used to support the implementation of NbS. The first presentation will focus on a watershed scale case-study in Northern Portugal, where the link between the two concepts is reinforced, to improve ES supply in a climate change scenario.

Last, a discussion will be facilitated, and an exercise will take place, to (1) think, as a group on ways that the ecosystem services concept can be beneficial for the implementation of the NbS concept in the field; (2) to identify the main barriers in linking the two concepts.

Goals and objectives of the session:

The objectives of this session are to:

- present the NbS global standard for NbS, to raise the awareness of the ESP community, and get feedback from ecosystem services' experts on it.
- learn on ways the two concepts can be used and related to better address global challenges, through presentations of case-studies and research methods.
- discuss how NbS could be linked to ecosystem services, how they can address global changes through participants' relevant presentations.

The objective of the session is congruent with the conference theme of 'Ecosystem Service Science, Policy and Practice in the face of Global Changes'.

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 draft paper will potentially be prepared and developed into a full scientific manuscript to submit in a relevant journal. If there will be sufficient interest, we will propose at the end of the session, to develop.

Related to ESP Working Group/National Network:

Sectoral working group: SWG 8 – ES in Conservation

II. SESSION PROGRAM

Date of session: Wednesday, 9 June and Thursday, 10 June 2021
Time of session: 11:00 – 12:00 and 11:00 – 15:15

Timetable speakers Wednesday

Time	First name	Surname	Organization	Title of presentation
11:00 11:03	Emmanuelle Edna	Cohen-Shacham Cobecinha	IUCN UTAD/CITAB	Introduction
11:03 11:15	Emmanuelle	Cohen-Shacham	IUCN Commission on Ecosystem Management	IUCN's operational framework to implement Nature-based Solutions
11:15 11:30	Edna	Cabecinha	University of Trás-os-Montes and Alto Douro (UTAD)/CITAB	Linking Nature-based Solutions to Ecosystem Services: using IUCN Global Standard to upscale NbS implementation
11:45 12:00	Arantza	Murillas-Maza	AZTI	Nature-based solutions to climate change mitigation and adaptation: Indicators of Biodiversity by Ecosystem Services
11:30 11:45	Alessandra	La Notte	Joint Research Centre of the European Commission	Nature-Based Solutions as ecological assets providing ecosystem services in urban accounting

Timetable speakers Thursday

Time	First name	Surname	Organization	Title of presentation
11:00 11:15	Titouan	Dubo	French Alpine Ecology Research Lab - CNRS	Are Nature-based Solutions for adaptation to climate change located strategically in the Alps?
11:15 11:30	Maike	Paul	Leibniz University Hannover	Coastal protection and ecosystem services for nature-based management at the German North Sea coast
11:30 11:45	Valentina	Giombini	Eurac Research	Mapping multifunctional and interconnected Green Infrastructure networks: harnessing nature to meet multiple societal challenges
11:45 12:00	Stefano Davide	Murgese	SEAcoop STP	The assessment of City of Turin green areas ecosystem services as a tool for land management policies and climate change adaptation
12:00 12:15	Alejandra	Morán-Ordóñez	Consorci Centre de Ciència i Tecnologia	Forest restoration to maximize ecosystem service provision across a biological corridor. The

Time	First name	Surname	Organization	Title of presentation
			Forestal de Catalunya (CTFC)	importance of accounting for local livelihoods
12:15 12:30	Enora	Bruley	Laboratoire Ecologie Alpine - CNRS	Analysis of levers and barriers to ecosystem-based adaptation implementation in the French Alps
13:30 13:45	Judit	Lecina-Diaz	InBIO/CIBIO	Nature-based solutions to wildfires in complex socioecological systems: insights from stakeholders' perspectives in two transboundary protected areas
13:45 14:00	Stefano	Balbi	Basque Centre for Climate Change (BC3)	Intelligent planning of nature-based solutions for resilient socio-ecosystems
14:00 14:15	Laura	Costadone	Portland State University	The ecological and economic value of urban lakes in urban heat island mitigation
14:15 14:30	Hongmi	Koo	Martin Luther University, Halle	An integrative research-policy framework for the better implementation of nature-based solutions in policy-making of urban and peri-urban forests
14:30 14:45	Mario	Balzan	Malta College of Arts, Science and Technology	ReNaturing cities through evidence-based implementation of nature-based solutions
14:45 15:00	Stefano	Salata	Politecnico di Torino	Performance-based Solutions against Cloudburst Events. The case of Turin (North-West Italy)
15:00 15:15				Discussion and way forward

III. ABSTRACTS

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

1. Type of submission: Abstract

S. Sectoral Working Group sessions: S8a – Integrating ecosystem services science and tools in implementing Nature-based Solutions, to better address global changes

Linking Nature-based Solutions to Ecosystem Services: using IUCN Global Standard to upscale NbS implementation

Presenting author: Edna Cabecinha

Other author(s): José Teixeira, André Fonseca, Sandra Monteiro, Simone Varandas, Emmanuelle Cohen-Shacham

Affiliation: University of Trás-os-Montes-os-Montes and Alto Douro (UTAD), Portugal

Contact: edna@utad.pt

Ecosystems overexploitation, climate change and land use changes, are real threats to natural environment and communities. These factors have caused biodiversity loss and largely impacted Ecosystem Services (ES) supply in Atlantic Landscapes. UN has declared 2021-2030 as the Decade on Ecosystem Restoration, challenging states to scale up restoration efforts into degraded ecosystems massively. It has become an important goal to restore ecosystems through Nature-based Solutions (NbS) tackling these threats and achieve the 2030 Agenda objectives. NbS have been identified as alternatives to increase ecosystems' resilience, guarantee the delivery of ES and improve biodiversity conservation. Despite their potential, knowledge about this type of interventions needs to be better explored. An innovative approach linking NbS and ES, was implemented at the watershed scale, using Rio Paiva basin as a case study. Throughout a participatory approach, key stakeholders identify the main environmental issues and define the implementation of NbS in the region to minimize the detected problems. There is a need to ensure that a robust Standard informs the design and implementation of NbS. In this context, the IUCN Global Standard was used, allowing to define parameters for implementing the NbS approach in the field. This is essential to prevent negative outcomes or misuse, and help policymakers and other stakeholders to assess the interventions' effectiveness. The criteria's assessment and associated indicators, strongly builds on the NbS Principles defined by IUCN in 2016, addressed the sustainable development pillars and project management. In the NbS self-assessment overview of this case study, the stronger criteria were 2.Design scale, 5.Inclusive governance, 8.Sustainability and mainstreaming; 1.Societal challenges, and 7.Adaptive management. The weaker criteria were 4.Economic feasibility and 6.Balance trade-offs. We hope that IUCN Global Standard contributes to a more effective and integrative management of aquatic ecosystems, through a collaborative approach to implement NbS to improve ES and Biodiversity. ALICE EAPA_261/2016 funded by Atlantic Area: European Regional Development Fund (ERDF) through INTERREG Atlantic Area 2020 Transnational Cooperation Program. This work is supported by National Funds by FCT under the project UID/AGR/04033/2019.

Keywords: ecosystem services, nature based-dolutions, IUCN global dtandard, integrated aquatic management

2. Type of submission: Abstract

S. Sectoral Working Group sessions: S8a - Integrating ecosystem services science and tools in implementing Nature-based Solutions, to better address global changes

Nature-Based Solutions as ecological assets providing ecosystem services in urban accounting

Presenting author: Alessandra La Notte

Affiliation: Joint Research Centre of the European Commission, Italy

Contact: alessandra.la-notte@ec.europa.eu

The assessment of ecosystem services (ES) in urban areas can be an important policy instrument for both strategic directives at national and regional levels and concrete actions at municipality level. A unifying underpinning framework that combines different administrative levels through a common, consistent basis would greatly facilitate the mainstreaming of such an instrument. Three key concepts underpin this framework: urban ecosystems, nature-based solutions (NBS) and ES. By exploring these concepts in an integrated way, it is possible to coherently combine challenges to address societal needs, NBS scales and urban areas boundaries, and aims of NBS. First, NBS are acknowledged as the ecological assets that in the urban context can provide ecosystem services, meant as complex processes made possible through the existence of natural and semi-natural systems at various scales. Second, the classification of urban ecosystems needs to be consistent with the treatment of urban areas in ecosystem accounting, and with NBS levels of intervention and primary objectives. Third, by serving the societal challenges, it is important to clearly frame the strategic drivers of change: whether it concerns management practices of current land use or radical conversions in land use. Finally, once such a framework will be in place, it can facilitate a quantitative estimate of urban resilience, by assessing the presence of NBS, whose creation/maintenance assure the delivery of ecosystem services. The purpose of this presentation is to theoretically frame an ecosystem services-based approach with specific reference of NBS to urban ecosystem accounting, and to societal challenges (as reported in the European Commission Handbook for Practitioners concerning NBS impact evaluation).

Keywords: ecosystem services, nature-based solutions, urban resilience, urban ecosystem accounting, societal challenges

3. Type of submission: Abstract

S. Sectoral Working Group sessions: S8a - Integrating ecosystem services science and tools in implementing Nature-based Solutions, to better address global changes

Nature-based solutions to climate change mitigation and adaptation: Indicators of Biodiversity by Ecosystem Services

Presenting author: Arantza Murillas Maza

Other author(s): Stefanie Broszeit

Affiliation: AZTI, Spain

Contact: amurillas@azti.es

Nature based solutions (NBS) simultaneously provide environmental, social, and economic benefits helping build resilience and therefore, these will be able to benefit biodiversity through supporting a delivery set of ecosystem services (ES). This research funded by FUTUREMARES H2020 Project consider a set of three NBS for climate change (CC) adaptation and mitigation to safeguard the ecosystems' natural capital, biodiversity, and ES. These are, the effective restoration of habitats, the effective conservation actions (e.g., marine protected areas) and a sustainable harvesting of seafood. This research builds on a literature review compiling and revising a list of both existing biodiversity as well as socio-economic, and policy-answer indicators in the scientific literature, but also in European policy reports (e.g., SDGs, HELCOM, OSPAR, EEA) and other relevant international forums (e.g., IPBES, IPCC, Wold Bank, FAO, OECD). This will allow us to link biodiversity status and ecosystem services with current policy targets (e.g., MSFD, CFP, WFD) under CC scenarios. Tipping points in the relationship between indicators and ecosystem services will be based on Information Theory methods. Additionally, the research will integrate a set of used indicators through empirical knowledge and bio-economic modelling from a large number of storylines (32), covering the three NBS, being developed at five regions (Baltic, NE Atlantic & North Sea, and Bay of Biscay & Iberian Coast, Mediterranean Sea and, Carribean & SE Pacific). The main types of ecosystem services that will be considered will be regulation (e.g., carbon sequestration), provisioning services (e.g., seafood) and cultural (e.g.,

recreation and tourism). A framework for a common analysis of multidisciplinary indicators on the implementation of nature-based solutions will be provided. The indicators will allow current environmental, social, and economic benefits to be quantified in areas with and without the different NBS under CC scenarios.

Keywords: nature-based-solutions, ecosystem services, multidisciplinary indicators, climate change, storylines

4. Type of submission: Abstract

S. Sectoral Working Group sessions: S8a - Integrating ecosystem services science and tools in implementing Nature-based Solutions, to better address global changes

Are Nature-based Solutions for adaptation to climate change located strategically in the Alps?

Presenting author: Titouan Dubo
Other author(s): Ignacio Palomo, Lucía Laorden Camacho, Bruno Locatelli, Sandra Lavorel
Affiliation: French Alpine Ecology Research Lab (LECA - UMR 5553 - CNRS - UGA - USMB), France
Contact: titouan.dubo@univ-grenoble-alpes.fr

Mountain ecosystems are already threatened by climate change that is predicted to impact them more intensively than lowlands, and consequently reduce the ecosystem services they provide to the 14 million inhabitants living within the Alpine Convention space. Initiatives addressing climate change, biodiversity loss and human well-being will be required for adapting the alpine region to climate change. While the number of Nature-based Solutions (NbS) for adaptation implemented in the Alps is rapidly increasing, their effectiveness and their potential for initiating adaptation pathways are unknown. The PORTAL project (Pathways of Transformation in the Alps) is identifying and characterising a portfolio of actual NbS for adaptation to climate change in the Alps. Here we assess the relevance of these NbS by analysing their location in relation to current supply and demand for Nature´s Contributions to People (NCPs) and to vulnerability to climatic risks. We created a spatial database of NbS and georeferenced those that were place-based. We compared NbS locations with maps of NCPs at municipality scale produced by the AlpES project, and with past, current and future climatic risks. Results show that NbS locations are not related

to the supply or demand for NCP nor with climatic risks. These results indicate that the analysis of climatic vulnerability is not the main factor that determines the choice of NbS location. While they may serve other nature conservation or community purposes, we thus question their effectiveness in supporting adaptation of the alpine region to climate change. Further analyses of the effectiveness of NbS to tackle climatic risks are needed. For this we finally discuss the importance of interdisciplinary science to understand NbS implementation processes and why research on NbS should consider the changing interactions between human and nature.

Keywords: nature-based Solutions, climate change adaptation, NCP, Alps

5. Type of submission: Abstract

S. Sectoral Working Group sessions: S8a - Integrating ecosystem services science and tools in implementing Nature-based Solutions, to better address global changes

Coastal protection and ecosystem services for nature-based management at the German North Sea coast

Presenting author: Maike Paul
Other author(s): Kremena Burkhard, Daniela Kempa, Leena Karrasch, Evke Schulte-Güstenberg, Kara Keimer, Viktoria Kosmalla, Oliver Lojek
Affiliation: Leibniz University Hannover, Germany
Contact: paul@lufi.uni-hannover.de

The German North Sea coast is part of the Wadden Sea UNESCO World Heritage Site, which is characterised by barrier islands and strong tidal dynamics. It is very low lying, with some of the terrestrial part of the coastal zone below sea level. Coastal protection is thus a necessity especially with consideration of rising sea level and extreme events due to climate change. The landscape is a diverse pattern of sandy beaches, dunes, mudflats, salt marshes as well as infrastructure for human settlements and tourism, providing a variety of ecosystem services. The project "Gute Küste Niedersachsen" addresses possible pathways for the use of synergies between coastal protection and ecosystem services with the focus on nature-based coastal protection infrastructure. The latter is considered to provide a sustainable solution and multiple co-benefits for the socio-ecological system. Our research agenda focuses on the characteristics (e.g. bio-

mechanic properties) of different wetland, dune, and dike vegetation to stabilise the soil. Additionally, marine parameters like flow and sediment dynamics are assessed to understand the system dynamics and how it can contribute to coastal protection and ecosystem strengthening. Moreover, cultural services such as tourism and recreation are addressed, which are of high relevance in the region and are strongly impacted by the existing coastal protection infrastructure. Based on our findings, novel coastal protection strategies will be developed in co-design with science and local stakeholders within so-called real-world laboratories. There, case-specific research is executed in alignment with the local conditions and in active cooperation with the local stakeholders to achieve a coastal protection strategy that provides additional ecosystem services and thus promotes a sustainable management of the coastal region as a whole. The civil society and responsible parties in state and federal institutions are included in the project from the very beginning as part of this transdisciplinary effort.

Keywords: coastal protection, real-world laboratories, nature-based solutions, coastal management, transdisciplinarity

6. Type of submission: Abstract

S. Sectoral Working Group sessions: S8a - Integrating ecosystem services science and tools in implementing Nature-based Solutions, to better address global changes

Mapping multifunctional and interconnected Green Infrastructure networks: harnessing nature to meet multiple societal challenges

Presenting author: Valentina Giombini
Other author(s): Lukas Egarter Vigl, Thomas Marsoner, Heidi Simion
Affiliation: Eurac Research, Bozen, Italy
Contact: valentina.giombini@eurac.edu

The impact of human activities on, most notably, biodiversity and the carbon and nitrogen cycles are pushing humanity out of a safe operating space, undermining the resilience of many socio-ecological systems worldwide. The adoption and implementation of Nature-based Solutions (NbS) such as Green Infrastructure (GI), however, has the potential not only to foster the sustainable management of our resources, but also to enhance the delivery of benefits, or ecosystem services

(ES), to society. Ecosystems and natural features can indeed provide several environmental, socio-economic and biodiversity benefits which can help, among other things, mitigate, and adapt to, climate change. By proposing a practical approach for mapping GI networks in several pilot regions across the Alpine Space cooperation area, we aim to highlight how the multiple benefits provided by GI networks can help meet multiple societal challenges. We posit that the concept of multifunctional natural GI elements connects the ES and the NbS concepts in a way that fosters strategic planning at landscape level and the sustainable management of individual GI elements. To this end, we spatially explicitly map several ES, assess ecosystem multifunctionality, and combine these findings with an ecological connectivity analysis to identify potential GI networks. This mapping approach can support decision-makers and practitioners to conserve, restore or sustainably manage our natural resources effectively and efficiently. Planning for GI at regional level implies maximising the synergies but also navigating the conflicts occurring between different ES, public administration sectors, policies, and groups of people, in view of addressing societal challenges such as climate change. The consideration of not only provisioning, but also regulating and cultural ecosystem services provided by certain land covers, uses, or features also promotes a critical and inclusive approach in determining management strategies.

Keywords: green Infrastructure, ecosystem services, multifunctionality, ecological connectivity, European Alps

7. Type of submission: Abstract

S. Sectoral Working Group sessions: S8a - Integrating ecosystem services science and tools in implementing Nature-based Solutions, to better address global changes

The assessment of City of Turin green areas ecosystem services as a tool for land management policies and climate change adaptation

Presenting author: Stefano Davide Murgese

Other author(s): Giulia Amato, Mauro Masiero, Marta Cimini, Marco Allocco, Mauro Andrea Perino, Emanuele Pettenella, Arianna Ruberto

Affiliation: SEAcoop STP, Turin, Italy

Contact: murgese@seacoop.com

In recent years, the City of Turin introduced different policy and management tools to address environmental risks affecting its population and territory (e.g., Climate Adaptation Plan, Green Infrastructures Strategic Plan). Furthermore, the ongoing revision of the Municipal Urban Plan represents a crucial step to define an innovative development strategy for the future of the city. In this view, the administration has launched an assessment of ecosystem services (ES) provided by Turin public green areas aimed to identify appropriate future management solutions. The key focus of these solutions is on mitigating environmental impacts or improving environmental conditions, such as climate change, air pollution, urban floods, access to recreational areas and biodiversity loss. This led to the identification of the following ES: carbon sequestration, air pollutants removal, regulation of infiltration and runoff, temperature regulation, social benefits (cultural and recreational), habitat quality, food production and pollination. The assessment built on City of Turin land use map, developed by processing geographical data from the City of Turin Geodatabase. InVEST, Estimap and i-Tree models were adapted and implemented, depending on the considered ES and performed both in biophysical and monetary terms. As for the latter, specific analyses were conducted to identify evaluation approaches consistent whit the local socio-economic context. The results of the assessment were then applied for the following purposes:

- definition of environmental indicators for the strategic environmental assessment of the new Municipal Urban Plan;
- implementation of a QGIS plug in for public administration and professionals involved in land use transformation projects;
- definition of Climate Proofing Natural Based Solutions to be tested in pilot areas;
- development of climate adaptation strategies based on ecosystem services.
  A communication plan was also defined to increase citizens awareness on climate change threats and the role played by urban green areas in contributing to adaptation, resilience and mitigation strategies.

Keywords: ecosystem services, climate change, land management, adaptation, urban ecosystems

8. Type of submission: Abstract

S. Sectoral Working Group sessions: S8a - Integrating ecosystem services science and tools in implementing Nature-based Solutions, to better address global changes

Forest restoration to maximize ecosystem service provision across a biological corridor. The importance of accounting for local livelihoods

Presenting author: Alejandra Morán-Ordóñez

Other author(s): Virgilio Hermoso, Alejandra Martínez-Salinas

Affiliation: Consorci Centre de Ciència i Tecnologia Forestal de Catalunya (CTFC), Spain

Contact: alejandra.moran@ctfc.es

Forest restoration is key to recover ecosystems health and achieve Aichi Biodiversity Targets and Sustainable Development Goals. This is especially relevant in tropical biodiversity hotspots where forest degradation, fragmentation and loss has exponentially increased in the last decades leading to unprecedented rates of species extinctions and loss of ecosystems goods and services. In Latin America and the Caribbean, where agricultural lands occupy 38% of its territory, land restoration (including afforestation practices) has been promoted as a Nature-Based Solution that can help people adapt to the adverse effects of climate change. In this study, we used a spatial planning conservation tool (Marxan) to design a spatially optimal, multi-objective forest restoration plan across the Volcanica Central Talamanca Biological Corridor in central Costa Rica. The restoration plan sought to maximize the provision of forest-related services in this area (seed dispersal, tourism opportunities and carbon storage) while minimizing the impact on current land uses. The Corridor plays a key biological role at the national and continental scale, increasing forest connectivity across Central America to facilitate dispersal of emblematic species such as the Jaguar. However, only 57% of the corridor is currently forested, and further forest restoration will conflict with other land uses, some of them of high economic importance (30% of milk and meat national production comes from this area). We quantified seed dispersal and tourism services (birdwatching potential) using species distribution models. We used the carbon sequestration model of InVEST to quantify carbon storage potential. We showed how a landscape-scale forest restoration plan accounting for only forest connectivity and ecosystem service provision capacity can greatly differ from a plan that considers the potential impacts on local livelihoods (through the loss of land opportunity costs). Our results highlight the importance of using estimates of the socio-economic impact of restoration when designing afforestation plans.

Keywords: birds, ecosystem services, nature-based solutions, spatial conservation planning tools, species distribution models

9. Type of submission: Abstract

S. Sectoral Working Group sessions: S8a - Integrating ecosystem services science and tools in implementing Nature-based Solutions, to better address global changes

Analysis of levers and barriers to ecosystem-based adaptation implementation in the French Alps

Presenting author: Enora Bruley

Other author(s): Sandra Lavorel, Bruno Locatelli

Affiliation: Laboratoire Ecologie Alpine - CNRS, France

Contact: enora.bruley@univ-grenoble-alpes.fr

Adaptation of social-ecological systems to global changes requires sustainable mobilization of ecosystems while supporting good quality of life. Ecosystem-based adaptation (EBA) is part of the toolbox to achieve this goal. A major challenge related to adaptation lies in the identification of levers and barriers for the implementation of these initiatives. We propose to study the co-production, by social and natural systems, of ecosystem services (ES) to identify and evaluate such levers and barriers to adaptation. To capture the ES benefit cascade, we divided the co-production process into three steps: (1) ecosystem management, (2) ES mobilization and harvesting, and (3) ES appropriation and appreciation. We thus consider all capitals involved in ES co-production (natural, human, social, manufactured and financial) acting at different spatial and temporal scales. We illustrate this approach through an analysis of desirable EBA actions of a mountain social-ecological system in the French Alps. Adaptation objectives were elicited through a participatory process aimed at exploring adaptation pathways towards a desirable vision of the region for 2040. We conducted a systemic analysis to identify: (i) ecosystem services bundles supporting adaptation objectives; (ii) associated changes in multiple ES co-production defining EBA to reach the objectives; and (iii) levers and barriers to the implementation of adaptation. This analysis reveals EBA could play an important role in adaptation strategies to stir the social-ecological system on a desirable pathway. However, it also highlights significant barriers to their implementation. While in this case study natural capital does not appear as a limiting factor for adaptation, social and human capital remains the main barrier. Deep changes are required in the social system and in local community's agency in order to implement desired EBA. Thus, ES co-production analysis may help to highlight the strengths and weaknesses of a social-ecological system for the implementation of ecosystem-based adaptations.

Keywords: ecosystem services, co-production, ecosystem-based adaptation, agency, social-ecological system

10. Type of submission: Abstract

S. Sectoral Working Group sessions: S8a - Integrating ecosystem services science and tools in implementing Nature-based Solutions, to better address global changes

Nature-based solutions to wildfires in complex socioecological systems: insights from stakeholders' perspectives in two transboundary protected areas

Presenting author: Judit Lecina-Diaz

Other author(s): João Campos, María Agrelo, Nuria Aquilué, João Azevedo, Lluís Brotons, María-Luisa Chas-Amil, Sara Filipa Alves Cordeiro Rodrigues

Affiliation: InBIO, CIBIO, Portugal

Contact: j.lecina@creaf.uab.cat

Wildfires are one of the most common disturbances of forests at the global scale, but the increased frequency of extreme wildfires is causing more social and ecological losses. The problem of wildfires in complex socioecological systems – where both social and ecological factors interact – requires the inclusion of the diversity of local knowledges and values. In this sense, there is evidence that incorporating local stakeholders' perspectives can enhance the quality and effectiveness of nature-based solutions, defined as actions that protect, restore or sustainably manage ecosystems and the services they provide. Hence, the general aim of this study is to analyze the stakeholders' perceptions of the wildfire problem in two complex socioecological systems (Gerês-Xurés and Meseta Ibérica). Specifically, we aim (i) to identify the different groups of stakeholders, as well as their differences and relationships based on their perspectives of the wildfire problem and their solutions; and (ii) to identify the fire management strategies that can be considered nature-based solutions by the stakeholders, taking into account its trade-offs and benefits in different sectors and ecosystem services. Our study areas are the Gerês-Xurés and Meseta Ibérica transboundary protected areas (Portugal and Spain), where we have identified potential stakeholders through authors' knowledge of the areas and snowball sampling (i.e., asking key informants to name other relevant contacts). Then, structured questionnaires have been sent to the identified stakeholders. The questions were related to the

wildfire problem and its changes in the landscape (past and future evolution of fire and landscape, causes and solutions), as well as to the importance of landscape and fire management strategies considering their trade-offs and benefits in different sectors and ecosystem services. Incorporating the results of this study into the decision-making process could increase the quality and effectiveness of nature-based solutions in socioecological systems.

Keywords: biosphere reserves, fire management, local knowledge, nature-based solutions, stakeholders' perceptions

11. Type of submission: Abstract

S. Sectoral Working Group sessions: S8a - Integrating ecosystem services science and tools in implementing Nature-based Solutions, to better address global changes

Intelligent planning of nature-based solutions for resilient socio-ecosystems

Presenting author: Stefano Balbi

Other author(s): Jose Barquin, Thomas Houet, Edna Cabecinha, Johanna Ballé-Béganton, Jose Manue Álvarez-Martínez, Ferdinando Villa

Affiliation: Basque Centre for Climate Change (BC3), Spain

Contact: stefano.balbi@bc3research.org

Blue and green infrastructure networks (BGINs) have the potential to increase the resilience of ecosystems and human societies in the face of global environmental change. However, they are not a panacea either and their implementation might imply advantages and disadvantages: identifying such trade-offs is key. To plan smartly it is necessary to adopt a complexity embracing approach that considers both the effects on ecological dynamics at multiple scales and on human-related values for different stakeholders' groups. Thus, intelligent planning implies the maximization of positive consequences and the limitation of the negative ones according to multidimensional perspectives. To estimate the expected consequences before implementation (ex-ante) it is necessary to employ simulation models of different components of the combined social-ecological system and to integrate them in a coherent simulation framework. To understand their implications in the coming years, it is paramount to consider the expected trends in land use and cover change and in key ecological and climatic variables, also delivered through ad-hoc simulation models. Further, to secure acceptability and fairness across

different stakeholders, it is fundamental to engage different stakeholders groups since the beginning of the planning process: this is key to foster the co-creation, validation and ownership of the knowledge generated. Here we present a technological and humanistic approach to BGINs planning that was developed in a multilateral fashion within the ALICE Interreg Atlantic project's consortium. We discuss how this modular and trans-disciplinary approach was applied in four case studies across the Atlantic European region. All cases are characterized by a mix of productive and natural landscapes largely relying on freshwater ecosystems. We report on several BGIN scenarios and their implications on regulatory and provisioning ecosystem services, the benefits that humans receive from nature.

12. Type of submission: Abstract

S. Sectoral Working Group sessions: S8a - Integrating ecosystem services science and tools in implementing Nature-based Solutions, to better address global changes

The ecological and economic value of urban lakes in urban heat island mitigation

Presenting author: Laura Costadone
Other author(s): Mark Sytsma
Affiliation: Portland State University, United States of America
Contact: laura.costadone@pdx.edu

Rapid urbanization and climate change are exacerbating the negative consequences of the urban heat island effect (UHI). Nature-based solutions can mitigate these negative consequences and help guarantee a sustainable and livable urban environment. Evaporative cooling by lakes could be one such solution, particularly in hot and dry climates. The aim of this study was to evaluate the ecological and economic impact of artificial lakes in mitigating the UHI phenomenon under current conditions and future climate change scenarios. We used the InVEST urban cooling model to quantify the energy savings provided by artificial lakes within the Phoenix, Arizona (USA) Metropolitan area. The influence of lakes in mitigating the UHI was compared to three alternative LULC scenarios: a city park, a low-density and hi-density development urban scenarios. Our results showed that the presence of a lake significantly mitigated the air temperature and reduced electricity consumption, but the cooling effect decreased with distance from the lake. The potential to moderate air temperature was most evident within a 250m buffer around the lake.

Houses adjacent to a lake could save up to $110/month in electricity costs compared to houses within a 750m buffer. The heat reduction service provided by a lake could contribute an energy savings up to 57.1% with respect to the scenario characterized by high-density development. Our results indicated that the presence of a lake could also be beneficial in mitigating increased temperatures forecasted by climate change scenarios. This research could inform decision on sustainable urban planning and water use in a desert city.

Keywords: nature based solutions, urban heat island, urban lakes, InVEST

13. Type of submission: Abstract

S. Sectoral Working Group sessions: S8a - Integrating ecosystem services science and tools in implementing Nature-based Solutions, to better address global changes

An integrative research-policy framework for the better implementation of nature-based solutions in policy-making of urban and peri-urban forests

Presenting author: Hongmi Koo
Other author(s): Marcin Spyra, Nica Calò, Ramesh Krishnamurthy, Christine Fürst
Affiliation: Martin Luther University, Halle, Germany
Contact: hongmi.koo@gmail.com

Nature-based solutions (NBS) have emerged in sustainable landscape management and planning, which utilize the capacity of natural or modified ecosystems for climate change mitigation and adaptation, as well as generating various environmental, economic and social benefits. Nevertheless, there is a still lack of research on how to integrate NBS in policy-making in urban and peri-urban landscape context addressing trade-offs and conflicts between different ecosystem services (ES) and interests. Our study aims to develop the Integrative Research-Policy Framework (IRPF), which will support the implementation of NBS in policy-making related to urban and peri-urban forests. This framework will be tested in different areas in Germany, Slovenia and India, where NBS are relevant for policy-making. In order to identify effective NBS, spatial peculiarity of a region should be considered such as hotspots where the vulnerability due to climate change-induced impacts is high and green infrastructure is currently lacking. In this light, the suggested framework will integrate an ES assessment and spatially explicit simulation

for assessing effects of NBS. Through expert workshops, we will identify regionally relevant ES and NBS as future scenarios tested in the regions, which could include the expansion of existing green spaces and the establishment of new green infrastructure. The potential impact of identified NBS will be spatially simulated and visualized, which presents how NBS implementation could support to reduce ES trade-offs, and which NBS could be effectively applied as a regionally-adapted solution. Such results facilitate the discussion with different governance actors as feedback processes and help to establish shared understandings and visions on future actions. Thus, IRPF can provide strong arguments regarding the necessity of NBS to the policy makers, who are responsible for designing, implementing and revising policies affecting urban and peri-urban forests.

Keywords: ecosystem services, trade-offs, socio-ecological systems, modeling, participatory approach

14. Type of submission: Abstract

S. Sectoral Working Group sessions: S8a - Integrating ecosystem services science and tools in implementing Nature-based Solutions, to better address global changes

ReNaturing cities through evidence-based implementation of nature-based solutions

Presenting author: Mario Balzan
Other author(s): Miriam Grace, Marcus Collier, Davide Geneletti, Davide Longato, Anna Sapundzhieva, Lynn V Dicks, Judita Tomaskinova
Affiliation: Malta College of Arts, Science and Technology, Malta
Contact: mario.balzan@mcast.edu.mt

Nature-based solutions (NbS) can play a significant role in tackling some of the challenges associated with climate change and local drivers, including rapid urbanisation, which may lead to trade-offs and a decreasing supply of ecosystem services. However, various challenges remain, and recent reviews have identified the vague interpretation of NbS, the limited availability of examples of NbS implementation that includes stakeholder involvement, and the lack of quantitative and measurable targets or mandatory standards at the scale of implementation. This

presentation provides an overview of ongoing work within the Horizon 2020 ReNature project, which aims to create a NbS cluster in Malta that brings together researchers and stakeholders to foster the uptake of NbS concepts. Based on detailed conversations with stakeholders, we provide an overview of the challenges and opportunities for NbS implementation and present a strategy to guide NbS co-creation and knowledge integration for improved NbS design and impact assessment. This strategy is tested within ReNature for the small island state of Malta, which is characterised by rapid urbanisation and strong climate-related impacts. Actions are carried out to address multifaceted societal challenges, develop the evidence base through knowledge integration and participatory methods applied at the scale of implementation, and inform NbS implementation through multidisciplinary impact assessment tools. This strategy can be applied to promote long-term collaboration across the science, policy, business and societal interfaces, whilst using implementation-oriented tools and methodologies to address existing knowledge gaps limiting NbS uptake and effectiveness.

Keywords: climate resilience, ecological restoration, ecosystem services, knowledge synthesis, capacity-building

15. Type of submission: Abstract

S. Sectoral Working Group sessions: S8a - Integrating ecosystem services science and tools in implementing Nature-based Solutions, to better address global changes

Performance-based Solutions against Cloudburst Events. The case of Turin (North-West Italy)

Presenting author: Stefano Salata
Other author(s): Silvia Ronchi, Carolina Giaimo, Andrea Arcidiacono, Giulio Pantaloni
Affiliation: Politecnico di Torino, Italy
Contact: ssalata1983@gmail.com

Climate change is impacting urban areas with greater frequency and exposing continental cities located on floodplains to extreme short-duration rainfall events (cloudbursts). This scenario requires the development of site-specific flooding vulnerability mitigation strategies that improve local knowledge of flood-prone areas at the urban scale. Moreover, decision-makers need to

adopt performance-based strategies for contrasting climate changes and increasing the resilience of territories. The integration of vulnerability analysis in plans and project is still at its infancy, the so-called mainstreaming resilience is, therefore, unpractised with a sound analytical background, therefore new approaches, method and maps to support the decision-making are highly requested. The proposed work for this session develops and tests the recent Flooding Risk Mitigation model of InVEST (Integrated Evaluation of Ecosystem Services and Trade-off) presented and taught during the course "Introduction to the Natural Capital Approach and Urban InVEST", organized by Stanford University during the 10th World Ecosystem Service Partnership Conference, in Hannover (21st November 2019). The ES modelling output has been used to evaluate the distribution of biophysical values of run-off retention in the metropolitan catchment of Turin (Italy). According to other previous studies, the vulnerability of urban areas to a cloudburst can be measured with the run-off assessment during the present predicted scenario, assuming the Model returns a picture of the site-specific vulnerability in the analyzed urban catchment and that it is possible to run alternative scenarios to verify how specific Nature-Based or technological Solutions help to improve retention performance. The cloudburst vulnerability model is the result of the interaction between land use and soil hydrological conductivity. Having analyzed the modelling results and their spatial distribution, we propose a selection of NBS to be implemented through the Turin General town plan, based on the flooding vulnerability assessment as a framework to set the capacity to reduce a specific degree of vulnerability. The index is the first experimental GIS biophysical assessment developed in Turin (Italy) and it can prove useful in the revision process of the General Town Plan underway.

Keywords: ecosystem services, resilience, performance-based urban planning, cloudburst, flooding


3rd ESP
EUROPE Tartu, Estonia
CONFERENCE
2021 7-10 June
Ecosystem Services Science, Policy and Practice in the face of Global Changes