BOOK OF ABSTRACTS

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I. SESSION DESCRIPTION

ID: O4

Emerging issues in ES science, policy & practice

II. SESSION PROGRAM

Date of session: Friday 14 October
Time of session: 11:00-12:30

Timetable speakers subsession 1: ES Assessment and Valuation

Time	First name	Surname	Organization	Title of presentation
11:00-11:15	Marianna	Dimopoulou	Panteion University of Social and Political Sciences, Greece	Assessment and accounting of environmental damage after forest fires in Attica and Ileia regions, Greece
11:15-11:30	Luis	Garrido	University of Salamanca	The long and windy road towards the real-world economic valuation of natural capital
11:30-11:45	Zuzana	Polednikova	University of Ostrav	Ecosystem services and river geomorphic elements: the case study of large wood
11:45-12:00	Bahman	Jabbarian Amiri	University of Lodz	How Socio-Economic Drivers Explain Landscape Soil Erosion Regulation Services in Polish Catchments
12:00-12:15	Remi	Mongruel	IFREMER, Marine Economics Unit	A framework for specifying the various forms of demand for ecosystem services in the context of complex and dynamic social-ecological systems
12:15-12:30	Claudia	Carvalho-Santos	CBMA, UMinho	Management and conservation of aquatic biodiversity and ecosystem services: from citizen´s perception to watershed governance

Timetable speakers sub-session 2: ES Application and communication

13:30–13:45	Alexandre	Altmann	Univ. of Caxias do Sul	Assessment, accounting and traceability the wine sector impact over ecosystem services and biodiversity: designing a framework for implementing a certification and labelling in Mercosur countries to inform the EU consumers
13:45–14:00	Lara	Redolfi de Zan	DREAm-Italia	SEAFOREST LIFE ecosystem services from the conservation of carbon sinks of posidonia
14:00–14:15	Alice	Fitch	UK Centre for Ecology & Hydrology	Modelling flood regulation service of vegetation
14:15–14:30	Ursula	Cardenas	LAB, UCLouvain	Enhancing Urban Metabolism assessments through Ecosystem Service knowledge: integrated framework and applications in Lima
14:30–14:45	Dimitrios	Alexakis	Foundation for Research and Technology Hellas	GEOLAND project: Digital Educational Geoinformatic Methodologies for Monitoring Landscape
14:45 – 15:00	Marcin	Spyra	Opole University of Technology	Teaching the ES concept: experience from academia
15:00–15:30			Discussion	

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*

O. Other sessions: O4. Open sessions

Assessment and accounting of environmental damage after forest fires in Attica and Ileia regions, Greece

Presenting author: Maria Anna Dimopoulou
Other author(s): Dr. Zefi Dimadama, Dr. Theodoros Chatzivasileiadis
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In the last decades, forest fires have increased significantly, due to various factors, including intensification of human activity, agricultural land abandonment and climate change. Mediterranean countries are of the most affected by wildfires, suffering human losses, ecosystem and landscape damage and loss of infrastructure; subsequently, wildfires are one of the most important impacts on Ecosystem Services (ES). In the frame of this assessment, two case study regions (Ileia and Attica) in Greece, severely affected by forest fires in 2007 and 2021 have been selected, were a variety of ecosystems (forests, shrubland, phrygana, agricultural land, settlements) were burnt. The extent of burnt area in Ileia (2007) and in Attiki (2021) has been calculated for the different ecosystem categories and has been used for comparison in the two study areas. For the assessment and documentation of the different categories of ES losses, after the wildfires the following parameters have been used: biodiversity (regulating and maintenance services), non-woody products (provisioning services), grazing (provisioning services), hunting and game (provisioning services), recreation in forests (cultural services). Finally, the economic loss in ecosystem services and environmental damage from the natural environments' restoration cost has been calculated and possible policy implications are suggested.

Keywords: Ecosystem Services, Economic Impact, Greece, Wildfires

2. *Type of submission: Abstract*

O. Other sessions: O4. Open sessions

The long and windy road towards the real-world economic valuation of natural capital

Presenting author: Luis Garrido-Mateos
Other author(s): Fernando Rodríguez-López, José Ignacio Sánchez-Macías
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This review identifies and analyzes the elements of the main stages through which the operationalization of the valuation of natural capital has gone through in the last decades, from the economic valuation of the environment to the proposal of natural capital accounts. The succession of these phases has been accompanied by changes in the theoretical approaches and the improvement of methods and datasets, as well as an enhancement of the environmental sensitivity and the growing incorporation of economic valuation into public policies. This leads to the present emergence of two parallel lines: on the one hand, the application of national accounting principles to the valuation of natural capital and the consequent preparation of national accounts including the value of ecosystem services and natural capital; and, on the other hand, the application of concepts, methodologies and practices of natural capital valuation by the private sector. This contribution presents and assesses the main achievements of each stage, outlines their various limitations, and analyzes the evolution of the different challenges that have being faced during this roadmap.

Keywords: Natural Capital Accounting, Ecosystem Services.

3. *Type of submission: Abstract*

O. Other sessions: O4. Open sessions

Ecosystem services and river geomorphic elements: the case study of large wood

Presenting author: Zuzana Połedniková
Other author(s): Tomáš Galia
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Freshwater ecosystems are one with the highest number of ecosystem services owing to their semi-aquatic and semi-terrestrial character. It implies that the assessment of this ecosystems can represent a challenging process. Especially the research of river ecosystem services sometimes focuses only on the map measurable indicators or easy-to-calculate aspects of the mapped or classified units. We expect that such assessment could be improved by focusing on more detailed scale and by describing the typical phenomenon of the river (e.g., sediment regime, gravel bars, pool-riffle, and other features). In our research, we focused on large wood as a typical phenomenon of rivers draining forested riparian corridors all over the world. Presence of large wood in the river is linked to positive and negative benefits for society. We performed the systematic literature review to describe the current relations between large wood and ecosystem services. Of 499 articles, only 137 were eligible for identification of ecosystem services. Only two papers directly described the ecosystem services of large wood. So, we decided to analyse the rest of eligible papers (n=137), to extract their primary findings and to transfer them into ecosystem services (according to CICES V 5.1). We found that large wood is connected predominantly with following ecosystem services: specific habitat creation and increased channel heterogeneity. This implies the large wood is connected mainly to regulation and maintenance categories. Our research can serve as a basis for the detailed assessment and quantification of ecosystem services in the freshwater ecosystem. Findings can also be used to help plan and managing for nature-based solutions of rivers and surrounding floodplains.

Keywords: large wood, ecosystem services, fluvial geomorphology, review

4. *Type of submission: Abstract*

O. Other sessions: O4. Open sessions

How Socio-Economic Drivers Explain Landscape Soil Erosion Regulation Services in Polish Catchments

Presenting author: Bahman J. Amiri
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Most studies that address the relationship between socio-economic characteristics and soil erosion focus on the effects of soil erosion on socio-economic conditions at different levels, from global to smallholder. Few, if any, efforts are made to address the influence of socio-economic variables on the soil erosion rate as an indicator of landscape degradation. The present study was carried out using spatial data from 402 catchments that cover Poland, to find out how socio-economic variables, which include area-weighted average income per capita (PLN km−2), area-weighted average gross domestic product (PLN km−2), population density (person km−2), and human development index can drive the soil erosion rate (kg ha−1 yr−1), along with annual precipitation, soil and geomorphological variables that include soil organic carbon content, soil water content, clay ratio, stream gradient, and terrain slope. The results showed that the soil erosion rate is indirectly driven by the socio-economic variables in the study catchments, as it is alleviated by increasing population density, the area-weighted average gross domestic product, and the human development index. Furthermore, analyzing the incremental relationship between soil erosion rate and the area-weighted average of socio-economic variables revealed that no uniform change can be observed in the relationship between the area-weighted average socio-economic variables and soil erosion in the study catchments.

Keywords: ecosystem services, soil erosion regulation, area-weighted average income per capita, area-weighted average GDP, HDI

5. *Type of submission: Abstract*

O. Other sessions: O4. Open sessions

A framework for specifying the various forms of demand for ecosystem services in the context of complex and dynamic social-ecological systems

Presenting author: Remi Mongruel
Other author(s): Harold Levrel, Valérie Derolez, Pierre Scemama, Charlène Kermagoret, Adélie Pomade
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Ecosystem services science has its roots in the systems approach. Many frameworks used to analyse social-ecological systems (SES) place ecosystem services (ES) at the core of the Nature-Society interface. The “supply side” of ES has been widely studied by ecologists to assess the capacity of ecosystems to maintain ES flows. The “demand side” is assessed mainly from the economic viewpoint of benefits flows or from the sociological perspective of

ES perception. However, these attempts to characterize ES demand remain incomplete and/or disconnected from the complexity and dynamics of ecosystems and the social groups that depend on them. This results in operational shortcomings for the effective use of the ES approach for the study of SES.

This communication proposes a framework for specifying the various forms of demand for ecosystem services in the context of complex and dynamic SES. A form of demand is defined as the type of interaction that a given social group has developed with a particular ES. This means that one ES can be subject to several, possibly conflicting, forms of demand simultaneously. A total of twelve demand attributes have been identified in the literature. These attributes consider whether the demand is:

- subtractive (1), non-subtractive (2) or for conservation (3), which depicts the physical nature of the interaction;
- damaging (4) or non-damaging (5), which accounts for the impacts on ecosystems;
- direct (6) or indirect (7), which accounts for the dependence or influence on ES;
- latent (8), emergent (9) or settled (10), which accounts for temporality;
- satisfied (11) or unmet (12), which relates to social stability.

Some of these demand forms are particularly likely to generate changes. An application of this framework to three coastal ecosystems shows which ES and associated demands are responsible for key issues regarding SES dynamics and management.

Keywords: ES form of demand, social-ecological system, demand attributes, system dynamics

6. *Type of submission: Abstract*

O. Other sessions: O4. Open sessions

Management and conservation of aquatic biodiversity and ecosystem services: from citizen´s perception to watershed governance

Presenting author: Claudia Carvalho-Santos

Other author(s): Janeide Padilha, Luis Machado, Giorgio Pace, Cláudia Pascoal

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Humans have long depended on aquatic resources, from subsistence to recreational, industrial, and commercial purposes. Moreover, aquatic ecosystems support biochemical cycles, providing water purification, carbon sequestration and habitat for biodiversity, among others. Although the importance of healthy aquatic ecosystems is well documented, several human activities, alone or in combination, have led to high biodiversity losses and

consequent degradation of ecosystem services provision, including: overexploitation, introduction of non-indigenous species, habitat loss and fragmentation, climate change, and pollution. The River2Ocean project (https://river2ocean.pt/) aims to develop socio-ecological solutions to promote biodiversity and aquatic ecosystem services in the Minho region, NW Portugal, using an integrative approach from the river basins to the coast. To this end, a comprehensive survey of biodiversity was done and catalogued in a common database that supported further analysis of biodiversity risks and hotpots. In parallel, participative workshops were carried in three major watersheds (Minho, Lima and Cávado) collecting opinions on biodiversity and ecosystem services status. Results indicate that biodiversity conservation is a priority for local stakeholders, especially emphasising the increase in the protected areas extension. Regarding ecosystem services provision, stakeholders perceived the importance of regulation services, in particular fire prevention, but also the importance of provisioning and cultural services. Moreover, they identified the regulating services as being the most in demand in the main river basins. Our findings under de River2Ocean project clearly show that assessing the status and trends of aquatic biodiversity is critical for developing strategies for adequate watershed management, including local concerns for an effective global change ecosystems adaptation.

Keywords: Aquatic biodiversity, Ecosystem services, River2Ocean project, Watershed management, NW Portugal

7. *Type of submission: Abstract*

O. Other sessions: O4. Open sessions

Appraisal and accounting the ecosystem services related to Emerging Infectious Disease (EID) and pandemics: a “One Health” Approach.

Presenting author: Alexandre Altmann
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Emerging Infectious Diseases (EID), including zoonosis, are related to land-use change, ecosystem degradation, biodiversity loss and extinction. The recent COVID-19 pandemic cost billions of dollars and caused thousands of deaths. Avoiding new pandemics is a challenge that humanity needs to face. The work on the One Health approach helps to understand how public policies need to be developed and applied. Notably, accounting holds centre stage in organisation decision-making processes, and financial and non-financial appraisals can support the practical management of Emerging Infectious Disease problems. However, up to date, little work has been done in exploring ecosystem services related to the context of health ecosystem accounting. We argue that the ecosystem services associated with avoiding new pandemics and EID require an appraisal and supporting accounting process that will enable its ordination with the health public policies. In this paper, we

identify the ecosystem services and compatible accounting options that could support the prevention of EID risk.

Keywords: "Emerging Infectious Disease (EID)"; "pandemics"; "ecosystem services accounting"; "one health"; "health public policies".

8. *Type of submission: Abstract*

O. Other sessions: O4. Open sessions

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

Presenting author: Lara Redolfi de Zan

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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

Keywords: ecosystem services, habitat, blue carbon

9. *Type of submission: Abstract*

O. Other sessions: O4. Open sessions

Multifunctional open space and climate change adaptation: urban forest as part of an adaptation strategy for cities

Presenting author: Petja Ivanova-Radovanova

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The last decades have seen enthusiastic growth of urban open space and greening which takes many forms, from the large-scale reclamation of industrial dereliction to the small, scale-management of vacant urban plots and to the implementation of ICT in public open space. European governments are tending to perceive cities of renewed economic dynamism and physical renaissance and as a places that can help to resolve social and environmental challenges. However, the worsening social and environmental condition of many inner and outer-city areas both required and has stimulated decision-making, new planning approaches, community activities focused to renovate urban environment, neighborhoods in ways which combine work on open space and buildings.

Concerning the relationship between region, city and neighborhood level, the State of European Cities Report said that in many cases functional interdependencies call for regional-scale solutions – such as transport, water supply and sewage, but other issues can often be better addressed at the neighborhood level – such as design of public areas, education, social integration and mitigation of climate change.

But, if the community contribution to urban regeneration is to grow and become more effective, then specific knowledge, understanding of local corcumstances and extra support are needed. In support of this efforts, the paper presents the case study in Sofia for the implementation of the British concept of urban forest, as an important part of both the urban green system and development of successful adaptation strategy. Investigation ns had been carried out though documenentary study, site visits and interviews. The main factors, trends and expectations in application of the concept of urban forestry in Sofia as a part of effective adaptation plan had been outlined. It was proved that further development of urban forest could be a vital part of effective adaptation strategy for sustainable cities.

Keywords: Key words: open space, adaptation strategy, urban forestry, regeneration

10. *Type of submission: Abstract*

O. Other sessions: O4. Open sessions

Enhancing Urban Metabolism assessments through Ecosystem Service knowledge: integrated framework and applications in London and Lima

Presenting author: Ursula Cardenas
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Urban Metabolism (UM) assessments are gaining popularity across policy and science as a means to study the interaction between anthropogenic and natural systems in cities. This interaction is depicted by how resource demand - material and energy flows - and emissions/waste generation are related to the socio-economic and technical processes that occur within them. UM assessments and their underlying concepts have proved relevant to address current and future urban sustainability challenges (i.e. global environmental impacts due to the allocation of resources and energy). Moreover, Ecosystem Services (ES) analysis provides a vast reservoir of tools and strategies to optimize cities' metabolism through improved resource cycling and emissions reduction. Despite significant improvements in ES knowledge and classification, this reservoir remains largely untapped in UM research. In response to this knowledge gap, we propose an integrated Urban Metabolism and Ecosystem Service framework to extend the Economy-Wide Material Flow Analysis (EW-MFA), a widely used UM tool. The framework utilizes the factors "Pressures", "Drivers" and "State" to explain the relationships between anthropogenic and natural systems. CICES was used as a baseline for the classification and typology of ES and create a collection of indicators that allow context-sensitive analyses. Through the proposed framework, interdependencies and causal relationships between ecosystem service assessment and EW-MFA flow categories can be identified. The framework is applied and tested in two case studies: Lima and London. Simulations will be considered to estimate spatial and temporal variations based on urban growth, climate simulations, and land-use data. Scenario analysis is used to jointly estimate the amounts of resource flows/emissions and the change in ES supply to 2050 (increased or decreased quantities for each ES). Outcomes of the framework application can promote awareness of the value of nature in anthropogenic-dominated environments as well as leverage the integration of UM and ES knowledge in urban planning and sustainability policy.

Keywords: Urban Metabolism, Ecosystem Services

11. *Type of submission: Abstract*

O. Other sessions: O4. Open sessions

GEOLAND project: Digital Digital Educational Geoinformatic Methodologies for Monitoring Landscape

Presenting author: Dimitrios Alexakis

Other author(s): Christos Polykretis, Luc Zwartjes, Karl Donert, Rafael de Miquel Gonzalez, Natasha Nikolaidou, Roberto Zanon, Ayri Memishev

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Landscape means an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors" (Art.1 of European Landscape Convention (ELC)). The Landscape is the face of land with all its natural and anthropological elements and, at the same time, the feelings and emotions that it arouses in us when we see it. ELC aims to encourage public authorities to adopt policies and measures at local, regional, national and international levels for protecting, managing, and planning landscapes throughout Europe. The Covid-19 crisis seems to have hit a pause to these policies and activities, but it is not the time to ignore such issues nor forget about the training of trainers, students and citizens required to achieve these objectives. With this situation in mind, GEOLAND focuses on NATURA 2000 sites. Particularly GEOLAND:

1. explores and develops educational procedures for the effective participation of Higher Education students in decision-making for landscape management, planning, and protection of NATURA 2000 sites.

2. enables the uptake of novel ways to engage and empower HE students in environmental science and stimulates participatory decision-making. In particular, it provides the

opportunity for students, citizens & stakeholders being interested in the definition and implementation of landscape policies to play an active part in setting sustainability indicators of desirable landscape quality objectives (Landscape Quality Objectives/LQO).

3. attempts to identify and summarize the environmental/cultural stratification in the examined landscapes through a sophisticated Landscape Character Assessment (LCA). On the basis of this Assessment, the combined capabilities of geospatial technologies (Earth Observation and Geographic Information Systems) and web-based GIS applications are exploited.

4. encourage/introduce innovative pedagogies (citizen science), technologies and state-of-the-art approaches (LCA) to higher education studies in Europe, while addressing issues of

teaching and learning about Landscape as a multidisciplinary subject area in universities.

Keywords: Landscape, Citizen Science, LCA, Earth Observation, GIS

12. *Type of submission: Abstract*

O. Other sessions: O4. Open sessions

Teaching the ecosystem service concept: experience from academia

Presenting author: Marcin Spyra

Other author(s): Dr. Igone Palacios-Agundez Gloria Rodriguez-Loinaz, Nina Hagemann, Marta Sylla

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Although ecosystem service (ES) is a well-established concept among the scientific community, it has not reached the mainstream of public awareness because it lacks wide recognition among citizens and educators. Teaching of ES may contribute to the mainstreaming of the ES concept and its framework in society in a critical and meaningful way, toward sustainable development. In fact, the ES concept is a key tool for communicating our social dependence on natural ecosystems, and therefore it has high didactic potential. However, this didactic potential is under-explored, because there is a lack of scholarship related to teaching the ES concept. There is little evidence, for example, on whether scientists who research ES also teach the concept and thus contribute to raising the level of ES awareness in society, and if so, how such teaching processes could be improved, to broaden the impact to citizen awareness. To close this knowledge gap, we delved deeper into how the ES concept is taught and which teaching strategies are currently being used by ES research academics. We aimed to establish connections between those teaching practices and best educational practices described in educational literature. This analysis will help to provide insights into academics' teaching approaches, as well as how these practices could be improved. A key finding of our research is that teachers with little experience in ES teaching are less likely to use active teaching methods or to evaluate their teaching (both related to best educational practices), whereas lecturers with more years of experience in teaching the ES concept are more in line with best educational practices. Therefore, collaboration and networking among teachers with different levels of experience could help improve the quality of ES concept teaching. We suggest the establishment of a platform to facilitate regular exchange among teachers and educators from different teaching contexts and educational levels. Finally, we propose several future research directions in this emerging research area in order to continue revealing the existing research gap in the teaching of the ES concept.

Keywords: active learning; ecosystem services; evaluation; interdisciplinarity; networking; teaching

13. *Type of submission: Abstract*

O. Other sessions: O4. Open sessions

Modelling flood regulation services provided by vegetation

Presenting author: Alice Fitch

Other author(s): Laurence Jones, Tom Nisbet, Samantha Broadmeadow, Gregory Valatin. Emma Robinson

Affiliation: UK Centre for Ecology & Hydrology

Local natural capital/NbS, particularly woodland, can have catchment wide impacts on flood regulation. The process of how woodland affects the generation and conveyance of flood waters is understood, however, modelling and quantifying this at a country level remains challenging. This is due to the complex interactions of climate, antecedent soil conditions, and location specific characteristics (i.e. elevation, soil type) amongst others that influence the ability of natural capital to provide a flood regulation service.

We have developed a spatial modelling approach for estimating the physical flood regulation service provided by natural capital through utilising outputs from the JULES land surface model. Estimates were based on three processes: estimating volumes of water intercepted by the woodland canopy, water storage within soil as result of woodland presence (prior woodland water use in days leading up to a flood event results in drier soils), and retention due to higher floodplain hydraulic roughness of woodland. These volumes of water are considered to be effective floodwater storage that would otherwise have to be provided if this natural capital was absent. We demonstrate that without natural capital (compared to a baseline of bare soil) an extra 6 to 11 billion m^3 of water would have travelled downstream each year.

By constraining the analysis to catchments with downstream communities at risk from flooding, we were able to provide a monetary estimate of this floodwater storage based on the costs to provide the same storage volume through constructing and operating flood reservoirs (£3–£5 billion/year). These outputs are being utilised by UK government agencies for natural capital accounting, and we discuss how design of the modelling enables local and regional assessment of the wider impacts of tree planting. As well as our experience of parameterising biophysical models appropriately depending on service to be explored.