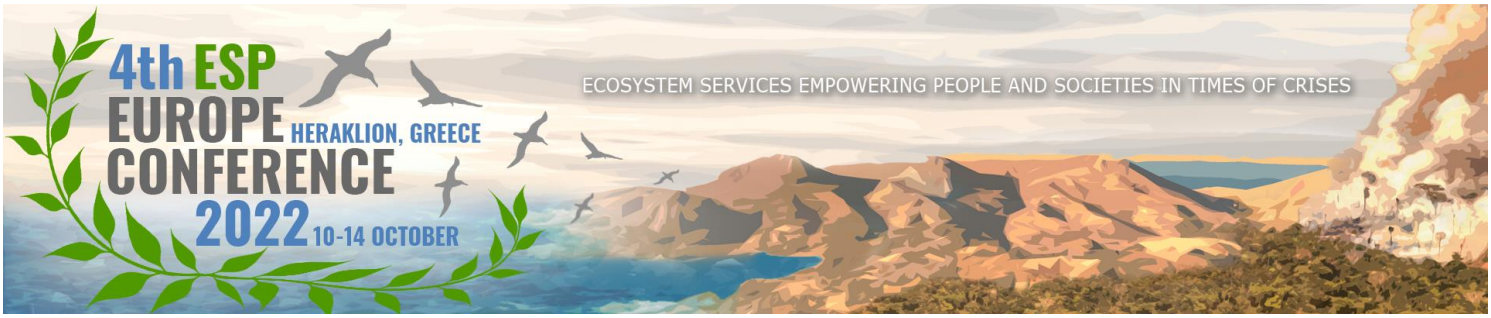


BOOK OF ABSTRACTS

I. SESSION DESCRIPTION

ID: T4b

The power of ecosystem services maps for transformative change

Hosts:

	Title	Name	Organisation	E-mail
Host:		Benjamin Burkhard	Leibniz University Hannover	burkhard@phygeo.uni-hannover.de
Co-host(s):		Louise Willemen	University of Twente	l.l.willemen@utwente.nl
		Evangelia Drakou	Harokopio University of Athens	e.drakou@hua.gr
		Miguel Villoslada	University of Eastern Finland	miguel.villoslada@uef.fi
		Solen le Clech	Wageningen University and Research	Solen.leclech@wur.nl

Abstract:

Maps are powerful tools to communicate complex spatial information in a visual format to different audiences. Ecosystem services (ES) are a powerful approach to raise awareness on human dependence on a functioning and biodiverse environment. Thus, ecosystem services maps can be considered super-powerful tools for spatial analyses of coupled human-environmental systems. Such analyses include integrated assessments of human impacts on the environment by for instance land and sea uses, resource exploitation or climate change.

Present human-environmental interactions are – in most cases – not sustainable and demand for transformative societal change. In this session we want to elaborate more on whether and how ES maps – as super-powerful tools – can actually contribute to the urgently needed changes. Transformative change means behaving and acting differently – not just a little more or less of something we are already doing. And doing things differently should happen following combined bottom-up and top-down approaches. We are looking for all kind of examples, where ES maps might support, drive, detect and inform transformative change, including ES map applications for awareness-raising and capacity building, policy making,

concrete environmental management and planning procedures, businesses or ecosystem accounting on different spatial and temporal scales.

We would like to know whether and how maps are used in combination with other efforts and with which types of methods to bring change. We are interested in both, stories of success and failure, in order to learn from each other's approaches and experience. Also, combinations of ES maps with scientific or non-scientific approaches and applications (e.g. citizen science, bottom-up and top-down public and private initiatives) in various sectors are relevant here.

Goals and objectives of the session:

Sharing experience and create new knowledge on how ecosystem services mapping can contribute to urgently needed transformative change.

Planned output / Deliverables:

A joint open access journal publication or a journal special issue.

Session format:

Standard session (presentations)

Voluntary contributions accepted:

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

Related to ESP Working Group/National Network:

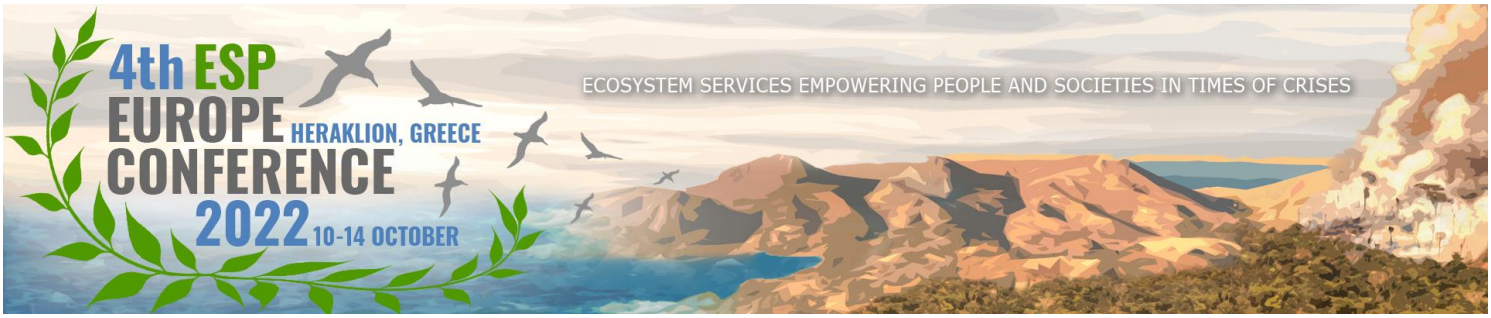
Thematic Working Groups: TWG 4 – Mapping ES

II. SESSION PROGRAM

Date of session: 12.10.2022
Time of session: 11:00 – 12:00 and 13:30 – 15:30

Timetable speakers

Time	First name	Surname	Organization	Title of presentation
11:00	Benjamin	Burkhard	Leibniz University Hannover	Session introduction

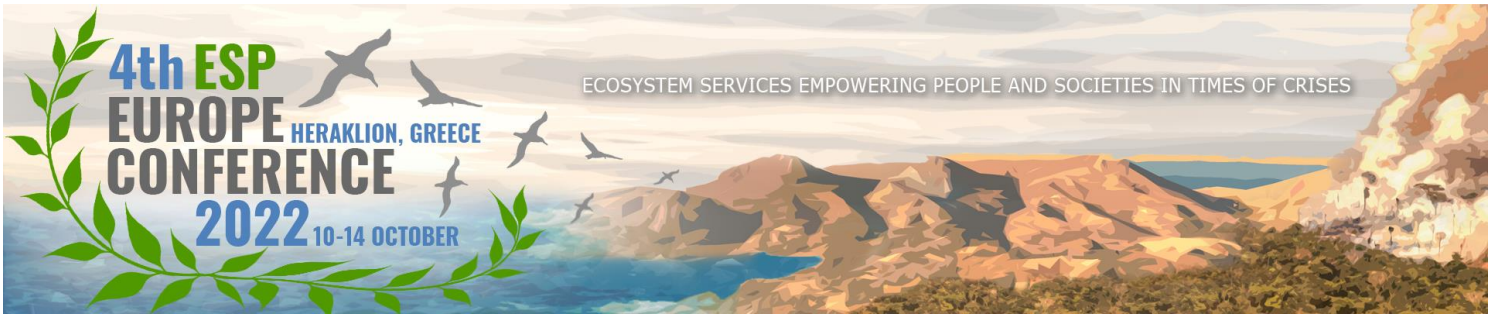


Time	First name	Surname	Organization	Title of presentation
11:00	Rui	Catarino	European Comission	A pan-European indicator of natural pest control services potential in agricultural landscapes
11:12 (virtual)	Claudia Cecilia	Caro Vera	National Agrarian University La Molina	Mapping ecosystem services at user-relevant scales to streamline the decision-making process. A use case from the Peruvian Andes
11:24	Patricia Arrogante	Funes	Rey Juan Carlos University	Ecosystem services assessment for their possible integration in the analysis of landslide risk
11:36	Matteo	Giacomelli	University of Camerino	Mapping bundles of Ecosystem Services supply and demand reveals interdependencies between inland areas and urban poles
11:48	Melvin	Lippe	Thünen Institute of Forestry	Community land use maps as a tool to support ecosystem service management in uncertain situations: the case of forest communities in the Philippines
16:00	Thomas	Koellner	University of Bayreuth	Atlas for Ecosystem Services in Bavaria, Germany: An Interactive Tool to Explore, Evaluate and Suggest Improvements for Ecosystem Services.
16:12	Malte	Hinsch	Leibniz University Hannover	Linking ecosystem condition and pollination ecosystem service modelling with ESTIMAP on the regional scale
16:24	Adi	Elmaliah	Technion	Mapping and Assessing Cultural Ecosystem Services and their Spatial Correlation with Biodiversity in the Arava Valley
16:36 (virtual)	Silvia	Rova	Environmental Sciences, Informatics and Statistics Dept.	How (un)sustainable are we? A sustainability-driven analysis of ecosystem services in the Venice lagoon.
16:48	Linda	Zardo	IUAV (University of Venice)	No-regret energy production from renewables integrating regional energy plans with ecosystem service analysis. Empirical evidence and theoretical

Time	First name	Surname	Organization	Title of presentation
				insights from Veneto region (IT) through a GIS-based trade-off mapping
17:00	Carlos Rio	Carvalho	NOVA School of Science and Technology	Payments for ecosystem services in Portugal: challenges to design a new incentive scheme based on costs of provision and landowners WTA in the Pinhal Interior (Centre Portugal) region
17:12	Miguel	Moreira	Centre for Functional Ecology	Participatory mapping as a management approach for the spatialization of key-ecosystem services: the Portuguese Biosphere Reserves case-study
17:24 (virtual)	Joana	Alves	University of Coimbra	Assessing forest multifunctionality: an ecosystem services approach to forest ecosystems in Portugal
17:36	George	Linney		Vive la différence: evidence matters to ecosystem service mapping
17:48				Session wrap-up, discussion and lookout

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

T. Thematic Working Group sessions: T4b - The power of ecosystem services maps for transformative change

No-regret energy production from renewables integrating regional energy plans with ecosystem service analysis. Empirical evidence and theoretical insights from Veneto region (IT) through a GIS-based trade-off mapping

Presenting author: Linda Zardo

Other author(s): , Massimiliano Bradaschia Granceri

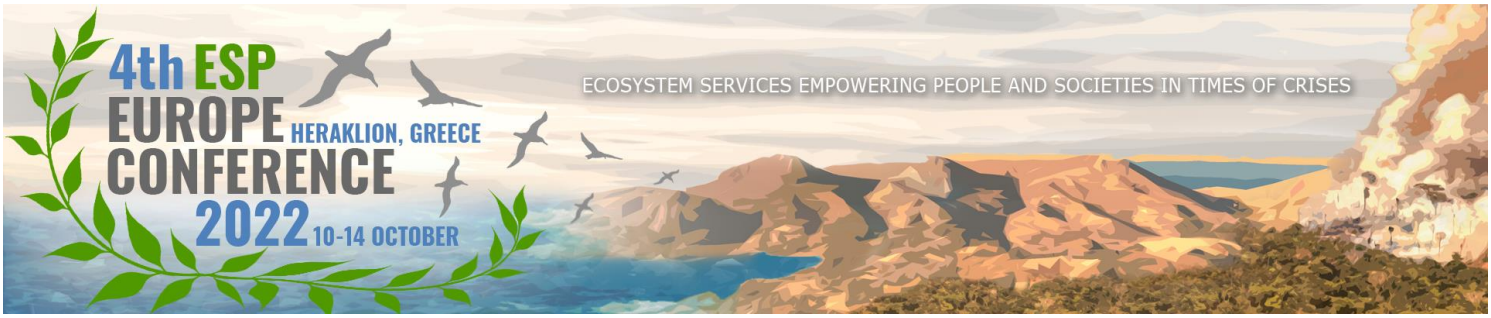
Affiliation: IUAV, Italy

Contact: lzardo@iuav.it

Despite the EU regions reached many 2020's targets, both in terms of decarbonization and renewable energy source (RES) production, in the light of the new challenges further energy production from RES is needed and local planning has to cope with it. The upscale of RES production at regional level implicates possible trade-offs between RES production and natural assets' goods and services provision. If these trade-offs remain unsolved the sustainability of regional energy plans can be compromised.

This study aims for the integration of the ecosystem service (ES) approach in the regional energy planning, which is a promising tool acknowledged by the academia and at EU policy level, but not yet diffused in the practice at the local level. Therefore, this study's goal is to bridge theory and practice by integrating the ES concept into regional energy planning. In particular, the study analyses the RES-ESs trade-offs of the Regional Energy Plan of Veneto Region (IT). Through a GIS-based approach, the study analyses and maps the suitable land for RES production (agricultural biomass and solar farms) based on policy constraints, and ES-trade off analysis. Then, a comparison between land suitability based on the two different approaches is addressed. The study identifies lower potential negative impacts from agricultural biomass, compared to solar farms, based on ES tradeoff analysis. Mismatches in terms of potential impacts highlighted by policy constrains and by ES trade-off analysis are listed and described. The methodology to map trade-offs can be replicated into other regional context, and results can be used as basis to fine tune new criteria to define suitable areas for renewable energy production, minimizing negative impacts on other ES provisioning

Keywords: Spatial Planning; Renewable Energy; Ecosystem Services; Trade-off analysis; Policymaking



2. Type of submission: Abstract

T. Thematic Working Group sessions: T4b - The power of ecosystem services maps for transformative change

A pan-European indicator of natural pest control services potential in agricultural landscapes

Presenting author: Rui Catarino

Other author(s): Rui Catarino, Ana Klinnert

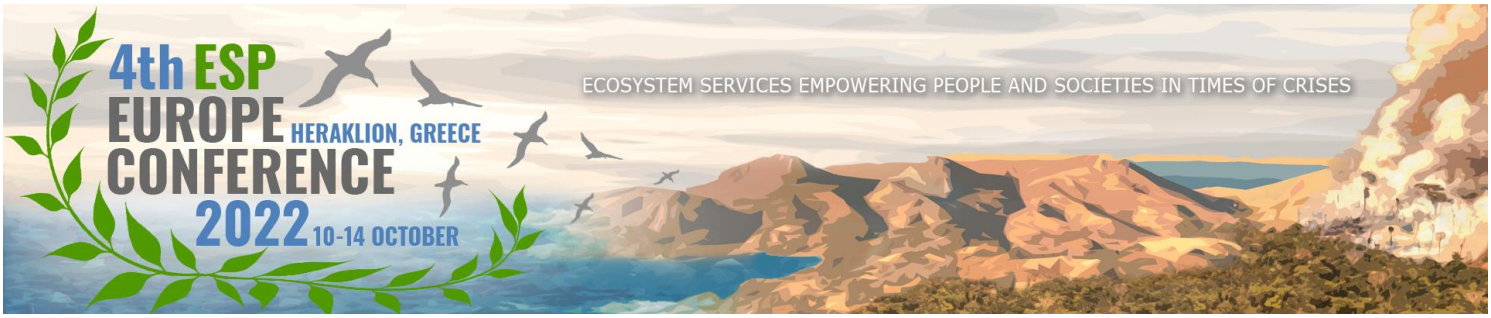
Affiliation: European Commission, Joint Research Centre, Via Enrico Fermi 2749, 21027, Ispra, Italy, Italy

Contact: rui.catarino@ec.europa.eu

Regulating ecosystem services delivered by biodiversity in farmland, such as pest control, are key to maintain crop yields while reducing the use of agrochemicals. Natural pest control by natural enemies allows farmers to put in place alternative control strategies to reduce potential crop damage. This requires a heterogeneous landscape with the presence of semi-natural habitats providing shelter and food to beneficial insects.

Benefitting from the newly delivered high resolution data on woody elements in the agricultural landscape, we improved the pan-European, spatially-explicit model developed in Rega et al (2018), to map and assess the landscape potential to sustain natural pest control. This updated model combines recent high-resolution (up to 10m) geospatial layers (reference year 2018) derived from Sentinel Satellites imagery with empirical results from extensive field surveys. The latter measure the specific contribution of different semi-natural habitats to support natural enemies. Specifically, we combined Corine Land Cover with three high resolution layers of the Copernicus project, which have been released in recent years, namely: i) Tree Cover Density, ii) Grasslands, and iii) Small Woody Features layer. Using morphological spatial pattern analysis we further classify these habitats according to their shape being linear or areal.

The resulting map allows to characterise and contrast areas with high and low biological control potential, based on landscape composition in terms of semi-natural habitats types, abundance, spatial configuration and distance from the focal field. The obtained indicator be integrated into existing modelling and evaluation frameworks, for example to incorporate regional variety and to account for the benefits biodiversity bring to production. It is particular useful to assess the implementation of the future CAP, the Farm to Fork and the Biodiversity strategies of the European Union.



Keywords: Biodiversity, Copernicus, Biological control, Landscape complexity, Semi-natural habitats

3. Type of submission: Abstract

T. Thematic Working Group sessions: T4b - The power of ecosystem services maps for transformative change

Atlas for Ecosystem Services in Bavaria, Germany: An Interactive Tool to Explore, Evaluate and Suggest Improvements for Ecosystem Services.

Presenting author: Thomas Koellner
Other author(s): Melissa Versluis, Rebekka Riebl
Affiliation: University of Bayreuth, Germany
Contact: thomas.koellner@uni-bayreuth.de

Maps provide a powerful tool to allow information on ecosystem services flowing from scientists to societal actors. But also in the other direction spatially explicit survey tools enable people to provide their opinion and express ideas for improving ecosystem services, which is a prerequisite for transformative change. Towards this goal we will launch this year an interactive Atlas for Ecosystem Services for whole of Bavaria, which is with 70'550 km2 the largest federal state in Germany. Nine research groups from Bavarian universities and colleges have contributed to this atlas in the framework of the Research Program BayKlif. Here we present the set-up of our atlas to inform decision-makers and interested public about the spatial patterns of climate change, land use and ecosystem services in Bavaria. The atlas currently (as of July 2022) shows nine different ecosystem services next to species diversity, land use and climate on a 5 km2 hexagon grid. The online GIS enables comparing maps to explore spatial correlations. An interactive survey tool allows users to select polygons and answer questions for those. We offer an extensive survey (20 min) on land use, climate change and ecosystem services for a user-selected municipality. The online questionnaire is well tested since already 3295 persons (farmers, foresters, nature managers and citizens) filled it in in 2020. More than one third (n = 1233) provided contact information to receive further information on the topic. In addition, we offer a short survey (5 min) in the Atlas where participants can select one of the 5 km2 hexagons and their answers are published instantly. We conclude that this Atlas for Ecosystem Services is an example of an online platform which not only provides information, but also collects

opinions and ideas from actors in a spatially explicit manner. The implementation will show to what extend this will be taken up.

Keywords: Online GIS, Atlas, Drivers, Ecosystem services, Online Survey

4. Type of submission: Abstract

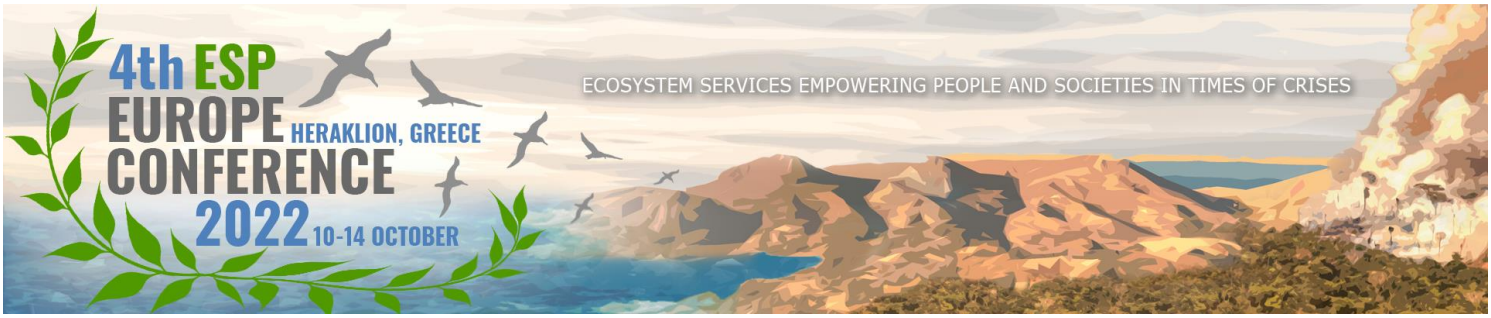
T. Thematic Working Group sessions: T4b - The power of ecosystem services maps for transformative change

Mapping bundles of Ecosystem Services supply and demand reveals interdependencies between inland areas and urban poles

Presenting author: Matteo Giacomelli
Other author(s): ,
Affiliation: School of Architecture and Design, University of Camerino,
Contact: matteo.giacomelli@unicam.it

Urbanization together with growing human activities is leading to increasing marginalization and regional inequalities. While cities are mostly associated with economic success and power, the inland areas – defined as territories remote from the delivering of services such as health, education, and mobility – are undergoing a process of socio-economic decline. Nevertheless, inland areas are crucial in the delivery of goods and services to society. The multiple ways society benefits from ecosystems is captured by the definition of "Ecosystem Services" (ES), and its integration into regional planning can help researchers and policy-makers to identify trade-offs between ecological and socioeconomic aspects.

On that account, the study investigates spatial interdependencies through the lens of ES, emphasizing the role of inland systems in providing benefits to society. In the regional case study of Le Marche, Italy, we assessed landscapes as social ecological systems while mapping bundles of ES supply and demand, and further describing them according to local social-economic characteristics. Thereafter, the study develops in two parallel paths, on the one side testing ES bundles for the visualization of social-ecological systems, on the other applying ES budgeting to highlight interdependencies along the inland-urban gradient. In this sense the study intends to provide suggestions for the sustainable landscape development as well as insights for regional cohesion strategies.



The ES mapping proved to be a powerful tool to analyze landscapes as social-ecological systems. The study highlighted bundles of ES supply and demand further explaining them as landscape units associated to local socio-economic assets, allowing recommendation for regional landscape planning. Furthermore, the budgeting operation underlined existing dependencies of urban towards inland systems in terms of environmental resources. The study suggests that cohesion policies should embed a place-based approach integrating local characteristics in the strategies for regional development.

Keywords: social-ecological systems, landscape planning, ES bundles, inland areas, regional cohesion

5. Type of submission: Abstract

T. Thematic Working Group sessions: T4b - The power of ecosystem services maps for transformative change

How (un)sustainable are we? A sustainability-driven analysis of ecosystem services in the Venice lagoon.

Presenting author: Silvia Rova
Other author(s): Alice Stocco, Fabio Pranovi
Affiliation: Ca' Foscari University of Venice, Italy
Contact: silvia.rova@unive.it

One of the biggest challenges for ecosystem services' (ES) science is to make the concept operational for decision making purposes. In this work, we aim to use ES, and particularly the assessment of their capacity and flow, to explore the sustainability of the ES provision in a coastal social-ecological system. We present an ES assessment in the Venice lagoon, Italy, in which the capacity and flow of 12 ES have been quantified and mapped. By applying multivariate analysis on this set of maps, we derive a zonation of the lagoon which reflects the different patterns of ES and accounts for situations characterized by spatial/temporal lags between the capacity and the flow. Building on the rationale that not all combinations of ES uses are desirable for the long term maintenance of ES capacity, we propose an approach that analyses the ES patterns found in each zone to explore the degree of sustainability of the uses of the ecosystem in the different zones. These results can be used to suggest potential strategies for the sustainable management of the lagoon social-ecological system,

aimed at enjoying the benefits offered by the ecosystem without impairing its capacity to provide them.

Keywords: Ecosystem services mapping, coastal ecosystems, sustainability, ecosystem-based management, multiple ecosystem services

6. Type of submission: Abstract

T. Thematic Working Group sessions: T4b - The power of ecosystem services maps for transformative change

Mapping and Assessing Cultural Ecosystem Services and their Spatial Correlation with Biodiversity in the Arava Valley

Presenting author: Adi Elmaliah
Other author(s): Daniel Orenstein,
Affiliation: Faculty of Architecture and Town Planning, Technion - Israel Institute of Technology, Haifa 32000, Israel, Israel
Contact: adi.e@campus.technion.ac.il

After nearly two decades of ecosystem service research and assessment, the relationship and spatial correlation between cultural ecosystem services and biodiversity remains a subject of uncertainty and debate. Such knowledge has significant implications for spatial planning and conservation efforts. This study examines the spatial correlation between cultural ecosystem services (CES) and biodiversity in a hyper-arid ecosystem which, despite its aridity, is rich with both CES and biodiversity. The research uses public participation mapping method (PPGIS) to create spatial distribution maps of CES in the southern Arava valley in Israel. The area is located in the Great Rift Valley with the Negev mountains in Israel and the Edom mountains in Jordan, and is populated with small rural villages and an active tourism industry.

The online PPGIS survey included a mapping activity where participants marked areas of significant cultural importance on an area map, followed by questions regarding the marked point. The data was analyzed first using ArcGIS Pro to [1] identify CES hotspots, [2] examine spatial correlations between CES with biodiversity data, and [3] to define patterns of cultural use by comparing CES data to landscape features and infrastructures, such as distance from settlements, marked trails, etc. Finally, a qualitative analysis of survey responses is

conducted to identify the main themes characterizing CES, and to investigate if biodiversity plays a role in participants' descriptions of the CES they indicated.

This research thus highlights the power of qualitative and quantitative mapping by identifying spatial hotspots of CES provision and of biodiversity and illuminating the trade-offs and complementarities that are critical for landscape management and planning. All data, research results, and maps will be made available for the public and local decision makers, highlighting the resident's areas of interest as well as tradeoffs with biodiversity for planning and landscape management purposes.

Keywords: CES. Biodiversity. PPGIS. mapping.

7. Type of submission: Abstract

T. Thematic Working Group sessions: T4b - The power of ecosystem services maps for transformative change

Payments for ecosystem services in Portugal: challenges to design a new incentive scheme based on costs of provision and landowners WTA in the Pinhal Interior (Centre Portugal) region

Presenting author: Carlos Rio Carvalho
Other author(s): Rui,SANTOS, Paula,ANTUNES
Affiliation: CENSE - Center for Environmental and Sustainability Research, Nova School of Science & Technology, NOVA University Lisbon, Portugal
Contact: crc@erena.pt

Portugal is in an implementation early stage of a public incentive system that includes the payment for ecosystem services (PES) on forest, under a National Plan for Landscape Transformation. This incentive system applies to regions of very low dimension property with registration failures. This regions, located in the Centre and North of Portugal have also very low intensity of forest management, resulting in chronic wildfires, sometimes with catastrophic results, and impacts on soil, water and biodiversity conservation.

The preparation of the above-mentioned incentive policy included a pilot study in a 1180 ha watershed, located in the sub-region of Pinhal Interior (Centre Portugal). Based on the analysis of forest systems (ownership structure, stakeholder dynamics, forest production aptitude, land use, fire risk and natural values), a policy paper on the incentive structure

applied to obtaining additionality in the provision of ecosystem services was delivered. This paper analyzed the role of PES in landscape change, and justified the type of costs involved including investment costs, maintenance costs of forest systems, opportunity costs for land use change and payment for ecosystem services strictu sensu.

The present research, already with preliminary results, follows up this process, applying to the same pilot area and, focus now on: i) assess the cost of provision of each of the ecosystem services, obtained jointly in a bundle, under the conditions of the forest areas of the Pinhal Interior region; ii) obtain site specific quantitative biophysical assessment of the provision of ES CICES 2.2.2.3 – Maintenance of breeding populations and habitats, to assess additionality in the provision of this particular service; iii) given the PES conditionality bound to the provision of the forest ecosystem services bundle, assess the WTA of the land managers regarding payments associated to the scheme.

Keywords: Landscape change,PES,Portugal,WTA

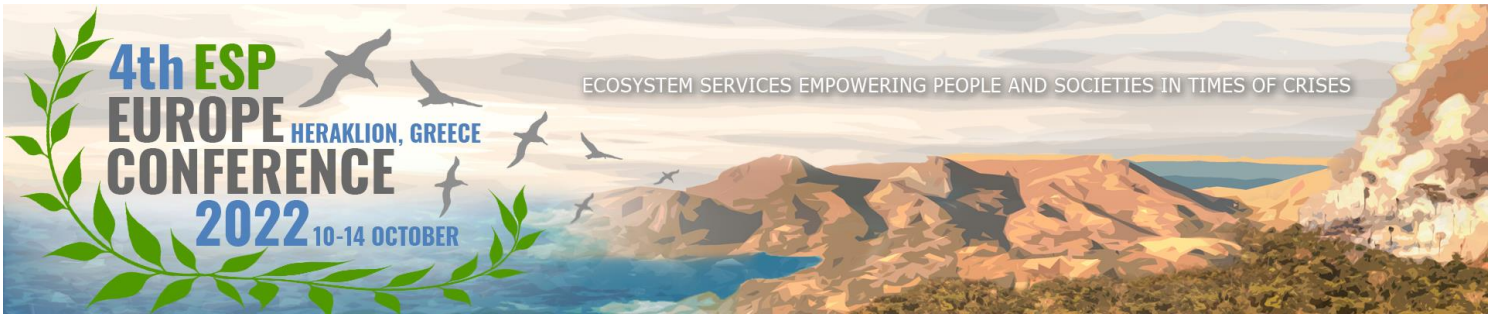
8. Type of submission: Abstract

T. Thematic Working Group sessions: T4b – The power of ecosystem services maps for transformative change

Assessing forest multifunctionality: an ecosystem services approach to forest ecosystems in Portugal

Presenting author: Joana Alves
Other author(s): Fernanda Follmann, Paula Castro
Affiliation: Centre for Functional Ecology – Science for People and the Planet (CFE), TERRA Associate Laboratory, Department of Life Sciences, University of Coimbra, Portugal, Portugal
Contact: jalves@uc.pt

The multifunctional nature of forest ecosystems has acquired great relevance, making it necessary to have a holistic approach to the forest that allows an integrated management of natural resources in a broad territorial and multi-actor perspective. However, unsustainable management practices have compromised the multifunctionality of forests, resulting not only in the loss of biodiversity and habitat degradation but also in the loss of financial income associated with forest products and services. Forests provide a rich and diverse set of services and associated products, not all with market value but highly important to human well-being.



This study focuses on assessing the multifunctional potential of forests in Portugal in terms of the valuation of ecosystem goods and services. Achieving the proposed objectives implies the development of a methodological approach capable of evaluating the potential of providing ecosystem services (ES) at a regional and local scale. The assessment of key ES provision potential of each of the identified ecosystem types followed a matrix approach, based on the analysis of specific indicators (MAES Tier 2) and validated by experts, combined with the current condition of ecosystems. The spatially explicit modeling of ES provision potential at the local level was carried out in a GIS environment, and for which it was considered that the current provision potential results from the potential provision through the matrix evaluation, combined with the ecosystem condition.

The results obtained show the global importance of these ecosystems and the multifunctional character of forests. However, it was also evident from the results that biodiverse forests provide more and better ecosystem services. So, the territorial strategy should involve changing some monoculture forest areas into mixed forest areas, which have a wider range of uses and greater economic profitability through the exploitation of forest by-products, thus contributing to the sustainability of forest ecosystems.

Keywords: Ecosystem services assessment, Forest ecosystems, Multifunctionality, Non-wood products, Sustainability

9. Type of submission: Abstract

T. Thematic Working Group sessions: T4b - The power of ecosystem services maps for transformative change

Linking ecosystem condition and pollination ecosystem service modelling with ESTIMAP on the regional scale

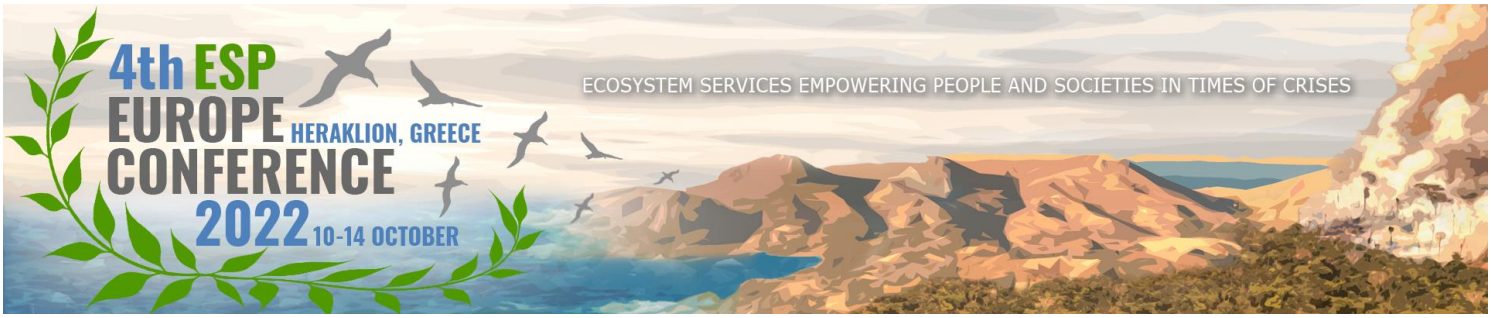
Presenting author: Malte Hinsch

Other author(s): Grazia Zulian, Benjamin Burkhard

Affiliation: Institute of Physical Geography and Landscape Ecology (University of Hannover), Germany

Contact: hinsch@phygeo.uni-hannover.de

Spatially explicit ecosystem services (ES) models are commonly used to assess the benefits nature provides to humans. ESTIMAP (Ecosystem Services Mapping Tool) is one common approach for biophysical ES mapping. These maps serve to communicate spatial habitat



suitability for pollinators and can further educate on the importance of pollination services. In this way, they serve to increase awareness of the need to protect insect populations. In this research, we adapted the ESTIMAP-pollination model to fit the needs of the Hannover region in Germany. The adaptation process was structured in three sections: 1) very detailed data on the regional scale were selected to be included in the model; 2) a panel of experts was engaged to score each dataset concerning its capacity to provide floral availability and nesting suitability for pollinators; 3) the data were further weighted using indicators of ecosystem condition. In this way, the score assigned to each input data varies according to the ecological condition of the related ecosystem types.

The ecosystem condition was estimated based on the intensity of use for agricultural land and forest areas and by the degree of greenness in urban areas. The results show that the habitat suitability for pollinators varies drastically between areas of the same biotope type. Especially in rather unspecific habitat types such as arable land, the influence of the ecosystem condition comes into play. Comparisons with an area-wide mean value modeling show that this often leads to an overestimation of habitat suitability in agricultural areas, and to an underestimation in urban areas. In conclusion, this method used here provides a) a useful adaptation to the existing ESTIMAP modeling framework in order to avoid a homogenous assessment of heterogenous biotope types, and b) a relevant contribution to the remaining challenge to link ecosystem condition and services.

Keywords: ESTIMAP, Habitat suitability, Spatial data, Ecosystem condition, Ecosystem service modeling

10. Type of submission: Abstract

T. Thematic Working Group sessions: T4b - The power of ecosystem services maps for transformative change

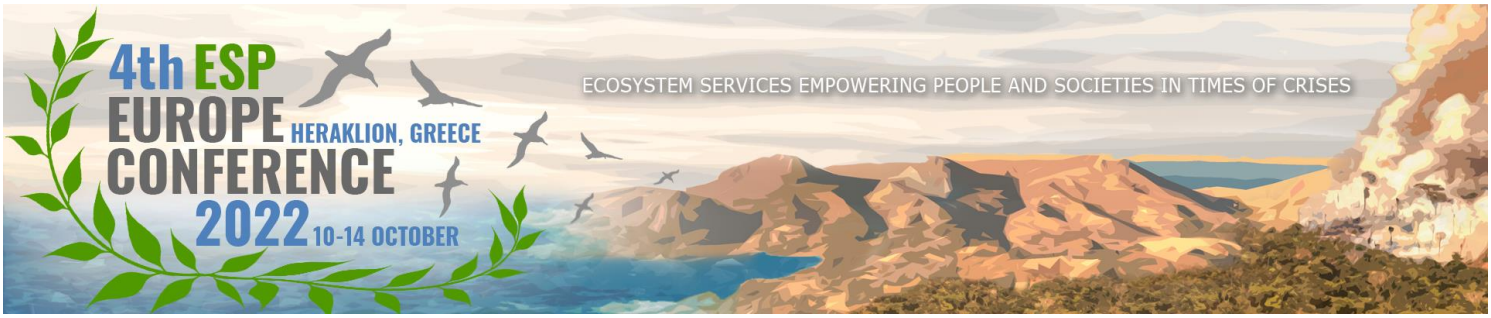
GEOLAND project: Digital Digital Educational Geoinformatic Methodologies for Monitoring Landscape

Presenting author: Dimitrios Alexakis

Other author(s): Christos Polykretis, Luc Zwartjes

Affiliation: Institute for Mediterranean Studies, Foundation for Research and Technology Hellas (FORTH), Rethimno, Crete, Greece., Greece

Contact: dalexakis@ims.forth.gr



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.

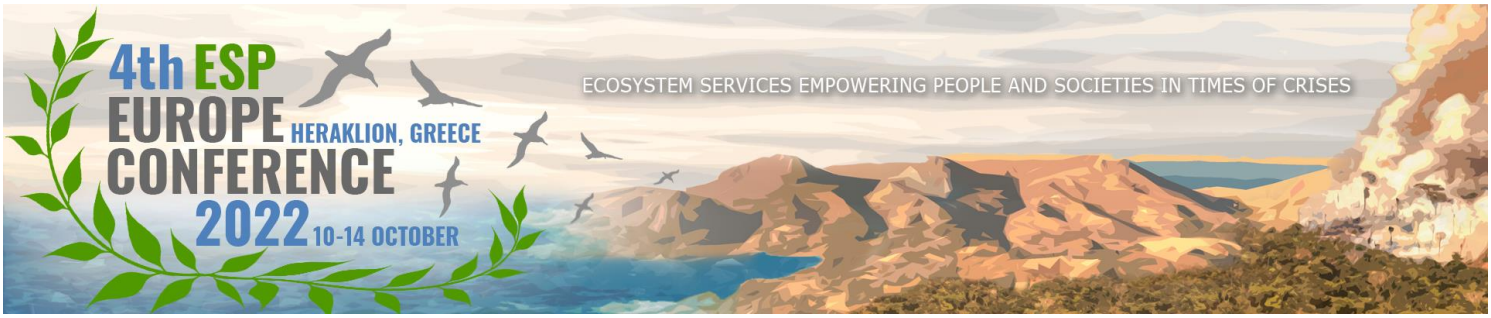
4. encourage/introduce innovative pedagogies (citizen science), technologies and state-of-the-art approaches (LCA) to higher education studies in Europe, while addressing issues of

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

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

11. Type of submission: Abstract

T. Thematic Working Group sessions: T4b - The power of ecosystem services maps for transformative change



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

Presenting author: Carvalho-Santos Carvalho-Santos

Other author(s): Janeide Padilha, Luis Machado

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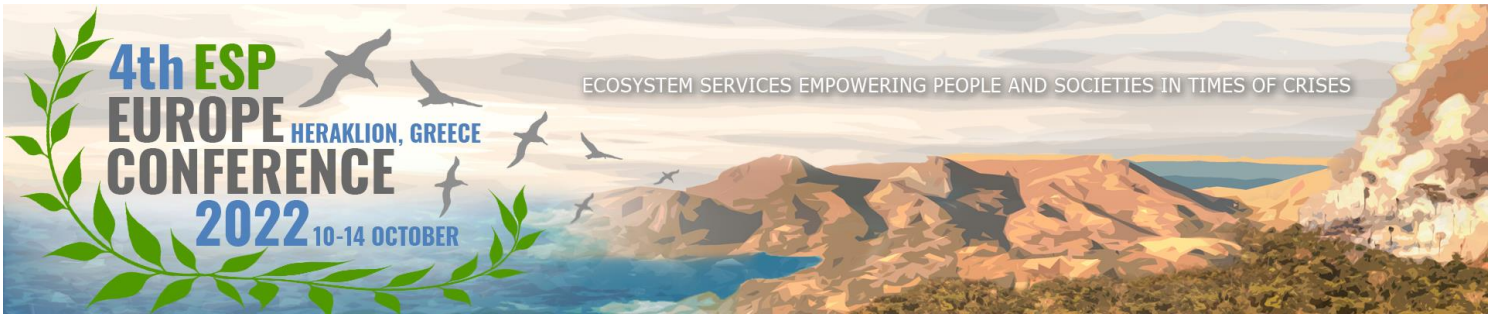
Humans have long depended on aquatic resources, from subsistence to recreational, industrial, and commercial purposes. Moreover, aquatic ecosystems support biochemical cycles, providing water purification, carbon sequestration and habitat for biodiversity, among others. Although the importance of healthy 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



12. Type of submission: Abstract

T. Thematic Working Group sessions: T4b - The power of ecosystem services maps for transformative change

Mapping ecosystem services at user-relevant scales to streamline the decision-making process. A use case from the Peruvian Andes

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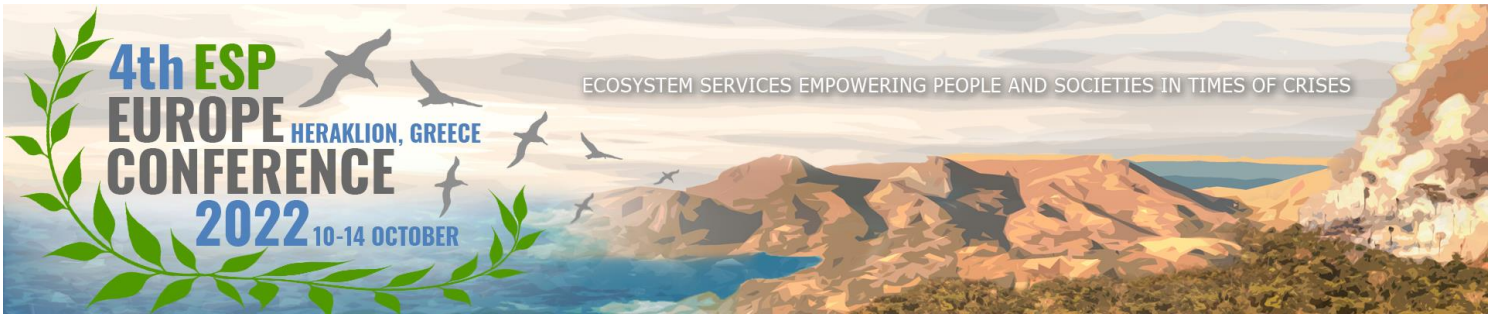
Sustainable development requires an informed decision-making process capable of preserving biodiversity and natural functions. Advances in ecosystem services (ES) research highlighted the need of providing stakeholders with information at useful scales, including spatial, temporal, and thematic. This open challenge precludes a disruptive transformation on how ES research is integrated into operational decision-making workflows.

Mainstreaming ES in the decision making requires explicit spatial information translated into maps, enabling a better understanding of trade-offs between community demands, ecosystems limits and policy objectives. In this sense, a methodology was designed and implemented to integrate: i) multicriteria analysis of the available information about ES coupled with the Common International Classification of Ecosystem Services to determine the abundance of ES by land cover type, and ii) A habitat risk assessment using the INVEST tool, that includes the abundance of ES by land cover type as proxy of resilience, assigning different weights to provisioning, regulation, and cultural services. The methodology leverages a novel land cover dynamics database created using a machine-learning model applied to satellite imagery and calibrated with ground truth data.

A use case is described, focusing on the National Reserve of Junín (NRJ), one of the most important protected areas in the Peruvian High Andean Mountains. Considered as a RAMSAR site, this place hosts the second largest lake in Peru and delivers important ecosystem services. Nevertheless, this protected area also faces many pressures as for example mining, biomass loss, and climate change.



The main findings include a map to identify priority intervention areas, at local level, under an ecosystem services approach. The main categories identified were areas for conservation, research, restoration, and sustainable use of resources. The methodology is easily reproduceable and can be applied in a wide range of settings, including when limited information or resources are available.

Keywords: Ecosystem services mapping, decision-making, high Andean mountains, priority intervention areas, National Reserve of Junín,

13. Type of submission: Abstract

T. Thematic Working Group sessions: T4b - The power of ecosystem services maps for transformative change

Ecosystem services assessment for their possible integration in the analysis of landslide risk

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Landslides are disasters that cause damage to anthropic activities, innumerable loss of human life and affect the natural ecosystem and its services globally. The landslide risk evaluated by integrating susceptibility and vulnerability maps has recently become a manner of studying sites prone to landslide events and managing these regions well. Developing countries, where the impact of landslides is frequent, need risk assessment tools to address these disasters, starting with their prevention, with free spatial data and appropriate models. However, to correctly understand their interrelationships and social affection, studying the different ecosystem services that relate to them is necessary. In the present study, we have evaluated how ecosystem services could be included as a key in the landslide risk. For the integration of ecosystem services into the landslide risk evaluation, (1) eight ecosystem services were chosen and mapped to improve understanding of the spatial relationships between these services in the Guerrero State (México), and (2) areas of synergies and trade-offs were identified through a PCA analysis, to understand their influence on risk analysis better. These are extracted from the models of the ARIES platform. Finally, (3) it was analysed the similarity between the risk characteristics (susceptibility and vulnerability, already mapped by the authors) and the ecosystem services assessment. The results showed

that the ecosystem services that most affect the synergy are carbon sequestration and the potential recreation; meanwhile, the potential removed soil mass was the most important in the trade-offs. Furthermore, the lowest similarity value was found between landslide vulnerability and ecosystem services synergy, indicating the importance of including these ecosystem services as a source of valuable information in the risk analysis methodologies.

Keywords: Ecosystem services mapping, landslides, risk assessment, spatial analyst, synergy and trade-offs.

14. Type of submission: Abstract

T. Thematic Working Group sessions: T4b - The power of ecosystem services maps for transformative change

Community land use maps as a tool to support ecosystem service management in uncertain situations: the case of forest communities in the Philippines

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The effectiveness of ecosystem service management and decision-making and the ability to make sustainable choices will be influenced not only by varying stakeholder interests but also by the availability of reliable information and data. Maps are undoubtedly an important instrument to visualize and support resource use and management but they are only as good as the information in which they are founded to. This however can be misleading if based on erroneous sources. The availability of spatially-explicit information of land uses and their related ecosystem services, both in terms of quality and reliability, is particularly variable in developing countries. Thus, the ability to make informed decisions on ecosystem service management will be hindered or helped according to that information at hand.

The presented study explores the utility of participatory mapping and stakeholder feedback elucidations to support ecosystem service management and decision making at the landscape level in the Philippines. It focused on study sites along a gradient of forest extends (high, medium, low) and transition stages (ongoing deforestation, persistent forest dynamics, restoration) across twelve landscapes of approx. 80-100 km² and twenty-four communities in the Philippines. In addition, other spatial data and maps were collected to

compare and contrast the available information from differing sources. The findings from the study highlight a number of inconsistencies, gaps and ambiguities with the existing in-country spatial data. Meanwhile the community maps reveal perceptions and values and spatial knowledge of ecosystem services at a high spatial resolution, highlighting the link between social and environmental systems as a result. Participatory mapping, although not without its own limitations, provides a valuable tool to inform planning mechanisms and can assist in corroborating with existing data to improve accuracy and effectiveness of decisions on ecosystem service management based on resource availability and needs.

Keywords: participatory mapping, community land use maps, gradient of forest extends, Philippines

15. Type of submission: Abstract

T. Thematic Working Group sessions: T4b - The power of ecosystem services maps for transformative change

Vive la différence: evidence matters to ecosystem service mapping

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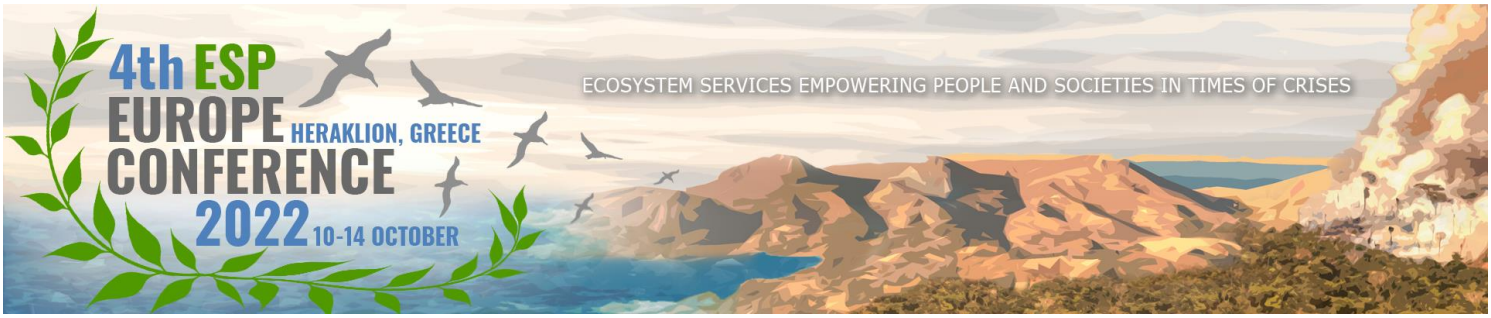
Mapping the provision of ecosystem services is important to inform management and policy decisions to help avoid further loss of our vital ecosystem services. A wide range of evidence types can be used to map ecosystem service provision. However, we do not fully understand the impact of using different evidence types upon the ecosystem service maps produced in different contexts or the implications for management decisions when these maps are used to model future scenarios. We created ecosystem service provision maps for Europe using evidence from an integrated modelling platform, expert opinion and literature synthesis, for the ecosystem services timber production, carbon sequestration and aesthetic landscapes. These maps were then compared to identify similarities and differences for current conditions. We created future ecosystem service provision maps for different climate change and socioeconomic scenario combinations using each evidence type and investigated how they varied depending on the future scenario mapped. We found that the variations between ecosystem service maps derived from different evidence types changed according to region,



ecosystem service and the future scenario investigated, to the extent that the different evidence types can give a different overall direction of change in provision for the same scenario. This study highlights that the type of evidence underpinning ecosystem service maps may have strong impacts on decision making, emphasizing the importance of understanding the strengths and limitations of the underlying evidence.

Keywords: ecosystem service, evidence type, context dependency, future scenarios, Europe

16. Type of submission: Abstract

T. Thematic Working Group sessions: T4b - The power of ecosystem services maps for transformative change

Participatory mapping as a management approach for the spatialization of key-ecosystem services: the Portuguese Biosphere Reserves case-study

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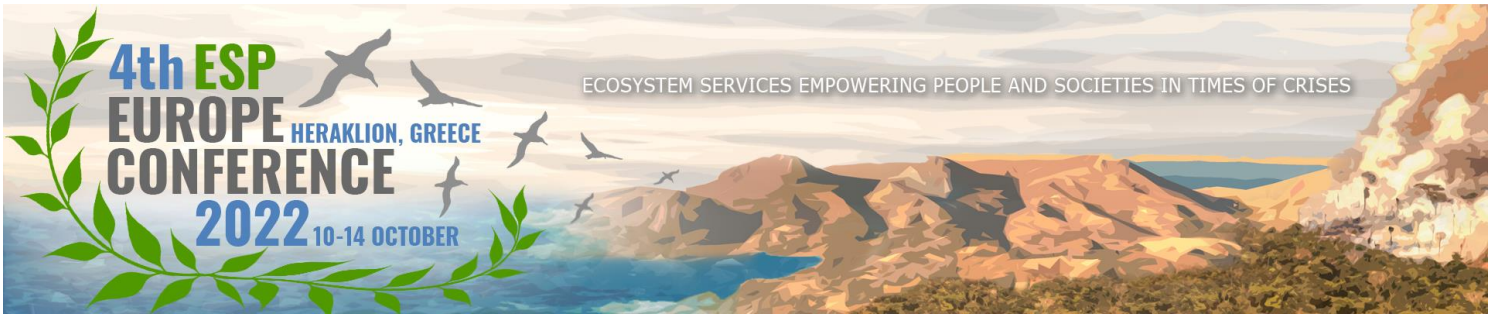
Ecosystem services (ES) supply is dependent on land-use governance and management decisions, where stakeholders in a landscape can be both beneficiaries and/or co-producers of ES. Participatory methodologies are crucial for linking territory needs to the sustainability of ES supply. In this sense, public participation geographical information system (PPGIS) approaches seek to understand the location of specific nature values and human perceptions and preferences for future land use and development. Promoting the use of GIS technologies to engage the public and stakeholders into participatory planning constitutes a strategic goal for decision-making. In this study, we developed an innovative participatory approach in the Portuguese Biosphere Reserves (BRs), following IPBES's "Nature's Contributions to People" (NCP) approach. RBs, being places for achieving the UN Sustainable Development Goals, involve local communities and all interested stakeholders in planning and management. Hence, the linkage between the spatialization of ES based on stakeholders' perception and BR territories' governance is a powerful tool to enhance its sustainable management.

Local participatory mapping was developed at each BR in Portugal, where a group of selected stakeholders were asked to map the key NCPs of their BR territory. The spatial distribution of



NCPs in BRs was afterwards assessed using PPGIS tools, yielding a set of results: (a) how those NCPs vary according to each BR zonation and ecosystem type; (b) identifying hotspots of NCPs and spatial bundles of NCPs; and (c) assessing the social-economic characteristics that determined the distribution of those NCPs by the attendees. Therefore, conservation actions and land management strategies can be derived, regarding the local actors as fundamental players in the territory's sustainable management. As well, BRs were regarded as sites for testing interdisciplinary approaches to the understanding and managing interactions between social and ecological systems, defining priority areas through the geolocation of the key-ES in a multi-actor-based approach.

Keywords: Ecosystem services governance, PPGIS, Stakeholders, Biosphere Reserves, Nature's contributions to people