BOOK OF ABSTRACTS

I. SESSION DESCRIPTION

ID: T1f

Challenges and opportunities of ecosystem services assessments on small and medium islands

Hosts:

	Name	Organisation	E-mail
Host:	Evangelia (Valia) Drakou	Harokopio University of Athens	e.drakou@hua.gr
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II. SESSION PROGRAM

Room: Expert Street 6

Date of session: 21st of November 2024
Time of session: 13:30-15:30

Timetable speakers

Time	First name	Surname	Organization	Title of presentation
13:30-13:40	Evangelia	Drakou	Harokopio University of Athens	Small and medium islands and their contributions to people: a literature review within the European context

Time	First name	Surname	Organization	Title of presentation
13:40–13:50	Ioannis	Vogiatzakis	Open University of Cyprus	The natural capital of European islands: towards common protocols of assessment
13:50–14:00	Miriam	Montero-Hidalgo	Rey Juan Carlos University	Assessment of nature recreation associated with coastal ecosystems in the Canary Islands through maps, indicators, and stakeholders' perceptions.
14:00–14:10	Christos	Zoumides	The Cyprus Institute	Tourism-induced impacts and transformations on small and medium islands: Implications for Ecosystem Services from Tourists' Food Consumption in Cyprus
14:10–14:20	Savvas	Zotos	Open University of Cyprus	The contribution of the N2K network to ecosystem services in an island state: The case study of Cyprus
14:20–14:40	Alistair	McVittie	Scotland's Rural College	Developing a natural capital assessment and land use decision tool for Montserrat
14:40–14:50	Rex	Steward	Vrije Universiteit Amsterdam	Navigating the spatial trade-offs between ecosystem services in Curacao: Land use modeling for scenario assessment
14:50–15:00	Pierre	Chopin		"Navigating the Tides of Change: Challenges and Opportunities in Ecosystem Services Assessments on Small and Medium Islands"
15:00 – 15:30		Group discussion		

III. ABSTRACTS

The first author is the presenting author unless indicated otherwise.

1. Navigating the spatial trade-offs between ecosystem services in Curacao: Land use modeling for scenario assessment

First authors(s): Rex Steward

Other author(s): Pierre Chopin, Peter Verburg

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The sustainable development of small island states faces complex challenges exacerbated by their unique vulnerabilities and limited resource bases. Global change and pressures can locally affect ecosystem functions and benefits to society. High resolution spatial planning is key in such inherently bounded contexts to minimize trade-offs associated with land development amidst scarce land resources.

In this study, we propose an integrated approach combining participatory Bayesian networks, land use modelling, and ecosystem services impact analysis to explore three development pathways to 2050 (business as usual, tourism development, and agricultural development) constrained by three alternative spatial planning options (no zoning, current zoning, and alternative zoning) in Curaçao, a Caribbean Small Island Developing State (SIDS).

Our results show that, while sectoral expansion plays the most significant role in determining the scale of potential impacts, spatial planning steers future land use considerably, yielding distinct outcomes for nutrient cycling, habitat for biodiversity and well being for society. Zoning regulations limited sprawling built-up patterns and confined development to specific segments of the coast, reducing loss of rare vegetation by an average of 32% and reducing added nutrient fluxes to the coastline by up to 22%. Outcomes arising from unregulated development typically perform worst in terms of delivery of ecosystem services – as land use change occurs in areas of high hydrological connectivity relative to the coast or bays, often coincident with patches of rare vegetation. Ultimately, this research contributes practical insights for decision makers –such as land planners in Curaçao – grappling with the intricate challenges of spatial development in small island contexts, fostering planning debates and aiding in navigating trade offs across various ecosystem services and benefits to society. By elucidating the relationships between zoning regulations, socio-economic drivers, ecosystem

services, the study supports informed decision-making towards achieving sustainable development goals amidst uncertainty and resource constraints.

Keywords: ecosystem function, habitat for biodiversity, land system science, nutrient cycling, provisioning services

2. The support of the Global Environment Facility (GEF) for the effective integration of the value of nature into coherent nature positive policy and planning reforms in Micronesia

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Micronesia, an archipelago in the Western Pacific Ocean, faces significant environmental challenges. These problems, driven by geographic and climatic conditions and human activities, include coral reef degradation, deforestation and habitat loss, land degradation, unsustainable fishing practices, and climate change effects such as rising sea levels, droughts, and extreme weather events.

Addressing these issues requires concerted efforts at local, national, and international levels, including designing and implementing sustainable practices and enhancing environmental policies. Often, policies and regulations fail to sufficiently consider the value of natural capital and ecosystem services in decision-making processes. This leads to undervaluing or overlooking natural capital in policy decisions, and the short- and long-term negative impacts of human activities on ecosystems and biodiversity are not properly accounted for. Furthermore, the lack of clear policies and regulations creates uncertainty for investors and businesses looking to make nature-positive investments, making it difficult for such investments to compete with traditional ones that do not consider environmental impacts.

The Global Environment Facility (GEF) is funding the Blue and Green Island Integrated Programme, which finances nature-positive interventions in 15 Small Island Development States (SIDS) around the globe, including Palau and the Federated States of Micronesia. This Programme provides technical and financial support to strengthen capacities for Natural Capital Accounting (NCA) and Ecosystem Services Valuation (ESV), covering key sectors and ecosystems to effectively mainstream environmental considerations into sectoral decision-making.

Supported by outputs of a strategic social and political economy assessment, this will promote greater policy coherence through more integrated and comprehensive planning.

The presentation will showcase examples of these actions in Palau and the Federated States of Micronesia.

Keywords: Small Island Development States, Natural Capital Accounting, Ecosystem Services Valuation, policy, planning

3. Small and medium islands and their contributions to people: a literature review within the European context

First authors(s): Evangelia Drakou
Other author(s): Roxanne S. Lorilla, Javier Martinez-Lopez, Laura Abraham, Valentini Stamatiadou, Ina M. Sieber, Dimitrios Bormpoudakis, George Kefalas, Wendy Fjellstad
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Small and medium islands are characterized by unique biodiversity, cultural legacy, landscapes, and are places where human societies have historically developed iconic relations with the natural environment. The value of these spaces has been widely recognized yet neglected in national and regional policy agendas. Within the SMILES COST action, we aim to capture the different values attributed to these spaces within the scientific literature across Europe. We conducted a systematic literature review and distilled information about the core ecosystem services (ES) and nature's contributions to people (NCPs) that were assessed, the size-related challenges reflected in the conceptualization of ES/NCPs, the methods used, data availability, the main realms assessed, as well as the extent to which island "dependencies" in relation to their counterpart mainland are considered.

Within the 443 reviewed papers, most targeted terrestrial realms within small and medium islands. Those assessing marine and coastal realms were limited and mainly targeted food from fisheries and coastal protection. We detected a strong focus on cultural NCPs, particularly on recreational NCPs. Overall, we identified a very limited manifested applicability of existing ES or NCP frameworks and in most cases, the reviewed studies developed tailor-made approaches for defining and quantifying island related ES/NCPs. The main detected conceptual and methodological gaps in island ES studies were in most cases related to space and data scarcity issues. Three points of improvement for future research are discussed that can contribute to a

better recognition of the values and contributions of these spaces to society: i) recognition of unique nature's contributions which are specific to islands (e.g., dialects, dietary habits); ii) improvement of data quality and resolution through enhanced monitoring ; and iii) enhanced methodologies and conceptualizations that better account for the telecoupled nature of the contributions these islands provide to society at the local, national and regional levels.

Keywords: telecoupled systems, social-ecological systems, isolation, human-nature relations

4. The contribution of the N2K network to ecosystem services in an island state: The case study of Cyprus

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Presenting authors(s): Savvas Zotos
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A wide range of ecosystem services (ES) are based on habitat and species protection and on biodiversity conservation. The Natura 2000 ecological network, which aims to safeguard Europe's biodiversity, increases the recognition of the socio-economic benefits of protected areas. However, significant challenges remain in the integration of ES in the conservation efforts of the protected areas, especially at a national level. The aim of the study is to provide a methodological approach and the first qualitative results from ES assessment in Natura 2000 areas in Cyprus.

Following the completion of the first national ES assessment in Cyprus, we quantified and mapped the potential of ES provisions in the network of protected areas. We applied a rapid method, using the assessment matrix approach, to quantify the potential ES provided by each habitat type. Summing up individual ES, we obtained a total ES supply map per N2K site in Cyprus. ES indices were then calculated for those ES having the highest score in the assessment matrix.

Significant differences were found in the supply of ES among ecosystem types. Inland aquatic ecosystems have the highest potential for regulating ES services, while forests and shrublands provide a high level of cultural ES. Agroecosystems have the highest potential for provisioning ES. We present ES hotspots and cold spots, discuss the differences between N2K sites and show

why ES hotspots should be considered in spatial planning, focusing on the specificities of small island states.

Keywords: Ecosystem Services Assessment, Natura 2000 network, Island state, ES hotspots, habitat types, spatial planning

5. Developing a natural capital assessment and land use decision tool for Montserrat

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Montserrat is a British Overseas Territory, part of the leeward islands in the Caribbean. Like many small, isolated islands its biodiversity is characterised by rare and endemic species. Mountainous terrain means there is limited agricultural land (resulting in import dependence and reducing food security), and it is vulnerable to extreme weather events. These common issues were exacerbated by eruptions of the Soufriere Hills volcano since 1995 which rendered much of the island uninhabitable and increased sedimentation loads. The latter is a key issue for the health of the island's coral reefs which underpin their fishing and tourism sectors.

Understanding Montserrat's natural capital constraints and opportunities provides the potential to increase resilience and inform land use decisions. However, the available data to assess natural capital are often outdated (the Montserrat soils map dates from 1967) or limited in scope. Consequently, a flexible approach is needed to model and evaluate natural capital. We developed a model using a spatial Bayesian Belief Network (BBN). This approach incorporates the limited available data into a model of ecosystem processes and resulting ecosystem services. The model identifies key areas for ecosystem services such as water supply, flood risk reduction and sedimentation loads. We also identify opportunities for expanding agricultural production taking into account the hydrological and sedimentation risks.

We explored the extension of the spatial BBN to model the impacts of land use on the marine environment. This was supplemented by citizen science-based ground sampling of in-stream sediments, habitats and soil properties to develop catchment level sediment transport models. However, the project research and further impact were constrained by limited capacity on island and respondent fatigue amongst important stakeholders. Many day-to-day planning decisions also remain at small scale rather than accounting for wider impacts.

Keywords: Ecosystem services, natural capital, Bayesian Belief Networks, Small islands

6. Assessment of nature recreation associated with coastal ecosystems in the Canary Islands through maps, indicators, and stakeholders' perceptions.

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Although the Canary Islands represent one of the richest biodiversity hotspots in Europe, assessments of the non-material benefits people obtain from ecosystems (cultural ecosystem services) are scarce, and evaluations of the recreational services provided by marine and coastal ecosystems are even rarer. These services are crucial for managing the use of coastal areas, supporting the socio-economic activities of the archipelago, and considering the identity of the local population. To fill that knowledge gap, this is the first study that evaluates the recreational ecosystem service provided by coastal ecosystems spatially explicitly, covering the entire archipelago and using local information. Local and official information sources were used to identify, select, and zone the most relevant recreational activities practiced in coastal areas. Simultaneously, a participatory approach comprising online and phone surveys and the organization of a workshop including a participatory mapping exercise with relevant actors from the recreational sector was employed to localize areas where water sports occur and gather social perceptions about their management in coastal areas. The main outputs obtained included detailed maps of maritime recreational activity hotspots and the sector's perception of both the synergies and conflicts among the activities, as well as the primary issues regarding their management. In conclusion, this study provides science-based evidence and local perceptions, filling an important knowledge gap for decision-making in marine spatial planning.

Keywords: Cultural Ecosystem Services, Coastal ecosystems management, Participatory Approach, Canary Islands, Recreational Activities

7. The natural capital of European islands: towards common protocols of assessment

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Natural capital includes certain stocks of the elements of nature that have value to society and includes both the living and non-living aspects of ecosystems. On islands, the terrestrial and marine natural capital are equally important but assessments rarely include the latter. The marine natural capital become perhaps more important as the island's size decreases and isolation increases. An island's limited space and isolation means that natural capital is constrained influenced more by externalities but at the same time precious for island societies and beyond.

Based on two workshops, as part of the COST action SMILES we brought together a team of terrestrial and marine ecologists reviewed main "variables" which conform to the natural capital definition and the relevant datasets which can support their assessment. We put together a metadatabase which includes a parsimonious set of attributes for natural capital elements and main pressures related to the components of the natural capital of small-medium islands of Europe (about 6.000 islands).

With the help of such a database and by following established Natural Capital Protocols, we demonstrate for 3 case studies which reflect different island profiles (in terms of capital, pressures and geography) how can other European islands with similar characteristics use this decision-making framework t to identify, measure and value the direct and indirect impacts and dependencies on natural capital.

Keywords: Decision making, Natural Capital Protocols, pressures, small-medium islands

8. Tourism-induced impacts and transformations on small and medium islands: Implications for Ecosystem Services from Tourists' Food Consumption in Cyprus

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Tourism is a major economic sector and source of income for many small and medium islands. Apart from job and income generation, tourism brings significant pressure on local ecosystems, particularly through food consumption patterns that influence land use and biodiversity. Tourist food experiences significantly enhance cultural immersion and satisfaction, especially in island destinations where unique agricultural systems reflect the rich local heritage. However, on islands such as Cyprus, Malta, Phuket, and Fiji, the influx of tourists often surpasses the local population, particularly during peak seasons. This surge in demand exerts substantial pressure on local ecosystems and biodiversity, leading to notable adverse impacts and land use transformations for food production and tourist establishments. Additionally, tourism food demand is associated with increased reliance on imported food, affecting ecosystem services and causing environmental degradation beyond the boundaries of island destinations.

This study investigates the pathways through which tourist food consumption affects provisioning ecosystem services, land use, and biodiversity on islands with high tourist influx, using Cyprus as a case study. By employing primary data collected from hotel establishments and tourists visiting Cyprus, as well as secondary data on food consumption, the study quantifies land use requirements and environmental impacts associated with tourism food demand. The results reveal a direct relationship between tourist food preferences and environmental impacts, providing a better understanding of how tourism-driven demand in one location can affect production systems and ecosystem services in distant regions. The research highlights the importance of promoting seasonal and local foods, introducing meat-free days, implementing sustainable land-use planning and food management frameworks, and raising awareness about the environmental implications of tourism. The study concludes by discussing several recommendations for effective practices and tourists' behavior that can potentially minimize the environmental impacts on small and medium island destinations.

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Keywords: Food Consumption, Food Production, Land Use, Food Trade, Tourism, Ecosystem Services