OPERAs

54 Month Summary of Progress

July 2017

Ecosystem Science for Policy & Practice

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Context

The OPERAs project is working toward improved understanding of how ecosystem services/natural capital (ES/NC) contribute to human well-being in different social-ecological systems. The OPERAs research will establish whether, how and under what conditions the ES/NC concepts can move beyond the academic domain towards practical implementation in support of sustainable ecosystem management. Ecosystems provide humankind with a wide range of resources, goods and services. Yet the rate at which we consume and exploit these is increasing so rapidly that many of the major ecosystems are threatened. ES/NC provide a framework to better manage and preserve our ecosystems. High-level policy frameworks have adopted the ES/NC concepts. However, there is a wide gap between the wealth of ecosystem science and the practical application of this knowledge in policy and decision-making practice.

Objectives

1. Improve understanding of the effects that multiple drivers have on ecosystem management in the context of EU regulatory frameworks and how these impact ecosystem services;
2. Explore and validate mechanisms, instruments and best practices to maintain a sustainable flow of ecosystem services, while preserving ecological value and biological diversity;
3. Qualify any trade-offs/synergies between the traits and functions of ecosystem services and their social and economic values both in Europe and globally;
4. Improve existing decision-support tools and instruments to better capture and represent the concepts of ecosystem services;
5. Provide policymakers and stakeholders with clear guidelines on effective and cost-efficient ecosystem services governance structures and practical management measures;
6. Develop and test protocols to generate ecosystem services datasets and policy indicators that are both consistent and sensitive to bio-physical and socio-economic change;
7. Ensure the long-term perennity of key databases and other major research outputs.

Main results achieved

Assessing the evidence-base for methods used in ES/NC assessments. An evidence assessment tool to identify the reliability of ecosystem services case studies was developed and published. An application of the tool to quantify the influence of forest management on water quality showed that nitrate concentrations were influenced significantly by harvest methods, forest composition, site altitude, and time after harvesting.

Developing efficiency indicators for the instruments used in ES/NC assessments. A set of 30 indicators of effectiveness and efficiency were identified for application across studies. Results also show that information is available to evaluate the "Extent of accounting systems" through indicators that link natural capital with human well-being. By contrast "Reform environmental harmful subsidies" is neglected in ES research.

Identifying knowledge gaps based on the analysis of the database. A meta-analysis identified the knowledge gaps and 'blind spots' in ecosystem service research. Several of the OPERAs exemplar case studies are working toward filling these knowledge gaps.

Iterative learning between end-users, stakeholders, researchers and developers of tools and instruments. The *OPERAs UserBoard* was an important learning opportunity between researchers, tool developers and stakeholders. The *Userboard* was a forum for sharing tools, policy analyses, stakeholder engagement processes, and collaborative synthesis products from which the OPERAs team received valuable feedback.

Exploring uncertainty in historical land-carbon emissions (and uptake) from land-cover and land-use changes. Multi-model experiments demonstrated that historical carbon emissions from land-use/land-cover change (LUC) were substantially larger with better accounting for land use and management effects. This highlights large uncertainties in future land-based mitigation efforts that seek to maintain and enhance carbon uptake on land. Further simulations demonstrated that estimates of historical carbon stocks and fluxes are highly uncertain due to the choice of LUC reconstruction dataset.

Changes in ecosystem services supply in the peri-urban areas of the North and South Mediterranean. The net ecosystem service supply capacity of the peri-urban areas of Mediterranean cities has reduced over the last 20-30 years. However, supply capacity for nine ecosystem services increased for North African cities, while this happened for only three in European cities. Across all cities, the services timber, wood fuel and religious and spiritual experience increased.

Changes in Mediterranean terrestrial ecosystems under different scenarios of climate change. Only a rigorous climate protection policy compatible with the objectives of keeping global mean temperatures below 1.5°C above pre-industrial will ensure that Mediterranean land ecosystems remain in the envelope of past variability. Any warming (and associated rainfall changes) above the Paris limit will cause losses of ecosystems due to enhanced drought in the Iberian Peninsula and over much of the Southern Mediterranean countries.

Spatial methods of socio-cultural valuation. A survey of 3,293 people showed that land cover, topography and protected area status alone do not adequately capture the recreational potential of

land. The models based on landscape attributes underestimated the attractiveness of the most popular spots for recreation, and overestimated the attractiveness of the least popular spots. This demonstrates the need for a wider suite of explanatory variables using socio-cultural valuation to supplement maps of nature-based recreation based on physical landscape attributes.

Measuring hypothetical bias and social anchoring in stated preference methods. Social expectations explain individuals' willingness to pay for ES/NC. In particular, higher expectations lead to higher payments, i.e., social anchoring exists and is substantial. Also providing feedback on actual payment figures changes payments to a certain extent, but that providing feedback changes the expectation-payment relationship.

Ecosystem service valuation in the Montado, Portugal. Social survey results indicate that current management of the Montado areas in Portugal are not preferable from a citizens' perspective. We also found that other management options may be partly financed by crowdfunding or more generally donation campaigns among citizens (as well as the private sector).

Institutional structures and governance systems. There are still a number of incoherencies and uncertainties in the governance of ecosystem services and the institutional context through which they can, and should, be managed. This is not surprising as our understanding of the interlinkages between ecosystem function, environmental change and human actions evolves. Spatial scales vary greatly and temporal inertia and lags are often not sufficiently understood. Even if they are understood, scientific evidence is often insufficiently included in policies and management practices. This can be attributed to strong interest groups and other interests that play down scientific advice.

Tools to evaluate ES/NC. The OPERAs team have developed and enhanced a range of information and decision support tools used to evaluate ES/NC in response to a demand analysis. These tools were tested extensively in practice in exemplar case studies. This included an assessment of 'success' criteria in the uptake and use of tools.

Recommendations and good practice guidelines. Recommendations for the choice of tools and instruments were developed. This was based on filters and user-friendly guidance, user guides for selecting instruments, as well as short descriptions and factsheet for instruments and tools complete with metadata about the resources needed to run them. Detailed good practice guidelines and training materials for the application of tools and instruments are also available for each tool.

Design of a suite of decision trees. Bayesian Belief Networks (BBNs) were selected as the method to guide user to tools and instruments within Oppla (see below). Results from focus groups and questionnaires highlighted that the expertise required and financial resources are key factors in users selecting tools and instruments in ES/NC assessments.

Constructing a Resource Hub. Oppla is the resource hub that contains all of the tools, instruments and cases from the OPERAs and OpenNESS projects within an online 'marketplace' (www.oppla.eu). It also has content from many other completed and on-going projects. Oppla was launched in September 2016 at the European Ecosystem Services Conference in Antwerp. Oppla is now fully operational including an upgrade of the platform and a substantial increase in content as well as in the size of the user community (>1000). A version of Oppla was also developed in support of the IPBES Catalogue of Policy Support Tools and Methodologies. Oppla has been established as

a legal entity in the form of a European Economic Interest Grouping (EEIG) with an associated business plan.

Outreach and dissemination. Oppla has developed a wide range of approaches to communicate the outcomes of the project research through a website, and a series of videos that are both educational and specific to individual exemplar case studies. Constituency building activities are now focused around Oppla, including a webinar series and contributions to the European Ecosystem Services conference.

The expected final results and their potential impact and use

OPERAs partners have been engaged in the dissemination of the project results at major international conferences organised by the International Association of Landscape Ecologists, the European Ecosystem Services Conference (Antwerp, Sep 2016), A community on Ecosystem Services (ACES) and the American Geophysical Union (AGU). Partners are also contributing to the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES). OPERAs outputs are contributing to:

- Policy impacts that will enhance individuals' well-being through improved management of ES & contributions of NC to the green economy.
- Economic and societal impacts by increasing the effectiveness of ecosystem management and significant advances in ES understanding, methods, theory and application.
- Practical guidance for the policy community by delivering a range of tested tools and instruments in operationalising the EC/NC concepts.
- The OPPLA web-based portal that was co-developed by scientists and practitioners representing different perspectives of the ES/NC concepts.
- A ‘Community of Practice’ built around OPPLA for continued practice that will benefit from the OPERAs outcomes.

Further information on the project can be obtained from the project’s website (www.operas-project.eu/) or by contacting the Project Coordinator: Prof. Mark Rounsevell (mark.rounsevell@ed.ac.uk).

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