



Ecosystem Science for Policy & Practice



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Context

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 with loss of function, which is required to support the existence of humanity. Ecosystem services and natural capital provide guidance to better manage and preserve our ecosystems. The ecosystem services (ES) and natural capital (NC) concepts have been adopted in high-level policy frameworks. 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. The OPERAs project will explore whether, how and under what conditions these concepts can move beyond the academic domain towards practical implementation in support of sustainable ecosystem management.

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.

Work performed since the beginning of the project

The practical implementation of the project objectives is being achieved through four scientific work packages (WPs) – Knowledge, Instruments, Practice and Resource Hub (see Figure 1) plus WPs on management and dissemination. The main tasks undertaken in the first 18 months of the project are given in Table 1.

Table 1 The main tasks undertaken in the first 18 months of OPERAs

| WP Practice | WP Knowledge | WP Instruments | WP Resource Hub |
|--|--|---|---|
| <ol style="list-style-type: none"> 1. Estimate knowledge supply and gaps in ES/NC research through a meta-analysis; 2. Launch the Exemplar case studies to identify ES/NC management needs, leading to the design and implementation of instruments and tools; 3. Create and test the BluePrint Protocol as a standardised approach to reporting the exemplars. | <ol style="list-style-type: none"> 1. Provide operational means to link ecosystem function, biodiversity and ES provision; 2. Review and develop social and cultural valuation methods for ES/NC; 3. Develop market and non-market valuation methods for ES/NC; 4. Analyse institutional structures and governance systems for ES/NC management. | <ol style="list-style-type: none"> 1. Assess the demand for ES/NC instruments (especially policy instruments) with key stakeholders; 2. Develop and test ES/NC information tools; 3. Develop and test ES/NC Decision Support Tools; 4. Explore the implementation and uptake of ES/NC concepts in practice. | <ol style="list-style-type: none"> 1. Identify communities of practice and encourage their development; 2. Engage with key stakeholders to assess the needs of potential Resource Hub users in a facilitated process. |

Main results achieved so far

Establishing the Exemplars

OPERAs has established 12 Exemplar case studies with the purpose of identifying ES/NC management needs, leading to the design and implementation of instruments and tools to support ecosystem management. The Exemplars have developed Study Designs that follow a commonly developed logic and format created in order to facilitate collaboration and synthesis between Exemplars. The study designs lay out the scope of both the academic and practical work that is being conducted in the Exemplars. The Exemplar Study Designs were supported by the creation and testing of a Blueprint protocol. The Blueprint protocol is a methodological framework that facilitates comparison and synthesis across the Exemplars.

Meta-analysis of existing cases

A consistent database was constructed of existing ES/NC case studies from literature sources, which was used as the basis of a meta-analysis. The meta-analysis raised a number of issues, including that there is a lack of studies for several ES (especially biochemical products and medicinal resources, genetic material, ornamental species, soil formation and spiritual and artistic inspiration), very few studies explore the implications for ES of future scenarios, and that there is a geographic bias in the location of studies towards the US, Europe and China. The analysis also found that most studies focus on the supply of ES, and omit analysis of the demand side and there was little involvement of stakeholders. It also suggests that modeling approaches (lookup tables and simple GIS models) are overly used and that these models are often not validated nor are their uncertainties quantified. Overall there is a lack of use of primary data and very few studies (<20%) that provide specific recommendations.

Demand analysis of policy needs

A demand analysis for EC/NC policy instrument needs (summarised in Figure 1) concluded that there are a range of gaps – both in terms of needs and opportunities - in the current integration of ES/NC into the EU policy framework. While a number of relevant EU policies have, at least partially, integrated ES/NC into their conceptual basis (i.e. key policy documents outlining the overall scope of a policy) the uptake of these concepts in the context of concrete policy instruments is generally far weaker. Hence, there is a potential for greater conceptual integration (i.e. explicit acknowledgement of the importance of nature, ES/NC in sectoral policy premises and objectives) and operational integration (i.e. use of instruments to ensure that policy objectives are implemented) at the EU level. In addition to integration, monitoring the impacts of policies will be essential, to create a concrete evidence base to inform policy development and/or refinement. This requires investment in a science-policy interface that can take into account both developments in the knowledge base and policy implementation.

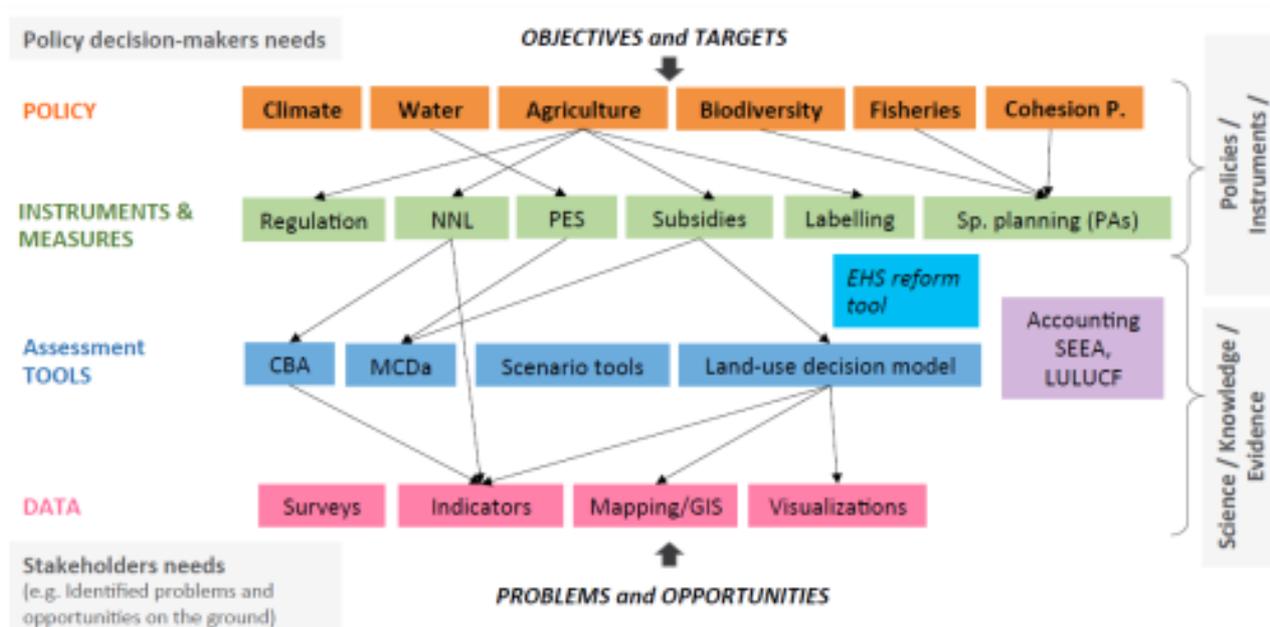


Figure 1. A decision tree approach matching stakeholder with policy decision-maker needs

Mapping and quantifying ES/NC supply

An analysis was completed of transferable geo-referenced metrics and GIS based quantification functions for the incorporation of biodiversity into ES biophysical assessment. Recently introduced concepts and metrics were used to quantify the wider implications of selected ES in an ecosystem (e.g. see Figure 2). The study concluded that while the mapping of ES supply has become quite common for terrestrial ecosystems, land cover is the most common indicator used in so-called spatial proxy, GIS models of ES supply, ignoring other determinants of ecosystem function. For marine ecosystems, practice is even less advanced, with a clear deficit in spatially-explicit assessments of ES supply. This situation contrasts with increasing understanding of the role of terrestrial and marine biodiversity for ecosystem functioning and thereby for ES.

Building the Resource Hub and communities of practice

OPERAs has in cooperation with the [OpenNESS](#) project, established the conceptual and structural basis of OPPLA (a web based resource hub for ES/NC data, on-line tools, documents, worked examples, videos and best practice guidelines amongst other resources and online materials). The development of OPPLA has involved considerable stakeholder engagement and consultation through discussions at the User Board meeting and during workshops organised within the Exemplars. OPPLA is being developed to support the activities of communities of practice across the Europe. In the Scottish Exemplar, the process of supporting such communities has started with

the establishment of the Ecosystem Services Community – Scotland (or ESCom-Scotland), which was launched in 2014. This involved OPERAs working closely with the OpenNESS project and other Scottish research providers (see <http://escomscotland.wordpress.com> for further details). OPPLA will continue to provide the main interface between OPERAs, OpenNESS and communities of practice across Europe that will benefit from the project outcomes. OPPLA will focus on constituency building, developing an operational ES/NC toolkit, and ensuring perennity of the web-based portal.

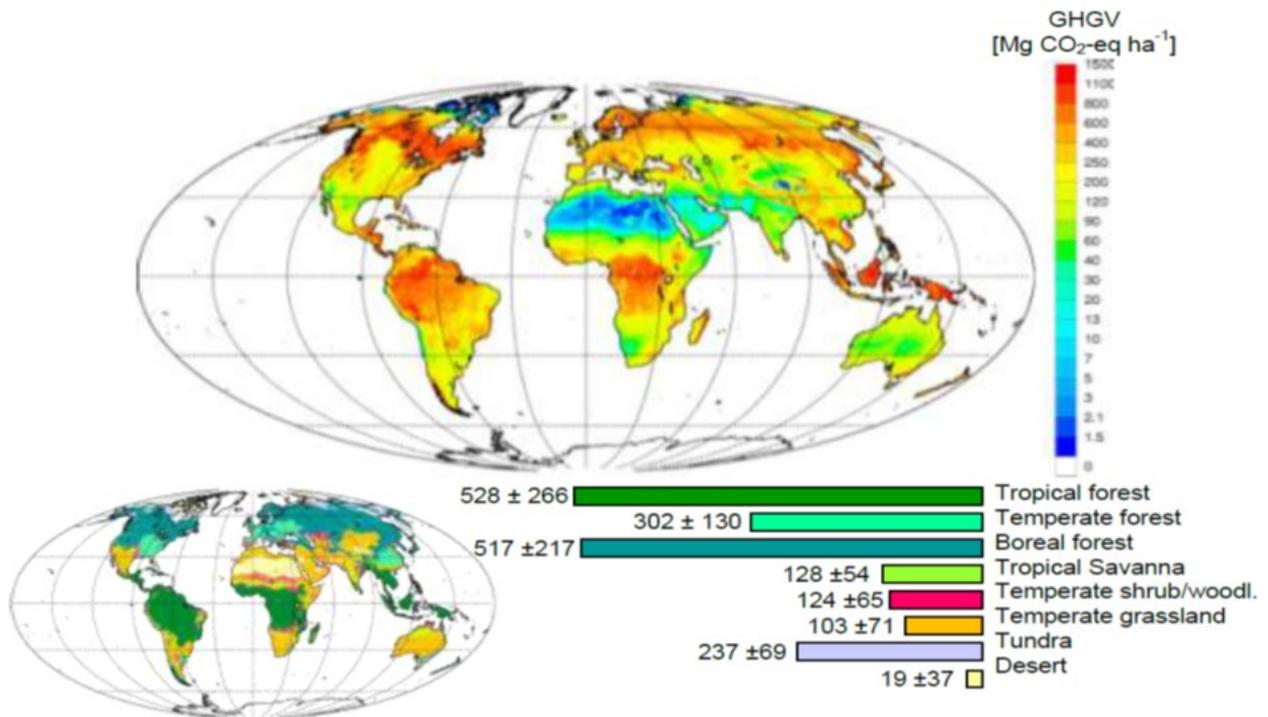


Figure 2. Biological carbon sequestration quantified with the Greenhouse Gas Value (GHGV) that is calculated based on simulations of a dynamic global vegetation model.

The expected final results and their potential impact and use

OPERAs partners are currently engaged in the dissemination of the project results at major international conferences (organised by the International Association of Landscape Ecologists, the Ecosystem Services Partnership, A community on Ecosystem Services and the American Geophysical Union). Partners are also contributing to the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES). In the longer-term, OPERAs has a number of expected outcomes that include:

- 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 will be 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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