Compilation of Exemplars: Portfolio of Collaborative Products

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Ecosystem Science for Policy & Practice

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Takeaway Summary

Deliverable Purpose

We used this deliverable as an opportunity to promote collaboration and learning between OPERAs Exemplar case study researchers by working together on topics of shared interest. (For more information on the deliverable background and approach, see Appendix 1.)

What is new?

This deliverable comprises a portfolio of concise, stand-alone products based on the topics and audiences the Exemplars felt were most important to address. These products represent insight gained from experience as well as practical guidance to inform future projects, and are included as attachments as follows:

1. *Eliciting Demand for Ecosystem Services: Results and User Guidance from the OPERAs Demand Synthesis Working Group.* (3 page quick guide + 33 page guidance document.)
2. *Governance of Ecosystem Services: How to Transform the Ecosystem Services Concept into an Explicit Management Tool.* (Infographic.)
3. *Ecosystem Services for Local Authorities.* (2 short videos.)
4. *Integrating Stakeholder Perspectives into Environmental Planning through Social Valuation of Ecosystem Services: Guidance and Prototype Applications.* (29 page guidance document.)
5. *Creating Space, Aligning Motivations, and Building Trust: Key Elements of Stakeholder Engagement in 12 Ecosystem Services Case Studies.* (15 page guidance document.)
6. *Identifying and Analyzing Stakeholders of Ecosystem Services.* (PowerPoint presentation.)

Why is this important?

Since the goal of the exemplars is to put ecosystem services into policy and practice, one of the unique contributions the Exemplars could make was to develop practical outputs that draw from our combined experiences. This answered requests from the OPERAs Userboard for more translation of our research into practice, including more concrete examples, guidance materials, and communications for audiences beyond academia.

Who benefits from this?

Practitioners and researchers working on ecosystem services-related projects who want inspiration for working with ecosystem services, and practical guidance for how to do so.

How could this be used in policy or practice?

In developing focused products aimed at specific audiences, we have created practical, useful materials that researchers and practitioners can use to accomplish their goals related to operationalizing ecosystem services, ranging from local authorities wanting to engage citizens in municipal planning, to conservation organizations aiming to develop support for ecosystem restoration.

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Motivation

Since 2012, the European ecosystem services project OPERAs has explored how to use the ecosystem services concept in support of sustainable ecosystem management. At the heart of OPERAs are twelve Exemplar case studies that span a range of geographies, ecosystems, scales, and sectors, and all share the common goal of working with stakeholders to bring ecosystem services into policy and practice (Appendix 2).

Structure

To complement the vigorous research output from the Exemplars, we wanted to use this deliverable to answer requests from stakeholders for more translation of our research into practice, including more concrete examples, guidance materials, and communications for audiences beyond academia. Therefore, we have chosen to structure this deliverable as a portfolio of practical products that drew from our combined experiences. This introductory document explains our rationale and approach, with the products themselves appended here and also freely available on Oppla (http://www.oppla.eu), "an open platform for collaboration between communities of science, policy and practice."

Deliverable Topics and Outputs

Reflecting on our work over the duration of the project, the Exemplar researchers brainstormed the issues and questions that we felt were the most prominent, challenging, cross-cutting, or could most benefit from our collaborative synthesis efforts. These issues and questions reflected the diverse and complementary work the Exemplar researchers had done in terms of developing methods, working with different stakeholders, and influencing policy and practice. The six questions we agreed to pursue included:

1. How can researchers and practitioners elicit demand for ecosystem services?
2. How can governance be considered in ecosystem services projects?
3. How can local authorities use the ecosystem services concept to achieve their goals?
4. How can socio-cultural valuation support sustainable ecosystem management?
5. How can researchers build productive researcher-stakeholder relationships?
6. How can researchers and practitioners identify and understand stakeholders?

These six questions and their respective products are listed in Table 1 and briefly described on the following pages. For each product we've included the rationale for why we selected the particular topic, a short summary of the product's content and the intended primary audience, as well as a link to the product itself. We hope this introductory overview will allow practitioners and researchers to easily assess the relevance and usefulness of each product for their needs, and quickly guide them to the most relevant ones.

Table 1. Overview of the six Exemplar collaborative products, including guiding question, topic, product type, intended primary audience, and participating Exemplar researchers who contributed to each topical working groups.

Topic	**Guiding Question**	**Product**	**Primary Audience**	Balearic	Barcelona	Danube	Dublin	Europe	French Alps	Global	Mediterranean	Montado	Scotland	Swiss Alps	Wine
Demand for Ecosystem Services	How can researchers and practitioners elicit demand for ecosystem services?	Guidance document	Researchers and practitioners		x	x		x				x	x	x	x
Governance	How can governance be considered in ecosystem services projects?	Infographic	Researchers and practitioners	x	x								x		
Local Authorities	How can local authorities use the ecosystem services concept to achieve their goals?	Animated video series	Local authorities	x			x								
Socio-Cultural Valuation	How can socio-cultural valuation support sustainable ecosystem management?	Guidance document	Practitioners including land use planners, natural resource managers and local authorities	x	x	x	x		x			x	x		
Stakeholder Engagement	How can researchers build productive researcher-stakeholder relationships?	Guidance document	Researchers	x	x	x	x	x	x	x	x	x	x	x	x
	How can researchers and practitioners identify and analyze stakeholders?	PowerPoint presentation	Researchers and practitioners		x										

How can researchers and practitioners elicit demand for ecosystem services?

Topic: Demand for ecosystem services

Product title: *Eliciting Demand for Ecosystem Services: Results and User Guidance from the OPERAs Demand Synthesis Working Group*

Product type: Guidance document

Primary audience: Researchers and practitioners interested in capturing stakeholder demand for ecosystem services

Rationale

A great deal of ecosystem services research focuses on describing and mapping the supply of individual ecosystem services – what nature provides. However, studying only ecosystem service supply risks focusing on those services that are easy to measure or viewed as ecologically important by researchers, but may be not well understood or highly valued by stakeholders. Understanding the ecosystem services that stakeholders value and demand can help illustrate conservation and education priorities, raise awareness of the importance of ecosystem services, and inform better policy and practice.

Summary

- Based on the experience of seven OPERAs Exemplars that sought to understand what people demand and value from ecosystems, this step-by-step guidance document illustrates how to elicit stakeholder demand for ecosystem services, with examples from the OPERAs Exemplars for each step.

Find it here: http://www.oppla.eu/product/17515

Steps to elicit demand for ecosystem services
1. Determine study objectives
2. Identify and engage key stakeholders
3. Identify all potential ecosystem services for your case
4. Develop indicators for ecosystem services
5. Select method to elicit demand
6. Elicit stakeholder demand for ecosystem services
7. Analyze and compare demand
8. Assess implications of results

How can governance be considered in ecosystem services projects?

Topic: Governance

Product title: *Governance of Ecosystem Services: How to Transform the Ecosystem Services Concept into an Explicit Management Tool*

Product type: Infographic

Primary audience: Researchers and practitioners

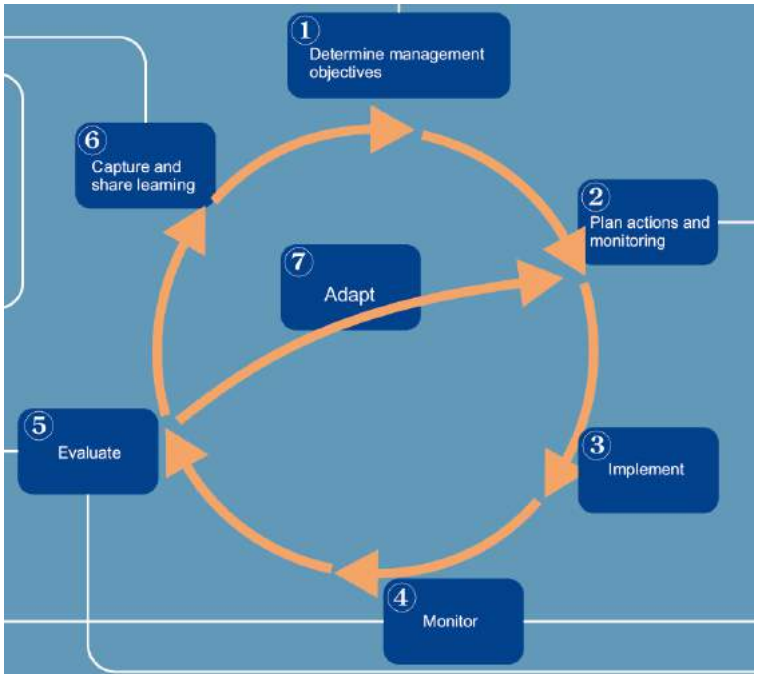
Rationale

Governance is the process of managing resources by formal and informal institutions. It is important for ecosystem services because it determines how resources are allocated and guides the process of integration and decision-making among stakeholders involved in ecosystem services flows. Given the continuous and unpredictable changes that result from human-nature interaction, governance has to go beyond regulation and be adaptive in order to cope.

Summary

- Using the OPERAs Barcelona Exemplar as an example, this infographic shows how using the adaptive management governance approach can promote greater stakeholder involvement and better ecosystem management.

Find it here: http://www.oppla.eu/product/17517



How can local authorities use the ecosystem services concept to achieve their goals?

Topic: Local authorities
Product title: *Ecosystem Services for Local Authorities (ESLA)*
Product type: Animated video series (2 videos at present)
Primary audience: Local government authorities

Rationale

Local government authorities make and influence decisions on a wide range of issues. Many of these decisions, particularly those related to land use and conservation, could benefit from inclusion of the ecosystem services concept. However, determining how to use this concept in practice can be difficult.

Summary

- This animated video series, *Ecosystem Services for Local Authorities*, highlights how local authorities can consider and demonstrate the links between human well-being and the natural environment. The videos show how the ecosystem services concept can be applied in two unique ways to address real problems of local authorities, namely the need to better understand the context of decision-making and the need to improve communications about conservation and environmental management.

- Video 1 illustrates how by using the ecosystem services approach of socio-cultural valuation, it is possible to demonstrate the values connected to ecosystem services in a given context before decisions are made. This can help to reduce conflicts and can also inform the design of land use strategies or management plans that are more responsive to or reflective of value demands. Socio-cultural valuation could thereby assist developers and decision makers in lowering the risk of marginalizing and disturbing local communities and also goes some way toward making more considered and collaborative decisions.

- Video 2 uses the OPERAs Balearic Exemplar's work on seagrass conservation to illustrate how using the ecosystem services approach to communicate conservation priorities in a way that resonates with the public can help change attitudes and behaviors towards an ecosystem and thus help to protect it.

Find them here: http://operas-project.eu/ESLA and http://operas-project.eu/ESLABalearic

How can socio-cultural valuation support sustainable ecosystem management?

Topic: Socio-cultural valuation

Product title: *Integrating Stakeholder Perspectives into Environmental Planning through Social Valuation of Ecosystem Services: Guidance and Prototype Applications*

Product type: Guidance document

Primary audience: Practitioners including land use planners, natural resource managers and local authorities

Rationale

Socio-cultural valuation – the process of discovering what stakeholders value about ecosystem services – makes stakeholders' values and preferences explicit, and helps ensure they are taken into account in decision-making processes. Incorporating such knowledge can help to determine multi-functional, feasible and accepted solutions, and has proven to increase acceptance and success of environmental planning, natural resource management, and nature conservation.

Summary

- This guidance document explains different purposes and methods of socio-cultural valuation and provides a catalogue of exemplary case studies from OPERAs for each of them.

- Each catalogued case study includes the aim of the study, stakeholders involved, methods used, study results, and how decision-makers have used the results.

Find it here: http://www.oppla.eu/product/17514

Purpose of social valuation	Specific objectives
Assess current social value of an ecosystem and its services	1. Identify current social values 2. Measure current social values 3. Understanding the underlying reasoning for social values
Determine preferred future ecosystem states and acceptable trade-offs	4. Identify visions for future land management 5. Identify preferences and acceptable trade-offs between distinct management options 6. Develop and test feasibility of alternative land management
Identify involved stakeholders and potential beneficiaries, and their interactions.	7. Identify (diversity of) beneficiaries and stakeholders 8. Understand actor behavior

How can researchers build productive researcher-stakeholder relationships?

Topic: Stakeholder engagement

Product title: *Creating Space, Aligning Motivations, and Building Trust: Key Elements of Stakeholder Engagement in 12 Ecosystem Services Case Studies*

Product type: Guidance document

Primary audience: Researchers interested in engaging stakeholders in ecosystem services research

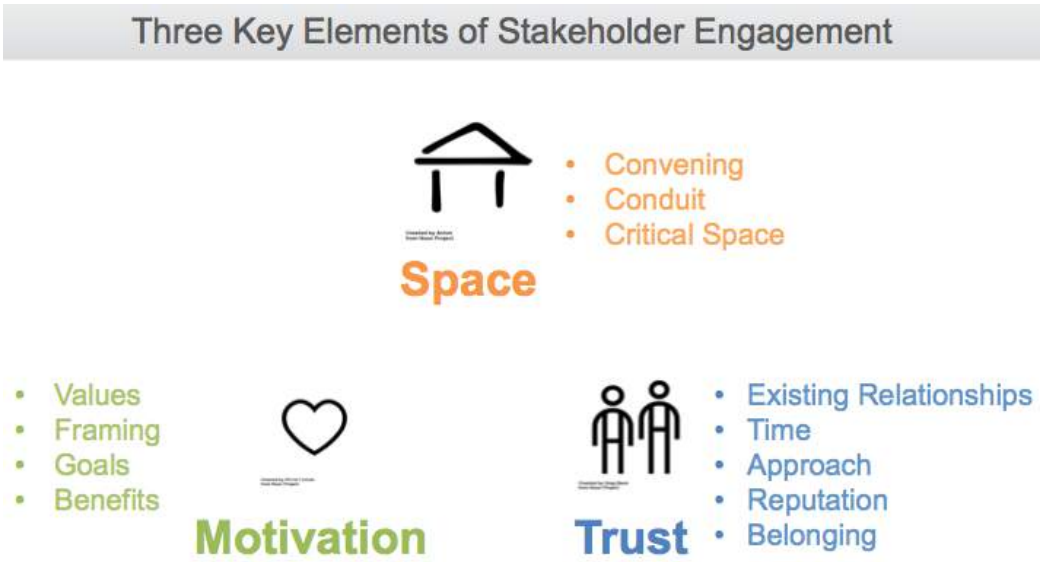
Rationale

Because ecosystem services inherently involve people whose values help define the benefits of nature's services, it is important to involve stakeholders in ecosystem services research. However, it can be difficult to develop productive researcher-stakeholder relationships if researchers do not have a clear framework to guide their overall stakeholder engagement approach.

Summary

- Using examples from all twelve of the OPERAs Exemplars, this guidance document puts forth a stakeholder engagement framework comprising three key elements and their respective components, and demonstrates how awareness of key questions and issues and a strategy for addressing them can help build productive researcher-stakeholder relationships.

Find it here: http://www.oppla.eu/product/17516



How can researchers and practitioners identify and understand stakeholders?

Topic: Stakeholder engagement

Product title: *Identifying and Analyzing Stakeholders of Ecosystem Services*

Product type: PowerPoint presentation

Primary audience: Researchers and practitioners interested in engaging stakeholders in ecosystem services research and conservation projects

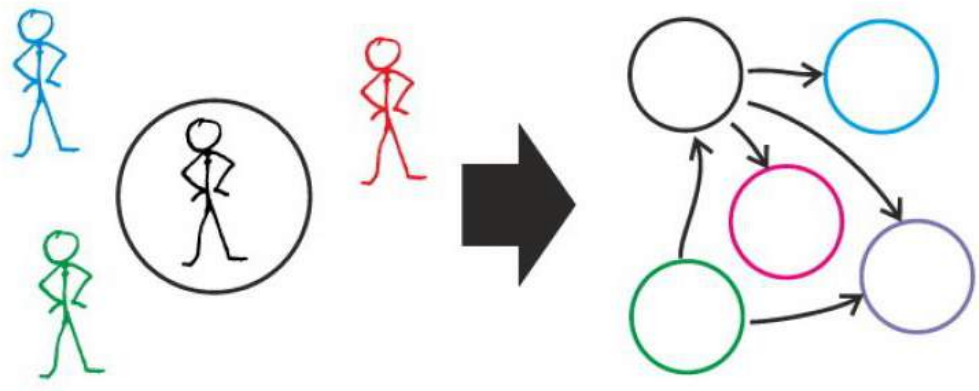
Rationale

To determine and implement ecosystem management objectives it is important to understand not only the natural system, but also the human system. This goes beyond simply identifying stakeholders to understanding them both on an individual level and in terms of how they interact with each other and with the ecosystem in question. As the relationships between stakeholders, ecosystems and decision-making processes are complex, there is a need for a clear way to visualize them.

Summary

- Using the OPERAs Barcelona Exemplar as an example, this PowerPoint presentation illustrates how to identify and classify stakeholders, both on an individual level and in terms of the interactions between them.

Find it here: http://www.oppla.eu/product/17518



Appendix 1. Deliverable Background and Approach

Background

OPERAs is a European Commission-funded five-year research project involving 27 research partners from 17 countries. It includes 12 case studies, called “Exemplars,” chosen to represent different geographies, ecosystems, scales, sectors and stakeholders, all of which share the goal of putting the ecosystem services concept into policy and practice. This deliverable presents a synthesis of some of the Exemplars’ work and findings over the duration of the project.

Approach

At the OPERAs Consortium meeting in Barcelona in June 2016, researchers involved in the 12 OPERAs Exemplars talked through what we wanted our final Exemplar deliverable to look like. Since the goal of the Exemplars is to put ecosystem services into policy and practice, we thought that one of the unique contributions the Exemplars could make was to go beyond reporting and develop practical outputs that drew from our combined experiences, aimed at particular audiences with whom we had engaged. This answered requests from OPERAs’ external stakeholders and advisors (the Userboard) for more translation of our research into practice, including more concrete examples, guidance materials, and communications to audiences beyond academia. We thus decided to create a collection of concise, stand-alone synthesis products based on the topics and audiences the Exemplars felt were most important to address.

Reflecting on our work over the past several years, the Exemplar researchers brainstormed the topics that we felt were most prominent, challenging, cross-cutting, and/or could most benefit from our synthesis and insights. To allow focus and depth, as well as to maximize opportunities to learn from each other, we decided that each working group would comprise a subset of Exemplars who were most interested in and had the most experience with a particular topic. From the initial topic list we then asked researchers to sign up for the topic(s) they would most like to contribute to, aiming for representatives from each Exemplar to contribute to at least one topic, and for each topic to include at least two Exemplar representatives to promote synthesis.

From these responses, we agreed on a set of five broad synthesis topics (with two teams focused on the topic of stakeholders) and designated a leader and working group for each. Each working group met on their own and was responsible for refining their topic into an answerable research question, determining what sort of synthesis product they wanted to create and for which audience, and ultimately delivering this product.

Additional topics identified by the Exemplars as of high interest for potential future analysis included trade-offs between ecosystem services; mapping and modeling ecosystem services; and shared learnings among the aquatic-focused Exemplars. Some of these topics are addressed in the syntheses of other OPERAs work packages, while others may be taken up in the future.

Project Management

Managing such a multi-pronged deliverable is not an easy task, especially when the goal is to synthesize learnings across different projects and people. As we learned from our previous research on stakeholder engagement (Schoonover et al., Attachment 5), it can be difficult to keep people motivated and engaged if

researchers do not first consider and align with stakeholders such aspects as goals, expectations, areas of common ground and potential disagreement, and benefits of engaging with each other. We thus approached our synthesis process as a form of stakeholder engagement – with the "stakeholders" being the OPERAs Exemplar researchers and the "researchers" being the two main authors coordinating the synthesis process – and did our best to follow our own stakeholder engagement framework.

In order to maximize opportunities for exchange and synthesis, we held monthly calls to share progress, learnings, feedback, challenges and questions across all of the synthesis working groups. We also set a detailed timeline (Appendix 3) to ensure that all of the products were produced in good time, with a number of check-in points along the way. Finally, the working groups kept all of their work in a shared Dropbox folder allowing them to easily share, find, read, and provide feedback on each other's work.

Conclusion

This deliverable includes practical advice gained from the experiences of the OPERAs Exemplars with respect to ecosystem service demand, governance, local authorities, socio-cultural valuation, and stakeholder engagement. In developing focused products aimed at specific audiences, our hope is that we have created practical, useful materials that practitioners and researchers can use to accomplish their goals to better understand and manage ecosystem services.

Appendix 2. OPERAs Exemplar Case Study Descriptions

Exemplar Region	Project Title	Objective
Balearic	Co-beneficiary management of marine/coastal ecosystems for Blue Carbon on the Balearic Islands	To assess the co-beneficiary management of seagrass ecosystems for blue carbon in the Balearic Islands in order to develop strategies for mitigation of CO_2 emissions through conservation of coastal marine ecosystems.
Barcelona	Barcelona's hybrid dunes	To learn to construct and maintain dunes on urban beaches to optimize the flows of ecosystem services such as protection against sea level rise, and to learn how to shape social attitudes to make intensive recreational use of beaches compatible with the protection of the dunes.
Danube	Trans-boundary river and wetland management of the Lower Danube	To identify and raise awareness of the societal, economic, and environmental values of wetlands, and to explore the relationship between restored and sustainably-managed wetlands and socio-economic welfare to inform decision-making in the Danube river basin.
Dublin	Urban-rural fringe of the Greater Dublin region	To research the expression of cultural ecosystem services values in a coastal setting, and to consider the contribution of ecosystem services approaches to consultation within land use planning.
European	Land-based EU policy and ecosystem services in Europe	To evaluate how recent and forthcoming EU policy developments affect the levels of ecosystem services and natural capital in Europe.
French Alps	Land use and ecosystem services in the Grenoble Urban Area	To analyze future land use trajectories and their effects on networks of biodiversity and ecosystem services in the Grenoble urban area, in order to inform territorial planning and management.
Global	Global scale prediction of ecosystem services to inform international policy	To use the ecosystem services concept to identify and communicate geographic areas and management solutions that support the multiple goals of biodiversity conservation, climate change mitigation, and feeding an increasing global population.
Mediterranean	Circum-Mediterranean agricultural land abandonment	To assess how changes in the way farmers manage their land in the Mediterranean can lead to changes in human wellbeing, both now and in the future.
Montado	Conservation of cultural landscapes in the region of Montado in Portugal	To employ the ecosystem services and natural capital concepts to combine the productive, ecological, and cultural aspects of socio-ecological systems in order to promote improved management of cork trees and help facilitate the wellbeing of the Montado for generations to come.
Scottish	Multi-scale implementation of environmental policy in Scotland	To match the needs of land use management and biodiversity policy in Scotland by contributing to the science, information, and assessment methods necessary to support policy implementation.
Swiss Alps	Matching regional supply of and demand for mountain ecosystem services	To answer the question: Which policy strategies can balance the supply of and demand for mountain ecosystem services in the future?
Wine	Translating from consumer values to environmental structures and functions	To understand how different players in the wine value chain (producers, retailers, consumers) influence wine production, and thus the ecosystem services provided by vineyard ecosystems, and to promote more sustainable vineyard management to increase ecosystem services.

For more information, see the Exemplar Study Design Descriptions at
http://operas-project.eu/sites/default/files/resources/d2.1-description-study-design.pdf

Appendix 3. OPERAs Exemplar Deliverable Timeline

Date	Description
June 13	Brainstorm approach and topics
July 5	Confirm working groups, members and leads
August 5	Confirm research questions, approach, data, products and audience
August 31	Product outlines due
September 19	Present flash talks and share feedback on products
November 2	Product first drafts due
November 17	Gather feedback from the Userboard
January 15	Product final drafts due
January-February	Internal review and revisions of products, write and finalize overview
Early March	Exemplar deliverable submitted

+ monthly calls to discuss and give feedback on ideas and drafts in progress

Attachments

The Exemplar products described above are attached in the following order:

1. *Eliciting Demand for Ecosystem Services: Results and User Guidance from the OPERAs Demand Synthesis Working Group.* (3 page quick guide + 33 page guidance document.)

2. *Governance of Ecosystem Services: How to Transform the Ecosystem Services Concept into an Explicit Management Tool.* (Infographic.)

3. *Ecosystem Services for Local Authorities.* (2 short videos.)

4. *Integrating Stakeholder Perspectives into Environmental Planning through Social Valuation of Ecosystem Services: Guidance and Prototype Applications.* (29 page guidance document.)

5. *Creating Space, Aligning Motivations, and Building Trust: Key Elements of Stakeholder Engagement in 12 Ecosystem Services Case Studies.* (15 page guidance document.)

6. *Identifying and Analyzing Stakeholders of Ecosystem Services.* (PowerPoint presentation.)

Attachment 1

Eliciting Demand for Ecosystem Services: Results and User Guidance from the OPERAs Demand Synthesis Working Group

Guidance Document
("Quick Guide" and Full Document)

OPERAs

Quick Guide to Eliciting Demand for Ecosystem Services

Summary

Based on experience in seven of the OPERAs Exemplar case studies, we summarize what the research team has learned about working with stakeholders to elicit demand for ecosystem services.

Purpose

This summary document is intended to help researchers apply an ecosystem services approach to identify the ecosystem services that stakeholders value.

The full user guidance document, *Eliciting Demand for Ecosystem Services: Results and User Guidance from the OPERAs Demand Synthesis Working Group*, is available at: http://www.oppla.eu/product/17515.

Motivation

- A great deal of ecosystem services research focuses on describing and mapping the supply of individual ecosystem services – what nature provides.

- Studying only ecosystem service supply risks focusing on those services that are easy to measure or viewed as ecologically important by researchers, but may be not well understood or highly valued by stakeholders.

- One way to motivate conservation and using ecosystem services in practice is for researchers to connect ecosystem services to things that people care about.

- Much OPERAs research aimed to understand what people demand and value from ecosystems.

- Better understanding and linking the supply and demand perspectives can help more fully achieve the potential for ecosystem services to improve policy and practice.

Eliciting demand

We propose an eight-step process for eliciting ecosystem service demand:

1. Determine study objectives
2. Identify and engage key stakeholders
3. Identify all potential ecosystem services for your case
4. Develop indicators for ecosystem services
5. Select method to elicit demand
6. Elicit stakeholder demand for ecosystem services
7. Analyze and compare demand
8. Assess implications of results

Ecosystem Science for Policy & Practice

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1. Determine study objectives

2. Identify and engage key stakeholders

2.1. Identify and analyze your stakeholders

2.2. Approach and engage stakeholders

3. Identify all potential ecosystem services for your case

3.1. Select an ecosystem services framework

3.2. Use the framework to enumerate ecosystem services for your case

3.3. Involve experts and stakeholders in enumerating ecosystem services

4. Develop indicators for ecosystem services

4.1. Find an indicator for each ecosystem service

4.2. Consider the types of indicators

4.3. Represent indicators clearly in words

5. Select method to elicit demand

5.1. Select an appropriate method to answer your questions for your case

5.2. Consider the most appropriate format for conducting your method

6. Elicit stakeholder demand for ecosystem services

6.1. Conduct research

6.2. Give space for stakholders to express views in their own words

7. Analyze and compare demand

7.1. Identify the most highly valued services within your study

7.2. Explore questions of scale

7.3. Compare stakeholder demand with ecosystem supply, and with ecological assessments of priority for conservation

7.4. Compare between cases

8. Assess implications of results

8.1. Draw conclusions from your analysis

8.2. Communicate demand

8.3. Determine action plans to use your results to improve policy or practice

Examples from OPERAs for each of the eight steps of this framework are included in the full user guidance document.

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Conclusion

- Through collaborating across OPERAs Exemplars, we were able to identify common threads in our approaches from very different studies that aimed to elicit stakeholder values for ecosystems.

- This affirmed the importance of eliciting stakeholder demand and helped us to reflect on our approach to doing so, resulting in the creation of this eight-step framework.

- Ultimately, understanding the ecosystem services that stakeholders value can illustrate conservation and education priorities, raise awareness of the importance of ecosystem services, and inform better policy and practice.

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Eliciting Demand for Ecosystem Services: Results and User Guidance from the OPERAs Demand Synthesis Working Group

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Summary

Here we share what we have learned from working with stakeholders to elicit demand for ecosystem services, drawn from experience in seven of the OPERAs Exemplar case studies. We have developed an eight-step framework for identifying and working with stakeholders, identifying and eliciting ecosystem services that stakeholders value, and analyzing and communicating these services. Here we show how we applied this framework in our own research in seven cases in diverse European ecosystems, including rural and urban areas, coastal and mountain systems, and local and regional scales. By doing so, we have two goals: (1) to provide guidance to a wide audience of researchers and practitioners interested in capturing demand for ecosystem services for their own studies in a rigorous way, and (2) to present specific results of interest to the OPERAs community using this framework to compare between cases. Ultimately, understanding the ecosystem services that stakeholders value can illustrate conservation and education priorities, raise awareness of the importance of ecosystem services, and inform better policy and practice.

Purpose

This document is intended to help researchers apply an ecosystem services approach to identify the ecosystem services that stakeholders value. Although it is aimed at researchers, it could also be used by practitioners interested in eliciting demand for ecosystem services. A “quick guide” summary version of this document is available at http://www.oppla.eu/product/17540.

Motivation

- A major goal of OPERAs is to improve ecosystem services in policy and practice. The test cases for doing this are found in the twelve Exemplar case studies, designed to span a range of geographies, scales, ecosystems, stakeholders, and sectors.
- A great deal of ecosystem services research focuses on describing and mapping the supply of individual ecosystem services – what nature provides.
- Studying only ecosystem service supply risks focusing on those services that are easy to measure or viewed as ecologically important by researchers, but may be not well understood or highly valued by stakeholders.
- One way to motivate conservation and using ecosystem services in practice is for researchers to connect ecosystem services to things that people care about.
- Much OPERAs research aimed to understand what people demand and value from ecosystems.
- Better understanding and linking the supply and demand perspectives can help more fully achieve the potential for ecosystem services to improve policy and practice.

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Eight Steps to Eliciting Ecosystem Service Demand

Through synthesizing our experiences of developing and carrying out research within diverse OPERAs Exemplars, the Demand Synthesis Working Group has developed the following framework for assessing stakeholder demand for ecosystem services:

1. Determine study objectives
2. Identify and engage key stakeholders
3. Identify all potential ecosystem services for your case
4. Develop indicators for ecosystem services
5. Select method to elicit demand
6. Elicit stakeholder demand for ecosystem services
7. Analyze and compare demand
8. Assess implications of results

It is important to note that studying ecosystem services demand requires a focus on both the ecosystem services that are (potentially) provided by the study area, as well as the value that stakeholders place on these services. The traditional ecosystem services cascade model (Haines-Young and Potschin, 2013) begins with the natural ecosystem structure and function that provide the service (these first three steps constitute the supply of ecosystem services), and then continues to the human system where people benefit from and value those services (the latter two steps can be interpreted as demand for ecosystem services). The focus on demand starts at the end of this chain (Figure 1), and requires engaging stakeholders to elicit their values, since these cannot be directly observed in the environment.

An alternative to elicit demand in large-scale or desk-based research is to use proxy values. Proxies can be observation-based, such as visitor counts to national parks, and social media data (e.g. Van Zanten et al., 2016) as indicators of environmental appreciation. Demand values can also be modelled through a quantitative approach, where a conceptual model for the demand for the ecosystem service is constructed by experts or stakeholders, and subsequently mapped over larger areas. For example, air quality regulation service is provided by vegetation, but it is only in populated areas and in areas where there is air pollution that the service relevant, and therefore the demand can be assumed to exist only in those areas.

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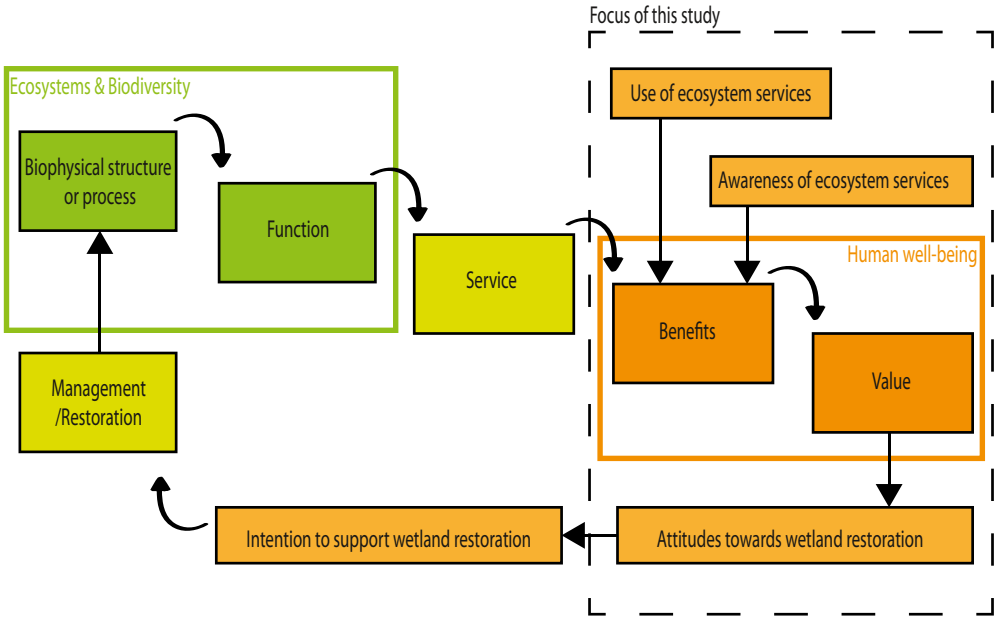

Figure 1. The ecosystem services cascade represents ecosystem service supply flowing from nature (green boxes), resulting in benefits and values for people, representing ecosystem service demand (orange boxes). Figure reprinted from Scholte et al., 2016, adapted from de Groot et al., 2010, and Haines-Young and Potschin, 2010.

1. Determine study objectives

An obvious starting point that will guide data collection and the entire research design is of course the goal of your work. In a research project, this will mean specifying the research questions. In an applied management project, this will involve specifying management objectives and targets.

At the beginning of the OPERAs project, each of the twelve Exemplars produced a study design, specifying the Exemplar rationale and motivation, how and why the case study boundaries were chosen, research questions, Exemplar goals, and links between stakeholders, instruments, and ecosystem services (Nicholas et al., 2014). Seven Exemplars that considered demand for ecosystem services were included in the demand synthesis (Table 1).

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Table 1. The OPERAs Exemplars and their respective studies included in this demand synthesis. Although many of the OPERAs Exemplars are extensive and include multiple studies, for this synthesis we focused on the specific studies within each Exemplar that had measured stakeholder demand for ecosystem services.

Exemplar Name	Demand Study Focus	Demand Study Location and Scale
Swiss Alps	Valuing mountain cultural ecosystem services	Regional – Visp/Saastal, Switzerland
Wine	Several, including local residents' value for cultural ecosystem services from vineyards, and literature review mapping vineyard ecosystem services in over 4,000 papers	Local surveys (England and California); Global literature review
Scotland Inner Forth	Local residents' value for coastal areas	Local – Inner Forth, Scotland
Barcelona	Coastal restoration and construction with the local authority	Municipal – Barcelona, Spain
Danube	Support for wetland restoration	Regional – Persina, Bulgaria
Europe	Regional-scale ecosystem services mapping	Across the European continent
Montado	Local and regional ecosystem services delivery	Local and regional – Montado, Portugal

2. Identify and engage key stakeholders

2.1. Identify and analyze your stakeholders

A wide range of techniques exists to identify and analyse your stakeholders, ranging from stakeholder mapping tools, to working with professional facilitators, to using online research including social media. It is important to identify both stakeholders' individual characteristics and how stakeholders interact with each other, as ecosystem services management and governance include interactions between both human and natural systems. We have developed a separate guidance document that explains some stakeholder identification and analysis approaches in more detail (Lascurain, 2017).

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2.2. Approach and engage stakeholders

Once your key stakeholders are identified, you need to engage and build relationships with the stakeholders. From earlier interviews with the Exemplar leads regarding their stakeholder experiences, we found that three key elements were necessary for successful stakeholder engagement: shared motivation, trust, and space (Schoonover et al., 2016). In turn, each of these three elements comprised three to five different components. See Schoonover et al. (2016) for more information.

2.3. Examples from OPERAs

From analyzing the results of an email survey with researchers in each of the seven Exemplars participating in the Demand Synthesis Working Group, we found four methods were used to initially identify stakeholders, including: asking existing stakeholder contacts to connect with new stakeholders; publicizing the opportunity for stakeholders to participate in workshops in local media; web analysis; and directly approaching individuals in person. As an example of the first method, researchers in the Montado Exemplar asked local land managers to provide a list of stakeholders. The publicizing method was used by the Swiss Alps Exemplar through an article published in a local newspaper and a radio interview, while web analysis was carried out by researchers in the Wine Exemplar to identify global carbon leaders for their online survey. Finally, students working on the Scotland Inner Forth Exemplar approached local residents on the high street of Alloa, Scotland, to talk about research and invite participants to a workshop in a local town hall.

Exemplar researchers found several key points that helped to facilitate the initial contact with potential stakeholders and set a good foundation for a positive working relationship (Table 2). The factors are related to three aspects of the research: the researcher, the stakeholder, and the research process itself. The researcher could improve relationships by taking care in introducing themselves properly, explaining their research goals, and sharing results from previous work. Important aspects to address about the stakeholder included discussing and linking their stake to the research, recognizing their knowledge and values, and getting a testimony from another stakeholder. Finally, regarding the project, it was important to be clear about how the stakeholder could help and what they could expect, to consider conflicts, and to be transparent.

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Table 2. Foundations of a positive relationship with stakeholders in research, identified from an email survey with the seven OPERAs Exemplars in the Demand Synthesis Working Group.

Research aspect	**Situation**	**Explanation**
Researcher	Explaining research goals	Researchers in the Wine Exemplar presented their project to stakeholders via both email and phone before asking the stakeholders to participate in the research.
	Sharing results from previous work	The Swiss Alps Exemplar researchers presented research from previous project in their first stakeholder workshop with local experts. This helped the research team set the context for launching a new project.
Stakeholder	Linking their stake to the research	When convincing the visitors and hunters of Companhia das Lezírias to take part in the choice experiment, researchers in the Montado Exemplar explained how the results would help in choosing the best land management practices for the area.
	Recognising their knowledge and values	Researchers in the Montado Exemplar sent individual invitations to their workshop that specifically mentioned how the stakeholders' knowledge would make an important contribution to the research.
	Getting a testimony from another stakeholder	Researchers working on the Streamline tool in the Scottish Exemplar asked participants for feedback on the interview experience after it is finished. Testimonials of the research were then added to the research website to help convince others to take part in an interview.
Research process	Being clear about expectations and ways to help	Researchers in the Scotland Inner Forth Exemplar told the residents that they were researching the coastal areas and were organising workshops to find out what local residents thought about their local landscape, future plans and any concerns.
	Conflicts	Researchers in the Scotland Inner Forth Exemplar brought in neutral and trained facilitators to help in moderating the conversation and allow different sides of the discussion topics to be heard. Facilitators set good ground rules that helped the researchers to achieve their research goals by directing the conversation further, so that it did not only center around conflicting views.
	Transparency	Researchers in the Scotland Inner Forth exemplar attempted to address any key concerns before asking participants to commit to a workshop, e.g., their ability to contribute to conversation, anonymity, and how the researchers would use their input.

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3. Identify all potential ecosystem services for your case

3.1. Select an ecosystem services framework

To identify which ecosystem services are important to stakeholders, you must first identify the possible range of ecosystem services that the study system can or does provide. The ecosystem services approach aims to provide one structured way to understand the benefits that people derive from nature, out of a huge range of alternative possible approaches to the same topic (for example, literature or economics). Major benefits of the ecosystem services approach include taking a holistic view across methods and disciplines (Hermelingemier and Nicholas, 2017), avoiding a narrow focus on only one service and considering possible tradeoffs, and serving as a "platform for bringing people and their different views and interests together" (Schröter et al., 2014, pp. 518).

To take advantage of the ecosystem services approach, it is important to make use of the extensive learning that has already taken place from international assessment and synthesis efforts, aimed at standardizing the approach, and follow an existing framework. Some of the major ecosystem services frameworks include the Millennium Ecosystem Assessment (2005), TEEB (2010), CICES (2013), and IPBES (Díaz et al., 2015), among many others. Some efforts have been made to harmonize between frameworks (e.g., Liquete, 2013), but the most important aspect is to select an established framework and avoid "reinventing the wheel" by defining case-specific services that may be hard to translate to a broader audience.

3.2. Use the framework to enumerate ecosystem services for your case

Starting with the chosen ecosystem services framework, enumerate each generic service (e.g., "harvest of crops") to your particular case ("winegrape harvest"). Consider both importance and the feasibility of collecting or obtaining data in selecting which services are relevant to your case.

When enumerating services, be sure to include at least one example from each of the highest levels (e.g., Sections in CICES) of the framework – in other words, at least one provisioning, one regulating, and one cultural service – to identify trade-offs between domains. If you are studying more than three services, consider selecting services at the next-highest level (e.g., Division in CICES, such as nutrition, materials, and energy from the provisioning section) as your organizing principle.

3.3. Involve experts and stakeholders in enumerating ecosystem services

To ensure you capture all the possible ecosystem services for your case, make sure you involve people with local knowledge of your study system, especially if you are new to the area. Consider experts from both research (e.g., researchers who have published papers on the ecosystem, or who

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work at local universities and research agencies), and practice (e.g., local NGOs and conservation and management organizations). Be sure the perspectives of your chosen stakeholder groups are represented by the selection of ecosystem services. You may even conduct research with stakeholders (e.g., focus groups, pilot interviews) to help refine the list of ecosystem services you plan to study in your system.

3.4. Examples from OPERAS

All of the OPERAs exemplars followed the CICES framework because it is the European standard for assessing policy goals, such as progress towards the European Biodiversity Targets of 2020. Starting with this framework, the Wine Exemplar determined which ecosystem services were most relevant to their case, ultimately including two provisioning, ten regulating and maintenance, and eight cultural services. They then translated the CICES terminology into terms more recognizable to wine industry stakeholders (Table 3). Both the selection of services and the chosen terminology were informed by wine researchers.

Table 3. A selection of ecosystem services enumerated for the OPERAs Wine Exemplar (last column), using the CICES framework (first four columns).

Section	Division	Group	Class	**Enumerated for Wine**
Provisioning	Nutrition	Biomass	Cultivated crops	**Direct harvest of grapes and leaves for consumption**
	Materials	Biomass	Fibers and other materials from plants, algae and animals for direct use or processing	**Fibers and other materials from grapevine (e.g., prunings, grape skins, grape seeds)**
Regulation & Maintenance	Maintenance of physical, chemical, biological conditions	Water conditions	Chemical condition of freshwaters	**Water is of sufficient quality for growing grapes**
		Atmospheric composition and climate regulation	Micro and regional climate regulation	**Micro and regional climate are suitable for growing grapes**
Cultural	Physical and intellectual interactions with biota, ecosystems, and land-/seascapes [environmental settings]	Physical and experiential interactions	Physical use of land-/seascapes in different environmental settings	**Physical use of vineyard landscapes (e.g., hiking, biking, horseback riding)**
		Intellectual and representative interactions	Aesthetic	**Beauty and inspiration of vineyard landscapes**

As another example, to ensure they included all the possible ecosystem services for their case, researchers in the Scotland Inner Forth Exemplar first interviewed local residents to find out which ecosystem services participants knew of and cared about. These ecosystem services were then included in a choice experiment in the main phase of the research project.

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4. Develop indicators for ecosystem services

4.1. Find an indicator for each ecosystem service

Each ecosystem service selected for your study will require an indicator to measure it. Indicators convey information about the characteristics and trends of the service of interest (Brown et al. 2014). Indicators should be appropriate to your study system, and reasonable to measure or observe with the time and resources available. Useful guidelines or reviews on developing indicators are available (e.g., Brown et al. 2014; Egoh et al. 2012; Maes et al. 2016), however they often focus on ecosystem service supply indicators. Finding appropriate demand indicators is especially challenging since demand values – in contrast to more biophysically-grounded ecosystem service supply values – are often not directly observable entities (Wolff et al. 2015).

Figure 2 provides an overview of the key steps of ecosystem service indicator development. Experiences from our research show that to determine demand indicators it is particularly important to find indicators that relate to the actual benefits people derive from ecosystem services. This requires that stakeholders are engaged in deriving or at least reviewing indicators for ecosystem services. As illustrated in Figure 2, progressing from services to indicators is often an iterative, rather than linear, process.

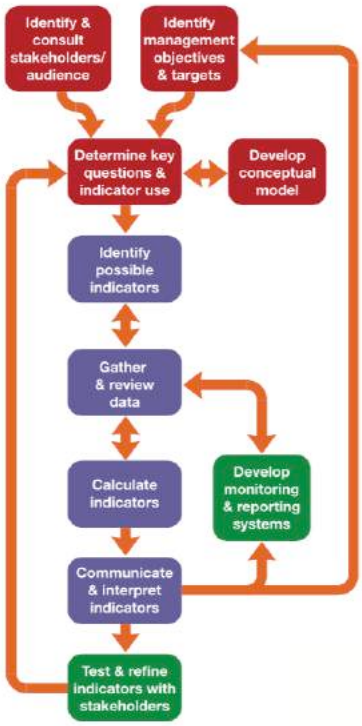

Figure 2. Ecosystem Service Indicator Development Framework developed by OPERAs partners to work with stakeholders in developing indicators. Figure reprinted from Brown et al., 2014.

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4.2. Consider the types of indicators

When choosing indicators, consider their relative strengths and weaknesses for the research you want to conduct. Indicators may be either **quantitative or qualitative** (Table 4). Quantitative indicators can be biophysical, monetary, or non-monetary. **Biophysical** indicators are usually applied to measure the supply of ecosystem services. If used as a proxy for demand, they equate the demand with the actual use or consumption of a service and thus measure the demand that is met by supply (Burkhard et al., 2012; Wolff et al., 2015). **Monetary** indicators can be derived from direct use and consumption information or from willingness-to-pay studies. If cost and price information is used to define indicators, they are similar to biophysical indicators. Since willingness-to-pay studies are hypothetical, it is possible that demand may exceed the current supply, and to infer demand for ecosystem services for which no direct consumption information exists. **Non-monetary** quantitative indicators include rankings or scores and are useful to compare services of different categories. In general, quantitative research is likely easier to administer (e.g., via an online survey) and can be more widely distributed than qualitative research, allowing larger sample sizes.

Qualitative indicators are often derived from open-ended text responses in questionnaires or structured face-to-face interviews. Commonly used questions used to derive qualitative indicators across the Exemplars included asking stakeholders for their wish-list of services, their concerns or opinions given different management scenarios, their preferences of the spatial use of different places, their perception of landscape quality, or their awareness of the impacts of the use of natural resources.

In general, quantitative indicators are often more easily observed and comparable than qualitative indicators. However, qualitative indicators can better reveal different types of value dimensions and why services matter to people (Martín-López et al., 2014). The type of indicator chosen also relates to the method for eliciting demand (Section 5 of this document). Indicators and methods should be selected together in an iterative process if possible. If you first chose an indicator, you will be restricted in the method suitable to measure it. On the other hand, if you first chose a method, it will restrict the type of indicator you can use. You might start with an indicator and look at the methods you could use and then go back to the indicator and adapt it to better suit the method.

Table 4. Characteristics of different indicator types for measuring ecosystem services.

Type	Category	Focus of Analysis
Quantitative	Biophysical	Ecosystem
Quantitative	Monetary	People
Quantitative	Ranking, score	People
Qualitative	Open	People

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4.3. Represent indicators clearly in words

Phrase your indicators in simple, clear, familiar language for your audience, not necessarily using the term “ecosystem services” or the specialist terminology from your particular ecosystem services framework. Since you have used a framework to develop your indicators, it will still be possible to “back translate” your work to a shared standard. In this stage, the words you select become your indicator. Informally discussing ecosystem services with several stakeholders can reveal common understanding and words for different services. It is best to pilot test indicators with members of your intended participant groups to make sure the descriptions selected are clear for them, and get feedback to improve before launching.

4.4. Examples from OPERAs

The use of indicators across the Exemplars in the Demand Synthesis Working Group is illustrated in Figure 3. Demand for ecosystem services in all three CICES ecosystem services categories was most often elicited with a method that assigns relative importance or a score to different ecosystem services. Indicators were derived by methods such as counting numbers of published papers, asking stakeholders to rank ecosystem services, or asking stakeholders to assign a value between 1 and 5 for the importance of different services. Monetary studies used indicators such as market prices for provisioning services (e.g., market price of fish), avoided costs for regulation services (e.g., avoided costs of repairing after storm or flood impacts) or willingness-to-pay for cultural services (e.g., willingness to pay for maintaining a cultural landscape). Biophysical indicators were either biophysical entities (e.g., NO_2 concentrations in air) or entities that resulted from processes in ecosystems and social-ecological systems (e.g., population density in urban areas).

Qualitative studies in the OPERAs Exemplars included in this synthesis relied on stated concerns or appreciations of stakeholders (e.g., concerns about impact of severe weather on crops). Overall, as Figure 3 illustrates, many of our studies investigated cultural ecosystem services, which is in contrast to more supply-side oriented studies and highlights the importance of cultural ecosystem services to stakeholders. Furthermore, our results do not support the common assumption that quantitative ecosystem services demand assessments are restricted to larger scales where corresponding consumption data are available (Busch et al., 2012), as the majority of the regional case studies used quantitative indicators.

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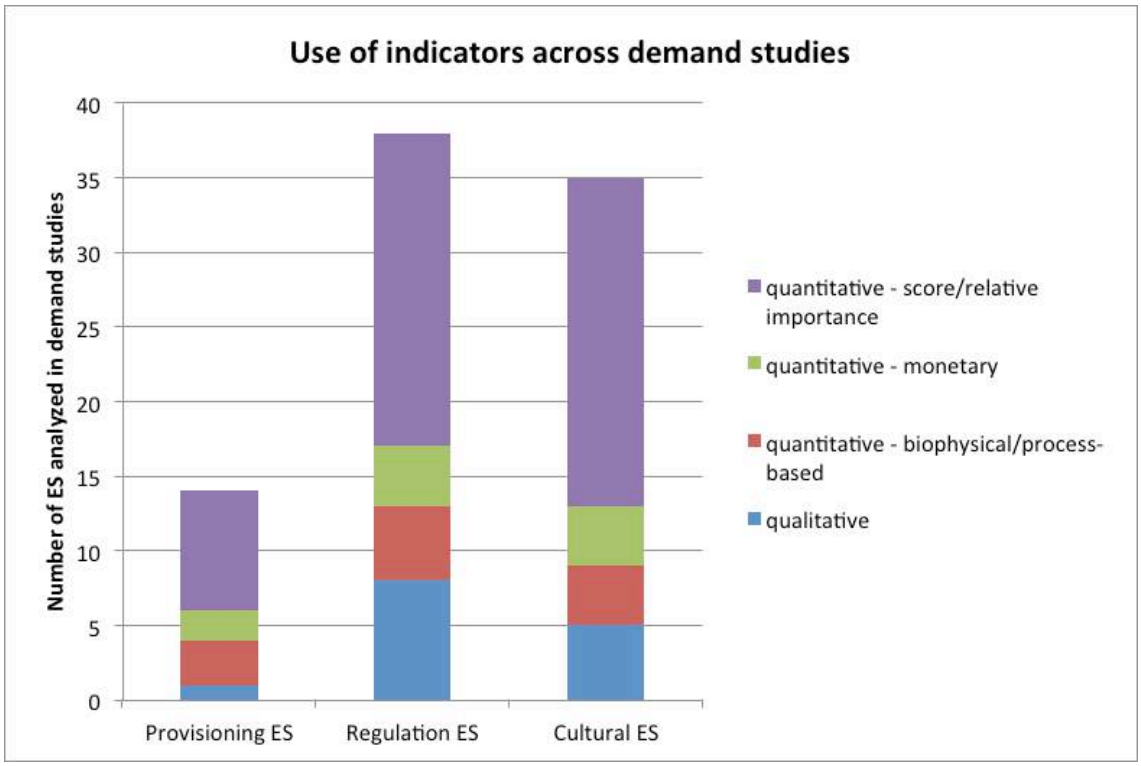

Figure 3. Use of ecosystem services indicators to analyze ecosystem service demand across the seven Exemplars in the Demand Synthesis Working Group. A total of different 87 ecosystem services were explored in these studies, spanning all three ecosystem services categories and using a range of different indicator types to elicit demand for these services.

Table 5 gives some examples of how ecosystem services were translated into indicators in our Exemplars. Starting with the CICES class, we determined whether the indicators should be quantitative or qualitative and then phrased them in clear, simple language. Further indicators for ecosystem service demand are reviewed by Wolff et al. (2015).

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Table 5. Examples of indicators translated into clear and simple language in the OPERAs Exemplars.

CICES Class	Indicator	Exemplar
Maintaining nursery population and habitats	Area of dry meadows in the region (hectares)	Swiss Alps
Heritage, cultural	Number of farms in the region	Swiss Alps
Mass stabilization and control of erosion rates	Quantity of natural hazard (avalanche) incidents within last 10 years	Swiss Alps
Experiential use of plants, animals and landscapes	Frequency of visits to special sites	Scotland Inner Forth
Cultivated crops	Grape yields (tons per hectare)	Wine
Aesthetic	Number of prizes granted for innovation in maritime promenade landscape architecture	Barcelona

5. Select method to elicit demand

5.1. Select an appropriate method to answer your questions for your case

Once you have selected your indicators, you must then choose the method(s) you will use to collect your data. There are many different methods that can be used to elicit demand for ecosystem services. The choice of method will depend on several of factors, including which ecosystem services you want to assess, what type of information you want to collect, what indicators you plan to use, how large a sample you want to engage, and how much time and resources you have to devote to your study. Some potential methods include choice experiments, surveys, focus groups, participatory GIS, interviews, and quantitative indicator analysis from existing databases, maps, and photos for desk-based research. Table 6 describes a number of these methods.

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Table 6. Illustrative methods used to elicit demand for ecosystem services for studies in this synthesis. See Appendix for study references.

Method	Description	Indicator type(s)	Ecosystem Services
Choice experiment	Participants choose between hypothetical options that differ in ecosystem services provision. Researchers analyze participants' preferences for ecosystem services based on the trade-offs in ecosystem services they were willing to make.	Quantitative	Any
Q-method	Participants sort statements from literature or popular discourse. Researchers analyze sorting to derive a handful of main perspectives on a topic.	Qualitative	Any
Participatory GIS	Participants mark places of importance on a map using an online tool or on paper. Researchers aggregate results and analyze patterns across space.	Spatially explicit; use-based or appreciation-based	Spatially explicit (not cultural intangible)
Quantitative indicator analysis	Existing data sources are used to map or quantify the distribution of ecosystem services that may be used as proxies for demand, e.g., photos uploaded to social media sites indicate aesthetic landscape enjoyment.	Quantitative	Any
Workshops	Participants interact with others and researchers during a range of exercises which may include discussion, mapping, listing, drawing, writing and playing games.	Quantitative or qualitative; spatially explicit or implicit; use-based or appreciation-based	Any, but especially cultural services that are best expressed in narrative methods; socially important services that require group deliberation; or situations where learning is required before participants feel comfortable to express their views
Focus groups	A discussion amongst a representative group of participants, moderated by facilitators.	Qualitative; spatially explicit or implicit; use-based or appreciation-based	Similar ecosystem services as in workshops
Surveys	Participants respond to a pre-defined set of questions without the presence of a researcher	Quantitative or qualitative; use-based or appreciation-based	Ecosystem services that are well known and understood by participants
Interviews	Participants interact with the researcher in person or over the phone.	Quantitative or qualitative; use-based or appreciation-based	Same as for surveys

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5.2. Consider the most appropriate format for conducting your method

In addition to selecting your method, it is also important to select the format in which you plan to carry out the method. This includes determining whether to meet in person or carry out your method online, as well as whether to engage stakeholders in groups or individually. As with the method, this depends on what type of information you want to collect, how large a sample you want to engage, and how much time, resources and effort you have to devote to your study. For example, carrying out a survey online might allow you to reach a greater number of stakeholders but likely would not achieve the depth of information that you might be able to collect by meeting in person. Similarly, a group workshop might reach a greater number of people and encourage more exchange than interviewing stakeholders individually, but might also limit the amount of information an individual stakeholder is able or willing to share.

5.3. Examples from OPERAs

Examples of the methods employed by each of the OPERAs demand studies and their rationale can be seen in Table 7. As seen from the table, the methods varied widely.

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Table 7. Examples of the methods used in OPERAs demand studies included in this synthesis. See Appendix 1 for study references.

Exemplar Study	Stakeholders	Method	Unit of Indicator	Why Chosen
Swiss Alps: Valuing mountain cultural ecosystem services	265 + 311 local residents in 2 villages	Choice experiment	Utility coefficient (willingness to pay)	Use of feasible alternatives in the elicitation process; based on the same theoretical background as method for simulating supply of ecosystem services; allows estimation of value in marginal changes in services; applicable to non-marketable services
Wine: Cultural values for vineyards	45 residents and wine producers	Q-method	Ranking of qualitative statements	Insight into various perspectives; allows comparison between people; interactive format
Wine: Low-carbon vineyard leaders & practices	10 global + 6 English wine producers	Online survey / semi-structured face-to-face interviews	Ranking of most important ecosystem services	Survey allowed contacting stakeholders around the world in a short time; interviews allowed for follow-up questions
Wine: Quantitative lit review of vineyard ecosystem services	Academic researchers (4000 papers)	Quantitative lit review	Number of peer-reviewed publications	To provide an overview of existing knowledge and knowledge gaps
Wine: Motives for organic winegrowing in Germany	12 German winegrowers	In-depth interviews	Qualitative statements	Allowed time for participants to consider their responses, as the topic was unfamiliar or not frequently discussed
Scotland Inner Forth: Local residents' value for coastal areas	109 local citizens	Workshops, choice experiments, participatory GIS	Spatial distribution & frequency of visits, votes for most important services, qualitative statements	Wide range of methods was included to allow participants to articulate values in different ways, which was particularly important for cultural services
Barcelona: Coastal restoration and construction with the local authority	Approximately 4800 photos + 220 beach visitors	Quantitative indicator analysis (photos), interviews, surveys	Observations and mapping (e.g., number of beach visits)	To reveal patterns in use and awareness in the local community
Danube: Support for wetland restoration	105 farmers, fishermen, local residents	Structured face-to-face interviews	Qualitative statements on use values	To reveal differences in awareness and value for ecosystem services
Europe: Regional-scale ecosystem services mapping	Regional datasets	Matching supply and demand indicators	Spatial analysis of European-wide datasets	To capture large-scale patterns revealed by existing data
Montado: Local & regional ecosystem services delivery	13 regional + 31 local (NGOs, municipalities, land managers, others)	Participatory workshops	Local: ranking ecosystem services, Regional: choosing the top 5 services	Ranking revealed differences in value between services, underlying motivations could be discussed in the workshops

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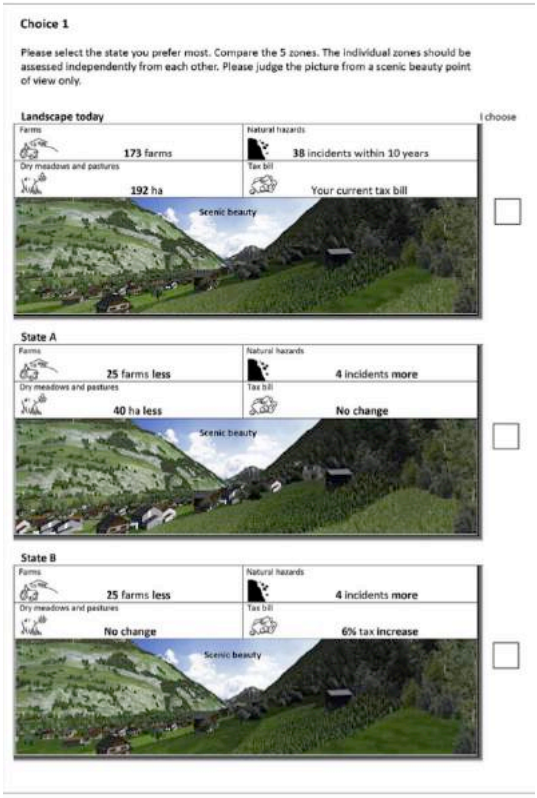
A specific example of a method used to assess stakeholder demand came from the Swiss Alps Exemplar, where the ecosystem service scenic beauty was represented in pictures for a choice experiment (Figure 4). Three landscape elements were represented by simple icons: farms (as an indicator for cultural heritage), natural hazards (mass flow regulation) and dry meadows and pastures (habitat service). In the choice tasks, stakeholders had to choose between the landscape today and hypothetical future states A or B. The icons and pictures were developed with a graphic designer and pilot tested with different people to reveal their intuitive associations with the symbols.

Figure 4. Visualizations used in the choice experiment in the Swiss Alps Exemplar (Brunner et al., 2016).



6. Elicit stakeholder demand for ecosystem services

6.1. Conduct research

Once you have selected an appropriate method to collect data that will achieve your study objective related to ecosystem service demand, you have to actually collect the data, that is, implement your research design and carry out the chosen method. Here a range of fundamental research design and subject-specific resources can be helpful, such as the Research Methods Knowledge Base

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(Trochim, 2006), or guides to specific research styles such as case studies (Yin, 2014) or methods such as surveys (Kelley et al., 2003).

6.2. Give space for stakeholders to express views in their own words

One important aspect of studying stakeholder demand is that participants will likely hold views that even the best study design cannot anticipate. And of course, no framework is entirely complete, or best for every application, so the ecosystem services framework may not capture some values important to your stakeholders. Therefore, it's important to include at least some open-ended questions to capture participant responses in their own words. For example, at the end of a structured survey, you might ask, "What is your most formative experience in [the study landscape], and why?" These questions, if linked with your research objectives, can be powerful in revealing and understanding participant motivations important to understand demand for ecosystem services.

6.3. Examples from OPERAs

As noted above, studies in the Demand Synthesis Working Group included a wide range of goals, methods, and approaches. More detail on how these studies were carried out can be found in Appendix 1.

7. Analyze and compare demand

7.1. Identify the most highly valued services within your study

Based the data you have collected, you should now be able to analyze your data to determine the ecosystem services most demanded by your stakeholders. These data can be analyzed in terms of both highest demand overall, and demand preferences between different groups of stakeholders (e.g., residents vs. tourists, farmers vs. birdwatchers). Understanding which stakeholders value which services and why can help identify management options to achieve shared objectives, or highlight areas of conflict to try to address.

7.2. Explore questions of scale

Scale is an important factor when assessing the importance of ecosystem services because services can be generated at a range of scales and supplied to stakeholders at many other different scales (Castro et al., 2014). This can sometimes create potential conflicts in environmental management, in particular between local stakeholders and stakeholders at larger scales (Hein, van Koppen, de Groot, & van Ierland, 2006). Comparisons across scales are seldom done (Dick, Maes,

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Smith, Paracchini, & Zulian, 2014) but can reveal important information about potential conflicts and trade-offs.

7.3. Compare stakeholder demand with ecosystem supply, and with ecological assessments of priority for conservation

It is also important to consider the relationships between ecosystem service demand and ecosystem service supply. There are often spatial differences between areas that have the capacity to supply ecosystem services, and those in which ecosystem services are demanded. Ensuring that areas prioritized for conservation and management are those that will benefit society requires identifying where demand and supply coincide (Verhagen et al., 2016). For example, ecosystem service maps that depict the capacity of the landscape to provide services can be weighted so that only the areas where the service is potentially demanded remain as relevant for the service. Multiple studies have demonstrated that policy appraisal and planning outcomes can be markedly different depending on whether or not demand is considered in the assessment (e.g. Luck et al., 2012; Cimon-Morin, et al,, 2014; Verhagen et al., 2016).

7.4. Compare between cases

One benefit of using a standard ecosystem services framework is that it supports comparisons between your study and other cases. Depending on your research question, you may be interested to know results for ecosystem services demand or supply in similar geographic regions (e.g., Mediterranean) or similar ecosystems (e.g., mountains). You may also be interested to compare how different systems facing similar problems (e.g., climate change, urbanization) have fared. For collaborative projects, the framework allows comparison between different cases to learn about unexpected synergies and deduce common patterns more easily, promoting deeper fundamental understanding. Even if your study does not focus on comparison, the use of a shared framework will facilitate others learning from your study in designing future research and in conducting future synthesis or meta-analysis efforts (e.g., IPBES (Díaz et al, 2015)).

7.5. Examples from OPERAs

The Montado Exemplar wanted to get an overall idea of the value of ecosystem services. The Exemplar started with the group level of the CICES framework and adapted it to their case, resulting in 12 groups of ecosystem services. Participatory workshops with different stakeholders of the Montado (e.g., landowners, land managers, beekeepers, hunters, researchers, etc.) were then conducted at both at the local and regional scales. Regional stakeholders chose the five most important ecosystem services and valued them on a scale of 1 to 5. A classification of 0.5 was further given to other services considered important but not in the top five, while services that were

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not considered important received a score of zero. At the local scale, stakeholders valued each of the 12 ecosystem services on a scale of 1 to 5. In the end all values were averaged by service for each scale.

Looking at demand for ecosystem services on at one scale (regional) in the Montado Exemplar revealed that regulating and maintenance services were most valued by the stakeholders, followed by provisioning services, while cultural services were seldom selected as important. Within the first category, soil formation and composition and maintenance of water quality were the most important services. Wild or cultivated products for food was the second most important for stakeholders in this agro-silvo-pastoral system (Figure 5).

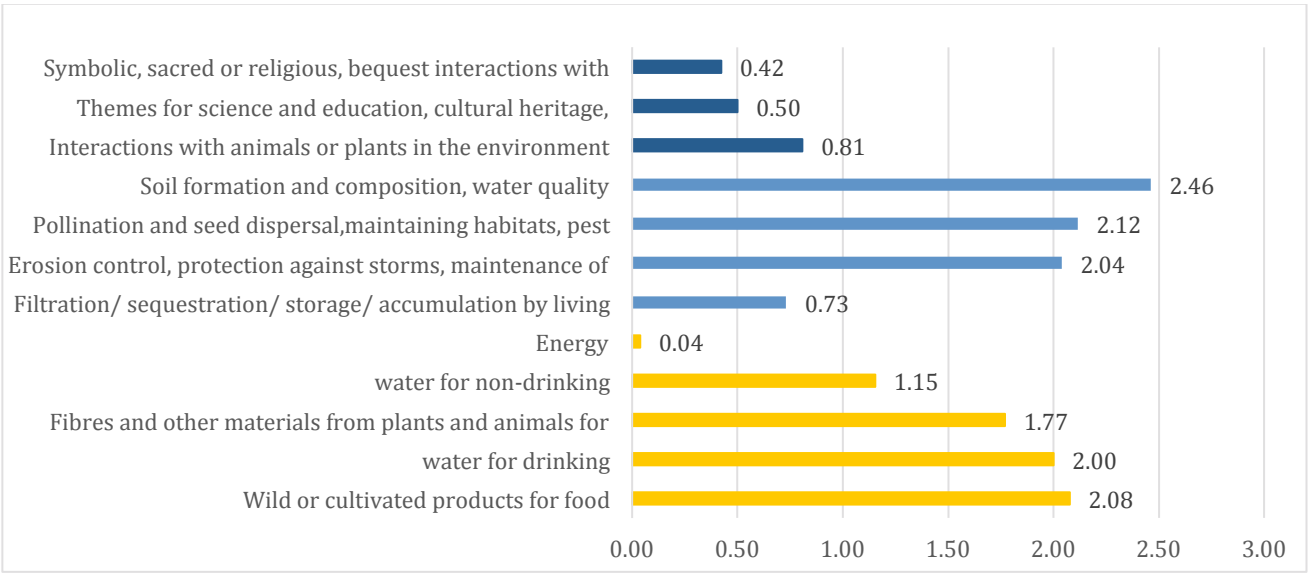

Figure 5. Bar plot showing workshop results for ecosystem services valuation by the Montado stakeholders at a regional scale. Plot axis represents the classification given by the stakeholders to each of the 12 ecosystem services on a scale of 1 to 5 for the five services considered as most important. Other ecosystem services considered as important (but not in the top five) were given the classification of 0.5. Services considered not important received a value of zero. All values were averaged for each ecosystem service. Dark blue: cultural ecosystem services; blue: regulation and maintenance services; yellow: provisioning services.

Comparing the Montado Exemplar's demand for ecosystem services at the regional scale with that at the local scale reveals different levels of demand (Figure 6). For example, although stakeholders rated soil formation and composition as the most important service at both scales, demand for cultural ecosystem services such as science and education was quite a bit higher at the local scale than at the regional scale.

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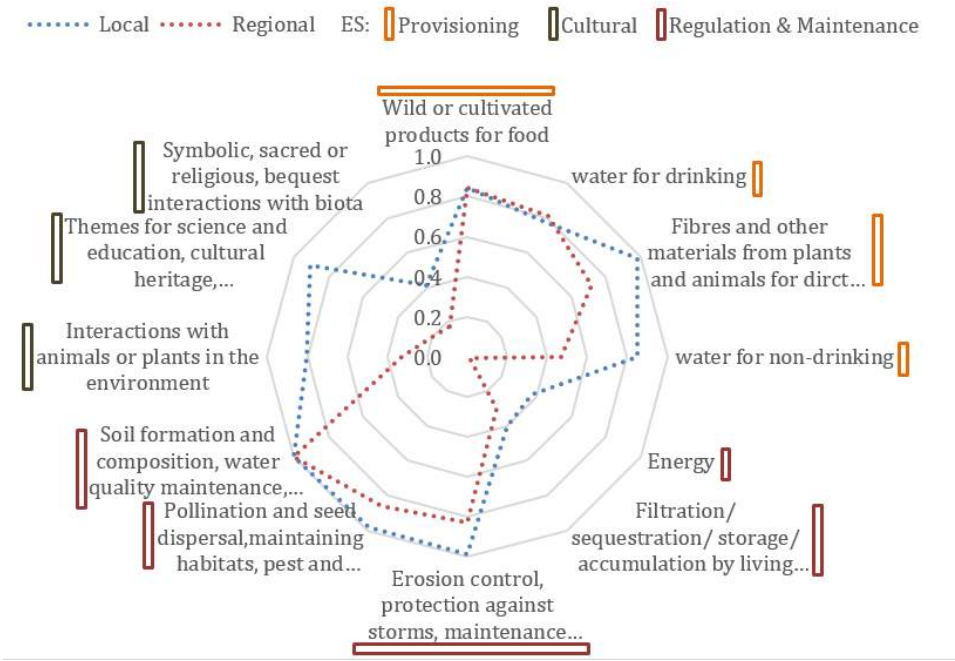

Figure 6. Radar plot showing workshop results for ecosystem services valuation by the Montado stakeholders at both local (N=31 stakeholders) and regional (N=13 stakeholders) scales. Plot axis represents the classification given by the stakeholders to each of the 12 ecosystem services on a scale of 1 to 5 for local scale and on a scale of 1 to 5 or the five considered as most important at the regional scale. At the regional scale, other services considered as important (but not in the top five) were given the classification of 0.5, while services considered not important received a value of zero. All values were standardized by dividing the values by the maximum of each scale.

In the Demand Synthesis Working Group as a whole, our use of CICES allowed us to compare demand across quite different OPERAs exemplars. To do so we selected six services that were the most commonly measured and/or the most highly valued in one or more of our studies. We chose two provisioning services (nutrition and materials), two regulating and maintenance (flow mediation and “maintenance of physical, chemical, biological conditions”, renamed Habitat for labeling below), and two cultural services (scientific and aesthetic). We represented the results in a flower diagram (Figure 7).

The indicators used varied between studies, so each petal in the flower diagram represents the same CICES class but may have measured different things. For example, for the orange “flow mediation” petal in Figure 7, the Swiss Exemplar used willingness to pay for one less natural hazard (avalanche), the Wine Exemplar used soil conservation and erosion protection (among other things), the Scotland Inner Forth Exemplar used “coastal safety”, the Barcelona Exemplar used “beaches as

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a buffer system against storm and flood events", and the Montado Exemplar used erosion control and storm protection (among other things).

Drawing on a method developed by Malinga (2016), we normalized the maximum value for a given service (e.g., nutrition) within one study by calculating the ratio between the demand for that service, and the highest demand expressed for any service in the same study. Therefore, the petal length in the flower diagrams represents relative demand within each study, relative to the maximum demand observed. Since each study is assessed relative to its own maximum, we can use these flowers to compare relative demand between studies, but not to compare absolute values of service delivery between studies.

Overall this figure shows that all five studies valued flow mediation (this could vary widely, from carbon sequestration to avalanche protection). Scientific services were also valued in four of the studies. Aesthetic services were valued for the Swiss Alps, Wine, and Montado Exemplars.

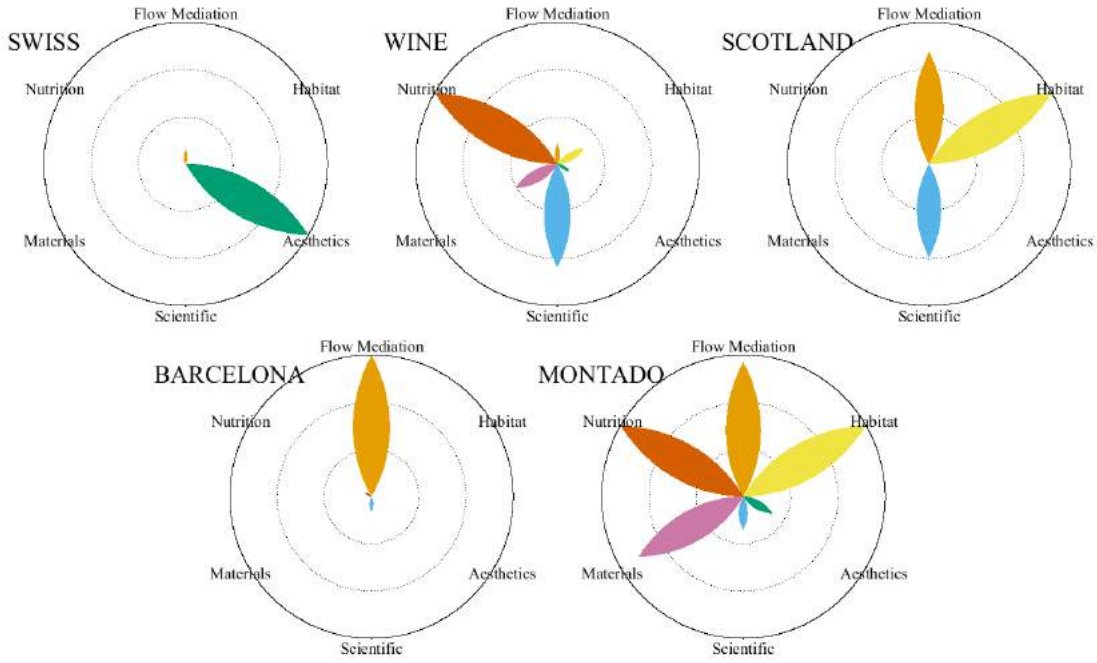

Figure 7. Relative demand for the six most valued ecosystem services across five OPERAs exemplars. Petal length depicts relative demand within one study, from 0% in the middle to 100% (the most highly valued service within that study) at the outer ring. For example, in the Wine Exemplar, nutrition was the most highly demanded service, and thus it is counted as 100%. Other petal lengths are relative to this baseline, e.g., demand for materials was about one third as high as for nutrition in the Wine Exemplar. Services that were not measured are not shown.

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8. Assess implications of results

8.1. Draw conclusions from your analysis

For an applied study, the ultimate goal of assessing demand for ecosystem services is to use this information to help improve policy and practice. It is thus important to consider both what your results mean for stakeholders and how they could be actionable and for whom.

8.2. Communicate demand

As with eliciting demand, it is important to communicate the results and implications of your study in a way that resonates with your various stakeholders. This includes tailoring your message and communications vehicle to your audience. For example, while a policy brief might be the most effective vehicle to reach a local government official, it is likely not an appropriate communications tool for an audience of local citizens. It is also important to keep in mind that different stakeholders may be positively or negatively affected by any actions you propose.

8.3. Determine action plans to use your results to improve policy or practice

Understanding demand for ecosystem services can help you determine potential strategies and actions to improve policy or practice. For example, given an ecologically important ecosystem service, if demand for that service exceeds supply – i.e., stakeholders already value the ecosystem service but more needs to be done to increase provision of the service – you could harness this interest to involve the community in management of the ecosystem. On the other hand, if supply of the service exceeds demand – i.e., there is sufficient delivery of the service but stakeholders don't value it highly – you could educate stakeholders on why the service is important and link it to something they already care about to ensure they do value and thus protect it (Figure 8).

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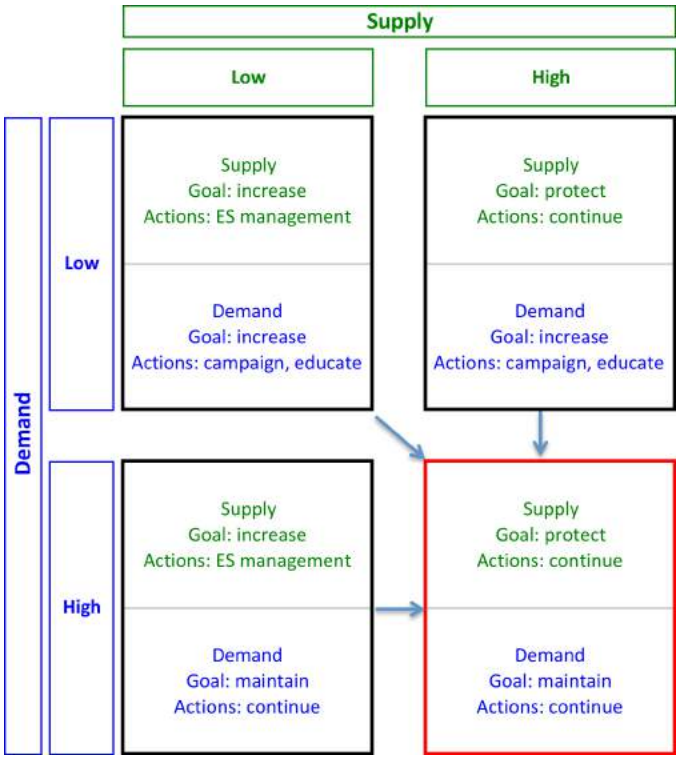

Figure 8. Assessing both supply and demand for an ecologically important ecosystem service can help determine potential actions to improve or maintain that service. For example, if the supply (green) of a particular service is low but demand (blue) is high, one strategy could be to harness this demand and involve stakeholders in managing the ecosystem to help increase the provision of the service. Ultimately, the goal is to get to place where both supply and are sufficiently high (red box).

8.4. Example from OPERAs

The Danube Exemplar conducted a demonstration with stakeholders of one of the tools used in their study to support management planning and wetland restoration decisions in the Persina Nature Park. The park management and regional environmental inspectorate reviewed the results. The Exemplar also shared results with the Bulgarian Executive Forestry Agency, as the agency is currently selecting a methodology for estimating demand of forest ecosystem services, to support a nation-wide forest owner compensation scheme to be launched in 2018-2020.

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Discussion

Through collaborating across OPERAs Exemplars, we were able to identify common threads in our approaches from very different studies that aimed to elicit stakeholder values for ecosystems. This affirmed the importance of eliciting stakeholder values and helped us to reflect on our approach to doing so, resulting in the creation of this eight-step framework, which we hope will be of use to researchers in the future.

There are a number of points to reflect upon from our experience with applying this framework for eliciting demand for ecosystem services, especially regarding methodological challenges and the potential for conflicts of interest in dealing with an inherently normative issue like ecosystem services demand.

Methodologically, we found that even following similar approaches between the OPERAs Exemplars, it could still be quite a challenge to pull together and compare data. Each study had its own goals and therefore assessed different things, and did so via different indicators and methods. This could make it difficult to compare results between studies. Using the eight-step framework presented here, however, could make it easier for researchers in the future to share a common approach that would facilitate comparisons. We also realized the importance of consistent data curation and management for transparency in research, and to facilitate participation in future comparisons and meta-studies.

In terms of conflicts of interest, we found examples of conflicts both between researchers and stakeholders, and between different groups of stakeholders. In the first case, there may be a mismatch between ecosystem services demand by researchers and by stakeholders. For example, stakeholders may highly value a service that is ecologically trivial, while not being aware of or interested in a service deemed ecologically critical. This may be particularly true for regulating services, which are often more abstract and hard to see. Cultural ecosystem services have until recently been less well studied by researchers, but for stakeholders they might be a crucial part of their relationship with the ecosystem (Chan et al., 2012; Daniel et al., 2012).

Conflicts between stakeholders can also be revealed (or even created!) by assessing ecosystem service demand, especially if recommendations for policy and practice are made. This is because there are likely divergent interests, where certain groups of stakeholders will experience different costs and benefits from proposed conservation or management policies. For example, in the Inner Forth, the proposal for managed realignment of the estuary via wetland restoration was supported by bird conservation organizations and town planners as a flood control measure, but opposed by the landowners who would have to give up farming on their land to convert cropland to wetland. The researchers in the Inner Forth have been working with local residents in the area to gauge citizen

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perspectives on the proposal for wetland restoration. Inclusion of a wider range of stakeholder perspectives, such as citizens, is an important step towards dealing with conflicts that arise from trade-offs related to ecosystem service demand.

Our analyses also revealed several opportunities for future research. One such opportunity would be addressing the complexity and diversity of ecosystem services demand. Different stakeholder groups often exhibit conflicting demands, which necessitates trade-offs in policy and management decisions. Research on demand for ecosystem services can help illustrate and contribute to solving potential conflicts of interest and supporting negotiation processes (Geijzendorffer et al., 2015).

Another area of potential research includes further explorations of both spatial and temporal scales. Demand for services is generated at different spatial and temporal scales. The notion of different spatial scales has been already developed and used for ecosystem service supply, but similar considerations are underdeveloped for ecosystem service demand. While certain demands are focused on local services (e.g., air purification), demand for other services can be more diffuse (e.g., carbon sequestration) or be linked at higher spatial scales (e.g., water purification). At the same time, the temporal dynamics of ecosystem service demand require further investigation. Longitudinal studies of demand could help understand the ability of stakeholders to adapt to changes in ecosystem supply over time (Wolff et al. 2015).

Finally, to support the development of sustainable and equitable management strategies, access of stakeholders to demanded ecosystem services needs to be explored. Often, issues of ownership, social status, education, or gender hinder the accessibility of ecosystem services and result in unsatisfied demand. Science can contribute to unravelling such obstacles and developing fair solutions (Geijzendorffer and Roche 2014).

Conclusion

Researchers often focus at the beginning of the ecosystem services cascade with the supply of services that their study system can or does provide. They may be guided in their choice of key services by their disciplinary background (seeing what is perceived as important to their discipline), or focus on services of high ecological interest or important conservation status, identified through expert analysis. They often seek to quantify the services they research. Stakeholders, on the other hand, often experience ecosystem services through their demand for them, based on their own personal, direct, daily, tangible, visible experience of the benefits from these services. Better understanding and linking these two perspectives can help more fully achieve the potential for ecosystem services to improve policy and practice.

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References

Brown, C., Reyers, B., Ingwall-King, L., Mapendembe, A., Nel, J., O'Farrell, P., Dixon, M., Bowles-Newark, N. (2014). Measuring ecosystem services: Guidance on developing ecosystem service indicators. UNEP-WCMC, Cambridge, UK. Available at: https://www.unep-wcmc.org/resources-and-data/measuring-ecosystem-services--guidance-on-developing-ecosystem-service-indicators.

Burkhard, B., Kroll, F., Nedkov, S., Müller, F. (2012). Mapping ecosystem service supply, demand and budgets. *Ecological Indicators* 21:17-29. doi:10.1016/j.ecolind.2011.06.019.

Busch, M., La Notte, A., Laporte, V., Erhard, M. (2012). Potentials of quantitative and qualitative approaches to assessing ecosystem services. *Ecological Indicators* 21:89-103. doi:10.1016/j.ecolind.2011.11.010.

Castro, A.J., Verburg, P.H., Martin-Lopez, B., Garcia-Llorente, M., Vaughn, C.C., Cabello, J. (2014). Ecosystem services trade-offs from supply to social demand: a landscape-scale spatial analysis. *Landscape and Urban Planning* 132: 102-110. doi:10.1016/j.landurbplan.2014.08.009.

Chan, K.M.A., Guerry, A.D., Balvanera, P., Klain, S., Satterfield, T., Basurto, X., Bostrom, A., Chuenpagdee, R., Gould, R., Halpern, B.S., Hannahs, N., Levine, J., Norton, B., Ruckelshaus, M., Russell, R., Tam, J., Woodside, U. (2012). Where are Cultural and Social in Ecosystem Services? A Framework for Constructive Engagement. *BioScience* 62:744-756. doi:10.1525/bio.2012.62.8.7.

CICES. (2013). CICES V4.3 (January 2013). Available at http://www.cices.eu.

Cimon-Morin, J., Darveau, M., Poulin, M. (2014). Towards systematic conservation planning adapted to the local flow of ecosystem services. *Global Ecology and Conservation 2*: 11-23. doi:10.1016/j.gecco.2014.07.005.

Daniel ,T.C., Muhar, A., Arnberger, A., Aznar, O., Boyd, J.W., Chan, K.M.A., Costanza, R., Elmqvist, T., Flint, C.G., Gobster, P.H., Grêt-Regamey, A., Lave, R., Muhar, S., Penker, M., Ribe, R.G., Schauppenlehner, T., Sikor, T., Soloviy, I., Spierenburg, M., Taczanowska, K,. Tam J., von der Dunk, A. (2012). Contributions of cultural services to the ecosystem services agenda. *Proceedings of the National Academy of Sciences* 109:8812-8819. doi:10.1073/pnas.1114773109.

Díaz, S., Demissew, S., Carabias, J., Joly, C., Lonsdale, M., Ash, N., et al.The IPBES conceptual framework: connecting nature and people. (2015). *Current Opinion in Environmental Sustainability* 14:1-16. doi:10.1016/j.cosust.2014.11.002.

Dick, J., Maes, J., Smith, R.I., Paracchini, M.L., Zulian, G. (2014). Cross-scale analysis of ecosystem services identified and assessed at local and European level. *Ecological Indicators* 38:20-30. doi:10.1016/j.ecolind.2013.10.023.

Egoh, B., Drakou, E.G., Dunbar, M.B., Maes, J., Willemen, L. (2012). Indicators for mapping ecosystem services: a review. Report EUR 25456.

Geijzendorffer, I.R., Roche, P.K. (2014). The relevant scales of ecosystem services demand. *Ecosystem Services* 10:49-51. doi:10.1016/j.ecoser.2014.09.002.

Geijzendorffer, I.R., Martín-López, B., Roche, P.K. (2015). Improving the identification of mismatches in ecosystem services assessments. *Ecological Indicators* 52:320-331 doi:10.1016/j.ecolind.2014.12.016.

This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement number 308393.

Haines-Young, R., and Potschin, M. (2013). Common International Classification of Ecosystem Services (CICES): Consultation on Version 4, August-December 2012. EEA Framework Contract No. Available at: http://www.cices.eu.

Hein, L., van Koppen, K., de Groot, R.S., van Ierland, E.C. (2006). Spatial scales, stakeholders and the valuation of ecosystem services. *Ecological Economics*, 57(2): 209-228. doi:/10.1016/j.ecolecon.2005.04.005.

Hermelingmeier, V., and Nicholas, K.A. (2017). Identifying Five Different Perspectives on the Ecosystem Services Concept Using Q-Methodology. *Ecological Economics.* In press. doi:10.1016/j.ecolecon.2017.01.006

Kelly, K., Clark, B., Brown, V., Sitzia, J. (2003). Good practice in the conduct and reporting of survey research. *International Journal for Quality Health Care* 15:261-266. doi:10.1093/intqhc/mzg031.

Lascurain, J. (2017). Identifying and analyzing stakeholders of ecosystem services. OPERAs Project guidance document, in progress.

Liquete, C., Piroddi, C., Drakou, E.G., Gurney, L., Katsanevakis, S., Charef, A., Egoh, B. (2013). Current Status and Future Prospects for the Assessment of Marine and Coastal Ecosystem Services: A Systematic Review. *PLOS ONE* 8(7): e67737. doi:10.1371/journal.pone.0067737.

Luck, G.W., Chan, K.M., Klien, C.J. (2012). Identifying spatial priorities for protecting ecosystem services. *F1000 Research* 1-16. doi:10.3410/f1000research.1-17.v1.

Maes, J., Liquete, C., Teller, A., Erhard, M., Paracchini, M.L., Barredo, J.I., Grizzetti, B., Cardoso, A., Somma, F., Petersen, J-E., Meiner, A., Gelabert,. ER., Zal, N., Kristensen, P., Bastrup-Birk, A., Biala, K., Piroddi, C., Egoh, B., Degeorges, P., Fiorina, C., Santos-Martín, F., Naruševičius, V., Verboven, J., Pereira, H.M., Bengtsson, J., Gocheva, K., Marta-Pedroso, C., Snäll, T., Estreguil, C., San-Miguel-Ayanz, J., Pérez-Soba, M., Grêt-Regamey, A., Lillebø, A.I., Malak, D.A., Condé, S., Moen, J., Czúcz, B., Drakou, E.G., Zulian, G., Lavalle, C. (2016). An indicator framework for assessing ecosystem services in support of the EU Biodiversity Strategy to 2020. *Ecosystem Services* 17:14-23. doi:10.1016/j.ecoser.2015.10.023.

Malinga, R. (2016). Ecosystem services in agricultural landscapes: A study on farming and farmers in South Africa and Sweden. Stockholm University Masters Thesis. Available at: https://su.diva-portal.org/smash/get/diva2:966824/FULLTEXT02.pdf.

Martín-López, B., Gómez-Baggethun, E., García-Llorente, M., Montes, C. (2014). Trade-offs across value-domains in ecosystem services assessment. *Ecological Indicators* 37, Part A:220-228 doi:10.1016/j.ecolind.2013.03.003.

Millennium Ecosystem Assessment. (2005). *Ecosystems and Human Well-being: Synthesis*. Washington, DC: Island Press.

Nicholas, K.A., Walz, A., Wilson, M., and OPERAs Exemplar teams. (2014). Exemplar Study Design Descriptions. OPERAs Project Deliverable 2.1. Available at: http://operas-project.eu/sites/default/files/resources/d2.1-description-study-design.pdf.

Scholte, S.S.K., Todorova, M., van Teeffelen, A.J.A., Verburg, P. (2016). Public Support for Wetland Restoration: What is the Link With Ecosystem Service Values? *Wetlands* 36:467-481. doi:10.1007/s13157-016-0755-6.

Schoonover, H., and Nicholas, K.A., with contributions from all OPERAs Exemplars. (2016). Creating Space, Aligning Motivations, and Building Trust: Key Elements of Stakeholder Engagement in 12 Ecosystem Services Case Studies. OPERAs Project Report.

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Schröter, M., van der Zanden, E. H., van Ouldenhoven, A. P. E., Remme, R. P., Serna-Chavez, H. M., de Groot, R. S., Opdam, P. Ecosystem Services as a Contested Concept: A Synthesis of Critique and Counter-Arguments. (2014). *Conservation Letters*. doi:10.1111/conl.12091.

TEEB. (2010). The Economics of Ecosystems and Biodiversity: Mainstreaming the Economics of Nature: A synthesis of the approach, conclusions and recommendations of TEEB. Available at: http://www.teebweb.org/our-publications/teeb-study-reports/synthesis-report/

Trochim, W.M. (2006). The Research Methods Knowledge Base, 2nd Edition. Web-based text book. Available at http://www.socialresearchmethods.net/kb/.

van Zanten, B.T., van Berkel, D.B., Meetemeyer, R.K., Smith, J.W., Tieskens, K.F., Verburg, P.H. (2016). Continental scale quantification of landscape values using social media data. *Proceedings of the National Academy of Sciences*, 1-7. doi:10.1073/pnas.1614158113.

Verhagen, W., Kukkala, A.S., Moilanen, A., van Teeffelen, A.J.A., Verburg, P.H. (2016). Use of demand and spatial flow in prioritizing areas for ecosystem services. *Conservation Biology*. doi:10.1111/cobi.12872

Wolff, S., Schulp, C.J.E., Verburg, P.H. (2015). Mapping ecosystem services demand: A review of current research and future perspectives. *Ecological Indicators* 55:159-171 doi:10.1016/j.ecolind.2015.03.016.

Yin, R.K. (2014). *Case Study Research: Design and Methods*. Thousand Oaks, CA: Sage.

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Appendix 1. List of OPERAs Exemplar studies referenced in this document

Exemplar Name	References
Swiss Alps	1. Brunner, S, R Huber & A Gret-Regamey. 2016. A backcasting approach for matching regional ecosystem services supply and demand. Environmental Modelling & Software 75: 439-458. 2. Ryffel, A, R Huber, R Seidl, and A Gret-Regamey. In review. Regional differences in preferences for ecosystem services: a choice experiment approach in two Swiss mountain regions.
Wine	1. Winkler K & KA Nicholas. 2016. More than wine: Cultural ecosystem services in vineyard landscapes in England and California. Ecological Economics 125 (16): 86-98 and related OPERAs blog post. 2. Winkler, KA, Viers, J & KA Nicholas, in review. Assessing ecosystem services and multifunctionality for a specific ecosystem: Applying the CICES classification to vineyard systems. In review at *Frontiers in Environmental Science*. 3. Siepman, L. 2016. Winegrowers' motives and barriers to convert to organic farming in Pfalz and Rheinhessen, Germany. Uppsala University MSc thesis and related OPERAs blog post. 4. Redford, E. 2016. Rosé tinted glasses? How a new wine region can adopt existing low carbon practices. Lund University MSc thesis and related OPERAs blog post.
Scotland Inner Forth	1. Workshops and choice experiments with local residents. 2. Farmer valuation of ecosystem services through ranking exercises. 3. Ambros, P. Bridging to the common ground, adapting to climate change through sustainable estuarine land use: a study of the Inner Forth, Scotland. Lund University MSc thesis and related OPERAs blog post.
Barcelona	1. Pinterest page
Danube	1. Scholte, Samantha S. K. et al. "Public Support For Wetland Restoration: What Is The Link With Ecosystem Service Values?". Wetlands 36.3 (2016): 467-481.
Europe	1. Schulp, C.J.E., Lautenbach, S. & Verburg, P.H. 2014. Quantifying and mapping ecosystem services: Demand and supply of pollination in the European Union. Ecological Indicators 36: 131-141. http://dx.doi.org/10.1016/j.ecolind.2013.07.014 2. Stürck, J., Poortinga, A. & Verburg, P.H. 2014. Mapping ecosystem services: The supply and demand of flood regulation services in Europe. Ecological Indicators, 38 (0):198-211. http://dx.doi.org/10.1016/j.ecolind.2013.11.010 3. Verhagen, W., Kukkala, A., Moilanen, A., van Teeffelen, AJA., Verburg, PH. Ecosystem services priority areas: the importance of accounting for demand and the spatial scale of ecosystem services flows. Conservation Biology (in review).

This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement number 308393.

Montado	1. Vasconcelos, L; Rosário, I.; Caser, U; Ferro, F; Rebelo, R; Máguas, C, Máguas; Santos-Reis, M. Building a Community of Practice for the Portuguese "Montado" – Capacitating Collaborative Management. World Congress Silvo-Pastoral Systems, Évora. 27-30 September 2016. 2. Correia, Otília; Branquinho, Cristina; Costa, C; Cruz, Cristina; Gonçalves, Paula; Máguas, Cristina; Mendes, T; Pinho, Pedro; Príncipe, Adriana; Rebelo, Rui; Rosário, Inês; Santos, JP; Santos-Reis, Margarida. Long term monitoring of mediterranean agro-silvo-pastoral systems: the LtsER Montado Platform. World Congress Silvo-Pastoral Systems, Évora. 27-30 September 2016. 3. Rosário, I; Caser, U; Máguas, C; Rebelo, R; Vasconcelos, L & Santos-Reis, M. Valuation of the montado ecosystem services by its users and stakeholders. cE3c – 2nd Annual Meeting, Lisboa. 28 June 2016. 4. Madeira, A M. Preferences and valuation of Montado natural values by visitors and other users: a site-based approach. MSc Thesis in Ecology and Environmental Management (Science faculty of Lisbon University). 2016. 5. Vasconcelos, L., Caser, U., Santos-Reis, M. Report of the first participative workshop. Engagement of the montado stakeholders platform. 8 April 2014. Observatório do Sobreiro e da Cortiça, Coruche. OPERAs Project. Unpublished technical report. Lisboa. 6. Vasconcelos, L., Caser, U., Rosário, I. Santos-Reis, M. Report of the second participative workshop. Engagement of the montado stakeholders platform. 9 December 2015. Observatório do Sobreiro e da Cortiça, Coruche. OPERAs Project. Unpublished technical report. Lisboa. 7. Vasconcelos, L., Caser, U., Rosário, I. Santos-Reis, M. Report of the third participative workshop. Engagement of the montado stakeholders platform. 19 May, 29 April and 6 June 2016. Coruche, Grândola, Herdade da Coitadinha. OPERA Project. Unpublished technical report. Lisboa. 8. Video of the 2nd Stakeholders workshop. Available at the LtsEr channel https://www.youtube.com/channel/UCRXlr94OZ4CsoxsNhmvO9Nw

This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement number 308393.

Appendix 2. The Demand Synthesis Working Group

Over an eight-month period, seven of the OPERAs exemplars formed a working group to synthesize our experiences in researching the demand for ecosystem services. These cases were diverse, ranging from global literature reviews (Wine Exemplar) to expert interviews and distributed questionnaires among many local residents (Swiss Alps Exemplar). Many of the OPERAs exemplars are extensive and include multiple studies. However, for this synthesis, we focused on the specific studies within each Exemplar that had measured stakeholder demand for ecosystem services (see Appendix 1).

The group members collaborated to design the synthesis process and share information on their studies, in a process developed through regular Skype calls and email exchanges. We developed electronic templates and questionnaires to harmonize very different kinds of qualitative and quantitative data across studies, and also shared a repository of papers, presentations, and other materials across Exemplars in order to learn more about what each Exemplar had done. Based on this iterative process, we propose the above eight-step framework for eliciting ecosystem service demand.

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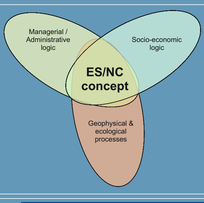
Attachment 2

Governance of Ecosystem Services: How to Transform the Ecosystem Services Concept into an Explicit Management Tool

Infographic

OPERAs

Governance of ecosystem services (ES): how to transform the ES concept into an explicit management tool

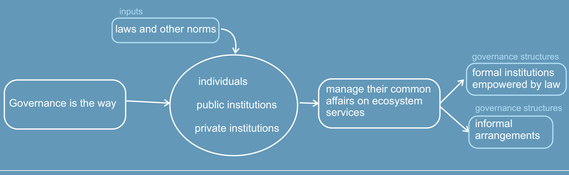


ES concept as an explicit management tool

One of the reasons for the popularity of the ES concept is that it can work as an explicit management tool. ES are about human-nature systems and integrate the three logics: managerial, social and economic, and finally the geophysical and ecological processes.

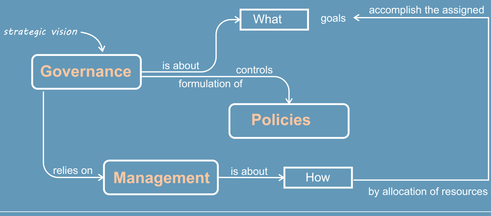
About the concept of governance

Governance is the way stakeholders manage their common affairs related to ES. This includes internal processes and relationships between stakeholders, and the input of laws and other norms. The resulting outcomes can be formal institutions empowered by a legal framework (such as city authorities), or can be informal arrangements (such as communities who visit a landscape).



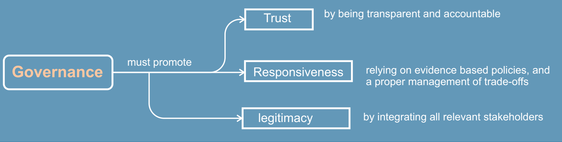
The blurred lines between governance, policies and management

Governance is about strategic decision making. It relies on management, which is about how to accomplish the assigned goals. Management functions at a day by day level and by allocating resources. And policies are a crucial element of governance. Governance controls the limits where policies function.



Good governance of Ecosystem Services (ES)

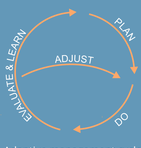
Governance also sets the framework where stakeholders interact. The governance system must promote trust, legitimacy and responsiveness by being accountable, open, transparent, and evidence-based. To promote trust it has to engage all the relevant stakeholders, although not necessarily in the same way. Governance can shape and avoid vulnerability and optimize ES flows. Good governance must be flexible and adapt to a changing environment in order to last.



Adaptive management: far beyond command and control instruments

Average command and control instruments

Command and control instruments directly regulate an industry or activity by legislation that states what is permitted and what is illegal. Ussualy those regulations do not include the situations and assumptions of their adjustment as an outcome of experience or monitoring. This limits their usefulness.

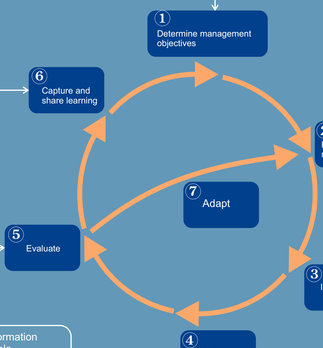


Adaptive management cycle

One of the most relevant aspects that enables the ES concept to be an explicit management tool is its ability to cope with complex and fluctuating environments. So, governance has to go beyond *command and control instruments* (only regulation based), and be adaptive in order to cope with the continuous and unpredictable changes brought by the different consequences of the human-nature interaction. Climatic change is one of those consequences.

The adaptive management wheel: a good way to place methods and instruments on the governance process of ecosystem service management

To determine management objectives there is a need not only of a correct understanding of the natural system, but also the human system. So, there is a need to identify stakeholders and their belief systems; the network narratives they establish; and their level of system knowledge in order to reach a common view of the process and trade-offs. In order to last and endure change, governance systems must be trusted by stakeholders.



Ensure diversity and creativity in planning by considering:

- Level of diversity of solutions
- How many options analysed?
- How many conceptual frames & trade-offs analysed?

- Continuous access to information
- As collaborative as possible
- Capacity to generate evidence-based policies
- Use of standardized metrics/indicators for monitoring the efficiency of ES/NC measures.

It is important to monitor both the biophysical system (through ES mapping and biophysical assessment), and involve stakeholder values of ecosystem services, through methods such as socio-cultural valuation and social media listening.

OPERAs

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Attachment 3

Ecosystem Services for Local Authorities

2 Short Videos

Available at:

http://operas-project.eu/ESLA

and

http://operas-project.eu/ESLABalearic

Attachment 4

Integrating Stakeholder Perspectives into Environmental Planning through Social Valuation of Ecosystem Services: Guidance and Prototype Applications

Guidance Document

OPERAs

Integrating stakeholder perspectives into environmental planning through social valuation of ecosystem services: Guidance and Prototype Applications

A. Walz, K. Schmidt, R. Noebel, C. Bullock, G. Cojocaru, M.J. Collier, A. de Vries Lentsch, A. Dyankov, L. Ingwall-King, D. Joyce, J. Lascurain, S. Lavorel, , N. Marba, M. Metzger, I. Rosário, A. Ruiz-Frau, S. Scholte

February 2017

Ecosystem Science for Policy & Practice

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Integrating stakeholder perspectives into environmental planning through social valuation of ecosystem services:

Guidance and Prototype Applications

By A. Walz, K. Schmidt, R. Noebel, C. Bullock, G. Cojocaru, M.J. Collier, A. de Vries Lentsch, A. Dyankov, L. Ingwall-King, D. Joyce, J. Lascurain, S. Lavorel, , N. Marba, M. Metzger, I. Rosário, A. Ruiz-Frau, S. Scholte

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February 2017

Take-home messages

- Within the framework of an ecosystem service assessment, social valuation has the potential to make people´s opinions, beliefs and preferences visible in the decision-making processes.

- Set up a tailor-made social valuation procedure for your specific problem:
  - Be clear about the purpose and specific objectives for your specific problem.
  - Identify the stakeholders and addressees.
  - Consider the appropriate format.
  - Decide for coherent methods.

- Learn from experience:
  - We provide you with a **Catalogue of Prototype Applications**.
  - Connect with an established community of practices, for instance through oppla.

- Be aware:
  - Perception and preferences of stakeholders might not be based on a comprehensive understanding of the ecosystem. They cannot replace biophysical assessments of ecosystem and ecosystem services.
  - Besides the concrete results of the social valuation, the process itself is likely to trigger changes in perception, knowledge and preferences of all partners.

Acknowledgements

We would like to thank all many practice partners that actively engaged in the social valuation studies described in the Catalogue of Prototype Applications. Further we would like to acknowledge the constructive feedback from members of the OPERAs userboard. This document is a product of the 7th framework programme of the European Commission in the project OPERAs (grant number 308393, www.operas-project.eu).

What is social valuation and why is it important?

Participatory and consultation processes have a great potential to find multi-functional, feasible and accepted solutions in regional environmental planning, natural resource management and nature conservation. They have the potential to foster synergetic solutions, reduce conflicts and increase acceptance and success of environmental planning, natural resource management and nature conservation (Reed 2008).

Over the past years, the Ecosystem Service concept (Box 1) has increasingly been used also in local and regional scale environmental planning. It encourages including not only ecologic and economic value of ecosystem services in such planning procedures, but also social values (Box 2).

Social – or often also referred to as socio-cultural – valuation of ecosystem services is the process of discovering what ecosystem services people value and how important they are to them. It is a way to bring in people's perspectives into the ecosystem service assessment which we strongly advocate (Box 3).

The social – or socio-cultural – value of an ecosystem or ecosystem services describes the importance it has to people. Such values can be utilitarian and experiential, namely how much people like to use or actively enjoy the ecosystem. Or they can be more intangible and related to transcendental or principle based values, for instance, how much people appreciate the existence of the ecosystem, that it can be used and enjoyed also by future generations. Social values can be individual or shared and they can often reflect the public good value of nature. Therefore, such values usually go beyond the domain of markets and exchange values. Instead they depend largely on the personal perception of individuals, and shared principles of a society (Chan et al. 2012).

Insights into peoples' perception and valuation of ecosystems play an increasingly important role in ecosystem management practices that are based on the ES concept as comprehensive Ecosystem Services Assessment requires capturing all three dimensions of value pertaining to ecosystem services: ecological/biophysical, social and economic value domains (Martín-Lopez et al. 2013).

BE AWARE: Social value is based on people´s perception and preferences. It might not be based on a comprehensive understanding of the ecosystem functioning and cannot replace biophysical assessments of ecosystems and ecosystem services.

Box 1: Brief introduction to the concept of ecosystem services and its application in regional environmental management.

Ecosystem services can be defined as the benefits people obtain from ecosystems (MEA 2005), or more specifically as the natural goods and benefits derived from functional ecosystems that sustain human life and wellbeing (Chan et al. 2012).

The concept of ecosystem services can help to address the conflict between human intervention and conservation needs. It gained a lot of political attention during the Millennium Ecosystem Assessment (MEA 2005) and is more and more streamlined for operational application.

There are many classification systems for ecosystem services. The Common International Classification of Ecosystem Services (CICES) is widely used within Europe, and differentiates between three main categories (Haines-Young and Potschin, 2012):

- provisioning services, such as food and water
- regulating and maintenance services, such as flood and disease control and natural cycles
- cultural services, such as recreation and cultural heritage

The concept of ecosystem services is designed to improve decision-making processes by identifying and quantifying shifts in ecosystem service supply, mainly through human intervention (De Groot et al. 2009). Studies have shown that in many cases of ecosystem conversion the natural state would provide greater economic benefits over time than the intended anthropogenic usage with its short-term benefit (Balmford et al. 2002). In Box 2, humans' dependency on

a functioning ecosystem and the provision of its services is further visualized and described.

For additional information about the ecosystem services concept and some illustrative examples of its operational application, watch this video: http://operas-project.eu/ESresearchtopractice.

Box 2: Linking human well-being to functioning ecosystems: the ecosystem service cascade

The relationship between human society and functioning ecosystems can be described in a cascade (Fig. 1). This cascade illustrates the dependency of human well-being on the biophysical structures, processes and functions of ecosystems to provide goods and services for human society. Humans benefit from goods and services that ecosystems supply them with, and they attribute values to them.

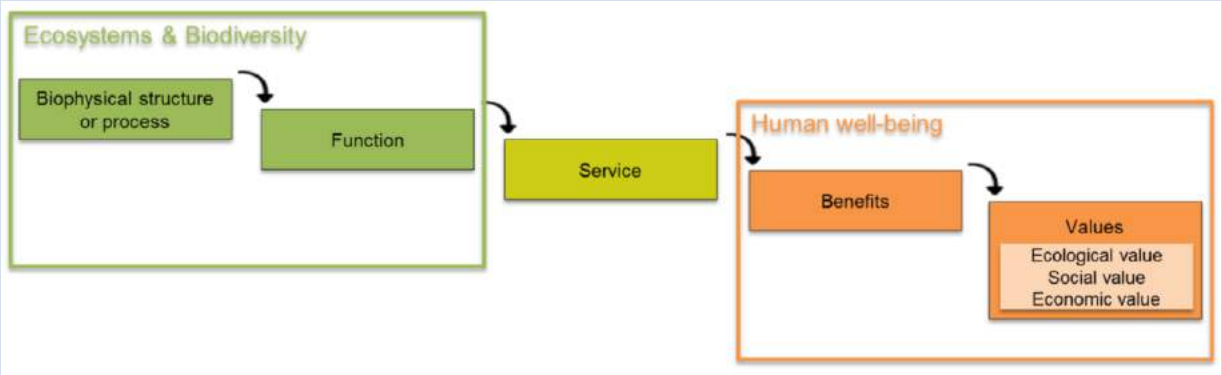


Figure 1: Framework for linking ecosystems and human well-being (adapted from Haines-Young & Potschin 2010)

These values are commonly divided into three complementary categories: ecological, social, and economic values (de Groot 2002, MEA 2005). Ecological values refer to biophysical units and thresholds that might be essential to maintain the functioning of the ecosystem in the long-term. The economic values refer to monetary units, which can be divided into market and non-market values. The social values reflect the perception and value people attach to an ecosystem service. They are usually measured in non-monetary terms, and can have a conceptual overlap to non-market economic valuation techniques (Koetse et al. 2015).

Provisioning, regulating, cultural and supporting services can all vary in their importance to people and therefore be subject of social valuation (Kenter et al. 2015, Scholte et al. 2015). In practice, however, economic market-based valuation has most often focused on provisioning services whereas social valuation has been used most often for intangible, mainly cultural ecosystem services.

Many large-scale assessments of ecosystem services have been criticized to ignore non-monetary social values (Chan et al. 2012). For regional and local scale assessments, we strongly recommend assessing and taking into account the social values of the ecosystem beneficiaries alongside that of experts and decision-makers.

In this document, we focus on the assessment of social values. We guide you to establish a tailor-made study to reveal social values for your specific purposes and provide a **Catalogue of Prototype Applications** that provides illustrative examples.

Box 3: The potential of social valuation.

The social value of ecosystems and ecosystem services – especially on local scale – are far from being self-evident. One of the big potentials of social valuation lies in the opportunity to identify and measure the importance, especially of non-material ecosystem services for the affected people and stakeholder groups. Such knowledge can be key in the elaboration of acceptable solutions in environmental planning.

But social valuation assessments are not only beneficial for the direct findings. By using techniques of social valuation, participants deepen their understanding of locally supplied ecosystem services and get the opportunity to close individual knowledge gaps. These important co-benefits on the individual level help to foster ecosystem appreciation and awareness. In addition to that, participatory approaches present a platform for collective discussions and mutual learning processes. Participatory formats therefore have the potential to capture existing collective transcendental meanings and values and overcome the designation of merely individual values.

Overall, social valuation can be of great significance for decision-making processes. The identification of social preferences and beliefs that are connected to a specific ecosystem combine the more abstract economic and ecological aspects with the personal reality of directly affected people – which has been one of the principle goals of the ecosystem service concept. Social valuation therefore represents a necessary element in the overall assessment of ecosystem services. At the same time, however, these social values, preferences, and opinions represent only one part of the entire puzzle and cannot replace for example the bio-physical aspects of an ecosystem service assessment.

This document builds on practical experience from case studies of the FP7 project OPERAs. This research project investigated the operational potential of the ecosystem services concept for practical environmental planning and natural resource management in 12 exemplary case studies. Experience and insights gained in social valuation from these case studies are manifold. They supported to elaborate guidance for the setting up further studies and build the basis for an illustrative **Catalogue of Prototype Applications** to learn from. More information on OPERAs is available under www.operas-project.eu.

Main steps towards a tailor-made social valuation procedure

Four main steps lead to a tailor-made social valuation procedure:

(1) Define purpose and specific objectives.

You need to be clear about the purpose and the specific objectives that you want to achieve with the social valuation. In the following section, we will present typical, but not exclusive purposes and objectives.

(2) Identify stakeholders and addressees.

Identifying the main stakeholders and addressees is crucial. The range of potential addressees extends from a small number of experts to the wider public. Make sure your targeted addressees cover a wide range of perspectives and add new or deeper insights in the decision-making process.

(3) Decide for an appropriate format for data collection.

The purpose of your study, the number of addressees, and their state of knowledge will be important constraints in selecting an appropriate format. You need to further consider whether your study focuses on revealing individual social values or on encouraging dialogue across stakeholder groups.

(4) Choose appropriate methods.

Finally, you will have to choose specific methods. We suggest a variety of methods for each of the formats which are explained in more detail in an Appendix: Inventory of Methods in the Appendix.

Step 1: Define purpose and specific objectives.

Social valuation serves mainly three purposes in environmental planning and management. Either it focuses on the assessment of the current social value of an ecosystem, on preferred future ecosystem states and acceptable trade-offs between ecosystem services, or it focuses on the identification of ill-defined stakeholder groups and their behaviour (Table 1). In most cases, the social valuation procedure will provide an overall social value, while revealing the variety of social preferences at the same time.

For any of these more general purposes, more specific objectives need to be detailed to set up your study. Table 1 gives some common examples within the multitude of specific objectives that can be followed by individual social valuation studies.

Table 1: Typical purposes for social valuation with examples for more specific objectives

Purpose of social valuation	Specific objectives
Assess current social value of an ecosystem and its services	1. Identify current social values 2. Measure current social values 3. Understanding the underlying reasoning for social values
Determine preferred future ecosystem states and acceptable trade-offs	4. Identify visions for future land management 5. Identify preferences and acceptable trade-offs between distinct management options 6. Develop and test feasibility of alternative land management
Identify involved stakeholders and potential beneficiaries, and their interactions.	7. Identify (diversity of) beneficiaries and stakeholders 8. Understand actor behavior

Each purpose and objective can be followed individually in a study. In many cases, you would want to start with a simple and clear objective. For instance, you would want to know what the ecosystem services are that visitors to the ecosystem of interest appreciate most. This question relates to Objective 1, which aims to identify the current social value of the ecosystem and the services it provides. Similarly you could identify, for instance, preferences for future management (Objective 5) or follow any other objective individually.

More complex social valuation assessments might have multiple purposes and objectives.. For example, studies may include stakeholder identification (Objective 7), the value they assign to the current state of ecosystem services (Objective 2) and their preferences for the future (Objective 5).

Step 2: Identify stakeholders and addressees.

People to be addressed include either individuals or representatives of groups

- who need to make the decisions in ecosystem management,
- who are affected by these decisions, i.e. beneficiaries of the ecosystem and its services, or
- who are particularly knowledgeable about the ecosystem and their management.

Social valuation processes can be tailored for one of these groups exclusively, or it can be designed to involve multiple stakeholders as to facilitate dialogue and social learning between these groups about the various values of ecosystems and ecosystem services in the study site.

Typical addressees include land owners, environmental managers, NGOs, organized interest groups, decision-makers (e.g. policy-makers, municipalities, park management), experts (e.g. consultants, planners, scientists) or the affected public (e.g. visitors, consumers, residents).

In many cases you will be aware of the main stakeholders. In some cases, you might be even able to contact them through formal institutions, such as cross-sectoral consultative platforms. In most cases, organic snowball-like networking has proven useful to establish contact between stakeholder groups outside and across formal institutions. A range of formal methods allow the systematic analysis and identification of stakeholders (described for instance in Reed et al. 2009).

BE AWARE: If stakeholder groups are diffuse or not organized, the identification of stakeholders can also be a main purpose of your social valuation study (see Table 1, Objective 7).

Step 3: Decide for an appropriate format for data collection.

For assessing social value, a wide range of formats is commonly used, including:

- Workshops
- Interviews
- Surveys
- Observation
- Document and media analysis

Which format is most appropriate for your assessment depends strongly on the purposes and objectives you follow (Table 2). The choice of formats is further constrained by the number of people addressed and how well-informed these addressees are. Each of these formats can be used to address (parts of) the public, selected stakeholders and/or experts.

Table 2: Typical data collection format for specific purposes and objectives, based on experience from the OPERAs exemplar cases

Purpose	Objectives	Workshops	Interviews	Surveys	Observations	Document and media analyses
Appreciation of current social values	(1) Identify social values	✓	✓			
	(2) Measure social values	✓		✓	✓	
	(3) Understand underlying reasoning	✓	✓			✓
Future preferences / acceptable trade-offs	(4) Identify visions for future LM	✓	✓	✓		✓
	(5) Identify preferences / acceptable trade-offs	✓		✓		
	(6) Develop and test feasibility of LM	✓	✓			
Identify stake-holders	(7) Identify stakeholders	✓		✓		✓
	(8) Understand actor behavior	✓	✓		✓	✓

These formats differ fundamentally in their degree of interaction between you (as a person who conducts social valuation assessment) and the addressees, as well as the interaction between addressees. Social learning may occur during interactions within workshops and therefore t the value that individuals would assign to an ecosystem services can be modified by such interaction (Liu and Opdam 2014). If the objective is to not only reveal social value, but encourage a dialogue across stakeholder groups, this can be accomplished by using a highly interactive format, such as a workshop setting.

Another decisive factor for the choice of format is whether your assessment aims for qualitative or quantitative data. If your objective is to measure social values (objective 2) or to identify preferences for future development (objective 5), survey techniques is preferable. If you are aiming for identifying social values (objective 1), understanding the underlying reasoning (objective 3) or identifying joint visions for future ecosystem management (objective 4), more open and in-depth formats, such as interviews or workshops,

could be more appropriate. Workshop formats are widely used in social valuation studies. They can cover quantitative as well as qualitative aspects. Another advantage of workshop formats is that it is possible to obtain data and knowledge about social values through deliberations during workshops and participants can also have the opportunity to connect and co-learn about the value of ecosystems as they share their own experience and debate the relative importance of nature to them within the workshop setting.

Step 4: Choose appropriate methods.

Each of the five formats allows for a variety of well-established methods to reveal social values and preferences (Table 3). The selection of the methods should allow capturing the desired outcome and stakeholder participation in the best possible way.

Further information on the listed methods can be found in an **Appendix: Inventory of Methods** (Appendix), and illustrative examples how to use and combine these methods in specific social valuation studies are provided in the **Catalogue of Prototype Applications**.

Table 3: Common methods for data collection for each data collection format (adapted from Scholte et al. 2016)

Workshops	Interviews	Surveys	Observation	Document and media analysis
• Expert workshops • Participatory workshop • Focus groups • Participatory mapping • Citizen juries	• Semi-structured interview • Unstructured interview	• Structured questionnaires (face-to-face interview, online, email) • Choice Experiment • Q method • Delphi techniques	• Participant observation • Unstructured observations • Structured observations	• Analyses of written texts • Analyses of social media channels • Analyses of other media (e.g. films, photos)

Catalogue of Prototype Applications

Ten prototype applications have been selected as illustrative examples to demonstrate the diversity of applications and to guide you on how to set up your own assessment. This selection covers the full range of purposes and objectives introduced in Step 1, a wide variety of the presented formats and methods and addresses different stakeholder groups.

Table 4 provides an overview. Select the preferred valuation and go to the Catalogue of Prototype Applications, where a one-page description of each of Prototype Application is presented. Each Prototype provides illustrative results and suggested use of the knowledge within decision-making. All Prototype Applications are drawn from the FP7 project OPERAs.

Table 4: Overview of prototypes on social valuation for different purposes and objectives

Main Purpose	Specific Objective	Prototype Application	Format					Methods/tools	Addressees		
			Workshop	Survey	Interview	Document	Observation		Public	Selected stakeholders	Experts
Appreciation of current social values	(1) Identify social values	 Spatial planning and coastline management on the North County Dublin Coastline, Fingal	✓		✓			• Focus groups • Participatory mapping • Rating values • Scenario analysis		✓	
	(2) Measure social values	 Visitor appreciation at the Pentland Hills Regional Park		✓				Structured questionnaire via face-to-face interviews, available also online	✓		
	(3) Understand underlying reasoning for social values	 Estuary restoration and conservation planning at the Inner Forth Estuary, Scotland			✓			In depth face-to-face interviews using the interactive visual tool ("streamline")	✓		
Preferences and acceptable trade-offs in future ecosystem management	(4) Identify visions for future land management directions	 A. Future visions based on visitor survey for the Pentland Hills Regional Park		✓				Structured interviews • On-site (tablet-based) • Online	✓		
		 B. Conservation of traditional cultural landscape Montado	✓	✓				• Participatory workshops (regional and local) • Structured questionnaires via interviews and online + choice experiment	✓	✓	
	(5) Identify preferences and accepted trade-offs between distinct management options	 A. Off-setting measures for housing development at East Lothian		✓				• Structured questionnaire via face-to-face interviews with choice experiment	✓		
		 B. Wetland management strategies in the Kaikusha Marsh, Persina Natural Park, Lower Danube	✓	✓				• Expert workshops with multi-criteria analysis and supporting tool: mDSS • Structured questionnaire via face-to-face interviews		✓	✓
	(6) Develop and test feasibility of alternative land management	 Future land use planning and implications for nature conservation and natural resource for Grenoble	✓					• Expert workshops with multi-criteria decision analysis (MCDA) • Structured preferences in combination with biophysical modelling		✓	✓
Beneficiaries/ actors/ stakeholders	(7) Identify stakeholders	 Coastal dune restoration and management for Barcelona		✓		✓		• Social media analytics • Visual classification of images & videos • Text analytics on blogs, on online newspaper	✓	✓	
	(8) Understand actor behavior	 Enforcing the protection of seagrass meadows at the Balearic Islands			✓			Semi-structured face-to-face Interviews (on perception and governance)		✓	✓

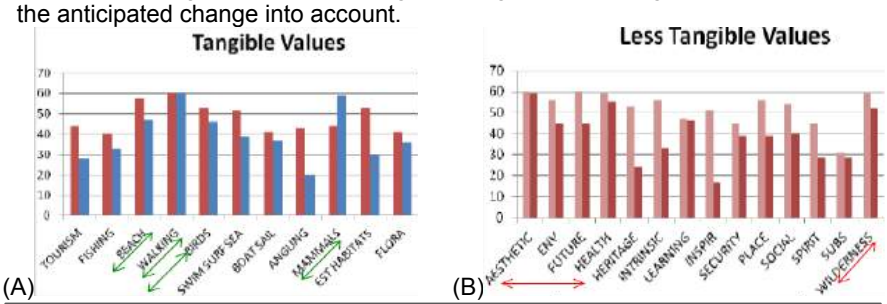
(1) IDENTIFY SOCIAL VALUE

Exemplary case	Spatial planning and coastline management on the North County Dublin Coastline, Fingal
Aim	Better understanding of the social value of Fingal coastline for improved spatial planning by Fingal Local Authority
People Addressed	Users and stakeholders including the public (residents), NGOs, fishing, coastal recreational businesses, community groups
Methods	Focus groups, participatory mapping, rating values, scenario assessment and individual interviews
Formats	3 workshops between October 2014 and February 2016, Feedback & Dissemination seminar in August 2016

Source: Deidre Joyce

Exemplary results

The study identified the benefits of the Fingal coastline to a large range of stakeholders, and how these benefits were valued by different stakeholders. The process allowed the participants the opportunity to acknowledge the benefits flowing from coastal ecosystem and make their tangible as well as intangible value explicit (Fig. 1.1 A+B). It informed the planners and decision-makers where these benefits are located and identified spatial hotspots of social value (Fig. 1.2). Further, it revealed expected changes in value against development scenarios which anticipated land use change along the coastline with Fig. 1.1 A+B showing the results of ratings for tangible and intangible social values before and after taking the anticipated change into account.



(A) (B)

Fig 1.1: Rating of tangible and intangible values of the Fingal Coastline, without and with anticipated change (first and second column)

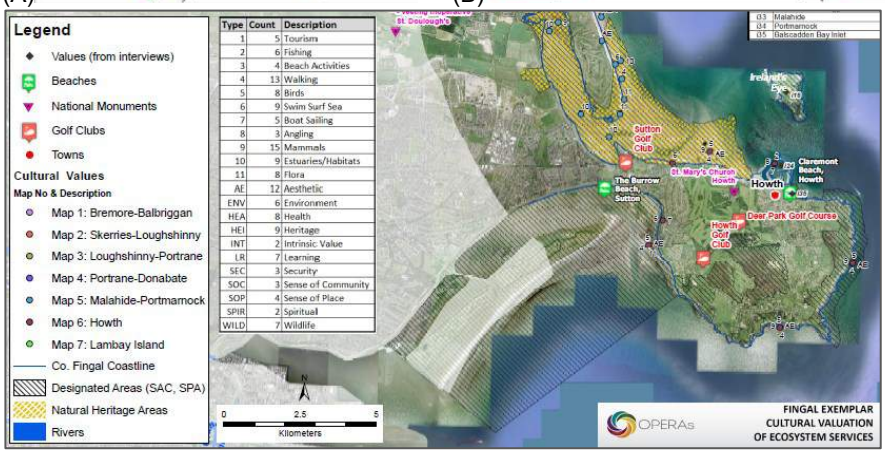


Fig 1.2: Map of social value for the Fingal Coastline.

Use of the results	The results of the study were presented to a cross-section of executives from Fingal Local Authority as part of a feedback and dissemination seminar. Representatives from various departments including spatial planning, natural heritage, water, parks and engineering and of the County Council attended. After the event, the councilor decided to propose amendments to the County Development Plan to take an ecosystem services approach, incorporating social valuation at the policy level. Guidelines on the process of social-cultural valuation are being devised for the local authority.
Contact	Deirdre Joyce (deirdre.joyce@ucdconnect.ie) and Craig Bullock (craig.bullock@ucd.ie), UCD, Dublin.
References and further sources	• Fingal study on OPPLA: http://www.oppla.eu/casestudy/139 • Fingal study on the OPERAs website: http://www.operas-project.eu/node/317 • Joyce, D., Bullock, C. 2016. Making Cultural Services Count in Policy and Decision Making. EU Ecosystem Services Partnership (ESP) Conference. Antwerp. Sept. 19-23, 2016. http://www.esconference2016.eu/86157/wiki/211589/book%20of%20abstracts#.WK2HrW-LTIU • Bullock, C., Joyce, D., Collier, M.J., Scholte, S., Zanten, B., Verburg. P., van Teeffelen, A., Schmidt, K., Walz, A. 2015. Strategies and methods for social valuation of ecosystem services. OPERAs Project Report. Deliverable 3.5. http://www.operas-project.eu/resources • Joyce, D., Bullock C., Collier, M.J. 2016. Social Valuation and its relevance for Land Use Planning. Dissemination and feedback session to Fingal Local Authority, Aug 2016. Dublin: http://operas-project.eu/node/317

(2) MEASURING SOCIAL VALUE

Exemplary case	Visitors appreciation at the Pentland Hills Regional Park, Scotland
Aim	Learning about user profiles and perceptions of ecosystems and ecosystem services
People Addressed	Visitors and users, interested public
Methods	Structured questionnaires via face-to-face interviews and online
Formats	Interviews (July-Aug 2014: 454) Online survey (Aug-Oct 2014: 109)

Source: Katja Schmidt

Exemplary results

The survey highlights the role of the Pentland Hills as a recreational asset for visitors mostly from Edinburgh and adjacent councils. Since 2006, the portfolio of activities has changed towards a broader range of activities, that include, e.g., mountain biking and running.

The socio-cultural valuation of ecosystem services was performed using a rating (importance on scale from 1-5) and ranking approach (allocate a total of 100 points across 9 ecosystem services). The rating exercise revealed fairly high values for all ecosystem services in general, and also showed that the values for the ecosystem services rated higher for societal needs in general ("others-oriented") than for the individual ("self-oriented") (Fig. 2.1A). The ranking exercise indicates particularly high values for physically using nature and the landscape (by walking, running, fishing, etc.), experiencing nature and habitat/biodiversity (Fig. 2.1B).

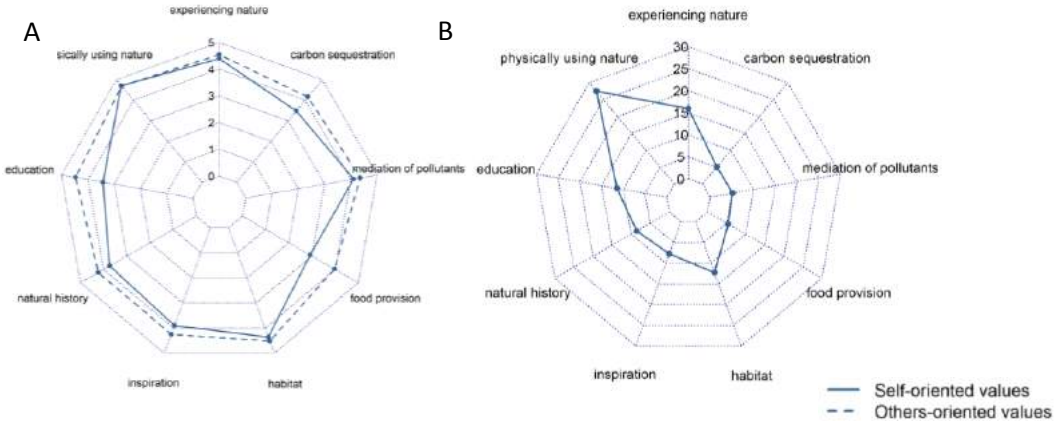


Fig. 2.1: Results of the socio-cultural valuation of ecosystem services in the Pentland Hills Regional Park, (A) Mean results of rating (scale 1-5) and (B) mean results of weighting (allocation of 100 points)

Use of the results

The survey results were shared between the multiple organs of the park management, including responsible decision-makers, land owners, and further stakeholder representatives.

They could demonstrate (1) the high overall appreciation of the park by users, (2) their appreciation of the park not only for recreational purposes, but also its regulating effects, and (3) the dynamics in park users, which underpins the need for appropriate infrastructure adaptation to avoid an increase in negative ecosystem impacts and user conflicts.

Contact

Katja Schmidt (schmikat@uni-potsdam.de) and Ariane Walz (awalz@uni-potsdam.de), Univ. of Potsdam, Germany.

References and further sources

- Pentland Hills study on the OPPLA: http://www.oppla.eu/casestudy/131
- LANDPREF tool on OPPLA: http://www.oppla.eu/product/218
- Schmidt, K., Sachse, R., Walz, A. 2015. Social valuation in the Pentland Hills: activities and first results. OPERAs Full Project Meeting. 10-12 March 2015, Dublin. https://www.youtube.com/watch?v=NhDrerKJMj8
- Schmidt, K., Jones, I., Metzger M.J.,& Walz A. 2016. The socio-cultural value of upland regions in the vicinity of cities in comparison with urban green spaces. Mountain Research and Development 36(4), 465-474.
- Schmidt, K., Müller C., Walz A. 2016. Use, appreciation and preferences for future development in the Pentland Hills Regional Park. Results of the user survey 2014. Online at www.pentlandhills.org

(3) UNDERSTAND UNDERLYING REASONING FOR SOCIAL VALUES

Source: www.weadapt.org

Exemplary case	Estuary restoration and conservation planning at the Inner Forth Estuary, Scotland
Aim	Understanding how people that live and work in the area value their landscape and the ecosystem services it provides.
People Addressed	Interested public and stakeholders
Methods	In-depth one-on-one interviews using the graphically supported STREAMLINE format, to engage in a two-way, interactive and thought provoking consultation.
Format	Interviews (Feb to June 2016: 22)
Exemplary results	Early results showed a great appreciation of the local landscape, in particular among participants from socially disadvantaged backgrounds. Especially cultural ecosystem services, such as the potential for recreation, are highly valued, alongside the natural environment's contribution to quality of living. The area's unlocked potential for (eco)tourism was highlighted by multiple stakeholders as an avenue for sustainable jobs creation to rejuvenate the waning industrial towns dotted throughout the region. Sustaining habitat and wildlife was cited as a key priority, along with jobs provision and flood protection.
Use of the results	Based on the gathered data a set of visions will be collated for the future of the area, which will be analyzed for common grounds, tensions, opportunities and threats. These in turn will feed into recommendations for a lottery funded regional development project, the Inner Forth Landscape Initiative, and will be presented to stakeholders at the Forth Estuary Forum annual conference. The results will also be published in report and an open access academic paper. Moreover, the project was able to show that the interactive STREAMLINE format served as a convenient methodology and was well received by the participants.
Contact	Aster de Vries Lentsch (aster.devrieslentsch@ed.ac.uk), Univ. of Edinburgh, Scotland
References and further sources	• Inner Forth Estuary study on Oppla: http://oppla.eu/casestudy/130 • More information about the format and methods: www.streamline-research.com • Inner Forth Landscape Initiative: http://www.innerforthlandscape.co.uk/ • Forth Estuary Forum: http://www.forthestuaryforum.co.uk/

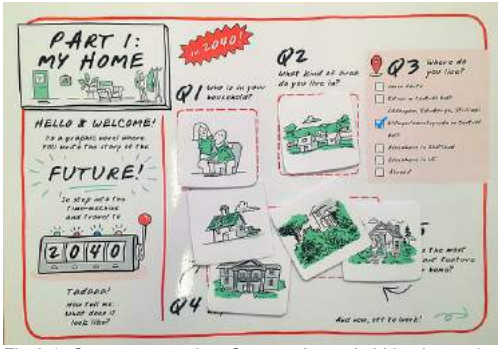


Fig 3.1: Canvas examples, Source: Aster de Vries Lentsch

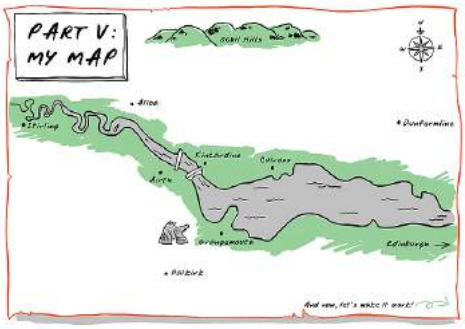


Fig 3.2: Canvas for the Inner Forth, Source: Aster de Vries Lentsch

(4A) IDENTIFY VISIONS FOR FUTURE LAND MANAGEMENT

Exemplary case	Future visions based on visitor survey for the Pentland Hills Regional Park
Aim	Assessment and visualization of landscape preferences
People Addressed	Visitors and users, interested public
Methods	Structured interviews, on-site (tablet-based) and online
Format	Interviews (July-Aug 2014: 454) Online survey (Aug-Oct 2014: 109)

Source: Katja Schmidt

Exemplary results

The visitors´ preferences for future management reveal that many visitors wish only for limited changes over the next 10 to 15 years. When looking more closely into preferences for future landscape management, we can identify five preference clusters. Almost 50 % of the respondents classify as “nature enthusiasts” supporting enhanced biodiversity and nature conservation while maintaining the great inspirational value of the park. Smaller clusters include the “forest enthusiasts” favouring an increase in native forest in parts of the Pentland Hills, the “recreation seekers” wishing for an enhanced recreational infrastructure, the “multi-functionalists” for whom the generation of wind energy would be acceptable to some degree, and the “traditionalists” who favour the current park management.

Fig. 4A.1: Identified preference clusters, Source: Schmidt et al. 2016

Use of the results

The topic of future landscape management directions was taken up amongst the park management and a superior authority. Additionally, a formal dialogue was initiated with land owners, and further stakeholder representatives. With the expected changes in the environmental and agricultural policy, social and climate change as well as financial constraints of the public sector, the future directions of park management are becoming a more and more relevant topic. After this impression of visitor perception, also the core management organs of the PHRP (i.e. the joint committee and the consultative forum) took up the discussion. A pilot study aiming towards developing a collaborative approach to land use and management was a first and promising opportunity to address this topic in the park.

Contact

Katja Schmidt (schmikat@uni-potsdam.de) and Ariane Walz (awalz@uni-potsdam.de), Univ. of Potsdam, Germany.

References and further sources

- Pentland Hills study on the OPPLA: http://www.oppla.eu/casestudy/131
- LANDPREF tool on OPPLA: http://www.oppla.eu/product/218
- Pentland Hills study in the OPERAs News blog: http://www.operas-project.eu/news-article/2014-08-04-000000
- Pentland Hills study in the OPERAs News blog: http://www.operas-project.eu/news-article/2015-12-10-131500
- Schmidt, K., Sachse, R., Walz, A. 2015. Social valuation in the Pentland Hills: activities and first results. OPERAs Full Project Meeting. 10-12 March 2015, Dublin. https://www.youtube.com/watch?v=NhDrerKJMj8
- Schmidt, K., Jones, I., Metzger M.J.,& Walz A. 2016. The socio-cultural value of upland regions in the vicinity of cities in comparison with urban green spaces. Mountain Research and Development 36(4), 465-474.
- Schmidt, K., Müller C., Walz A. 2016. Use, appreciation and preferences for future development in the Pentland Hills Regional Park. Results of the user survey 2014. Online at www.pentlandhills.org

(4B) IDENTIFY VISIONS FOR FUTURE LAND MANAGEMENT

Source: www.operas-project.eu

Exemplary case	Cultural Landscapes in the Montado, Portugal
Aim	(1) Identifying perceptions of benefits by different stakeholders at different scales (2) Understanding perceptions of present and future trends of the system, and (3) Identifying preferences in future Montado management
People Addressed	Land managers and owners, environmental NGO's representatives, municipalities, interested public
Methods	Participatory workshops (regional and local scales), Structured questionnaires for interviews including contingent valuation for scenario management preferences (local scale), Structured online questionnaire, with choice experiment on management preferences (national scale)
Formats	Workshops (April 2014, Dec 2015, April 2016, May 2016, June 2016) Interviews (Nov 2015-April 2016) Online survey (pilot in Aug 2016; full survey in Nov 2016)
Exemplary results	The results of the workshops and the surveys show that, both at the regional and the local scales, regulating and supporting ES are more valued by the stakeholders, followed by provisioning ES, while cultural ES were seldom selected as important. "Tree mortality" and "Severe drought" were the most plausible future scenarios for the Montado, according to stakeholders at the regional scale, emphasizing a decrease in of ES delivery in both scenarios.

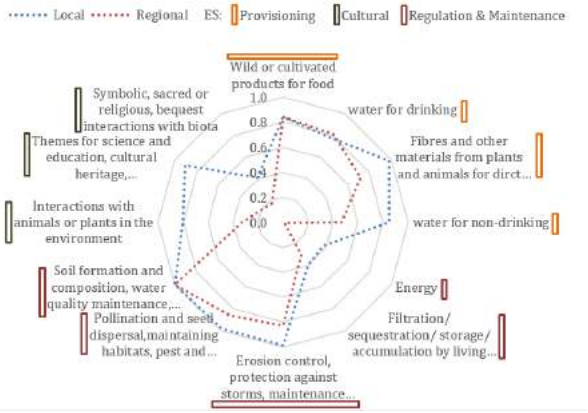


Fig 4B.1 Workshop results for ecosystem services (ES) valuation by the montado stakeholders at local and regional scales.

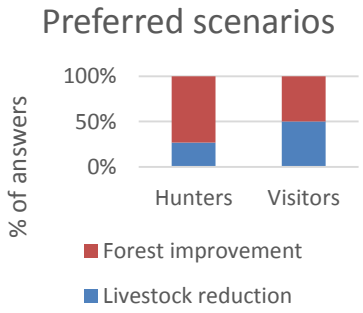


Fig 4B.2 Results for willingness to pay for different management scenarios at the local scale.

The survey also indicated that hunters and visitors do not show a high willingness to pay for different management scenarios. However, for those willing to pay, hunters showed preference for an improved forestry solution, while visitors didn't demonstrate a clear preference. At the national scale results are not yet available as data collection is still on-going.

Use of the results	With the current threats and drivers of change, the future of the Montado is at stake and it is a relevant issue for several sectors of the Portuguese society. Although the results of workshops have been shared between the participants, a final workshop is being prepared to disseminate and discuss the results across workshops. Other formats of results dissemination are being considered since stakeholders stated the importance of transferring this knowledge both to citizens and decision makers. The creation of a stakeholder platform for the montado (Montado Community of Practice) is a promising avenue to discuss and promote a sustainable management of the system.
Contact	Inês Rosário (itrosario@fc.ul.pt) and Margarida Santos-Reis (mmreis@fc.ul.pt) University of Lisbon, Portugal.
References and further sources	• Montado study on the OPPLA: http://www.oppla.eu/casestudy/136 • Video of Montado study on OPERAs website: http://www.operas-project.eu/node/319 • LTsER Montado platform: http://ltsermontado.pt • Video of one of the workshops https://www.youtube.com/watch?v=8BQwTro7lV • Vasconcelos, L., Rosário, I., Caser, U., Ferro, F., Rebelo, R., Máguas, C, Santos-Reis, M. 2016. Building a Community of Practice for the Portuguese "Montado" – Capacitating Collaborative Management. World Congress Silvo-Pastoral Systems, Évora. 27-30 September 2016 • Rosário, I.T., von Essen, M., Nicholas, K., Koetse, M., Máguas, C., Rebelo, R., Santos-Reis, M 2015. Valuing Ecosystem Services in the Montado Landscape: the OPERA's Project Approach. 4º Encontro Ibérico de Ecologia. Coimbra, 16-19 June 2015. •

(5A) IDENTIFY PREFERENCES AND ACCEPTED TRADE-OFFS BETWEEN DISTINCT MANAGEMENT OPTIONS

Exemplary case	Off-setting the impact of housing development in East Lothian, Scotland
Aim	Assessing to what extent people are willing to 'offset' the environmental impacts from urban development through woodland restoration in a rural to peri-urban environment.
People Addressed	Local rural and peri-urban residents
Methods	Choice experiment using housing as a cost attribute (i.e. without a monetary payment vehicle) based on structured face-to-face interviews

Source: www.iha.com

Format	Interviews (Oct 2014: 285)
Exemplary results	Results from the choice experiment show that respondents who felt most affected by additional housing (predominantly rural residents with long residence times) were least willing to accept woodland restoration as a way to compensate for the losses incurred by additional residential development. This is most likely because these residents do not only perceive additional housing as a threat to the landscape, but also as a threat to their own identity. The people who were most willing to make the trade-off between higher levels of housing with high levels of compensation and low levels of housing with no compensation, were respondents who thought that additional housing may have environmental impacts, but is also necessary to fulfil the increasing demand for housing. By also giving different options on possible woodland restoration, the restoration of broadleaved and softwood forests was seen as most valuable for preserving biodiversity and wildlife. Generally, the findings indicate that there is over- all support for the general idea of biodiversity offsets.

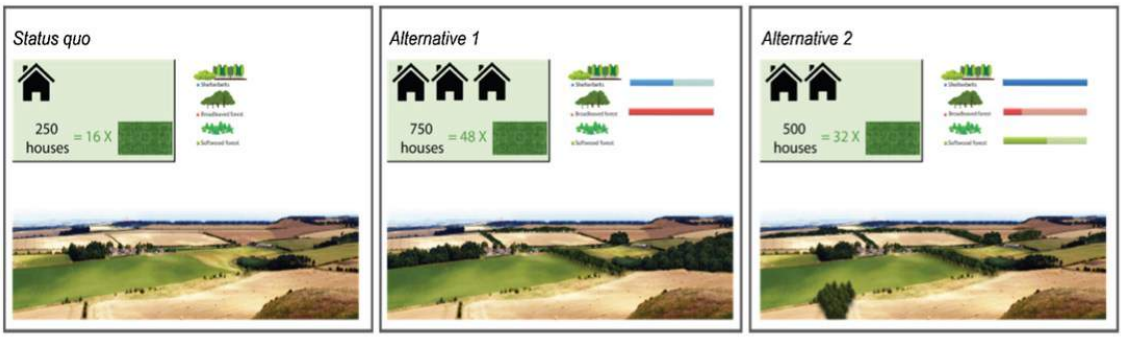


Fig. 5A.1: Choice card example, Source: Scholt, S.S.K. et al. 2016

Use of the results	The results show that any effort to achieve a 'no-net-loss' of ecosystem services (which is an explicit aim in the EU biodiversity strategy) should firstly begin by identifying: a.) who is affected by the proposed change, b.) how people are affected by the proposed change (e.g. in East Lothian recreation was not perceived to be threatened by additional housing, lowering the need to compensate for urban development by creating more space for nature-based recreation) c.)how those affected can and should be compensated.
Contact	Samatha Scholte (samantha.scholte@vu.nl) and Astrid van Teefelen (astrid.van.teeffelen@vu.nl), Vrije Universiteit Amsterdam, The Netherlands.
References ar further source	• East Lothian study on OPERAs website: http://www.operas-project.eu/sites/default/files/resources/astrid-ecosystem-services-offset-urban-development-east-lothian.pdf • Scholte, S.S.K., van Zanten, B.T., Verburg, P.H., van Teeffelen, A.J.A. 2016. Willingness to offset? Residents' perspectives on compensating impacts from urban development through woodland restoration. Land Use Policy, 58, 403-414. doi:10.1016/j.landusepol.2016.08.008.

(5B) IDENTIFY PREFERENCES AND ACCEPTED TRADE-OFFS BETWEEN DISTINCT MANAGEMENT OPTIONS

Source: OPERAs-project.eu

Exemplary case	Wetland management of Kaikusha Marsh, Persina Natural Park, Lower Danube, Bulgaria
Aim	Testing preferences of real-life management options for the Kaikusha marsh, including for instance, opportunistic reed removal coupled with economic use of the biomass, a three-year mosaic mowing cycle and business-as-usual
People Addressed	Stakeholders, such as fishermen, nature park management, farmers, and also non-expert local stakeholders
Methods	• Expert workshop to (1) elaborate management scenarios, (2) define a set of criteria for multiple impacts, and (3) quantify impacts of management scenarios based on earlier studies. • Face-to-face interviews with public based on a structured questionnaire to identify preferences in the criteria. • Formal analysis of the preferences in the multi-criteria analysis (using the mDSS tool)
Format	Workshop (May 2016: experts only) Face-to-face interviews (April-May 2016: 10 interviews)
Exemplary results	The results showed that the current management is unsatisfactory for all participants in the survey. The business-as-usual scenario with no reed removal which leads to desiccation of the marsh and consequent loss of economic value was consistently rated very low. Instead, stakeholder preferred some reed removal for better economic use of the marsh. The highest preferences were attributed to both management options including periodic mowing of selected sections of the marsh, either by opportunistic reed removal or as part of a regular mowing cycle.
Use of the results	The pilot study highlighted the consensus to change the management of the Kaikusha marsh and revealed explicitly the conflicting perspectives of different stakeholder groups. This provides the decision-makers the opportunity to deal with these conflicts more openly during the planning process. Multi-criteria analysis, here supported by the mDSS tool, was generally found very helpful to reveal and deal with conflicts in such planning processes.
Contact	Apostol Dyankov (adyankov@wwfdcp.bg), WWF Bulgaria, and George Cojocaru (gco@tiamasg.com), TIAMASG Foundation, Romania.
References and further sources	• Danube Study on OPPLA: http://oppla.eu/casestudy/133 • Danube Study on OPERAs website: http://www.operas-project.eu/node/322 • mDSS on OPPLA: http://oppla.eu/marketplace • Instructions and download of the mDSS: http://www.netsymod.eu/mdss/

OPTIONS:	Score:	%(relative to first position)	
Mosaic Mowing	0.7878		100%
Cleaning channels	0.7783		99%
Partial mowing	0.6961		88%
Opportunistic mowing	0.575		73%
In situ	0.4882		62%
BAU	0.3393		43%
Fire prevention	0.1661		21%

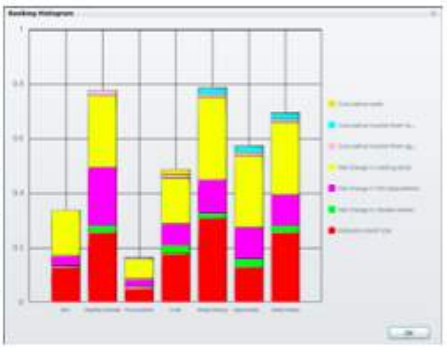


Fig 5B.1: Exemplary results of the mDSS software comparing management options.

(6) DEVELOP AND TEST FEASIBILITY OF ALTERNATIVE LAND MANAGEMENT

Exemplary case	French Alps: Land use and ecosystem services in the Grenoble Urban Area
Aim	(1) Co-constructing alternative future options for land planning and management (2) Co-evaluating their implications for nature conservation and ecosystem services depending on structured preferences
People Addressed	Local government, urban planners, nature conservation managers and NGOs, agriculture, forest and nature managers, tourism stakeholders
Methods	• Scenario development using a four-step participatory approach with scientists and stakeholders, and following translation to land use maps using modeling. • Selection of focus ecosystem services to by stakeholders with respect key management and land planning issues • Assessment of current and modeled future bundles of ecosystem services using multi-criteria analysis (MCA), with to by stakeholders criteria and assessment rules developed by stakeholders according to management priorities.
Survey period	Workshops (4 workshops between September 2013 and June 2016)
Exemplary results	The MCA demonstrated that multifunctionality cannot necessarily be achieved by ecological trade-offs, nor does it actually meet stakeholder goals and values, e.g. for nature conservation.
Use of the results	Land planners and managers will use the results to support debates on specific issues such as the multiple values of biodiversity corridors, rural development planning, or the design of biodiversity offsetting plans.
Contact	Sandra Lavorel (sandra.lavorel@univ-grenoble-alpes.fr), CNRS, Grenoble, France
References and further sources	• Grenoble Study on OPPLA: http://www.oppla.eu/casestudy/135 • Grenoble Study on OPERAs website: http://operas-project.eu/node/323 • Communication site of the Grenoble study in French: http://www.projet-esnet.org/ • One of the Workshops in the OPERAs News blog: http://www.operas-project.eu/news-article/2014-03-27-000000 • Bierry, A., Lavorel, S., 2016. Implication des parties prenantes d'un projet de territoire dans l'élaboration d'une recherche à visée opérationnelle. Sciences, Eaux & Territoires in press. • Lavorel, S., Bierry, A., Vannier, C., Crouzat, E., Lasseur, R., Byczek, C., Nettier, B., Cordonnier, T., Longaretti, P.-Y., Rolland, A., 2016. Scenarios and models of biodiversity and ecosystem services for land use planning, ScenNet: Scenarios and models of biodiversity and ecosystem services in support of policy, Montpellier, France. • Vannier, C., Bierry, A., Longaretti, P.-Y., Nettier, B., Cordonnier, T., Chauvin, C., Bertrand, N., Lasseur, R., Lavorel, S. In preparation. Co-constructing future land-use scenarios for the Grenoble region, France.

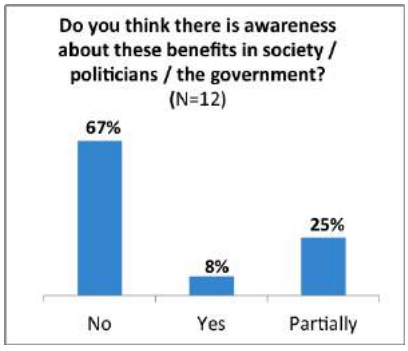
(7) IDENTIFY STAKEHOLDERS

Source: J Lascurain SGM

Exemplary case	Urban coastal dune and sand management for resilient beaches at Barcelona.
Aim	(1) Identification and clustering of the different stakeholder groups (2) Identification of underlying narratives and moral orders (3) Early identification of potential polarization risks by competing moral orders on trade-offs (4) Quantification of capacity of generating opinion trends (5) Identification of information gaps
People Addressed	Identification of affected members of the public, including not formally organized groups and relevant stakeholders
Methods	Mapping / counting visitors for beach stretches, social network analysis, social media listening & analytics, visual classification of images & videos, text analytics on blogs, comments on online news (tag clustering, word clouds, phrase nets, word trees)
Format	Observation Interviews Document and Media Analysis (2015-2017)
Exemplary results	 Fig 7.1: Key words could from social media  Fig 7.2: Revealed CES preferences for different beaches The social network analysis showed that the importance of various cultural ecosystem services (CES) differ between the beaches of Barcelona (see Fig 7.2). An analysis of the stakeholder interaction also revealed that there are big information gaps and strong differences in social media visibility among actors. Additionally, strong differences in the perception of environmental impacts and acceptable trade-offs can be identified. Social media listening is useful to identify CES preferences and its spatial variation as well as for early warning systems to avoid polarization and eco-chamber processes.
Use of the results	Building on the findings of the social network analysis, an alternative governance scheme is being discussed on the coastal defense scheme. It will probably be approved in 2017. Information gaps in the social networks were identified and led to new opportunities of use for social media to promote knowledge and solve trade-offs.
Contact	Josep Lascurain (lascurain@sgm.es), Consultora de Servicios Globales Medioambientales, Barcelona, Spain.
References and further sources	• Barcelona study on OPPLA: http://www.oppla.eu/node/17510 • Barcelona study on OPERAs website: http://www.operas-project.eu/node/318 • Link to Pinterest site http://ow.ly/g8K2309i4hD

(8) UNDERSTAND ACTOR BEHAVIOUR

Source: ww.opperas.eu

Exemplary case	Value and governance of Posidonia seagrass meadows for the Balearic Islands, Spain
Aim	(1) Better understanding of the perceptions of seagrass systems and why regulations to release pressures on seagrass meadows are not effective (2) Learn about perception of benefits provided by seagrass meadows of Posidonia amongst different actors (3) Identify perceived pressures on Posidonia amongst different actors seagrass meadows (4) Assess the governance system surrounding Posidonia
People addressed	Representatives of government, NGOs, recreational businesses, commercial and recreational fisheries, and the general public
Methods	Semi-structured face-to-face interviews
Formats	Interviews (perceptions: stakeholder representatives May-June 2015, general public March 2017; and on governance: April-June 2016)
Exemplary results	Results shows a ranking of the perceived importance of the different benefits derived from Posidonia and the pressures that degrade this ecosystem. Furthermore, results show the difference in awareness between the main stakeholder groups that are generally well informed and the general public who is mostly unaware of the role that Posidonia plays for society.  Fig 8.1: Exemplary interview result  Source: Manu San Félix Regarding governance, results reveal that stakeholders consider the amount of existing regulations to reduce pressure on Posidonia as sufficient. Yet, a simplification, application and enforcement of these regulations is needed. Interviewees consider that this will only happen through public awareness raising of the role of Posidonia.
Use of the results	The social valuation study identified considerable knowledge gaps among many stakeholders, including the public, as a crucial bottleneck in the implementation of existing regulations. Non-professional actors are not aware of the benefits seagrass meadows provide to society and how these serve private interests. Furthermore, people generally lack knowledge about existing regulations, and therefore do not comply with them. Informing and educating key actors and the public is therefore seen an effective way to better enforcement of regulations and release pressure on seagrass meadows. But even for professional stakeholders, such as commercial fishers and local authorities, the existing regulations turned out to be over-complicated and un-practical which hinders their enforcement even amongst the professionals.
Contact	Ana Ruiz (anaruiz@imedea.uib-csic.es) and Núria Marba (nmarba@imedea.uib-csic.es), IMEDEA, Illes Balears, Spain
References and further sources	• Balearic study on OPPLA: http://www.oppla.eu/casestudy/134 • Balearic study on OPERAs website: http://operas-project.eu/node/320 • Balearic study in the OPERAs News blog: http://www.operas-project.eu/Surfseagrassandsustainablesands • Ruiz-Frau, A., Gelrich, S., Hendriks, I.E., Duarte, C.M., Marbà, N. Under review. Seagrass Ecosystem Services: from buzzword to practice. Ecosystem Services. • Ruiz-Frau et al. In preparation. Socio-cultural valuation: how should we take it into account?

References

Balmford, A., Bruner, A., Cooper, P., Costanza, R., Farber, S., Green, R.; Jenkins, M., Jefferiss, P., Jessamay, V., Madden, J., Munro, K., Myers,N., Naeem, S., Paavola, J., Rayment, M., Rosendo, S., Roughgarden, J., Trumper, K.,Turner, R.K. 2002. Economic reasons for conserving wild nature. Science 297: 950-953.

Chan KM, Guerry AD, Balvanera P, Klain S, Satterfield T, Basurto X, Bostrom A, Chuenpagdee R, Gould R, Halpern BS, Hannahs N. 2012. Where are cultural and social in ecosystem services? A framework for constructive engagement. BioScience 62(8): 744-56.

De Groot, R.S., Wilson, A., Boumans, R.M.J. 2002. A typology for the classification, description and valuation of ecosystem functions, goods and services. Ecological Economics 41: 393-408.

De Groot, R.S., Alkemade, R., Braat, L., Hein, L., Willemen, L. 2009. Challenges in integrating the concept of ecosystem services and values in landscape planning, management and decision making. Ecological Complexity 7: 260-272.

Haines-Young, R.H., & Potschin, M.B. 2012. Common international classification of ecosystem services (CICES, Version 4.1). European Environment Agency, 33.

Haines-Young, R.H., Potschin, M.B. 2010. The links between biodiversity, ecosystem services and human well-being. In: Raffaelli, D. & C. Frid (eds.) Ecosystem Ecology: a new synthesis. Ecological Reviews Series, CUP, Cambridge: 110-139.

Hauck, J., Schweppe-Kraft, B., Albert, C., Görg, C., Jax, K., Jensen, R., Fürst, C., Meas, J., Ring, I., Hönigová, I., Burkhard, B., Mehring, M., Tiefenbach, M., Crunewald, K., Schwarzer, M., Meurer, J., Sommerhäuser, M., Priess, J.A., Schmidt, J., Grêt-Regamey, A. 2013. The Promise of the Ecosystem services Concept for Planning and Decision-Making. GAIA 22/4: 232-236.

Kenter, J.O., O'Brien, L., Hockley, N., Ravenscroft, N., Fazey, I., Irvine, K.N., Reed, M.S., Christie, M., Brady, E., Bryce, R., Church, A., Cooper, N., Davies, A., Evely, A., Everard, M., Fish, R., Fisher, J.A., Jobstvogt, N., Molloy, C., Orchard-Webb, J., Ranger, S., Ryan, M., Watson, V., Williams, S. 2015. What are shared and social values of ecosystems? Ecological Economics 111: 86-99.

Koetse, M., Agarwala, M., Bullock, C., ten Brink, P. (eds.) 2015. Monetary and Social Valuation: State of the Art. Deliverable 3.2 of the EU-FP7 project OPERAs. http://operas-project.eu/sites/default/files/resources/d-3.2-monetary-and-social-valuation-state-art.pdf

Liu, J., & Opdam, P. 2014. Valuing ecosystem services in community-based landscape planning: introducing a wellbeing-based approach. Landscape ecology, 29(8), 1347-1360.

Martín-Lopéz, B., Gómez-Baggethun, E., García-Llorente, M., Montes, C. 2013. Trade-offs across value-domains in ecosystem services assessment. Ecological Indicators 37: 220-228.

Millennium Ecosystem Assessment (MEA). 2005. Ecosystems and human well-being: Synthesis. Island Press, Washington, D.C..

Scholte, S.S.K., Todorova, M., van Teeffelen, A.J.A. 2016. Public support for wetland restoration: what is the link with ecosystem service values? Wetlands, 36(6): 467-481.

Reed, M. S. 2008. Stakeholder participation for environmental management: a literature review. Biological conservation, 141(10), 2417-2431.

Reed, M. S., Graves, A., Dandy, N., Posthumus, H., Hubacek, K., Morris, J., Prell C., Quinn, C. H. & Stringer, L. C. 2009. Who's in and why? A typology of stakeholder analysis methods for natural resource management. Journal of environmental management, 90(5), 1933-1949.

Appendix: Inventory of Methods

Workshop techniques			
Methodology	**Characteristics**	**Usage**	**Illustrated references**
Expert workshop	This workshop method is designed to gather the existing knowledge on a certain issue/case study. Respective experts are invited to present and discuss their experiences and focus towards a specific subject.	This method is used for the free exchange of information and to gather objective in-depth knowledge during the initiating process of a project. Additionally, it is useful to get an overview of the relevant stakeholders.	Fischer, A., Wentholt, M., Rowe, G. 2013. Expert involvement in policy development: A systematic review of current practice. Science and Public Policy, 41(3): 332-343.
Participatory workshop	The participatory workshop is open for a broad range of participants. This format seeks to create a supportive environment in which learning (on a specific subject) takes place. The moderator merely facilitates an open learning process by the exchange of ideas and experience between the participants. Additional expertise or experience from the moderator is not necessarily needed. To get the involvement of the participants, ample methods are available.	Participatory workshops are an interesting option to start an interaction with and between different stakeholder groups. It is an open process, where the participants are given the opportunity to learn from each other or get to know different perspectives. The workshop needs careful preparation to get meaningful and satisfactory results.	Chambers, R. 2002. Participatory Workshops: A Sourcebook of 21 Sets of Ideas and Activities. Earthscan. New York. Seedsforchange. Facilitating Participatory Workshops. https://we.riseup.net/assets/25682/FacilitatingWorkshops.pdf .
Focus groups	The timeframe of this group format is usually set between 45 - 90 minutes. The best group size is between 6 -10 participants. The process is led by a guided group discussion on a particular topic. It is structured through a set of carefully predetermined questions (not more than 10) with a free flowing discussion. The quality of results is highly sensitive to the individual planning and execution process. Here, for example, the group mix (e.g. age, sexes, social and professional backgrounds) should be considered, due to its influence on results.	The method uses group dynamics to generate information and a deeper understanding on collective views and participants' experiences or beliefs. It is also useful for preliminary data collection to prepare a follow-up questionnaire.	Kitzinger, J. 1995. Introducing focus groups. BMJ, volume 311: 299-302. Nagle, B, Williams, N. o.J. Methodology Brief: Introduction to Focus Groups. Center for Assessment, Planning & Accountability. Morgan, D. L. (1997). Focus groups as qualitative Research. In: Qualitative research methods series, 2. Edition.
Participatory Mapping	Participatory mapping is a group-based map-making process that attempts to visualize the association between land and local communities on a defined	The method is primarily used to represent a communities' priorities, needs and also knowledge in land-use planning and	International Fund for Agricultural Development / IFAD 2009. Good practices in participatory mapping.

	spatial scale. Participatory maps are planned around a common goal and strategy for use and are often made with the input from an entire community in an open and inclusive process. For this method, minimal intervention from moderator is required. For the mapping process there are also tools available, ranging from multimedia and internet-based mapping tools to GIS applications.	resource management. It is helpful to identify (spatial) conflicts and hotspots. The possibility, to articulate their situation is also beneficial for networking and communication to strengthen bonds and the solidarity among a community.	
Scenario Analysis	Scenario analysis is a systematic process where a set of four to five plausible and contrasting narratives of a future development is created. It is usually divided into five different phases: 1) identification of the scenario field, 2) identification of key factors, 3) analysis of key factors, 4) scenario generation, and if necessary 5) scenario transfer. The (often) opposing scenarios visualize consequential social, political, economic and technological impacts. The scenarios should be participatory process together with key decision-makers, experts and stakeholder representatives.	The scenario analysis is an effective tool to develop and analyse prospects of changes in ecosystem service provisioning and possible trade-offs. It augments the understanding of future effects on present decision-making. A visualization of possible outcomes helps therefore to minimize risks and provides a solid base for informed decisions and enhanced consensus.	Aplizar, F. and Boavarnick 2013. Targeted scenario analysis: a new approach to capturing and presenting ecosystem service values for decision making. UNDP. Kosow, H., Gaßner, R. 2008. Methods of future and scenario analysis: Overview, assessment and selection criteria DIE Studies 39. USB Köln. ValuES Method Database: http://aboutvalues.net/method_database/
Citizen juries	The process of citizen juries involves the creation of a “jury” with a representative sample of citizens (usually selected randomly or in stratified manner). They are briefed in detail on the respective background and current situation on a specific issue or project. The concerned issue will be one that affects the community. The “jury” then has to decide between a range of alternatives and present their decision as they would in legal juries.	Citizen juries as participatory processes involve the community in the decision-making process in a representative manner. They are intended to complement other forms of consultation, as the “evidence” (values, concerns, etc.) has to be gathered beforehand.	EPA 2017: Public Participation Guide: Citizen Juries. https://www.epa.gov/international-cooperation/public-participation-guide-citizen-juries

Interview techniques			
Methodology	**Characteristics**	**Usage**	**Illustrated references**
Structured interview	Structured interviews are verbally administered questionnaires with a list of predetermined questions. In this type of interview, there is no flexibility for variations or optional follow-up questions to responses.	The interviews are quick and easy to administer and are used for clarification of certain questions. However, this method only allows limited participant responses and is not suited for an in-depth interview format.	Taylor, S.J., Bogdan, R., DeValt, M. 2016. Introduction to Qualitative Research Methods: A Guidebook and Resource. 4th edition. Ney Jersey.
Semi-structured interview	Semi-structured interviews are composed of several prepared key questions to define the field of interest. In addition, they give the opportunity of flexible follow-up questions to pursue important insights, discoveries and allow therefore the elaboration of information.	The method is considered to be average in time-consuming. It is used to gather detailed personal insights of views, experiences, beliefs and motivations towards a specific subject. This leads to a deeper understanding of social phenomena than would be obtained from, e.g. a questionnaire. The method is especially appropriate when dealing with sensitive or problematic topics. Usually, the in-depth interview is composed of a semi-structured format.	Taylor, S.J., Bogdan, R., DeValt, M. 2016. Introduction to Qualitative Research Methods: A Guidebook and Resource. 4th edition. New Jersey.
Unstructured interview	Unstructured interviews are long-lasting formats which can last up to several hours. There are no preconceived theories or predetermined questions required. Nonetheless, it could start with an open question.	The method is highly time-consuming and especially useful for a significant in-depth approach for (sensitive) topics where detailed insights are required. It gives the opportunity to learn about totally new subject areas where little prior knowledge on the studied phenomenon is available. Still, for the researcher it is important to have a clear agenda for the inquiry.	Cohen D, Crabtree B. "Qualitative Research Guidelines Project." July 2006. http://www.qualres.org/HomeUnst-3630.html Gill, P., Stewart, K., Treasure, E., Chadwick, B. 2008: Methods of data collection in qualitative research: interviews and focus groups. British Dental Journal 204: 291-295.
STREAMLINE technique	The streamline method consists of a set of A3 canvasses and combination of image tiles, writing and storytelling, which allow an interactive approach to capture the interviewees' point of view. It combines the flexibility and depth of a semi-structured interview with the rigour of a structured session so rich data can be gathered in relatively little time.	Streamline's open and interactive format gives the interviewee the freedom to lead the interview towards his/her personal priorities. Therefore, the method is best used within a fixed frame on a specific case study (e.g. spatial planning or landscape scale conservation).	http://www.streamline-research.com/format De Vries Lentsch A & Metzger M. Forthcoming. Bonkers but Good" Introducing the STREAMLINE format. International Journal for Biodiversity and Ecosystem Services Management.

Survey techniques			
Methodology	**Characteristics**	**Usage**	**Illustrated references**
Structured Questionnaire	Questionnaires are based on predetermined questions and / or stated preferences. For a valid data collection and meaningful results, a representative sample size is required. Typically, questionnaires are delivered via post, e-mail, digital devises, handout or face-to-face interviews (see structured interview).	Questionnaires are quick and easy to administer and are used to establish the prevalence of a particular condition and to collect information on behaviour, beliefs or experiences. The method is useful to get targeted information about a specific topic. They are also used to elicit ranking or scoring parameters for a non-monetary value estimation.	Mathers, N., Fox, N., Hunn, A. 2009: Surveys and Questionnaires. National Institute for Health Research. Joffe, M. 1992. Validity of Exposure Data derived from a structured Questionnaire. American Journal of Epidemology 135: 564-571.
Choice experiment	In a choice experiment, the participant is presented with a choice set, consisting of two or more alternative representations of a certain good or situation, which are tabularly displayed. Following Lancaster's theory, value choice experiments are built on the assumption that individuals obtain benefits from certain characteristics of a good, i.e. attributes, rather than the good itself.	The method is used to derive with concrete results that consist of the preferred participants' choice. Hence, it can give direct courses of action and decisions. Through this approach, a high external validity can be covered. On the other hand, concrete viable options of the have to be in existence.	Lancaster, K.J. 1966. A new approach to consumer theory. The Journal of Political Economy 74:132-157. Auspurg, K., Liebe, U. Choice-experiments and the measurement of behavioural decisions in sociology. Köln Z Soziol 63: 301-314.
Rating methods	With the rating method, respondents rate each value on a scale of importance. The scale can individually be generated according to the necessities.	A rating method is especially suited for measuring the personal values of respondents, because it yields data that are amenable to parametric statistical analyses. Compared to ranking methods, it is easier to administer and also practicable over telephone.	McCarty, J.A., Shrum, L.J. 2000: The Measurement of personal values in survey research: a test of alternative rating procedures. The public Opinion Quarterly 64: 271-298.
Ranking method	With a ranking technique, the respondent is asked to compare options to each other by placing them in order of preference. For optimal results, there should not be significantly more options than five. Later, the average ranking for each option can be calculated.	Ranking approaches are also suitable for measuring peoples' perceptions. In contrast to rating methods, the respondents are presented with different choices, which automatically provides and visualises a relationship between the different options.	Alwin, D.F., Krosnick, J.A. 1985. The measurement of values in surveys: a comparison of ratings and rankings. Public Opinion Quarterly 49: 535.552.
Delphi Method	The Delphi technique is designed as an expert group communication process that aims at conducting detailed discussions of a specific issue. Through	The Delphi method is well suited as a means for consensus-building as this method allows the participants to reassess	Hsu, C.C., Sandford, B.A. 2007: The Delphi Technique: making sense of consensus. Practical Assessment,

	adjusted questionnaires the method allows an open number of controlled feedback rounds. The number of respondents depends on the topic, as it should represent all judgements regarding the target issue.	their initial judgments about the information provided in previous iterations. From the planning perspective, this open-end approach can be more time-consuming than other methods.	Research & Evaluation: 12/10.
Q-methodology	Participants of the Q-methodology are asked to decide what is meaningful and significant from their perspective. The technique is called Q-sort and presents the people with a broad range of standpoints/statements towards a specific topic which they then have to sort according to their personal priority. The statements are generated from prior research or interviews. The sorting of previously gained statements reveal the individual subjectivity as the so called Q-grid leads the participants to decide on a scale of consent (e.g. between -5 to +5). The participants' Q-sorts are then correlated and factor-analysed.	The method is specifically designed to express the participant's subjectivity, their collective means but also subtle differences. In the planning process, sufficient time for statement preparation has to be included. For conducting such a research a manual and a free program for the factor analysis is available on the Q Methodology Website.	Watts, S., Stenner, P. 2005: Doing Q methodology: theory, method and interpretation. Qualitative Research in Psychology 2: 67-91. Coogan, J., Herrington, N. 2011: research in secondary teacher education, Vol. ½: 24-28. Q Methodology: https://qmethod.org/

Document and media analysis			
Methodology	**Characteristics**	**Usage**	**Illustrated references**
Social media analytics	As social media is a predominant communication platform, lots of valuable information can be derived. Social media analytics consist of informatics tools to collect, monitor, analyse, summarize and visualize social media data. There are three main methods: - Text analytics: content and opinion analysis to draws comprehensive and replicable conclusions out of large datasets - Social network analysis: analyses the relationship between different actors, e.g. organisations, NGOs, states to identify key user and option leader. - Trend analysis: identifies and forecasts new themes and trends in social networks. With different available tools systematic results can be derived.	Social media analytics target the challenge to analyse the high quantity of user-generated content to gain meaningful insights into the diffusion of information, opinions and sentiments as well as emergent issues and trends (towards certain areas of interest). It therefore can support the targeted decision making process as it displays social perception and importance of the targeted subject.	Stieglitz, S. Dang-Xuan, L. 2013. Social media and political communication: a social media analytics framework. Soc. Netw. Anal. Min. 3: 1277-1291. Stieglitz S, Dang-Xuan L, Bruns A, Neuberger C 2014. Social Media Analytics. An Interdisciplinary Approach and Its Implications for Information Systems. Bus Inf Syst Eng. doi:10.1007/s12599-014-0315-7.
Visual classification	Visual classification is a general term for the visualization of data mining results in general or social media evaluation. Here, different diagrams, images or videos can be created. Some common visualization methods are decision trees, tag clouds, diagrams etc..	As classification is one of the major tasks of data mining, appropriate visualization is essential for a comprehensive representation.	Ankererst, M., Elsen, C., Ester, M., Kriegel, H.P. 1999. Visual classification: an interactive approach to decision tree construction. KDD ’99: 392-396.

Additional analytical techniques			
Methodology	**Characteristics**	**Usage**	**Illustrated references**
mDSS software	The mDSS software is a generic indicator-based Decision Support System (DSS) developed to assist decision makers in the participatory management of environmental problems by applying several Multi-Criteria Analysis Methods and Group Decision Making.	Specifically, it supports decision and policy makers in instances where there are choices to be made between alternative options for environmental management with the involvement of multiple actors. Moreover, this methodology facilitates the integration of environmental, social and economic concerns to express preferences in terms of options sustainability with consideration of alternative exogenous scenarios drivers.	OPPLA marketplace: http://oppla.eu/marketplace?p_p_id=marketplace_WAR_OpplaGCMportlet&p_p_lifecycle=0&p_p_state=normal&p_p_mode=view&p_p_col_id=column-1&p_p_col_count=1&_marketplace_WAR_OpplaGCMportlet_mvcPath=%2Fhtml%2Fmarketplace%2Fshow_product.jsp&_marketplace_WAR_OpplaGCMportlet_productId=1
Multi-Criteria Analysis (MCA) / Multi-Criteria Decision Analysis (MCDA)	Multi-Criteria Decision Analysis (MCDA) and the Multi-Criteria analysis (MCA) are methods of research and decision making analysis. The terms describe any structured approach used to determine overall preferences among alternative options. In MCA /MCDA, desirable objectives are specified and corresponding attributes or indicators are identified. The actual measurement of indicators need not be in monetary terms, but are often based on the quantitative analysis (through scoring, ranking and weighting) of a wide range of qualitative impact categories and criteria. The criteria to be used for evaluation can cover economic as well as social and ecologic aspects. There is a wide range of MCA/MCDA tools available.	The Multi-Criteria methods offer the possibility to integrate economic and non-economic aspects, which cannot be quantified (or are difficult to be quantified) in monetary terms. This is particularly applicable to complex problems where single-criterion approaches (such as cost-benefit analysis) fall short, especially where significant environmental and social impacts cannot be assigned with monetary values.	Department for Communities and Local Government 2009. Multi-criteria analysis: a manual. London. http://eprints.lse.ac.uk/12761/1/Multi-criteria_Analysis.pdf Velasquez, M., Hester, P.T. 2013. An analysis of multi-criteria decision making methods. International Journal of Operations Research 10/2: 56-66.

Attachment 5

Creating Space, Aligning Motivations, and Building Trust: Key Elements of Stakeholder Engagement in 12 Ecosystem Services Case Studies

Guidance Document

OPERAs

Creating Space, Aligning Motivations, and Building Trust: Key Elements of Stakeholder Engagement in 12 Ecosystem Services Case Studies

Heather Schoonover, Adrienne Grêt-Regamey, Samantha Scholte, Ariane Walz, and Kimberly Nicholas, with contributions from all OPERAs case study researchers

ABSTRACT

Ecosystem services inherently involve people whose values help define the benefits of nature's service. Therefore, it is important to involve stakeholders in ecosystem services research. However, a broad framework to guide such engagement has not been well explored, particularly from a researcher's perspective. Here we use experience from the 12 case studies in the pan-European Operational Potential of Ecosystem Research Applications (OPERAs) project to propose a stakeholder engagement framework comprising three key elements important to consider before getting to specific details such as who to involve and how to involve them: space, motivation and trust. Involving stakeholders in research demands thoughtful reflection from the researchers about what kind of space they want to create, and what will best meet the needs of the stakeholders. In addition, understanding their own motivations, as well as what motivates stakeholders, will help researchers decide when and how to involve stakeholders, identify areas of common ground and potential disagreement, frame the project appropriately, set expectations, and ensure each is able to see benefits of engaging with each other. Finally, as with any relationship, building relationships with stakeholders can be difficult but considering the roles of existing relationships, time, approach, reputation and belonging can help build mutual trust. Although the three key elements and the paths between them can play out differently depending on the particular research project, we suggest that a research design that considers how to create the space in which researchers and stakeholders will meet, aligns motivations between researchers and stakeholders, and builds mutual trust will help foster productive researcher-stakeholder relationships. Our hope is that the insights from this paper will be used in practice by academics looking to meaningfully engage stakeholders in ecosystem services research.

INTRODUCTION

In order to meet sustainability challenges, researchers from different disciplines need to collaborate both with each other and with practitioners and other stakeholders to develop solutions (Future Earth, 2014). Such collaboration promises to increase legitimacy, ownership, and accountability for the problem as well as for the solution options (Lang et al., 2012). While the number of publications on collaborative approaches between and among academics and non-academics has exponentially increased (Zscheischler and Rogga, 2015), such collaborative

settings have also been increasingly expected from environmental research (Küffer and Hirsch Hadorn, 2008).

The reasons for engaging stakeholders in research are many, including gaining knowledge from those most deeply connected to a particular resource, issue or community; achieving buy-in by those most likely to be affected by the research results, and building stronger connections between science, policy and society (Durham, Baker, Smith, Moore & Morgan, 2014). Truly collaborative, transdisciplinary settings seek towards solving true societal problems (Durham at al., 2014) with a strong integration of knowledge from various scientific and societal bodies of knowledge (Lang et al., 2012). The degree of stakeholder integration in these processes can vary depending on the purpose of the collaboration, from low (participatory, multidisciplinary), to fully integrated (interdisciplinary, transdisciplinary), (Tress et al., 2005), with new frameworks involving stakeholders at varying strengths in the process of co-designing, co-producing and co-disseminating knowledge (Mauser et al., 2013).

The need to engage stakeholders in research is particularly true for ecosystem services research, as what can be considered as an ecosystem service inherently involves the perceptions, needs, and values of the people who make use of and/or depend on the ecosystem. The identification of ecosystem services is therefore dependent on the careful assessment of which ecosystem structures and processes contribute to a population's needs and desires (Harrington et al., 2010; Hauck, Go, Varjopuro, Ratama, & Jax, 2012; Spangenberg, Görg, & Settele, 2015). As such, the identification of ecosystem services should go hand in hand with the identification of the stakeholders who rely on and appreciate these services. Yet, many ecosystem service projects are driven by biophysical data and experts, who act as 'superior referees' and in a preliminary stage identify which ecosystem services are relevant to be studied (Spangenberg et al., 2015). Reviewing local to regional ecosystem service case studies, Seppelt et al, (2011) showed that only 39% of the included publications reported some form of stakeholder involvement. Menzel & Teng (2009) warn that current ecosystem service projects 'do not effectively include people's actual values and needs and run the risk of being irrelevant for policy' (p. 908). If we are to integrate insights from ecosystem service research with environmental policy and practice, a better engagement of stakeholders – throughout different stages of the research project – is invaluable.

Although much has been written about the importance of engaging stakeholders and at least one "how-to" guide exists that suggests specific details of how to do so in research (Durham et al., 2014), what is missing is a level of "general principles" that help can provide a common framework to guide the logic and motivation behind such engagement. In other words, what are the key elements that ecosystem services researchers should consider to better understand their goals and motivations for engaging stakeholders and shape their overall approach, before jumping to details such as who to involve or how to involve them? To answer this question, we conducted interviews and focus groups with the scientific experts leading 12 ecosystem services case studies, reflect on their stakeholder engagement processes thus far, and suggest, from the

perspective of the researcher, key elements researchers should consider to set them up for effective stakeholder engagement.

METHODS

Case description

We conducted this research within the pan-European Operational Potential of Ecosystem Research Applications (OPERAs) project. OPERAs aims to better integrate ecosystem services into EU policy and practice and includes 12 ecosystem services research case studies across different scales, geographies and ecosystems that are working with stakeholders to better measure and manage ecosystem services (Table 1). The 12 case studies have all engaged stakeholders to various degrees, and with varying amounts of challenge and success. They thus provide an excellent opportunity through which to explore the nitty-gritty, “behind the scenes” aspects of how stakeholder engagement actually plays out – and what researchers wish they would have known before starting the process.

Table 1: The 12 case studies in the OPERAs pan-European ecosystem services research project.

Case Study Region	Project Title	Objective
Balearic	Co-beneficiary management of marine/coastal ecosystems for Blue Carbon on the Balearic Islands	To assess the co-beneficiary management of seagrass ecosystems for blue carbon in the Balearic Islands in order to develop strategies for mitigation of CO2 emissions through conservation of coastal marine ecosystems.
Barcelona	Barcelona's hybrid dunes	To learn to construct and maintain dunes on urban beaches to optimize the flows of ecosystem services such as protection against sea level rise, and to learn how to shape social attitudes to make intensive recreational use of beaches compatible with the protection of the dunes.
Danube	Trans-boundary river and wetland management of the Lower Danube	To identify and raise awareness of the societal, economic, and environmental values of wetlands, and to explore the relationship between restored and sustainably-managed wetlands and socio-economic welfare to inform decision-making in the Danube river basin.
Dublin	Urban-rural fringe of the Greater Dublin region	To research the expression of cultural ecosystem services values in a coastal setting, and to consider the contribution of ecosystem services approaches to consultation within land use planning.
European	Land-based EU policy and ecosystem services in Europe	To evaluate how recent and forthcoming EU policy developments affect the levels of ecosystem services and natural capital in Europe.
French Alps	Land use and ecosystem services in the Grenoble Urban Area	To analyse future land use trajectories and their effects on networks of biodiversity and ecosystem services in the Grenoble urban area, in order to inform territorial planning and management.
Global	Global scale prediction of ecosystem services to inform international policy	To use the ecosystem services concept to identify and communicate geographic areas and management solutions that support the multiple goals of biodiversity conservation, climate change mitigation, and feeding an increasing global population.
Mediterranean	Circum-Mediterranean agricultural land abandonment	To assess how changes in the way farmers manage their land in the Mediterranean can lead to changes in human wellbeing, both now and in the future.
Montado	Conservation of cultural landscapes in the region of Montado in Portugal	To employ the ecosystem services and natural capital concepts to combine the productive, ecological, and cultural aspects of socio-ecological systems in order to promote improved management of cork trees and help facilitate the wellbeing of the Montado for generations to come.
Scottish	Multi-scale implementation of environmental policy in Scotland	To match the needs of land use management and biodiversity policy in Scotland by contributing to the science, information, and assessment methods necessary to support policy implementation.
Swiss Alps	Matching regional supply of and demand for mountain ecosystem services	To answer the question: Which policy strategies can balance the supply of and demand for mountain ecosystem services in the future?
Wine	Translating from consumer values to environmental structures and functions	To understand how different players in the wine value chain (producers, retailers, consumers) influence wine production, and thus the ecosystem services provided by vineyard ecosystems, and to promote more sustainable vineyard management to increase ecosystem services.

Study design

To understand the key elements of stakeholder engagement in ecosystem services research, we asked the researchers leading each of the 12 case studies questions about the following five aspects of the stakeholder engagement process from start to present:

- Stakeholder identification
- Timing of stakeholder involvement
- Methods of stakeholder involvement
- Nature of stakeholder relationships
- Inter-stakeholder interactions

Case study leads were first asked to fill out a short email survey (Appendix 1), after which they were individually interviewed (Appendix 2) either in person or via video-conferencing. Both the survey and the interview questions addressed the same five factors. The survey was aimed at gathering background information and thus asked about the "how" – e.g., "How did you identify stakeholders?" The interviews sought to gain insight into how successful the researchers felt the different aspects of the process were and thus focused on the "how well?" – e.g., "Do you feel that your method of stakeholder engagement worked for you? Was there anything you would have done differently?"

Additional context was provided during two working sessions in which the researchers discussed the key questions that they thought an analysis of stakeholder engagement within ecosystem services research should address, and reflected upon their experiences with stakeholder engagement thus far, as well as through materials such as project reports and websites in which the case study leads have previously discussed their work with stakeholder engagement.

Many of the interview responses pointed to factors broader than the specific topics the interview questions addressed. Thus, a qualitative content analysis of the interview responses was performed to determine groupings and themes. This was done by first capturing individual responses and grouping those that addressed similar topics. We identified these groups as the "components" of stakeholder engagement. The components were then further sorted into higher-level themes, which we identified as the "key elements" of stakeholder engagement.

The initial findings were presented to a group of ecosystem services stakeholders from policy, government, and business for feedback on whether the components and key elements we identified resonated with them. The components were also presented to a group of Lund University researchers, PhD and masters students, who were asked to do their own qualitative analysis to group them into key elements. Based on both groups' feedback, the components and key elements were revised.

RESULTS

We identified 12 components of stakeholder engagement, which were further grouped into three key elements – space, motivation, and trust – comprising 3-5 components each (Table 2).

Table 2: Three key elements and their constituent 12 components of stakeholder engagement in ecosystem services research, identified via qualitative analysis of interview responses from researchers leading 12 ecosystem services research case studies. The "Description" category indicates the topics that comprise each component. The "Considerations" column illustrates different ways, both positive and negative, that the components can play out depending on the context of the project, and is addressed in the Discussion section.

Key Element	Components	Description	Considerations
SPACE	Convening	Project such as OPERAs serve as means to bring together stakeholders who may not otherwise interact, and/or allow them to get to know each other	+ Good opportunity to build trust between stakeholders
			- Can lead to conflicts
	Conduit	One actor, such as an NGO, can serve as a go-between for actors that wouldn't otherwise interact	+ Can be beneficial to increase lines of communication and build understanding
			- Adds an additional layer between actors
	Critical Space	Need for space for critical reflection (e.g., on problem definition, conflicts between stakeholders, etc.)	+ Lets stakeholders' concerns be heard and can give them confidence they're being listened to
			- Can sidetrack project
MOTIVATION	Values	What some stakeholders value might differ from what researchers or other stakeholders value	+ Understanding what stakeholders value can help align motivations
			- Can be difficult if values differ from researchers' and/or between stakeholders
	Framing	Stakeholders may not understand the *term* ecosystem services, but intuitively understand the idea behind it	+ Approaching projects in ways stakeholders can relate to can lead to greater understanding
			- May stray too far away from ecosystem services, for researchers' tastes
	Goals	Stakeholders and researchers may have different expectations for involvement or influence in a project	+ Stating clear goals can help set expectations
			- May lead to chicken-and-egg situation, where researchers want to shape project to meet stakeholders' needs, but stakeholders first want to know what researchers can offer
	Benefits	Stakeholders often don't see what they'll get out of participating in a project or why they should stay involved long-term	+ Ensuring stakeholders see some benefit to participating can help attract and retain them
			- Desired benefits may differ between stakeholders
TRUST	Existing Relationships	Researchers often build on existing relationships and networks or select stakeholders they already know	+ May already have trust and buy-in
			- Could raise questions about representativeness of stakeholders and/or lead to stakeholder burnout
	Time	Relationships take time to build	+ Can be worthwhile to take the time to build relationships and networks
			- Time constraints may hinder the ability to build strong relationships
	Approach	Method of engagement depends in part on researchers' desired duration and level of stakeholder engagement	+ In-person methods can be good for deeper engagements
			- In person methods can be difficult given scale and time constraints
	Reputation	One individual can play an important role in project's start and/or success	+ A key person can be good for making connections and attracting stakeholders
			- Can backfire if not the right person
	Belonging	Researchers can be seen as outside the community	+ Researchers could potentially be seen as an objective third party
			- Can make it difficult to be accepted by stakeholders

Space

The first key element that emerged from our interviews with the case study leads was the importance of **space**. The very existence of an ecosystem services research project creates a space – both conceptual and physical – in which to bring together different people, viewpoints and disciplines, and to foster relationships and communications that might otherwise be missing or contentious. We identified the components of space as *convening, conduit*, and *critical space*.

Many case study leads found their projects to be a means to *convene* stakeholders who would not otherwise interact with each other – such as local and national stakeholders in the Danube case study. The Dublin case study lead similarly found that "the process brought together strange bedfellows, which facilitated the social learning and sharing of knowledge across the group."

Not all stakeholder gatherings are without contention, which led to discussion of the role of particular groups or organizations serving as *conduits*. For example, the Danube case study lead mentioned that their organization, as an NGO, is often a go-between for different groups:

> "We've had some issues with different groups not listening to each other (for example, farmers versus landowners, or residents thinking that scientists are from another world) but different groups can act as a neutral third party. For example, scientists can talk to an NGO and residents will talk to an NGO so the NGO becomes a conduit. Similarly, scientists can talk with both farmers and landowners even though the farmers and landowners may not talk to each other."

Case study leads also discussed the importance of having a space for *critical* discussion, either about stakeholders' different goals and agendas or about the concept of ecosystem services itself, In the Dublin case study, "Stakeholders did have strong and different concerns, but saw the project workshops as a way to air their concerns and appreciated that someone cared what they had to say. The stakeholders saw conflict as OK." The Scottish case study lead observed, "There has to be a place for critical assessment and criticism. Not everyone likes the ecosystem services concept. For some, it's about better resource management, not just about ecosystem services. Acknowledging this and providing a space for critical discussion opened the floor wider."

Motivation

Another key element that emerged from our interviews was that stakeholders need to have some intrinsic **motivation** for wanting to get and stay involved in a project and, relatedly, that their involvement is more likely if they see that the project addresses something they care about. We identified the components of motivation as *values, framing, goals*, and *benefits*.

A number of case study leads mentioned the importance – and challenges – of understanding what stakeholders *value* and adapting research approaches to those values. Inherent in this was the recognition that these values often differ between stakeholders, as well as between stakeholders and researchers. For example, as the Barcelona case study lead found, “Community residents may care about sand dunes more for flood protection than biodiversity. The researchers’ goal of building and protecting dunes to conserve biodiversity can still be accomplished, but we may need to change what benefits to emphasize so they resonate with residents.”

Understanding values helped researchers *frame* the work in terms to which stakeholders can relate. In many cases the term “ecosystem services” did not resonate with stakeholders even though they intuitively understood the concept. For example, the Swiss Alps case study lead found that “residents intuitively get ecosystem services but not if you use that word. You have to connect it to their reality – e.g. you’re benefiting from this thing, this is your ecosystem service.” The Wine case study had the most success engaging a leading wine retailer when the researchers were able to speak the “language of business” and frame their discussions using terms reflected in the retailer’s own sustainability-related publications.

Differences in values and the importance of framing also led to discussion of *goals* – particularly the importance of determining what the researchers’ goals are and when and how much they may be determined or influenced by the stakeholders, which can help set appropriate expectations. The Wine case study struggled with a chicken-and-egg situation in that “the research partners were eager to meet the needs of stakeholders, but stakeholders seemed to want a clear idea of what research could offer them before they decided to engage.” The French Alps case study “made changes along the way based on stakeholder input to ensure we produced research for them.” On the other hand, the Global case study, which builds on models whose parameters and inputs were largely defined, had less of a role for stakeholders in influencing the research direction.

Many case study leads referenced struggles to keep stakeholders engaged, noting that stakeholders are often asked to give a lot of themselves and thus need to understand what *benefits* they will get out of participating in a research project to maintain their engagement. The Montado case study lead found that “the most difficult thing is getting people to workshops. Either they don't know what they'll get out of it or they’re burned out because they get called for lots of different workshops and often don't see any results or feedback after the workshops.”

Trust

The third key element that emerged from our interviews was that of building **trust** between researchers and stakeholders. We identified the components of trust to include *existing relationships, time, approach, reputation* and *belonging*.

Many of the case study leads mentioned that they benefitted from having pre-existing relationships with their stakeholders. In the Swiss Alps case study, “We could profit from a parallel project in which the coordinator and the principal investigator have been in touch with these people and been working in the study region for years. We believe that this continuity is one of the success factors of stakeholder engagement in our project." The European case study lead similarly found that “knowing the people was a great advantage for getting them to participate – without this, we would not have gotten this high-level group together.”

Relatedly, many case study leads referenced the *time* it takes to build relationships. The French Alps case study lead reflected, “The important thing is to build the network; once you have this, you can go to them with other projects and questions. We have spent a lot of time building relationships and as a result have had the same people involved since the beginning. It is very time consuming but worthwhile.”

The *approach* to building relationships with stakeholders was also identified as important, namely the importance of tailoring the approach to the desired level and duration of stakeholder engagement. A number of case study leads talked about the importance of meeting people in person, particularly if they were seeking deeper or longer-term engagement. The Scottish case study leads built an entire community of practice for ecosystem services work beyond just their OPERAs project before even developing their project ideas, the result of which is “we now have a pool of stakeholders who trust us and will come to us.”

Many case study leads discussed the important role of a key person or organization whose *reputation* can help make or break a project. The Mediterranean case study lead “had a strong relationship with one key contact (an agronomist), who has helped us be able to build out a group with strong relationships.” The lead for the Barcelona case study had a strong track record of success, having won an international prize for a previous project, which helped the current project go forward, in part because “it was seen as low risk; you can bet on a person who has done a good project.” The Balearic case study lead was “surprised at how willing people with whom we didn’t have a previous relationship were to engage” and reflected that it could have been in part because the researchers are part of a well-respected research institution.

Relatedly, several case study leads talked about the importance of being perceived as belonging to the local community. In the Swiss Alps case study, “We did in-person surveys using students born in the same area with the same dialect, which worked very well. Also, our first workshop had a researcher with close connections to the area and the people, which attracted a lot of attendees.” The Wine case study lacked this, with the case study lead reflecting, “I felt I was viewed a bit suspiciously as an outsider. It was hard to explain that I was from California, now based in Sweden, and wanting to study English wine.” However, both the Scottish and Montado case study leads saw ways to overcome this, with the latter noting, “since the goal of our project is to help

influence management decisions at the farm level, approaching stakeholders with the support of the landowner or land manager may be worthwhile."

DISCUSSION

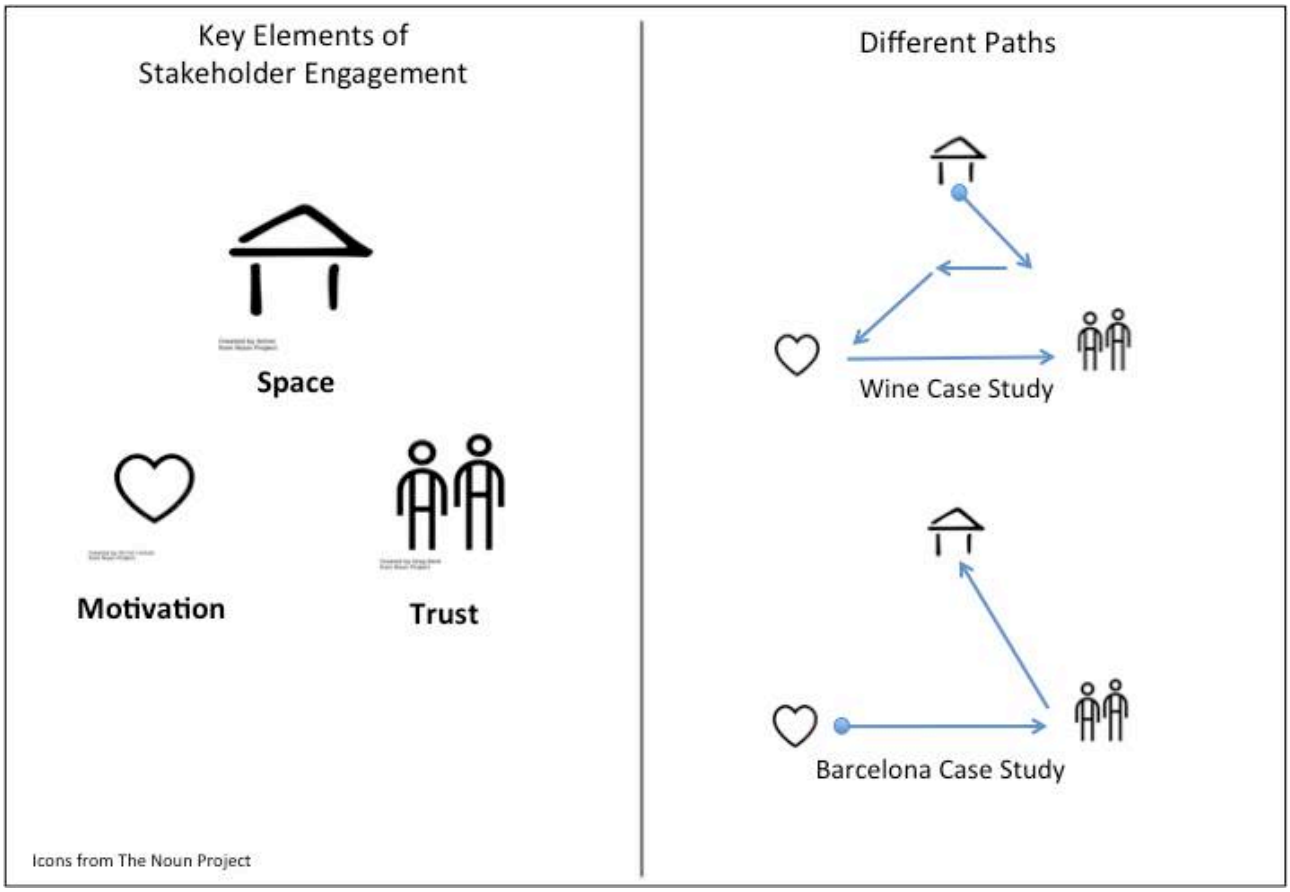
From the interview responses it became clear that many of the experiences researchers had with particular aspects of stakeholder engagement stemmed from other, bigger-picture factors. For example, when asked whether they felt a chosen method of engagement such as a workshop was successful, researchers mentioned challenges not with the workshops themselves but stemming from that fact that stakeholders were not familiar with the ecosystem services concept or that the researchers' focus didn't align with what the stakeholders cared about. Similarly, some of the struggles with engaging particular stakeholders were seen to be more the result of lack of clarity about what the researchers could offer the stakeholders rather than characteristics of the stakeholders themselves.

Many of these challenges likely could have been minimized or avoided had the researchers had a common framework to guide their overall stakeholder engagement approach before getting to more specific details such as what sorts of engagement methods to use and whom to involve. We propose that the key elements of space, motivation, and trust, and their associated components, can serve as this framework.

The relationships between the key elements of space, motivation and trust are complex and context-dependent, and many of the elements build on each other. For example, bringing together stakeholders with different viewpoints (space) may in turn build trust with the researchers and increase the stakeholders' motivation for wanting to participate in a project. On the other hand, stakeholders may not be willing to come together (space) if they do not already have a relationship with the researchers (trust). Indeed, depending on the context their project, researchers followed different paths to create space, align motivations and build trust (Figure 1).

In Figure 1 we illustrate two examples of how the paths through the three key elements of stakeholder engagement can vary. In the wine case study, which was a new project, the space existed (in the form of the research project) but the researchers lacked relationships with stakeholders. In trying to build these relationships, the researchers realized that their own goals were not entirely clear, and thus it was difficult to align motivations with potential stakeholders. The researchers went back and clarified their goals, and then worked to build trust with a new group of stakeholders. For the Barcelona case study, the researchers' motivation (building dunes) was clear. The researchers then worked to build trust with separate groups of stakeholders, namely the administration and local residents. With that trust established, the exemplar is now looking to bring those groups together (space).

Figure 1: The three key elements of stakeholder engagement (space, motivation and trust) and the paths between them can play out differently depending on the context of the particular research project. The three key elements are the result of qualitative analysis of interview responses from the leaders of 12 ecosystem services research case studies about their experiences with stakeholder engagement.



To this end, it is perhaps also not surprising that the same components of stakeholder engagement can play out either negatively or positively depending on the particular project. For example, in terms of creating space, responses were mixed as to whether it was a good idea to bring together stakeholders who might have opposing viewpoints. Some researchers strategically engaged different groups of stakeholders at different times to keep discussions and project progress from getting sidetracked, while others found that their project provided a venue in which traditionally opposing stakeholders could have their differences acknowledged and build understanding.

Similarly, in terms of aligning motivations, depending on the goals of their project, some researchers found it most useful to engage stakeholders right at the beginning in helping define the problem and/or approach, whereas others brought (or wished they had brought) stakeholders in later, after the project had more structure. Researchers also displayed different degrees of flexibility in changing their projects along the way, such as in adjusting their projects be more in line with particular stakeholder needs. For example, the Wine case study added an analysis of wine eco-labels, which was specifically requested by one of their stakeholders.

For building trust, nearly all of the case study leads noted the advantages of working with stakeholders who they already knew, whether to build on existing trust or engage the particular expertise they were looking for. However, this also raised questions about the representativeness of the stakeholders, and whether efficiency or transparency was more important to project success. Another component that varied depending on context was reputation. In the best case, a key person could recruit, engage, and mobilize other stakeholders. However, one case study lead found this approach to be a hindrance when it emerged that the key person identified was actually quite a divisive figure within the local community.

Involving stakeholders in research demands thoughtful reflection from the researchers about what kind of space they want to create, and what will best meet the needs of the stakeholders. In addition, understanding their own motivations, as well as what motivates stakeholders, will help researchers decide when and how to involve stakeholders, identify areas of common ground and potential disagreement, frame the project appropriately, set expectations, and ensure each is able to see benefits of engaging with each other. Finally, as with any relationship, building relationships with stakeholders can be difficult but considering the roles of existing relationships, time, approach, reputation and belonging can help build mutual trust.

Although we have identified some key elements and their respective components of stakeholder engagement in ecosystem services research, it is not possible to generalize and say any one particular approach to such stakeholder engagement is best. Rather, awareness of key questions, issues and considerations and a strategy for addressing them is needed.

CONCLUSION

Both academics and stakeholders can benefit from insights that encourage more successful interactions between them. While further research could explore the perspective and experience of stakeholders, here we have focused on the researcher's view. We suggest that a research design that considers how to create the space in which researchers and stakeholders will meet, aligns motivations between researchers and stakeholders, and builds mutual trust, will help foster productive researcher-stakeholder relationships. Our hope is that the insights from this paper will be used in practice by academics looking to meaningfully engage stakeholders in ecosystem services research.

REFERENCES

Durham E., Baker H., Smith M., Moore E. & Morgan V. (2014). *The BiodivERsA Stakeholder Engagement Handbook.* BiodivERsA, Paris (108 pp).

Future Earth. (2014). Strategic Research Agenda 2014: Priorities for a global sustainability research strategy. http://www.futureearth.org/sites/default/files/strategic_research_agenda_2014.pdf

Harrington, R., Anton, C., Dawson, T. P., de Bello, F., Feld, C. K., Haslett, J. R., & Harrison, P. A. (2010). Ecosystem services and biodiversity conservation: concepts and a glossary. *Biodiversity and Conservation*, 19, 2773-2790.

Hauck, J., Go, C., Varjopuro, R., Ratama, O., & Jax, K. (2012). Benefits and limitations of the ecosystem services concept in environmental policy and decision making: Some stakeholder perspectives. *Environmental Science & Policy,* 5, 13-21.

Kueffer, C., & Hirsch Hadorn, G. (2008). How to achieve effectiveness in problem-oriented landscape research: the example of research on biotic invasions. *Living reviews in landscape research,* 2(2).

Lang, D.J., Wiek, A., Bergmann, M., Stauffacher, M., Martens, P., Moll, P., Swilling, M., & Thomas, C.J. (2012.). Transdisciplinary research in sustainability science — practice, principles, and challenges. *Sustain Science* 7, (Supplement 1): 25-43.

Mauser, W. Klepper, G., Rice, M. , Schmalzbauer, B.S., Hackmann, H., Leemans, R., & Moore, H. (2013). Transdisciplinary global change research: the co-creation of knowledge for sustainability. *Current Opinion in Environmental Sustainability,* 5, 420–431.

Menzel, S., & Teng, J. (2009). Ecosystem Services as a Stakeholder-Driven Concept for Conservation Science. *Conservation Biology,* 24, 907-909.

Seppelt, R., Dormann, C. F., Eppink, F. V., Lautenbach, S., & Schmidt, S. (2011). A quantitative review of ecosystem service studies: approaches, shortcomings and the road ahead. *Journal of Applied Ecology*, 48(3), 630–636.

Spangenberg, J. H., Görg, C., & Settele, J. (2015). Stakeholder involvement in ESS research and governance: Between conceptual ambition and practical experiences – risks, challenges and tested tools. *Ecosystem Services*, 16, 201-211.

Tress, B., Tress, G., & Fry, G. (2004). Clarifying integrative research concepts in landscape ecology. *Landscape Ecology* 20, 479-493.

Zscheischler, J., & Rogga, S. (2005). Transdisciplinarity in land use science – a review of concepts, empirical findings and current practices. *Futures,* 65, 28-44.

APPENDIX 1: Written survey questions

Each of the 12 OPERAs case study leads were asked to answer these specific survey questions via email.

Stakeholder identification

How were stakeholders identified?

How was it decided who not to include as stakeholders?

Timing of stakeholder involvement

At what points in your OPERAs project were stakeholders involved?

Methods of stakeholder involvement

What methods did you use to involve stakeholders?

Nature of stakeholder relationships

What was the nature of the relationships with these stakeholders before OPERAs?

Inter-stakeholder interactions

How did stakeholders interact with each other?

APPENDIX 2: In-person interview questions

These questions served to guide the in-person semi-structured interviews with each of the 12 OPERAs case study leads.

Stakeholder identification

Were your stakeholder identification method(s) successful? Is there anything you would you have done differently? Was anyone not at the table who should have been? Was anyone included who should not have been?

Timing of stakeholder involvement

Were the points at which you brought in stakeholders appropriate? For example, did it make sense to include stakeholders from the beginning to help shape your project? Were new stakeholders identified as the project progressed? Should anyone have been brought in earlier or later?

Methods of stakeholder involvement

Did you feel that your method(s) of stakeholder engagement (e.g. workshops, surveys) worked for you? Did your methods vary by stakeholder?

Nature of stakeholder relationships

How did the status of your relationships with your stakeholders (e.g. whether you already knew them) affect engagement? For new partners, was there sufficient time and venues through which to build trust and understanding to successfully execute the project?

Inter-stakeholder interactions

How did your stakeholders interact with each other? For example, were there any conflicts? Were these stakeholders who had worked together before or did OPERAs bring them together? Did the mix of stakeholders and/or existing relationships/conflicts between stakeholders affect the project (positively or negatively)?

Attachment 6

Identifying and Analyzing Stakeholders of Ecosystem Services

PowerPoint Presentation

OPERAs

OPERAs

Ecosystem Science for Policy & Practice

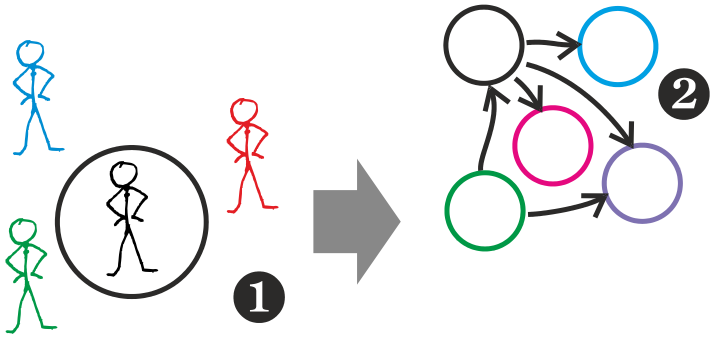
Identifying and analyzing stakeholders of ecosystem services

J Lascurain
info@sgm.es

23 February 2017

Overview

1. Why include stakeholders in ecosystem services?
2. How to identify and analyze key stakeholders



OPERAs

Purpose

- The purpose of this slideshow is to illustrate a process for identifying stakeholders in an ecosystem services (ES) study, based on experience in the OPERAs Barcelona dunes exemplar case study.

OPERAs

Why stakeholders?

- Because ES are about human-nature interface, it is essential to know what happens on the “human” side.
- Good stakeholder knowledge and engagement is a key factor for trustworthy and efficient governance of ES, and can contribute to better ecosystem management.

Who are stakeholders?

Stakeholder: any group, organization or individual who can affect or is affected by the ecosystem's services.

Definition developed by OpenNESS

OpenNESS Glossary http://www.oppla.eu/product/29

OPERAs

Introducing Barcelona OPERAs Case Study

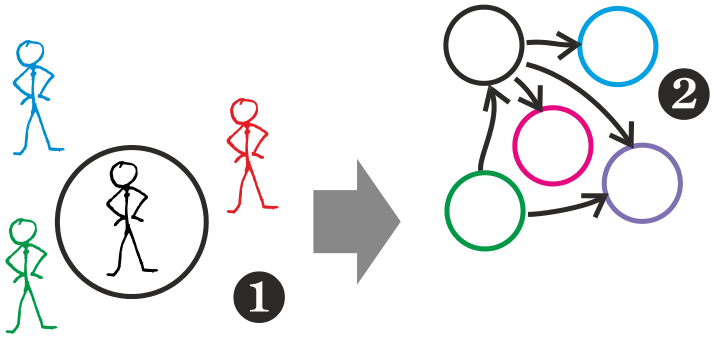
Objective:

To learn to construct and maintain dunes on urban beaches to optimize the flows of ecosystem services such as protection against sea level rise, and to learn how to shape social attitudes to make intensive recreational use of beaches compatible with the protection of the dunes.

OPERAs

2 steps to identify and analyze key stakeholders

1. Identify individual stakeholder characteristics
2. See how stakeholders interact



OPERAs

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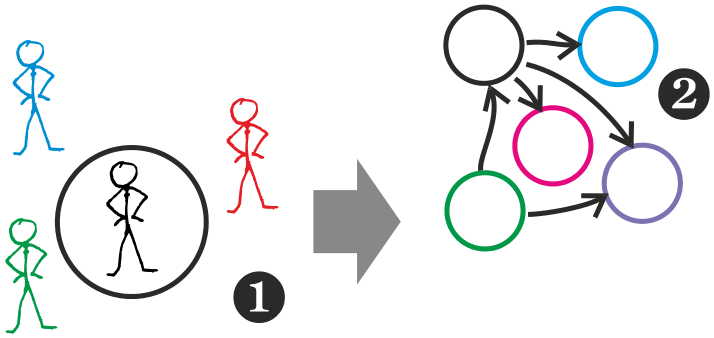


OPERAs

1. Identify individual stakeholder characteristics

First identify individual stakeholder characteristics

It can be quite open:

- Level of system knowledge
- Level of dependence/interest
- Quantity
- Environmental impact
- Spatial & temporal distribution
- Role (e.g., administration, NGO, …)

OPERAs

Selected methods to identify stakeholders and their interests in Barcelona

Fieldwork: make observations to discover what people do.

Interviews: Discover motivations.

Online surveys: cost efficient, but need to check representativeness of the population that fills the surveys.

OPERAs

Characterizing stakeholders in Barcelona

CMSCA

The port activity does not need to preserve beaches to keep its activity going on; but, because of the EIA of the port expansion project, is the only stakeholder conducting significative coastal defence actions.

El Prat de Llobregat is the only city council integrated at the CMSCA. Its beaches receive barely 10% of summer sunbathers.

The central government has been the only stakeholder enacted to conduct coastal defence actions till the most recent modification of the Shores Act.

Viladecans, Gavà and Castelldefels are municipalities not integrated at the CMSCA, but enduring the effects of the port expansion.

The Catalan government has no authority over coastal defence. Different departments forming part of the CMSCA.

The Metropolitan administration of Barcelona has the mission of providing citizens with clean and well equipped beaches.

There are different research institutions conducting studies over the coastal regression issue at the Llobregat delta. But the Instituto de Hidrología ambiental de la Universidad de Cantabria is the only one informing the CMSCA.

Different research institutions are advising different stakeholders. There are at least two more research institutions working over the same issue.

Citizen science could play a relevant role providing geopositioned information on storm and flood events, but not used at all.

The economic activities sector (including housing properties, hotels, restaurants and "chiringuitos") have very low knowledge of the beach system. But a quite high level of dependency and vulnerability to climatic change.

More than 7 million people visits those beaches each year. There is a big potential based on the knowledge of the scientific issues linked to dune ecology, coastal defence and adaptation to climatic change.

OPERAs

Different stakeholders have different characteristics

Sunbathers

Quantity	7.000.000 sunbathers
Level of dependence or interest	Beach is a real need at the AMB
Capacity to act	Not mobilized, organized. Low capacity to act.
Capacity to influence	As not organized, low capacity of influence.
Capacity to modify nat. envmt.	Sun bathing is a relatively low impact use if not using dunes as WC

No need to include them on the decision-chain. But their needs must be taken into serious account.

Port Authority

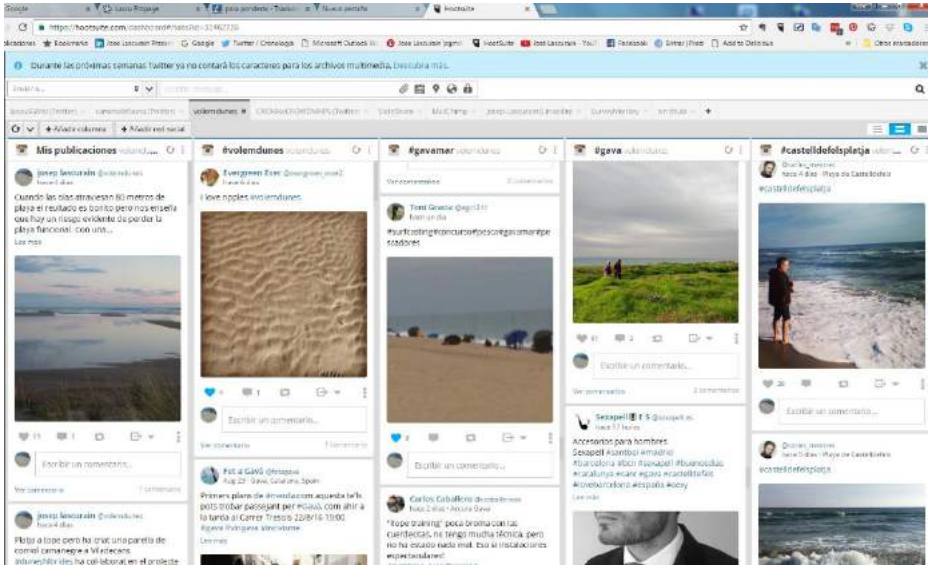
Quantity	One organization
Level of dependence or interest	Beyond CSR, “beach defence” is not their business.
Capacity to act	Obligued by law.
Capacity to influence	Not opinion raisers but a very relevant institution.
Capacity to modify nat. envmt.	The construction of the new dyke has triggered morphodynamic changes.

MUST be included on the decision chain system. Social and knowledge opportunities should be included on their CSR strategy

OPERAs

Using social media to analyze stakeholder interests

Social media listening helped to discover what people like from beaches and its variability with time and among different beaches.



OPERAs

Barcelona results of social listening

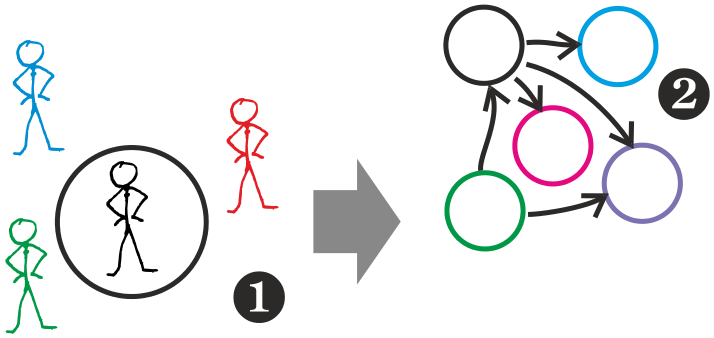
An analysis on Instagram by #hashstags shows how different stakeholders at different parts of the beach enjoy different ecosystem benefits

Some examples from OPERAs Barcelona dunes exemplar case study

Socio cultural valuation can be an efficient method to classify beaches at a bigger scale.

2 steps to identify and analyze key stakeholders

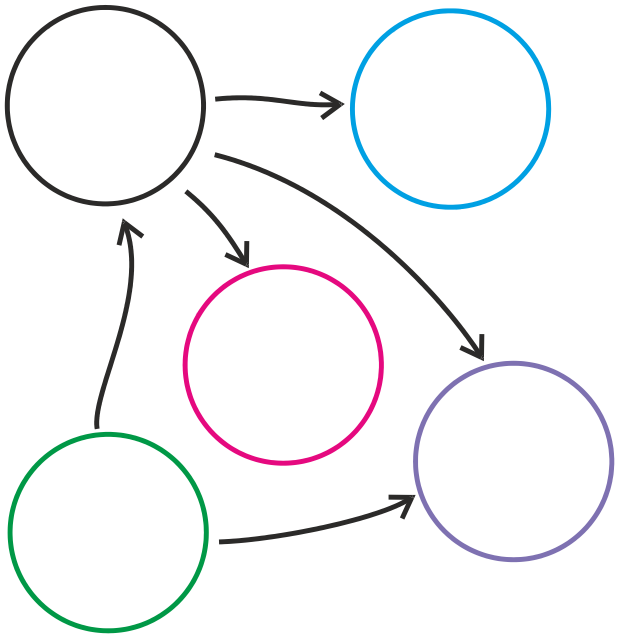
1. Identify individual stakeholder characteristics
2. See how stakeholders interact



OPERAs

2. See how stakeholders interact

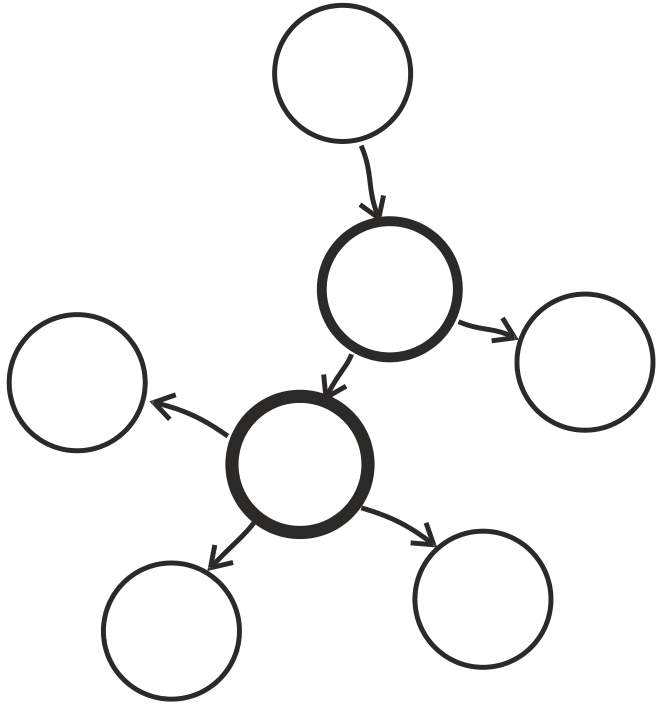
Once identified, see how stakeholders interact.



OPERAs

Analyze relationships between stakeholders

The level of centrality will help identifying key stakeholders.



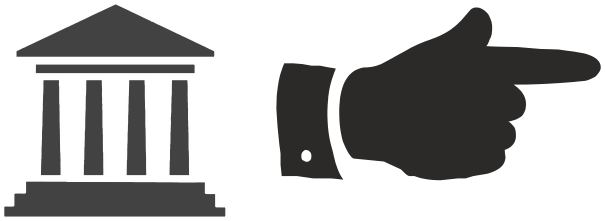
Some stakeholders are essential to sustain the network.

If the bold nodes disappeared, links would be lost.

OPERAs

Analyze how stakeholders influence each other

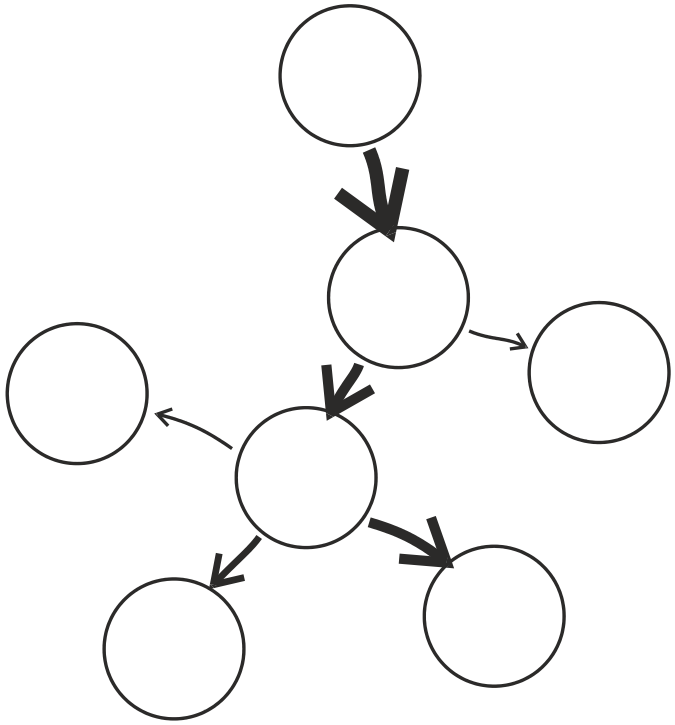
Sometimes this influence capacity is just a regulatory flow, while in others is social pressure



OPERAs

Findings from Barcelona Dunes

The capacity to influence or exert social pressure.



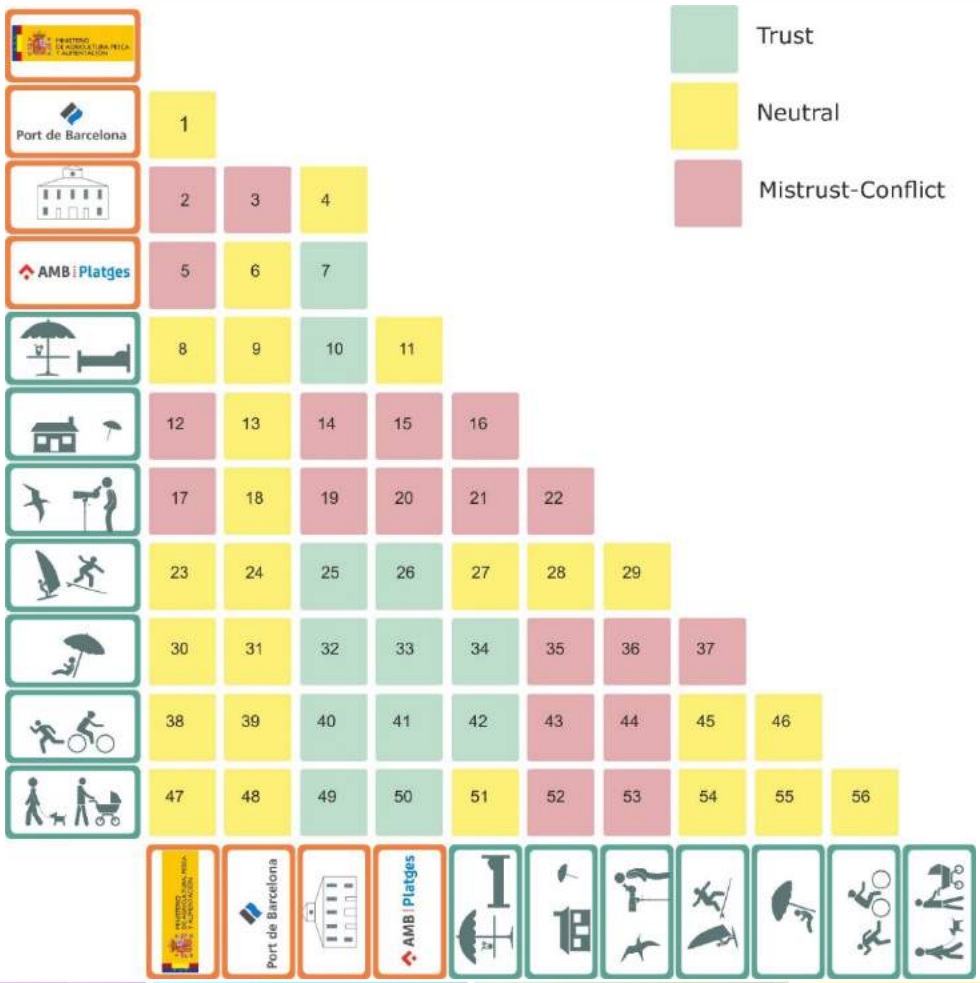
Local press media is a big influencer.

Municipalities can have a big influence on metropolitan administrations.

Stakeholder networks and associations can be big influencers.

OPERAs

Identifying stakeholder interaction in Barcelona



We found that had a high level of trust from beach users, but not from birdwatchers. And local residents are not happy with the crowds of sunbathers at summer.

OPERAs

Flows of information, capacity to influence, power to act, and its consequences

Power to act over coastal management

Coastal dynamics triggered after the construction of the new port dyke.

Information flows

Capacity & power to influence

The port authority conducts the beach nourishment operations (around 100.000m3 /yr).

CMSCA

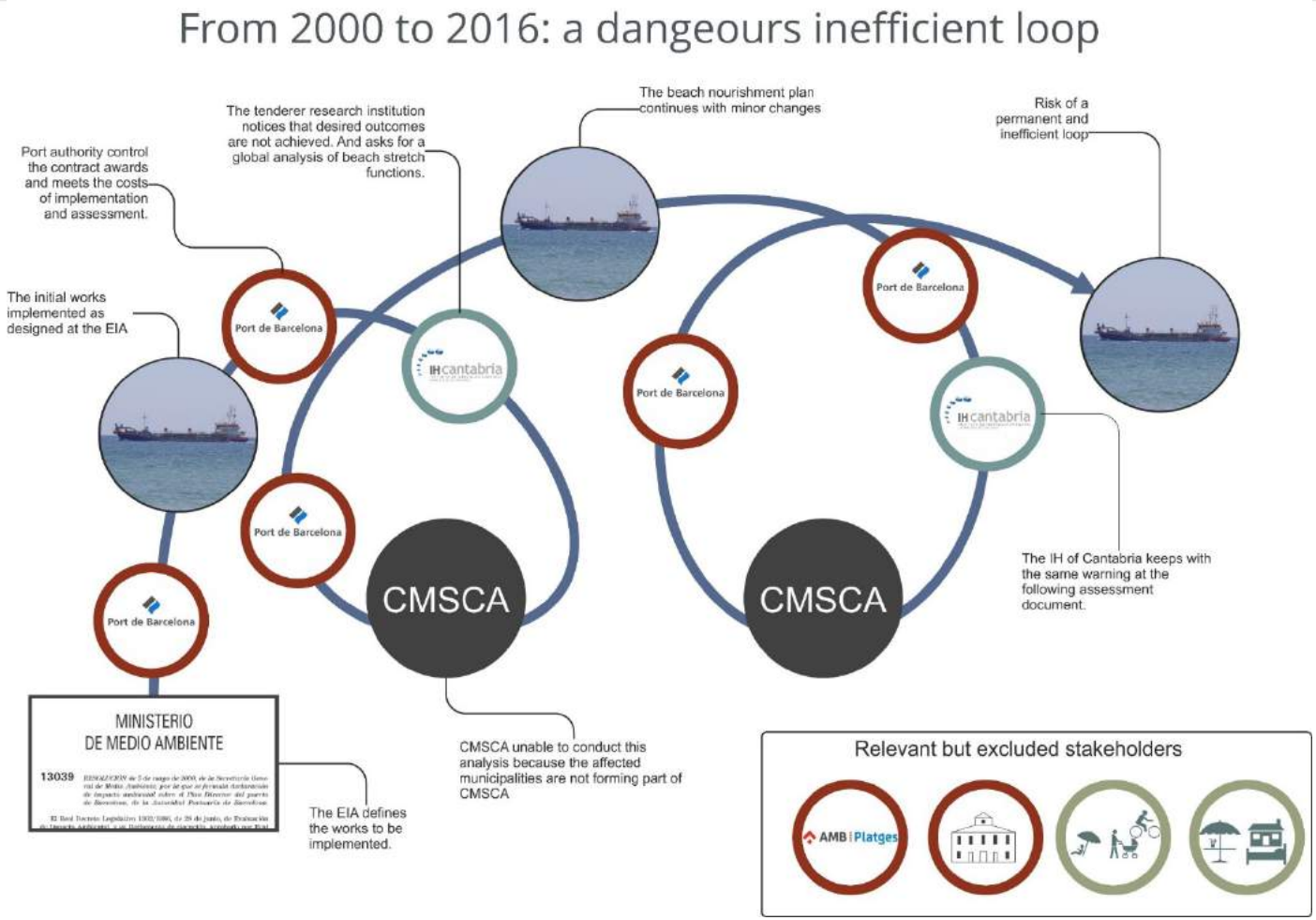
The joint comittee of monitoring and environmental control (CMSCA) was created as a prescription of the Environmental Monitoring Plan included at the Environmental Impact Assessment (EIA) of the Pla director del Puerto de Barcelona. It has the mission of supervision of the environmental monitoring of the whole set of environmental issues identified by the study. One of the EIA conditions (superfised by the CMSCA) is to prevent the regression processes at the shoreline of El Prat de Llobregat, and not the whole coastal cell.

The coastal administration has conducted projects of beach reconstruction independently of the CMSCA

The decision environment is not evidence-based, partly because the monitoring studies are only focussed to bring sand to el Prat de Llobregat and lacks a global vision including the evolution of the emerged sand budget.

All those processes are directly caused by the alteration of the longshore currents originated by the construction of a new dyke that penetrates 1,76 km in to the sea.

Some examples from OPERAs Barcelona dunes exemplar case study



Decision making schemes that did not include all relevant stakeholders leads to inefficient management

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