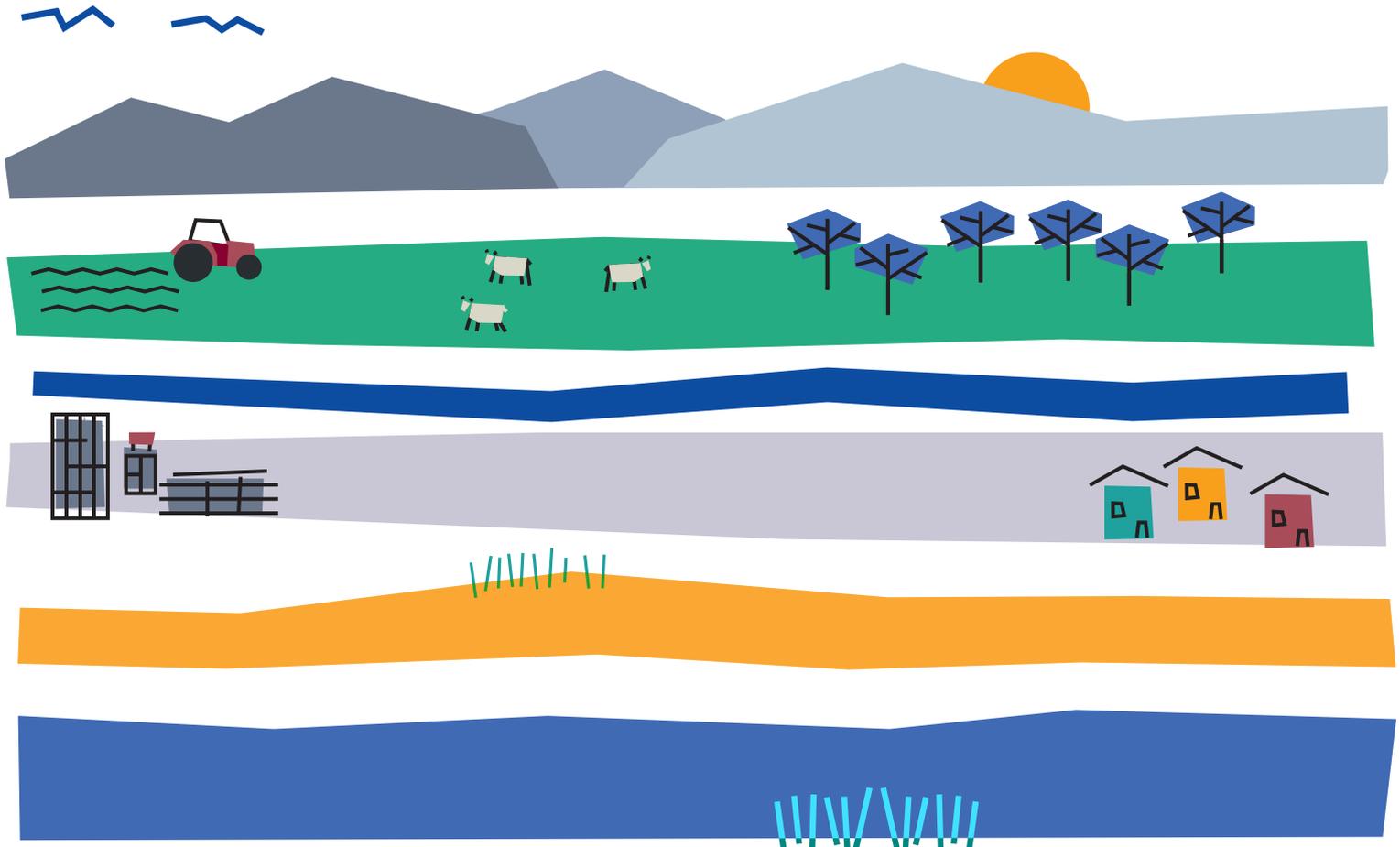




# FIVE YEARS OF ECOSYSTEM SCIENCE FOR POLICY & PRACTICE 2012–2017

---

## SUMMARY REPORT



---

# SUMMARY

## ECOSYSTEMS PROVIDE HUMANKIND WITH A RANGE OF BENEFITS, KNOWN AS ECOSYSTEM SERVICES (ES).

High-level policy frameworks have adopted ES, but the application of the concept in decision-making remains challenging. Between 2012 and 2017, OPERAs explored how and under what conditions the ES concept could support sustainable decision-making and ecosystem management. OPERAs co-produced a diversity of approaches in twelve 'exemplar' case studies across a range of ecosystems. It also established the online knowledge marketplace, Oppla, to improve and simplify how knowledge for better managing our environment is shared, obtained and created.

[www.operas-project.eu](http://www.operas-project.eu)

[info@operas-project.eu](mailto:info@operas-project.eu)

   **OPERAsProject**



OPERAs was funded by the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement number 308393 coordinated by Mark Rounsevell and Marc Metzger from The University of Edinburgh.

Design by Countryscape.

# KEY MESSAGES

**1** Minimising damage to ecosystems and safeguarding human well-being requires effective integration of ecosystem services across policy sectors

---

**2** It is important to understand what people value when developing ecosystem management plans

---

**3** Traditional economic methods alone are insufficient to value the full benefits of ecosystem services; socio-cultural valuation can ensure a more comprehensive understanding

---

**4** Land use decisions come with trade-offs over space, time and between stakeholders, but tools are available to help decision-makers navigate trade-offs effectively

---

**5** There are many methods, approaches and tools to support ecosystem management, but applying them requires sharing real examples from which to learn best practice

---

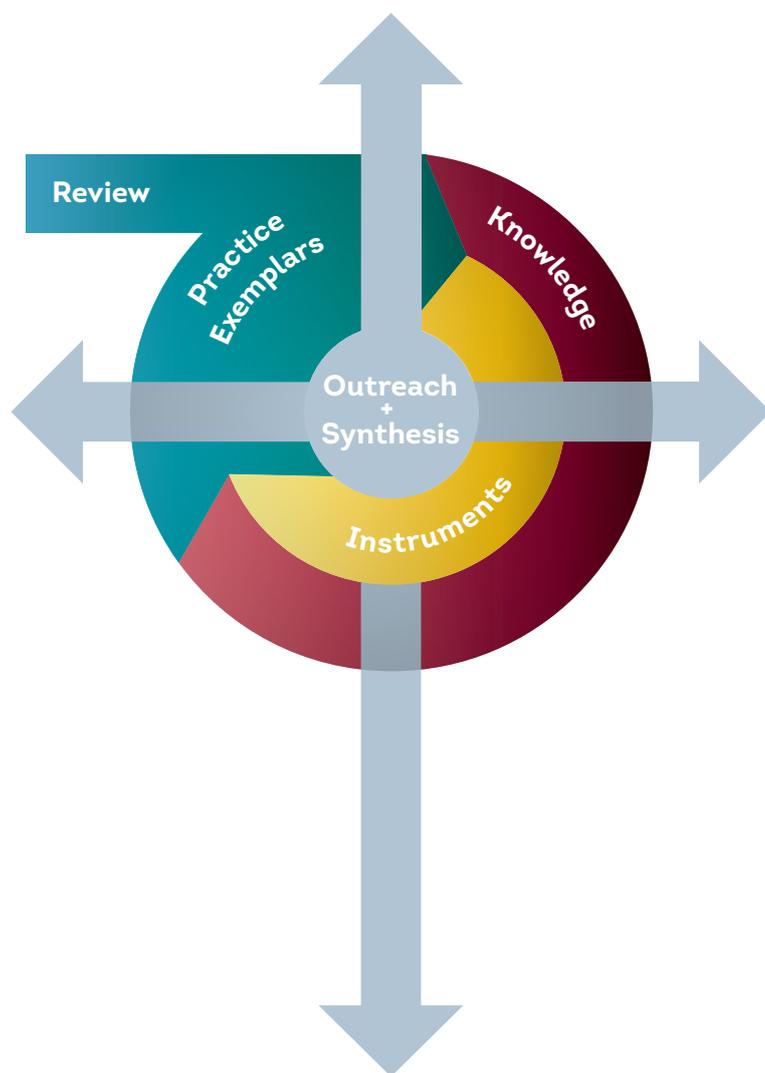
# CONTEXT

**ECOSYSTEMS PROVIDE US WITH A RANGE OF BENEFICIAL RESOURCES, GOODS AND SERVICES. YET OUR USE AND EXPLOITATION OF THE BIOSPHERE IS INCREASING AT SUCH A PACE AND SCALE THAT MANY OF THE MAJOR ECOSYSTEMS ARE AT RISK OF BEING UNABLE TO CONTINUE FUNCTIONING IN WAYS THAT ARE VITAL TO SUPPORT HUMANKIND.**

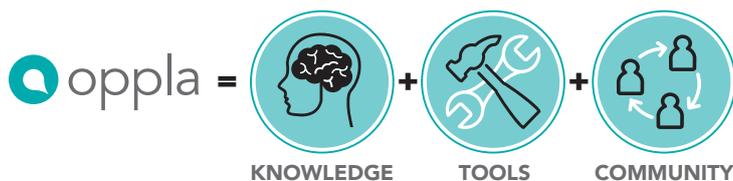
Re-framing environmental resource use has led to the emergence of the ecosystem services (ES) concept, which explicitly acknowledges our dependence on nature and the need to better protect and manage natural resources.

Although ES have been adopted in high-level policy frameworks – including the Convention on Biological Diversity and the EU biodiversity strategy – the application of the concept in policy and decision-making remains challenging. Between 2012 and 2017 OPERAs explored how and under what conditions the ES concept can move beyond the academic domain towards practical implementation in support of sustainable ecosystem management.

# OBJECTIVES



Knowledge marketplace  
and community of practice



- ▶ **Review and synthesise** knowledge gaps, user needs and best practice
- ▶ Increase **knowledge** and understanding to support policy and decision-making
- ▶ Improve and develop methods, tools and **instruments** to support ecosystem management
- ▶ Co-develop and test these approaches in **practice** with stakeholders across a range of ecosystems in twelve 'exemplar' case-studies
- ▶ Establish **communities of practice** and a **knowledge marketplace** where the latest ES thinking is brought together (the **Oppla** online platform: [www.oppla.eu](http://www.oppla.eu))

# TWELVE EXEMPLARS



## **Tools for today**

### ***Policy and market instruments for climate change mitigation and habitat conservation***

Exploring management solutions that synergistically support biodiversity conservation and climate change mitigation, as well as the growing demand to feed an increasing global population, using the ecosystem services concept.



## **Ecosystem services and climate strategies**

### ***Analysis of tradeoffs in Peru with pantropical comparisons***

Assessing the provision of ES in the region, evaluating the associated trade-offs and learning about the impacts these have on local stakeholders.

## **Cultural Seascapes**

### ***Sociocultural benefits of the Irish coastline***

Exploring cultural ecosystem services and considering how these might be used to inform land use planning.



## **Values and Vines**

### ***Reaching out to consumers on responsible wines***

Understanding consumer demand for ES and whether the concept can be used to market wine.



## **Desert in the city**

### ***How one plant is helping protect Barcelona's coastline***

Learning to construct and maintain semi-stabilised dune ecosystems, while working with stakeholders to change attitudes towards beach systems.



## **More than Cork**

### ***Cultural Landscapes in the Montado***

Using the ES approach to promote improved management of cork trees so that generations to come can enjoy the benefits of the Montado ecosystem.



**From Highlands to Lowlands**

*Supporting environmental policy in Scotland at all levels*

Developing knowledge, tools and methods to help implement land use management and biodiversity policies in Scotland.



**Traversing Waters**

*Waterway management in the lower Danube*

Evaluating the social, economic and environmental values of wetlands and communicating these to stakeholders in order to determine the viability of wetland restoration.



**Pan European Policy**

*Conflicts and synergies across Europe*

Evaluating how recent and forthcoming EU policy developments affect the levels of ES provision in Europe.



**All Eyes on the Future**

*Transition pathways and sustainability in the Swiss Alps*

Finding out which policy strategies can balance the supply of and demand for mountain ES in the future.



**Land Use Legacies**

*Looking at infrastructure development in the central Alps*

Analysing future land use trajectories and their effects on networks of biodiversity and ecosystem services in the Grenoble area.



**Abandoned Lands**

*Agricultural shifts in the Mediterranean*

Quantifying the impacts of management practices on ES provision and human wellbeing in the Mediterranean.



**Blue Carbon in the Balearic Islands**

*Assessing the future of seagrass*

Quantifying the carbon benefits of seagrass meadows and communicating these to stakeholders in order to encourage the protection of these valuable ecosystems.



# KEY MESSAGE:

**Ecosystem services (ES) need to be included in policy to minimise damage to ecosystems and ensure the sustainable supply of these essential services for human well-being. To achieve this, integration is required at all levels of governance and across multiple policy sectors.**

The current level of integration of ES varies across policy areas and governance levels. However, the existing policy frameworks for ES are generally far from optimal and so further knowledge and guidance on how to integrate ES in policies was developed. Specifically, integration into sectoral policies should occur at three levels: conceptual, operational and implementation. Conceptual integration

occurs where documents underpinning sectoral policies (e.g. strategies and roadmaps) either explicitly or implicitly consider ES. Operational integration is where specific measures or instruments are identified and committed to address ES related objectives within policy sectors. Implementation integration is where concrete measures achieve integration on the ground in actual policy- and decision-making situations. Several high-level policy initiatives provide opportunities for the effective integration of ES into sectoral policies. These include the green economy, resource efficiency roadmap, green infrastructure strategy and the reform of environmentally harmful subsidies.

Concrete policy instruments are essential to support the integration of ES in practice. Different types of policy instruments exist to support (or as in most cases, have the potential to support) the integration of ES. These instruments classify into three different types: information, decision-support and implementation. Information instruments include indicators for assessing the implementation of policies; databases and frameworks for monitoring, mapping and accounting; and a range of science-policy assessments supporting policy development. Decision-support instruments include those for planning and targeting, reporting, and impact and risk assessment/procedures. Implementation integration includes concrete measures to achieve integration on the ground in actual policy- and decision-making situations.



## Minimising damage to ecosystems and ensuring human well-being requires effective integration of ES across policy sectors

For effective integration of ES in policy, more targeted actions and application at all three instrument levels and at all levels of governance is necessary. A three-step approach was developed based on using the green economy framework as a premise and strategic platform to assess the level of integration and improve the implementation of ES in sectoral policies.

- ▶ **Step 1** assesses the current level of policy integration across sectors.
- ▶ **Step 2** identifies key policy and sectoral opportunities and needs for future integration.
- ▶ **Step 3** provides advice on how to use the assessment of sectoral integration of ES as a concrete means of developing 'green' transition plans for different economic sectors. The application of this assessment approach in practice shows varying levels of integration across different policy sectors, with the level of operational integration generally lacking behind conceptual integration. For example, none of the EU policy sectors currently provides a comprehensive framework for the implementation and uptake of ES.

A study in Dublin found that a Socio-Cultural Valuation method for ES served as a favourable approach for public consultation and provided useful data on ES to inform land use planning. This led to the Council committing to utilise the ES approach for public consultation within the new Fingal County Development Plan (2017–2023).

“VERY GOOD IDEA – I GOT IT – IT CAME ACROSS VERY WELL”

– DUBLIN RESIDENT



# KEY MESSAGE:

**Sustainable citizen behaviour is important for effective ecosystem conservation. Decision-makers sometimes fail to engage with the public surrounding the importance of ecosystems and many people are unaware of the importance of conservation, or how it is relevant to them. Successful public engagement in the conservation of ecosystems depends on framing the topic in a way that everyone understands.**

By highlighting the ecosystem service (ES) that people care about, decision-makers can adopt an approach that resonates with the public. To achieve this, it is important to map and understand the values that a community places on its local ecosystems.

The role of engaging citizens and other stakeholders was tested in eight, diverse case studies (Swiss Alps, the wine sector, Scotland, Barcelona, the Lower Danube, the Montado region, Dublin and Pan-Europe). This led to the development of an eight-step framework for eliciting demand for ES from citizens and stakeholders.

1. Determine the study objectives, e.g. find out the value that local residents place on coastal areas.
2. Identify and engage with key stakeholders from groups or individuals who can affect, or are affected by, ES.
3. Identify all potential ES for a study area, select an ES framework (e.g., CICES, TEEB, MAES) and use this framework to work out, with stakeholders, which ES are relevant to the study.
4. Develop indicators for ES supply in order to measure and understand ES demand.
5. Select methods to elicit demand, e.g. choice experiments, participatory GIS, workshops or focus groups; the choice depends on the stakeholders and the study objectives.
6. Elicit stakeholder demand for ES and carry out the planned research.
7. Analyse and compare demand, e.g. identify the most highly valued services within the study and compare stakeholder demand with ES supply.
8. Assess the implications of the results and determine potential actions to improve or maintain ES.

# 2

## It is important to understand what people value when developing ecosystem management plans

A number of different methods can elicit the values people place on ES. Their selection depends on the context, specific circumstances, and objectives of the study, including whether or not the study informs decision- or policy-making. The purpose of valuation includes: **a)** assessing the current social value of an ecosystem and its services; **b)** determining preferred future ecosystem states and acceptable trade-offs; and **c)** identifying and understanding the diversity of stakeholders and their behaviour. Regardless of the chosen method, it is important to approach a study in a way that relates to stakeholders. This includes using language that resonates with stakeholders and framing issues for specific audiences. Identifying different perspectives on ecosystem conservation can provide guidance for targeted information of use to local organisations in reaching a diverse set of stakeholders. Policy makers can also use this insight to make decisions based on the values of a wider stakeholder community within an ecosystem. These values are usually not immediately obvious, which is why engaging citizens in decision-making processes is key. Considering demand for an ES can guide actions to improve or maintain that service and inform nature conservation goals ('capacity effect'). Understanding demand can also influence decisions and reduce conflict ('constraint effect'). If supply of the service is low, but demand is high, managers could harness this demand to involve stakeholders in managing the ecosystem. However, if both demand and supply are low, awareness raising may be a more appropriate strategy.

“TAKING ECOSYSTEM SERVICES INTO LAND PLANNING SHOULD BECOME THE RULE”

– GRENOBLE STAKEHOLDER



---

# KEY MESSAGE:

**Decision-makers need to be aware of the full range of implications of management decisions and can use various valuation methods to gain this understanding. This often involves assigning monetary values to ecosystem services (ES).**

However, monetary valuation lends itself to certain ecosystems and services, to the exclusion of others. Social values and cultural services are particularly difficult to identify, monetise, quantify and explain and so are often ignored. Personal experience, social institutions and social interactions inform social values, which can be particularly

important for certain groups and communities. Social-Cultural Valuation (SCV) is a way of making these services, and the values associated with them, explicit. Taking account of the full suite of ES can ensure that proposed management practices are more widely accepted and have a greater chance of success. ES are a complex and unfamiliar concept for most people and their role can be difficult to communicate or comprehend. It is important to understand what people value in the environment in order to communicate effectively, gain support for potential management schemes and reduce conflict. As many ES are linked, and depend on healthy ecosystem function, Cultural ES (CES) can be used to communicate the value of the whole ecosystem and the full range of services it provides. SCV is also important in helping stakeholders to engage with their environment and to understand their relationship with it. In this way, SCV can be utilised as a new public consultation model to inform Green Infrastructure planning.

# 3

## Traditional economic methods alone are insufficient to value the full benefits of ES; socio-cultural valuation can ensure a more comprehensive understanding

Every ecosystem has a range of services and values associated with it, so SCV must use a variety of methods in order to understand fully how and what people value in their environment. People relate most closely to CES as these are experienced in the settings or situations in which they most typically interact with nature and enjoy its benefits. By comparison, the value associated with Regulating ES (RES) are less obvious or less well understood. A number of SCV methods are available, which can be used in combination and have been tested in practice. For example: Participatory Mapping of ES (PPGIS) and associated values helps people to connect their values to the landscape and to see the area as a whole. Decision-makers can also identify 'value hotspots' or areas where conflicts might arise. Deliberation allows people to develop their ideas through iterative discussion, building consensus and learning throughout the process. Choice experiments force people to think about what they value most using weighting or ranking techniques. Visualisation tools can help people to better understand the ES and landscapes in question. Scenario techniques encourage people to think about the sort of future they would like and what sort of management might help to achieve this.

“IN COLLABORATION WITH OPERAS, WE CO-DESIGNED AN INNOVATIVE PARTICIPATORY LAND USE PLANNING PROJECT, APPLYING THE PRINCIPLES OF THE ECOSYSTEM APPROACH, MAPPING ECOSYSTEM SERVICES AND ELICITING SOCIO-CULTURAL VALUES. ALL OF THIS WORK IS SUCCESSFULLY BEING USED TO INFORM THE NEXT ITERATION OF THE PENTLAND HILLS REGIONAL PARK PLAN.”

– NEVILLE MAKAN, SCOTTISH NATURAL HERITAGE



# KEY MESSAGE:

**Navigating trade-offs is an essential part of decision-making. It is particularly important in natural resource management in ecosystems where decisions made today may have implications for other ecosystems and future generations. To operationalise the ecosystem services (ES) concept and to manage natural capital wisely, decision-makers need to have a full understanding of the trade-offs associated with their decisions, particularly regarding ES provisioning.**

If the increase of one ES happens directly or indirectly at the cost of another, maximising the provision of that service might lead to sub-optimal results. To support decisions, explicit information about trade-offs between ES is required and trade-off methods must be tested in practice. For instance: different trade-offs exist between different ES categories. Some ES are more likely to lead to trade-offs rather than synergies, whilst others can be synergistic if well managed. Regulating and cultural ES are more likely to have a synergistic relationship, while trade-offs are more common between regulating

and provisioning services. Setting objectives for ES provision is often not straightforward, since the relationships between how much of a service is provided, and the value it has for society are often non-linear (e.g. minimum levels needed before a benefit is provided), location-dependent (pollination near crops, air purification near urban areas) and context-dependent. Improvements are often possible compared to the current level of ES provision and business-as-usual scenarios.

Ecosystem management often requires choices to be made between different land use options and decision-support tools can be used to weigh up the trade-offs involved. A number of decision-support tools deal with trade-offs explicitly by working with preferences (e.g. CBA, MCA, MCDA, mDSS), while others do so implicitly by quantifying the impacts of different decisions and comparing these against one another (e.g. TESSA, ToSIA, WeLCA). Policy-making can often involve trade-offs when choosing which activities to encourage or favour and where to allocate funding. The Environmental Harmful Subsidy (EHS) tool supports policy making in identifying the impacts of policies, and navigates the potential trade-offs associated with them.



## Land use decisions come with trade-offs over space, time and between stakeholders, but tools are available to help decision-makers navigate trade-offs effectively

Multi-functional landscapes provide a test-bed to explore the many facets of ES trade-offs and synergies. Research in the French Alps and in Costa Rica looked at whether services align spatially, i.e. form a 'bundle' (synergy) or not (trade-off). Spatial relationships typically relate to the land cover or land management with which these services are associated. For example, in Costa Rica biodiversity hotspots had the highest co-benefits for other services, while carbon hotspots had the lowest. In the French Alps, scenarios of temporal synergies and trade-offs were used to explore how ES respond to factors such as changes in policy decisions, hydrological regimes, or climate. However, multifunctional landscapes are not always win-win situation; some trade-offs are unavoidable. Supply and demand trade-offs, studied in Barcelona, the Swiss Alps and the Lower Danube, refer to the societal demand for ES and the capacity of the ecosystem to provide ES. Trade-offs among beneficiaries looks at the degree to which changing boundary conditions or planning decisions affect the ES objectives of different stakeholders. In Peru, the ES approach contributes to territorial management by creating networks and strengthening relationships between actors.

“THE FACT THAT THE BEST SCENARIO IS NOT THE SAME EVERYWHERE HIGHLIGHTS THE NEED TO PLAY ON COMPLEMENTARITIES AT THE REGIONAL SCALE”

– GRENOBLE STAKEHOLDER



# KEY MESSAGE:

**Despite their being a wealth of research on the subject of ecosystem services (ES), the principles of the concept do not always make it into practice. There are a number of reasons for this. Particular gaps in knowledge as well as practical obstacles can create bottlenecks. A lack of standardisation of the methods used or the reporting of findings can make it difficult to compare projects, identify trends and make recommendations.**

These issues in turn can make it difficult for decision-makers to know where to focus funding, which behaviours to encourage and how to give guidance on best practice. There are now many tools and methods, that have been tested in real-world situations, to support decision-making in applying the ES concept. However, the tools and methods alone are not enough to encourage better ecosystem management. There is also a need to provide access to these tools and to foster their use through co-learning and applications in practice. Co-learning and knowledge exchange is achievable

through communities of practice. The OPERAs project worked with nine Scottish organizations to establish an ES Community Scotland (ESCom) for individuals with an interest in using the ES concept to further ecosystem management (<http://escom.scot>). With over 500 members, and regular events to bring together researchers, decision makers and practitioners, ESCom illustrates how an ES community of practice can create space, align motivations and build trust.

“LOOKS LIKE USER REQUIREMENTS HAVE BEEN TAKEN UP SERIOUSLY SO WE CAN EXPECT VERY USEFUL RESULTS, TOOLS AND INFORMATION”

– USERBOARD PARTICIPANT

# 5

## There are many methods, approaches and tools to support ecosystem management, but applying them requires sharing real examples from which to learn best practice

Providing free and ready access to ES tools, methods and worked examples is also a critical pillar of using the ES concept for better ecosystem management. The Oppla information hub was developed with this purpose in mind (<https://oppla.eu>). Oppla is an online, knowledge marketplace; a place where the latest thinking on ES, natural capital and nature-based solutions is brought together. Its purpose is to simplify how we share, obtain and create knowledge to manage our environment in a better way. Oppla is an open platform that is designed for people with diverse needs and interests – from science, policy and practice; public, private and voluntary sectors; organisations large and small, as well as individuals. Membership of Oppla is free and includes access to a number of services. Ask-Oppla is a crowd-sourced enquiry service, where members of the Oppla community help to answer one another's questions. The Oppla Marketplace is a 'knowledge supermarket' from where to obtain guidance, software, data and other useful resources, as well as promote the outputs of individual's own projects or networks. The Oppla Community is an easy-to-use system for networking with other members from around the world. As a not-for-profit company, Oppla also provides a legacy for the OPERAs project by continuing to engage with science, policy and practice into the future. Furthermore it has supported the Intergovernmental science-policy Platform on Biodiversity & Ecosystem Services (IPBES) in developing its web portal of policy support tools, thereby ensuring the widest possible access to ES knowledge worldwide.



“WE WANT DUNES  
BECAUSE THEY ARE AWESOME!”

– BARCELONA SCHOOL CHILD



---

# Creating hybrid dunes in Barcelona to stabilize its beaches

<https://oppla.eu/casestudy/17274>

Signs explaining the research and community engagement

---



The beaches of Barcelona are important for tourism and recreation, whilst protecting homes and businesses from storms and rising sea levels. However, the beaches are shrinking as less sand is deposited and winds blow the existing sand away. The beaches can be stabilised and even expand by planting marram grass, which traps the sand and forms biodiverse sand dunes that protect the beaches from the wind and act as a natural flood defence. OPERAs developed a new methodology to construct mobile and semi-mobile coastal dunes on urban beaches. Citizens, including school classes, help to plant the marram grass along with support from local municipalities and the metropolitan administration. Analysis of social media (Twitter and Instagram), as well as online and face-to-face surveys, identified information needs from beach users. Combined with new insights in the biophysical functioning of the beach system, there is now good understanding of the need for improved evidence-based governance among the municipalities of the metropolitan beaches of the Llobregat Delta.

---

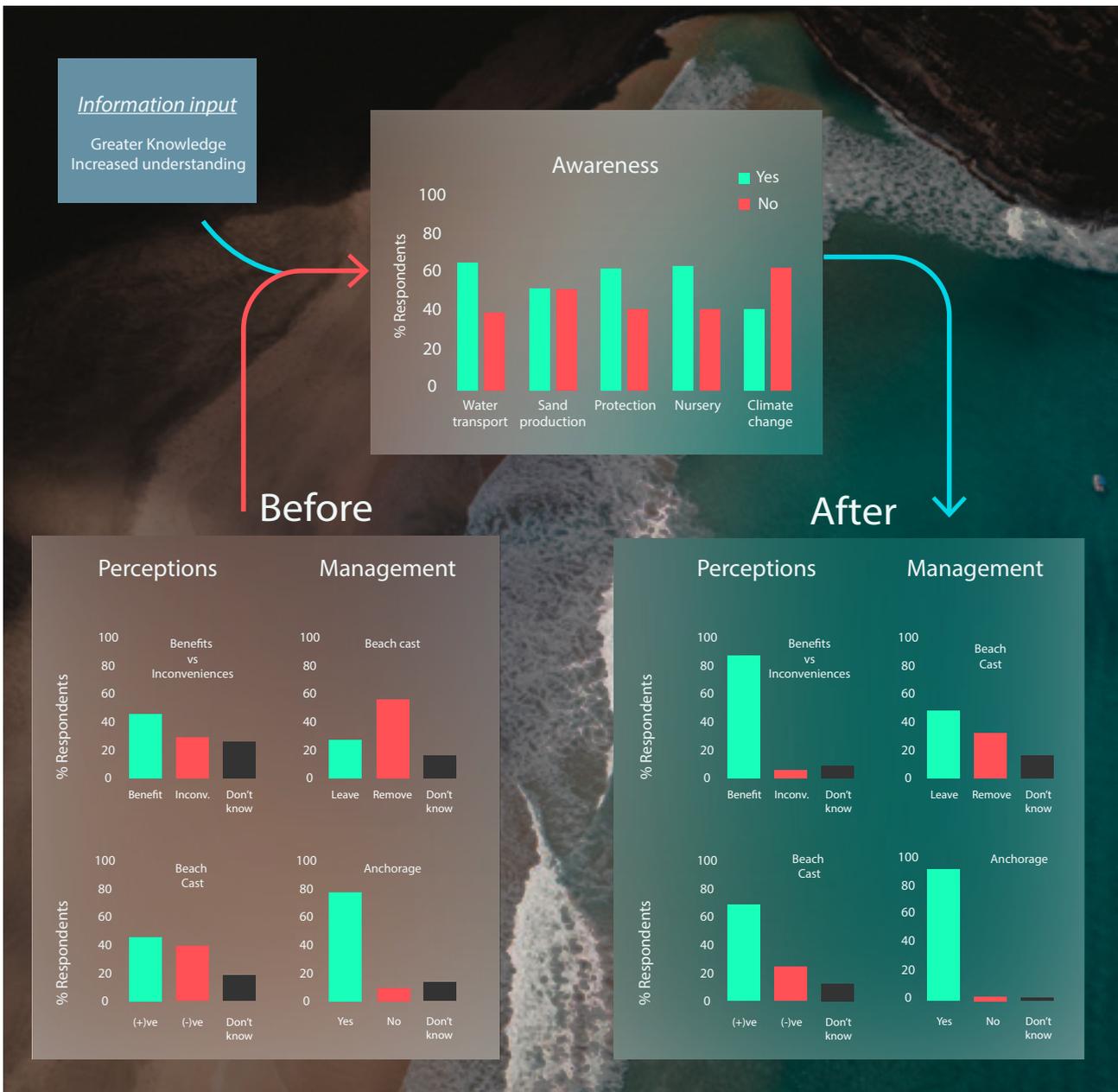
# Blue Carbon in the Balearics

 <https://oppla.eu/casestudy/17271>



Seagrass meadows purify sea water, providing habitats for marine wildlife whilst supporting and stabilising the beaches. They also form an important carbon sink, helping to mitigate climate change. But this valuable ecosystem is shrinking due to warming waters, pollution and dredging by anchors. OPERAs assessed seagrass carbon stocks and strengthened the collaboration between science and policymakers to better protect and manage seagrass meadows around the Balearic Islands. Scientific knowledge on seagrass ecosystem services is now taken into account in new regulations for seagrass conservation in the region, including:

- plans for a new sewage treatment facility, part funded by a tourist tax;
- new anchoring regulations that include permanent anchoring points for boats, rather than each anchor disturbing a new patch of 3,000-year-old seagrass;
- enhancement patrolling to prevent anchoring outside these designated sites.



Change is awareness of seagrass ES following stakeholder engagement activities

---

---

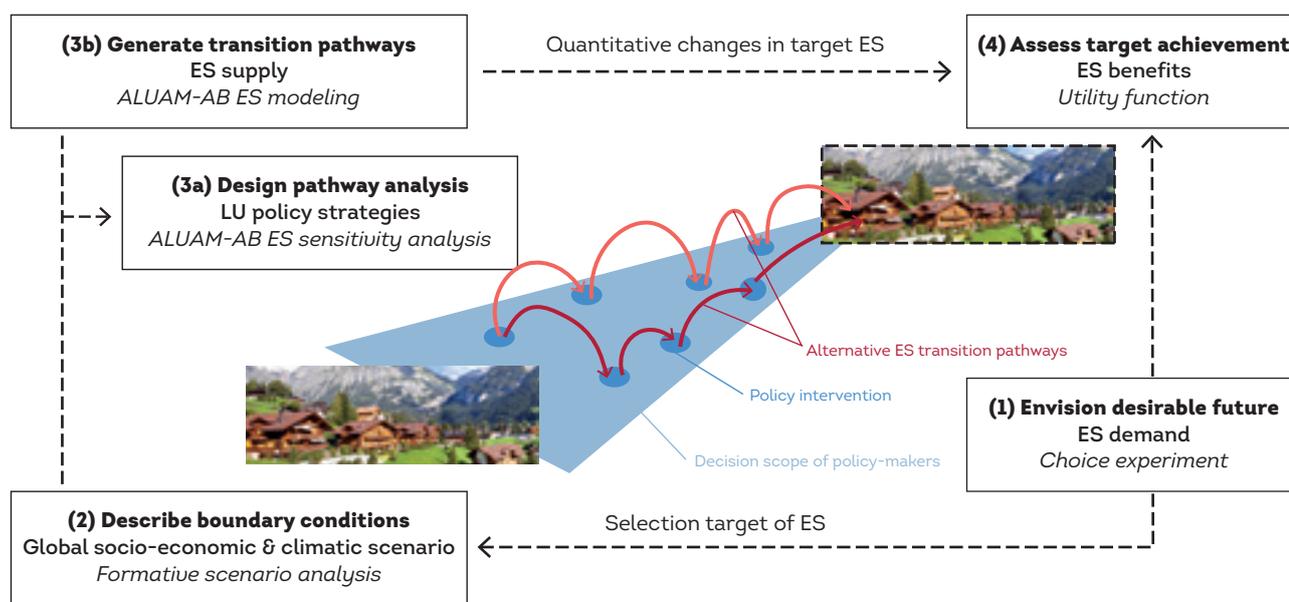
## Developing better land use policy in the Swiss Alps

<https://oppla.eu/casestudy/17275>



In the Swiss Alps, OPERAs worked with local residents and policy makers to develop strategies that improve the match between ecosystem service provision and societal demand. Using a back-casting approach, the study developed ideal future visions of the landscape based on the preferences of local residents. These were then used to evaluate policy actions using ES modelling tool BackES (described below). The study identified a gap between a high demand for cultural services (e.g. landscape aesthetics) and a decreasing number of farms managing the landscape and maintaining the supply of these ES. By establishing a collaborative platform, regional policy-makers and practitioners could explore and discuss adequate actions to balance conflicting interests. Furthermore, the project raised public awareness of the valuable services mountain regions provide and of the trade-offs related to their future provision.

# BackES – a tool for exploring land use solutions



## Outline of the integrated backcasting approach:

Bold titles delineate four generic steps of a backcasting analysis, subtitles show operationalization based on land use (LU) and ecosystem services (ES) in a welfare economic context, methods used in this study are given in italic.

Arrows show qualitative and quantitative information exchanged between modules.

DOI: 10.1016/j.envsoft.2015.10.018

BackES is a tool for exploring possible solutions to current and future problems based on socio-economic, political and environmental information, criteria and goals. It supports the development of land use strategies that will lead to a desirable combination of ecosystem benefits.

## BackES follows four main steps:

1. Envisioning a normative desirable future with local residents
2. Describing boundary conditions relevant to the system
3. Designing and generating alternative transition pathways using an economic land allocation model
4. Assessing how well the pursued targets are achieved under different pathways

BackES can inform policy at time scales that are relevant to the work of institutions and individual decision-makers, evaluate how effectively interventions from different policy sectors change ES, and identify trade-offs behind these changes.

---

## Understanding the cultural value

 <https://oppla.eu/casestudy/17273>



### THE MONTADO

The Montado is a unique and complex agro-sylvo-pastoral system – centred on the Cork tree – that maintains high levels of biodiversity while being productive and providing employment to people in the region. Despite the highly sustainable management of cork, the system is under threat from rural abandonment, tree mortality, and a depreciation of the market value of cork.

OPERAs worked with managers, landowners, hunters, NGOs and tourists to understand the socio-cultural value of this ecosystem and raise awareness of potential impacts of future change under various scenarios. This led to an increased awareness and engagement with the challenges facing the landscape, and the establishment of a stakeholder platform, which in combination with the existing Long-term Socio-Ecological Research network (LTsER Montado), provides the basis for a community of practice that will collaborate to find solutions for current threats allowing the long-term sustainability of this high-nature value farmland.



## THE LOWER DANUBE

The Persina Nature Park, is one of the few remaining natural/semi natural ecosystems along the Danube river. The wetlands are important for biodiversity, flood protection, water quality and carbon sequestration, and support socio-economic activities such as fishing, farming and crafts. Despite its importance, there is low recognition among local and national stakeholders of the societal, economic and environmental values of wetlands, which are under threat from pollution, dyke abstraction and land reclamation.

OPERAs demonstrated the interest and commitment of stakeholders, specifically landowners and users, to participate and contribute to good management practices of wetland nature parks and protected areas in Bulgaria and Romania. This research demonstrated that stakeholders were not only interested in the market value of the provisioning services, such as fish and reed, but also showed interest in cultural ecosystem services such as recreation. Stakeholders were also willing to participate in alternative management options such as economic reed harvesting. Management authorities and regulatory stakeholders from both countries will now incorporate local stakeholder values and preferences in the management of protected areas in the future.

---

## Improving farming practices in the Mediterranean

 <https://oppla.eu/casestudy/17277>

Closing shot of OPERAs video explaining the challenge for Mediterranean agriculture

---



In the Mediterranean, climate change will increase water stress and mismanagement often leads to soil degradation, threatening the future sustainability of agriculture in the region. Following discussions with agronomists specialising in Mediterranean systems, OPERAs explored farming practices that could improve the sustainability of agriculture using an ecosystem model to simulate a bundle of ecosystem services provided by Mediterranean agro-ecosystems. Results illustrated how changes in farming practices focusing on soil conservation can also improve the adaptation of agriculture to climate change and contribute to climate mitigation. Depending on the location and the chosen management, the analysis of trade-offs between the different simulated ES and socio-economic indicators (e.g. irrigation water consumption) appeared to be a good way to identify potentially sustainable farming options for the Mediterranean.

---

# Developing and evaluating future land management scenarios with stakeholders in the French Alps

 <https://oppla.eu/product/2074>



Grenoble in the French Alps is dynamic metropolitan area, set within highly heterogeneous and multifunctional landscapes that require careful management to meet everyone's needs. OPERAs used a participatory approach to co-construct a range of future land management scenarios for the area, using land use mapping and modelling. Resulting policy options were co-evaluated using participatory multi-criteria analysis (MCA), which led to increased levels of engagement by managers, planners and decision-makers.

Outcomes demonstrated the geographic heterogeneity (or spatial trade-offs) of scenario outcomes. Stakeholders are now better aware of how the current metropolitan and regional park plans may perform in terms of nature conservation and ecosystem services, and of the risks and benefits of alternatives. For example, they found that multifunctionality is constrained by biophysical trade-offs and is therefore not always achievable or desirable. These results will be used to help target specific issues such as the implementation of the regional connectivity network or biodiversity offsetting.

# Making the green economy happen

<https://oppla.eu/product/18160>

Current level of policy integration in Scotland

	Environment: Air	Environment: Soil	Environment: Water	Agriculture & Rural Development	Forest	Marine/coastal environment, fisheries	Climate	Bioenergy
Conceptual integration	+	=	-	▨	=	=	=	-
Operational integration	+	+	=	+	+	+	+	+

**Comparison with EU policy**

- +** Integration in Scottish policy superior to what has been observed for the EU
- =** Integration in Scottish policy equivalent to what has been observed for the EU
- Integration in Scottish policy inferior to what has been observed for the EU

**Overall level of ES/NC integration**

- Explicit and comprehensive
- Explicit but comprehensive
- Implicit and comprehensive
- Policy sector transition
- Policy area with subsectors displaying uneven levels of ES/NC integration

The integration of ecosystem services into the functioning of economic sectors provides a concrete means to initiate a shift towards green economy. OPERAs produced guidance for policy- and decision-makers to assist with this integration and applied this guidance to Scotland, an environmentally diverse country that faces many of the challenges encountered across Europe.

The analysis explored how explicit and comprehensive the Scottish policy framework was in taking into account and sustaining ES. It also compared the level of national integration to the level of integration at EU level. The analysis encompassed eight policy sectors, as shown below.

In most of the eight sectors assessed, Scotland does as well as the EU if not better. This is mostly because Scottish policymakers have committed to provisions that are optional in European action plans. A number of these sectors are in a transitional state, however, as strategic policies have yet to be translated into concrete norms, projects and practices.

# Exploring support for managing realignment in the Inner Forth

<https://oppla.eu/casestudy/17267>



The Inner Forth estuary in Scotland is a complex socio-ecological system, marked by centuries of human activities and impacts. Approximately fifty percent of intertidal habitats in the Inner Forth Estuary were historically claimed for agricultural and industrial use. The remaining saltmarshes – an important habitat for birds and invertebrates – have been fragmented leading to reduced flood protection. Climate change adaptation to rising sea levels can involve either strengthen sea walls or managed realignment where reclaimed farmland is converted back to wetland.

OPERAs engaged with local organisations, landowners, farmers and residents to explore how stakeholders feel about these management options through workshops, interviews and choice experiments. Farmers were mostly in favour of strengthened sea walls to maintain their livelihoods and heritage, while citizens and local organisations were mainly supportive of managed realignment. This study also illustrated how stakeholders were limited in their ability to engage with and understand the management of their shoreline, yet were generally keen to get involved.

---

## LandPref tool to understand the values of local stakeholders

<https://oppla.eu/product/2099>

“THOUGHT PROVOKING STUFF”

– PENTLAND HILLS REGIONAL PARK VISITOR



LandPref is an interactive tool that allows users to indicate preferences for management options for a particular landscape, and to see the effect those management decisions might have. Participants adjust a virtual landscape combining elements of the landscape at varying intensity levels to produce an overall multifunctional vision.

The interactive use and the visual representation encourages participants to engage with the survey and makes it easier for them to relate to the topic. It has been used as part of an online survey, within face-to-face interviews and during public events - where the gathered data could be directly analysed and displayed on a screen.

The tool was developed for use in the Pentland Hills Regional Park, in Scotland. Visions developed based on responses from 715 park visitors illustrated a willingness for change and opened up a comprehensive dialogue about the future management of the regional park, which will be addressed in the next update of the management plan.

Examples of different landscape preferences for the Pentland Hills Regional Park

• Bird habitats need to be diverse to allow for a high number of species, habitats are most diverse with a mix of sheep farming (open grassland) and woodland  
 • Carbon stored in trees, increasing forest will automatically increase carbon sequestration

Sheep farming	0	1	2	3	4	5
Native forest	0	1	2	3	4	5
Birds	0	1	2	3	4	5
Wind turbines	0	1	2	3	4	5
Carbon sequestration	0	1	2	3	4	5
Recreation	0	1	2	3	4	5
Inspiration	0	1	2	3	4	5

Please indicate the role that inspiration plays in your vision of the Park over the next 10-15 years by selecting (0 - "not at all important" to 5 - "extremely important"). Your choice will not be reflected in the picture of the landscape.

Sheep farming	0	1	2	3	4	5
Native forest	0	1	2	3	4	5
Birds	0	1	2	3	4	5
Wind turbines	0	1	2	3	4	5
Carbon sequestration	0	1	2	3	4	5
Recreation	0	1	2	3	4	5
Inspiration	0	1	2	3	4	5

Please indicate the role that inspiration plays in your vision of the Park over the next 10-15 years by selecting (0 - "not at all important" to 5 - "extremely important"). Your choice will not be reflected in the picture of the landscape.

Sheep farming	0	1	2	3	4	5
Native forest	0	1	2	3	4	5
Birds	0	1	2	3	4	5
Wind turbines	0	1	2	3	4	5
Carbon sequestration	0	1	2	3	4	5
Recreation	0	1	2	3	4	5
Inspiration	0	1	2	3	4	5

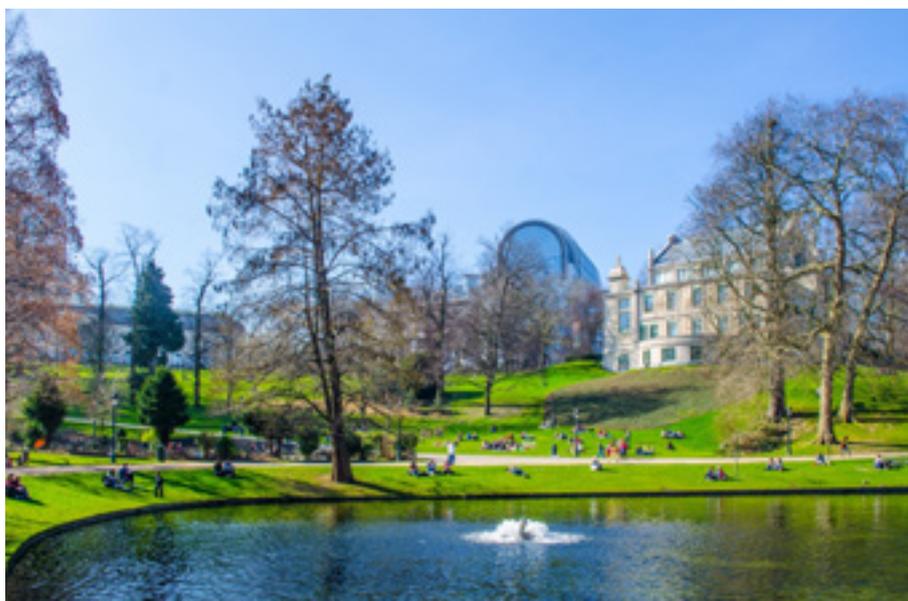
Please indicate the role that inspiration plays in your vision of the Park over the next 10-15 years by selecting (0 - "not at all important" to 5 - "extremely important"). Your choice will not be reflected in the picture of the landscape.

Sheep farming	0	1	2	3	4	5
Native forest	0	1	2	3	4	5
Birds	0	1	2	3	4	5
Wind turbines	0	1	2	3	4	5
Carbon sequestration	0	1	2	3	4	5
Recreation	0	1	2	3	4	5
Inspiration	0	1	2	3	4	5

---

## European policy can prevent, minimise and offset negative impacts

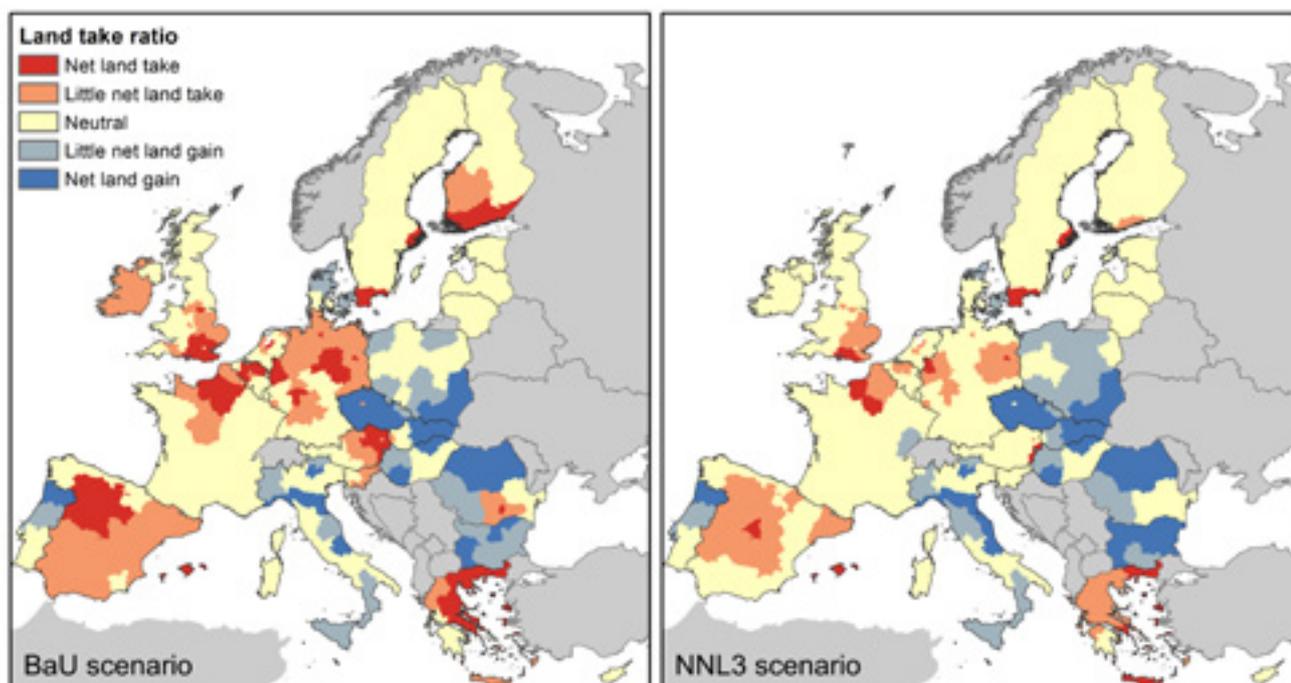
<https://oppla.eu/casestudy/17278>



While the EU has a number of policies in place to help safeguard Europe's ecosystems, losses are ongoing for many habitats, species and associated ecosystem services (ES). OPERAs modelled scenarios of recent and forthcoming EU policy developments that could affect ES in Europe and assessed how future developments may interact with existing policies – for example, the Birds Directive, the Habitats Directive and the Water Framework Directive. The findings show that business-as-usual scenarios of land use change in Europe have widespread negative effects on ES provision, but policy measures to avoid, minimize and offset impacts on (semi)natural habitats are projected to be effective in reducing these impacts.

“UNPRECEDENTED IN ITS INTERDISCIPLINARY SCOPE & MULTI-STAKEHOLDER ENGAGEMENT”

– USERBOARD PARTICIPANT



Ratio between land take (land use conversions towards less natural land use types) and land gain (conversion to more natural land use types) at regional level for the Business-as-Usual (BAU) scenario, and a policy scenario to offset impacts on (semi)natural habitats.

DOI: 10.1016/j.landusepol.2016.05.018

Although significant challenges remain to meet biodiversity and ES targets, important opportunities exist outside the protected Natura 2000 areas. For example, while in the future, urban agglomerates are projected to remain under pressure from urbanisation, these same areas are of pivotal importance in ensuring ES flows to their inhabitants. Prioritisation and optimization methods can be used to assist spatial planning in such regions, seeking to restrict impacts to areas of lower ES priority.

---

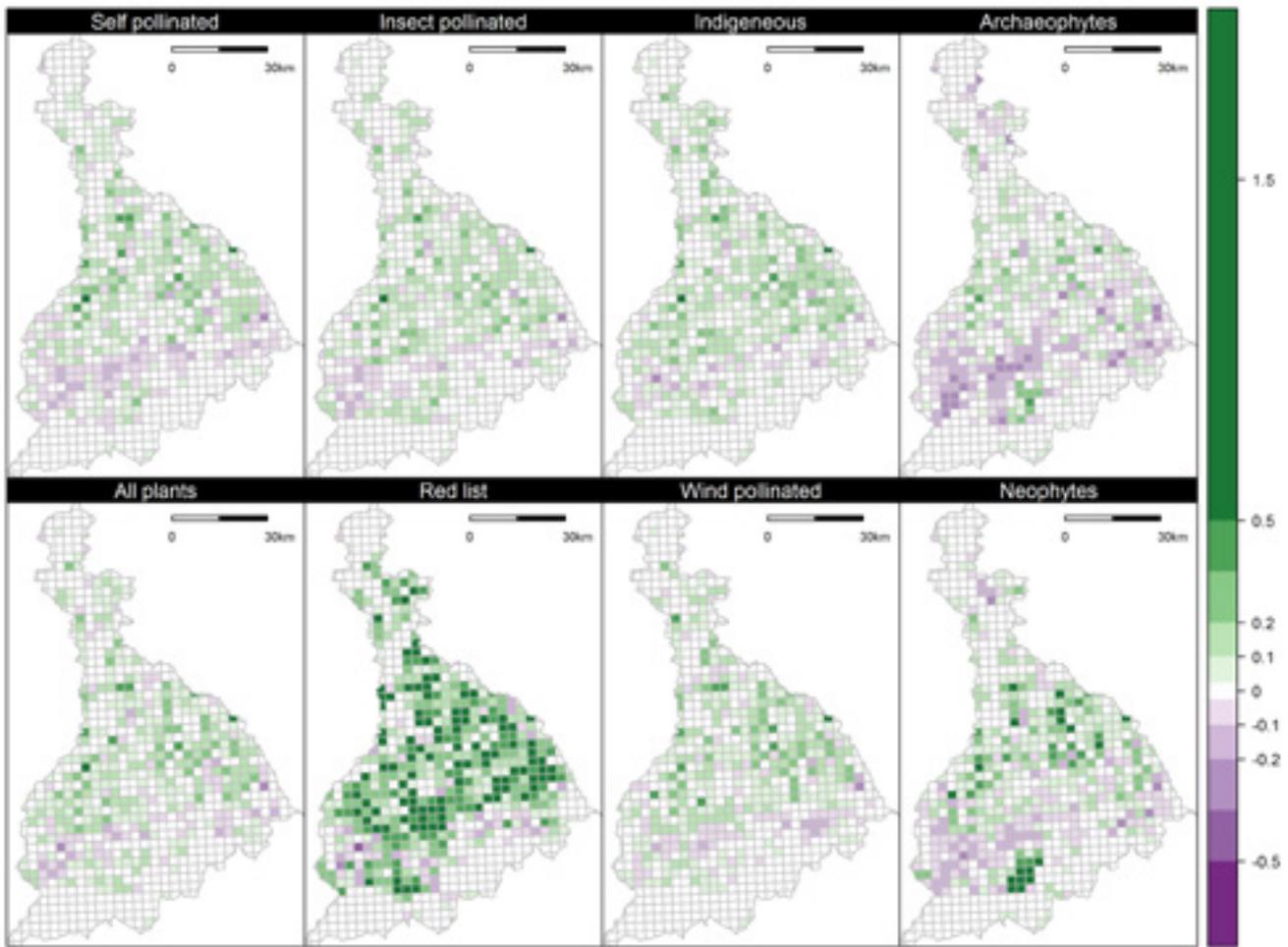
## Identifying land management trade-offs

<https://oppla.eu/operas/trade-offs>



Trade-offs in land management are almost unavoidable. To prevent unwanted trade-offs in ecosystem services (ES) provision, it is important to identify where trade-offs occur and find ways to navigate them. OPERAs reviewed published research into ES trade-offs and identified relationships between different types of ES. Regulating and cultural ES were more likely to have a synergistic relationship, while trade-offs were more common between regulating and provisioning services. Cultural and provisioning services had a 'no effect' relationship.

### Changes relative to reference, 35% scenario



Spatial pattern of plant species richness due to afforestation in Saxony (Germany). The colours indicate the change in species numbers due to the 35% forest cover scenario relative to the prediction for the reference situation.

DOI: 10.1016/j.ecolind.2016.09.035

Different regulating services often had a synergistic relationship, but this could change depending on the scale. For example, the relationship between carbon storage and biodiversity was synergistic at the large scale, but could lead to trade-offs at the finer scale. The OPERAs team explored this issue in practice by looking at the trade-offs between plant species richness and carbon storage in the context of afforestation in the Mulde Basin, Germany. Using a range of vegetation and carbon storage models, they were able to show that the trade-offs between plant biodiversity and carbon storage depended very much on the context of the forest in question. While afforestation had overall positive effects on both plant species richness and carbon storage, a number of locations were identified for which afforestation would lead to a decrease in plant species richness.

## The Wine Ecosystem Life-Cycle Assessment tool

 <https://oppla.eu/product/17473>



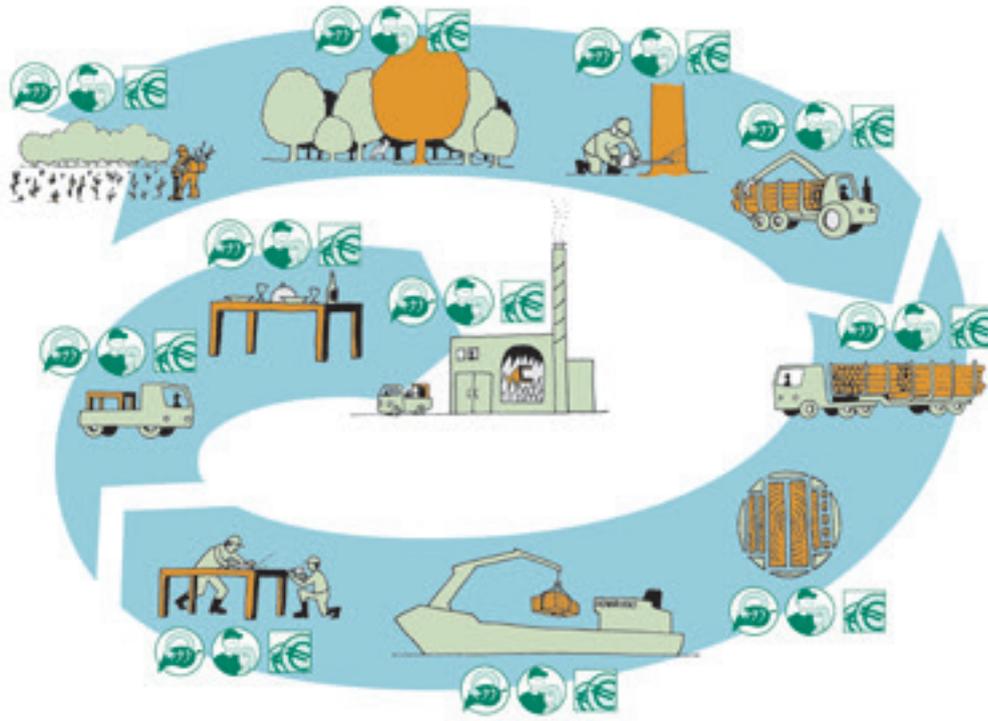
WeLCa – the Wine Ecosystem Life-Cycle Assessment tool – provides qualitative and quantitative assessments of the impacts of different wine production and management practices and identifies areas for improvement, with a particular focus on biodiversity. Phase I is suitable for raising awareness of the ES concept and provides a qualitative assessment of the impact of a variety of agricultural management and production practices. Phase II provides a quantitative assessment, suitable for progress monitoring through biodiversity indicators, identification of hotspots and evaluation of the impact of different scenarios.



WeLCa is primarily aimed at grape growers and wineries to help guide their production and distribution decisions, but it may also be of use to distributors, retailers and others interested in assessing and comparing the environmental performance of different wine producers.

# ToSIA – analysing sustainability impacts of value chains

<https://oppla.eu/product/1911>



ToSIA – a decision support tool that was originally developed for the forestry sector – analyses sustainability impacts of value chains related to resource use. Value chains are sequences of production processes that are linked with products. ToSIA uses scenarios to compare alternative process chains by analysing the sustainability effects of changes due to deliberate actions (e.g. in policies or business activities) or due to external forces (e.g. climate change, global markets). A baseline scenario is compared to a number of alternatives and impacts are assessed by calculating changes in material flows and indicators of environmental, economic and social sustainability within each forest value chain.

ToSIA was adapted for wine making by mapping out the wine production process and associated material flows to allow wine growers and wineries to understand potential environmental impacts due to different management options. In the future it could be further developed to include changes in practices and resulting impacts by distributors, retailers and consumers.

---

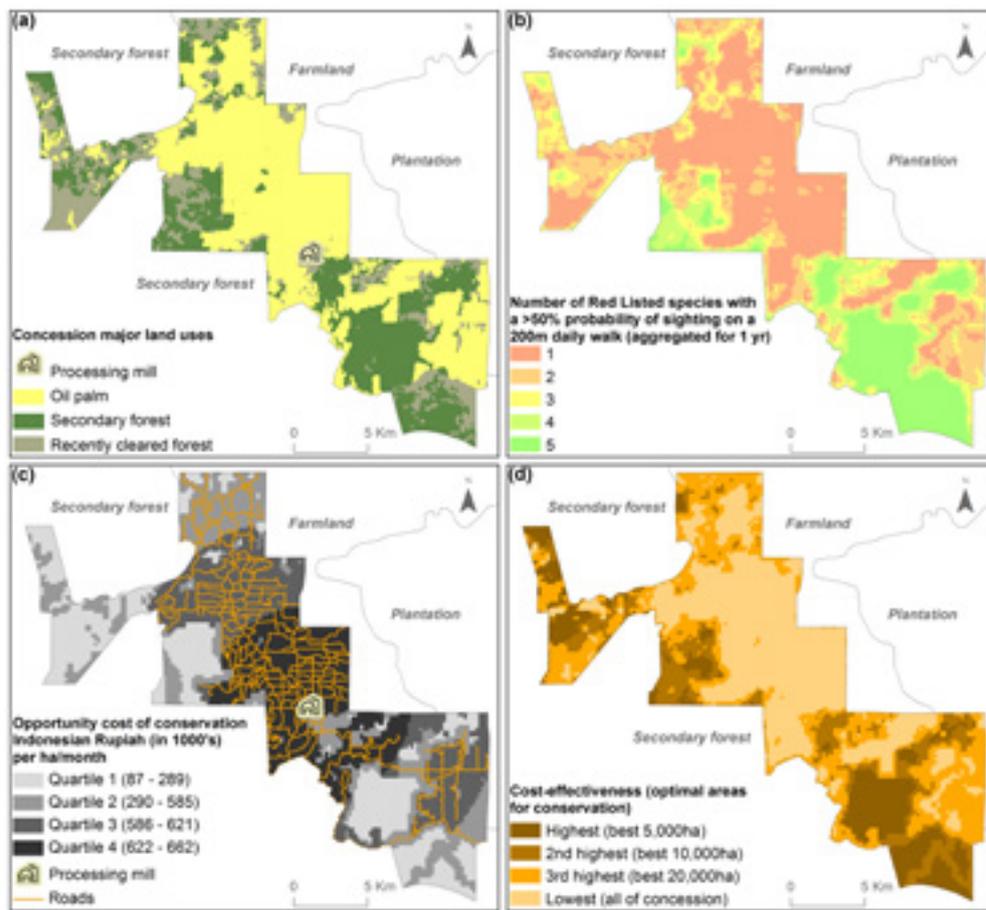
## Conservation on private land in global biodiversity hotspots

 <https://oppla.eu/product/18330>



OPERAs research showed that successful conservation on private land depends on three factors: the conservation effectiveness for the target species; the private costs in reduced productivity; and the private benefits that conservation provides, for example, by enhancing the value of remaining production.

Research on palm-oil production in a major tropical biodiversity hotspot found that the levels of both conservation effectiveness and private costs were inherently spatial. Changing the location of conservation activities can, therefore, have great impacts on both their effectiveness and private cost implications.



**(A)**  
Distribution of predominant habitat types across the concession

**(B)**  
The predicted number of IUCN Red Listed species

**(C)**  
The opportunity cost of conservation CC assuming high-productivity management regimes

**(D)**  
Optimal cost-effective allocation

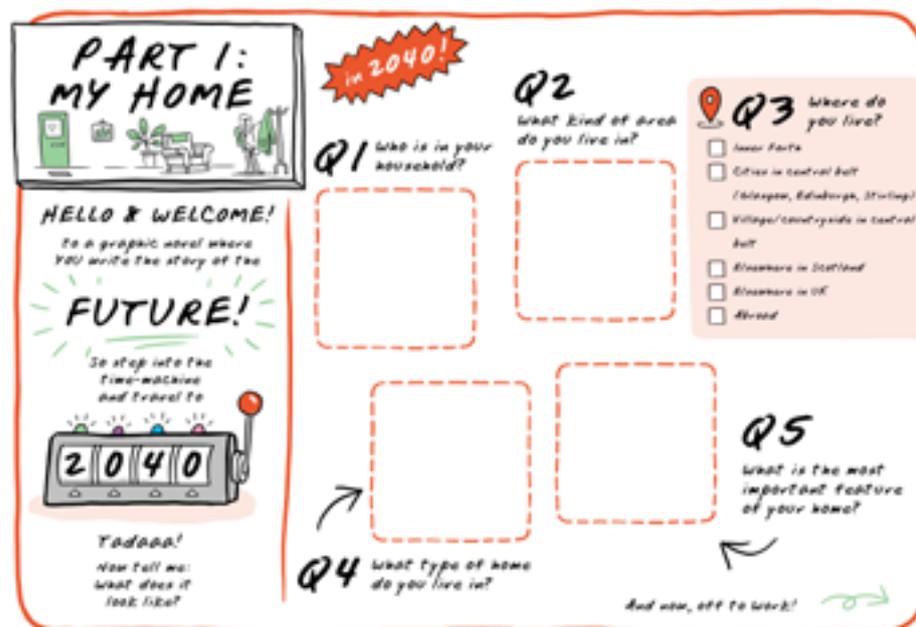
DOI: 10.1073/pnas.1406484112

An economic choice experiment revealed that consumers' willingness to pay for conservation-grade palm-oil products has the potential to incentivise private producers to engage in conservation activities that support vulnerable IUCN Nature Red Listed species. However, these incentives vary according to the scale and efficiency of production and the extent to which conservation programs are designed to optimise cost-effectiveness. By combining information on the spatial variability of conservation effectiveness and private costs, with market information on consumer willingness to pay, it should be possible to design successful and cost-effective conservation schemes.

## STREAMLINE – a fun and engaging interview format

<https://oppla.eu/product/1907>

Example of completed  
STREAMLINE canvases,  
where interviewees  
have placed illustration  
tiles to answer the  
canvas questions



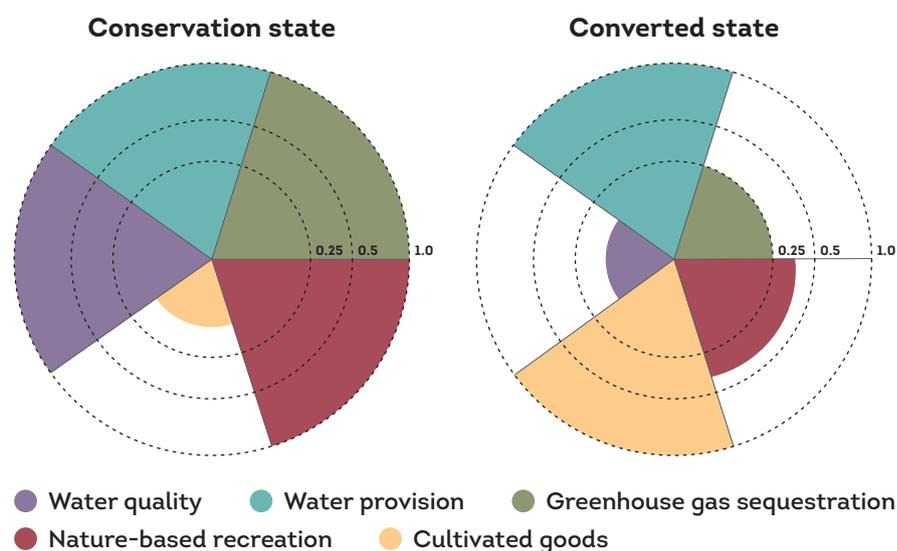
STREAMLINE combines the benefits of traditional interviewing with the use of visual images. It consists of a series of laminated A3 graphic canvases. Each canvas invites the participant to set out their vision on a different aspect of the future through a series of questions, which can be answered using a set of illustrated tiles. STREAMLINE takes the experience of the participant as a starting point, to focus on what he or she cares about most in their life in the future. Along with the colourful appearance and tactile interface of the canvas, this makes for an open and interactive format where people can express 'what' they want or think and 'why' they feel that way. STREAMLINE has been used in the Inner Forth and in Edinburgh, Scotland to explore people's visions for their local seascape.

“BONKERS BUT GOOD!”

– ALLOA RESIDENT

# A toolkit for Ecosystem Service Site-Based Assessment

<https://oppla.eu/product/1910>



Rose plots present the overall balance of services on a common scale of 0–1 where 1 represents the maximum value of the services between the two states. Based on DOI: 10.1016/j.ecoser.2013.06.003

The TESSA toolkit provides practical guidance for measuring ecosystem services (ES) at the site scale. It is useful for effectively communicating the results of ES measurements to aid decision-making on a local level – an area where existing tools have had limited applicability. TESSA provides scientifically robust information and a simple gross assessment of ES (e.g. climate regulating, coastal and waters services; nature-based tourism, harvested wild and cultivated goods). It has been tested in over 10 case study sites in different parts of the world, as was further developed and tested in OPERAs. The toolkit helps users to identify which services to assess, what data are needed to measure them, which methods or sources might be used in different contexts and how the results can be communicated to stakeholders.

---

## Creating impact through OPERAs videos



To communicate OPERAs work, a series of animated videos were developed that examined different aspects of the ecosystem services (ES) and OPERAs research in a concise and entertaining way. All of the videos are available to stream and download from the OPERAs YouTube channel. The videos have been popular with the general public, receiving over 10,000 views to date. They have also been used as a means of engagement during workshops with the general public and stakeholders. The videos leave a strong legacy of helping people to comprehend and develop a positive understanding of ES and the importance of its integration into European policy.

 <https://tinyurl.com/OPERAsYouTubeChannel>

## The Antwerp Declaration



Launched during the European Ecosystem Services conference in Antwerp (2016) and signed by over 300 people, the Antwerp declaration was based on a survey of over 100 delegates and discussion during the conference.

The declaration comprises three key principles:

- **Re-focus on principles of sustainability** – ES quantification, valuation and mapping which is carried out with consideration of equality and social justice will ensure fairer distribution nature's benefits.
- **Reclaim the notion of value** – ES assessments which include diverse values, incorporate alternative world views, respect indigenous and local knowledge and do so at multiple scales of governance will be better able to reflect the needs and desires of society.
- **Expand collaboration** – effective ecosystem service assessment and management can best be achieved through collaboration across disciplines and sectors. This requires long-term institutional support.

<https://oppla.eu/antwerp-declaration-we-must-now-deliver-societal-impact>

## Building ES communities of practice



"GREAT DAY OF DISCUSSIONS  
ON #sharedvalues AT #ESCom17

@ESComScot KEY THREAD:  
INSTITUTIONAL CONTEXT  
OF VALUATIONS IS  
CRUCIAL CONSIDERATION"

– @JasperKenter

Many OPERAs exemplars realised the need to bring together key stakeholders from science, policy and practice to identify where their research would provide added value and provide synergies to ongoing initiatives. This has led to the emergence of several communities of practice for individuals with an interest using the ES concept for better land management. In Scotland, nine organizations jointly launched the Ecosystem Services Community Scotland (ESCom; [www.escom.scot](http://www.escom.scot)). With over 500 members and regular events to bring together researchers, decision makers and practitioners, ESCom illustrates how a community of practice can create space, align motivations and build trust.

<https://oppla.eu/casestudy/17269> • [www.escom.scot](http://www.escom.scot)

# A map of Europe's natural treasures

OPERAs research identified how communication is a major barrier for the ecosystem services (ES) concept. To better engage non-expert audiences in the importance of ES, a graphic ES map for Europe was developed. It illustrates many of the concepts covered by OPERAs research and is available as a public resource.

<https://oppla.eu/product/18309>



---

## Developing Oppla



One of the most enterprising outputs of the collaboration between the OPERAs and OpenNESS projects is Oppla: a non-profit organisation with a mission to “assist people in making nature work for the benefit of humankind”. Oppla works to achieve this aim by managing a web-based community and innovation hub for sharing knowledge about natural capital, ecosystem services and nature-based solutions. In doing so Oppla provides solutions for a number of problems that are common throughout the research sector, notably:

- Bringing together the outputs of environmental research (typically dispersed across multiple platforms) so that information can be more easily obtained.
- Helping the outputs of environmental research achieve impact in other sectors by ‘packaging’ tools and resources in ways that are more accessible to target audiences.
- Providing longevity to research outputs beyond the lifespan of projects.
- Enabling organisations to immediately engage with an established community of interest: saving time and money on outreach and dissemination.

Oppla is the first spin-off SME of its kind to emerge from the EU FP7-Environment programme and since launching in 2016 has generated approximately €0.5 million in projected income, alongside a community of over 1500 members drawn from a wide range of sectors (representing science, policy, business and society). In its first year Oppla has developed a network of approximately 100 strategic partners, including the United Nations Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), through which it now aims to begin operating as a global platform: significantly increasing the impact of the OPERAs project.

Oppla provides a 'freemium' model for users, meaning that membership and access to services are free at point of use. Content is obtained and managed using the principles of crowd-sourcing and open data, creating unprecedented opportunities for co-design and innovation. Current services include:



**Ask Oppla:** A crowd-sourced enquiry service, where members of the Oppla community help to answer each other's questions.



**Oppla Marketplace:** A 'knowledge supermarket' where users can obtain guidance, software, data and other useful resources – as well as promote their own products and outputs.



**Case Study Finder:** An interactive map where Oppla members can browse and contribute case studies of practical projects.



**Oppla Community:** A searchable directory of Oppla members, which includes a 'Find My Match' facility – enabling users to identify other members who share similar expertise and interests.



**Oppla Groups:** Facility for users to create their own micro-communities within Oppla, focusing on specific topics, activities, scales, localities, etc.



**Oppla Labs:** A 'virtual laboratory' for showcasing, testing and sharing feedback on tools that are in development (software, data, models, guidance, etc).



**Oppla Webinars:** An ongoing programme of web-based presentations and discussions on a wide range of topics.

Both the Oppla organisation and web platform are continuing to expand, with significant new developments planned for 2018 and beyond. Members of OPERAs remain involved in the governance of Oppla through its Strategic Working Group, ensuring the future success of Oppla is guided by the same academic rigour and entrepreneurial spirit that led to its conception.

## Oppla in numbers

*In its first year Oppla has accumulated:*

**1,500+**

members of the  
Oppla community

**300+**

products in the  
Oppla marketplace

**120+** Case  
studies

**1,000+**

Twitter followers

**100+** Strategic  
partners

### Legacy

OPERAs has demonstrated how and under what conditions the ecosystem services (ES) concept can move beyond the academic domain towards practical implementation in support of sustainable ecosystem management. Its legacy lies in a wide-range of successful practical applications across Europe where co-production and co-creation between researchers, policy makers and practitioners has led to real change on the ground. OPERAs has also ensured continued learning into the future: through the collaboration that has been established as part of its research activities; and by creating Oppla as a knowledge marketplace that brings the latest thinking on ES to a growing audience.



### Further information

-  [www.operas-project.eu](http://www.operas-project.eu)
-  [www.oppla.eu/operas](http://www.oppla.eu/operas)
-  [@OPERAsProject](https://twitter.com/OPERAsProject)
-  <https://tinyurl.com/OPERAsYouTubeChannel>



OPERAs was funded by the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement number 308393 coordinated by Mark Rounsevell and Marc Metzger from The University of Edinburgh.