OpenNESS

Operationalisation of Natural Capital and Ecosystem Services

OpenNESS case studies

OpenNESS case studies were selected to allow real-world testing of the ecosystem service approach in relevant policy and management situations in different social-ecological systems and institutional and geographic contexts. The cases are linked with a wide range of EU regulatory frameworks such as Water Framework Directive, Water Framework Directive and the Thematic Strategy on the Urban Environment. The case studies have a central role in OpenNESS research design which is based on an iterative cycle of methodological development and refinement linked to the application in a set of real-word case studies.

1. Operationalising ecosystem services in urban land-use planning in Sibbesborg near Helsinki

https://oppla.eu/casestudy/17239

Objective

Exploring how ecosystem services can be integrated in a land-use planning process using a real-life planning case. A special focus is on multifunctional green infrastructure and applying new tools to operationalise ecosystem services in the plans in a participatory way.

Potential impacts and benefits

The unique natural values of the area have received the attention they deserve. A better understanding of the values of the services that ecosystems offer to the area is leading to more resilient solutions in allocating land for different purposes. The desired outcome is a master plan that presents novel thinking in ecosystem-based community development.

Area characterisation

Coastal area east of Helsinki, Southern Finland. The area, covering about 26 km^2 and owned partly by the municipality and partly by private land-owners, has prior planning and is an agricultural and forest-dominated landscape, including the Sipoonlahti bay as a centre of the area. The area has unique natural values, including Natura 2000 sites, exceptional fjord-like bay area and archipelago. In addition, there are specific historical and cultural heritage values in the area.

Transferability of the result

The results are relevant to other developing urban areas and can be beneficial to urban planners and decision-makers in general. The results offer an example of how the ecosystem services approach can be applied in urban planning and what methods can be used to support this. The case also serves as an example of working in a participatory way both in planning and research.

Lessons learned

The stakeholders were very positive towards Ecosystem Services (ES) concept and methods, but it remains to be seen how well the new ES-based approach will be present in the resulting plans. Sectoral collaboration and ability to comprehend the multifunctional nature of green infrastructure are

prerequisites for applying the ES-based approach. The GIS-based tools of mapping ES are a good way to illustrate the provision of and demand for ES, as well as the areas of conflicting interests.

2. Landscape-ecological planning in urban and peri-urban area - study area Trnava, Slovakia (Ecosystem services approach)

https://oppla.eu/casestudy/17266

Objective

Develop and test usable methods for valuation selected ecosystem services at the local and regional level, and promote their incorporation into the spatial planning process and in the broader decision making process in Slovakia.

Potential impacts and benefits

- Review of key national regulatory frameworks, planning and strategic documents in the research area
- Test of several approaches of ES assessment, development of new methods contributing to spatial and urban planning
- Regularly organized meetings, active work with stakeholders, raised public awareness
- Positive feedback from the potential users of new methods.
- Policy recommendations.

Results and proposed actions should be implemented by local authorities, regional authority, partly also by Ministry of Environment.

Area characterisation

Trnava is an administrative, economic, cultural and science-research centre in Western Slovakia. It is one of the oldest and most beautiful mediaeval towns in Slovakia. Nowadays Trnava belongs to the most rapidly developing cities in Slovakia with strong industrial investments (e.g. Peugeot-Citroën, Samsung, Johns Manville). Urban growth causes strong environmental problems in the area – air and water pollution, agricultural land take and low ecological stability of landscapes. The adjacent area to the city of Trnava represents intensively managed large-scale farmland. The study area consists of the city and its buffer area (16 settlements, 324.8 km^2, 92,730 inhabitants).

Transferability of the result

Results of case study could be used as methodical background for ES assessment in the similar types of landscape:

- Small and medium-sized cities
- Sub-urban areas with dominant agricultural use

Lessons learned

- The simple valuation methods are more suitable for practical implementation, comprehensive methods are more reliable
- Stakeholder involvement is a powerful tool, but it has several constrains
- Usefulness of "tiered" approach: national ES assessment – regional priorities - local planning process.

Case specific publications

Bezák, P., P. Mederly, Z. Izakovičová, J. Špulerová, and C. Schleyer. 2017. Divergence and conflicts in landscape planning across spatial scales in Slovakia: An opportunity for an ecosystem services-based approach? International Journal of Biodiversity Science, Ecosystem Services & Management **13**:119-135.

3. Valuation of urban ecosystem services in Oslo

https://oppla.eu/casestudy/17240

Objective

Conducting an integrated assessment and valuation of urban ecosystem services, which supports urban management and decision-making in Oslo. This scrutinises the potential and limitations of the concepts of ecosystem services and natural capital in an urban and Norwegian context.

Potential impacts and benefits

- Awareness raising about the current monetary value of blue-green structures for cultural ES.
- Assessment of property value added from blue-green structures and support for municipal property taxes.
- Mapping recreational values of urban forest in support of zoning.
- Applications for municipal assessment of environmental liability for city trees.
- Applications for scoring of property blue green factors.

Area characterisation

Oslo, South Eastern Norway. Population: 635 000 (2013), predicted to rise to 820 000 by 2030. Europe"s fastest growing capital city. Oslo Municipality Total area: 454 km^2 ; Forest: 287 km^2 ; Green space in built zone: 28 km^2

Transferability of the result

Transferable methods: Hedonic property pricing. ESTIMAP of recreation and pollination potential. Blue-green structural diversity mapping. Transferable technologies: Smartphone applications for mapping property blue-green factors (BGF App); Smartphone application for mapping urban residents" recreational habitat (mAptivity); Application for surveying and assessing the compensation value of city trees; Online survey of recreational use

Lessons learned

Nature in Oslo has a high monetary value. Despite this monetary value, ecological, socio-cultural and economic valuation methods must be combined in order to address the diversity of decision contexts and spatial scales for which assessments are needed by municipal planners.

Case specific publications

Barton, D., 2016. Ecosystem Services: concepts, methodologies and instruments for research and applied use. In Nuss-Girona and Castaner eds. Ecosystem services : concepts, methodologies and instruments for research and applied use.

Soy Massoni, E., D. N. Barton, G. M. Rusch, and V. Gundersen. 2018. Bigger, more diverse and better? Mapping structural diversity and its recreational value in urban green spaces. Ecosystem Services **31**:502-516.

Stange, E. E., G. Zulian, G. M. Rusch, D. N. Barton, and M. Nowell. 2017. Ecosystem services mapping for municipal policy: ESTIMAP and zoning for urban beekeeping. One Ecosystem **2**:e14014.

Stange, E., D. N. Barton, and G. Rusch. 2018. A closer look at Norway's natural capital-how enhancing urban pollination promotes cultural ecosystem services in Oslo. Pages 235-243 in M. L. Paracchini, P. C. Zingari, and C. Blasi, editors. Reconnecting natural and cultural capital. Contributions from science and policy. Publications Office of the European Union, Luxembourg.

4. Towards the design and implementation of a green infrastructure strategy in Vitoria-Gasteiz

https://oppla.eu/casestudy/17241

Objective

Demonstrating the benefits of incorporating a network of green spaces in the urban planning. This multifunctional "green infrastructure" network supplies ecosystem services and benefits to the city.

Potential impacts and benefits

- Evaluation and valorisation of the ecosystem services provided by urban green areas.
- Transformation and improvement of urban green elements.
- Boosting nature-based solutions towards climate change mitigation and adaptation.

Area characterisation

Vitoria-Gasteiz, Spain. Sub-project 1: "Salburua Wetlands": (61ha) located in the peri-urban area, 5 km from the city centre. Sub-project 2: Avenida Gasteiz. Area evaluated: 41,879.39 m2. It is one of the main axes of the inner green belt, characterised by private motorised transport, with numerous lines that divide and occupy parking space, preventing urban life.

Transferability of the result

Findings on the operationalisation of the ecosystem services concept and the demonstration of its benefits in urban planning and management are not considered spatially explicit. Hence, these findings can be easily benchmarked with other cities and pilot projects, providing:
insights on the implementation of the methods and tools used, i.e. standardisations
inputs to decision making and awareness based on the importance of ecosystem-based approaches, i.e. monitoring systems and strategies.

Lessons learned

- Wording is important: urban planners use Ecosystem Services approaches although they do not always talk about services or functions per se.
- Need to design and plan with nature
- Synergies and co-benefits from different ecosystem services and actions are crucial
- Learning from past experiences is essential

Case specific publications

Environmental Studies Centre, Vitoria-Gasteiz City Council. 2014. THE URBAN GREEN INFRASTRUCTURE OF VITORIA-GASTEIZ, PROPOSAL DOCUMENT

5. Operationalising ecosystem services in regional and national forest management planning in the multifunctional landscape of the French Alps

https://oppla.eu/casestudy/17242

Objective

Designing conservation strategies and adaptive management for the French Alps region. In particular, management options are targeted to support stakeholders and policymakers in making choices.

Potential impacts and benefits

The work underway responds to national level targets set on reconciling biodiversity conservation with the increased demands of natural resources, mainly in managed forests. The work will assist in the simultaneous maintenance of economically and ecologically sustainable forestry on the landscape scale in the long run - the main concern of the National Forest Office in France. Spatial models provided different alternatives for policy makers in order to help target conservation priorities and production management options.

Area characterisation

The Vercors Regional Natural Park (VRNP), French Alps is a 206,000 ha area located at the border between the Northern and Southern French Alps. 139,000 ha are covered by forest land, with altitudes varying from 180 m to 2,453 m. The particular case study selected for this research focuses on 25,000 ha (12% of the total area) located at the North of VRNP, in an area known as "Quatre Montagnes" encompassing seven communes that constitute the region. The area is undergoing important land use changes: afforestation, artificialisation (i.e. increase in urban sprawl, mainly in valleys) and deforestation (http://vercors.fr/fr-ete/decouvrir-vercors-ete-montagne/territoires-plateau-rhones-alpes/quatre-montagnes/)http://parc-du-vercors.fr/fr_FR/index.php

Transferability of the result

The results are relevant to other mountain landscapes in Europe and beyond. The work is focused in a Regional Park with different levels of protection and management. Consequently, the results may be relevant to other protected areas and related decision makers and planners.

Lessons learned

Sustainable ecosystem management and well-being can be enriched with local knowledge and people perceptions. Consequently, we applied innovative methods that do not only facilitate shared understanding of the human-landscape relationships, but also foster participatory decision-making that can be incorporated into landscape planning processes.

Case specific publications

Gonzalez-Redin, J., S. Luque, L. Poggio, R. Smith, and A. Gimona. 2016. Spatial Bayesian belief networks as a planning decision tool for mapping ecosystem services trade-offs on forested landscapes. Environmental Research **144**:15-26.

Tenerelli, P., Püffel, C. & Luque, S. 2017. Spatial assessment of aesthetic services in a complex mountain region: combining visual landscape properties with crowdsourced geographic information. Landscape Ecol **32**: 1097.
Tenerelli, P., U. Demšar, and S. Luque. 2016. Crowdsourcing indicators for cultural ecosystem services: A geographically weighted approach for mountain landscapes. Ecological Indicators **64**:237-248.

6. Forest bioenergy production in the south of Finland

https://oppla.eu/casestudy/17243

Objective

Informing policy makers at national and EU level about the short and long term consequences of forest bioenergy production and its trade-offs for other ecosystem services.

Potential impacts and benefits

- Increased knowledge - for regional stakeholders and policy makers, as well as for researchers - on the environmental and socio-economic impacts of forest bioenergy production.
- Increased understanding of different stakeholder perceptions on regional bioenergy production and its impacts.
- Increased understanding of links between EU and national policy making.

Area characterisation

Hämeenlinna, Southern Finland. Total land area of 2 000 km^2 of which forests around 69% (1415 km^2) and protected areas 1840 hectares, located in Vanajavesi watershed area.

Transferability of the result

Three kinds of results are provided: first on the actual impact on the forest bioenergy production, second on the stakeholder perceptions on the different bioenergy options and third on the applicability of the MCDA methodology for this kind of context. Knowledge on the actual impacts and associated stakeholder preferences can be relevant for both policy making and bioenergy research in other countries.

Lessons learned

- Removal of stumps appears not to be part of sustainable use of forest bioenergy.
- Removal of other harvest residuals can be carried out in a way that maintains forest ecosystem services in the long run.
- Stakeholder preferences for different management options appeared to be similar.

Case specific publications

Forsius, M., A. Akujärvi, T. Mattsson, M. Holmberg, P. Punttila, M. Posch, J. Liski, A. Repo, R. Virkkala, and P. Vihervaara. 2016. Modelling impacts of forest bioenergy use on ecosystem sustainability: Lammi LTER region, southern Finland. Ecological Indicators **65**:66-75.

Kangas, H.-L., J. Lyytimäki, S.-R. Saarela, and E. Primmer. 2018. Burning roots: Stakeholder arguments and media representations on the sustainability of tree stump extraction in Finland. Biomass and Bioenergy **118**:65-73.

7. Forest management in the Carpathian mountains, Romania

https://oppla.eu/casestudy/17244

Objective

Identifying the ecosystem services and their connections to biological diversity and forest ecosystem functioning, to support local communities and their traditional activities.

Potential impacts and benefits

Identification of possible conflicts between EU framework legislation and national legislation and clarification of the Ecosystem Services concept, specifically for forest ecosystems.

Area characterisation

The Carpathian Mountains cover approximately one fifth of Romania"s surface, most of their area being covered by forests. The Bucegi Natural Park (NP), where the case study is located, is one of the most important protected areas in Romania, due to its rare and diverse flora and fauna and its proximity to

Bucharest and other Romanian cities, which makes it a tourist hotspot. It also comprises forests with different management regimes, from strictly protected to protection and production forests.

Transferability of the result

The results will be useful in general for managers of forested areas in Romania, especially for managers of protected areas in mountaineous regions. It also presents a scientific basis for compensatory payments for timber production losses due to restrictions imposed on forested land use.

Lessons learned

The stakeholders positively valued the harmonising between the park functional zoning and the Romanian forest functional categories, and the Ecosystem Services international classification systems (CICES, MA, TEEB), considering the need for Natural Capital and Ecosystem Services concept development for forests, and in particular mountain ones.

8. Bioenergy production in Saxony, Germany

https://oppla.eu/casestudy/17245

Objective

Assessing how current and expected future land use changes affect the synergies or trade-offs between bioenergy provision and other ecosystem services. This will assist Germany in its aim to increase renewable energy provision up to 35% in 2020.

Potential impacts and benefits

- Better understanding of trade-offs and synergies between bioenergy provision and other ecosystem services
- Recommendations for avoiding trade-offs while realising synergies between ecosystem services
- Future research questions co-produced with scientists and practitioners

Area characterisation

The federal state of Saxony is located in the Central Eastern part of Germany. Land cover is dominated by agricultural land and production focuses on cereals, rape seed and maize, the latter two increasing in

recent years. Saxony comprises fertile lowlands and sub-mountainous regions towards the east and south-west.

Transferability of the result

Results will be transferable to areas, which expect similar land use changes due to bioenergy production. However, since soil or climatic conditions and societal and institutional settings are expected to influence the specific results, a 1:1 transfer of outcomes will not be possible.

Lessons learned

Production of energy crops was expected to impact negatively on landscape aesthetics as is the case for other regions in Germany. However, respective data on preferences for ecosystem services, collected in our case study, did not confirm this assumption. The main lesson learned is that assumptions should not be made about preferences for particular ecosystem services and instead work should be focused on assessing preferences directly, for example using MapNat: Ecosystem Service Mapping Application (App for Android based phones and tablets). More information can be found here: http://www.ufz.de/index.php?en=33303

9. Improved, integrated management of the natural resources within the Cairngorms National Park, Scotland

https://oppla.eu/casestudy/17246

Objective

Involving managers and residents in designing an integrated land management plan for biodiversity and tourism. Biodiversity and visiting people.

Potential impacts and benefits

Improved management of the natural resources within the park for the benefit of the people and biodiversity of the area.

Area characterisation

The Cairngorms National Park is Britain"s largest national park (4,528 km²) and is located in the north of Scotland; 36% of land is over 800 metres and 2% is over 1000 metres. It is home to an incredible diversity of wildlife and plants; 49% is designated as a Natura site and 25% as Sites of Scientific Importance. The land is owned in a heterogeneous mix of public and private ownership; 18,000 people call the Park their home and 1.4m people visit the Park every year.

Transferability of the result

The methodologies tested in the subprojects have relevance for any one managing a diverse landscape. The ESTIMAP-Recreational model is useful to understand recreational potential and accessibility; the mapping and societal survey approach to integrated landscape value is useful to visualise and engage with people; the QuickScan tool is useful to provide a platform for integrated transparent management and the BBN is a useful approach to enhance integration of diverse knowledge sources.

Lessons learned

ESTIMAP-Recreation and the integrated valuation approach have been evaluated by 15 stakeholders. These

evaluations provided useful insight for management decisions in conjunction with other approaches.

Case specific publications

Dick, J., L. Banin, S. Reis, and R. Smith. 2014a. Ecosystem service indicators: data sources and conceptual frameworks for sustainable management. Sustainability Accounting, Management and Policy Journal **5**:346-375.

Dick, J., J. Maes, R. I. Smith, M. L. Paracchini, and G. Zulian. 2014b. Cross-scale analysis of ecosystem services identified and assessed at local and European level. Ecological Indicators **38**:20-30.

Dick, J., A.-A. Amani, A. Chris, D.-D. Ricardo, G. Elli, H. Ľuboš, I. Zita, K. Miklós, K. Fares, K. Dušanka, K. Kinga, M. Giorgio, M. Viesturs, M. Michael, E. O. Daniel, P. Elena, S.-R. Margarida, I. S. Rognvald, V. Angheluta, V. Sanja, and V. Petteri. 2014. Ecosytem Services: A Rapid Assessment Method Tested at 35 Sites of the LTER-Europe Network. Ekológia (Bratislava) **33**:217-231.

10. Ecosystem services in the multifunctional landscape of the Sierra Nevada, Spain

https://oppla.eu/casestudy/17247

Objective

Assessing how the ecosystem service approach can be used to demonstrate problems in protected areas such as rural abandonment, land-use intensification and social conflicts emerging from strict conservation practices.

Potential impacts and benefits

- Increased awareness about the role of National Parks for human well-being in rural regions of the Mediterranean Basin;

- Better understanding of trade-offs and synergies between ecosystem services and rural development in the protected areas and surroundings;
- New insights about integrating the ecosystem services into protected area management;
- Identification of future research questions in the ecosystem services field

Area characterisation

Sierra Nevada Protected Area is the highest mountain massif in the Iberian Peninsula that covers different ecosystems, including high summits, Mediterranean forests, traditional agroecosystems, and semi-arid environments. It is the location of many local plant endemisms and multifunctional landscapes. The area is facing the effects of contrasting land-use changes: intensification in the lower areas and rural abandonment in the upper ones.

Transferability of the result

Results will be transferable to areas with similar biophysical and social characteristics and having a similar institutional architecture. These are European mountaineous areas characterised by mixed rural landscapes where depopulation processes and land use intensification take place together.

Lessons learned

Land-use intensification generally has resulted in losses of the biophysical factors that underpin the supply of ecosystem services, increases in social demand for services, and fosters the transformation of traditional governance practices. This has an uneven impact on stakeholders and their wellbeing, generating "winners" and "losers".

Case specific publications

García-Llorente, M., A. J. Castro, C. Quintas-Soriano, I. López, H. Castro, C. Montes, and B. Martín-López. 2016. The value of time in biological conservation and supplied ecosystem services: A willingness to give up time exercise. Journal of Arid Environments **124**:13-21.

García-Llorente, M., I. Iniesta-Arandia, B. A. Willaarts, P. A. Harrison, P. Berry, M. d. M. Bayo, A. J. Castro, C. Montes, and B. Martín-López. 2015. Biophysical and sociocultural factors underlying spatial trade-offs of ecosystem services in semiarid watersheds. Ecology and Society **20**.

García-Nieto, A. P., C. Quintas-Soriano, M. García-Llorente, I. Palomo, C. Montes, and B. Martín-López. 2015. Collaborative mapping of ecosystem services: The role of stakeholders' profiles. Ecosystem Services **13**:141-152.

Iniesta-Arandia, I., M. García-Llorente, P. A. Aguilera, C. Montes, and B. Martín-López. 2014. Socio-cultural valuation of ecosystem services: uncovering the links between values, drivers of change, and human well-being. Ecological Economics **108**:36-48.

11. Investigating ecosystem services and compensation measures for biodiversity impacts in the East Midlands of England

https://oppla.eu/casestudy/17248

Objective

Assessing ecosystem service delivery and the options for biodiversity offsetting (compensation measures for biodiversity impacts). Also, the future resilience of offsetting in the context of climate change is being studied.

Potential impacts and benefits

- Improved understanding of the ecosystem services of Warwickshire.
- Improved understanding of the role of ecosystem services in the context of biodiversity offsetting and the potential impact of climate change on the offset habitats.
- Documentation of existing models for offsetting and analysis of its costs and benefits.

Area characterisation

The Warwickshire case study includes the regions of Warwickshire, Coventry and Solihull in the East Midlands of England. The region is very rural and sparsely populated. It borders Birmingham, which is one of the UK"s largest cities after London. The Warwickshire, Coventry and Solihull sub-region has some excellent wildlife areas, but these are often quite fragmented. Warwickshire has lost more than 70 plant species and 40 species of moth in recent decades and less than 2% of the county is designated for its natural interest.

Transferability of the result

The offsetting context is relevant to any studies interested in different approaches to meeting no-net-loss targets for development. The methods could be transferred to any area that is assessing ecosystem services or applying biodiversity offsetting. Some ecosystem service delivery findings could be applied to other mixed rural landscapes, but the cultural services would be more societally specific. The resilience of offsets to climate change would depend on the habitat and location.

Lessons learned

The methods offer very different insights into Ecosystem Services and a combination of approaches is useful to obtain a broad understanding of the mixed rural context. Further assessment with the case study stakeholders is required to assess the extent to which each approach can help frame management practice beyond awareness raising.

Case specific publications

Smith, A.C. and Dunford, R.W. (2017) Land use scores for ecosystem service assessment. Project report from the NERC Green Infrastructure Innovation project ‘Tools for Planning and Evaluating Urban Green Infrastructure: Bicester and beyond’. Available on request from Alison.smith@eci.ox.ac.uk.

12. Supporting sustainable land use and water management practices in the Kiskunság National Park, Hungary

https://oppla.eu/casestudy/17249

Objective

Supporting sustainable land use and water management practices. By identifying the main problems and involving local stakeholders the basis will be laid for the later resolution of the water-management conflicts in the area and the introduction of an ecosystem services perspective.

Potential impacts and benefits

The ecosystem service and natural capital concept has now been introduced into the local and regional discourses about environmental management. This contributes to regional planning and facilitates conflict management between stakeholder groups.

Area characterisation

Kiskunság Sand Ridge is an 8300 km^2 semi-arid lowland region with large extents of inland sand dunes and shallow alkali lakes in Central Hungary. Traditional land-uses were pastures and grazing, as well as small-scale arable fields, vineyards and orchards. In the last 50 years drainage, intensive farming and timber plantations have profoundly transformed the landscape, leading to shifting patterns of abandonment and cultivation, as well as depopulation of the rural areas. Since 1947 the Directorate of National Park of Kiskunság has been operating in the area protecting the environmentally special and unique species.

Transferability of the result

The participatory methods involving a broad spectrum of stakeholder groups can be transferred to facilitate environmental management planning on a similar scale. The conflict management approach may be applied to regions where nature conservation authorities are major stakeholders. The elaborated indicators promise the scale-up of the ecosystem service assessment.

Lessons learned

The ecosystem service concept and application of indicators facilitate stakeholder involvement in environmental management and planning. Participatory methods are appropriate for coupling non-monetary evaluation with scenario conflict management and scenario building.

13. Reintroducing green corridors in the agricultural land of the Province of Limburg, Belgium

https://oppla.eu/casestudy/17250

Objective

Enabling more rational farm management and planning space for green corridors in the agricultural land, together with all relevant stakeholders at landscape level. The context of this case study is explained by a short YouTube clip: http://youtu.be/sD0gVUmmwnE

Potential impacts and benefits

The expectation is that the green areas deliver several benefits: additional agro-biodiversity, social benefits (such as recreation and tourism), economic benefits (alternative income opportunities for farmers) and additional value from products derived from the maintenance of the natural elements. The fact that the plan is built with the active cooperation of local stakeholders is expected to result in more public support and more sustainable maintenance.

Area characterisation

The total project area is 2170 ha and it is located in the province of Limburg (Belgium). The most dominant uses are: agriculture and "others" (57%), half-natural grassland (21%), and forest (10%). The landscape is open and gently undulating. The villages are traditionally farming communities, but there is an increasing number of people who live there and whose income does not depend on agriculture. There is also immigration of people who choose to live there for the quietness and landscape beauty. Tourism and recreation are growing sectors.

Transferability of the result

The results will be relevant for the organisation and management of multifunctional agricultural landscapes, which face demands from diverse stakeholders.

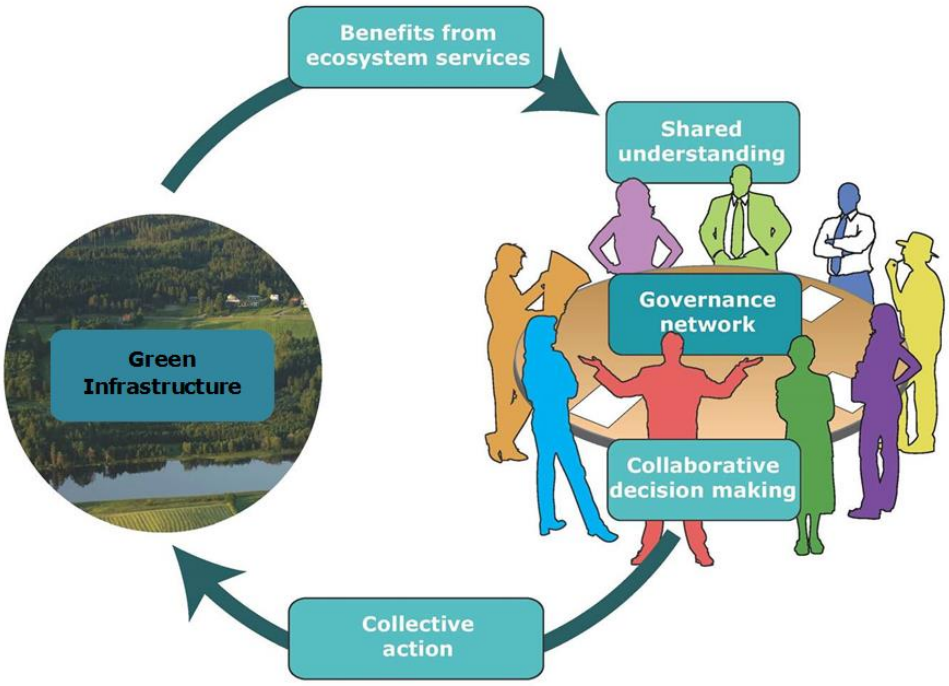
Lessons learned

Although most people have a dominant stake in the area, all interviewed people recognized the necessity of multiple landscape functions. In most cases these functions can be combined, but some uses can result

in trade-offs. The identification of these trade-offs can support better landscape planning and help to avoid possible conflicts.

14. Planning with Green Infrastructure

https://oppla.eu/casestudy/17251



Objective

Incorporating social learning in collaborative decision making processes within which the development of multifunctional, multi-services delivering Green Infrastructure is included in local level planning.

Potential impacts and benefits

Improved understanding of how the social learning processes in planning with Green Infrastructure services work, and the learning of how this experience can be used in other, similar, local and regional planning processes with impact on the actual realisation of Green Infrastructure.

Area characterisation

Five local planning cases in Great Britain, The Netherlands and Belgium where the learning process of developing Green Infrastructure was studied. The five case study areas encompass a gradient of developed to undeveloped land. Transnational cooperation was central to the work, to be able to sample the variety of planning cultures, land use patterns and economic drivers across NW Europe. Green Infrastructure is a broad concept, which includes both protected areas (e.g. Natura 2000 areas) and networks of landscape elements in multifunctional landscapes which are owned and used by a wide variety of stakeholders. We

focus on developing Green Infrastructure in such multifunctional landscapes, including rural, urban and peri-urban landscapes.

Transferability of the result

The five areas we studied encompass a gradient of developed to undeveloped land, and also a variety of planning cultures and protocols. We, therefore, propose that what we learned about the effectiveness and impact of our method will ensure that the final method is robust enough to apply in landscape governance across NW Europe. Moreover, the approach and methods were tested in the five areas and adjusted to general use.

Lessons learned

The essential lesson regarding Green Infrastructure and Ecosystem Services is that social learning is the essence of community based Green Infrastructure planning.

15. Constructed wetlands as a multipurpose green infrastructure in Gorla Maggiore, Italy

https://oppla.eu/casestudy/17252

Objective

Testing the feasibility of a green infrastructure, instead of a traditional grey infrastructure, to treat sewage overflows, and investigating the multiple benefits that the green infrastructure provides and its relevance for water management.

Potential impacts and benefits

- Improved management of water resources for the benefit of people and biodiversity.
- Providing evidence that green infrastructures, besides complying with the existing water regulations, provide additional services.
- Providing the regional government, the main sponsor of the infrastructure, with a cost-benefit analysis that can be replicated to analyse the potential impact of this kind of intervention in other locations.
- Showing the perspective of different groups of stakeholders (local residents, municipality, water & environmental managers, experts and NGOs).

Area characterisation

Gorla Maggiore is a municipality of ca. 5000 inhabitants in the Lombardy Region, northern Italy. The mean household annual income is around 29,120 €; and the population economically active is 54%. The green infrastructure consists of a set of constructed wetlands (CW), surrounded by a park on the shore of the Olona River in an area previously used for poplar plantation. It includes a) a pollutant removal area with a grid, a sedimentation tank and 4 vertical sub-surface flow CW; b) a surface flow CW with multiple roles, such as pollution retention, buffer for flood events, maintenance of biodiversity and recreation; and c) a recreational park with restored riparian trees, green open space, information panels, walking and cycling paths and other services. The whole surface area is 6.5 ha.

Transferability of the result

The findings can be particularly useful for similar situations: municipalities aiming to treat their Combined Sewer Overflow as required, for instance, by the EU Water Framework Directive.Our methods and results could offer practical tools to use the concept of ecosystem services to select the best option between a multi-purpose green infrastructure and a grey alternative, to apply a cost-benefit analysis, and to communicate with the stakeholders and local community. This will increase the awareness about the benefits provided by new or restored ecosystems.

Lessons learned

The green infrastructure (constructed wetlands and park) performs equal to or even better than the grey alternative for water purification and flood protection. It provides additional benefits (wildlife support and recreation) specially valued by the local residents and stakeholders, and it has similar costs.

Case specific publications

Grizzetti, B., C. Liquete, P. Antunes, L. Carvalho, N. Geamănă, R. Giucă, M. Leone, S. McConnell, E. Preda, R. Santos, F. Turkelboom, A. Vădineanu, and H. Woods. 2016. Ecosystem services for water policy: Insights across Europe. Environmental Science & Policy **66**:179-190.

Liquete, C., A. Udias, G. Conte, B. Grizzetti, and F. Masi. 2016. Integrated valuation of a nature-based solution for water pollution control. Highlighting hidden benefits. Ecosystem Services **22**:392-401.

Masi, F., A. Rizzo, R. Bresciani, and G. Conte. 2017. Constructed wetlands for combined sewer overflow treatment: Ecosystem services at Gorla Maggiore, Italy. Ecological Engineering **98**:427-438.

16. Quantifying the consequences of the EU Water Policy for ecosystem service delivery at Loch Leven, Scotland

https://oppla.eu/casestudy/116

Objective

Quantifying the links between the ecological status and the provision of ecosystem services for a freshwater lake. Focus is on understanding environmental quality needed to deliver recreation and fishing services provided by the lake, and the value of these two services.

Potential impacts and benefits

- Demonstration of positive synergistic provision of ecosystem services due to river basin management under the Water Framework Directive, which is originally only aimed at achieving good ecological status.
- Delivering practical management recommendations to help protect the ecological status and freshwater biodiversity, while maintaining ecosystem service provision at the catchment scale.

Area characterisation

Loch Leven is a large, shallow lake in Scotland (latitude 56°10"N, longitude 3°30"W). It is a site with high conservation value, designated a SSSI, RAMSAR, SAC and Natura 2000 site, as well as a site of important historical and cultural significance (Loch Leven Castle and a world famous brown trout fishery). The case study focuses on the water and surrounding land (about 20 km^2), but also takes into consideration the whole catchment upstream (145 km^2) and downstream of the lake. The loch itself is privately owned, but the surrounding case study area also includes a mix of public and private ownership. The local population of Kinross-shire is approximately 13,000 (2011) and the lake attracts over 200,000 visitors each year.

Transferability of the result

The ESTIMAP tool used at Loch Leven is valuable in mapping and assessing recreational potential, and visualisation of ecosystem conflicts on local scales. It has been adapted for mapping services around freshwater landscapes. The work on fishing quality and fishing services developed a Bayesian Belief Network to understand the complex drivers linking environmental quality to fishing services and helps communicate uncertainty in social-ecological relationships.

Lessons learned

Application of the ESTIMAP and BBN models highlighted the value of large datasets needed on both environmental quality and ecosystem services. It has also highlighted the value of incorporating local knowledge for decision support in the models.

17. Operationalising ecosystem services for an adaptive management plan for the Lower Danube River, Romania

https://oppla.eu/casestudy/17254

Objective

Enhancing the effectiveness of the integrated and adaptive management planning and its implementation in the area. This will be done by mainstreaming the improved understanding, using operational tools regarding the concepts of natural capital and ecosystem services.

Potential impacts and benefits

- Better understanding of the relationships between long term dynamics of the biophysical structure and functions of natural capital and the supplied ecosystem services.
- Maintaining and restoring of longitudinal and lateral connectivity of Lower Danube River Wetlands System, which is expected to recover conditions for migration, spawning and feeding of birds and fishes (e.g. sturgeons).
- Enhancing the stakeholders operational capacity to assess ecosystem services.

Area characterisation

The area under study is a regional complex system covering the Romanian part of the Lower Danube Wetlands System. It includes the Danube River stretch, lakes, wet meadows, alluvial forests, agricultural polders and fish ponds (approximately 11.000 km^2). The complex contains also many protected areas such as Natura 2000 sites, Danube Delta Biosphere Reserve and Small Island of Braila Natural Park. The work has been organised on two levels: case study level which allows for policies and regulatory frameworks analysis and integration, landscape and waterscape services assessment and local level, respectively selected areas where different assessment and valuation methods have been applied, tested and validated. The current structural configuration of Lower Danube River Wetlands System, consisting of more than 50% mono-functional agricultural ecosystems, leads to severe reduction of its former major ecological functions and, consequently, to the loss of benefits and ecosystem services, such as provisioning services (e.g. fish catches, reed or reed-mace biomass); regulation and support services (e.g. nutrients regulation;

hydrological and water quality regulation, species and habitat diversity) and cultural services (e.g. recreation, tourism).

Transferability of the result

The results can be used for assessment of similar ecosystems (e.g. wetlands, floodplains, coastal ecosystems) and for ecosystem services valuation under similar socio-economic and environmental conditions.

Lessons learned

- It is very important to involve all relevant stakeholders, including local population.
- For a proper assessment of ecosystem services it is necessary to have a common understanding of terms, concepts and tools.
- It is essential to define the spatial and temporal scales for ecosystem services assessment.

18. Integration of ecosystem services in the planning of a flood control area in Stevoort, Belgium

https://oppla.eu/casestudy/17255

Objective

Formulating a widely supported vision for developing a sustainable flood control area. To gain local support, local and societal needs were taken into consideration. Also, possible disservices needed to be tackled, while developing valuable nature values.

Potential impacts and benefits

By considering more ecosystem services and opinions of different stakeholders, it is expected that this will result in a sustainable and widely accepted vision. In the long run, it is expected that the water managers involved will consider more stakeholder opinions about possible benefits of flood control areas compared to their standard practise, by using some of the ecosystem services tools.

Area characterisation

The project area of Stevoort (150 ha) is a designated flood control area located in the City of Hasselt (Region of Flanders, Belgium), in the Atlantic Region. It is part of the wider valley around the rivers Herk and Mombeek and their tributaries. Land use is characterised by semi-natural grasslands (58%), forests (32%), water and swamps (5%), agricultural land (3%), residential area (1%) and other green areas (1%). There is an interesting potential for nature development. Much of the land is privately owned, so a large part of the implementation depends on mobilising interested stakeholders and private land owners. Flemish Environment Agency (VMM) and other government agencies have the mandate and capacity to implement only a limited part of the agreed plans.

Transferability of the result

The results are relevant for other areas that want to integrate different ecosystem services in the planning of a flood control area. Although the results are rather case-specific and not easily transferable to other locations, lessons learned can be inspirational for similar cases elsewhere.

Lessons learned

It is important to confront scientific Ecosystem Services assessments regularly with the practical needs from (local) stakeholders in an interactive feedback process. Desired habitats do not always coincide with the areas with highest Ecosystem Services potential.

19. Incorporation of ecosystem services in maintenance of the traditional cultural landscape of Doñana in South Western Spain

https://oppla.eu/casestudy/17256

Objective

Analysing the effects of the landscape planning scheme in ecosystem service performance, and exploring the ways in which ecosystem services can be explicitly incorporated in the management of the protected areas of Doñana and the surrounding landscape.

Potential impacts and benefits

- Exploring the possibilities for a multi-scale management using the ecosystem services framework.
- Evaluation of the different proposals towards the maintenance of the traditional cultural landscape in the long term.
- Supporting local stakeholders in identifying pathways towards sustainable maintenance of ecosystem services.

Area characterisation

Doñana is located at the end of the Guadalquivir watershed in Andalusia, Spain. The population amounts to 650,000 inhabitants and the economy is mostly based on agriculture and tourism. The Doñana socio-ecological system (DSES) is a paradigmatic example of land sparing, where protected natural areas under strict conservation programs are embedded in a broader matrix of intensively managed land uses (mostly for food production). This polarised approach to territorial planning has often resulted in social conflicts between conservation authorities and resource users, with largely negative consequences for biodiversity and ecosystem services. The main ecosystems include an agricultural matrix, marshes, estuary, sand dunes and the coast line.

Transferability of the result

The results are transferable for different contexts, including protected areas (especially if surrounded by transformed lands), and to any agrarian landscape. Nonetheless, the methods, results and conclusions of the land use change analysis, ecosystem services mapping, institutional analysis, integrated valuation, multi-criteria decision analysis and ecosystem services perception could be of interest to any other context dealing with landscape management.

Lessons learned

Protecting Doñana"s traditional vineyards is a challenge in the neighbourhood of one of the largest and most emblemic wetlands in Europe. Economic instruments such as Payment for Ecosystem Services tax and subsidy reforms were evaluated as less suitable and viable among the policy alternatives to maintain Doñana"s traditional vineyards and the ecosystem services they provide.

Case specific publications

Palomo, I., B. Martín-López, P. Zorrilla-Miras, D. García Del Amo, and C. Montes. 2014. Deliberative mapping of ecosystem services within and around Doñana National Park (SW Spain) in relation to land use change. Regional Environmental Change **14**:237-251.

Zorrilla-Miras, P., I. Palomo, E. Gómez-Baggethun, B. Martín-López, P. L. Lomas, and C. Montes. 2014. Effects of land-use change on wetland ecosystem services: A case study in the Doñana marshes (SW Spain). Landscape and Urban Planning **122**:160-174.

20. Managing the deposition of harbour maintenance dredging sludge in a Wadden Sea N2000 area

https://oppla.eu/casestudy/17257

Objective

Examine management scenarios related to the maintenance of a marina at the Dutch Wadden Sea Island Schiermonnikoog. Identify how ecosystem services in a N2000 area would be affected by different ways of depositing the dredging sludge. Gather stakeholder feedback to advance the ES approach.

Potential impacts and benefits

The examination of different management scenarios and of the related ecosystem services provides valuable knowledge and tools to decision makers for future harbour management in Wadden Sea and similar Natura 2000 areas. The ecosystem services approach can be operationalized as a key policy instrument in this and similar Natura 2000 case study areas.

Area characterisation

The intertidal Wadden Sea zone, one of the largest wetlands in the world, spreading from the Netherlands to Denmark along the South-eastern part of the North Sea, is an international UNESCO World Heritage site, considered unique from ecological, geological and socio-cultural perspectives. The case study is located at the South-western edge of the Wadden Sea island Schiermonnikoog, along the coast between the marina (old ferry dyke) and the new ferry dyke. The rectangular area covers ca. 2km x 250m. The marina, one of 17

Wadden Sea harbours, yields 1.3 mio Euro in income annually and provides 15 FTEs. Ca. 10,000 m³ of sludge are dredged annually for maintenance, to ensure the marina's accessibility.

Transferability of the result

In general, this case study can provide transferable lessons regarding ecosystem services to managers and practitioners of any coastal harbour site with sedimentation problems that require regular dredging for maintenance and accessibility. In particular, the lessons are easily transferable to similar harbour sites on the other Dutch, German and Danish Wadden Sea Islands, which are also classified as Natura 2000 and UNESCO World Heritage sites.

Lessons learned

The ES approach was useful to identify and value effects on ecosystem services of three harbour management scenarios. The ES approach allows decision makers to identify management options that enhance socio-economic development while maintaining ecological quality and integrity.

21. Operationalising ecosystem services in the Sudoeste Alentejano e Costa Vicentina Natural Park, Portugal

https://oppla.eu/casestudy/17258

Objective

Supporting the design of policies and planning instruments to ensure the sustainable management of natural capital stocks and the delivery of critical ecosystem services in the Natural Park. Engaging local stakeholders and decision makers throughout the process to promote awareness raising and social learning.

Potential impacts and benefits

The work developed using the ecosystem services concept provides stakeholders with valuable knowledge and tools, such as maps showing the ecosystem services, that can be operationalised into some of the key policy instruments in place, such as the Natural Park management plan. The workshops and discussion sessions organised during this project increased the communication between stakeholders and created new bridges for cooperation. The partnerships developed with the local stakeholders provided more detailed and innovative assessments and revealed how academia and scientific research can work directly with and for society.

Area characterisation

This Natural Park, established in 1995, is located in the SW corner of Portugal. It is an extended coastal sandy stretch covering 60,567 ha in land and 28,858 ha in the sea. It has a coastline with elevated cliffs,

small beaches, temporary watercourses, and estuaries that host a large variety of habitats. This area faces several pressures, such as habitat degradation due to the spread of invasive species. The park is also impacted by some polluting activities, such as irrigated agriculture or certain industries in its vicinity. Although tourism is growing, the promotion of a nature based model, the restrictions imposed by the natural park and the impact of the economic crisis have prevented the development of massive infrastructure.

Transferability of the result

The results provide transferable lessons to other coastal areas, particularly those under a protection status such as national protected areas or Natura 2000 sites. In non-protected areas contexts, the work developed in the fields of nature-based tourism and pollination may also provide valuable lessons for managers of these activities.

Lessons learned

The different methods applied may be useful to inform decision-making and planning, and to support participatory processes. Their complementarity provided more comprehensive assessments, as well as valuable knowledge through stakeholder engagement, whilst enhancing their awareness. This seems essential to manage the conflicts between promoters of economic activities and natural park authorities.

Case specific publications

Clemente, P., M. Calvache, P. Antunes, R. Santos, J. O. Cerdeira, and M. J. Martins. 2019. Combining social media photographs and species distribution models to map cultural ecosystem services: The case of a Natural Park in Portugal. Ecological Indicators **96**:59-68.

22. Investigating ecosystem services and compensation measures for biodiversity impacts in Essex, United Kingdom

https://oppla.eu/casestudy/17259

Objective

Assessing ecosystem service delivery and the options for biodiversity offsetting (compensation measures for biodiversity impacts). Also, the future resilience of offsetting in the context of climate change is being studied.

Potential impacts and benefits

- Improved understanding of the ecosystem services of Essex.
- Improved understanding of the role of ecosystem services in the context of biodiversity offsetting and the potential impacts of climate change on the offset habitats.
- Documentation of existing models for offsetting and analysis of its costs and benefits.

Area characterisation

Essex county is found in South East England immediately north-east of London. Essex contains several valuable and rare habitats, from coastal saltmarshes and mudflats to ancient woodlands, trees and

wetlands. Although protected from the urban spread of London by the metropolitan green belt and Epping forest, the close proximity to the capital places the county under constant pressure from expanding development. Parts of Essex suffer from high levels of deprivation whilst, in contrast, the west and south-west areas of Essex, within the London commuter belt, are amongst the most affluent areas in the east of England with a large middle class. This case study focuses on the provision and uptake of cultural ecosystem services across the county as a whole, and in the county town of Chelmsford.

Transferability of the result

The offsetting context is relevant to any studies interested in different approaches to meeting no-net-loss targets for development. The methods could be transferred to any area that is assessing ecosystem services or applying biodiversity offsetting. Some ecosystem service delivery findings could be applied to other mixed rural landscapes, but the cultural services would be more societally specific. The resilience of offsets to climate change would depend on the habitat and location.

Lessons learned

The methods offer very different insights into Ecosystem Services and a combination of approaches is useful to obtain a broad understanding of the mixed rural context. Further assessment with the case study stakeholders is required to assess the extent to which each approach can help frame management practice beyond awareness raising.

23. Participatory biodiversity management for ecosystem services in Bankur, India

https://oppla.eu/casestudy/17260


Objective

Mobilizing the local community and government functionaries for a collaborative Participatory Biodiversity Management plan and the conservation of the natural capital.

Potential impacts and benefits

The community and the field staff have learnt and applied the methods of Participatory Biodiversity Management to find improved conservation and livelihood of the local community. The Indian Ministry of Environment, Forest, and Climate change has appreciated the approach.

Area characterisation

The study areas are firstly coastal from the Godavari mangrove ecosystems constitute 321 km^2, making it the second largest area of mangroves along the east coast of India. The mangrove forest is managed by the Coringa Wildlife Sanctuary and also by the territorial forest division through community participation. The second one is woodland -forest from the district Bankura, located in the western part of the State of West Bengal in India. The District Bankura is bounded by latitude 22038" N and longitude 86036" E to 87047" E. River Demodar flows along the northern boundary of the district. The forest land is undulating Red & lateritic partly degraded, owned by the state forest department and the members of the community are partner in forest protection, management and benefit sharing.

Transferability of the result

The results have relevance for any kind of forest ecosystem where the local community and the government has a stake in conservation and that deal with biodiversity conservation and sustainable livelihood in particular.

Lessons learned

"Scientific Methods" or "Policy" may not be effective to improve ecosystem services, unless there is accountable public governance that is compatible with appropriate social institution for "Participatory Biodiversity Monitoring and Management", blending scientific principles with indigenous knowledge.

Case specific publications

Mukhopadhyay, R. and S. B. Roy. 2015. Traditional Knowledge for Biodiversity Conservation, Maintain Ecosystem Services and Livelihood Security in the Context of Climate Change: Case Studies from West Bengal, India. Journal of Biodiversity **6**:22-29.

24. Operationalising ecosystem services for improved management of natural resources within the Kakamega Forest, Kenya

https://oppla.eu/casestudy/17261

Objective

Enhancing conservation of biodiversity, sustainable management and the utilisation of forest resources by addressing ecosystem services that are central to local livelihoods.

Potential impacts and benefits

- Improved management of natural resources within the forest.
- Improved livelihoods of the forest adjacent communities.

Area characterisation

Kakamega forest is the easternmost relic of tropical rainforest located at an altitude ranging from 1460-1765 masl in the western region of Kenya, East Africa. The forest is rich in flora and fauna that includes

endemic, rare, endangered and threatened species providing vital ecosystem services for the wellbeing of the local communities. It is a designated Important Bird Area, and covers an area of 230 km^2 that includes one National Reserve, three Forest Reserves, two Nature Reserves and the surrounding farmlands. The main purpose of KFE management plan is to protect and conserve the unique biodiversity of the forest through sustainable management and utilisation of ES (http://www.kws.go.ke/content/kakamega-forest-reserve).

Transferability of the result

The findings should be transferable to forest ecosystems of similar socio-ecological settings and geographic scale.

25. Retention forestry to improve biodiversity conservation and ecosystem services in Southern Patagonia, Argentina

https://oppla.eu/casestudy/17262

Objective

Quantifying the impacts of traditional forest management on biodiversity and ecosystem services values and developing new forest management strategies using the retention capacity of the forest.

Potential impacts and benefits

The study demonstrates the advantages of the different proposals on biodiversity and ES values, and the costs for companies and society. The case-study improves the local forestry with practical recommendations, improving conservation in the managed forests.

Area characterisation

Santa Cruz province (Southern Patagonia, Argentina) is dominated by steppe and shrubland, where forests occupy a narrow fringe along the base of the mountains. It has a population density of 1.3 inhabitants per km^2 mainly concentrated in small towns and cities. Tierra del Fuego has grasslands in the north and forests

in the south and has a population density of 6.0 inhabitants per km^2. In Santa Cruz 75% of land is private, while private land accounts for 50% in Tierra del Fuego. Both provinces have large remote pristine areas with excellent conservation status.

Transferability of the result

The benefits of the projects were received mainly by ranchers and sawmill owners (e.g. certification processes and improvement of management methods), as well as technicians of the main regional institutions (e.g. forest and agricultural agencies) and national government. Local people and NGOs interested in nature will also benefit from better holistic management of the forest and grassland. Representative members of our case study advisory board will receive the news and the preliminary results of our studies.

Lessons learned

The landscape planning in Southern Patagonia is based mainly in provisioning Ecosystem Services, however other Ecosystem Services (e.g. cultural) have increased in importance during the last decades due to the increase in population and tourism-based companies. The synergies and trade-offs among the different Ecosystem Services provision and also with the biodiversity conservation have an effect on management planning and lead to the development of new strategies. The lesson learned is that biodiversity values and the different Ecosystem Services should be taken into account in management strategies at landscape level. Finally, the most employed methods in well-developed countries need a lot of data that are usually not available for remote areas like Patagonia. We therefore need to develop new alternatives that are suitable for our requirements and database availability.

Case specific publications

Soler, R. M., S. Schindler, M. V. Lencinas, P. L. Peri, and G. Martínez Pastur. 2016. Why biodiversity increases after variable retention harvesting: A meta-analysis for southern Patagonian forests. Forest Ecology and Management **369**:161-169.

26. Biofuel farming and restoration of natural vegetation in the São Paulo region, Brazil

https://oppla.eu/casestudy/17263

Objective

Investigating the feasibility of operationalising a "Payment for Ecosystem Services" (PES) scheme in the sugarcane belt from a political, financial and technical perspective.

Potential impacts and benefits

If the implementation and operationalisation of a Payment for Ecosystem Services scheme in the sugarcane belt is feasible, in the future landowners in the rural area could benefit from a compensation – monetary or of another type – for providing conservation and/or restoration of natural resources and ecosystem services.

Area characterisation

The study area is located in the region of Rio Claro municipality, representing the sugarcane belt in São Paulo State, Southeast Brazil. It comprises 14 municipalities with approximately 880,000 inhabitants, covering an area of 5,256 km^2 and lying around 180 km from the metropolis of São Paulo. Sugarcane production (157,176 hectares), extensive grazing (70,827 hectares) and orange plantations (35,608 hectares) dominate the regional agriculture, where sugarcane crops occupy 47% of the landscape cover while pastures and forests occupy 22% each. In this landscape context the municipality of Rio Claro presents a deficit of natural vegetation of about 3,500 ha that need to be restored according to The Forest Code (Brazilian Federal Law).

Transferability of the result

Results are transferable to other countries with similar ongoing economic development, large scale agricultural commodities and accelerated rates of loss of important ecosystems services, such as water and pollination. The institutional and governance arrangements among land users, policy makers and scientists can be also understood as possible arrangements that might promote and or undermine operationalization of the natural capital in an accelerated changing world.

Lessons learned

Rio Claro municipality is a pioneer case study where data and willingness of all stakeholders involved in a Payment for Ecosystem Services scheme are assessed. This gives a good opportunity to implement a

successful public policy. The semi-structured interviews strengthen the trust among stakeholders, which is a very important factor in a Payment for Ecosystem Services scheme.

Case specific publications

Silva, R. A., D. M. Lapola, G. B. Patricio, M. C. Teixeira, P. Pinho, and J. A. Priess. 2016. Operationalizing payments for ecosystem services in Brazil's sugarcane belt: How do stakeholder opinions match with successful cases in Latin America? Ecosystem Services **22**:128-138.

27. Mapping ecosystem services to support urban planning in the Barcelona Metropolitan Region

https://oppla.eu/casestudy/17264


Objective

Foster sustainable urban planning and management through the integration of ecosystem services in existing decision-support tools, focusing on both the provision and the demand of the ecosystem services.

Potential impacts and benefits

Fostering an integrated approach to urban planning and management. Practitioners and policy makers can consider these outputs in strategic environmental assessments of urban planning or through the development of green infrastructure action plans.

Area characterisation

The Barcelona metropolitan region (BMR), located in the North-East of Spain, is one of the most densely populated urban regions in Europe (5.04 million inhabitants in a total area of 3,244 km^2). It includes 164 municipalities and seven counties, but its urban core consists of the municipality of Barcelona (1.61 million inhabitants) and several adjacent medium-size cities. It still contains a rich variety of natural habitats of high ecological value, including Mediterranean forests (1184.56 km^2; 36.5%) and shrub land (448.62 km^2; 13.8%), extensive agro-systems (654.51 km^2; 20.2%) with a substantial share of vineyard, and various inland water bodies (24.08 km^2; 0.7%). Currently, almost 70% of the land is protected from urbanisation including, totally or partially, 14 Natura 2000 sites.

Transferability of the result

The results can be used in other metropolitan regions with urban and environmental planning powers at the regional and municipal level. The ecosystem services maps are useful if these can be effectively

integrated or considered in urban and environmental plans from an early stage. For example, the results can be easily integrated in strategic environmental assessment (SEA), a mandatory procedure in the EU for plans/programmes which are prepared for agriculture, forestry, transport, waste/ water management or land use.

Lessons learned

Making Ecosystem Services maps fully operational requires a clear distinction between Ecosystem Services capacity, flow and demand. The differentiated spatial assessment of these three components can better inform planners and policy makers where Ecosystem Services are used unsustainably and where Ecosystem Services provision is failing to meet societal demand. One of the main problems related to the application of Ecosystem Services models (such as ESTIMAP) is availability of data.

Case specific publications

Langemeyer J., Calcagni F., Baró F. 2018. Mapping the intangible: Using geolocated social media data to examine landscape aesthetics. Land Use Policy, 77: 542-552.
Langemeyer J., Baraibar S., Palomo I., Gómez-Baggethun E. 2018. Participatory Multi-Criteria Decision Aid: A way to operationalize ecosystem services. Ecosystem Services: 30, Part A, 49-60.
Langemeyer, J., Camps-Calvet, M., Calvet-Mir, L., Gómez-Baggethun, E., Barthel, S. 2018) Stewardship of Urban Ecosystem Services. Understanding the value(s) of urban gardens in Barcelona. Landscape and Urban Planning, 170: 79-89.

Synthesising publications

Barton, D. N., E. Kelemen, J. Dick, B. Martin-Lopez, E. Gómez-Baggethun, S. Jacobs, C. M. A. Hendriks, M. Termansen, M. García- Llorente, E. Primmer, R. Dunford, P. A. Harrison, F. Turkelboom, H. Saarikoski, J. van Dijk, G. M. Rusch, I. Palomo, V. J. Yli-Pelkonen, L. Carvalho, F. Baró, J. Langemeyer, J. T. van der Wal, P. Mederly, J. A. Priess, S. Luque, P. Berry, R. Santos, D. Odee, G. M. Pastur, G. García Blanco, S. R. Saarela, D. Silaghi, G. Pataki, F. Masi, A. Vădineanu, R. Mukhopadhyay, and D. M. Lapola. 2018. (Dis) integrated valuation – Assessing the information gaps in ecosystem service appraisals for governance support. Ecosystem Services **29**:529-541.

Dick, J., F. Turkelboom, H. Woods, I. Iniesta-Arandia, E. Primmer, S.-R. Saarela, P. Bezák, P. Mederly, M. Leone, W. Verheyden, E. Kelemen, J. Hauck, C. Andrews, P. Antunes, R. Aszalós, F. Baró, D. N. Barton, P. Berry, R. Bugter, L. Carvalho, B. Czúcz, R. Dunford, G. Garcia Blanco, N. Geamănă, R. Giucă, B. Grizzetti, Z. Izakovičová, M. Kertész, L. Kopperoinen, J. Langemeyer, D. Montenegro Lapola, C. Liquete, S. Luque, G. Martínez Pastur, B. Martin-Lopez, R. Mukhopadhyay, J. Niemela, D. Odee, P. L. Peri, P. Pinho, G. B. Patrício-Roberto, E. Preda, J. Priess, C. Röckmann, R. Santos, D. Silaghi, R. Smith, A. Vădineanu, J. T. van der Wal, I. Arany, O. Badea, G. Bela, E. Boros, M. Bucur, S. Blumentrath, M. Calvache, E. Carmen, P. Clemente, J. Fernandes, D. Ferraz, C. Fongar, M. García-Llorente, E. Gómez-Baggethun, V. Gundersen, O. Haavardsholm, Á. Kalóczkai, T. Khalalwe, G. Kiss, B. Köhler, O. Lazányi, E. Lellei-Kovács, R. Lichungu, H. Lindhjem, C. Magare, J. Mustajoki, C. Ndege, M. Nowell, S. Nuss Girona, J. Ochieng, A. Often, I. Palomo, G. Pataki, R. Reinvang, G. Rusch, H. Saarikoski, A. Smith, E. Soy Massoni, E. Stange, N. Vågnes Traaholt, Á. Vári, P. Verweij, S. Vikström, V. Yli-Pelkonen, and G. Zulian. 2018. Stakeholders' perspectives on the operationalisation of the ecosystem service concept: Results from 27 case studies. Ecosystem Services **29**:552-565.

Dunford, R., P. Harrison, A. Smith, J. Dick, D. N. Barton, B. Martin-Lopez, E. Kelemen, S. Jacobs, H. Saarikoski, F. Turkelboom, W. Verheyden, J. Hauck, P. Antunes, R. Aszalós, O. Badea, F. Baró, P. Berry, L. Carvalho, G. Conte, B. Czúcz, G. Garcia Blanco, D. Howard, R. Giuca, E. Gomez-Baggethun, B. Grizzetti, Z. Izakovicova, L. Kopperoinen, J. Langemeyer, S. Luque, D. M. Lapola, G. Martinez-Pastur, R. Mukhopadhyay, S. B. Roy, J. Niemelä, L. Norton, J. Ochieng, D. Odee, I. Palomo, P. Pinho, J. Priess, G. Rusch, S.-R. Saarela, R. Santos, J. T. van der Wal, A. Vadineanu, Á. Vári, H. Woods, and V. Yli-Pelkonen. 2018. Integrating methods for ecosystem service assessment: Experiences from real world situations. Ecosystem Services **29**:499-514.

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