# 54 Month Periodic Report

Mark Rounsevell, Marc Metzger, Rachel Chisholm
and the Project Management Team

May 2017

**OPERAs**



# Ecosystem Science
# for Policy & Practice

**Grant Agreement number:** 308393

**Project acronym:** OPERAs

**Project title:** Operational Potential of Ecosystem Research Applications

**Funding Scheme:** Collaborative Project

**Date of latest version of Annex I against which the assessment will be made:**

**Periodic report:** 1st    2nd    3rd **X**    4th

**Period covered:** from 1st December 2015 to 31st May 2017

**Name, title and organisation of the scientific representative of the project's coordinator[1]:**

Prof. Mark Rounsevell, University of Edinburgh

**Tel:** +44 (0) 131 651 4468

**Fax:** +44 (0) 131 650 2524

**E-mail:** mark.rounsevell@ed.ac.uk

**Project website address:** www.operas-project.eu

# Project objectives for the period

**The overall objective of the OPERAs project is to improve understanding of how ecosystem services/natural capital (ES/NC) contribute to human well-being** in different social-ecological systems in inland and coastal zones, in rural and urban areas, related to different ecosystems including forests and fresh water resources. The OPERAs research will establish whether, how and under what conditions the ES/NC concepts can move beyond the academic domain towards practical implementation in support of sustainable ecosystem management. This will be achieved through the following **seven specific objectives**:

**O1.** To **improve understanding** of how multiple drivers and existing and future ecosystem management under EU regulatory frameworks change ES/NC.

**O2**. To **explore, demonstrate and validate** mechanisms, instruments and best practices to maintain and enhance a sustainable flow of ecosystem services while preserving ecological value and biological diversity.

**O3.** To **qualify and quantify** the trade-offs and synergies between the ecosystem traits and functions associated with ES/NC and their social and economic values in Europe and globally.

**O4.** To **improve and modify** existing integrated decision support tools and instruments to better capture and represent the concepts of ES/NC.

**O5.** To **provide transparent and clear guidelines** on improved effective and cost-efficient, multi-level ES/NC governance structures and practical management measures to policymakers and stakeholders.

**O6.** To **develop, apply and test protocols** to generate ES/NC datasets and policy indicators that are consistent and coherent across time and space and sensitive to biophysical and socio-economic change.

**O7.** To **ensure the long-term perennity of key databases** and other major products of the research.

The practical implementation of these objectives is being achieved through four scientific work packages (WPs) plus WPs on management and dissemination. The objectives of each WP for the third reporting period are described below.

## 1.1 WP1: Project Management

Specific objectives for WP1 during the third reporting period were:

- To organise the Project Management Team meetings
- To organise two full project meetings (Barcelona, Spain and Sofia, Bulgaria)
- To manage the communication between project partners and the European Commission
- To complete and submit the third Periodic Report

## 1.2 WP2: Practice

Specific objectives for WP2 during the third reporting period were:

- To contribute to OPPLA with first-hand experiences on the use of ES/NC-based methods, tools and instruments.
- To evaluate the processes in each Exemplar and determine areas for further collaboration.
- To facilitate collaboration and knowledge exchange both within and beyond OPERAs by contributing to the European Ecosystem Service Conference in Antwerp, the OPERAs Consortium meetings in Barcelona and Sofia, and the OPERAs Userboard meeting in Mallorca.
- To use the final Exemplar deliverable as an opportunity for the Exemplars to work together to produce useful outputs for stakeholders based on their own experiences (e.g., prototype applications for social valuation and a guidance document on eliciting demand for ecosystem services).
- To further elaborate the Blueprint Protocol for systematic reporting of the Exemplars.
- To continue reporting of Exemplars through the final round of the Blueprint Protocol.
- To begin to synthesize lessons-learned from the meta-analysis and Exemplars using the Blueprint Protocol.
- To develop, in collaboration with partners from OpenNESS, a suite of decision trees to assist users to decide on ES/NC based instruments and tools.

## 1.3 WP3: Knowledge

Specific objectives for WP3 during the third reporting period were:

- To update the draft version of D3.4 / submit the final version; "Recommendations for integration of ES/NC in existing accounting and reporting formats"
- To complete and submit D3.6; "A portfolio of ideal types of (public and private) governance modes for selected ES/NC"
- To complete and submit D3.7; "Synthesis, documentation and user guidance for new methods and decision trees"

## 1.4 WP4: Instruments

Specific objectives for WP4 during the third period were:

- To analyse the operational potential, needs, and demands for ES/NC concepts in policy development and implementation
- To develop new and improved information tools that include ES/NC concepts

- To improve and further develop existing decision-support tools that include the ES/NC concept, including multi-criteria decision support tools, various types of Environmental Assessments, social cost-benefit analysis, and scenario and foresight tools

- To develop and apply new and improved implementation management and appraisal tools and instruments to support the implementation nand uptake of ES/NC concepts

- To guide the development, choice and application of instruments that include ES/NC concepts both within and beyond the OPERAs project

## 1.5 WP5: Resource Hub

Specific objectives for WP5 during the third reporting period were:

- Resource Hub development
- To design the structure of the Resource Hub (
- To construct the Resource Hub
- To ensure maintenance and perennity of the Resource Hub
- Stakeholder engagement and facilitation
- To facilitate stakeholder engagement in selected exemplars
- To monitor stakeholder engagement

## 1.6 WP6: Outreach and dissemination

Specific objectives for WP6 during the third reporting period were:

- To disseminate project outcomes to science, policy and practice
- To reach out and build stakeholder constituencies around OPERAs and Oppla
- To help organise and support PhD summer schools
- To organise the European Ecosystem Services conference in Antwerp (19 – 23 September 2016) in collaboration with OpenNESS and ESP

# 1. Work Progress and achievements during this period

## 2.1 WP1: Project Management

See Section 5

## 2.2 WP2: Practice

### 2.2.1 Task Objectives

**Task 2.1 – Meta-analysis**

1. Set-up a database to characterise ES/NC assessments based on published case studies (T 2.1.1),
2. Assess the evidence-base for methods used in ES/NC assessments (T 2.1.2)
3. Develop efficiency indicators for the instruments used in ES/NC assessments (T 2.1.3)
4. Conduct a meta-analysis of existing case studies (T 2.1.4)
5. Identify the knowledge gaps based on the analysis of the database (T 2.1.5 )

**Task 2.2 – Exemplars**

1. Launch of OPERAS cooperation, identification of stakeholder needs for different tools and instruments in each exemplar and optimisation of study design (T 2.2.1)
2. Regular reporting and evaluation of the process of tool and instrument testing (T 2.2.2)
3. Iterative learning processes between end-users, stakeholders, researchers and developers of tools and instruments (T 2.2.3)
4. Final reporting and critical evaluation of the process as a contribution to the Resource Hub (T2.2.4)

**Task 2.3 – Practice design and synthesis**

1. Elaboration of the Blue Print Protocol (Sub task 2.3.1)
2. Synthesis of Lessons Learned (Sub task 2.3.2)
3. Design of a suite of decision trees (Sub task 2.3.3)

## 2.2.2 Progress towards objectives

## Task 2.1 – Meta-analysis

Subtask 2.1.1. Set-up a database to characterise ES/NC assessments based on published case studies (UFZ, ALU, UBO, PU). This subtask was completed in the first reporting period. The database SynES (Database for Synthesis of Information on Ecosystem Services) was developed capturing case studies on ES studies, including indicators for ES, instruments as well as characteristics on uncertainty (Subtask 3.1.3 and 3.1.4), and provided input to conduct a meta-analysis (Subtask 2.1.4). SynES provides a structured way, for consistent and transparent reporting on ES research to ensure comparability between various analyses, allow for evidence-based reviews and may support implementation mechanism such as Decision Support Systems (DSS). SynES was presented in the OPERAs User Board Webinar (June 2015) and is accessible via the Resource Hub OPPLA (see WP3 list: Contributions to Resource Hub).

Subtask 2.1.2. Assess the evidence-base for methods used in ES/NC assessments (UFZ, ALU, UBO, PU). An evidence assessment tool to identify the reliability of ecosystem services case studies was developed and published[2]. The approach was applied to quantify the influence of forest management on water quality[3]. Results indicate that nitrate concentrations were significantly influenced by harvest methods, forest composition, site altitude, and time passed after the harvesting.
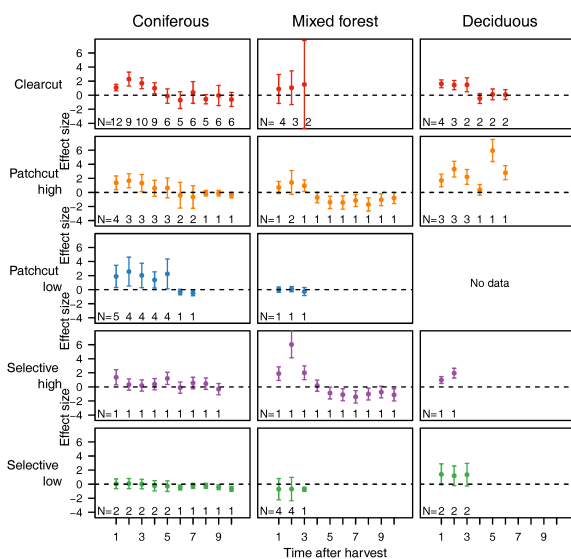


Fig. 1. Application of the evidence assessment tool to the influence of forest management on water quality. Subgroup analysis for every combination of forest harvest and forest composition.

[2] Mupepele A-C, Walsh JC, Sutherland WJ, and Dormann CF (2016) An evidence assessment tool for ecosystem services and conservation studies, Ecological Applications 26 (5), 1295-1301

[3] Mupepele, A.C., Dormann, C.F., 2017. Influence of forest harvest on nitrate concentration in temperate streams-a meta-analysis. Forests 8. doi:10.3390/f8010005

Summary effect sizes are plotted with confidence intervals against time for the first ten years. Number of studies entering the subgroup analysis is given by "N =" in each plot. Coniferous and deciduous forests show a significantly elevated nitrate concentration three to five years after clearcut and patchcut harvests, contrary to mixed forests. Selective harvest at low intensity does not significantly influence nitrate concentrations.

Subtask 2.1.3. Develop efficiency indicators for the instruments used in ES/NC assessments (UFZ, ALU, UBO). Based on the work done in the first reporting period *D2.2 Report on standardized metrics/indicators for monitoring the efficiency of ES/NC based measures* was compiled and submitted (December 2014). Results highlight a set of 30 indicators of effectiveness and efficiency, and identifies challenges of application across studies. Also, findings of the D2.2 were used to revise the Blueprint Protocol regarding the consideration of effectiveness, efficiency and evidence criteria in collaboration with UEDIN. Forward steps on how to improve the evidence of the effectiveness of ES studies for ecosystem management were presented at the IALE World Congress 2015 in Portland, Oregon (USA). Moreover, we examined the relevance of ES studies and projects for decision making by matching information supply provided by major ES databases with information demand for policy making instruments of safeguarding nature. Results show most information is available for the instrument "Extent accounting systems" by indicator that link natural capital with human well-being, in contrast to "Reform environmental harmful subsidies", which is neglected in ES research community (Fig. 2). The study was presented at the ESP Conference 2014, in the first OPERAs User Board Webinar (June 2015) and at the OPERAs Consortium Meeting in Sofia (Mai 2017). Also a manuscript was compiled and submitted[4].

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[4] Schmidt S., Seppelt R. (submitted). Ecosystem service databases and their relevance for mainstreaming the ecosystem service concept for decision making. Ecosystem Services.
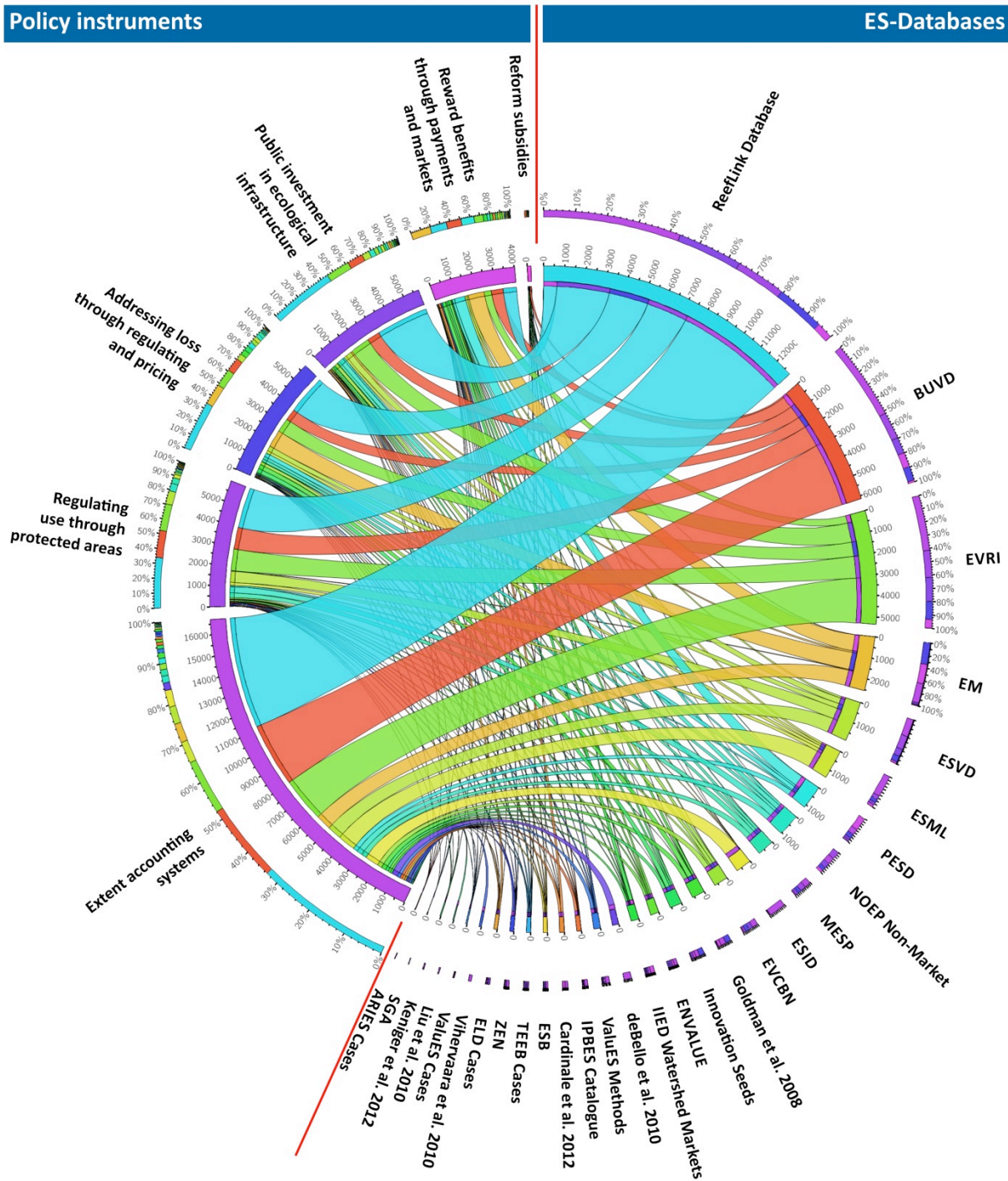
Fig. 2. Matches between information supply provided by databases and information demand of policy-making instruments for safeguarding nature. The chord diagram faces information supply from 29 databases (right half) against six policy instruments representing information demand (left half). It shows the relative contribution (percentage values of outer segments of stacked bars) and total number of (inner monochrome segment) matches between database entries and categories of information demand aggregated within the policy instruments (ribbons).

Subtask 2.1.4 Conduct a meta-analysis of existing case studies (UFZ, ALU, UBO). The general meta-analysis already reported on in the previous reporting periods was updated in cooperation with IVM and is now based on the analysis of 505 ecosystem service case studies. The results indicate several blind spots (Figure 3) from which most were persistent across time. Effects of agricultural practice on ecosystem services were analysed at a much more detailed thematic level by a meta-analysis that focussed on the Mediterranean. This work was performed in cooperation with the Mediterranean exemplar and supports this exemplar.

The work was augmented by a meta-analysis on the pairwise relationships between ecosystem services that revealed a strong pattern for most pairs of ecosystem services which can be used as a starting point for trade-off analysis[5].

Results from the meta-analysis were provided as input for work on synthesis at UEDIN. Information for UEDIN focused on studies with specific recommendations and supported work of UEDIN on decision trees.
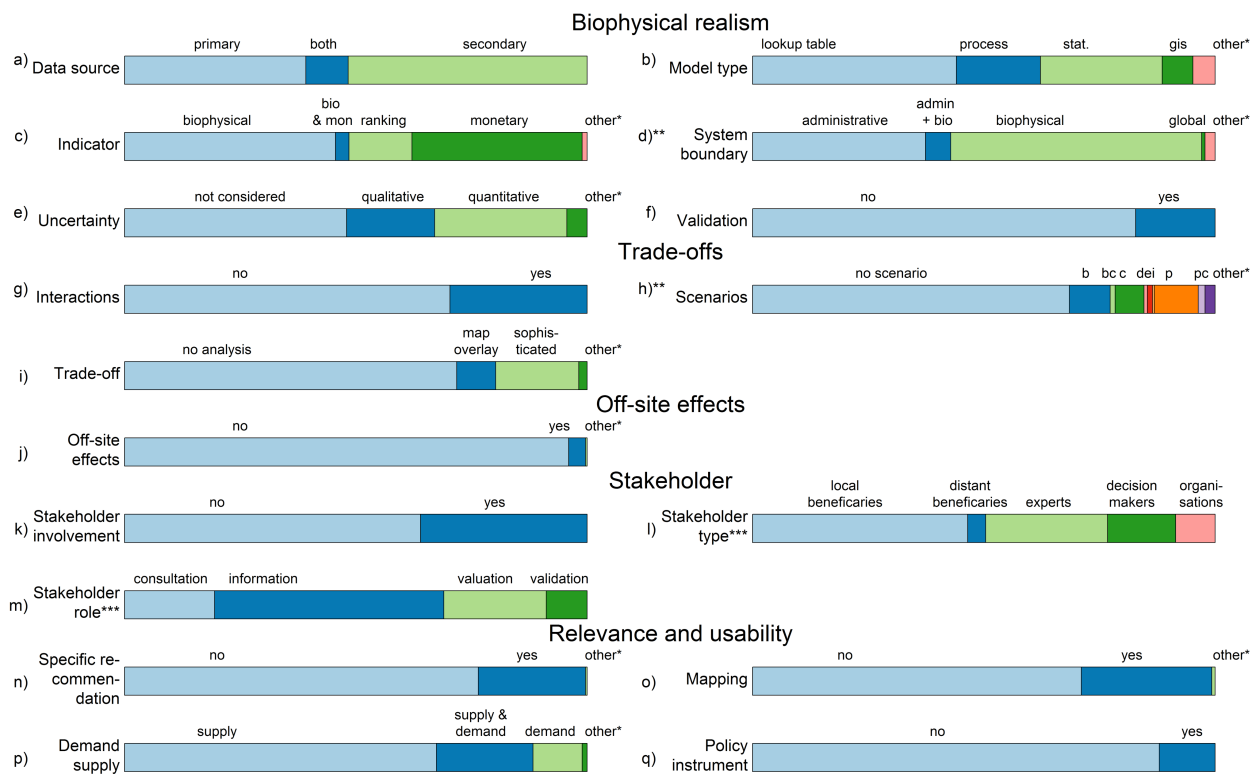


Figure 3. Percentage of the studies that belong to the specified factor level. The factor level 'other' refers to cases in which insufficient information to assign the article to a factor was given in the article. For scenarios the following types have been distinguished: b -behavioural changes, c - climate change, d- demographic changes, e- economic changes, I - invasive species, p - policy changes, two letter combinations represent a combination of several scenario types in the same case study.

** System boundary and scenarios belong not exclusively to one fact.

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[5] Lee, H. Lautenbach, S. (2016). A quantitative review of relationships between Ecosystem Services, *Ecological indicators* 66, 340-351

\*\*\* For stakeholder role and stakeholder type the percentage refers only to the number of studies that involved stakeholders.



Figure 4. Effect of management practice on different ecological indicators based as an result of the Mediterranean meta-analysis. The response ratio describes the effect of an environmental management practice relative to conventional management. A value of zero indicates no difference while positive values indicate a better performance of the environmental management practice.

Subtask 2.1.5. Identify the knowledge gaps based on the analysis of the database (UFZ, ALU, UBO). Based on the identified knowledge gaps from the meta-analysis a manuscript on blind spots in ecosystem service research w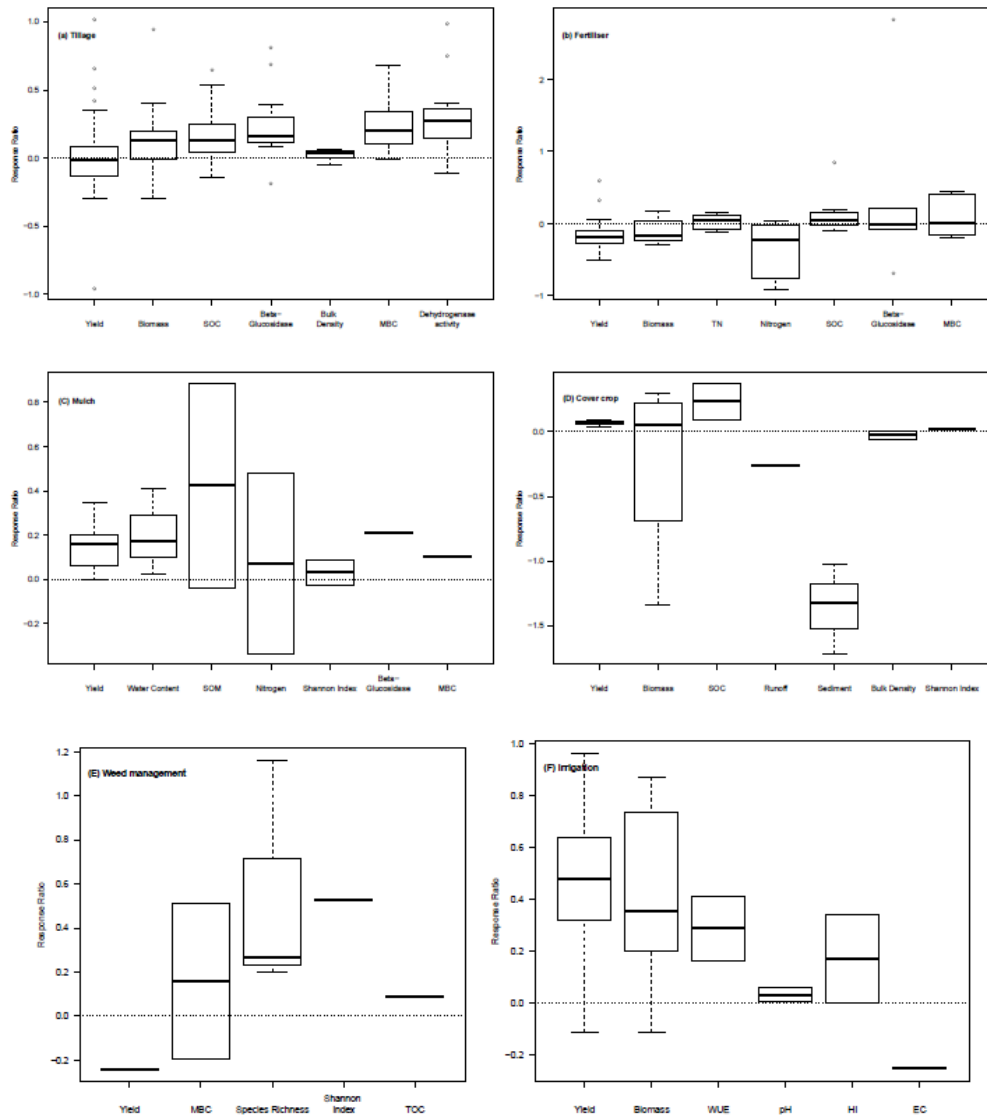as compiled and is currently under review[6]. An analysis of the self-reporting of the exemplars based on the blueprint showed that OPERAs exemplars were aiming at several of the identified knowledge gaps. Results on the identified knowledge gaps were provided to UP as well as to UEDIN.

## Task 2.2 – Exemplars

Subtask 2.2.1. Launch of OPERAS cooperation, identification of stakeholder needs for different tools and instruments in each exemplar and optimisation of study design. This subtask was completed through the Exemplar study design Milestone 2.6 and study design Deliverable 2.1. Since then, the Exemplars have continued to work with the developers of tools and instruments to ensure that the most relevant tools and instruments have been developed and selected for implementation, based on stakeholder needs.

Subtask 2.2.2. Regular reporting and evaluation of the process of tool and instrument testing. This subtask has been completed through a number of activities, including Exemplar inputs to each of the four iterations of the Blueprint Protocol and a related in-depth survey created by Task 2.3 and completed by each Exemplar at the OPERAs Consortium meeting in Aix-en Provence; Exemplar progress and reflections summarized in Milestones 2.11 and 2.14; exploration of Exemplar successes and challenges with respect to stakeholder engagement initiated in Milestone 2.14; and communications about key challenges and lessons learned on each of the Exemplar's pages on the OPERAs website and the Oppla case study finder. Exemplar leads have also been consulted in and contributed to the WP4 milestones and deliverables concerning tool development and use.

Subtask 2.2.3. Iterative learning processes between end-users, stakeholders, researchers and developers of tools and instruments. Rather than holding a separate Exemplar conference (Milestone 2.19), the goal of peer-to-peer learning and knowledge exchange was achieved at other gatherings, including the OPERAs Consortium meetings in Aix-en-Provence, Barcelona and Sofia, and the European Ecosystem Services conference in Antwerp – the latter of which provided opportunities for cross-pollination with partners beyond OPERAs. Exemplar leads have also shared their experiences and lessons learned via a collaborative paper on stakeholder engagement, monthly cross-exemplar conference calls, breakout sessions at OPERAs Consortia, and collaborative working groups who met regularly (via Skype and in Antwerp) over the course of eight months to synthesize their findings on specific topics for the final Exemplar deliverable (D2.3).

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[6] S. Lautenbach, A.-C. Mupepele, C. F. Dormann, H. Lee, S. Schmidt, S. S.K. Scholte, R. Seppelt, A. J.A. van Teeffelen, W. Verhagen, M. Volk (under review): Blind spots in ecosystem services research and implementation, submitted to Ecosystem Services

The UserBoard has also been an important learning opportunity between researchers, tool developers, and stakeholders. Exemplar leads have shared tools (Our Ecosystem, WeLCa, ToSIA, Ecolabel Review), policy analyses, stakeholder engagement processes, and collaborative synthesis products at each of the Userboard meetings and received valuable feedback on them. In addition, each of the Exemplars has engaged stakeholders, including end-users of their tools and instruments, over the course of their projects – which will be reflected in the WP5 Deliverable 5.7 (Comprehensive report on exemplar stakeholder workshops and stakeholder engagement monitoring), led by Prospex.

Subtask 2.2.4. Final reporting and critical evaluation of the process as a contribution to the Resource Hub. The exemplars have completed their final reporting via Deliverable 2.3. Rather than simply compiling reporting, Deliverable 2.3 was used as an opportunity for the Exemplars produce useful outputs derived from their own experiences and based on stakeholder needs. The resulting deliverable comprised six different products aimed at specific audiences, such as a guidance document on socio-cultural valuation for practitioners and a video series putting ecosystem services into context for local authorities. All of these products are available on Oppla and several were presented at the OPERAs Consortium meeting in Sofia in May 2017.

The Exemplars' reporting via the Blueprint Protocol is currently being synthesized by Task 2.3 and will be presented in Deliverable 2.4 (Targeted synthesis: Lessons learned from the meta-analysis and the Exemplars). The Exemplars also contributed to the WP4 final synthesis of experiences, results and lessons learned (Deliverable 4.3: Synthesis report documenting the operational potential of ES/NC instruments) and will be contributing to the OPERAs overall final synthesis materials and events being planned for September and October 2017. In addition, each Exemplar now has its own case study page on Oppla, where it has included tools and methods used in and publications resulting from its work.

Figure 5. Summary of tasks, milestones, and deliverables for Task 2.2, Exemplars. The partners engaged in these tasks includes Lund University (Task Leads Kimberly Nicholas and Heather Schoonover) along with UP, UEDIN, VU‑IVN, KIT, UCD, CNRS, ETH, WWF Bulgaria, WWF Romania, SGM, FFCUL, CIFOR, and CSIC. All of the Task 2.2. Milestones and Deliverables have been completed.

| Task number | Task description | Milestone/ Deliverable | Due Date & Status |
|---|---|---|---|
| Subtask 2.2.1 | Launch of OPERAS cooperation, identification of stakeholder needs for different tools and instruments in each exemplar and optimisation of study design | MS 2.6: Draft description of exemplars study design, stake-holder needs and tested tools/instruments | Nov 2013 - COMPLETED |
| | | D2.1: Description of Study Design: exemplars, SH needs, tools, instruments | Feb 2014 - COMPLETED |
| Subtask 2.2.2 | Regular reporting and evaluation of the process of tool and instrument testing | MS 2.11: Exemplars Interim report | Jun 2015 - COMPLETED |
| | | MS 2.14: Evaluation of processes in each exemplar with potential adaptation to the work plan | Jan 2016 – COMPLETED |
| Subtask 2.2.3 | Iterative learning processes between end-users, stakeholders, researchers and developers of tools and instruments. | MS 2.19: Final Operas Exemplar Conference | Jan 2017 – COMPLETED (Originally planned as a stand-alone conference for Jan 2017, but the goal of this task was instead achieved in combination with the OPERAs Consortium meeting in June 2016, European Ecosystem Services Conference in September 2016, and Exemplar deliverable working groups activities from June 2016 – February 2017.) |
| Subtask 2.2.4 | Final reporting and critical evaluation of the process as a contribution to the Resource Hub | D2.3: Compilation of reporting of all exemplars for further evaluation and synthesis | Feb 2017 – COMPLETED |

## Task 2.3 – Practice design and synthesis

Subtask 2.3.1. Elaboration of the Blueprint Protocol (UEDIN, UFZ, ALU, UBO, VU-IVN, UP, ULUND)

The final version of the blueprint (BP) has been completed and feedback on the previous versions was received, compiled and analysed. The BP is designed to elicit responses from the exemplar teams on key aspects including study purpose and design, execution of study and implementation, ecosystem services assessed, geographical elements, policy and regulatory aspects, foresight, analysis and monitoring. The final version entails entirely new sections on stakeholder involvement and on the assessment of the nature & quality of the evidence collected in the exemplars.  As with previous version (and since V2), the data are gathered via google form. Beyond the added sections mentioned above, the main changes to the final version of the blueprint, as a result of the feedback received, were to:

- Remove questions that are highly unlikely to elicit a different response in future versions (e.g., geographical data).
- Provide a better introduction to the blueprint to help the user understand what it is for and why it is important to complete.
- Make it easier to describe cultural ES approaches and methodologies.

The blueprint is now available online, and ready for uploading onto the Oppla's marketplace. Responses have now been received from 80% of exemplars and data collection will be completed in early June. The results will be analysed during summer 2017, for completion and publication in Autumn 2017.
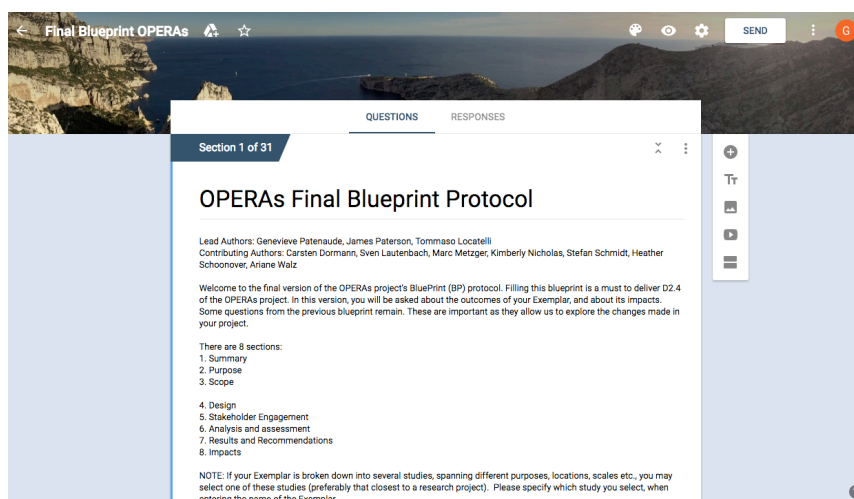


Figure 6: Final version of the blueprint protocol questionnaire available at https://goo.gl/forms/IW3gGorOj9qhMQyv1

Subtask 2.3.2. Synthesis of Lessons Learned (UEDIN, UFZ, ALU, UBO, VU-IVN, UP, ULUND, WCMC).

Lessons learned on the innovations and challenges faced by the exemplar teams in operationalising the ES concept were collected using the questionnaire distributed at the OPERAs Aix en Provence consortium.  A summary table of results is presented below.

## Purpose and Design

| Was it straight-forward to … | Responses | | |
|---|---|---|---|
| | Yes | No | NA |
| … understand the ES concept and its terminology? | **58%** | 42% | 0% |
| … widen your perspective in ES using the blueprint? | 25% | 33% | **42%** |
| … define a primary/main study objective ? | **58%** | 42% | 0% |
| … define the scope of the project? (e.g. find out who wants the ESA and which management options it should address) | **58%** | 25% | 17% |
| … delineate the study system (e.g. geographical range, historical range, sectors of industry)? | **75%** | 17% | 8% |
| …use your existing way of thinking to implement research in the ES domain? | **67%** | 25% | 8% |
| … design the biophysical and social domains to your study? | **50%** | 17% | 33% |
| … decide which stakeholder to involve? | **67%** | 25% | 8% |

(Row label: **Purpose & design**)

## Execution and Implementation

| Was it straight-forward to … | Responses | | |
|---|---|---|---|
| | Yes | No | NA |
| …identify key implementation constraints (fund, resources, expertise, time)? | **42%** | 41% | 17% |
| … engage with stakeholders? | **42%** | 33% | 25% |
| … use the ES approach in a way that encouraged open discussion between parties? (Researcher and/or stakeholders)? | **42%** | 33% | 25% |
| … limit/prioritize the number of ecosystem services to be assessed? | **58%** | 17% | 25% |
| … find  and collect suitable indicators for ES? | **50%** | 33% | 17% |
| … find/collect sufficient data to support a quantitative assessment? | 33% | **42%** | 25% |
| … find/collect sufficient data to support a qualitative assessment? | 17% | 33% | 50% |
| … to robustly quantify ES indicators (data, analysis) and predict to scenarios? | **42%** | 25% | 33% |
| … identify realistic (meaning feasible, legal, economically viable) management options? | 33% | 8% | **58%** |

(Row label: **Execution Implementation**)

## Outputs and Interpretation

| Was it straight-forward to … | Responses | | |
|---|---|---|---|
| | Yes | No | NA |
| … interpret and verify the results (review of assumptions, methodology, validity uncertainties, trade-offs, off-site effects, demand/supply,…)? | 8% | 34% | **58%** |
| … are your result robust enough to guide policy implementation? | 25% | 17% | **58%** |
| … identify winner (beneficiaries) and/or losers of your management options? | 8% | 9% | **83%** |
| … agree with your stakeholders on (policy or management) solutions based on the results? | 0% | 0% | **100%** |
| … formulate governance recommendation for the management options (incentive scheme/regulations)? | 0% | 0% | **100%** |
| … design a monitoring scheme to examine the effect of any further development? | 8% | 9% | **83%** |

(Row label: **Outputs Interpretation**)

## Embedding Results into Decision Making

| Was it straight-forward to … | Responses | | |
|---|---|---|---|
| | Yes | No | NA |
| … to identify a target audience | 41% | 17% | **42%** |
| … to operationalise the ES concept ? | 17% | 33% | **50%** |
| …to identify groups to build awareness across targeted audiences | 8% | 17% | **75%** |
| … …to identify groups to create ownership across targeted audiences | 0% | 25% | **75%** |

(Row label: **Embedding results into decision-making**)

The results suggest that many of the exemplars have pursued an adaptive approach to the project design. Several project aspects have changed and have been re-designed over the last years (in reflection on time, money, expertise and constraints). The "NA" responses in the sections 'research outputs' and 'embedding into decision making' are an indication of the stage at which the exemplars were, when responding to this questionnaire. Collecting outcomes or impacts of the research at that stage was premature.

The gap in research outcomes and impact information emerging from this questionnaire alongside the results from the meta-analysis were instrumental in electing the focus of the last blueprint and lessons learned. Obtaining information on Exemplar **outcomes** and **impact** became a critical part of the last blueprint. The results from the Meta-analysis have also highlighted important opportunities and blind spot in these areas. The M2.11 Exemplar Interim Report (and the resulting

publication from Lautenbach et al., submitted[7]) provides a summary of how exemplars meet recent research gaps. The following outcomes are relevant here:

- On stakeholder engagement: All Exemplars integrate stakeholders, compared to 38% in earlier studies investigated in the systematic review.

- On robustness: Uncertainties are intended to be quantified in 60 % of the Exemplars, with 10% planning to indicate them at least qualitatively. These rates compare to 30% for quantitative and 20% for qualitative documentation of uncertainty in the systematic review.

- On robustness and stakeholder engagement: Of all studies included in the meta-analysis, 9.5% involved stakeholders and assessed uncertainties quantitatively while an additional 6.7% involved stakeholders and assessed uncertainties at least qualitatively. In other words, our sample [505 case studies] there is no significant difference between the percentage of studies that did not quantify uncertainty at all, with respect to studies that involved stakeholders or not.

It is worth noting how few of the references considered in the systematic review provided policy recommendations (with intent to generate policy and practice impacts). The percentage of studies that provided specific policy recommendations was only 33%. These results therefore guided the focus of our lessons learned on understanding the drivers of impact, namely study robustness as well as extent and nature of stakeholder engagement, on policy outcomes. This became our key research priority. Results and analyses will emerge in Autumn 2017, and lead to Deliverable 2.4: Targeted Synthesis: Lessons Learned from Meta Analysis and Exemplars in November 2017.

Subtask 2.3.3. Design of a suite of decision trees (UEDIN, UFZ, ALU, UBO, VU-IVN, UP, ULUND, WCMC)

Task 2.3 took the lead in forming a working group to synchronise and take forward work on guidance tools/decision trees within OpenNESS and OPERAs and to discuss how this work can be integrated in to Oppla. The group met virtually every 6 weeks. Members of this group (Genevieve Patenaude, Paula Harrison, James Paterson, Diana Tuomasjukka, Anita Bayer, David Barton, Martin Karlson, Anders Madsen amongst others) cover all workpackages involved in the design of guidance tools and decision trees and ensure that the information and decisions made in this group trickle down to the relevant teams. The ultimate objective of the WG was the delivery of guidance on OPPLA over the summer 2017 (Table 1).

Table 1: Activities from the cross work-packages, cross project working group

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[7] Sven Lautenbach, Anne-Christine Mupepele, Carsten F. Dormann, Heera Lee, Stefan Schmidt, Samantha S.K. Scholte, Ralf Seppelt, Astrid J.A. van Teeffelen, Willem Verhagen, Martin Volk (in review) Blind spots in ecosystem services research and implementation, submitted to Ecosystem Services

| | |
|---|---|
| 2 Oct 2015 | Creation of WG |
| 28 Oct 2015 | Summary of guidance planned |
| Nov 2015 | Discuss plan for collaboration |
| 8 Jan 2016 | Input to Oppla strategy Working Group meeting |
| June 2016 | Working version of suite of guidance tools |
| Nov 2016 | Final deadline for all tools fully operational |
| Mai 2017 | BBN on OPPLA Lab |

Once the WG established, OPERAs task 2.3 led research on selecting the most suitable decision support tool for guiding users to tools and instruments. The process illustrated in Figure  2 steered the design of the guidance tool. Three questions were addressed:

1. Which tools and instruments should be included in the guidance
2. Which decision support tool can best guide the stakeholders and users to a suitable tool or instrument
3. What are the criteria and factors which will help filter suitable tools and instruments.
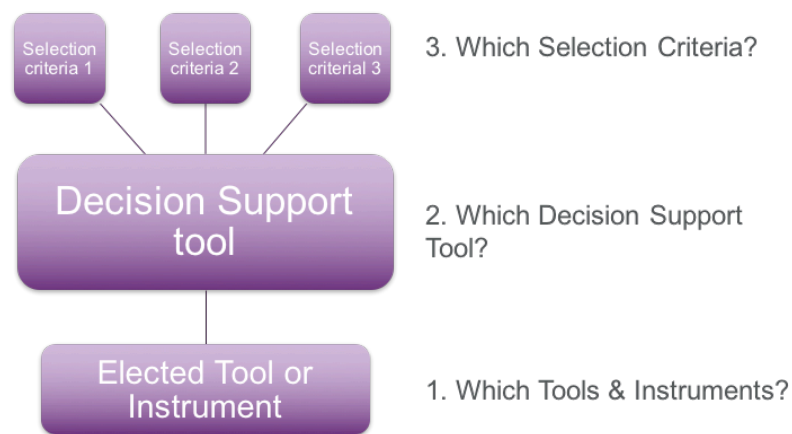


Figure 7: Questions steering the design of the decision guidance

Standardised definitions of tools and instruments were agreed across the WG.  *Instruments* *refer to ' a means of pursuing an aim' (Oxford dictionaries). A term for a framework, concept or approach (e.g. Regulation, payments for ecosystem services, subsidies) while* **Tools***: are ' devices or implements […], used to carry out a particular function. (Oxford dictionaries). A term for concrete executable or software-based means that can be used to support the implementation of instruments.*

A total of 52 Instruments and Tools were included in the guidance. 19 from OPERAs and from 33 OpenNESS, broken down as 5 Management Instruments (e.g. PES), 18 Information tools (e.g. Our Ecosystem) and 29 Decision support tools (e.g. MCDA). Some examples are listed in Table 2.

Table 2: Examples of biophysical methods tools and instruments included (12)

|       |                                           |
|-------|-------------------------------------------|
| (i)   | mapping using spreadsheet/GIS approaches; |
| (ii)  | ESTIMAP (Europe and downscaled versions); |
| (iii) | QUICKScan;                                |
| (iv)  | BBNs;                                     |
| (v)   | State-and-Transition models (STMs)        |
| (vi)  | InVEST;                                   |
| (vii) | Species distribution models;              |
| (viii)| MapNat smartphone app;                    |
| (ix)  | RUSLE erosion model;                      |
| (x)   | blue-green factor scoring;                |
| (xi)  | photo-series analysis;                    |
| (xii) | Eco-chain.                                |

An inter-comparison study of decision guidance tools available was then conducted[8], and the tools were scored based on a suite of selection criteria. These criteria were defined by the needs of stakeholders (Table 3 below) and literature analyses.

Table 3: Most important criteria for guidance, as selected by stakeholders. Guidance must be 'Easy to use' and produce 'communicable outputs'.

| |
|---|
| Easy to use |
| Communicable output |
| Accuracy |
| Precision |
| Quick to use |
| Easy to access |
| Accessible language |
| Visual appeal |
| Transparency |
| Exit points |

[8] Keller Fin, S. 2015. The OPERAs Ecosystem Services Guidance Tool - An Exploratory Study of How Best to Provide Guidance to Practitioners and Policy-Makers. MSc Dissertation, The University of Edinburgh

| | | |
|---|---|---|
| Use of graphics | | |
| Legitimacy | | |
| Stability | | |
| Statistical probability | | |
| Data Requirements | | |

Out of 6 dominant decision support tools, Multi-criteria decision analyses and Bayesian Belief networks scored highest with important differences between them.
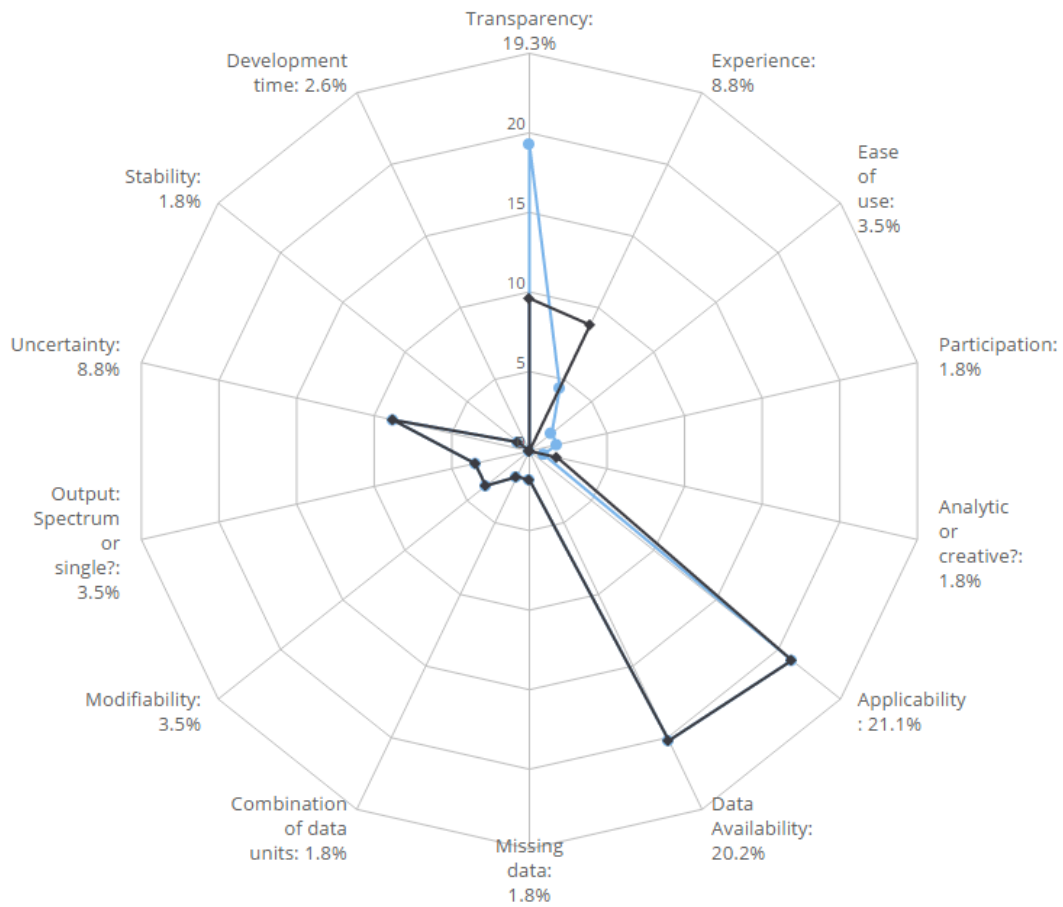


Figure 7: Radar chart comparing multi criteria decision analyses (MCDA) & Bayesian belief networks on 14 criteria derived from stakeholder surveys and literature analyses.

Given the expertise available in our team and the flexibility provided by Bayesian Belief Networks, BBNs were selected to guide user to tools and instruments.

To understand how tools and instruments are selected, we used questionnaires as well as focus groups targeted at userboard meetings, users conferences (Escom – May 7th-8th 2015) and OPERAs consortia (covering all WPs). We also conducted context analysis based on articles and findings of the Meta-Analysis and sought input from relevant WPs teams as part of both OPERAs WP4 & OpenNESS.

The results from the focus groups and questionnaires highlighted that the expertise required and financial resources are key factors in selecting tools and instruments (Table 4).

Table 4: What influences stakeholders in their choice of ES tools and Instruments (results from questionnaires and focus groups).

| For selection of ES instruments | For selection of ES tools |
| --- | --- |
| **Financial resources required** | **Expertise required** |
| Human power required | **Financial resources required** |
| **Expertise required** | Application setting |
| Social implications | Scale of application |
| Amount of bureaucracy | Human power required |
| Scale of application | Social implications |
| Time for implementation | Time for implementation |
| Application setting | Amount of bureaucracy |
| Buy-in | Buy-in |
| Geographical context covered | Policy area covered |

A typology of criteria (derived from articles selected as part of the Meta-analysis database) was further created to contribute towards identifying the factors influencing users in their choice and usage of tools and instruments[9]. Fifty-seven ES case studies that contain recommendations were analysed. Recommendations were grouped into three sub-groups related to tools and instruments, and advice regarding a project, policy, or instrument. Contextual factors were searched and visualised in network diagrams. A total of 8 network diagrams were created. An example is provided below (Figure 4). They represent the initial conceptual framework and show how different recommendation themes are associated with specific contexts. The results from this study will help design the OPERAs Guidance Tool.

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[9]   Oelze, J. 2015. Guidance on Ecosystem Service Implementation - An initial empirically grounded conceptual framework for lessons learned and associated contextual factors. MSc Dissertation, The University of Edinburgh
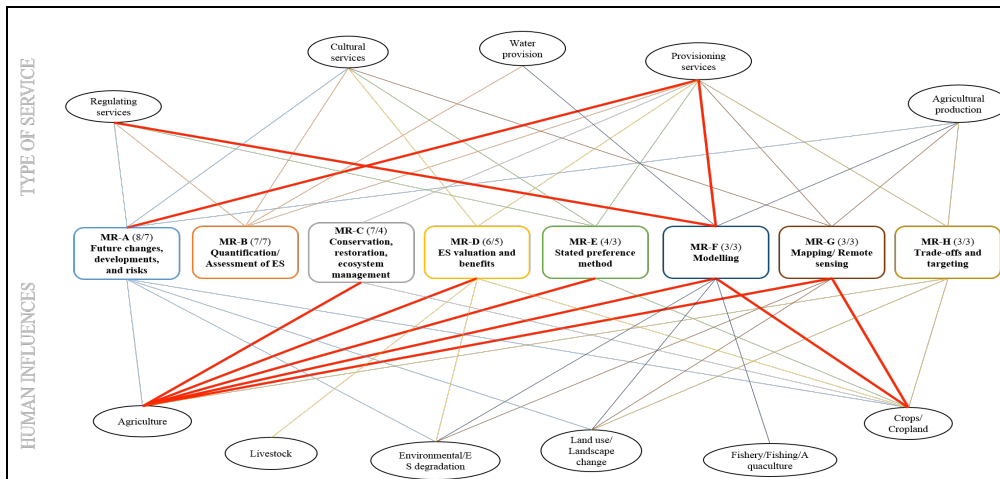
Figure 8: An example of network diagram showing the contextual factors related to specific tools and instruments.

The ultimate suite of filters is available below and presented in a guidance matrix. The listed questions/filters (or nodes in the BBN) ultimately lead to the selection or a given tool or instrument. This matrix serves as the backbone to the guidance tool and is schematically represented in Figure 5:



Figure 9: 26 selection criteria (or filters) part of the BBN, leading to the selection of tools or instruments

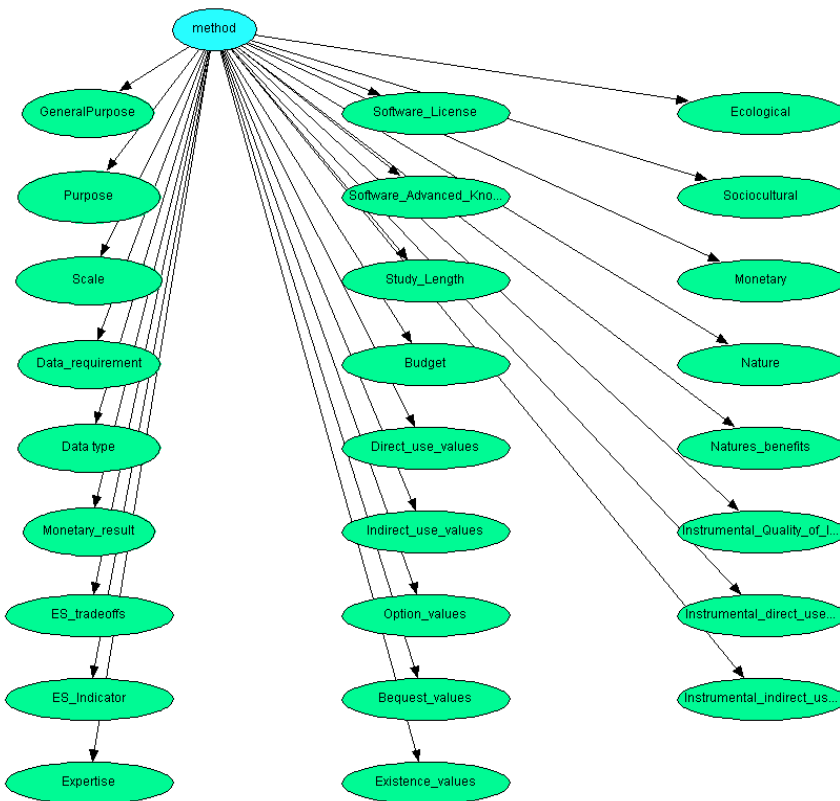These criteria are then integrated in the classification BBN, where the tools and instruments evaluated and designed as part of the OPERAs and OpenNESS projects are listed. The 26 criteria help understand the context within which these are selected/applied.

The BBN is underpinned by a data matrix for OpenNESS and Opera's ecosystem service method classification. It is now available online[10] and is being integrated within the OPPLA labs (Figure 6).
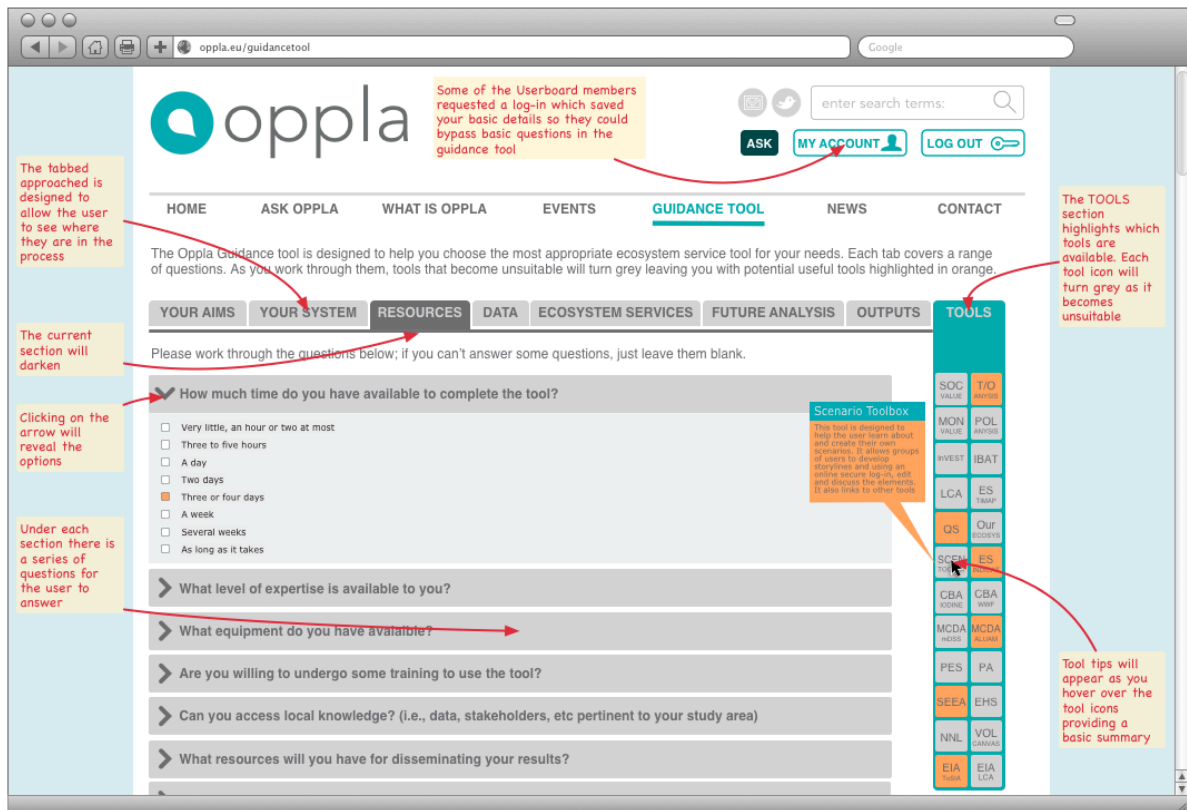


Figure 10: Mock of BBN on OPPLA lab

## 2.2.3 Deviations

### Task 2.1 – Meta Analysis

No deviations to report.

### Task 2.2 – Exemplars

The Exemplar Conference (Milestone 2.19) originally planned for Jan 2017 was instead achieved in combination with the OPERAs Consortium meeting in June 2016, European Ecosystem

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[10] http://openness.hugin.com/oppla/ValuationSelection

Services Conference in September 2016, and Exemplar deliverable working groups activities from June 2016 – February 2017.

### Task 2.3 – Synthesis

The task lead has been on two maternity leaves, in 2013 for 12 months, and from January 2016 until March 2017. Most milestones have been shifted accordingly. By the end of the reporting period, most of the milestones and one of the deliverables were completed (including MS 2.15 "Final decision trees for selecting instruments for maintaining and protecting ES/NC", MS 2.16 "Decision tree workshops in collaboration with meta-analysis and the Exemplars", MS 2.18 "Contributions to the Resource Hub", and D2.5: Suite of decision trees to assist users to decide on ES/NC based on instruments and tools). Deliverable 2.4 "Targeted Synthesis: Lessons Learned from Meta Analysis and Exemplars" and the closely related MS 2.17 "Report on Fourth Blue Print" were postponed to Nov 2017 when the Research Implementation Plan was updated in Deliverable 1.5 (May 2017).

## 2.2.4 Use of Resources

See Table – Work Package Person Months per Partner

# 2.3 WP3: Knowledge

## 2.3.1 Task Objectives

**Task 3.1 – Ecosystem function and quantification**
1. Provide operational means to link ecosystem function, biodiversity and ES provision (T. 3.1.1).
2. Apply process-based modelling frameworks to derive metrics usable in the operational ES/NC domain (T 3.1.2)
3. Explore the temporal and spatial dimensions of the ES/NC concept (T 3.1.3).
4. Evaluate methods and metrics to assess uncertainty in EC/NC quantification (T 3.1.4).

**Task 3.2 – Social and cultural values**
1. To develop new methods to measure social and cultural values attached to ES especially in cases where existing economic valuation methods are less effective. To demonstrate the relationship with economic and individual values/motivations.
2. To integrate values with ES function quantification and economic valuation to support the development of new instruments.

**Task 3.3 – Market and non-market valuation**

1. Provide a review of the state-of-the-art of environmental valuation techniques (Sub task 3.3.1);
2. Expand existing and/or creating new meta-analysis databases with socio-economic and biophysical data, and testing and validating the improved environmental value functions in several of the exemplars (Sub task 3.3.2);
3. Provide a critical review of existing accounting techniques and ways to integrate economic ES values in accounting frameworks (Sub task 3.3.3);
4. Use ES value estimates in cost-benefit analyses or other instruments  (preferably in exemplars) and assessing the potential effectiveness and efficiency of mixing different policy instruments (Sub task 3.3.4).

## Task 3.4 – Institutional structures and governance systems

1. Provide a theoretically informed typology of governance modes of ES/NC based on the nature of the services (subtask 3.4.1);
2. Make a more detailed investigation of the role of property rights in relation to selected ES/NC in the context of the exemplars (subtask 3.4.2);
3. Study existing and potential policy integration examples in EU (subtask 3.4.3); and
4. Analyze cross-scale and cross-jurisdiction aspects of selected ES/NC governance (subtask 3.4.4).

## Task 3.5 – Trade-offs and synergies in ES/NC and alternative valuation perspectives

1. Coordination of knowledge transfer across WP3 and to/from WP2 and WP4 (Task 3.5.1).
2. Assess and enhance the operational potential of methods for assessing trade-offs and synergies in ES/NC quantification (T3.5.2).
3. Develop novel assessment methods that integrate various ES valuation methods (T3.5.3)
4. Analyze patterns of synergies/trade-offs across exemplars (T3.5.4)

## 2.3.2 Progress towards objectives

During this reporting period WP3 has been making considerable progress in terms of scientific advances (see task descriptions and publications), but also in terms of work towards the operationalization of these findings. In this regard, WP3 had collated a substantial list of joint and individual provisions for the OPPLA resource hub, and uploaded many of these in this 3rd reporting period already. Further finalisation and upload is anticipated in the final project period. .

Besides efforts on the individual tasks/topics, WP3 has concentrated on the integration of its work in T3.5, through the final deliverable D3.7, which combines contributions from all tasks and is a cross-work package synthesis. Progress meetings were held in Barcelona and Sofia during the

General Assembly meetings of OPERAs. We ensured the delivery of the final two deliverables during this reporting period:

- D3.6 "A portfolio of ideal types of (public and private) governance modes for selected ES/NC" (led by LUND)
- D3.7 "Synthesis, documentation and user guidance for new methods and decision trees"

The work package is already delivering joint synthesis / review papers, including for example:

- Lavorel, S., Bayer, A., Bondeau, A., Lautenbach, S., Ruiz, A., Schulp, N., Seppelt, R., Verburg, P., Van Teeffelen, A., Vannier, C., Arneth, A., Cramer, W. & Marba, N. (2017) Pathways to bridge the biophysical realism gap in ecosystem services mapping approaches. *Ecological Indicators,* **74,** 241-260. (derived from the work undertaken for D3.1)

- Lautenbach, S., A-C Mupepele, CF Dormann, H. Lee, S. Schmidt, S.S.K. Scholte; R. Seppelt, AJA van Teeffelen, W.Verhagen; M. Volk. Blind spots in ecosystem services research and implementation. *Ecosystem services (under review). Followed from wp2-wp3 interaction regarding the meta-analysis.*

Given the substantial progress made in this reporting period, the work package can fully focus on maximizing the further expansion of the knowledge base of ES science for practice, and contribute to its operationalisation, e.g. through the final stakeholder workshop on navigating ES trade-offs, the OPPLA products and stakeholder engagement activities planned centrally (which also includes a theme week on trade-offs). Results of the project are also actively used as teaching material in University courses on ecosystem services and environmental resource management, thus actively teaching the future generation of ecosystem services policy and decision makers.

## Task 3.1 – Ecosystem function and quantification

During the 3<sup>rd</sup> reporting period, the research efforts within T3.1 have focussed on the continued scientifically underpinning a range of ES research applications that demonstrate the advantages and challenges of the concept. Here, the OPERAs exemplars were important ground for testing and implementation.

In two cross-over continental-global studies that focussed on assessing the impact of land-use change on a range of ES (and ES indicators) were assessed.

1) **Explore uncertainty in historical land-carbon emissions (and uptake) from land-cover and land-use changes**

Understanding and projecting the broad implications of land use change on terrestrial carbon cycle, and hence land-based climate change mitigation, suffers from incomplete process-representations or uncertain parameterisations both in the "impact" models (e.g., dynamic global vegetation models) as well as in the land-use models used to recreate historical land-use and land-cover changes (LUC) as well as future projections. In a multi-model experiment we tested for the effect of accounting for (i) shifting cultivation ("gross-net-transitions"), (ii) historical timber harvest, and (iii) a number of management processes on pastures and croplands. In all cases, historical carbon emissions from land-use/land-cover change were substantially enhanced which poses questions of our understanding of today's carbon sink but also highlights large uncertainties regarding future land-based mitigation efforts that seek to maintain and enhance carbon uptake on land[11].

In an accompanying study, uncertainties arising from historical land-cover change reconstructions were assessed for the global domain and Europe as an example region[12]. Simulations demonstrated that estimates of historical carbon stocks and fluxes are highly uncertain due to the choice of LUC reconstruction (Fig *11*). Considering different, contrasting LUC reconstructions is needed to account for the fact that we do not have an observation-based record of past land-use/land-cover changes that dates back more than few decades. In addition to past trends and larger-scale patterns (net changes), incorporating bi-directional land-use changes in a given region over a given time-step (gross changes) leads to larger simulated carbon emissions, confirming the results found by Arneth et al. (2017). This introduces not only technical challenges to process-based models that have to implement these dynamics, but also emphasises the complexity of historical (and future) land-use transitions.
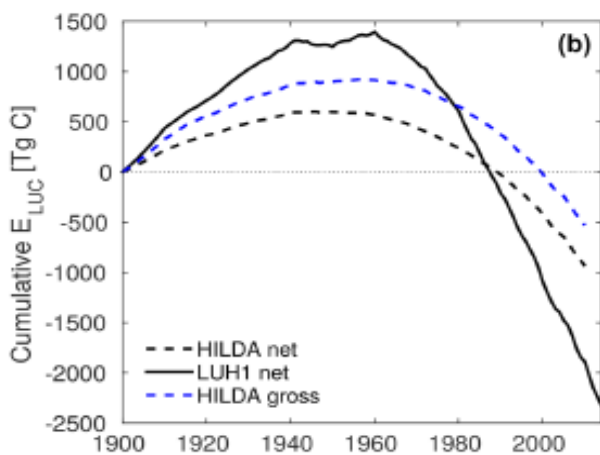


**Fig 11**: Effects of different land-use representations on cumulative land-use change emission flux in Europe (EU27+CH). HILDA net and gross refers to a reconstruction that seeks to account for bi-directional land-cover change dynamics at given regions, while LUH1-net is the reconstruction used so far most widely in the IPCC context.

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[11] Arneth, A., et al. (2017), Historical carbon dioxide emissions caused by land-use changes are possibly larger than assumed, *Nature Geoscience*, *10*(2), 79-+.

[12] Bayer, A. D., M. Lindeskog, T. A. M. Pugh, P. M. Anthoni, R. Fuchs, and A. Arneth (2017), Uncertainties in the land-use flux resulting from land-use change reconstructions and gross land transitions, *Earth System Dynamics*, *8*(1), 91-111.

### 2) Future ecosystem service indicators in scenarios of land-based climate mitigation policies

Given the large pool of carbon in global vegetation and soils, land use is becoming increasingly central to achieve a <2°C global warming in the wake of the Paris agreement. Among others, avoided deforestation jointly with afforestation/reforestation (ADAFF) efforts is listed as one possible strategy; another being the extended growth of bioenergy (and subsequent combustion, carbon capture and storage; BECCS). At the same time, managed lands need to fulfill demands by society for a broad range of ecosystem services beyond climate regulation. Few studies so far have quantified global consequences of land-based mitigation efforts in future 2-degree warming scenarios beyond considering two or three factors, aside of bioenergy. We used projections of future land use and land cover (ADAFF, BECCS, and a reference-case) from two land-use models (IMAGE and MAgPIE) and evaluated their ecosystem impacts with a global dynamic vegetation model (LPJ-GUESS). We analysed the LPJ-GUESS simulations with the aim to assess synergies and trade-offs across a range of ecosystem service indicators: carbon sequestration, surface albedo, evapotranspiration, water runoff, crop production, nitrogen loss, and emissions of biogenic volatile organic compounds.

Carbon removal by year 2099 ranged between 55 and 89 GtC. Other ecosystem service indicators were influenced heterogeneously both positively and negatively, with large variability across regions and land-use scenarios (Figure *12*. Bioenergy-based climate change mitigation was projected to affect less area globally than in the forest expansion scenarios, and resulted in less pronounced changes in most ecosystem service indicators than forest-based mitigation (when compared to the reference base-line that assumed no specific mitigation policy), but included a decrease in crop production, nitrogen loss and biogenic volatile organic compounds emissions[13].

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[13] Andreas Krause, Anita D. Bayer, Thomas A. M. Pugh, Jonathan C. Doelman, Florian Humpenöder, Peter Anthoni, Stefan Olin, Benjamin L. Bodirsky, Alexander Popp, Elke Stehfest, Almut Arneth. Global consequences of afforestation and bioenergy cultivation on ecosystem service indicators. Submitted to Biogeosciences.
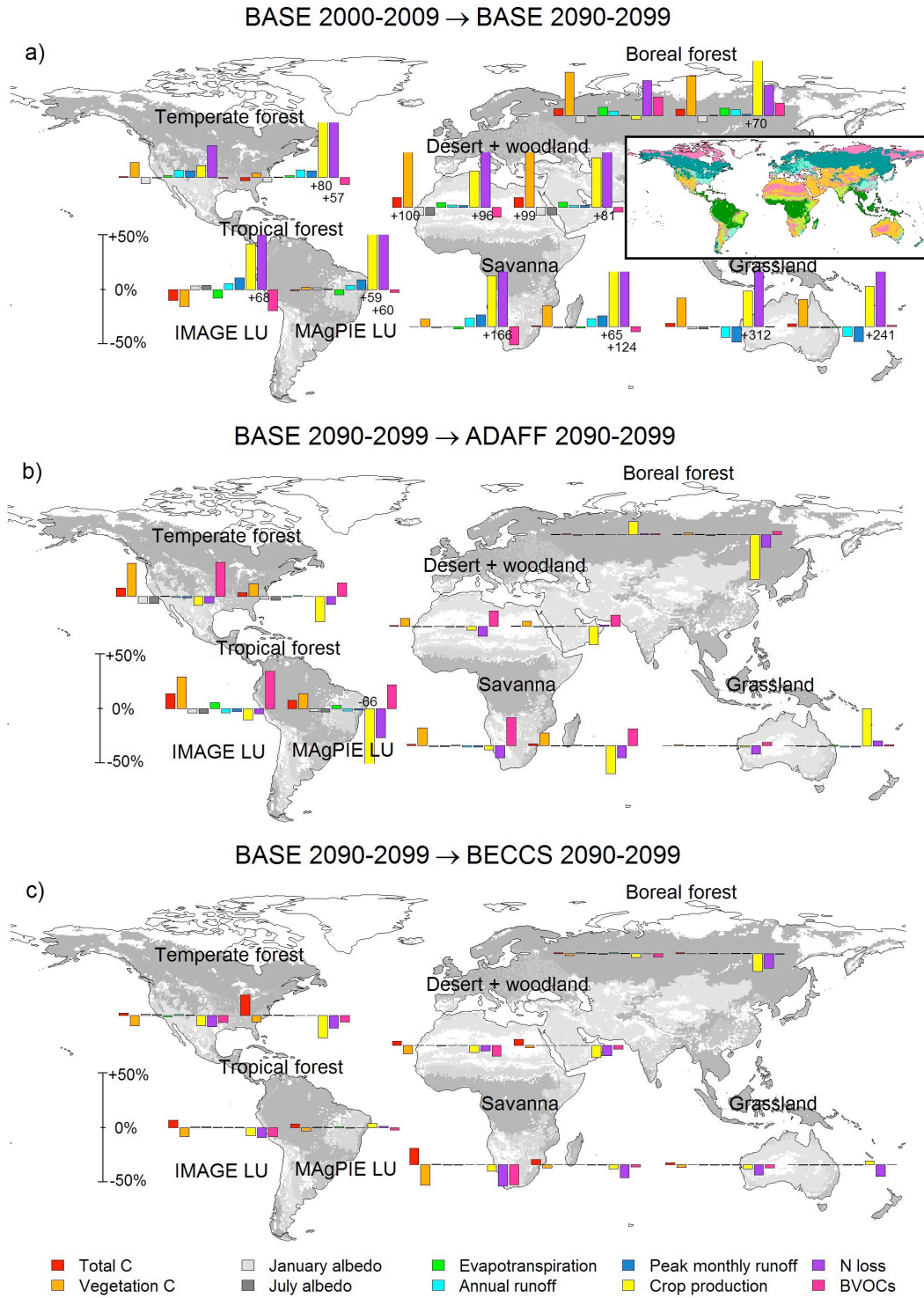
Figure 12 Regional relative changes in ecosystem functions for two land-use change models: IMAGE LU (left) and MAgPIE LU (right) applied to a dynamic global vegetation model (LPJ-GUESS). Changes are capped at ±50 % for clarity reasons, values exceeding ±50 % are written upon/below the bar. Regions are aggregated by biome (see panel a, inset). a) changes in a RCP2.6 reference case (BASE) from 2000-2009 to 2090-2099. b) changes from BASE to ADAFF by the 2090-2099 period. c) same as b) but from BASE to BECCS (Krause et al., submitted).

In another study in the same context[14], also using the LPJ-GUESS model, the environmental consequences for ecosystem services and service indicators were assessed for land use scenarios developed by the CLUMondo model[15] for a reference case (FAO scenario) and following protection policies (biodiversity protection, carbon storage) in the period from today (1996-2000) to the near future (2036-2040). Environmental effects (e.g. carbon storage, crop production, water supply, nitrogen leaching, BVOC emissions) were compared to those from the well established Hurtt land use scenarios[16] that were established using different land use and integrated assessment models and associated with the RCPs. The novel CLUMondo scenarios are valuable land-use projections following predicted societal demands and dietal preferences. This study was accomplished also in the context of the OPERAs Global Exemplar.

For all land-use scenarios an increase in ecosystem service provision from the present to the future period was achieved, however, with significant differences accross the scenarios. Global totals of the different CLUMondo scenarios were similar, but spatially aligned in respect to the consoidered policy restriction (e.g. no land changes in tropical areas in the biodiversity scenario). In the Hurtt scenarios, the RCP4.5 scenrio including the afforestation of vast regions had the strongest effects on ecosystem service provision. By global application of PCA, temporally almost unaffected, some synergetic relations were observed (e.g. crop production and nitrogen leaching, carbon storage and nitrogen storage), but no clear trade-off between seven selected ecosystem services and service indicators was identified. Relationships were stable over time. Three regional examples were investigated (Eastern Europe, Afghanistan/Pakistan, Indonesia) where this situation changed and obvious trade-offs were determined (e.g. between crop production and carbon storage or crop production and water supply).


**Three studies addressed land-use changes and their effect on ecosystem services in the Mediterranean:**

1) Changes in ecosystem services supply in the peri-urban areas of the North and South Mediterranean.


Like in many coastal regions, urbanization has expanded significantly in the Mediterranean during the last decades. For eight European and four North African cities (Lisbon, Madrid, Barcelona, Marseille, Florence, Rome, Athens, Thessaloniki, Nabeul, Sfax, Tunis, Rabat), we have quantified changes in peri-urban land cover, for periods of sixteen years (1990-2006) in the Northern African, and twenty-two years (1990-2012) in the European cities, respectively. Using an expert-based method, we derived quantitative estimates of the dynamics in the supply of twenty-seven ecosystem services. The nature of land cover changes differed between European and North African Mediterranean cities, but overall urban area increased and agricultural land decreased. The net ecosystem service supply capacity of the peri-urban areas of Mediterranean cities was

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[14] R. Mey: Evaluation of global ecosystem services and service indicators under alternative land-use scenarios with the dynamic vegetation model LPJ-GUESS. MScThesis, Carl von Ossietzky University of Oldenburg, Germany, 2017.

[15] van Asselen, S. & Verburg, P.H. (2013) Land cover change or land-use intensification: simulating land system change with a global-scale land change model. Global Change Biology, 19, 3648–3667.

[16] Hurtt, G.C., et al. (2011) Harmonization of land-use scenarios for the period 1500–2100: 600 years of global gridded annual land-use transitions, wood harvest, and resulting secondary lands. Climatic Change, 109, 117–161.

reduced over the last 20-30 years. However, supply capacity for nine ecosystem services actually increased for North African cities, while this happened for only three in the European cities. Across all cities, the services timber, wood fuel and religious and spiritual experience increased. A full manuscript presenting these results has been submitted[17]

<u>2) Sustainability of Mediterranean agriculture. Modelling the trade-offs between different ecosystem services for assessing the sustainability of alternative management strategies.</u>

Agro-ecosystems may deliver a large bundle of ecosystem services, however several farming practices lead to a degradation of the system, making agriculture less sustainable, and decreasing its potential ecosystem service supply capacity. This is particularly the case for Mediterranean agro-ecosystems which are subject to soil erosion and other forms of land degradation. We focus on Tunisia where the FAO project LADA (Land Degradation Assessment in Drylands) provides a typology of agricultural regions based on their farming systems, with the identification of the management types responsible for degradation, as well as possible solutions for restoring sustainability. Using the agro-ecosystem model LPJmL, we simulate the trade-offs between several ecosystem services and other socio-economic indicators depending on various agricultural managements. Different scales are considered for the trade-off analysis, depending on the indicators, allowing to balance the local, regional, and national contribution to sustainability. This work has uncovered severe shortcomings in widely used databases of Tunisian agricultural systems which needed correction. It is currently in its final stages for Tunisia, and will be soon extended to the whole Mediterranean.
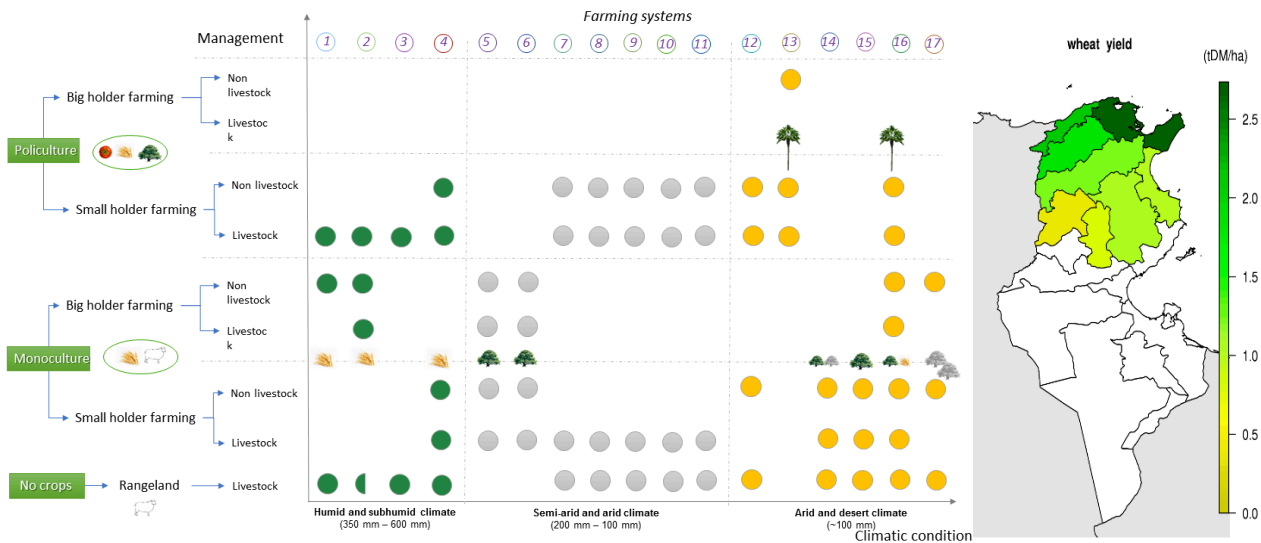


Figure 13 Typology of the Farming Systems in Tunisia, collected from the LADA expert studies, wheat yield data (Monfreda et al. 2008) aggregated at the farming system level for calibrating LPJmL (Garcia-Nieto et al., in prep)

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[17] García-Nieto AP, Geijzendorffer IR, Roche PK, Baró F, Bondeau A, Cramer W. Impacts of urbanization around Mediterranean cities: changes on ecosystem service supply. Manuscript submitted to Ecological Indicators, May 2017.

<u>3) Changes in Mediterranean terrestrial ecosystems under different scenarios of climate change, in particular for the possible achievement of the Paris agreement</u>

Mediterranean land ecosystems have fluctuated during the past, due to variability in climate and human use. Employing a new consistent modelling approach, we have investigated the degree to which future scenarios of changing monthly temperatures and rainfall present risks for Mediterranean ecosystem sustainability that go beyond the variability experienced during the Holocene. The analysis demonstrated that only a rigorous climate protection policy compatible with the objectives of keeping global mean temperatures below 1.5 degree C above pre-industrial means can ensure that Mediterranean land ecosystems remain in the envelope of past variability. Any warming (and associated rainfall changes) above the Paris limit will cause losses of ecosystems due to enhanced drought in the Iberian Peninsula and over much of the Southern Mediterranean countries. These results will translate directly into reduced capacity of Mediterranean ecosystems to provide ecosystem services to people. This work was published in Science in 2016 [18].

## Task 3.2 – Social and cultural values

**Work plan progress**

The principal objective of Work Task 3.2 has been to explore new or promising approaches for the non-monetary valuation of ecosystem services by means of socio-cultural approaches. Principal responsibility for work task 3.2.1 rests with UCD, but VU-IVM and UP also have responsibility for sub-tasks 3.2.2 and 3.2.3 on the development of spatial and multi-dimensional methods respectively.

The previous periodic report described the outputs MS 3.4 and MS 3.10. These involved, respectively, the preparation of a discussion paper on socio-cultural valuation and a coordinated plan for the application of social valuation methods in selected exemplars. Both were intended primarily to inform the consortium partners. At that time, one peer-reviewed paper had been published, namely Scholte S (2015)[19].

In the current reporting period, Deliverable D3.5 has been submitted. This report addresses Strategies and Methods for Social Valuation and was completed with the additional input of VU and UP. Moreover, many additional studies were conducted, pushing the forefront of socio-cultural valuation science and practice, in various ways. Examples hereof are included below and a full list can be found in the WP3 output section of this report.

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[18]  Guiot J, Cramer W 2016 Climate change: The 2015 Paris Agreement thresholds and Mediterranean basin ecosystems. *Science* 354(6311):465-468, doi: 10.1126/science.aah5015

[19]  Scholte, S. S. K., Van Teeffelen, A. J. A. & Verburg, P. H. 2015. Integrating socio-cultural perspectives into ecosystem service valuation: A review of concepts and methods. Ecological Economics, 114, 67-78.

There has been a close connection between the work in the exemplars and Task 3.2 throughout the project with the exemplars providing the context for examining the applicability of different approaches. UCD's Irish exemplar focused most-uniquely on the use of a deliberative-instrumental approach and on identifying the diverse range of values that exist for the natural environment and ES and the relevance of the Ecosystem Services Approach for strategic and environmental impact assessment and for spatial planning. Several papers were published in this context[20]. A related approach was taken by the VU/WWF Bulgaria exemplar on wetland restoration on the Danube river with information collected by interviews with different stakeholder types[21]. VU undertook another study examining people's willingness to make trade-offs between the enhancement of woodland cover in exchange for new housing development in a peri-urban setting[22].

The UP exemplar in Scotland explored the application of rating and weighing and included a comparison with trade-offs between various scenarios of landscape and environment change in an upland area close to the city of Edinburgh. This has resulted in various outputs[23].

The UEDIN exemplar on the Fifth of Forth combined workshops and participation with rounds of deliberative monetary valuation (see T3.3) to explore alternative landscape scenarios for wetland restoration in the face of rising sea levels threatened reclaimed farmland along the Firth of Forth. The work highlighted how common barriers for stakeholder engagement can be overcome through a participatory process to inform environmental governance arrangements (see 3.4).

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[20] Bullock, C. 2016 Developments and future opportunities for the economic and wider socio-cultural valuation of ecosystem services. CAB Reviews. Jan 2016. 10.1079/PAVSNNR20160002

Bullock, C. Nature's Values: From intrinsic to instrumental. National Economic and Social Council (NESC) Natural Capital Series. April 2017. http:// http://www.nesc.ie/en/publications/publications/nesc-research-series/natures-value/

Bullock, C., Joyce, D. & Collier, M. An exploration of the relationships between cultural ecosystem services, socio-cultural values and well-being. Submitted to Ecosystem Services, Mar 2017

Joyce, D., Bullock, C. & Collier, M. Socio-cultural valuation and its potential for land-use planning. Submitted to Ecosystem Services, May 2017.

Collier, M.J. (2015) Novel ecosystems and the emergence of cultural ecosystem services. Ecosystem Services, 9, 166-169

[21] Scholte, S.S.K., Todorova, M., van Teeffelen, A.J.A., & Verburg, P.H. (2016). Public support for wetland restoration: What is the link with ecosystem service values? Wetlands 36(3): 467–481. http://dx.doi.org/10.1007/s13157-016-0755-6

[22] Scholte, S.S.K., van Zanten, B.T., Verburg, P.H., & Van Teeffelen, A.J.A. 2016. Willingness to offset? Residents' perspectives on compensating impacts from urban development through woodland restoration measures. Land Use Policy 58: 403-414.

[23] Schmidt, K., Walz, A., & R. Sachse. 2016. Current role of social benefits in ecosystem service assessments. Landscape and Urban Planning 149, 49-64.

Schmidt, K., Walz, A., Jones, I., Metzger, M. J., 2016b, The Sociocultural Value of Upland Regions in the Vicinity of Cities in Comparison With Urban Green Spaces, Mountain Research and Development 36(4):465-474.

Schmidt, K. and A. Walz. 2017c. Pentland Hills Regional Park 2014 survey results – Assessing the use, appreciation and preferences for the future. Pentland Beacon 47, 9.

Schmidt, K., Walz, A., Martín-López, B., Sachse, R., under revision, Testing socio-cultural valuation methods to explain land use preferences. Submitted to Ecosystem Services.

Schmidt, K., Müller, C., Walz, A. 2016d. Use, appreciation and preferences for future development in the Pentland Hills Regional Park – Results of the user survey 2014. Report for Regional Park Management published online.

In combination with this work UEDIN has also developed and tested a new format for socio-cultural valuation and citizen engagement, called STREAMLINE. The method, takes a visual, landscape scale approach to SCV. The methods and findings have been presented in oral and poster means to a wide audience. Two academic papers based on this body of work are in development.

Other exemplars and partners have adopted elements of socio-cultural valuation, for example in relation to options for the preservation of seagrass in the Balearics, and the combination of socio-cultural methods and visual deliberative techniques to explore alternative futures in the First of Forth (UEDIN), (forthcoming).

In addition, it has been an important element of this work-task that integrated methods with economic valuation be identified. To this end, the work task has been working closer with the leads for Work Task 3.3 and this has resulted in contributions to D3.2 Monetary and Social Valuation: State of the Art (May 2015) and to D3.7 Valuation Pillar (Research Synthesis) (May 2017).

### 3.2.2. Spatial methods of socio-cultural valuation

In addition to the work on spatial trade-offs between new housing development and woodland compensation referred to above, VU have been developing methods to map the nature-based recreational potential of land beyond a reliance on physical landscape attributes, examining instead. Based on 3,293 survey responses of users' perceptions of landscape attributes, point pattern analyses was undertaken to show that land cover, topography and protected area status alone do not adequately capture the recreational potential of land. The models based on landscape attributes underestimated the attractiveness of the most popular spots for recreation, and overestimated the attractiveness of the least popular spots (see Figure). These results show that maps representing nature-based recreation based on physical landscape attributes should be interpreted with caution and points to the relevance of a wider suite of explanatory variables using socio-cultural valuation.



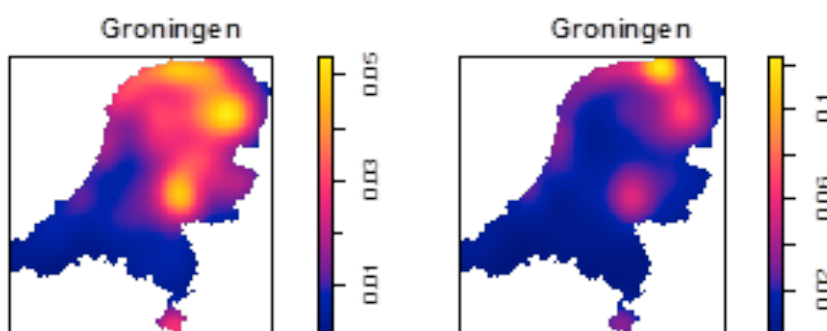Figure 14  Kernel density estimates based on simulated point patterns (left) and observed point  patterns (right), for respondents from the region of Groningen

(From: S. S. K. Scholte, P. H. Verburg, A. J. A. van Teeffelen, M. Daams, F. J. Sijtsma, and H. Farjon, "How well can nature-based recreation be mapped using landscape attributes? Insights from the Netherlands," *Landsc. Urban Plan.(under review).*

### 3.2.3 Multidimensional methods of socio-cultural valuation

UP undertook an examination of alternative options for ES enhancement in an upland recreational area (Pentland Hills) on the urban fringe of Edinburgh. This research has resulted in one peer-reviewed publication and another that is currently under review. The basis of a third paper is provided by a comparison of socio-cultural values in urban spaces within the city. UP have planned and executed stakeholder workshops with Scottish Natural Heritage using the information on socio-cultural values from the Pentland Hills project and this in turn formed the basis of presentations at the Ecosystem Services Conference in Antwerp in 2016, an ecosystem, service community conference in Edinburgh and an ALTER-net conference in Ghent. Reports on the study and the visitor survey were also prepared for the park service's own journal and for on-going management.  A further study is underway that compares landscape features identified in existing management plans with the distribution of ecosystem service benefits and their socio-cultural value. The research highlights the limitations of existing ecosystem service valuation and the need to integrate plural values into a multidimensional approach to ecosystem service assessment.

**Collaboration with WP4.**

In addition to the collaboration with exemplars and other work tasks within WP2, there has also been input in WP4. This has taken the form of collaboration with WCMC on the development of the TESSA approach to the social valuation of alternative development scenarios based on ecosystem service change, specifically within the Dublin Fingal exemplar and the subsequent national guidance document for planners and impact assessment. A chapter on socio-cultural valuation was also provided for the work task on natural ecosystem accounting method.

## Task 3.3 – Market and non-market valuation of ES/NC

Research efforts within T3.3 were among others focused on research for and finalising our input on valuation methods for the synthesis report (D3.7). The valuation synthesis contains summaries of socio-cultural and economic valuation exercises in some of the exemplars and in some additional case studies. The synthesis summarises the findings and most importantly identifies patterns in results. The synthesis is aimed at identifying the pros and cons of both socio-cultural and economic valuation, and attempts to derive some general conclusions on when one method may be preferred over the other. Its main conclusion, however, is that the two methods or approaches do not exclude but rather complement each other, and should ideally be used in combination such that the strengths of both methods can be exploited. Examples of such integrated approaches are provided, one of which has been applied in the Inner Forth exemplar together with WP2 (see below for details of this particular study). Other substantial work was done on Deliverable 3.4 "The use of (economic & social) values of Natural Capital and Ecosystem Services in national accounting", which was submitted in July 2016, and contributed to Task 3.3.3. The report includes five chapters, among others on developments in natural capital and ecosystem accounting, using monetary and social values into natural capital accounting and the policy use of ecosystem accounting.

Also work on various milestones have been achieved. Milestone 3.12 was finalised and provides a concise guideline to economic valuation and social cost-benefit analysis, contributing to tasks 3.3.1 and 3.3.4 (for details see below). Work on Milestone 3.17 (task 3.3.2) has resulted in two meta-analysis databases, one on forest values and one on values of urban open space. Reduced forms of these databases will be uploaded to OPPLA in the coming months. With respect to Milestone 3.22, we also expect to have two papers on these two datasets in 2017 (for details see below). Further research efforts within T3.3 were focused on many issues, such as uncovering hypothetical bias in stated preference research (Task 3.3.1), work on a relative price increase for ecosystem services in SCBA's (Task 3.3.4), dissemination of research demonstrating the advances delivered by OPERAs work on the valuation of ES/NC within both policy and business relevant contexts (Task 3.3.4), and building further and long lasting dissemination of OPERAS findings through a co-funded programme of work with business and policy users.

Details of these research efforts are discussed below.

**Measuring hypothetical bias and social anchoring in stated preference research (Task 3.3.1)**

Using a contingent valuation study in the Netherlands we aimed to uncover the extent of hypothetical bias and social anchoring in economic valuation and especially stated preference methods. Detailed study design and results are reported in Bouma and Koetse (2017)[24] and in Koetse et al. (2017).[25] Here we just summarise the main elements and insights. For uncovering hypothetical bias we perform a contingent valuation study using hypothetical donations (standard setting, control treatment) and a contingent valuation study using actual donations (experimental treatment 1). Results show that on average people overstate their willingness to donate by a factor 3.5, which is in line with the limited set of previous findings. By measuring various behavioural factors and attitudes through a survey we are able to uncover some important sources of hypothetical bias. We find that next to income and education, especially social expectations about other people's behaviour and warm glow increase the extent of hypothetical bias in stated willingness to pay estimates.

Measuring social anchoring is interesting because neo-classical economic theory assumes that values are strictly individual and independent of others. We aimed to measure the existence of social anchoring by asking for people's expectations about the share of households that is willing to donate and the average donated amount in a previous experiment (using mean values from the experimental treatment in the hypothetical bias experiment discussed above). In the control treatment people were asked for their expectations but were not given any feedback. In the two experimental treatments we provided feedback right after the expectations questions (so before the CV donation question) on the share of households that donated (experimental treatment 2) and on both the share of households and the average donation (experimental treatment 3). By using social expectations as a variable in explaining the willingness to donate we show that (1) higher

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[24] Bouma JA, Koetse MJ (2017) Mind the Gap: Assessing Hypothetical Bias and the Impact of Behavioural Factors on Stated WTP. Discussion paper, Institute for Environmental Studies, Vrije Universiteit Amsterdam.

[25] Koetse MJ, Bouma JA, Hauck D (2017) Social Anchoring in Donating to a Public Environmental Good. Discussion paper, Institute for Environmental Studies, Vrije Universiteit Amsterdam.

expectations lead to higher donations, i.e., social anchoring exists and is substantial, (2) providing feedback on actual donation figures changes donations to a certain extent, (3) providing feedback changes the expectation-donation relationship, but differently for people who underestimate than people who overestimate other people's donation behaviour. This is also shows in Figure 3.1 where the relationship between (left) the probability of donating (y-axis) and expectations on the share of households (left; x-axis) and (right) the donated amount (y-axis) and expectations on the average donated amount by others (x-axis) for the control treatment (t1) and the two experimental treatments (t2 and t3).
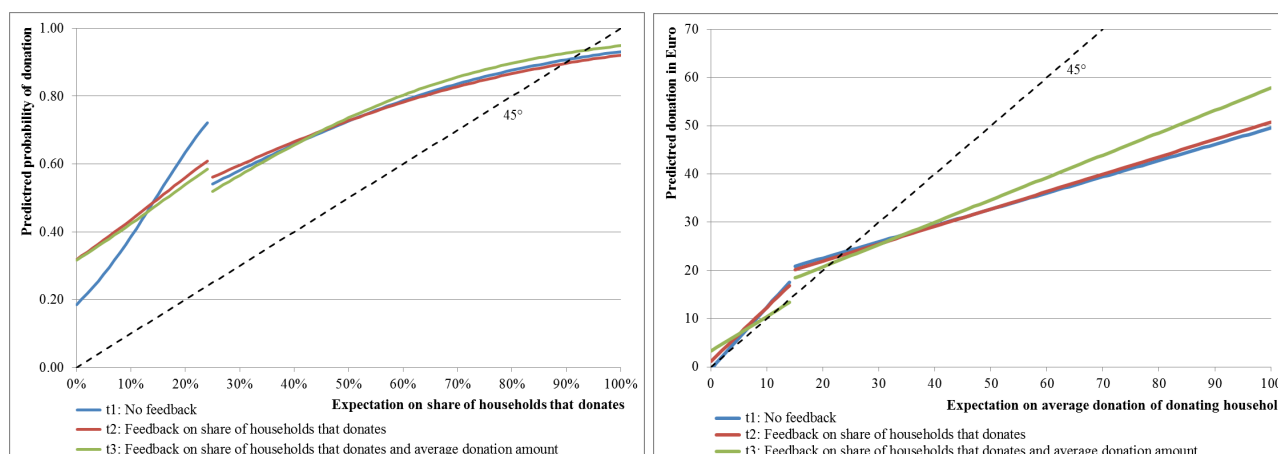


Figure 15 . Relationship between expectations and donations

Notes: In the left figure we plot the relationship between the probability of donating (y-axis) and expectations on the share of households (x-axis). In the right figure we plot the relationship between the donated amount (y-axis) and expectations on the average donated amount by others (x-axis). Results are given for the control treatment (t1, blue line) and the two experimental treatments (t2, red line and t3, green line)

**Integrated ecosystem service valuation in the Inner Forth (Tasks 3.3.1 and 3.3.4)**

The cooperation between WP2 and WP3.3 on developing and applying integrated socio-cultural and economic valuation study resulted in an extensive database containing results from various valuation exercises. The integration of socio-cultural and economic elements consists of performing a choice experiment in a workshop setting, rather than doing this online or through individual face-to-face surveys, which is the standard economic approach. Our integrated approach allows for introducing deliberative elements into the economic valuation exercise. Specifically, we test of providing additional information and deliberation on monetary value estimates by performing the choice experiment at three specific points in the workshop, i.e., at the beginning, after an extensive introduction of problems in the study area and after social deliberation in groups. Results show that monetary value estimates are affected substantially, both by information provision and by social deliberation. An example of these effects is provided in Figure 3.2, which shows that the mean willingness to pay for one of the choice attributes in the first round (black line) is reduced after information provision (red line) but especially after social deliberation (blue line). Moreover, the distribution of WTP values also changes. Further work on this particular issue is aimed at identifying the underlying reasons for the changes we observe, which will be done partly by additional modelling and partly through information obtained through other exercises in the workshops.
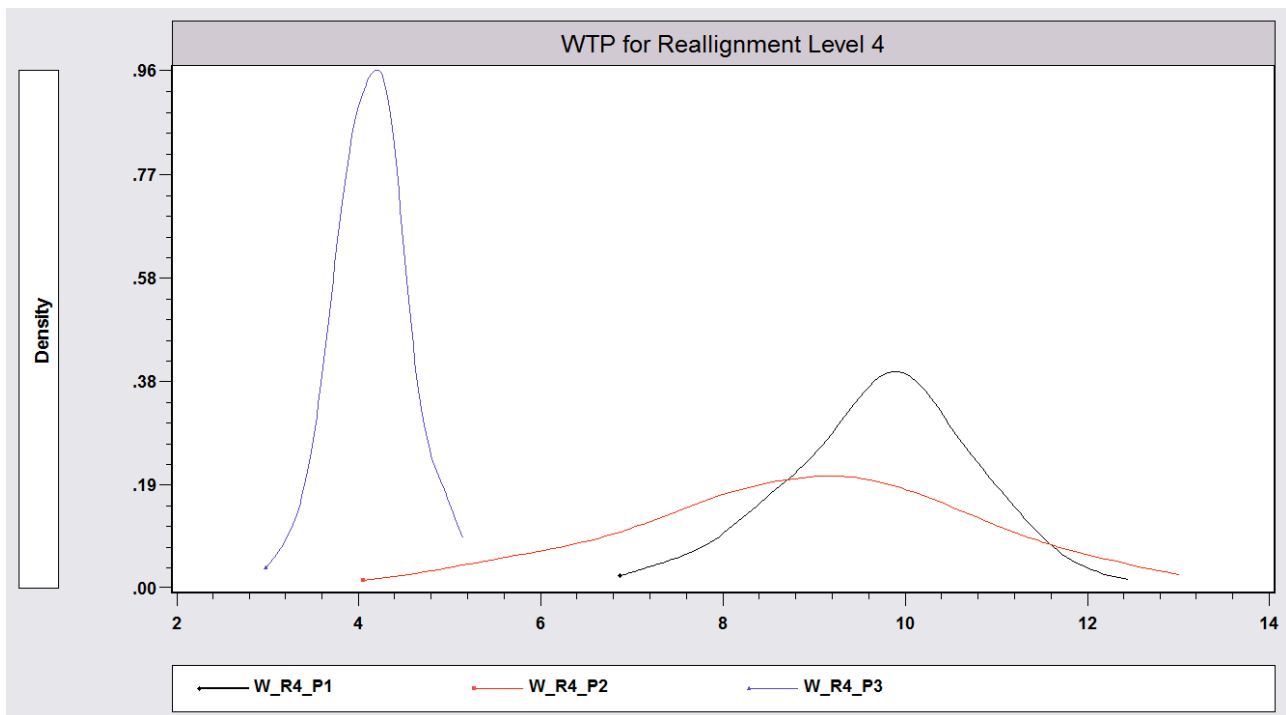
Figure 16 A shift in (the distribution of) willingness to pay for one of the Inner Forth choice attributes

Notes: WTP from choice experiment in the beginning of the workshop (black line), WTP from choice experiment after additional information provision (red line), WTP from choice experiment after social deliberation (blue line). Results are obtained from kernel density estimation and in the figure willingness to pay estimates per respondent are on the x-axis and frequency of observation is on the y-axis.

**Disseminating research demonstrating OPERAs advances on the valuation of ES/NC (Task 3.3.1)**

OPERAS research has significantly advanced the theory of ES/NC valuation. Work in T3.3 has turned that into practical application through two peer reviewed papers published in top ranked international journals. The first of these papers was focussed upon the use of ES/NC valuation methods to improve decision making for the implementation of the EU Water Framework Directive. Using a case study of the River Aire catchment in north England the study undertook and linked:

▪ An econometric analysis of the drivers of agricultural land use decisions incorporating market forces (output prices and input costs), policy drivers (including incentive payments) and environmental driers (including cross sectional variables such as soil types and temporal factors such as climate change);

▪ A hydrological model linking land use to water quality across the catchment;

▪ An ecological model linking water quality to biological outcomes including indicators of biodiversity;

▪ A revealed preference study examining non-use values arising from changes in water and ecological quality;

▪ A stated preference study examining non-use values arising from changes in water and ecological quality.

The analysis therefore provides a system linkage through the chain of environmental impacts arising from some driver shift. In our analyses we examine both changes in climate and offsetting changes in policy. The analysis was conducted using spatially explicit modelling throughout allowing the decision maker to see the consequences of change in all locations across the catchment. Figure 3.3 shows the spatial distribution of the recreational values that would be lost by the impacts of climate change in the catchment; which in turn provides an input to a decision regarding any policy to mitigate those impacts.
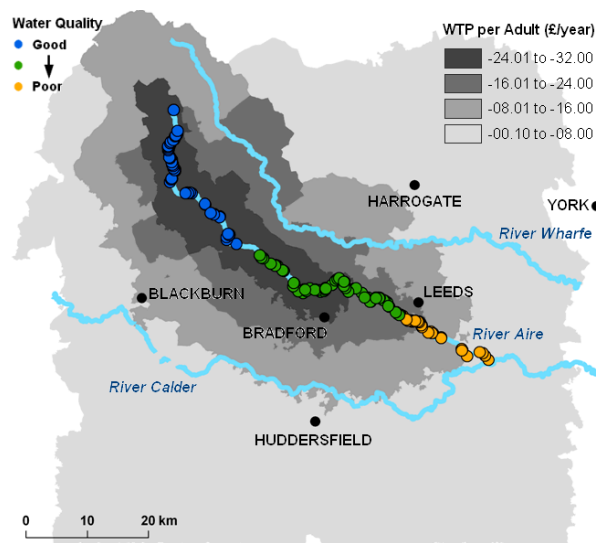


Figure 17. The spatial distribution of per person changes in recreation value under the climate change scenario

Notes: Colours represent predicted site qualities in the baseline scenario where: blue = Pristine; green = Good; yellow = Mixed. Under the climate change scenario, water quality at all currently Pristine sites declines to Good quality. Water quality is as follows: blue = Pristine; green = Good; yellow = Mixed; red = Poor. Water quality definitions given in Bateman et al., *Journal of Environmental Management*, 181: 172-184, http://dx.doi.org/10.1016/j.jenvman.2016.06.020

While the above paper focussed principally upon providing support to policy makers, the second paper addressed the business community. This initiative was specifically designed for developing economies where Government incentive payments for conservation were insufficient or unavailable. As illustrated in Figure 18, the case study was conducted in a large palm oil concession in Sumatra (panel (a)). It examined the effectiveness of business decisions to conserve biodiversity (panel (b)), the costs associated with those strategies (panel (c)) and hence the cost effectiveness of conservation (panel (d)).

Figure 18. Study area and analysis results

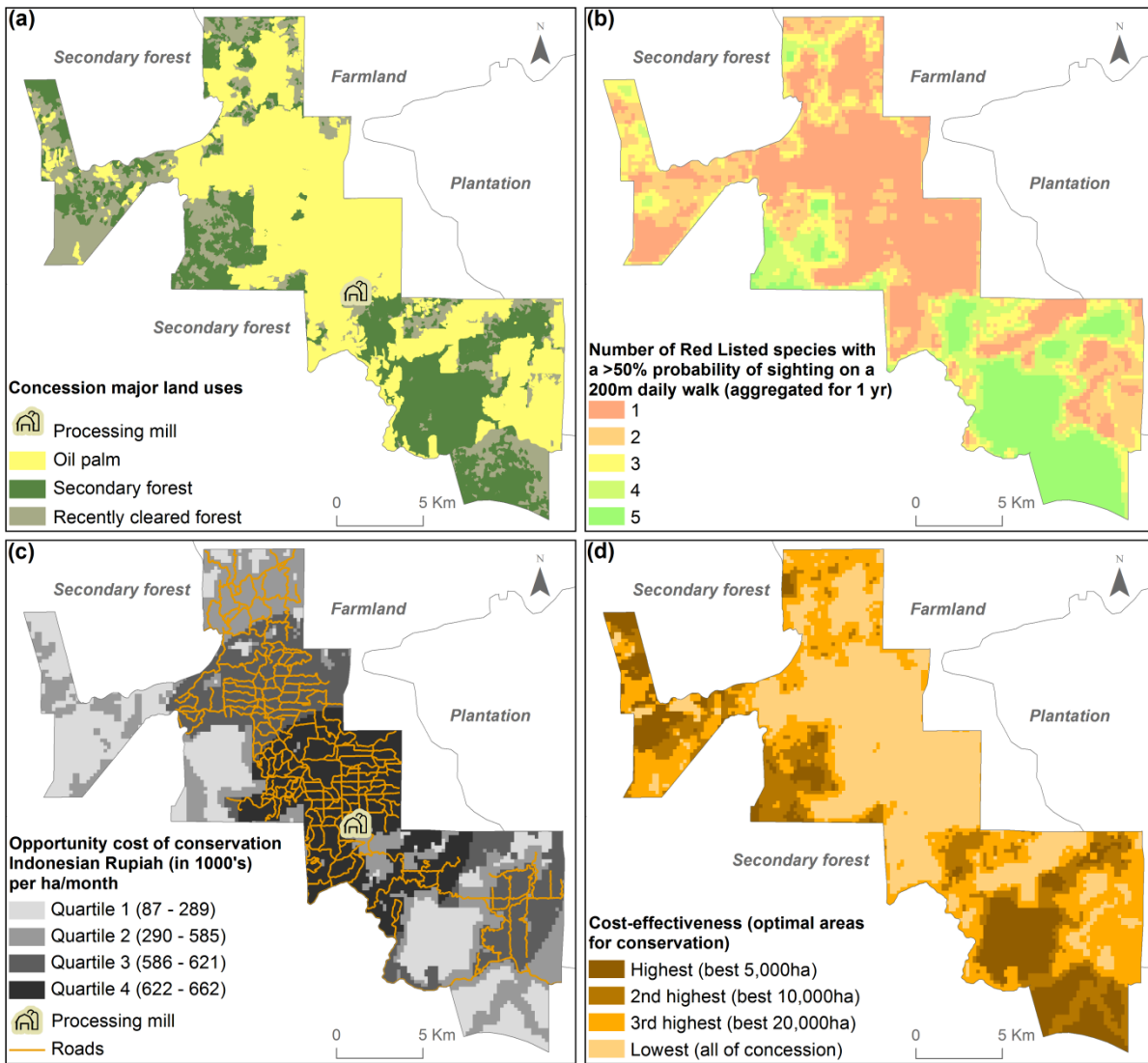Notes: (a) Distribution of predominant habitat types across the concession (Areas shown as oil palm are principally plantation; Secondary forest is typified by areas where large trees had been logged but were otherwise relatively undisturbed; Recently cleared areas include land under preparation for potential planting with oil palm or cleared as a result of illegal settlement (burnt and in preparation for crop planting), typically having little vegetation cover, although some grasses and herbaceous plants occur amongst the tree stumps). (b) The predicted number of IUCN Red Listed species with a greater than 50% probability of being observed on a given 200m transect walked once each day for a year. (c) The opportunity cost of conservation (assuming high productivity management regime) shown in thousands of Indonesian Rupiah per hectare per month. (d) Optimal cost-effective allocation of land to three sizes of conservation scheme. Source: Bateman, et al., Conserving tropical biodiversity via market forces and spatial targeting, *Proceedings of the National Academy of Sciences (PNAS)*, 112 (24) 7408–7413, doi: 10.1073/pnas.1406484112.

This information was then combined with a further analysis examining the impact which wildlife friendly certification would have upon consumers' willingness to pay for products. The resulting net profit premium which such actions could deliver to companies is detailed in Figure 19.
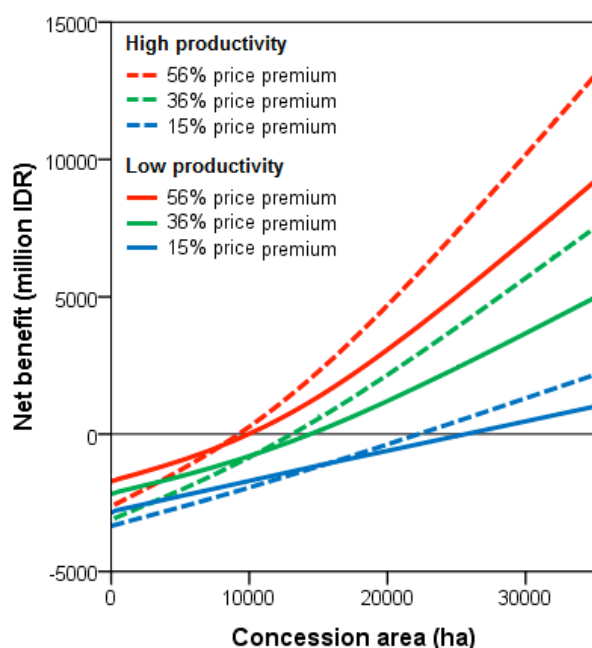
Figure 19. The profitability of cost-effective conservation schemes in the presence of differing price premiums and productivity levels: The net benefit accrued by concessions of differing sizes with a constant conservation area (5,000 ha).

The OPERAs programme was formally acknowledged in both of the above papers.

**Spatially explicit ecosystem service meta-analyses (Task 3.3.2)**

One of two meta-analysis databases was finalised, and contains value estimates of urban open space derived from contingent valuation and hedonic pricing studies, with specific attention for including ecosystem service details and spatially specific information. The database is an extension of a database used in Brander and Koetse (2011).[26] The second database contains observations on forest values from studies around the globe and also contains spatially explicit information. Although work on this database was delayed due to unforeseen circumstances, we expect to finalise the database around September 2017. Also the papers related to these research endeavours are expected in the second half of 2017.

**Integration of market and non-market ES/NC values into existing accounting frameworks (Task 3.3.3)**

Deliverable 3.4 is entitled "The use of (economic & social) values of Natural Capital and Ecosystem Services in national accounting", and was led by Patrick ten Brink (IEEP) and co-authored by Rob Tinch (Iodine), Cindy Schoumacher (Iodine), Matthew Agarwala (University of

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[26] Brander LM, Koetse MJ, 2011, The Value of Urban Open Space: Meta-Analyses of Contingent Valuation and Hedonic Pricing Results, *Journal of Environmental Management* **92**, 2763–2773.

East Anglia, University of Exeter), Ian Bateman (University of Exeter) and Craig Bullock (UCD). The report includes five chapters:

1. *Developments of Natural Capital accounting*, by Daniela Russi (IEEP), Patrick ten Brink (IEEP), and Rob Tinch (IODINE). This chapter summarises recent developments of Natural Capital Accounting, including recent initiatives at the global and European level, examples in European countries, and a summary of the System of Environmental-Economic Accounting (SEEA).

2. *Ecosystem Accounting through biophysical indicators* by Daniela Russi (IEEP), Patrick ten Brink (IEEP), and Rob Tinch (IODINE). This chapter discusses Ecosystem Accounts through physical indicators, including an overview of available methodologies, relevant EU and national initiatives and processes, interesting uses and challenges.

3. *The use of monetary valuation for Natural Capital and Ecosystem Accounting* by Rob Tinch (IODINE) , Cindy Schoumacher (IODINE), Matthew Agarwala (University of East Anglia, University of Exeter), Ian Bateman (University of Exeter). This chapter is about monetary valuation for Natural Capital Accounting. It discusses the valuation principles for accounts (e.g. exchange vs. welfare values) and how to extend valuation boundaries. It also summarises the existing monetary valuation methods for accounts.

4. *Integrating Social Values into Natural Capital Accounting* by Craig H Bullock (University College Dublin). Chapter four is about how to represent socio-cultural values and subjective well-being in Natural Capital Accounting, and discusses the related methodological challenges.

5. *The policy use of ecosystem accounting* by Patrick ten Brink (IEEP), Daniela Russi (IEEP), and Rob Tinch (IODINE). Chapter five is about the policy use of accounts in the policy cycle and the potential added value to policy making. It summarises the actual and potential policy use of accounts in the different policy areas (biodiversity, water policy, climate mitigation and adaptation, marine policy, forestry policy. It also provides conclusions and insight into the way forward.

To canvass insights to feed into the work, to disseminate working results and test and revise them, IEEP organised and contributed to a range of workshops and conferences. This included the organisation of a session in the European Ecosystem Services Conference (www.esconference2016.eu), in Antwerp, Belgium, 19-23 September 2012. In addition we contributed presentations at a range of other stakeholder workshops, and also integrated reflections on natural capital accounting in several publications.[27]

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[27] For example: ten Brink, P. (2015) *Natural Capital – an old concept with a new life* in Nature and the Wealth of Nations / *Qu'est-ce que le capital naturel ?* Dans Nature et richesse des nations - La Revue du CGDD, Service de l'économie, de l'évaluation et de l'intégration du développement durable. Collection « La Revue » du Service de l'Économie, de l'Évaluation et de l'Intégration du Développement Durable (SEEIDD) du Commissariat Général au Développement Durable (CGDD). Septembre 2015 (FR) December 2015 (EN).

**Relative price increase for ecosystem services in social cost-benefit analyses (Task 3.3.4)**

In the literature there are recent developments with respect to valuing ecosystem services differently than regular consumption in social cost benefit analyses by using different discount rates for the two categories (e.g., Baumgartner et al., 2015).[28] The general practice in SCBA's is that future relative prices are kept constant, and the intuition in this new development is that this practice may be flawed when relative scarcity of ecosystem services increases compared to regular consumption. The Dutch government has decided, partly based on these insights, that ecosystem services should be treated with a 1% lower discount rate in SCBA's than other welfare effects, with is equivalent to stating that ecosystem services are given a relative price increase of 1%. This holds unless it can be shown that consumption and ecosystem services in the welfare function can be easily substituted within the welfare function. In our study we analyse whether this decision is sensible for the situation for the Netherlands.[29] Results show that ecosystem services are indeed becoming scarcer relative to regular consumption, and are also expected to become relatively scarcer in the future. Empirical insights on substitution potential between ecosystem services and regular consumption are scarce and vary widely. The report concludes that a relative price increase for ecosystem services (through a lower discount rate of 1%) appears to be a sensible decision. One of the main exceptions are production services, which can be easily substituted with import, implying they are not becoming scarcer than regular consumption. Another exception holds for locally provided ecosystem services in urban environments, which are arguably getter even scarcer relative to regular consumption than is reflected in the average figures we are using. Moreover, because of the local character of these services the potential to substitute with regular consumption is arguably limited. These two factors imply that applying a relative price increase larger than 1% may or even should be considered.

**Ecosystem service valuation in the Montado (Task 3.3.4)**

Cooperation between WP2 and WP3.3 on designing and performing led to an extensive economic valuation study on values of the Montado Exemplar in Portugal. We performed an online choice experiment among around 1,000 respondents sampled from the Portuguese population. The choices that people are faced with contain different management options of the Montado, i.e., the status quo (with overgrazing and shrub clearing), a livestock management option and a forest improvement option. Other attributes are the types of trees planted, the donation to a fund from which management is financed, and the fund manager. Respondents are asked to choose their preferred option in six different choice cards. The choice data obtained are modelled using a discrete choice model, and the results reveal that Portuguese citizens strongly prefer the forest

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[28] Baumgärtner S, Klein AM, Thiel D, Winkler K, 2015, Ramsey Discounting of Ecosystem Services, *Environmental and Resource Economics* **61**, 273–296.

[29] The resulting report is now only available in Dutch because first and foremost it is aimed at Dutch government and policy. An English version is expected later in 2017. See Koetse MJ, Renes G, Ruijs A, De Zeeuw AJ (2017) *Relatieve Prijsstijging voor Natuur en Ecosysteemdiensten in de MKBA* (in Dutch), English title: *A Relative Price Increase for Nature and Ecosystem Services in SCBA's*. PBL Netherlands Environmental Assessment Agency, Den Haag, the Netherlands.

improvement option over the other two options, and also the livestock management option is preferred over the status quo. The distributions of willingness to donate to the fund for the livestock management option (black line) and the forest improvement option (red line) for the sample of respondents are shown in Figure 20. In conclusion, current management of the Montado areas in Portugal are not preferable from a citizens' perspective, and results indicate that other management options may be partly financed by crowdfunding or more generally donation campaigns among citizens (and potentially companies as well).
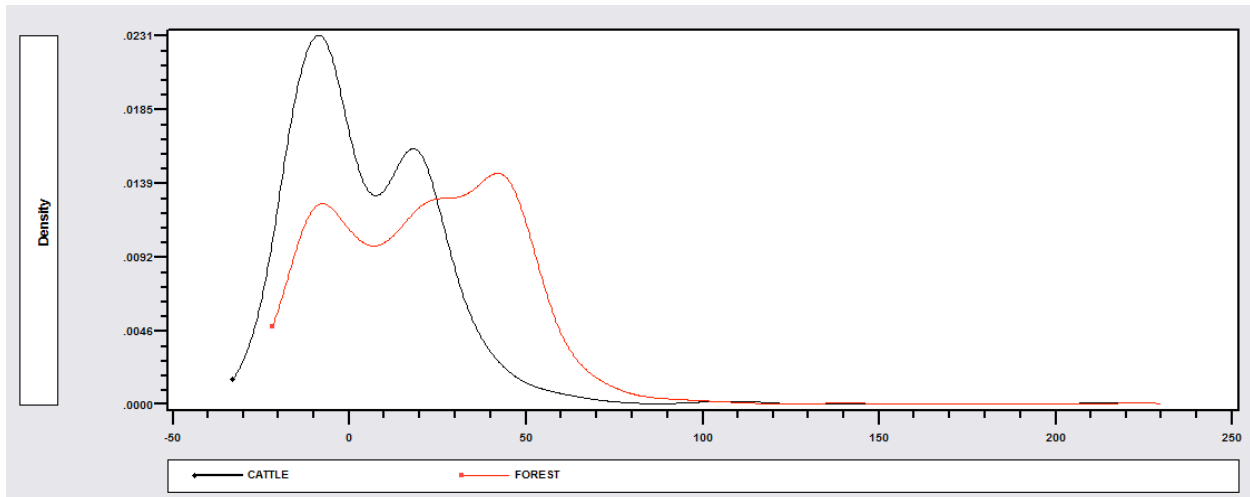


Figure 20. Distribution of willingness to donate to a fund for the livestock management option (black line) and the forest improvement option (red line)

Notes: Results are obtained from kernel density estimation and willingness to donate estimates per respondent are on the x-axis and frequency of observation is on the y-axis.

**Building long lasting dissemination of OPERAs findings through a co-funded programme of work with business and policy users (Task 3.3.4)**

OPERAs research will be disseminated and economic, social wellbeing and environmental enhancements delivered through a new partnership between OPERAs researchers, the business community, policy makers and social stakeholders. South West Partnership for Environment and Economic Prosperity (SWEEP), led by OPERAs research Professor Ian Bateman at the University of Exeter Has brought together a substantial array of organisations ranging from major international corporations to SMEs and from local Councils to national Government and from local environmental groups to international conservation bodies. Funded through a five year grant of £5,000,000 from the UK Natural Environment Research Council (NERC) and with over £11,000,000 in additional funding from partners, SWEEP (http://www.sweep.ac.uk/) seeks to place OPERAs style natural capital thinking at the heart of decision making across all of these organisations to deliver real world impact and improvement at regional, national and international level.

## Task 3.4 – Institutional structures and governance systems

Deliverable 3.6 A portfolio of ideal types of (public and private) governance modes for selected ES/NC" was submitted in November 2016 and written with support from Anja Helena Liski (UEDIN); Ana Ruiz (IMEDEA); Deirdre Joyce (UCD) and Marianne Kettunen (IEEP). In the deliverable we developed a set of questions that serve as a guideline to study and unpack the different components that play a role for the governance of ecosystem services in the respective exemplar context and beyond. To inform the deliverable, we two selected two exemplars, (1) the Balearic Islands and the co-beneficiary management of seagrass ecosystems and (2) coastal wetland realignment in the Inner Forth in Scotland. The set of questions that we developed are used to guide the creation of ideal types of governance modes for the selected ecosystem services. However, there are still a number of incoherencies and uncertainties with regards to the governance and the institutional context through which ecosystem services can and should be managed. This is not surprising as our understanding of the interlinkages of ecosystem functions, environmental changes and human actions evolves. Spatial scales vary greatly and temporal inertia and lags are often not sufficiently understood. And even if they are understand to a large degree, scientific evidence is frequently not sufficiently included in policies and management practices. This can be attributed to strong interest groups and other interests that play down scientific advice. In the case of the Balearic Islands, the hotel and tourism lobby is influential in shaping local environmental management that often supercedes available knowledge and advice. In addition, as part of a more inclusive form of governance for ecosystem services, platforms that give space to open deliberation and discussion regarding ecosystem management is key in the Inner Forth, where private landowners are most affected by sea level rise and managed realignment, but also the wider population who will be affected by coastal flooding in the Inner Forth area.

Under task 3.4, we have completed the following Milestone and Deliverable during the 3rd reporting period.

Milestones
1) Milestone MS 3.14 "First test of the portfolio of ideal types in some exemplars" which was submitted January 2016. This Milestone was a pre-cursor to the deliverable D3.6 and was written with support from UEDIN (Anja Helena Liski); IMEDEA (Núria Marbà); L'aboratoire d'Ecologie Alpine – CNRS (Adeline Bierry)

Deliverables:

1) Deliverable 3.6 "A portfolio of ideal types of (public and private) governance modes for selected ES/NC" submitted in November 2016.

In addition, a significant contribution was made to D3.7, which is reported in T3.5.

In February 2016 we visited the Scottish Multi-Scalar exemplar and conducted interviews around the Inner Forth with different council representatives and various environmental organisations. We participated in a workshop led by Anja Liski (UEDIN) and developed a joint research paper based on the data collected during interviews and in the participatory workshops. We returned to the exemplar site in October 2016 to complement data and inform Deliverable 3.6. Furthermore, we conducted personal visits and fieldwork in  the Balearic exemplar (April/May 2016) together with colleagues from IMEDEA (Ana Ruiz and Nuria Marba). We conducted 15 interviews with representatives from civil society organizations working with marine questions, the government (Ministry of Environment, Fisheries, Tourism) and private entities. The visit to the Baleares and the data collected informed Deliverable 3.6 and is also used in a joint paper.

## Task 3.5 – Trade-offs and synergies in ES/NC and alternative valuation perspectives

During the 3$^{rd}$ reporting period task 3.5 has primarily focussed on the advancement of methods for navigating ecosystem services trade-offs through land management and land use. Moreover, we facilitated bringing together key research on ES trade-offs by organising a symposium on this topic at the Ecosystem Services Partnership conference in Ghent, September 2016, where we also presented key OPERAs results. To facilitate the operationalization of methods for understanding and dealing with ES trade-offs, we have been preparing a stakeholder workshop together with the European exemplar and Prospex, which is scheduled for the fall 2017. T3.5's main responsibility is bringing together the findings of WP3 through a synthesis. This Deliverable 3.7 has been submitted in April 2017 as a final draft, and contains three pillars, as was decided at the General Assembly in Barcelona, June 2016:

1) Valuation of ecosystem services (Synthesis of work conducted in the context of T3.2 and T3.3, led by Mark Koetse en Craig Bullock).

2) Governance of ecosystem services (Synthesis of work conducted in the context of T3.4, led by Torsten Krause).

3) Navigating ecosystem services trade-offs in land use and land management (corresponding to work conducted in the context of T3.5, led by Astrid van Teeffelen).The **work in Scotland as a joint case study** as reported in MS3.5, has resulted in a number of studies, both at the National scale and in the Firth of Forth (partly ongoing still) by multiple partners and from biophysical, social and monetary perspectives. Our efforts revealed opportunities, but importantly also limitations, of applying the various methods to a single case study. The most important limitation is the mismatch in spatial scale at which the data is available / needs to be collected, e.g. at the individual/household level for preference studies and at national scale for biophysical modelling of ecosystem services provisioning. When mapping the types of results the different
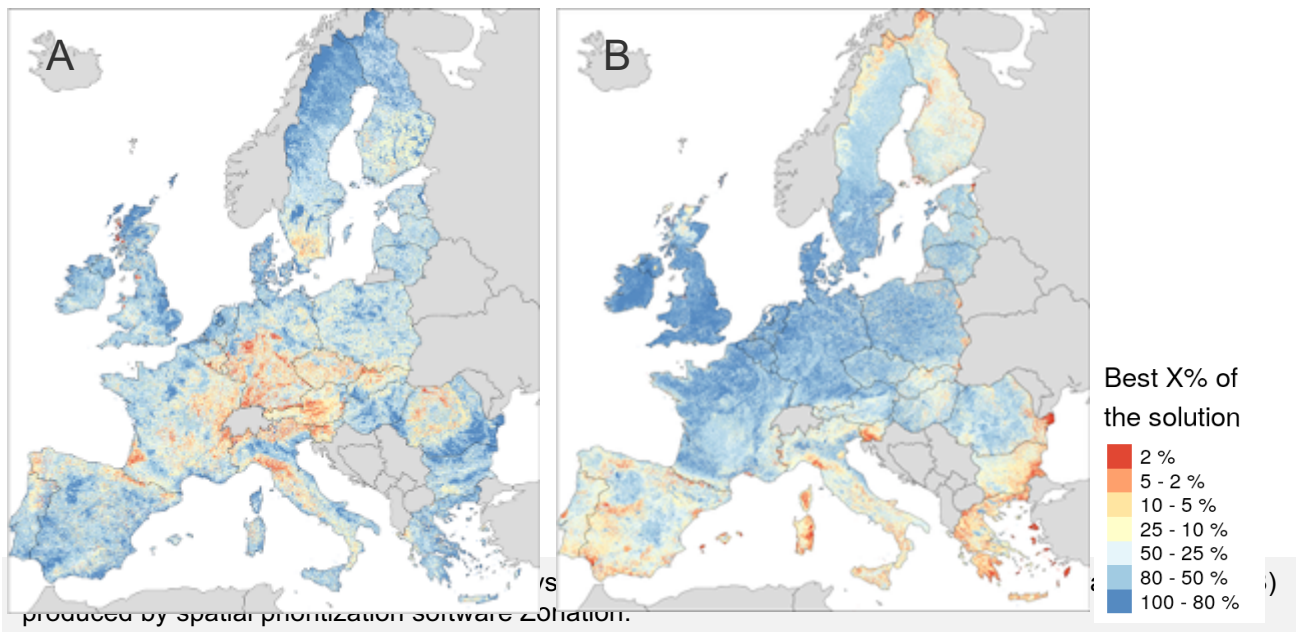
studies/approaches yield onto the planning and policy cycle however, demonstrates how methods and approaches can interact and complement one another despite these differences (D3.7).

In the context of navigating ecosystem services trade-offs in land use planning, the task has actively sought the testing and developing of different optimization tools and methods for ecosystem services, in particular in the context of the European exemplar. Verhagen et al (2016) identified priority areas for ecosystem services in Europe, and demonstrated the importance of carefully considering the demand and flow for services in the prioritization (Figure ). Further assessment of the applicability of prioritization for ecosystem services was done by overlaying priority areas identified for current land use, and for future land use projections. This revealed the degree to which land use change poses threats or opportunities for ES provision, providing operational guidance on land management for ES, as well as technical guidance regarding the designing prioritization analysis for ES (Verhagen et al. Revised for Ecosystem Services[30]). Moreover, Lethomäki et al.[31] have compared spatial prioritization methods for biodiversity conservation and ecosystem service supply:

"Identifying the areas important for biodiversity conservation and ecosystem services supply is useful in guiding land-use decisions, including navigating trade-offs between the two if, and when, they arise. Different quantitative software methods exist for such decision-support, but each comes with its own advantages and disadvantages. We compared three methods for spatial prioritization of areas suitable for ecosystem services supply and biodiversity conservation on the EU scale: Rarity-weighted richness (RWR), Zonation, and integer linear programming (ILP) exact optimization. The different methods differ in their ability to account factors relevant for real-life spatial prioritization (e.g. costs and ecological connectivity), ease of implementation, speed of execution, and the degree of optimality of the solutions. The prioritizations were based on 9 ecosystem services supply maps and the occurrence estimates of 763 terrestrial vertebrate species. For ecosystem services and biodiversity respectively, the high-priority areas are dissimilar in Europe (Figure ) indicating trade-offs between them. While the overall correlation between the resulting priority rank maps was high between all methods, there were notable differences in where the highest priority areas were located. RWR is good for quick and simple analysis, Zonation for situations where a balanced outcome including as much of all features as possible is required. ILP on the other hand is the only method capable of producing truly optimal outcomes. The suitability of each method depends on the decision-support objective at hand as well as on resources, both data and human, available for executing the prioritization."

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[30] Verhagen, W. Van Teeffelen A.J.A., P.H. Verburg. Shifting spatial priorities for ecosystem services in Europe following land use change. *Ecosystem services (under review).*

[31] Lehtomäki, J., Maiorano, L. & Verburg, P. (*in prep*): Comparing spatial prioritization methods for biodiversity conservation and ecosystem service supply in Europe.

Best X% of
the solution

2 %
5 - 2 %
10 - 5 %
25 - 10 %
50 - 25 %
80 - 50 %
100 - 80 %

produced by spatial prioritization software Zonation.

This work is further extended in the coming reporting period (Lethomäki et al. In prep; Verhagen et al. In prep; Van Teeffelen et al. In prep,), not just in the context of the European exemplar, but also for example in the Mediterranean exemplar (see T3.1, and Malek et al. forthcoming), and the Global exemplar (Lautenbach et al. in prep. See also [32]).

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[32] Lautenbach S, Bayer A, Arneth A. Trade-offs between carbon storage, crop yield production and water supply at the global scale. IEMSs 2016, Touluse, http://scholarsarchive.byu.edu/iemssconference/2016/Stream-B/39/. 2016.
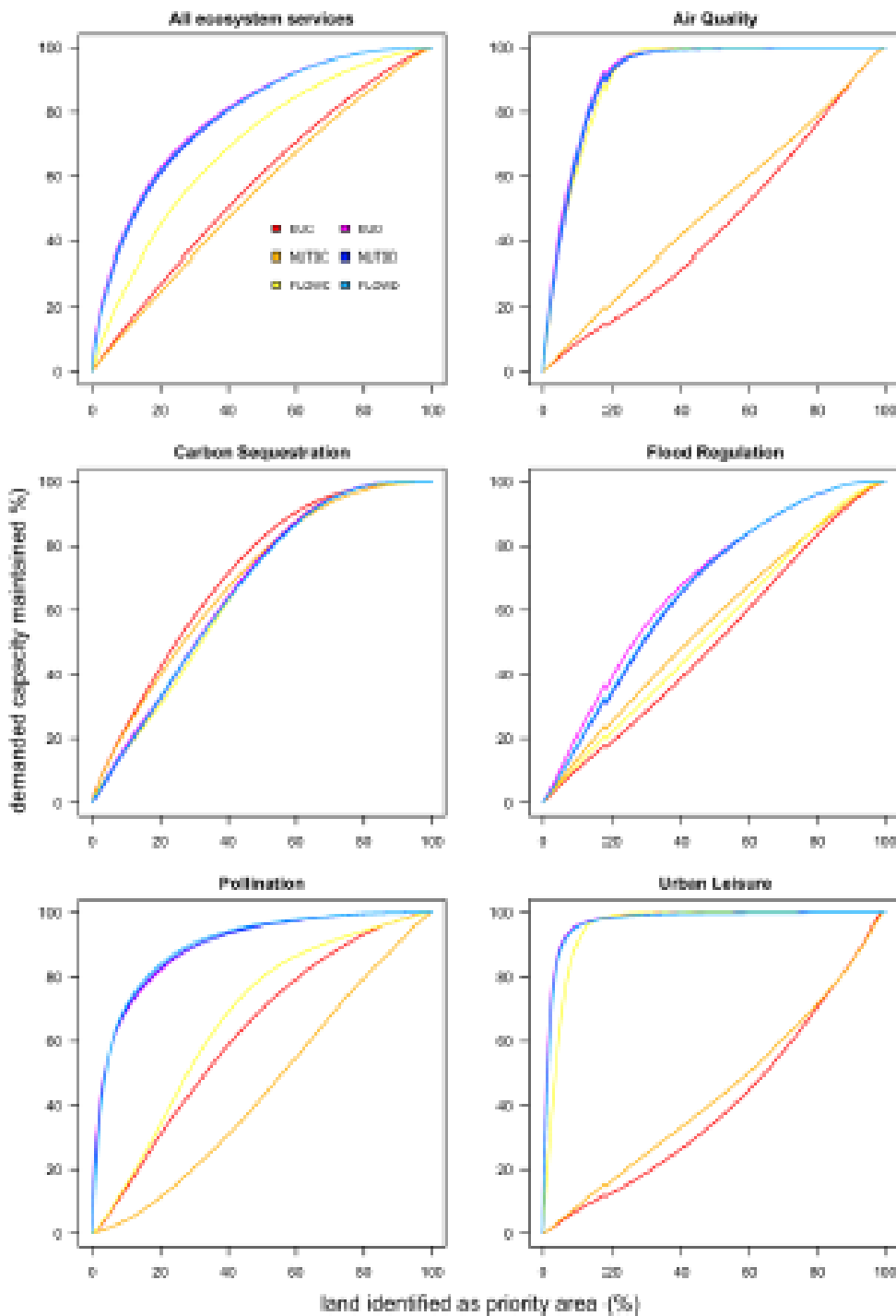
Figure 22 The level of ecosystem services (ESs) maintained (percent capacity demanded) in the EU relative to the percentage of conservation-priority areas identified based on 6 tests of ecosystem services capacity, demand, and flow zone (an area with a unique demand–supply combination dependent on the ES flow). Different degrees of concavity in the curves result from different size distributions of ESs across the landscape and from the fact that all prioritizations are based on the distribution of five ESs but results are presented per service. *FROM: Verhagen, W. A. Kukkala, A. Moilanen, A.J.A. Van Teeffelen, P.H. Verburg (2017). Ecosystem services priority areas: the importance of accounting for demand and the spatial scale of ecosystem services flows. Conservation Biology (in press).*

To maximise the further operationalisation of findings and methods from WP3/T3.5 a number of events have been held and are being planned. These include:

- T3.5 researchers (Van Teeffelen - VU, Lautenbach - UBO, Bayer - KIT) organised a Session regarding Trade-Offs at the ESP conference in Antwerp, in September 2016. (Table below). The session was well attended by approximately 60 people, primarily researchers (despite our submission to the science/practice day) though also some practitioners.

| G6 Ecosystem services trade-offs workshop: synthesis and implications for knowledge production and uptake | | |
|---|---|---|
| Room D.014 Tuesday, 20 September, 16:00–17:30 | | |
| Host(s) | A. van Teeffelen, A. Bayer | |
| **Time** | **Name** | **Title of the presentation** |
| 16:00 | A. Van Teeffelen | The plethora of ecosystem services trade-off research: trade-offs between what? |
| 16:10 | A. Vallet | Interactions between stakeholders and ecosystems: social networks, power, beneficiaries, and agents of change |
| 16:15 | C. Bullock | Environmental vs social trade-offs |
| 16:20 | A. Bayer | Methods for trade-off analysis: do's and don'ts |
| 16:30 | A. Thomas | Modelling trade-offs in ecosystem service provision at the national scale in Wales |
| 16.35 | S. Lavorel | Ecosystem services trade-offs by 2040 in the Grenoble urban region (French Alps) |
| 16:40 | M. Volk | Analyzing trade-offs between land use, ecosystem services and biodiversity – How far are we and what is used in practice? |
| 16:45 | S. Lautenbach | Trade-off findings – do patterns emerge or is the context all that matters? |
| 16:55 | A. Norström | PECS working group on social-ecological dynamics of ecosystem services |
| 17:00 Discussion groups around the three topics | | |

- T3.5 was invited to provide a keynote at the Alternet conference regarding Trade-offs (May 2017), which was held by Sven Lautenbach (UBO) also on behalf of several WP3 partners (opening slide included below):

- Stakeholder workshop in close collaboration with the European exemplar & Prospex (Sept/Oct 2017) – Topic: methods for navigating ES trade-offs. Lead partners: Astrid van Teeffelen, Willem Verhagen (VU), Sven Lautenbach (UBO).

- The OPERAs extravaganza in Oct 2017. where one of the weeks is dedicated to Trade-offs.

- Output (results, methods) for OPPLA, which is partly uploaded already, and which we will continue to upload.

- Decision tree contributions from WP3 in close collaboration with OPERAs and OPENNESS.

## 2.3.3 Deviations

Minor deviations were observed, none of them having implications as regards the overall progress of the WP or individual tasks. Deviations included:

Deliverable D3.7 under Task 3.5 experienced a slight delay that was caused primarily by the Trade-offs chapter, for which scoping turned out to be exceptionally challenging, given the large amount of related work on the topic (>1000 papers, with a current rate of at least one paper a day coming out on this topic), in combination with the ambition to develop a journal article from the chapter. A suitable scope has been found and the draft final deliverable was submitted in April 2017 instead of November 2016, with the final version expected in Summer 2017. The delay had no implications as regards the overall progress of the WP.

Deliverable D3.6 was delivered in time (November 2016, LUND).

## 2.3.4 Use of resources

See Table– Work Package Person Months per Partner

# 2.4 WP4: Instruments

## 2.4.1 Task Objectives

Specific objectives for WP4 during the third reporting period

To analyse the operational potential, needs, and demands for ES/NC concepts in policy development and implementation

- To analyse demands and potentials from both 'top-down' and 'botton-up' perspectives, including in respect to policies for biodiversity conservations, sustainable use of natural resources, and environmental protections

- To identify and assess sector-specific and stakeholder-specific needs for the application and integration of ES/NC into key policy instruments and their implementations

- To identify and assess opportunities for ES/NC integration in key emerging issues, including the green eceonomy and trade sustainability

To develop new and improved information tools that include ES/NC concepts

- To enhance and develop innovative data capture tools:

- To improve existing indicator-based information tools and develop new ones with ES/NC utility

- To enhance and develop selected indicator-based  tools To improve information tools as input to accounting and ratings systems with ES/NC relevance

- To improve ES/NC data and information storage and presentation for improved data and information exchange

To improve and further develop existing decision-support tools that include the ES/NC concept, including multi-criteria decision support tools, various types of Environmental Assessments, social cost-benefit analysis, and scenario and foresight tools

- To secure the inter-oprability of decision-support tools and methods, allowing information transfer between them

- To develop interactive user-interfaces in improved decision support tools, such as collaborative platforms siwht GIS-based 3D visulaisations and smart phone applications

- To define the necessary institutional and policy frameworks to facilitate the embedding of integrated decision-support tools into actual decision-making processes

To develop and apply new and improved implementation management and appraisal tools and instruments to support the implementation nand uptake of ES/NC concepts

- To appraise different approaches to implementation in a range of contexts

- To understand factors in the choice and combination of instruments, and the implications of choices for cost-structures (including transactions costs), implementation impacts, and outcomes

- To propose scheme modifications to reduce implementation costs, enhance cost effectiveness increase transparency, overcome obstacles, avert risks, and improve policy outcomes

To guide the development, choice and application of instruments that include ES/NC concepts both within and beyond the OPERAs project

- To coordinate instrument development in T4.2.4 ensuring innovations meet demands specified in T4.1 and that the work is interfaced with T2.1.3

- To synthesise the potential for operational ES/NC instruments and develop a road map for application of different instruments and tools

- To elaborate good practice guidelines for choice and application of ES/NC instruments as input to the Resource Hub/Oppla (WP5)

## 2.4.2 Progress towards objectives

Tasks 4.1 to 4.5 were active during the third 18 months reporting period, with Task 4.1 linking to policy needs and gaps and work in WP3, tasks 4.2 to 4.4 being active and applied in WP2 Exemplars and providing instruments and tools to OPPLA Marketplace (WP5) in a user-oriented way with suitable guidance as developed in Task 4.5 in cooperation between WP2-3-4-5 in OPERAs and with the OPENness project. . Suggestions for user guidance to instruments, as well as about instruments, their metadata and application have been iterated with the Userboard, as well as OPERAs and OPENness project. The results thereof are accessible at www.oppla.eu/marketplace

### Task 4.1 Demand for ES/NC instruments (task lead: IEEP; with ALU, OBU, denkstatt, EFI (+BOKU), WWF, UEDIN, PU, Biotope)

The analysis carried out under Task 4.1, including all its subtasks, has lead to the development of a dedicated guidance on the integration of ecosystem services and natural capital into sectoral policies, published as Deliverable 4,2.

The development of the guidance has been a joint venture between WP4 and WP3, integrating a range of aspects related to the policy and governance frameworks and individual instruments for ecosystem services. As foreseen in the DoW (D4.2), the guidance builds on the relevant lessons learned over the course of OPERAs and provides recommendations as to how to integrate ecosystem services into different sectoral policies and policy instruments.

The guidance provides a framework for systematically identifying and assessing all important elements linked to ecosystem services policy integration. Mainstreaming the ecosystem service concept into policy development and implementation across sectors needs a good evidence base (e.g. understanding of the current situation), range of tools and instruments, engagement by

different stakeholders, mobilisation of resources to facilitate the uptake and a framework to monitor impacts. Furthermore, it is crucial to focus on both realising benefits to the sectors linked to the mainstreaming of ecosystem services and natural capital and reducing possible trade-offs between such benefits and other sectoral policy goals.

The guidance is aimed at policy and decision-makers at different levels of governance - ranging from national to regional and local - interested at furthering the integration of biodiversity into sectoral policies while simultaneously identifying concrete opportunities for a shift towards green economy. Throughout the guidance a range of visualisations and illustrative examples are provided, aimed at to be adaptable for concrete use when applying the guidance. In addition, two examples of concrete assessment of sectoral policy integrations carried out in the context of OPERAs exemplars (Scotland and Danube) while applying the ESPI methodology are provided.

In addition to the D2.4 and related guidance document, Task 4.1 has also resulted in another stand-alone guidance: a toolkit for the reform of environmental harmful subsidies (EHS) for biodiversity and ecosystem services (EHS). This toolkit is aimed at supporting countries to identify and assess incentives harmful for biodiversity, understand potential reform options and prioritise reform efforts. In doing so it provides a practical guide to policy-makers considering actions to implement Aichi Biodiversity Target 3.

Both guidance documents will be made available under OPPLA over the summer.

Finally, under Task 4.1 work has also been carried out to explore the "bottom-up" demand for integrating ES into the climate policy, with focus on the application of the ecosystem service concept for climate protection in Germany. The research carried out by UBO revealed the important role that ES play in German climate protection strategies. The analysis investigated climate protection laws at state level, communal climate protection concepts and the climate protection amendment of the German Building Code. Abiotic services for climate change mitigation, such as the provisioning of solar energy or wind energy, played an important role especially at the level of the federal states. At the local to regional level also adaptation measures by regulating ecosystem services were of importance.
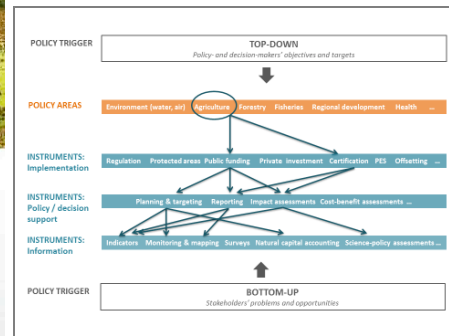
Figure 24  D4.2 "Making green economy happen: Integration of ecosystem services and natural capital into sectoral policies" provides guidance for policy and decision makers

## EHS Reform Flowchart
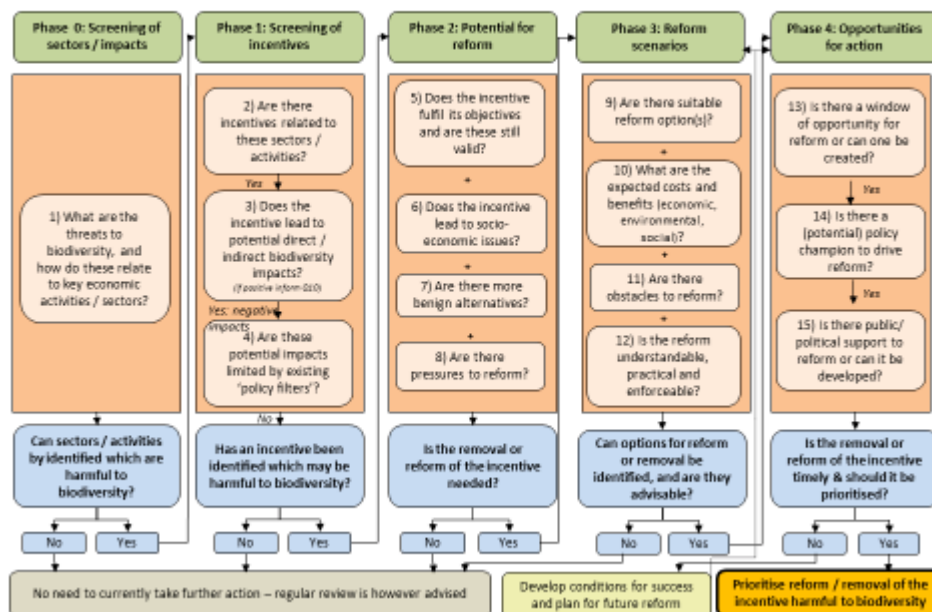


Figure 25 EHS reform flowchart from the EHS toolkit, illustrating the different steps required to plan and implement a reform of subsidies harmful for biodiversity and ecosystem services.

## Task 4.2 ES/NC information tools

Sub task 4.2.1 Enhancement and development of innovative data capture tools (UEDIN, EFI, WCMC). This task focuses on under-developed means of capturing information from stakeholders, including the public, on social and cultural values of ES/NC. For this sub-task three tools (TESSA, STREAMLINE and ToSIA) have been further developed and enhanced. To improve their scope of assessment and to further their applicability and impact. For the Toolkit for Ecosystem Services Site-based Assessment (TESSA) a new module on Cultural Ecosystem Services has been developed, tested in three exemplars (Dublin, Peru and Scotland) and further improved after feedback from the testing. The cultural ecosystem services module is available on request from www.tessa.tools and will be incorporated into the new version of TESSA 2.0, which will be launched this autumn (2017). The whole TESSA toolkit has also been enhanced, to improve its user friendliness. The toolkit has been converted from its original Word format into an interactive PDF, and has been tested by two exemplars (Montado and Peru, Global). (Work done by WCMC)

 The STREAMLINE canvas tool, adapted from the online canvas tool (developed in the VOLANTE project) using crowd-sourcing methods. This tool can now be used in face-to-face interactions to structure and guide semi-structured interviews and deliberative approaches around ecosystem services futures. It has been being tested in the Scottish exemplar with good results and feedback. It can now be accessed via its website (https://www.streamline-research.com/). (Work done by UEDIN)

ToSIA is another tool that has been enhanced by improving the user interface for easier data entry to the database by reprogramming the ToSIA Database Client TDC 1.0.5 in Java and linking the database connection directly to ToSIA 3.0.0. ToSIA and the Scenario tool were harmonised in the data structure to ease stakeholder use in developing complete and meaningful scenarios for

ToSIA. This work resulted in an "Extended ToSIA case stuy template" both as a word document and as a Scenario Toolbox template. The foremer has been used for all new ToSIA case studies and the latter was tested for the wine case study.  OE wsa and is used as a data provision paltform for ToSIA and tested in the Global Peru REDD+ case study. Currently the MCA module of ToSIA is being redeveloped to allow for group mode instead of only single-user applications. Furthermore a material flow allocation to user-selected products in ToSIA is developed tested to allow comparisons with LCA-like assessemnts. ToSIA has been tested in three exemplar (Montado, Wine and Peru, Global). For further information on the tools and their progress please see MS report 54-55 and Deliverable 4.4 - 4.6. (Work done by EFI)

Sub task 4.2.2 Enhancement of selected indicator-based tools and development of new indicator-based tools (WCMC, Biotope, EFI, ETH, Tiamasg). After an extended consultation both with several exemplars and OPERAs Userboard, opportunities for strengthening existing indicator-based tools and further opportunities to develop new tools have been identified. WCMC developed and published an ES indicator framework and guidance titled 'Measuring ecosystem services: Guidance on how to develop ecosystem services indicators' (Brown et al. 2014) to aid the process of developing ES indicators. It also contains newly developed indicators described in factsheets, that has been tested and developed in the South Africa. Biotope continued to work on the development of indicators for biodiversity and ecosystem services in the context of land-use decisions, with methods being produced for wetlands (Gayet et al. 2016) and a wide variety of land-cover types that could be harmed in the context of accidental damages (Gaubert et al. 2017), for example.

EFI and Denkstatt have worked on quantitative and operations ES indicators as well as on an eco-label and certification review to extract suitable ES indicators. So far a rating framework to capture user preferences has been developed. This includes the development of spatially explicit indicators to quantify and map ES (within Ecometrica Mapping Tool which is tested in several exemplars; e.g risk of deforestation and erosion in OE), drawing on the methods developed in T3.1. In a joint effort to catch crucial factors in information and decision making in wine production was captured in a questionnaire providing information to both ToSIA and WeLCA.

Indicators have been developed and tested in the context of European and global policy and strategy instruments, in private sector reporting and assessment frameworks (links to T4.3 and 13) and trialled in T2.2.

Sub task 4.2.3 Enhancement of information tools to support accounting and ratings systems (Denkstatt, WCMC, LUND, ECM).  Businesses increasingly require an understanding of their impact on ES/NC, and many aspire to be recognized against common social and environmental standards. Accounting systems such as life-cycle assessment (LCA), together with standards and certification schemes (e.g. for eco-labeling and/or elaborating on existing EPD's (Environmental Product declaration) product category rules (PCR) rules) criteria) both need to reflect ES/NC considerations. To address this gap, several tools have been developed and enhanced. First a new LCA-based tool by Denkstatt has been developed and tested for the wine industry, to guide and to assess vine grape growers level of sustainability. This tool has been developed and tested in close collaboration with the Wine and Montado Exemplars.

Denkstatt has developed a 2-step approach via the WeLCa tool designed to assess the impacts on biodiversity with respect to vineyards management. The first phase of WeLCa is qualitative and based on methodology for self-assessment of farmer's performance. It is using set of indicators, allowing users to identify environmental hotspots and to take informed management decisions. The second face is quantitative LCA-based and it provides detailed assessment on the impact of wine

production on biodiversity during all production stages. This tool has been developed in close collaboration with various stakeholders representing the scientific community, wine makers, traders within the Wine Exemplars. More details on the WeLCa tool can be found on OPPLA.

EFI is developing and conducting an Eco-label review to guide customers and retailers on ecolabel choice. This review will also be used for sustainability Impact Assessment (SIA method) for the identification of hot-spots and suitable indicators. One application of the ecolabel results is to evaluate ES with respect to vineyards management and wine production.

<u>Sub task 4.2.4 Improve data and information storage and presentation including web-based visualization interfaces</u> (Tiamasg, WCMC, ECM, Biotope, EFI).  This task draws together and makes data and information more accessible to use in decision-making tools that have been enhanced and developed in T4.3. Information tools in T4.2 have been examined and tested with regard to their usability as Decision Support tools and the modes of information transfer has been proposed and addressed to avoid common problems such as data and model availability biases for ES/NC assessments. The boundaries between decision support and information tools are sometimes very vague and determined by the purpose of the user: the same tools can be used for information and/or for decision support. For this reason, D4.4 and D4.6 have been harmonised in contents, structure and time of submission. This includes metadata descriptions and user guidance for each tool/instrument including a description of data transfer and translation interfaces, user requirements, development of databases and metadata standards, together with web-based visualization interfaces for data access and review, which is available via Oppla (T5.1) and instruction on user guidance were developed in cooperation with T4.5 as documented in D4.5 and reflected in Oppla Marketplace for each tool and instrument. Examples of database development includes a database structure for characterizing NC restoration and enhancement in the context of investment in green infrastructure and the no-net-loss initiatives put forward by the European Commission. A paper was submitted on data transparency regarding the implementation of European 'no net loss' biodiversity policies (Bull et al. submitted). A new interface to the "Toolkit for Ecosystem Service Site-Based Assessment" have been created at the address: http://tessa.tools/.

The Ecometrica Mapping tool, a web-based platform, has been used to present some of the exemplars ES and NC results in the form of web-based applications. This tool enables the exemplar groups to share their research outcomes (in the form of spatial data) with various stakeholders, enabling the stakeholders to easily extract results out of the data. There is guidance included in each app to help the user interpret the results presented. As an example of how the Ecometrica Mapping tool can be used in the context of ES/NC information tools, the following application shows the risk to seagrass ecosystem in the Balearic Islands, and allows the user to extract results on the seagrass distribution, the risk drivers and the ES provided by this ecosystem: https://operas-balearicislands.ourecosystem.com.

In summary for task 4.2 and 4.3, the same tool or instrument can serve both information purposes and/or decision support purposes, depending on the user's needs and purpose. For this reason D4.4. and D4.6 were harmonised in submission deadline, structure and content; and submitted as one joint deliverable "Report on new and enhanced Ecosystem Service tools", synthesising the tool and instrument development which was carried out under Task 4.2 and 4.3, and are integral part of oppla Marketplace.
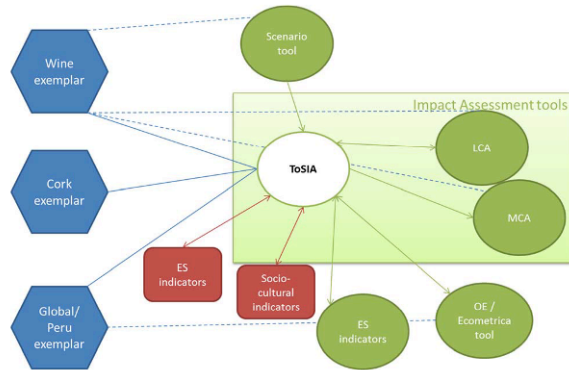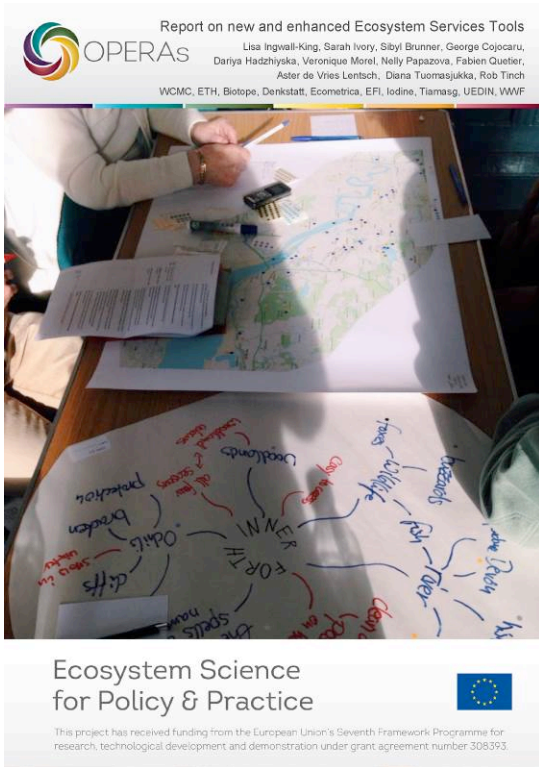
Figure 27: Joint D4.4 and D4.6 deliverable, which describes tools and instruments that have been developed in OPERAs WP4 and submitted to oppla Marketplace. Tasks 4.2 and 4.3 combined efforts and used for each tool/instrument the same schematic (right) to show how/to which other instruments (WP4) and methods (WP3) a specific instrument can be linked, and in which exemplars it was used (WP2). This information is part of oppla (WP5).

## Task 4.3 ES/NC Decision Support Tools (Task lead ETH)

Sub task 4.3.1 Multicriteria decision analysis (EFI, Biotope, ETH, ALU, OBU).  Work in this task has concentrated on integrating and adapting existing MCDA approaches into decision-support tools and testing these tools within heterogeneous decision environments among the Exemplars. The ToSIA framework has  been successfully applied to the cork Exemplar and applications to the wine and REDD+ cases are ongoing. A more user-friendly interface has been designed while work on a new allocation function for material flows and a MCDA-group mode are ongoing.  ETH has applied a novel decision-support tool, BackES in the Swiss Alps Exemplar to infer regional and national policy strategies for matching ES supply and demand and to spatially-explicitly identify areas which deserve special management support as information for ES managers and policy-makers. Two papers have been published recently. New modules have been added to the web version of the mDSS tool by Tiamasg, including pairwise comparison of weights, a sustainability chart and the ordered weighted average method and the tool has been applied in the Lower Danube Exemplar. Work has been presented to the stakeholders in different Exemplars, e.g., to regional policy-makers in a workshop in the Swiss Alps Exemplar or to stakeholders in the Lower Danube Exemplar in a stakeholder meeting in Belene.

Sub task 4.3.2 Cost-Benefit Analyses (IODINE, EFI) The CBA for the Balearic Exemplar is now at an advanced stage and a paper is being prepared for submission to a journal (Iodine, CSIC).

Work on comparison with MCA in the Balearic Exemplar is ongoing, as part of work on the comparison and combination of CBA and MCA techniques (Iodine, EFI). This work focuses on the relative strengths and weaknesses of CBA, MCA and economic impact assessment methods, with assessment of the conditions under which these decision-support methods can be useful individually or in combination. Assessment focuses on the differences in approaches to key features including assumptions about commensurability and comparability of costs and benefits, treatment of future impacts and discounting, treatment of distributional impacts and treatment of uncertainty and sensitivity analysis, with links to the work on valuation methods and accounting tools (WP3). Progress on extending to other cases has been slow due to reduction in staff number at Iodine, however work is in progress and on target for completion before the end of the project. Continuity is ensured by links to Iodine's role in the use of CBA/MCA tools in the ATLAS and MERCES projects, in particular MERCES where seagrass restoration is planned to be one of the case studies for which CBA methods can be applied.

Further, the MCA approach is curently further developed in connection to ToSIA to allow for multi-stakeholder assessments. It will be applied and tested for the cork exemplar, based on the ToSIA Cark case study.

Sub task 4.3.3 Environmental assessments (Biotope, ETH, EFI, DENKSTATT)–

Work to integrate ES/NC representation in impact assessment tools (including sustainability assessments, SEA, and EIA) has proceeded well. Denkstatt has developed a life-cycle based decision-support tool, WeLCa for quantification of impacts on ecosystem services including both a qualitative and quantitative assessment. 20 ecosystem quality indicators, e.g. for soil quality, crop health, or habitat control, have been included and assessed in the Wine Exemplar and step by step guidance is being written in form of a user manual for WeLCa. . Biotope conducted an analysis of how ES/NC could be taken into account in urban development plans, a network of protected areas and environmental impact assessments in the French Alps Exemplar which led to a publication in French, aimed at practitioners and a report on ES in protected area planning by the local government there (French Département of Isère). Subsequently, Biotope developed and tested a decision-support tool for analyzing the effects of various models for implementing mitigation and offsetting of impacts on wetlands in the Exemplar. Preliminary results from this study are available, and a scientific publication in English is being prepared with full results. This is particularly relevant to Strategic Environmental Assessment (SEA), and to ongoing discussions across the EU on options for achieving 'no net loss' of biodiversity and ecosystem services. In relation to this topic, Biotope continued to conduct work on methodologies to assess losses and gains of ES and biodiversity (i.e. metrics for 'no net loss'), e.g. for wetlands, with several publications being prepared. A book is being finalized (with IEEP and other OPERAs partners) on the experience of several EU member states with mitigation and offsetting. Currently the MCA module of ToSIA is being redeveloped to allow for group mode instead of only single-user applications. Furthermore a material flow allocation to user-selected products in ToSIA is developed tested to allow comparisons with LCA-like assessments.

<u>Subtask4.3.4 Scenario and foresight tools</u> (UEDIN, ETH). UEDIN has developed a novel web-based scenario toolbox allowing stakeholders to collaboratively develop scenarios. The planned testing of the scenario toolbox in the wine Exemplar could not be realized as a change in the research team of UEDIN prevented from finalizing the toolbox to be operational enough for the specific case study.

Subtask 4.3.5 In this task, interfaces have been developed that foster the use of decision-support tools and methods to better and more accurately include information on ES/NC into decision-making processes. TIAMASG improved the mDSS desktop decision support software instrument by creating a web interface and translating a first part of the existing mDSS instrument into a web based instrument named mDSSweb (see Subtask 4.3.1.) ETH has tested different versions of a collaborative web-platform with improved visualisation and communication of ES information in the Swiss Alps and finalised recommendations on how to visualise and communicate ES information in different decision contexts. In an eye-tracking study, ETH furthermore investigated how user demands and behaviours differ between ES information users with and without connection to case study region and how this characteristic influenced the cognitive process and therefore decision-making process. Results of these extensive analyses have been published in a PhD thesis in 2016.
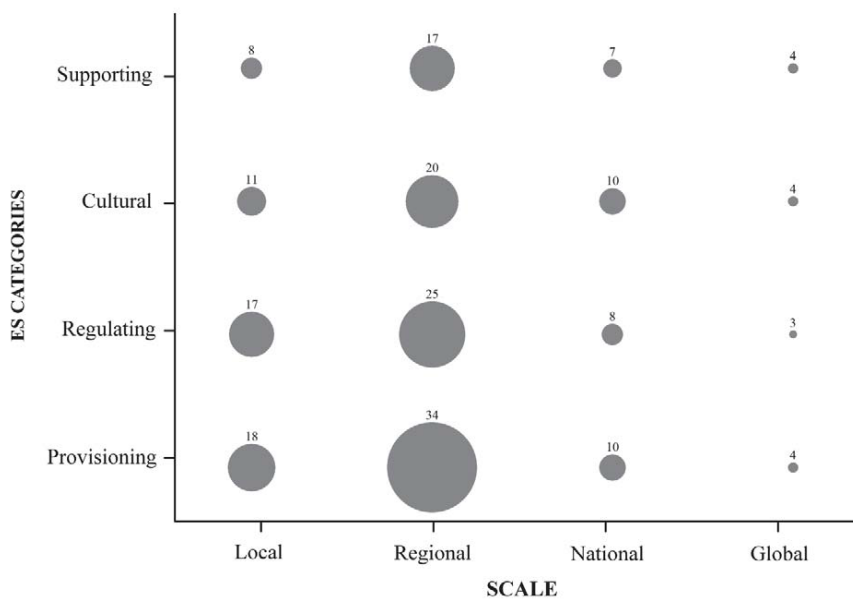


Figure 27: Spatial scales at which the tool could be applied in relation to ES categories. Only tools specifically addressing ES were
considered. from a "Review of decision support tools to operationalize the ecosystem services concept, published by Gret-Regamey et al 2016.

## |Task 4.4 Implementation and uptake of ES/NC concepts (Task lead ULUND)

Subtask 4.4.1 Design and 'success' criteria in implementing NC/ES concepts (ULUND). Work has focused on developing a tool and guidance for helping select and design schemes of implementation that are sensitive to applications context and purpose. The tool takes the form of templates and matrices that provide for aspects of implementation context, design, and performance (outcomes) and the relations between these to be described and explored. The tool has been developed to a level enabling it to be used to support description, analysis and appraisal of past implementations (sub-tasks 4.4.3 – 4.4.5). In the present reporting period it was tested in two OPERAs exemplars, Urban Dunes (Barcelona) and conservation of Seagrass (Mallorca) to suggests ways of developing the exemplar.

Sub-task 4.4.2 Design of analytical methods and protocols to assess implementation (IODINE, ULUND) Substantial advance was made in this sub-task, which has included comprehensive inventorying, review, characterisation, and documentation of available economic assessment tools and methods for the assessment of ecosystem services and the development and application of criteria to appraise the potential of different tools and methods for impact and cost assessment in different implementation contexts e.g. whether tools are open-access, versatile, have a spatial dimension, are able to account for cumulative impacts, etc. Work during the reporting period involved testing implementation-specific modifications and improvements to assessment tools and combinations in the context of the Mediterranean-Balearic and Global exemplars and to support guidance in tool selection and use.

Sub-task 4.4.3 Implementation of market-based approaches (IEEP, IVM, IODINE, EFI, WWF-Bulgaria, ULUND, BIOTOPE, and CIFOR) The tool developed in sub-task 4.4.1 has been used to describe and characterise PES and Offsets as broad types of market-based implementation instruments as well as to analyse and appraise specific PES and Offset implementation projects illustrating implementation contexts of different type and character. Feedback developed from experience with using the tool is being used to improve the tool. Relationships between aspects of context, project design, and project performance were explored during the reporting period and lessons and guidance was developed from meta-analysis of specific implementations of PES projects. Work to develop guidance on Offsets is on-going. Guidance will be refined through the Mediterranean, Alps, and Pan-European exemplars. Results feed into T4.5 and 5.1.

Sub-task 4.4.4 Implementation of approaches based on spatial planning, permitting, and direct investment, including Green Infrastructure (GI): (ULUND, IVM, IEEP, and UCD The tool developed in sub-task 4.4.1 has been used in this period to explore schemes for integrating NC/ES concepts and habitat/biodiversity conservation into physical and spatial planning and decision making and development design and control. The focus during the reporting period has been on Habitat/Biodiversity Offsetting, Green Infrastructure and a specific case of Marine Spatial Planning.

There is synergy with 4.4.3, since 4.4.4 explores the integration of a no-net-loss principle into physical and spatial planning, permitting, and project funding.  Results feed into T4.5 and 5.1.

Sub-task 4.4.5 Implementations in Green Business and Finance (Denkstatt, WCMC, IODINE, WWF-Bulgaria, ULUND, EFI).  The tool developed in 4.4.1 has been used to characterise implementations of the NC/ES concepts in a suite of related instruments and schemes, including standards, certificates, labels, reporting, and disclosure, and to analyse and appraise the take-up status of the concepts in specific schemes across diverse contexts and sectors: agriculture, livestock, forestry products, bio-fuels, fisheries, extractives. During this reporting period attention focused on the integration of habitat/biodiversity into standards and on factors driving and influencing the use made and contributions of these instruments. Results feed into T4.5 and 5.1.

## Task 4.5 Guidance on Choice and Application of Instruments (Task lead: EFI)

Sub task 4.5.1 Coordinating Instruments Development (EFI, ULUND) - ES/NC tools and instruments that fit the demands from policy making and practice while incorporating the latest scientific methods and approaches were/are developed and improved both in cooperation within WP4- and accross-WP2-5 cooperation. All results are submitted to WP5 oppla and feature on the Marketplace. This task facilitates the interaction between WPs by (i) organising and participating in dedicated break-out sessions during project meetings and in having an ongoing exchange, (ii) by working in cross-WP task groups and individual connections between exemplars, knowledge and instruments, (iii) by working in a cross project (OPERAS-OPENness) working group on harmonising guidance and filters to link between WP and between decision tree elements. For that purpose regular online and physical meetings, and information exchange has been taking place, to ensure that at the end of the project, the developed tools and instruments are continuously and will further be made available through Oppla (T5.1). To date 19 instruemtns and tools are accessible at oppla Marketplace (www.oppla.eu/marketplace). This cooperation lead to the development of a Bayesian-Believe-Network (BBN) which includes all submitted OPERAs and OPENness instruments (prototype by Hugin: openness.hugin.com/oppla/ValuationSelection; WP4 content by WP4 partners) and which will be integrated into oppla. EFI and UEDIN also gave feedput to OPENness' EAST to enable a connection to OPERAs instrument (WP4) and knowledge (WP3) content. The BBN and WP4 instruments in oppla (Task 4.5.2) and guidance (Task 4.5.3) were presented to the Userboard as well as the ESP Conference in Antwerp (Sept 2016) in a dedicated session hosted by EFI and UEDIN for OPERAs and CEH and SYKE for OPENness.

Sub task 4.5.2 Synthesizing operational potentials (EFI, IEEP, ULUND, WCMC, denkstatt, UEDIN, ecometrica, ETH) - This task connects the demand for operational ES/NC instruments from T4.1 with the insights from the development of the broad range of tools and instruments in T4.2-4 and combines them in a synthesis of the operational potential of improved existing and innovative new instruments. The tools and instruments were presented both in generic categories (decision tree that can be run bottom-up and top-down; describing timing and links between instruments) as well as in clusters for different types of end-uses (WP4 instruments and tools are part of a BBN which categorises and filters all instruments in oppla; see T4.5.3). Road maps for action were developed for different policy fields in D4.2, for example the EU 2020 biodiversity strategy or the EU resource efficiency flag ship initiative, acknowledging the interaction, coherence, and conflicts among these addressed policy fields. Network analysis of operational potentials with regard to policy fields and related actors ensures transparency and comprehensibility of the synthesis approach (see T4.4; MS50).

The final deliverable collecting experiences form OPERAs tool and instrument development with particular focus on stakeholder involvement is D4.3. As it is the overarching experience of WP4 on

a higher resolution level, it was changed in timing to be the last deliverable and thus to build on task 4.1 to 4.5's synthesising deliverables. It also received input on its concept from the last userboard. This report is the synthesis deliverable of WP4 and thus brings together the overarching message of experiences and results of the joint WP4 Instruments work. It is aimed at persons who develop – or consider funding the development of – ES and NC instruments. The aim is to ensure that lessons learned under the OPERAs project are taken into consideration in future tool instrument development.

The report describes the four stages in the development and uptake of tools and instruments. It discusses work completed under the OPERAs project, and lessons learnt. To illustrate the theory, four examples from the OPERAs project are provided as Factsheets at the end, which describes how the different exemplar has used and combined different tools to maximise the impact of their research and to ensure integration of ES into the decision-making arena and takes policy perspective, information perspective, decision making and implementation perspective for each exemplar application factsheet.





Figure 28: WP4's lessons learnt on tool and instrument development: D4.3 Synthesis report on the operational potential of ES/NC instruments come along with a set of key messages.

Sub task 4.5.3 Recommendations and good practice guidelines (EFI, ULUND, IEEP, ETH, WCMC, PU, ALU, OBU) - Recommendations for the choice of instruments have been developed and submitted with the instruments/tools to oppla: filters and user-firendly guidance in oppla to guide users in selecting instruments, as well as attractive short descriptions and factsheet like posterst for instrumetns and tools in oppla have been developed, complete with metadata on resources needed to run tools and information on handbooks/manuals to run the selected instruments/tools).

Detailed good practice guidelines and training materials for the application of alternative tools and instruments were developed in T4.2-4.4 for each tool. Outcomes from the uptake analysis of T4.4 are synthesized and integrated by performing a meta-analysis that accounts for feedbacks from experiments in the Exemplars (T2.2), the meta-analysis (T2.1) and the synthesis of the Exemplars (T2.3) to propose generic and context-specific guidance for the design of effective implementation and uptake schemes for market creation and support based on existing, improved and new instrument combinations (D4.7, under development). A first application of this concept is included in D4.3 (Synthesis) at the factsheet 3 on the Implementation case – Barcelona costal management. New and improved instrumetns and instrument combinations are described in D4.4/4.6 for each instrument/tool, in D4.3 in application examples, and in D4.7 as part of the good guidance recommendations.

Good practice guidelines and recommendations was achieved in close cooperation with T5.1, where oppla functionality and structure were designed and with T2.3 where a lessons-learned database is compiled based on the results of the Exemplars. All user guidance decisions was extensively discussed in a cross-WP-and cross-project task force. Results of T2.1 and T4.1 were used to identify information needs for different stakeholder types, and helped identify tailoring needs with respect to a diversity of use and implementation. To date 19 tools and instruments have been described as factsheets, with metadata and categories for Oppla guidance tree, with 18 tools being already included in the Oppla test version.

A summary of WP4's user-friendly guidance was described in D4.7 Good practice guidelines for instrument choice and tutorials for instrument application. It addresses new and experienced users of Oppla, and builds on the question "What types of guidance do users need?" in a four-fold approach:

a. What is out there? Guidance to the tool: Overview of tools and help in selecting a suitable tool

b. What is it, what does it do or not do? Guidance about the tool: Metadata on the tool

c. How does it work? Guidance on the tool: Handbooks, manual, online help, interactive pdfs, etc.

d. Where has it been used? Guidance on use cases: Link to Exemplars and earlier case studies, link to other tools and methods



Figure 29: D4.7 Good practice guidelines for instrument choice and tutorials for instrument application describes in a report how userfriendliness was implemented in oppla Marketplace to guide users to an instrument, give guidance on and about an instrument (i.e. metadata plus where it has been used), as well as which forms guidance on instrumetn application took (maunals, webinars, etc).

These concepts were presented at the ESP Conference in Antwerp in a dedicated session C8 which was organised jointly by OPERAs Synthesis (WP4 and WP1; EFI + UEDIN) and OPENness.

Any particular issues relevant to each task/subtask

To date 19 tools and instruments have been described with short descriptions, factsheets, SWOT analysism attractive factsheet poster and 18 of those integrated into the Oppla-system. For each tool or instrument guidance for using the tool has been or is being developed. Depending on the tool that aid function is a manual, interactive pdf, online user aid or other tooltips.

All these tools and instruments in oppla are also integrated in the userfriendly BBN, which will be integrated into oppla (test version here: openness.hugin.com/oppla/ValuationSelection). User-friendliness is the main guiding principle on WP4 tools and instrument development.

All but one WP4 deliverable have been delivered which synthesis the resutls of the tasks: D4.2 for T4.1, D4.4/4.6 for T4.2 and T4.3, D4.5 for T4.5; and D4.3 for all of WP4. D4.7 (for T4.4) exists as a draft and is currently being finalised.

## 2.4.3 Deviations

**D4.2** A report on lessons learned and recommendations for taking account ES/NC in key policy instruments was submitted this reporting period (as informed in the previous reporting). The delay was partly due to delayed submission of inputs by partners, partly due to the decision to ensure that all relevant material was available for the development of an output that could be immediately operationalised in a form of a guidance. This deliverable has now been finalised and submitted (see Task 4.1 above).

**D4.7** The report is delayed owing to changes in the personnel contributing to the task and personal circumstances of the task coordinator, but these did not affect the task feeding into synthesis report D4.3 and only affect submission of the deliverable D4.7. A submission delay of 3 months is requested.

**D4.3**: The Synthesis deliverable D4.3 was changed in timing from month 47 to 52 to be the last deliverable after all contributing deliverables have been submitted. Deliverable submitted in time.

**D4.4** and **D4.6** report on information tools and decision support tools. Both deliverables were harmonised in time and reporting format as all tool development and use related information was submitted to oppla, and thus a joint reporting came natural. Deliverable submitted in time.

## 2.4.4 Use of resources

See Table  – Work Package Person Months per Partner[33]

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[33]

# 2.5 WP5: Resource Hub

## 2.5.1 Task Objectives

Task 5.1 – Resource Hub development

1. To identify communities of practice and user needs (T5.1.1)

2. To design the structure of the Resource Hub (T5.1.2)

3. To construct the Resource Hub (T5.1.3)

4. To ensure maintenance and perennity of the Resource Hub (T5.1.4)

Task 5.2 – Stakeholder engagement and facilitation

1. To develop a stakeholder analysis and engagement plan (T5.2.1)

2. To set-up and manage the OPERAs UserBoard (T5.2.2)

3. To facilitate stakeholder engagement in selected exemplars (T5.2.3)

4. To monitor stakeholder engagement (T5.2.4)

## 2.5.2 Progress towards objectives

### Task 5.1 - Resource Hub development

This task is carried out in collaboration with OpenNESS.

Subtask 5.2.1 To identify communities of practice and user needs. Addressing user needs associated with Oppla is an ongoing process, associated with the User Board workshops (see task 5.2.2). During the last User Board workshop, Communities of Practice was comprehensively discussed as well as in the OPERAs consortium meeting in November 2015. During these meetings participants discussed issues around what kinds of communities of practice would they join, what scale and what theme etc. Feedback has been gathered and will be examined in the next Strategic Working Group meeting for Oppla in January 2016 to discuss a plan for developing communities of practice for Oppla.

Market research associated with Oppla will be carried out in 2016 by a Master Student from the University of Cambridge in conjunction with WCMC.

Subtask 5.1.2 To design the structure of the Resource Hub. During the visionary development of the website three sequential design steps were followed:

1. *Sketch screens* – on paper and white board to analyse how to structure what content and with what layout to display it. Screen sketching includes determining the responsive logic within a single screen as well as the relationship between screens.
2. *Wire frame* the sketches to find out how the designs fit the actual screen sizes (e.g. in pixels on different platforms).
3. Include *aesthetics* like colours, fonts, imagery which highly impact how a website is experienced.

Further information including wireframes are set out in Milestones 5.1 and 5.3.

Subtask 5.1.3 To construct the Resource Hub. Oppla was launched in September 2016 at the European Ecosystem Services Conference in Antwerp. Oppla is now fully operational including an upgrade of the platform which Oppla sits (e.g. move Drupal) including a substantial increase in content as well as in the size of the community. The development of Oppla is set out in a suite of deliverables, which provided regular updates. All the deliverables under this sub task have now been completed. Furthermore a version of Oppla has been developed for IPBES for the Catalogue of Policy Support Tools and Methdologies.

Subtask 5.1.4 To ensure the maintenance and perennity of the Resource Hub. A business plan has been developed and submitted in May 2017. These plans take into consideration the governance issues as well, The Oppla EEIG has now been formally established and an independent business and is taking forward these plans. All deliverables under this sub task are completed.

## Task 5.2 – Stakeholder engagement and facilitation

Sub-task 5.2.1 Stakeholder analysis and engagement plan: completed during last reporting period

Sub-task 5.2.2: Setting up and managing the OPERAs UserBoard: During this reporting period the OPERAs UserBoard was further expanded and physically met two more times: 6-7 November 2014 in Lisbon and 25-26 November 2015 in Edinburgh. Both meetings were strongly linked to the work in OPERAs exemplars, the Portuguese Montado exemplar and the Scottish exemplar, allowing for a direct translation from theoretical knowledge to practical application.

The second workshop gathered 17 UserBoard members, of which 9 have attended the first workshop in Brussels. Whereas the first UserBoard workshop in 2013 was used to identify stakeholder's needs for operationalizing ES/NC in their work, the aim of the second UserBoard meeting was to assess and give feedback on the progress registered by the OPERAs work packages and to see how the identified needs were being covered by OPERAs in the knowledge, instruments and practices under development.

The third workshop gathered 17 Userboard members, of which 6 had attended both previous workshops (3 on individual, 3 on organisational level) and 3 had attended either the first or second workshop. Building on the previous two workshops and the progress in the project, it was decided that the third workshop should focus on the detailed feedback to three selected OPERAs tools and products as well as the development of the OPPLA platform.

In both workshops all relevant stakeholder groups were covered (government, civil society, business, research and policy-making) and both workshop managed to bring in some representative from the exemplars, although improvement on this aspect is envisioned for the final workshop. The UserBoard members positively highlighted the wealth of different perspectives represented by the attending stakeholders, and encouraged the participation of additional representatives from other business sectors, as well as land owners. They appreciated the opportunity to reach across and outside one's usual professional network, and particularly stress the practical value of the field trips to the exemplars. In additional, participants favourable assessed the structure of the meeting, which provided enough time and space for opinion sharing, and the high quality organisation and facilitation of the meetings. They particularly appreciated the constant engagement with stakeholder in this ambitious project and (again) expressed their willingness to participate in subject-specific engagement with the project team in between the annual UserBoard meetings.

The last physical UserBoard workshop will be held in October/November 2016.

In addition to the physical UserBoard workshops, the project has also set-up an online UserBoard platform, which provides access to documents and discussion forums to all members. Moreover, This reporting period saw the first online engagement activities in form of a webinar on ecosystem databases (9 June 2015) and a survey on needs and wants of stakeholders regarding guidance on ecosystem services (open from 29 May to 12 June 2015). More of the online engagement is planned for the next reporting period.

Sub-task 5.2.3 Facilitation of stakeholder engagement in selected exemplars: Based on the needs assessment done with the exemplar leaders during the first reporting period, the second 18 months were used to work more concretely with a large number of the exemplars. In detail the engagement looked as follows:

- Co-design and facilitation of one scenario workshop in the French Alps exemplar (data)
- Design and implementation of stakeholder workshop on cultural ecosystem services in Fingal County, Ireland (22 October 2014)
- Design, facilitation and organisation of European level stakeholder workshop on No-net loss in Montpellier, France (7 August 2015)

- Assistance in the set-up and design of four workshop in the Scottish exemplar, including the co-facilitation of one workshop (10 October 2015)

Furthermore ad-hoc advice was given to the global and the wine exemplar.

Sub-task 5.2.4 Monitoring and corrective action for stakeholder engagement: Based on the developed plan for the monitoring of stakeholder engagement activities in OPERAs, a total of stakeholder events have been evaluated:

- 1st UserBoard workshop (17 respondents)
- Stakeholder workshop in Fingal county, Ireland (9 respondents)
- 2nd UserBoard workshop (16 respondents)
- Stakeholder workshop on No-net loss (13 respondents)
- Stakeholder workshop in French Alps exemplar (4 respondents)
- Stakeholder workshop in Scottish exemplar (6 respondents)
- 3rd UserBoard workshop (16 respondents)

Each of these events was evaluated with the help of a written (online) questionnaire that consisted of 6 standard questions, plus – if desired – additional questions specific to the individual workshop. Overall, the evaluations have been very positive and stakeholders have expressed their content with the way the interactions were designed and how their input has been taken up. Many stakeholders recognise the challenge of operationalizing ecosystem services and natural capital and are unclear, if OPERAs will achieve this goal. As a corrective action this point has been brought to the attention of the Project Management Team and measures are taken to adapt activities and events towards achieving a better and more visible integration between science and practice.

## 2.5.3 Deviations

Not for T5.2

## 2.5.4 Use of resources

See Table – Work Package Person Months per Partner

# 2.6 WP6: Outreach & Dissemination

## 2.6.1 Task Objectives

**Task 6.1 – Constituency building, outreach and project dissemination**

1. To disseminate project outcomes to science, policy and practice (T6.1.1)
2. To reach out and build stakeholder constituencies around OPERAs (T6.1.2)
3. To organise and OPERAs summer school (T6.1.3)
4. To organise an OPERAs peer-to-peer exchange conference (T6.1.4)

## 2.6.2 Progress towards objectives

Over the third reporting period WP6 has focused on implementing the dissemination plan (D6.1). In addition to academic dissemination at conferences and in journal articles, emphasis was placed on developing a social-media presence on Twitter, and communicating activities through videos on the OPERAs website (including D6.2). Constituency building activities are now focused around Oppla, the joint resource hub developed in collaboration with the OpenNESS project. Oppla branding and Oppla policy brief (D6.3) has been used to explain our ambitions to a wide audience.

The OPERAs project has dissemination and outreach written into the project design, throughout the work packages. The WP6 activities cannot be seen in isolation from activities in other work packages, particularly WP4 (Instruments) and WP5 (Resource Hub), and the overarching OPERAs research design. Specific examples of the latter include the extensive stakeholder engagement in WP2 (Practice) and WP5. As such there were few meeting or activities that can be solely attributed to WP6, although clearly there has been a lot of dissemination. The work completed by WP6 in this reporting period has been driven by the aims identified in the Dissemination Strategy and Plan (D6.1):

- To connect with target audiences
- To promote OPERAs and establish an Ecosystem Services Community
- To disseminate project results to the scientific community
- To promote the resource hub
- To commence organisation of an OPERAs summer school
- To commence organisation of an OPERAs conference

## Task 6.1 – Constituency building, outreach and project dissemination

Sub-task 6.1.1 Project dissemination: After 3 years the OPERAs website is currently under-going a refresh, changing the emphasis form explaining the project ambitions to communicating results. To

appeal to as wide a group as possible, the website incorporates various different media types, including videos, blogs, twitter and standard text. Considerable effort was placed in developing films that explain core concepts of ecosystem services concept and its benefits, to describe the work in the exemplars, and to introduce Oppla. As well as these, all flash talks, debates and conferences that have been held in relation to OPERAs have been filmed and archived on the OPERAs youtube channel.
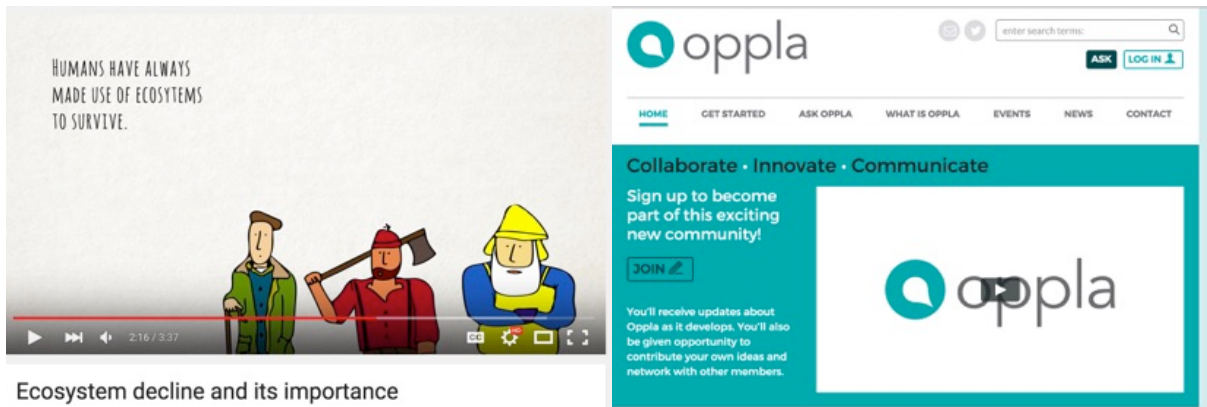


Figure 30. Exmaples of two videos produced to explain the ecosystem services concept and to introduce Oppla.

Priority for the remainder of the project will be to increase dissemination of project outcomes as they become available. We have started including popular summaries of OPERAs deliverables on the website, which are also promoted through social media. We also plan to adapt the internal project newsletter for external circulation.

Sub-task 6.1.2 Outreach and constituency building: As described in section 2.5, OPERAs collaborates closely with OpenNESS on developing the Resource Hub Oppla. As part of this activity target audiences have been identified and future joint activities (including those described below and under WP5) will target these groups. Support in establishing the Ecosystem Services Community Scotland provided some first insights.

The social media strategy has been streamlined to focus on frequent project videos, written articles (blogs). Twitter has proved to be the most successful social media platform, and is used successfully to communicate web-content and project activity in general. Our followers have grown from <300 in July 2014 to about 2000 in January 2016. Section 4.6 provides a detailed overview of specific dissemination activities.

Currently plans are in development to start a series of bi-monthly webinars explaining key research outcomes in an accessible format to a wide range of audiences. These webinars are likely to be hosted on Oppla to help built its community, and will focus on OPERAs contribution to Oppla (i.e. tools and instruments) as well as increasing understanding of a number of key methodologies.

<u>Sub-task 6.1.3 OPERAs summer school</u>: Rather than organising a single OPERAs summer school agreement has been reached that both OPERAs and OpenNESS will contribute to the existing Alter-NET summer schools throughout the project. Summer school towards the end of OPERAs would have a greater focus on OPERAs results. OPERAs contributions to the 2016 summer school are currently being discussed, and OPERAs PhD students have been encouraged to attend this event.

<u>Sub-task 6.1.4 OPERAs conference</u>: In consultation with OpenNESS and the Ecosystem Services Partnership we agreed to jointly organise the first European Ecosystem Services Conference in September 2016 ([http://www.esconference2016.eu)](http://www.esconference2016.eu). Although this earlier than our originally envisaged conference, we realised greater impact would be had by a single event. We're still considering whether OPERAs should organise some final event focusing specifically on the project's results, or whether efforts are better places promoting Oppla.

## 2.6.3 Deviations

The main deviations result form greater collaboration with the OpenNESS project in the summer school and conference organisation. This has meant that greater resource could now be given to the promotion of Oppla and the development of its constituency. It has also enabled the planned webinar series.

## 2.6.4 Use of resources

See Table 7 – Work Package Person Months per Partner

## 2. Deliverables and Milestones

Table 5 Project Deliverables in this period

| Del. no. | Deliverable name | Version | WP no. | Lead beneficiary | Nature | Dissemination level[34] | Delivery date from Annex I (project month) | Actual / Forecast delivery date Dd/mm/yyyy | Status | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| 1.5 | Updated research implementation plan | | WP1 | UEDIN | Report | PU | 31/05/17 | 31/06/17 | | |
| 2.3 | Compilation of the reporting of all exemplars for further evaluation and synthesis | | WP2 | LUND | Report | PU | 31/03/17 | 03/03/17 | submitted | |
| 2.4 | Targeted synthesis: lessons-learned from the meta-analysis and the exempalrs | | WP2 | UEDIN | Report | PU | 31/05/17 | 30/11/17 | delayed | |

| 2.5 | Suite of decision trees to assist users to decide on ES/NC based insgturments and tools | | WP2 | UEDIN | Report | PU | 31/05/17 | 31/6/17 | | |
|-----|---|---|-----|-------|--------|----|----------|----------|-----------|---|
| 3.7 | Synthesis, documentation and user guidance for new methods and the decision trees | | WP3 | Stichting | Report | PU | 30/11/17 | Draft submitted | | Final updated version due in Summer 2017 |
| 4.2 | A report on lessons learned and recommendations for taking account ES/NC in key policy insturments | | WP4 | IEEP | Report | PU | 30/11/15 | Received April 2017 | submitted | |
| 4.3 | Synthesis report documenting the operation potential of ES/NC instruments | | WP4 | EFI | Report | PU | 31/03/17 | Received 20/3/17 | submitted | |
| 4.4 | New and enhanced existing data capture, indicator-based, and information tools incl. documentation | | WP4 | WCMC LBG | Report | PU | 30/11/2016 | submitted 1.12.2016 | | D4.4 was submitted as a joint deliverable with D4.6. Format is a report, documenting what has been submitted to the oppla prototype |

| 4.6 | | New and improved decision support tools and methods, linked with a user interface | | WP4 | ETH | Prototype/Report | | | 31/10/2016 | submitted 1.12.2016 | | D4.6 was submitted as a joint deliverable with D4.4. Format is a report, documenting what has been submitted to the oppla prototype |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4.5 | | Good practice guidelines for instrument choice and tutorials for instrument application | | WP4 | EFI | Report | PU | | 30/11/2016 | submitted 08.11.2016; after internal review 1.12.2016 | | |
| 4.7 | | Management information tools and manuals for concept mainstreaming in three arenas | | WP4 | LUND | Other | PU | | 31/03/17  extended to 31/6/17 | 31/06/17  delayed until 30/9/17 | | |
| 5.3 | | Secojd version of the scoping document | | WP5 | WCMC | Report | PP | | 29/02/16 | 10/03/16 | submitted | |
| 5.4 | | A prototype of the common platform | | WP5 | TIAMASG | Prototype | PU | | 30/9/16 | 30/9/16 | submitted | |

| 5.5 | Third version of the Scoping report | | WP5 | WCMC | Report | PP | 28/02/17 | 21/03/17 | submitted | |
|-----|---|---|-----|------|--------|----|----------|----------|-----------|---|
| 5.6 | Business plan to ensure perennity | | WP5 | WCMC | Report | PU | 31/05/17 | 19/05/17 | submitted | |
| 6.4 | Short films describing resource hub and instruments | | WP6 | WCMC | Other | PU | 31/01/17 | 23/6/17 | submitted | |
| 6.5 | Summer school for post graduate researchers | | WP6 | CNRS | Other | PU | 31/05/17 | 26/6/17 | submitted | |

## Milestones in the third reporting period

The new numbering from the OPERAs DoW List of Milestones has been used in the table below.  The system does not allow for decimal points so all milestones had to be renumbered and will appear within an updated DoW as per first column.  **The working number given to each milestone is within the title.**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | Table 6 Project Milestones in this period | | | | |
| **Milestone no.** | **Milestone name** | **Work package no** | **Lead beneficiary** | **Delivery date  from Annex I** | **Achieved Yes/No** | **Actual / Forecast achievement** | **Comments** |
| MS7 (MS1.7) | 6<sup>th</sup> Consortium Assembly to evaluate progress | 1 | UEDIN | 42 | yes | 14-16<sup>TH</sup> JUNE 2016 | |
| MS8 (MS1.8) | 7<sup>th</sup> Consortium Assembly to evaluate progress | 1 | UEDIN | 50 | yes | 15-19 MAY 2017 | |
| MS22 (S2.14) | Evaluation of processes in each exemplar with potential adaptation to the work plan | 2 | ULUND | 38 | YES | JAN 2016 – | |
| MS23 (MS2.15) | Final decision trees for selecting instruments for mainataining and protecting ES/NC | 2 | UEDIN | 38 | YES | May 2017 | |
| MS25 (MS2.17) | Report of the Fourth Blue Print | 2 | UEDIN | 47 | Delayed | Nov 2017 | |
| MS26 (MS2.18) | Contributions to the Resource Hub | 2 | UEDIN | 50 | YES | May 2017 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| MS27(MS2.19) | Final Operas Exemplar conference | 2 | ULUND | 50 | YES | JUNE 2016 SEPT 2016 | |
| MS40 (MS3.13) | Framework for model-based quantification of ES and their uncertainty | 3 | CNRS | 36 | Yes | June 2016 | |
| MS41 (MS3.14) | First test of the portfolio of ideal types in some exemplars | 3 | ETH | 36 | Yes | Nov 2015 | |
| MS42 (MS3.15) | Discussion paper: trade of analysis performed for at least 3 different exemplar | 3 | CNRS | 36 | Yes | Nov 2015 | |
| MS43 (MS3.16) | MS3.16Synthesis workshop for documentation & user guidance for new methods & the decision trees(T3.5 | 3 | KIT | 37 | Yes | March 2016 | |
| MS44 (MS3.17) | Expanded meta-analysis database made available to Resource Hub under restricted Access(T3.3) | 3 | VU | 48 | Delayed | September 2017 | |
| MS45(MS3.18) | Provide knowledge on the governance typology with guidelines to the resource hub(T3.4) | 3 | |ULUND | 50 | Yes | Dec 2016 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| MS46(MS3.19) | publication: use of governance typology to assess existing EU/other policies for harnesing ES | 3 | ULUND | 54 | Delayed to Sept 2017 | |
| MS66 (MS4.14) | Updated report on testing of information tools for ES/NC data capture storage, resentation | 4 | WCMC | 38 | yes | Nov 2016 |
| MS67(MS4.16) | Trialling new and enhanced data capture, indicator-based, and information tools within exemplars | 4 | WCMC | 36 | yes | Nov 2016 |
| MS68(MS4.17) | Interim analyses of implementation designs in the three arenas | 4 | ULUND | 42 | Delayed to Sept 2017 | |
| MS72 (MS5.4) | Userboard meeting | 5 | PROSPEX | 36 | yes | Nov 2015 |
| MS73(MS5.5) | Userboard meeting | 5 | PROSPEX | 48 | yes | Nov 2016 |
| MS79 (MS6.6) | Updated outreach plan, with planning for summer school and final conference | 6 | UEDIN | 40 | yes | Oct 16 |
| | | | | | | |
| | | | | | | |

# 3. Project Management

## 4.1 Consortium management Tasks and Objectives

Central management within the OPERAs project is undertaken by the Daily Management Team (DMT) based at the University of Edinburgh (which includes the Coordinator, the Deputy Coordinator and the Project Manager).

The Project Management Team (PMT) supports the Coordinator in fulfilling obligations towards the Commission and has overall responsibility for liaison between the project partners, for analysing and approving the results and for proper administration of the project. Management of the different components of the project rests with the co-leaders of each work package, who are responsible for the WP deliverables. Along with the PMT, they ensure that the WPs are effectively integrated and eliminate any duplication of effort.

The consortium management tasks of the DMT and PMT in the first reporting period of the project are summarised below

- Overall administrative, legal and financial management of the OPERAs project, including administering the 36-month period payment from the European Commission regarding its allocation between partners in accordance with the grant agreement without unjustified delay.

- Organising two project meetings

- Writing up minutes and actions for all project meetings and circulating them to all partners.

- Attending WP meetings as necessary to promote integration across WPs

- Collaboration with our sister project OpenNESS including the development of OPPLA

- Attending meetings with representatives from the different Commission policy DGs and relevant external organisations

Table 5.2 Details of Project Meetings: physical, skype/telecon

| WP | Meeting | Date | Location | Attendees |
|---|---|---|---|---|
| WP1 | PMT teleconference | | | PMT members |
| | PMT Physical meeting | | | PMT members |
| | PMT Physical meeting | | | PMT members |
| | Full Consortium meeting | | | Consortium |
| | PMT Physical meeting | | | PMT members |
| | Full Consortium meeting | | | Consortium |
| | | | | |
| WP2 | WP2 Task Leads Meeting: monthly check-in, reporting update, report back from Userboard meeting | 17 December 2015 | Skype | UP: Ariane Walz<br>ULUND: Heather Schoonover<br>UEDIN: Genevieve Patenaude, James Paterson, Meriwether Wilson<br>UBO: Heera Lee<br>ALU: Anne Mupepele |
| | WP2 Task Leads Meeting: monthly check-in, exemplar conference discussion, milestone update | 18 January 2016 | Skype | UP: Ariane Walz, Jennifer Schultz<br>ULUND: Kim Nicholas, Heather Schoonover<br>UEDIN: James Paterson, Meriwether Wilson<br>UBO: Heera Lee<br>ALU: Anne Mupepele<br>UFZ: Stefan Schmidt |
| | WP2 Task Leads Meeting: monthly check-in, exemplar conference discussion, planning for Antwerp, Blueprint update | 16 February 2016 | Skype | UP: Ariane Walz, Jennifer Schultz<br>ULUND: Kim Nicholas, Heather Schoonover<br>UEDIN: James Paterson, Meriwether Wilson<br>UBO: Heera Lee, Sven Lautenbach<br>ALU: Anne Mupepele |

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|---|---|---|---|---|
| | WP2 Task Leads Meeting: monthly check-in, planning for Antwerp, deliverables updates | 21 March 2016 | Skype | UP: Ariane Walz<br>ULUND: Kim Nicholas, Heather Schoonover<br>UEDIN: Marc Metzger, Meriwether Wilson<br>UBO: Heera Lee, Sven Lautenbach<br>ALU: Anne Mupepele |
| | WP2 Task Leads Meeting: monthly check-in, planning for Barcelona | 26 April 2016 | Skype | UP: Ariane Walz<br>ULUND: Heather Schoonover<br>UEDIN: Marc Metzger<br>UBO: Heera Lee, Sven Lautenbach |
| | WP2 Task Leads Meeting: monthly check-in, final planning for Barcelona | 07 June 2016 | Skype | UP: Ariane Walz<br>ULUND: Kim Nicholas, Heather Schoonover<br>UEDIN: Meriwether Wilson |
| | WP2 Task Leads Meeting + Exemplars: monthly check-in, updates and synthesis planning | 14 June 2016 | Barcelona, Spain | UP: Ariane Walz<br>ULUND: Kim Nicholas, Heather Schoonover<br>UEDIN: Marc Metzger, Meriwether Wilson, Mark Rounsevell, Anja Liski, Tomaso Locatelli<br>UBO: Heera Lee, Sven Lautenbach<br>VU-IVM: J Peter Verburg, Astrid van Teefelen<br>SGM: Jose Lascurain<br>CSIC: Nuria Marba<br>FFCUL: Ines Rosario<br>WCMC: Claire Brown<br>PROSPEX: Marc Granbetter |
| | WP2 Task Leads Meeting: monthly check-in, planning for Userboard meeting | 24 October 2016 | Skype | UP: Ariane Walz<br>ULUND: Kim Nicholas, Heather Schoonover<br>UEDIN: Marc Metzger<br>UFZ: Stefan Schmidt |
| | WP2 Task Leads Meeting: monthly check-in, report back from Userboard | 02 December 2016 | Skype | UP: Ariane Walz<br>ULUND: Heather Schoonover |

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|---|---|---|---|---|
| | meeting | | | UEDIN: Meriwether Wilson |
| | WP2 Task Leads Meeting: monthly check-in, deliverables updates, planning for Sofia | 29 March 2017 | Skype | UP: Ariane Walz<br>ULUND: Heather Schoonover, Kim Nicholas<br>UEDIN: Genevieve Patenaude, Meriwether Wilson<br>UBO: Sven Lautenbach<br>UFZ: Stefan Schmidt |
| | WP2 Task Leads Meeting: monthly check-in, deliverables updates, planning for Sofia | 20 April 2017 | Skype | UP: Ariane Walz<br>ULUND: Heather Schoonover<br>UEDIN: Genevieve Patenaude<br>UBO: Sven Lautenbach |
| | Exemplar Leads Meeting: feedback on reporting, stakeholder paper updates, report-out from Userboard meeting, upcoming milestones, tour de table | 15 December 2015 | Skype | ULUND: Heather Schoonover<br>UP: Ariane Walz, Rene Sachse<br>UCD: Deidre Joyce<br>SGM: Jose Lascurain<br>WWF: Raina Popova, Apostal Dyankov<br>CSIC: Nuria Marba<br>CNRS:  Ana Paula Garcia Nieto<br>IODINE: Rob Tinch, Cindy Schoumacher |
| | Exemplar Leads Meeting; report-out on milestone submission, possible exemplar conference, ESP Antwerp conference participation, stakeholder paper authorship and plan, tour de table | 02 February 2016 | Skype | ULUND: Kim Nicholas, Heather Schoonover<br>UP: Ariane Walz, Jennifer Schulz<br>UEDIN: Marc Metzger<br>UCD: Deidre Joyce<br>SGM: Jose Lascurain<br>WWF: Raina Popova<br>CNRS: Ana Paula Garcia Nieto, Alberte Bondeau<br>FFCUL: Ines Rosario |
| | Exemplar Leads Meeting: sharing of planned presentation topics for Barcelona Consortium, plan for | 23 May 2016 | Skype | ULUND: Kim Nicholas, Heather Schoonover<br>UP: Ariane Walz<br>SGM: Jose Lascurain |

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|---|---|---|---|
| Barcelona WP2 meeting, stakeholder paper update | | | CSIC: Ana Ruiz<br>CNRS:  Wolfgang Cramer<br>FFCUL: Ines Rosario<br>ETH: Sibyl Brunner |
| Exemplar Leads Meeting: updates on upcoming milestones and deliverables, ESP Antwerp conference updates, exemplar deliverable brainstorming and planning | 13 June 2016 | Barcelona, Spain | ULUND: Kim Nicholas, Heather Schoonover<br>UP: Ariane Walz<br>UEDIN: Marc Metzger, Meriwether Wilson, Anja Liski, Mark Rounsevell, Tommaso Locatelli<br>SGM: Jose Lascurain<br>CSIC: Nuria Marba<br>FFCUL: Ines Rosario |
| Exemplar Leads Meeting: exemplar deliverable topics selection, working group formation, scoping plans | 05 July 2016 | Skype | ULUND: Kim Nicholas<br>UP: Ariane Walz<br>UEDIN: Aster deVries Lentsch<br>UCD: Deirdre Joyce<br>SGM: Jose Lascurain<br>WWF: Apostol Dyankov, Raina Popova<br>CSIC: Nuria Marba<br>VU-IVM: Astrid van Teeffelen<br>FFCUL: Ines Rosario<br>ETH: Sibyl Brunner |
| Exemplar Leads Meeting: exemplar deliverable working group leads and members confirmation, deliverable working group status updates and next steps | 08 August 2016 | Skype | ULUND: Kim Nicholas, Heather Schoonover<br>UCD: Deirdre Joyce<br>SGM: Jose Lascurain<br>WWF: Apostol Dyankov, Raina Popova<br>VU-IVM: Astrid van Teeffelen<br>FFCUL: Ines Rosario |
| Exemplar Leads Meeting: exemplar deliverable products outlines | 06 September | Skype | ULUND: Kim Nicholas, Heather Schoonover<br>SGM: Jose Lascurain |

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|---|---|---|---|---|
| | presentations, ESP conference final plans | 2016 | | |
| | Exemplar Leads Meeting: exemplar deliverable plan and timeline, deliverable working group updates and next steps, ESP Antwerp conference report-out | 04 October 2016 | Skype | ULUND: Kim Nicholas, Heather Schoonover<br>UP: Ariane Walz<br>UEDIN: Anja Liski<br>SGM: Jose Lascurain<br>CSIC: Nuria Marba<br>WWF: Nelly Papazova<br>FFCUL: Ines Rosario |
| | Exemplar Leads Meeting: exemplar deliverable products first drafts presentations and discussions, deliverable working groups requests for input and feedback, Userboard meeting update | 02 November 2016 | Skype | ULUND: Kim Nicholas, Heather Schoonover<br>UP: Ariane Walz<br>UCD: Deirdre Joyce<br>SGM: Jose Lascurain<br>WWF: Raina Popova, Nelly Papazova<br>CSIC: Nuria Marba<br>FFCUL: Ines Rosario<br>ETH: Sibyl Brunner |
| | Exemplar Leads Meeting: Userboard meeting report-out, exemplar deliverable products second drafts status updates and plans to finalise, update on blueprint protocol, discussion of data sharing and archiving | 06 December 2016 | Skype | ULUND: Kim Nicholas, Heather Schoonover<br>UP: Ariane Walz<br>UEDIN: Meriwether Wilson<br>UCD: Deirdre Joyce<br>WWF: Raina Popova |
| | Exemplar Leads Meeting: exemplar deliverable products final drafts updates and needs, deliverable overview update | 10 January 2017 | Skype | ULUND: Heather Schoonover<br>UEDIN: Aster deVries Lentsch<br>UCD: Deirdre Joyce, Craig Bullock<br>SGM: Jose Lascurain<br>WWF: Apostol Dyankov<br>ETH: Sibyl Brunner |

| | Exemplar Leads Meeting: feedback on exemplar deliverable process and submission, upcoming reporting needs, plans for Bulgaria consortium meeting, update on blueprint protocol, future communications opportunities, updates about other WP and overall OPERAs syntheses, tour de table | 21 March 2017 | Skype | ULUND: Kim Nicholas, Heather Schoonover<br>UP: Ariane Walz<br>UEDIN: Meriwether Wilson<br>SGM: Jose Lascurain<br>WWF: Raina Popova<br>VU-IVM: Astrid van Teeffelen<br>CNRS: Wolfgang Cramer<br>FFCUL: Ines Rosario, Margarida Santos-Reis<br>ETH: Sibyl Brunner |
|---|---|---|---|---|
| | Task 2.3 Guidance tool group Skype on decision trees | 08 January 2016 | Skype | UEDIN: James Paterson<br>EFI: Diana Tuomasjukka<br>CEH: Paul Harrison |
| | Task 2.3 Guidance tool group Skype on decision trees | 10 February 2016 | Skype | UEDIN: Marc Metzger, James Paterson<br>EFI: Diana Tuomasjukka<br>CEH: Paul Harrison |
| | Task 2.3 Guidance tool group Skype on decision trees | 08 March 2016 | Skype | UEDIN: Marc Metzger, James Paterson<br>EFI: Diana Tuomasjukka<br>NINA: David Barton |
| | Task 2.3 Guidance tool group Skype on decision trees | 16 March 2016 | Skype | UEDIN: Marc Metzger, James Paterson<br>EFI: Diana Tuomasjukka<br>CEH: Paul Harrison |
| | Task 2.3 Contribution to Oppla SWG meeting Manchester | 14-15 April 2016 | Manchester UK | UEDIN: Marc Metzger, Mark Rousnevell<br>WCMC: Claire Brown & OpenNESS partners |
| | Exemplar Demand Synthesis Working Group Meeting: refine research questions, discuss inputs, determine output product | 04 August 2016 | Skype | ULUND: Kim Nicholas, Heather Schoonover<br>UEDIN: Anja Liski, Meriwether Wilson<br>SGM: Jose Lascurain<br>WWF: Apostol Dyankov, Raina Popova<br>ETH: Adrienne Grêt-Regamey |

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| | Exemplar Demand Synthesis Working Group Meeting: review inputs, identify further data and analysis needs | 19 August 2016 | Skype | ULUND: Kim Nicholas, Heather Schoonover<br>UEDIN: Anja Liski<br>SGM: Jose Lascurain<br>ETH: Sibyl Brunner<br>FFCUL: Ines Rosario |
| | Exemplar Demand Synthesis Working Group Meeting: discuss analyses, narrow focus, discuss help needed | 20 September 2016 | Antwerp, Belgium | ULUND: Kim Nicholas, Heather Schoonover<br>UEDIN: Anja Liski<br>SGM: Jose Lascurain<br>ETH: Sibyl Brunner<br>FFCUL: Ines Rosario |
| | Exemplar Demand Synthesis Working Group Meeting: prep for draft due Nov 2 | 20 October 2016 | Skype | ULUND: Kim Nicholas, Heather Schoonover<br>UEDIN: Anja Liski<br>SGM: Jose Lascurain<br>WWF: Apostol Dyankov, Raina Popova<br>ETH: Sibyl Brunner |
| | Exemplar Demand Synthesis Working Group Meeting: update from Userboard presentation, discuss draft | 30 November 2016 | Skype | ULUND: Kim Nicholas, Heather Schoonover<br>UEDIN: Anja Liski<br>WWF: Apostol Dyankov<br>ETH: Sibyl Brunner<br>VU-IVM: Astrid van Teeffelen |
| | Exemplar Demand Synthesis Working Group Meeting: last steps to complete product | 18 January 2017 | Skype | ULUND: Kim Nicholas, Heather Schoonover<br>UEDIN: Anja Liski<br>SGM: Jose Lascurain<br>WWF: Raina Popova<br>ETH: Sibyl Brunner<br>FFCUL: Ines Rosario |
| | Exemplar Socio-Cultural Valuation Synthesis Working Group: First | 16 June 2016 | Barcelona, Spain | UP: Ariane Walz<br>WCMC: Lisa Ingwall-King |

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|---|---|---|---|
| brainstorming for a Social Valuation Synthesis across Exemplars | | | VUA: Samantha Scholte<br><br>UCD: Craig Bullock<br><br>EDIN: Anja Liski, Aster de Vries<br><br>SGM: José Lascurain |
| Exemplar Socio-Cultural Valuation Synthesis Working Group: Discussion on first draft for a Social Valuation Synthesis across Exemplars | 19 September 2016 | Antwerp, Belgium | UP: Ariane Walz<br><br>WCMC: Lisa Ingwall-King<br><br>VUA: Samantha Scholte<br><br>UCD: Deirdre Joyce<br><br>EDIN: Anja Liski<br><br>SGM: José Lascurain |
| Exemplar Socio-Cultural Valuation Synthesis Working Group: ongoing communications | October-December 2016 | Skype | UP: Ariane Walz, Katja Schmidt, Rebecca Noebel<br><br>WCMC: Lisa Ingwall-King<br><br>VUA: Samantha Scholte<br><br>UCD: Deirdre Joyce, Craig Bullock, Marcus Collier<br><br>EDIN: Anja Liski, Marc Metzger, Aster DeVries Lentsch,<br><br>SGM: José Lascurain<br><br>WWF: Apostol Dyankov<br><br>FFCUL: Ines Rosario<br><br>CNRS: Sandra Lavorel<br><br>CSIC: Nuria Marba, Ana Ruiz-Frau<br><br>VU-IVM: Samantha Scholte<br><br>TIAMASG: George Cojocaru<br><br>WCMC: Lisa Ingwall-King |
| Exemplar Local Authorities Synthesis Working Group: Dissemination Video: terms of reference and specification | 10 November 2016 | Skype | UCD: Deirdre Joyce<br><br>UEDIN: Archie Crofton |

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|---|---|---|---|---|
| | Exemplar Local Authorities Synthesis Working Group: Ecosystem Services for Local Authorities (ESLA) Video | 30 November 2016 | Skype | UCD: Deirdre Joyce<br>UEDIN: Archie Crofton |
| | Exemplar Local Authorities Synthesis Working Group: Dissemination Video: terms of reference and specification | 15 December 2016 | Skype | UCD: Deirdre Joyce<br>UEDIN: Archie Crofton<br>CSIC: Nuria Marba, Ana Ruiz |
| **WP** | **Meeting** | **Date** | **Location** | **Attendees** |
| | | | | |
| WP3 | WP3 task lead telecom, prep for Barcelona consortium meeting | 26.4.2016 | Telecon | Anita Bayer, Almut Arneth (KIT), Craig Bullock (UCD), Mark Koetse (VU), Lennart Olsson (LUND), Astrid van Teeffelen (VU) |
| | Joint research with Inner Forth Exemplar | 25 – 28 February 2016 | Edinburgh / Inner Forth Area, Scotland | Torsten Krause, Pontus Ambros (LUND) |
| | Joint research with Balearic Exemplar | 25 April – 6 May 2016 | Esporles, Mallorca | Torsten Krause (LUND), Ana Ruiz and Nuria Marba (IMEDEA) |
| | Ecosystem Service Conference – Antwerp | 19 – 22 September 2016 | Antwerp, Belgium | Torsten Krause (LUND), Astrid van Teeffelen (VU), Sven Lautenbach (UBO), Anita Bayer (KIT), Craig Bullock, Marcus Collier, Deirdre Joyce (UCD). |
| | Ecosystem Service Conference – Antwerp: Symposium on Ecosystem Services Trade-Offs | 21-9-2016 | Antwerp, Belgium | Astrid van Teeffelen, Sven Lautenbach, Anita Bayer (Organisers), plus invited speakers |
| | Joint research with Inner Forth Exemplar | October 2016 | Edinburgh / Inner Forth Area, Scotland | Pontus Ambros (LUND), Anja Liski and Marc Metzger (UEDIN) |
| | WP2 (Balearic exemplar) - WP3 teleconferences | Various in 2016 and 2017 | Telecon | Torsten Krause (ULUND), Ana Ruiz (IMEDEA) |

| WP | Meeting | Date | Location | Attendees |
|---|---|---|---|---|
| | WP2 (Inner Forth exemplar) - WP3 teleconferences | Various in 2016 and 2017 | Telecon | Torsten Krause (ULUND)& Anja Liski (UEDIN) |
| | Stakeholder meeting | 11 Mar 2016 | Edinburgh, Scotland | AW (UP), Consultative Forum Pentland Hills |
| | Inception telecom regarding stakeholder workshop I | 21 Apr 2016 | Telecon | AW, KS (UP), Workshop organisers |
| | Stakeholder workshop I | 20 May 2016 | Edinburgh, Scotland | AW, KS (UP), Stakeholder Pentland Hills |
| | Stakeholder meeting | 14 Oct 2016 | Edinburgh | KS (UP), Consultative Forum Pentland Hills |
| | Inception telecon regarding stakeholder workshop II | 20 Jan 2017 | telecon | AW, KS (UP), Workshop organisers |
| | Stakeholder workshop II | 3 Mar 2017 | Edinburgh, Scotland | KS (UP), Stakeholder Pentland Hills |
| | ESCom conference 2017 | 24 Apr 2017 | Edinburgh, Scotland | KS (UP), ESCom Scotland |
| | WP2 (Inner Forth exemplar) - WP3 teleconferences | Various in 2016 and 2017 | Telecon | Mark Koetse (VU), Anja Liski (UED) |
| | WP2 (Montado exemplar) - WP3 teleconferences | Various in 2016 and 2017 | Telecon | Mark Koetse (VU), Ines Rosario (UL) |
| | WP2 (Inner Forth exemplar) - WP3 physical meeting | 16 May 2017 | Sofia, Bulgaria | Mark Koetse (VU), Anja Liski (UED) |

| WP | Meeting | Date | Location | Attendees |
|----|---------|------|----------|-----------|
| | WP2 (Montado exemplar) - WP3 physical meeting | 16 May 2017 | Sofia, Bulgaria | Mark Koetse (VU), Ines Rosario (UL) |
| | WP3 synthesis teleconferences | Various in 2016 and 2017 | Telecon | Mark Koetse (VU), Craig Bullock (UCD) |
| **WP** | **Meeting** | **Date** | **Location** | **Attendees** |
| | WP2 (Barcelona exemplar) - WP3 teleconference | 5 9 2016 | Telecon | Jose Lascurain (SGM), Mark Koetse (VU) |
| | D3.7 | 26.9.2016 | Amsterdam | Peter Verburg, Joona Lehtomäki, Astrid van Teeffelen (VU) |
| | D3.7 | 26.9.2016 | Telecon | Sven Lautenbach (UBO), Anita Bayer (KIT), Astrid van Teeffelen (VU) |
| | Navigating trade-offs workshop T3.5 | 24.11.2016 | Amsterdam | Astrid van Teeffelen, Willem Verhagen, Joona Lehtomäki (VU) |
| | Prioritization methods for ES | 23.1.2017 | Amsterdam | Astrid van Teeffelen, Willem Verhagen, Joona Lehtomäki (VU) |
| | Optimization methods for navigating trade-offs | 24.3.2017 | Amsterdam | Astrid van Teeffelen, Willem Verhagen, Joona Lehtomäki (VU) |
| | Visualisation of WP3 results through OurEcosystem | 21.3.2017 | Telecon | Jill Bournazel, Véronique Morel (EcoMetrica), Willem Verhagen, Astrid van Teeffelen (VU) |
| | Stakeholder workshop T3.5/EU exemplar scoping | 5.12.2017 | Amsterdam | Peter Verburg, Astrid van Teeffelen (VU) |
| | Stakeholder workshop T3.5/EU exemplar scoping | 9.12.2017 | Telecon | Astrid van Teeffelen, Willem Verhagen (VU), Martin Watson, Michelle Nitschmann (Prospex) |
| | Stakeholder workshop T3.5/EU exemplar scoping | 15.3.2017 | Telecon | Astrid van Teeffelen, Willem Verhagen (VU), Martin Watson, Michelle Nitschmann (Prospex) |
| | Trade-offs D3.7, presentation, workshop | 7.4.2017 | Telecon | Astrid van Teeffelen (VU), Sven Lautenbach (UBO) |

| WP | Meeting | Date | Location | Attendees |
|---|---|---|---|---|
| | Navigating trade-offs workshop WP2/WP3 | 19.04.2017 | Amsterdam | Astrid van Teeffelen, Willem Verhagen, Joona Lehtomäki, Jeanne Nel (VU) |
| | Stakeholder workshop T3.5/EU exemplar preparation | 11.5.2017 | Telecon | Astrid van Teeffelen, Willem Verhagen (VU), Martin Watson, Michelle Nitschmann (Prospex) |
| **WP** | **Meeting** | **Date** | **Location** | **Attendees** |
| | Stakeholder workshop T3.5/EU exemplar preparation | 17.5.2017 | Sofia, Bulgaria | Astrid van Teeffelen (VU), Sven Lautenbach (UBO), Michelle Nitschmann (Prospex) |
| | Stakeholder workshop T3.5/EU exemplar preparation / participants list | 24.5.2017 | Telecon | Astrid van Teeffelen (VU), Sven Lautenbach (UBO), Michelle Nitschmann (Prospex) |
| | Scenario Analysis T3.1 / Global exemplar | 18.1.2016 | Telecon | Anita Bayer (KIT), Rene Sachs (UP) |
| | ESP Antwerp session trade-offs proposal T3.5 | 20.1.2016 | Telecon | Sven Lautenbach (UBO), Anita Bayer (KIT), Astrid van Teeffelen (VU) |
| | Decision tree discussions | 16.12.2016 8.1.2016 10.2.2016 | Telecon | Anita Bayer (KIT) and others from OPERAs and OPENNESS |
| | Stakeholder workshop – presentation on natural capital accounting T3.3 D3.4 | 26.04.2016 | Brussels | Patrick ten Brink (IEEP) |
| | Workshop session organisation and presentation on Natural Capital accounting at the ESP T3.3 D3.4 | 22.07.2016 | Antwerp. | Patrick ten Brink (IEEP), Rob Tinch (Iodine), Craig Bullock, (UCD) |
| | Presentation of 3.7 to Full Consortium Meeting | 17.05.2017 | Sofia, Bulgaria | Patrick ten Brink (IEEP) |
| WP4 | OPERAS Project Meeting | ma 13.6.2016 | Pati Manning, espai de cultura | WP4 representatives |

| | | 0:00 | http://www.diba.cat/en/web/cerc/pati | |
|---|---|---|---|---|
| | OPERAS 7th Consortium meeting 15-19th May 2017, Sofia, Bulgaria | ma 15.5.2017 0:00 | Sofia | WP4 representatives |
| | OPERAS PM in Dublin | su 8.3.2015 23:00 | Dublin | WP4 representatives |
| | OPERAS PMT meeting | ti 10.2.2015 13:00 | Amsterdam | Diana Tuomasjukka (EFI) and others |
| | OPERAS PMT | ke 27.1.2016 10:00 | Skype | Diana Tuomasjukka (EFI) and others |
| | OPERAS PMT | pe 1.4.2016 15:00 | Skype | Diana Tuomasjukka (EFI) and others |
| | OPERAs PMT skype | ti 28.2.2017 11:00 | skype | Diana Tuomasjukka (EFI) and others |
| | OPERAS PMT Skype | to 6.10.2016 10:00 | skype | Diana Tuomasjukka (EFI) and others |
| | WP4 meeting | ma 15.5.2017 6:30 | Sofia | WP4 representatives |
| | OPERAS D4.3 Skype meeting | ke 19.10.2016 14:00 | Skype Meeting | WP4 representatives |
| | D4.3 Synthesis meeting | ke 30.11.2016 14:00 | Skype Meeting | WP4 representatives |
| | OPERAS D4.3 (synthesis) deliverable - | ke 31.8.2016 | Skype Meeting | WP4 representatives |

| | Skype planning session (31/8/12-13 EET) | 11:00 | | |
|---|---|---|---|---|
| | WP4 Skype meeting | ma 7.12.2015 13:00 | Skype Meeting | WP4 representatives |
| | OPERAS WP4 Synthesis meeting | ke 15.2.2017 13:00 | Skype Meeting - click on the link | WP4 representatives |
| | OPERAS D4.3 deliverable follow-up | ke 21.9.2016 11:00 | somewhere at EU ES COnference, Antwerp - details next Tuesday | WP4 representatives |
| | WP4 meeting | ma 13.6.2016 13:00 | Barcelona | WP4 representatives |
| | WP4 pre meeting | ti 16.5.2017 9:00 | Sofia | WP4 representatives |
| | ESP Conference (tool presentations and session C8) | Sept 2016 | Antwerp, Belgium | WP4 representatives |
| | OPERAS Science-Policy Day | ti 1.3.2016 0:00 | Brussels, possibly EU Parliament, online | Diana Tuomasjukka (EFI) and others |
| | BBN call | ke 10.8.2016 10:00 | Skype | Diana Tuomasjukka (EFI) as WP4 represenative and others from cross-WP-project task force of OPERAs and OPENness |
| | cross-project guidance | ke 10.2.2016 15:00 | skype | Diana Tuomasjukka (EFI) as WP4 represenative and others from cross-WP-project task force of OPERAs and OPENness |
| | Decisiontree group meeting | ke 16.3.2016 11:00 | Skype | Diana Tuomasjukka (EFI) as WP4 represenative and others from cross-WP-project task force of OPERAs and OPENness |
| | decision trees | pe 8.1.2016 | skype | Diana Tuomasjukka (EFI) as WP4 represenative and others |

| | | 14:00 | | from cross-WP-project task force of OPERAs and OPENness |
|---|---|---|---|---|
| | OPERAs UserBoard lessons learned: Skype Tues Nov 11, 15:00 CET | ti 11.11.2014 15:00 | Skype | Diana Tuomasjukka (EFI) as WP4 represenative and others from cross-WP-project task force of OPERAs and OPENness |
| | BBN OPERAS: Anders, David | to 18.8.2016 8:30 | Skype | Diana Tuomasjukka (EFI) as WP4 represenative and others from cross-WP-project task force of OPERAs and OPENness |
| | Virtual Decission tree meeting | to 24.9.2015 0:00 | Skype | Diana Tuomasjukka (EFI) as WP4 representative and others from cross-WP-project task force of OPERAs and OPENness |
| | OPERAS Usergroup, Lisbon | to 6.11.2014 0:00 | Lisbon | Diana Tuomasjukka (EFI) as WP4 representative and others from cross-WP-project task force of OPERAs and OPENness |
| | OPERAS Synthesis work? | ti 22.11.2016 0:00 | Edinburgh | EFI + UEDIN |
| WP5 | Oppla SWG meeting | 13-14 January 2016 | Copenhagen, Denmark | Mark Rounsevell, Mark Metzger, Claire Brown, Martin Watson |
| | Oppla SWG Meeting | 14-15 April 2016 | Manchester, UK | Mark Rounsevell, Mark Metzger, Claire Brown, George |
| | Meeting between Oppla SWG and IPBES Secretariat | 4-5 July 2016 | Bonn, Germany | Mark Rounsevell, Claire Brown |
| | Oppla SWG Meeting | 3-4 August, 2016 | Edinburgh | Mark Rounsevell, Mark Metzger, Claire Brown, George |
| | OPERAs User Board | 17-18 November 2016 | Palma, Mallorca | Mark Rounsevell, Mark Metzger, Claire Brown, Martin Watson, Michelle Nitschmann |
| WP6 | Dissemination and outreach was discussed in all WP1 meetings, and in many WP specific meetings. There were no dedicated Outreach meetings. | | | |

## 4.2 Cooperation with other projects/programmes

The collaboration between the two groups has progressed well during the third reporting period. A joint working group was established to monitor and progress the joint areas of work between the two projects, which are (from the DoW):

- The two projects will have a common start date

- Organise joint project meetings to include: a) at least 2 policy meetings in Brussels (e.g. lunch debates), b) at least 1 project meeting elsewhere to plan collaboration (at an early stage of the work), c) ad hoc project meetings to implement collaboration

- Organise jointly at the end of the projects an Open Science Conference

- Produce joint Special Issue publications during the projects, linked also to the final conference

- Produce a joint stakeholder engagement and monitoring plan (to avoid overlap of individuals contacted)

- Communicate ideas/insights about protocols, methods and synthesis of exemplars/case studies - partner participation in workshops on a) method development (early on), and b) synthesis and comparison of results (later on)

- Explore options for collaboration in the Lower Danube exemplar/case study, to avoid redundancy and replication and compare results and lessons-learned (at the synthesis workshop, above)

- Coordinate communication and dissemination strategies and plans

- Compare the project policy briefs, and avoid confusion where differences in messages arise

- Ensure a high degree of inter-operability of the OPERAs Resource Hub and the OpenNESS Clearinghouse through a common platform (OPPLA)

- Ensure the perennity of the OPPLA

- Develop a joint business plan with the aim of commercialising the OPPLA

- Coordinate Summer School(s) and other training elements

- Include common members within the project Advisory groups, especially the coordinators

A sub-set of this working group has been established specifically to manage the development of the 'Common Platform' (now known as OPPLA). This includes the development of the business plan in support of the perennity of OPPLA. The joint working group and the OPPLA development team have now met on several occasions throughout the reporting period.

This has included meetings involving European Commission staff (DG RTD and DG Environment) and the European Environment Agency. An outcome of this process has been the harmonisation of deliverables that relate to OPPLA across the two projects. See section 2.5, for a description of progress on OPPLA.

The two projects have also collaborated on the establishment of stakeholder databases and are organising stakeholder meetings jointly.

Attendance at one other project's general project meetings continues, as does OPERAs representation on the OpenNESS Advisory Board.

Two external Advisors Dr Elena Bennet and Dr Albert Norstrom have been appointed, both of whom joined us for a consortium meeting in Dublin March 2015 and gave invaluable feedback.

## 4.3 Changes in the Consortium or legal status of the beneficiaries

A number of changes have been proposed and an amendment session has been open.  Although many changes have been made within the system we have been unable to make a final submission due to one change taking a long time to resolve.   It is anticipated that these amendments will be acknowledged within the next reporting period.

- Oppla has been added to the consortium as a partner
- Budget has been redistributed from WCMC and UEDIN to Oppla to reflect work undertaken

## 4.4 Development of the Project Website

The project website continues to develop and evolve with a current focus on showcasing project results and outcomes.  Short films describing issues have been added to the website and have proved very popular.  Project outputs are hosted on the site in public resources, and internal document (requires login)

## 4.5 Deviations from planned milestones and deliverables

There have been no major changes to the deliverables.  There have been some minor extensions granted to existing deliverables in line with project outcomes, and researcher maternity leave.

## 4.6 Dissemination activities in this period

### Presentations at workshops and conferences

**WP2**

Bierry, A., & Lavorel, S. 2016. Mobilization of the ES concept for integrated regional management: the Grenoble urban region. Société Française d'Ecologie - International Conference on Ecological Sciences, Marseille, France, 26 October 2016.

Cramer, W. 2017. Climate change and biodiversity. University of Lisbon, Lisbon, Portugal, 13 May

2017.

Cramer, W. 2017. Natural and socio-economic drivers. MedECC Workshop, Rabat, Morocco, 10 May 2017.

Cramer, W. 2017. Requirements for useful vegetation models. Workshop Contribution, IIASA, Laxenburg, Austria, 28 March 2017.

Cramer, W. 2017. Critical Limits to Environmental Change for the Mediterranean Region – a Multidisciplinary Approach. Seminar Talk, Justus-Liebig-Universität Giessen, Germany, 1 January 2017.

Cramer, W. 2016. Climate, biodiversity and sustainable development – the role of global land management strategies. Rio Pavilion Event, CBD COP13, Cancun, Mexico, 6 December 2016.

Cramer, W. 2016. Environmental Change in the Mediterranean Region. Side Event UNFCCC COP22, Marrakech, Morocco, 13 November 2016.

Cramer, W. 2016. Climate change and biodiversity. ALTER-Net Summer School, Peyresq, France, 11 September 2016.

Cramer, W. 2016. Risks associated with environmental change in the Mediterranean Basin. The Christina seminar on plant-herbivore interactions – and others, Evenstad, Norway, 13 August 2016.

Cramer, W., Bondeau, A., García-Nieto, A.P., Malek, Ž., Mekki, I., Belhouchette, H., Fader, M., Geijzendorffer, I., & Hervé, M. 2017. Sustainability of land systems assessed from ecosystem services & socio-economic indicators. OPERAs Consortium Meeting, Sofia, Bulgaria, 17 May 2017.

Cramer, W., & Guiot, J. 2016. Critical Limits to Environmental Change for the Mediterranean Region – a Multidisciplinary Approach. SFE Conference, Marseille, France, 27 October 2016.

Cramer W., & Guiot J. 2016. Critical Limits to Environmental Change for the Mediterranean Region – a Multidisciplinary Approach, MedECC Workshop, Aix-en-Provence, France, 10 October 2016.

Cramer, W., & Guiot, J. 2016. Critical Limits to Environmental Change for the Mediterranean Region – a Multidisciplinary Approach. MedCLIVAR Conference, Athens, Greece, 28 September 2016.

Cramer, W., et al. 2016. Towards an integrated model for the Mediterranean social-ecological system. OT-Med Annual Meeting, Aix-en-Provence, France, 7 January 2016.

Crouzat, E., Lavorel, S., Contin, A.-G., & Hiribarrondo, D. 2016. Ecosystem services as an operational tool for integrating environmental resources in land planning processes. European Ecosystem Services Partnership Conference, Antwerp, Belgium, 19-22 September 2016.

Di Gregorio, M., Nurrochmat, D., Locatelli, B., Maya Sari, I., & Kusumadew, S. 2016. Multi-level Challenges in Climate Change Policy Networks. XXXVI Sunbelt Conference of the International Network for Social Network Analysis (INSNA), Newport Beach, California, 5-10 April 2016.

Dyankov, A. 2017. Lower Danube Exemplar Challenges and Perspective for freshwater restoration efforts on the Lower Danube: WWF's experience and role of OPERAs. OPERAs Consortium Meeting, Sofia, Bulgaria, 17 May 2017.

Dyankov, A. & Cojocaru. G. 2016.Lower Danube Exemplar Preliminary results of a DSS instrument application in the Persina case study. OPERAs Consortium Meeting, Barcelona, Spain, 15 June 2016.

Fedele, G., Djoudi, H., & Locatelli, B. 2016. Mediating factors shaping ecosystem services for people's resilience to climate variability in forest landscapes. In: Plinio Sist (ed.), Stéphanie Carrière (ed.), Pia Parolin (ed.), Pierre-Michel Forget (ed.). Tropical ecology and society reconciliating conservation and sustainable use of biodiversity. Annual Meeting of the Association for Tropical Biology and Conservation (ATBC 2016), Montpellier, France, 19-23 June 2016.

Felipe Lucia, M., Martin-Lopez, B., Bennett ,E., Fischer, J., Garcia-Lorente, M., Hicks, C., Lavorel, S., Locatelli, B., Nostrom, A., Peterson, G., & Plieninger, T. 2016. Telecoupling mediates ecosystem services bundles through social interrelationships. European Ecosystem Services Conference, Antwerp, Belgium, 19-23 June 2016.

García-Nieto, A.P., Geijzendorffer, I., Belhouchette, H., Bondeau, A., Mekki, I., Bahri, H., & Cramer, W. 2016. Regional specific farming systems and ecosystem services tradeoffs: a Tunisian case study. International Conference on Ecological Sciences SFE, Marseille – Palais du Pharo, France, 24-28 October 2016.

García-Nieto, A.P., Geijzendorffer, I., Belhouchette, H., Bondeau, A., Mekki, I., Bahri, H., & Cramer, W. 2016. Regional specific farming systems and ecosystem services tradeoffs: a Tunisian case study. European Ecosystem Services Conference, Antwerp, Belgium, 19-23 September 2016.

García-Nieto, A.P., Geijzendorffer, I., Bondeau, A., & Cramer, W. 2016. Ecosystem services tradeoffs around the Mediterranean region: land cover change, management practices, farming systems. OPERAs Consortium Meeting, Barcelona, Spain, 14 June 2016.

Gheorgiu, C. 2017. Nature for decision making – an integrated approach. Romanian MAES Process workshop held at the European Commission, Brussels, Belgium, 17 March 2017.

Grigore, V. 2017.  Socio-economic and environmental benefits from restoring ecosystem services at Comana Nature Park. OPERAs workshop on sharing best practices in the Lower Danube, Belene, Bulgaria, 20 May 2017.

Guiot, J. & Cramer, W. 2015. MedECC: Mediterranean Experts on Climate and Environmental Change - Towards an improved scientific assessment of climate change and its impacts in the Mediterranean Basin. UNFCCC COP21 Side Event, Paris, France 4 December 2015.

Gupta, J., & Nicholas, K.A. An equity argument for nature-based solutions to implement the Sustainable Development Goals. European Ecosystem Services Conference, Antwerp, Belgium, 19-23 September.

Joyce, D., Bullock, C, & Collier, M.J. 2017. Socio-Cultural Valuation of ecosystem services – a tool for effective stakeholder engagement to inform land-use planning and management: a case study. Environ 2017 conference, Athlone, Ireland, 11-13 April 2017.

Joyce, D, Bullock, C., & Collier, M.J. 2016. Making Cultural Ecosystem Services count in policy and decision-making - Ecosystem Services Approach & Cultural Valuation - Potential Role in Land use planning. European Ecosystem Services Partnership Conference, Antwerp, Belgium, 19-23 September 2016.

Joyce, D., Bullock, C, & Collier, M.J. 2016. Ecosystem Services Approach & Socio-cultural valuation role in decision making – Practice and Feedback Seminar. Fingal County Council, Balbriggan, Dublin, Ireland, 23 August 2016.

Krause, T., Liski, A., Metzger, M., Ambros, P. & Nicholas, K.A. Farming with wading birds and tidal waters – The governance of adaptation to climate change in the Inner Forth estuary in Scotland. European Ecosystem Services Conference, Antwerp, Belgium, 19-23 September 2016.

Lascurain, J. 2016. Governance, stakeholder integration and adaptive management systems. OPERAs Userboard Conference, Mallorca, Spain, 17 November 2016.

Lascurain, J. 2016. Hybrid dune project. A case study of urban dune as nature-based solution and adaptation to climatic change. 22 September 2016.

Lascurain, J. 2016. Gestión de servicios ecosistémicos en dunas urbanas. El estudio de caso Dunes Híbrides. Conferencia de la Asociación Española de Ecologia Terrestre, 4 May 2016.

Lavorel, S., Bierry, A., Vannier, C., Crouzat, E., Lasseur, R., Byczek, C., Nettier, B., Cordonnier, T., Longaretti, P.-Y., & Rolland, A. 2016. Scenarios and models of biodiversity and ecosystem services for land use planning. ScenNet: Scenarios and models of biodiversity and ecosystem services in support of policy, Montpellier, France, 23 August 2016.

Lee, H. & Lautenbach, S. A quantitative review of relationships between ecosystem services. European Ecosystem Services Conference, Antwerp, Belgium, 19-23 Sept 2016.

Lee, H., & Lautenbach, S. OPERAs: An introduction to European Ecosystem Services research and its relation to policy and practice. Environmental research seminar, Kangwon National University, Chuncheon, South Korea, 8 Mar 2016.

Lee, H., & Lautenbach, S. The effect of afforestation on recreational services
- a case study in Saxony, Germany. Research Workshop on Ecosystem Services, University of Bayreuth, Bayreuth, Germany, 3 Dec 2015.

Lee, H., Seo, B., Koellner, T., & Lautenbach, S., 2017. Automatic tagging of crowdsourced image for quantifying cultural ecosystem services – a case study in Saxony, Germany. Natural Capital Symposium 2017, Stanford University, California, USA, 20-23 March 2017.

Liski, A. Participatory research in the Inner Forth: current activities and future directions. Land use change workshop, Karlsruhe Institute of Technology, Germany, 7 February 2017.

Liski, A. Citizen participation in valuing nature-based solutions in the Inner Forth, Scotland. Valuing Nature Annual Conference, Manchester, UK, 18 October 2016.

Liski, A. Integrated valuation of ecosystem services in the Inner Forth, Scotland. European Ecosystem Services Conference, Antwerp, Belgium. 22 September 2016.

Liski, A. Deliberative framework for valuation of nature-based solutions. European Ecosystem Services Conference. Antwerp, Belgium, 21 September 2016.

Liski, A. Impacts of deliberation on ecosystem service values in the Inner Forth, Scotland. University of Edinburgh, Alternet Summer School, Peyresq, France, 9 September 2016.

Liski, A. Citizen participation in developing nature-based solutions for climate resilience. OPERAs Consortium Meeting, Barcelona, Spain, 4 June 2016.

Liski, A. Citizen participation in developing nature-based solutions for climate resilience. Valuing Nature Business Impact School, London, UK, 1 March 2016.

Locatelli, B., Valdivia, M., & Vallet, A. 2016. Analyzing and mapping cultural ecosystem services with multiple integrated approaches: comparing methods and information sources in Peru. Latin American Ecosystem Services Partnership Conference: Healthy Ecosystems for Resilient Societies, Cali, Colombie, 18-21 October 2016.

Locatelli, B., Vignola, R., & Padilla, D. 2016. Nature-based solutions for climate change adaptation and mitigation: How have they been incorporated into climate policies in Latin America? Latin American Ecosystem Services Partnership Conference: Healthy Ecosystems for Resilient Societies, Cali, Colombie, 18-21 October 2016.

Locatelli B., Vignola R., & Padilla D. 2016. Conceptualizations of ecosystem-based adaptation and transformative adaptation in Latin America. EcoSummit Session 22 (Implementing transformative, ecosystem-based adaptation), Montpellier, France, 30 August 2016

Locatelli, B., Valdivia, M., & Vallet, A. 2016. Mapeo y modelamiento de servicios ecosistémicos: El caso de los servicios culturales en la cuenca del Mariño. Research Forum on Andean Forest Landscape Management, Abancay, Apurímac, Peru, 15 November 2016.

Makan, N., Phillips, P., & Schmidt, K. 2017. Participatory land use planning in the Pentland Hills: using ecosystem service values to inform decision-making. Keynote. ESCom 4th Annual Conference "Understanding and assessing shared and cultural values of ecosystem services", Edinburgh, Scotland, 24 April 2017.

Malek Ž:, & Verburg, P.H. Modeling the future of Mediterranean land systems: understanding changes to diversity, multifunctionality and intensity in a dynamic region. Global Land Programme, Open Science Meeting, Beijing, China, 24-27 October 2016.

Malek Ž., & Verburg P.H. Mediterranean land systems: Improving the representation of their diversity and intensity. IMERA: Agricultural sustainability in the Mediterranean: Towards a common assessment and modelling strategy, Marseille, France, 27 May 2016.

Marbà, N., Mazarrasa, I., Garcia-Orellana, J., Masqué, P., Arias-Ortiz, A. & Duarte, C.M. Mediterranean seagrass (*Posidonia oceanica*) carbon sinks under increasing anthropogenic pressures. OPERAs Consortium Meeting, Sofia, Bulgaria, 16- 18 May 2017.

Mupepele A-C., & Dormann C.F. The influence of forest management on nitrate concentration in temperate streams: a meta-analysis. Forstwissenschaftliche Tagung, Albert-Ludwigs-Universität Freiburg, Germany, 28 September 2016.
Book of Abstracts:
http://www.fowita.de/fileadmin/Anfahrtsskizzen/Programm/fowita16_abstractband.pdf

Mupepele A-C, Walsh J.C., Sutherland W.J., & Dormann C.F. An evidence assessment tool for ecosystem services and conservation studies. Evidence Grading Workshop by The Nature Conservancy (invited presentation). 5 September 2016.

Metzger M. Future landscapes – We need to know what we want, before we can get it !
IALE Italy annual conference key note. Asti, Italy, 25-28 May 2016.

Metzger M. What do we want future landscapes to look like? Iale UK annual conference. Reading, 7-9 September 2017

Metzger M. Future land use – We need to know what we want, before we can get it ! Seminar at the Lund University Centre for Sustainability Studies. Lund 19 December 2016

Metzger M. Understanding societal visions for future land use in Europe. American Association of Geographers annual conference. Boston, USA 5- 8 April 2017

Metzger M. The ecosystem services framework in decision making. COSTING THE EARTH? – translating the ecosystem services concept into practical decision-making LIFE Platform meeting on Ecosystem Services. Tallinn, Estonia 10-12 May 2017.


Nicholas, KA. Climate mitigation, biodiversity and ecosystem services in a changing climate. Invited presentation at BECC Annual Meeting, Varberg, Sweden, 23 October 2016. https://storify.com/KA_Nicholas/becc-annual-meeting-2016

Nicholas, K.A., Schoonover, H., Liski, A., Brunner, S., Gret-Regamey, A., Rosário, I., Santos-Reis. M., Dyankov, A., Popova, R., Lascurain, J., & van Teeffelen, A. Eliciting Demand for Ecosystem Services: Results and User Guidance from the OPERAs Demand Synthesis Working Group. OPERAs Consortium Meeting, Sofia, Bulgaria, 16-19 May 2017.

Nicholas, K.A., Schoonover, H., Brunner, S., Gret-Regamey, A., Liski, A., Rosário, I., Santos-Reis, M., Dyankov, A., Popova, R., Lascurain, J., & van Teeffelen, A. Demand for ecosystem services: Synthesis from seven case studies. OPERAs UserBoard Meeting, Palma de Mallorca, Spain, 16 November 2016.

Norström, A., Bennett, E., Peterson, G., Anderson, E., Enfors, E., Felipe Lucia, M., Fischer, J., Garcia-Lorente, M., Grace Turner, K., Hammann, M., Hanspach, J., Hicks, C., Jacobs, S., Lavorel, S., Dittrich, A., Martin-Lopez, B., Meacham, M., Locatelli B., Plieninger T., Qiu J., Queiroz C., Scholes B., Seppelt R., & Turner, M. 2016. Unbundling ecosystem service bundles. European Ecosystem Services Conference, Antwerp, Belgium, 19-23 September 2016.

Popova, R., & Dyankov, A. 2017. Lower Danube Exemplar: Persina Pilot Outcomes & Perspectives. OPERAs workshop on sharing best practices in the Lower Danube, Belene, Bulgaria, 20 May 2017.

Rosário, I.T. Natureza e aquilo que ela nos pode dar. Invited presentation. Ciclo de conferências Terças com gente gira, Unidade de Saúde Pública Arnaldo Sampaio, Moita, Portugal, 29 December 2015.

Rosário, I.T., Cardoso, P.,  Mendes, R., Rebelo, R., & Santos-Reis, M. Can geocaching be a proxy for cultural ecosystem services? The case of the Portuguese Montado. World Congress Silvo-Pastoral Systems, Évora, Portugal, 27-30 September 2016.

Rosário, I.T., Caser, U., Koetse, M., Madeira, A., Máguas, C. , Rebelo, R., Vasconcelos, L.,  & Santos-Reis, M. Valuation of the montado ecosystem services by its users. OPERA Consoritum Meeting, Barcelona, Spain, 13-16 June 2016.

Rosário, I.T., Caser, U., Máguas, C., Rebelo, R., Vasconcelos, L., & Santos-Reis, M. Valuation of the *montado* ecosystem services by its users and stakeholders. cE3c – 2nd Annual Meeting, Lisboa, Portugal, 28 June 2016.

Rosário, I.T, Koetse, M.,  Rebelo, R.,  Santos-Reis, & M. Montado value for Portuguese citizens: a nation-wide choice experiment. OPERAs Consortium Meeting, Sofia, Bulgaria, 16-19 May 2017.

Rosário, I.T., Madeira, A., Máguas, C., Rebelo, R., & Santos-Reis, M. Valorização dos serviços de ecossistema do montado da Companhia das Lezírias pelos seus utilizadores: primeiros resultados. Public session. Investigação Aplicada e Gestão Florestal na Companhia das Lezírias, Samora Correia, Portugal, 16 May 2016.

Rosário, I.T., Máguas, C., Rebelo, R., & Santos-Reis, M. Preservation of cork oak landscapes – OPERA. The Montado in Portugal. Invited presentation. Unwrapping the Package – towards a Circular Economy in Europe, Stakeholder Conference as part of the Dutch EU presidency in 2016, Rotterdam, Netherlands, 25 January 2016.

Ruiz-Frau, A., Krause, T., Santana-Garcon, J., Marbà, N., & Olsson, L. Seagrasses: a nuisance or an asset? Perceptions and Governance. OPERAs Consortium Meeting, Barcelona, Spain, 14-16 June 2016.

Ruiz-Frau, A., Krause, T., Marbà, N., & Olsson, L. Social Perceptions and Governance of Seagrass Ecosystem Services in the Mediterranean. OPERAs Userboard Meeting, Palma de Mallorca, Spain, 17 November 2016.

Ruiz-Frau, A., Krause, T., Marbà, N., & Olsson, L. Seagrasses: a nuisance or an asset? European Ecosystem Services Conference, Antwerp, Belgium, 19-23 September 2016.

Schmidt, K., Walz, A. Jones, K., & Metzger, M. 2015. Ecosystem services provided by mountain regions in the vicinity of cities compared to inner urban green spaces: The case of Edinburgh, Scotland. Mountains of Our Future Earth Conference, Perth, Scotland, 5-9 Oct 2015.

Schmidt, K., Walz, A., Martin-Lopéz. B., & Sachse, R. 2017. Testing socio-cultural valuation methods of ecosystem services to explain land use preferences. Scientific talk. ALTER-net Conference "Nature and society: synergies, conflicts, trade-offs", Ghent, Belgium, 2-4 May 2017.

Schmidt, K., **Walz**, A., Martin-Lopéz. B., & Sachse, R. 2017. Testing socio-cultural valuation methods of ecosystem services to explain land use preferences. Flashtalk. ESCom 4th Annual Conference "Understanding and assessing shared and cultural values of ecosystem services", Edinburgh, Scotland, 24 April 2017.

Schmidt, K., Walz, A., Martin-Lopéz. B., & Sachse, R. 2016. Social valuation of ecosystem services to explain trade-off in land management in the Pentland Hills Regional Park in Scotland. Scientific talk. European Ecosystem Services Conference, Antwerp, Belgium, 19-23 Sept 2016.

Schmidt, S., & Seppelt, R. 2017. Ecosystem service databases and their relevance for mainstreaming the ecosystem service concept for decision making, OPERAs Consortium Meeting, Sofia, Bulgaria, 16-19 May 2017.

Schmidt, S., & Seppelt, R. 2016. Uncertainty of monetary valued ecosystem services – value transfer functions for global mapping, OPERAs Consortium Meeting, Barcelona, Spain, 13-16 May 2016.

Schoonover, H., Grêt-Regamey, A., Scholte. S., Walz, A. & Nicholas, K.A., Creating Space, Aligning Motivations, and Building Trust: Key Elements of Stakeholder Engagement in 12 Ecosystem Services Case Studies. European Ecosystem Services Partnership Conference, Antwerp, Belgium, 19-23 September 2016.

Schoonover, H., Grêt-Regamey, A., Scholte. S., Walz, A. & Nicholas, K.A., Creating Space, Aligning Motivations, and Building Trust: Key Elements of Stakeholder Engagement in 12 Ecosystem Services Case Studies. OPERAs Consortium Meeting, Barcelona, Spain, 13-16 June 2016.

Seizov, P. WeLCa life cycle analysis tool. OPERAs Userboard Meeting, Mallorca, Spain, 17-18 November 2016.

Vallet, A., Locatelli, B., Levrel, H., & Dendoncker, N. 2016. Interactions between stakeholders and ecosystems: social networks, power, beneficiaries, and agents of change. Latin American Ecosystem Services Partnership Conference: Healthy Ecosystems for Resilient Societies, Cali, Colombie, 18-21 October 2016.

Vallet, A., Locatelli, B., Levrel, H., & Wunder, S. 2016. Ecosystem service tradeoffs and ecological-economic production possibilities frontier: A case study in Costa Rica. Latin American Ecosystem Services Partnership Conference: Healthy Ecosystems for Resilient Societies, Cali, Colombie, 18-21 October 2016.

Vallet, A., Locatelli, B., Levret, H., & Dendoncker, N. 2016. Interactions between stakeholders and ecosystems: social networks, power, beneficiaries, and agents of change. European Ecosystem Services Conference, Antwerp, Belgiuim, 19-23 September 2016.

Vallet, A., Locatelli, B., & Valdivia, M. 2016. Contribution of wild plants to human well-being in Apurimac, Peru: an ecosystem service perspective. Latin American Ecosystem Services Partnership Conference: Healthy Ecosystems for Resilient Societies, Cali, Colombie, 18-21 October 2016.

van Teeffelen, A. Bayer, A., & Lautenbach, S. Session organization, Ecosystem services trade-offs workshop: synthesis and implications for knowledge production and uptake. European Ecosystem Services Conference, Antwerp, Belgium, 19-23 September 2016.

van Teeffelen, A., Bayer, A., Lautenbach, S., & Verburg, P. The plethora of ecosystem services trade-off research: trade-offs between what? European Ecosystem Services Conference, Antwerp, Belgium, 19-23 September 2016.

van Teeffelen, A. Biophysical and socio-cultural perspectives on ecosystem services and their relevance to European policy. Invited talk at Monte Verità conference Global Change and Biodiversity: Integrating Mechanisms of Interactions, Feedbacks and Scale, URPP Global Change and Biodiversity, University of Zürich, 28 August - 1 September 2016.

Vannier, C., Lasseur, R., Byczek, C., Crouzat, E., Lefebvre, J., Cordonnier, T., Longaretti, P.-Y. & Lavorel, S. 2016. Cartographier les Services Écosystémiques : quelles données, quels modèles,

quelles échelles? Exemple autour du bassin de vie de Grenoble. Colloque Services Ecosystémiques urbains, Tours, France, 24 May 2016.

Vasconcelos, L., Rosário, I., Caser, U., Ferro, F., Rebelo, R., Máguas, C., & Santos-Reis, M. Building a Community of Practice for the Portuguese Montado – Capacitating Collaborative Management. World Congress Silvo-Pastoral Systems, Évora, Portugal, 27-30 September 2016.

Verhagen, W., Kukkala, A., Moilanen, A., van Teeffelen, A., & Verburg, P. Priority areas for ecosystem services in the European Union. OPERAs Consortium Meeting, Barcelona, Spain, 13-16 June 2016.

Walz A., Schmidt, K., Lascurain, J., Scholte, S., Joyce, D., Liski, A., Rosário, I., Santos-Reis, M., Marbá, N., Ingwall-King, L., de Vries, A. Bierry, A., & Lavorel, S. 2016. OPERAs WP2 Synthesis across Exemplars on Social Valuation. OPERAs User Board Meeting, Palma de Mallorca, Spain, 17-18 Nov 2016.

Walz A., Schmidt, K., Metzger, M., Makan, N., & Philips, P. 2016. Ecosystem services for operational use in land management. Highlighting the dialogue between science, policy and administration for the Pentland Hills Regional Park. OPPLA webinar on Ecosystem services in policy objectives, 12 Sept 2016.

Walz, A., Schmidt, K., Noebel, R., Bullock, C., Cojocaru, G., Collier, M.J., de Vries Lentsch, A., Dyankov, A., Ingwall-King, L., Joyce, D., Lascurain, J., Lavorel, S., Marbà, N., Metzger, M., Rosário, I., Ruiz-Frau, A., Santos-Reis, M. & Scholte, S. Integrating stakeholder perspectives into environmental planning through social valuation of ecosystem services: Guidance and Prototype Applications. OPERAs Consortium Meeting, Sofia, Bulgaria, 16-19 May 2017.

Wilson, M. Aquatic Ecosystem Services and Synergies: Restoration Insights from Scotland, Danube, Balearic and Barcelona. OPERAs Consortium Meeting, Sofia, Bulgaria, 17 May 2017.

Winkler, K.J., Viers, J.H., Kelsey, R., & Nicholas, K.A. Ecosystem Services and Vineyards: focus on single services hinders appreciation of multifunctional landscapes. European Ecosystem Services Conference, Antwerp, Belgium, 19-23 September 2016.
https://storify.com/KA_Nicholas/european-ecosystem-services-2016

**WP3**

Bayer, A. (2016) Methods for trade-off analysis: do's and don'ts, Ecosystem Service Partnership conference, Antwerp, 19.-23.09.2016

Bouma JA, Koetse MJ (2017) Mind the Gap: Assessing Hypothetical Bias and the Impact of Behavioural Factors on Stated WTP. Paper to be presented by Jetske Bouma at the EAERE 2017 Conference, 28 June–1 July 2017, Athens, Greece.

Bullock, C. Including the social in natural capital accounting. Ecosystem Services Conference Antwerp, September 19-22 2016

Bullock, C. Application of ecosystem services to freshwater management. Ecosystem Services Conference Antwerp, September 19-22 2016

Bullock, C. Peatlands, environmental and social trade-offs. Ecosystem Services Conference Antwerp, September 19-22 2016.

Bullock, C. Natural Capital Values. Presentation to Ireland Natural Capital Conference Debate at Trinity College, Dublin. 5 October 2016.

Bullock, C. Rivers, lakes, wetlands and ecosystem services. Wetlands Forum, Ireland. Abbeyleix. Ireland. May 2016.

Bullock, C. Biodiversity and ecosystem services: their relevance to planning in Fingal. Fingal County Council. 8 December 2015*.

Joyce, D. Making cultural ecosystem services count in policy and decision making: Potential role in land use planning. Ecosystem Services Conference Antwerp, September 19-22 2016.

Joyce, D. Ecosystem Services Approach and socio-cultural valuation – Role in decision making. Fingal County Council. 23 August 2016

Koetse MJ, Bouma JA, Hauck D (2017) Social Anchoring in Donating to an Environmental Public Good. Paper to be presented at the EAERE 2017 Conference, Athens, Greece, 28 June–1 July 2017.

Koetse MJ, Bouma JA, Hauck D (2016) Expectations on Others as Anchors in Donating to a Public Environmental Good. Paper presented at the 18th BIOECON Conference, Cambridge, UK, 14–16 September 2016.

Koetse MJ, Bouma JA, Hauck D (2016) Social Anchoring in Donating to an Environmental Public Good. Paper presented at the 9th Maastricht Behavioral and Experimental Economics Symposium (M-BEES), Maastricht, The Netherlands, 6 June 2016.

Koetse MJ. Behavioural Economics: Implications for ES Valuation, Management and Policy Design. Science/Policy session organised at the European Ecosystem Services Conference, Antwerp, 19–23 September 2016.

Krause, T. Consortium meeting Barcelona, 13-16 June 2016: "Seagrasses: a nuisance or an asset? Perception and Governance"

Krause, T. Antwerp conference, September 19-22 2016: "Farming with wading birds and tidal waters - The governance of adaptation to climate change in the Inner Forth estuary in Scotland"

Lautenbach, S., A. Bayer, A. Arneth (2016) Trade-offs between Carbon storage, crop yield production and water supply at the global scale, Ecosystem Service Partnership conference, Antwerp, 19.-23.09.2016

Lautenbach, S. (2016) Trade-off findings – do patterns emerge or is the context all that matters? , Ecosystem Service Partnership conference, Antwerp, 19.-23.09.2016

Lautenbach, S., A. Bayer, A. Arneth (2016) Trade-offs between C storage, crop yield production and water supply at the global scale, Global Land Project 3rd Open Science Meeting (GLPOSM16), Beijing, China, 24-27 October 2016

Lautenbach, S.; M. Volk (2016) Solving land use conflicts and identifying trade-offs in land management – from theory to implementation in practice, session at the Global Land Project 3rd Open Science Meeting (GLPOSM16), Beijing, China, 24-27 October 2016

Lautenbach, S., A. Bayer, A. Arneth (2016) Trade-offs between carbon storage, crop yield production and water supply at the global scale, IEMSs 2016, Toulouse, 10-14 July 2016

Lautenbach, S.; A, Bayer, S. Lavorel, A. van Teeffelen, P. Verburg, M. Volk (2017) "Understanding ecosystem service trade-offs and synergies for land use decision making", Keynote at the Alter-Net conference 02.-04.05.2017, Ghent

Lautenbach, S. (2016) Land use and ecosystem services - quantifying trade-offs, GIScience Colloquium University of Heidelberg, 12.12.2016

Lavorel, S. (2016) Cartographie des services rendus par la biodiversité des écosystèmes. *Séminaire de la ZABR - Les services écosystémiques pour la gestion des milieux aquatiques : pourquoi ? pourquoi pas ?* Lyon, France, 29 January 2016.

Lavorel, S. (2016) Temporal trajectories of ecosystem services: ecological insights for historical analyses. *PAGES workshop: Dynamics of socio-ecosystems on a changing Earth: sustainability or collapse?* Chambéry, France, 30 May - 1 June 2016.

Lavorel, S. (2016) Quantification biophysique des services écosystémiques. *Labex Item - Atelier de Réflexion Prospective en Ecologie Territoriale : la Maurienne* Grenoble, France, 7 June 2016.

Lavorel, S., Colloff, M., Doherty, M., Dunlop, M., Gorddard, R., Locatelli, B., Martín-López, B. & Prober, S. (2016) Mustering ecosystem power for social adaptation to climate change. *EcoSummit.* Montpellier, France, 1 Sept. 2016. (Invited Plenary Conference)

Liski A, Koetse MJ, Metzger M, Wilson M, Krause T (2016) For What it's Worth: A Deliberative Framework for Valuing Nature-Based Solutions. Paper presented by Anja Liski at the 1st European Ecosystem Services Conference, 19-23 September 2016, Antwerp, Belgium.

Makan, N., P. Phillips, K. Schmidt. 2017. Participatory land use planning in the Pentland Hills: using ecosystem service values to inform decision-making. Keynote. ESCom 4th Annual Conference "Understanding and assessing shared and cultural values of ecosystem services". 24 April 2017. Edinburgh, Scotland.

Malek Ž, Verburg PH. Modeling the future of Mediterranean land systems: understanding changes to diversity, multifunctionality and intensity in a dynamic region. Global Land Programme, Open Science Meeting 2016, Beijing.

Malek Ž, Verburg PH. Mediterranean land systems: Improving the representation of their diversity and intensity. IMERA: Agricultural sustainability in the Mediterranean: Towards a common assessment and modelling strategy, 2016, Marseille.

Schmidt, K., A. Walz, B. Martin-Lopéz and R. Sachse. 2016. Social valuation of ecosystem services to explain trade-off in land management in the Pentland Hills Regional Park in Scotland. Scientific talk. ESP Conference on "Helping Nature to Help Us". 19-23 Sept 2016, Antwerp, Belgium**.**

Schmidt, K., A. Walz, B. Martin-Lopéz and R. Sachse. 2017. Testing socio-cultural valuation methods of ecosystem services to explain land use preferences. Flashtalk. ESCom 4th Annual Conference "Understanding and assessing shared and cultural values of ecosystem services". 24 April 2017. Edinburgh, Scotland.

Schmidt, K., A. Walz, B. Martin-Lopéz and R. Sachse. 2017. Testing socio-cultural valuation methods of ecosystem services to explain land use preferences. Scientific talk. ALTER-net Conference "Nature and society: synergies, conflicts, trade-offs". 2-4 May 2017. Ghent, Belgium.

Scholte, S.S.K. (2016). Taking stock of socio-cultural ecosystem service assessments: current challenges and future perspectives. Consortium meeting, Barcelona, June 2016.

Scholte, Samantha S.K., Michiel N. Daams, Hans Farjon, Frans J. Sijtsma, Astrid J.A. van Teeffelen, Peter H. Verburg. (2017). How well can nature-based recreation be mapped using landscape attributes? Insights from the Netherlands Consortium meeting, Sofia, 16-19 May 2017.

Joyce, D. Ecosystem Services Approach & socio-cultural valuation: Potential & relevance for land-use planning. Environ 2017 Conference, Athlone, Ireland. 10-12th April, 2017
http://www.esaiweb.org/environ/

ten Brink P.  *Making Ecosystem Capital Accounts (ECA) policy relevant – opportunities and challenges* at the OpenNESS - OPERAs- European Commission Policy Day,  1 March 2016, Brussels, Belgium

P. ten Brink. *Nature and its role in the transition to a Green Economy.*  Lecture  to the  MSc Environmental Change and Management, Oxford University. Brussels course visit, organised by the Environmental Change Institute of the University of Oxford. 18 March 2016, Brussels.

ten Brink P.  *Ecosystem Accounts and Valuation:  Opportunities and Risks*  at the KIP-INCA Workshop, 25-26 April 2016, Brussels, Belgium.

ten Brink P.  *Natural Capital Accounting & Realistic Policy Utility* - workshop session organisation at the ESP, 22 September 2016, Antwerp, Belgium

ten Brink P.  *What are natural capital accounts and who is supporting their development?* - presentation at the ESP, 22 September 2016, Antwerp, Belgium

P. ten Brink. *Nature and its role in the transition to a Green Economy*.  Lecture  to the  MSc Environmental Change and Management, Oxford University. Brussels course visit, organised by the Environmental Change Institute of the University of Oxford. 17 March 2017, Brussels.

ten Brink P.  *Synthesis: Ecosystem Services Policy and Governance*  - a  summary of chapter in D3.7 by: Torsten Krause, Lennart Olsson, and Patrick ten Brink – at the OPERAS project meeting, 17 May 2017, Sofia, Bulgaria.

Van Teeffelen, A. A. Bayer, S. Lautenbach (2016) session organization Ecosystem services trade-offs workshop: synthesis and implications for knowledge production and uptake, Ecosystem Service Partnership conference, Antwerp, 19.-23.09.2016

Van Teeffelen, A. A. Bayer, S. Lautenbach, P. Verburg  (2016) The plethora of ecosystem services trade-off research: trade-offs between what? Ecosystem Service Partnership conference, Antwerp, 19.-23.09.2016.

Van Teeffelen, A. (2016) Biophysical and socio-cultural perspectives on ecosystem services and their relevance to European policy. Invited talk at Monte Verità conference *Global Change and Biodiversity: Integrating Mechanisms of Interactions, Feedbacks and Scale.* URPP Global Change and Biodiversity, University of Zürich.

Verhagen, W. A. Kukkala, A. Moilanen, A. Van Teeffelen, P Verburg (2016). Priority areas for ecosystem services in the European Union. Consortium meeting, Barcelona, June 2016.

Verhagen, W. A. Van Teeffelen, P Verburg (2017). Identifying priority areas for ecosystem services under land use change. Consortium meeting, Sofia, 16-19 May 2017.

Volk, M. (2016) Analyzing trade-offs between land use, ecosystem services and biodiversity - How far are we and what is used in practice? , Ecosystem Service Partnership conference, Antwerp, 19.-23.09.2016

**WP4**

Brunner, SH, Grêt-Regamey, A. 2016 Resilience of mountains to provide desired ecosystem services. ESP conference, Antwerp, Belgium, September 2016.

ESP-conference session at European Ecosystem Services Conference, 19-23 September 2016, Belgium:
        Key note presentation to C8 session "Guidance for users on ES": Marc Metzger and Diana Tuomasjukka, with Claire Brown, George Cojocaru, Ben Delbaere, Eeva Furman, Paula Harrison, Paul Mahoney, Marta Perez Soba, Mark Rounsevell, Adrian Smith, Marcus Lindner, James Paterson "Understanding user needs and guiding users in Oppla", 22/9/2016; https://www.aanmelder.nl/i/doc/9805311b5d1954e8e70284dd79090c1e?forcedownload=True
        Session host: C8: Diana Tuomasjukka and Paula Harrison: "Guidance for users on Ecosystem Services", 22/9/2016; https://www.aanmelder.nl/i/doc/9805311b5d1954e8e70284dd79090c1e?forcedownload=True

M. Ivanov, WeLCA - Wine Ecosystem Life-Cycle Assessment – presentation within OPPLA's launching at European Ecosystem Services Conference, 19-23 September 2016, Belgium

Invited speaker, Marianne Kettunen (ecosystem services and green economy), International Symposium on Northern Development, 25-27 February 2015, Québec City, Canada (https://www.slideshare.net/mkettunen/ecosystem-services-and-natural-capital-the-foundation-of-a-green-economy)

Invited speaker / organiser, Marianne Kettunen, Socio-economic assessment of marine protected areas (MPAs) - the How and the Why, International Marine Conservation Congress (IMCC3), Glasgow, Scotland, 18 August 2014,

Session host and speaker: Organisation of a session in the European Ecosystem Services Conference (www.esconference2016.eu), in Antwerp, Belgium, 19-23 September 2016. The parallel session was called "Natural Capital Accounting and Realistic Policy Utility" and was organised and chaired by Patrick ten Brink (IEEP), supported by Rob Tinch (Iodine), with support by Daniela Russi (IEEP) in the preparation. Patrick presented there:  ten Brink P. *What are natural*

*capital accounts and who is supporting their development?* 22 September 2016, Antwerp, Belgium. Details as follow:

Invited speaker, Patrick ten Brink . *Making Ecosystem Capital Accounts (ECA) policy relevant – opportunities and challenges* at the OpenNESS - OPERAs- European Commission Policy Day, 1 March 2016, Brussels, Belgium.

Invited speaker, Patrick ten Brink. *Ecosystem Accounts and Valuation: Opportunities and Risks* at the KIP-INCA Workshop, 25-26 April 2016, Brussels, Belgium.
Invited lecturer, Patrick ten Brink, **Nature and its role in the transition to a Green Economy.** Lecture  to the  MSc Environmental Change and Management, Oxford University. Brussels course visit, organised by the Environmental Change Institute of the University of Oxford. 17 March 2017, Brussels.      https://www.slideshare.net/Patricktenbrink/ptb-of-ieep-on-nature-and-green-economy-operas-to-oxford-univ-masters-17-march-2017

Invited lecturer, Patrick ten Brink, **Nature and its role in the transition to a Green Economy.** Lecture  to the  MSc Environmental Change and Management, Oxford University. Brussels course visit, organised by the Environmental Change Institute of the University of Oxford. 18 March 2016, Brussels.

Vaissière A.C., Tardieu L., Quétier F., Roussel S. (2016). « Farmers' preferences on implementing biodiversity offsets on arable lands: A choice experiment study », 3rd French Association of Environmental and Resources Economics (FAERE) Annual Conference, 8–9 Septembre 2016, Bordeaux, France.

Vaissière A.C., Tardieu L., Quétier F., Roussel S. (2016). « Farmers' preferences on implementing biodiversity offsets on arable lands », EcoSummit 2016 - Ecological Sustainability: Engineering Change, 29 August – 1st September 2016, Montpellier, France.

Quétier F. & Vaissière A.C. (2016). Innovative methods and organizational approaches for improved implementation of the French No Net Loss policy, EcoSummit 2016 - Ecological Sustainability: Engineering Change, 29 August – 1st September 2016, Montpellier, France.

Vaissière A.C., Bierry A., Quétier F. (2017). « Une approche cartographique et expert pour modéliser la prise en compte de la compensation écologique des impacts engendrés par le développement territorial », Colloque Eviter Réduire Compenser les impacts des aménagements sur la biodiversité du LabEx CeMEB, 31 March 2017, Montpellier, France.

Vaissière A.C., Tardieu L., Quétier F., Roussel S.  (2017). « Analyse des préférences des agriculteurs pour la compensation écologique », Colloque Eviter Réduire Compenser les impacts des aménagements sur la biodiversité du LabEx CeMEB, 31 March 2017, Montpellier, France.

Vaissière A.C., Tardieu L., Quétier F., Roussel S. (2017). « Biodiversity offsets on agricultural lands ? Preferences of farmers from Picardy using the choice experiment method », Séminaire du LAMETA, 6 January 2017, Montpellier, France.

Vaissière A.C., Tardieu L., Quétier F., Roussel S. (2016). « La compensation écologique sur les terres agricoles ? Perceptions des agriculteurs picards », Colloque de réflexion sur la séquence ERC, quelles réponses des territoires, Chambre d'Agriculture de l'Oise, 6 December 2016, Compiègne, France.

Vaissière A.C., Tardieu L., Quétier F., Roussel S. (2016). « La compensation écologique sur les terres agricoles ? Les préférences des agriculteurs picards par l'expérience des choix », Séminaire du LEF, 1st December 2016, Nancy, France.

Vaissière A.C., Bierry A., Quétier F. (2016). « Approche cartographique et experte de la compensation écologique du développement territorial, Atelier sur l'évaluation environnementale dans l'espace : territoire, planification et articulation des échelles », Premier séminaire national d'AgroParisTech sur les démarches d'évaluation environnementale « L'évaluation environnementale au-delà des procédures – Regards croisés sur les démarches de prise en compte de l'environnement pour améliorer la qualité des projets et des décisions », 5–6 September 2016, Paris, France.

## Posters

### WP2

Correia, O., Branquinho, C., Costa, C., Cruz, C., Gonçalves, P., Máguas, C., Mendes, T; Pinho, P., Príncipe, A., Rebelo, R., Rosário, I., Santos, J.P., & Santos-Reis, M. Long term monitoring of mediterranean agro-silvo-pastoral systems: the LtsER Montado Platform. World Congress Silvo-Pastoral Systems, Évora, Portugal, 27-30 September 2016.

García-Nieto, A.P., Geijzendorffer, I., Bondeau, A., & Cramer, W. 2016. Beyond land cover: Farming systems typology to assess ecosystem services from Mediterranean agro-ecosystems. 23ème Congrès des Doctorants en "Sciences de l'Environnement", OCEANOMED, Bâtiment Méditerranée, Campus de Luminy, Marseille, France, 27-28 April, 2016.

Joyce, D, Bullock, C., & Collier, M.J. 2016. Socio-Cultural Valuation of ES/NC. European Ecosystem Services Conference, Antwerp, Belgium, 19-23 September 2016.

Lee, H., Seo, B., Koellner, T., & Lautenbach, S., Machine-learning-based tagging of crowdsourced image for quantifying cultural ecosystem services – a case study in Saxony, Germany. European Ecosystem Services Conference, Antwerp, Belgium, 19-23 2016.

Liski, A., Metzger, M., & Wilson M. Impacts of deliberation on ecosystem service values in the Inner Forth, Scotland. University of Edinburgh Graduate School Conference, Gartmorn Lodge, Scotland, 29 January 2016.

Liski, A., Metzger, M., & Wilson M. Impacts of deliberation on ecosystem service values in the Inner Forth, Scotland. University of Edinburgh School of Geosciences Postgraduate Research Conference, Pollock Halls, Scotland, 4 May 2016.

Locatelli, B. 2016. Evaluación y modelación de servicios ecosistémicos en la cuenca del río Mariño, Apurímac, Perú: Un proyecto de investigación del CIFOR. Poster presented at the

Research Forum on Andean Forest Landscape Management, Abancay, Apurímac, Peru, 15 November 2016.

Locatelli, B., Valdivia, M., & Vallet, A. 2016. Mapear servicios ecosistémicos culturales con datos de Internet en la cuenca del Mariño, Apurímac, Perú. Poster presented at the Research Forum on Andean Forest Landscape Management, Abancay, Apurímac, Peru, 15 November 2016.

Marbà, N., Ruiz-Frau, A., Santana-Garcon, J., Mazarrasa, I., Hendriks, I.E., Tinch, R., Schoumacher, C., Gelcich, S., & Duarte, C.M. Co-beneficiary management of seagrass ecosystems for Blue Carbon in the Balearic Islands, Spain. European Ecosystem Services Conference, Antwerp, Belgium, 19-23 September 2016.

Vallet, A., Valdivia, M., & Locatelli B. 2016. Contribución de las plantas medicinales al bienestar humano en la cuenca del Mariño, Apurímac, Perú. Poster presented at the Research Forum on Andean Forest Landscape Management, Abancay, Apurímac, Peru, 15 November 2016.

Vallet, A., Locatelli, B., Levrel, H., & Dendoncker N. 2016. Interacciones entre actores y servicios ecosistémicos en la cuenca del Mariño, Perú: Redes y poder. Poster presented at the Research Forum on Andean Forest Landscape Management, Abancay, Apurímac, Peru, 15 November 2016.

Valdivia, M., Locatelli, B., & Vallet A. 2016. Análisis de percepciones de servicios ecosistémicos culturales en la cuenca del Mariño, Apurímac, Perú. Poster presented at the Research Forum on Andean Forest Landscape Management, Abancay, Apurímac, Peru, 15 November 2016.

Walz, A., Schmidt, K., Makan, N., & Metzger, M. 2016. Ecosystem services for operational use in land management. 2nd German Future Earth Summit, Berlin, Germany, 28-29 January 2016.

**Walz, A.**, Schmidt, K., Sachse, R., & Ruhrländer, P. 2016. LANDPREF: A visual trade-off tool to assess landscape preferences. European Ecosystem Services Partnership Conference, Antwerp, Belgium, 19-23 Sept 2016.

**WP3**

Schmidt, K., A. Walz, B. Martin-Lopéz and R. Sachse. 2017. Testing socio-cultural valuation methods of ecosystem services to explain land use preferences. Poster. ESCom 4th Annual Conference 'Understanding and assessing shared and cultural values of ecosystem services', 24 April 2017. Edinburgh, Scotland.

Walz, A., K. Schmidt, R. Sachse and P. Ruhrländer. 2016. LANDPREF: A visual trade-off tool to assess landscape preferences. ESP Conference on "Helping Nature to Help Us", 19-23 Sept 2016, Antwerp, Belgium.

**WP4**

## Journal Papers published

**WP2**

Bertrand, N. & Bierry, A. Editors. 2016. Gestion intégrée des territoires et des écosystèmes - Vers une compréhension des trajectoires futures de l'usage des sols, leurs conséquences pour la biodiversité et les services écosystémiques. *Sciences, Eaux & Territoires,* 21. http://www.set-revue.fr/gestion-integree-des-territoires-et-des-ecosystemes

Bierry, A. & Lavorel, S. 2016. Implication des parties prenantes d'un projet de territoire dans l'élaboration d'une recherche à visée opérationnelle. *Sciences, Eaux & Territoires,* 21. http://www.set-revue.fr/sites/default/files/articles/pdf/set-revue-gestion-territoires-recherche-implication-acteurs.pdf

Brunner, S.H., Grêt-Regamey, A., & Huber, R. 2017. Mapping uncertainties in the future provision of ecosystem services in a mountain region in Switzerland. *Regional Environmental Change*. doi:10.1007/s10113-017-1118-4

Brunner, S.H., & Grêt-Regamey, A. 2016. Policy strategies to foster the resilience of mountain social-ecological systems under uncertain global change. *Environmental Science & Policy*, 66:129-139. doi: 10.1016/j.envsci.2016.09.003

Canedoli, C., Bullock, C., Collier, M.J., Joyce, D. & Padoa-Schioppa, E. 2017. Public Participatory Mapping of Cultural Ecosystem Services: Citizen Perception and Park Management in the Parco Nord of Milan (Italy). *Sustainability,* 9, 891. doi:10.3390/su9060891

Collen, A.W., Krause, T. Mundaca, L. and Nicholas, K.A. 2016. Building local institutions for national conservation programs: Lessons for developing Reducing Emissions from Deforestation and forest Degradation (REDD+) programs. *Ecology and Society* 21(2):4. https://www.ecologyandsociety.org/vol21/iss2/art4/

Cramer, W. 2016. Impacts on terrestrial biodiversity and ecosystems. In: Thiébault S et al. (eds.) *The Mediterranean Region under Climate Change - A Scientific Update*. IRD Editions, Marseille, pp 335-386, ISBN 978-2-7099-2219-7.

Fader, M., Shi, S., Von Bloh, W., Bondeau, A., & Cramer, W. 2016. Mediterranean irrigation under climate change: more efficient irrigation needed to compensate increases in irrigation water requirements. *Hydrol Earth Syst Sci* 20:953-973, doi: 10.5194/hess-20-953-2016

Geijzendorffer, I.R., Cohen-Shacham, E., Cord, A.F., Cramer, W., Guerra, C., & Martín-López, B. 2017. Ecosystem services in global sustainability policies. *Env Sciences & Policy* 74:40-48, doi: 10.1016/j.envsci.2017.04.017

Guiot, J., & Cramer, W. 2016. The Mediterranean Basin, climate change and our common future. Engaging future research efforts to support policy. In : Thiébault S et al. (eds.) *The Mediterranean Region under Climate Change - A Scientific Update*. IRD Editions, Marseille, pp 661-664, ISBN 978-2-7099-2219-7 (also in French : Le bassin méditerranéen, le changement climatique et notre avenir commun. Lancer de nouvelles initiatives de recherche pour guider les décisions politiques futures. In: Thiébault S et al. (eds.) *The Mediterranean Region under Climate Change - A Scientific Update*. IRD Editions, Marseille, pp 665-669, ISBN 978-2-7099-2219-7).

Guiot, J., & Cramer, W. 2016. Climate change: The 2015 Paris Agreement thresholds and Mediterranean basin ecosystems. *Science* 354(6311):465-468, doi: 10.1126/science.aah5015

Hermelingmeier, V. & Nicholas, K.A. 2017. Identifying five different perspectives on the ecosystem services concept using Q-methodology. *Ecological Economics*, 136: 255-265. http://www.sciencedirect.com/science/article/pii/S0921800915304006

Hernes M.I., Metzger M.J. (2017) Understanding local community's values, worldviews and perceptions in the Galloway and Southern Ayrshire Biosphere Reserve, Scotland. *Journal of Environmental Management* 186: 12-23.

Huber, R., Snell, R., Monin, F., Brunner, S.H., Schmatz, D.R., & Finger, R. 2017. Interaction effects of targeted agri-environmental payments on non-marketed goods and services under climate change in a mountain region. *Land Use Policy*, in press.

Kongsager, R., Locatelli, B., & Chazarin, F. 2016. Addressing climate change mitigation and adaptation together: A global assessment of agriculture and forestry projects. *Environmental Management* 57(2): 271-282. http://dx.doi.org/10.1007/s00267-015-0605-y

Lavorel, S., Bierry, A., & Crouzat, E. 2016. Gestion intégrée des territoires par une approche par les réseaux de services. *Sciences, Eaux & Territoires,* 21. http://www.set-revue.fr/sites/default/files/articles/pdf/set-revue-gestion-territoires-reseaux-services_0.pdf

Lavorel, S., Bayer, A., Bondeau, A., Lautenbach, S., Ruiz-Frau, A., Schulp, C.J.E., Seppelt, R., Verburg, P., Teeffelen, A., Vannier, C., Arneth, A., Cramer, W., & Marbà, N. 2016. Pathways to bridge the biophysical realism gap in ecosystem services mapping approaches. Ecological Indicators 74, 241-260. https://doi.org/10.1016/j.ecolind.2016.11.015

Lee, H., & Lautenbach, S. 2016. A quantitative review of relationships between ecosystem services. *Ecological Indicators*, 66, 340-351. https://doi.org/10.1016/j.ecolind.2016.02.004

Locatelli, B., Vallet, A., Fedele, G., & Rapidel B. 2017. Analyser des services écosystémiques pour gérer des territoires. In: Des territoires vivants pour transformer le monde, Caron P., Valette E., Wassenaar T., Coppens d'Eeckenbrugge G., Papazian V. (eds.), Cirad-Quae.

Locatelli B. 2016. Ecosystem Services and Climate Change. In: Potschin M, Haines-Young R, Fish R, Turner RK. (eds) *Routledge Handbook of Ecosystem Services*. Routledge, London and New York, pp. 481-490. ISBN 978-1-138-02508-0 https://www.routledge.com/products/9781138025080

Longaretti, P.-Y., Vannier, C., Lasseur, R., & Lavorel, S. 2016. La modélisation des changements d'usage et de couverture des sols comme outil d'aide à la planification territoriale. *Sciences, Eaux & Territoires,* 21, http://www.set-revue.fr/sites/default/files/articles/pdf/set-revue-occupation-sols-gestion-territoire.pdf

Malek, Ž., & Verburg, P. Mediterranean land systems: Representing diversity and intensity of complex land systems in a dynamic region. *Landsc. Urban Plan.*, vol. 165, no. April 2016, pp. 102–116, 2017. doi.org/10.1016/j.landurbplan.2017.05.012

Martín-López, B., Oteros-Rozas, E., Cohen-Shacham, E., Santos-Martín, F., Nieto-Romero, M., Carvalho-Santos, C., González, J.A., García-Llorente, M., Klass, K., Geijzendorffer, I., Montes, C., & Cramer, W. 2016. Ecosystem services supplied by Mediterranean Basin ecosystems. In: Potschin M, Haines-Young R, Fish R, Turner RK. (eds) *Routledge Handbook of Ecosystem Services*. Routledge, London and New York, pp. 405-414. ISBN: 978-1-138-02508-0.

Mazarrasa, I., Marbà, N., Garcia-Orellana, J., Masqué, P., Arias-Ortiz, A., & Duarte, C.M. Dynamics of carbon sources supporting burial in seagrass sediments under increasing

anthropogenic pressure. *Limnology and Oceanography*. In Press. First published on-line 15th March 2017. doi:10.1002/lno.10509. http://onlinelibrary.wiley.com/doi/10.1002/lno.10509/full

Mazarrasa, I., Marbà, N., Garcia-Orellana, J., Masqué, P., Arias-Ortiz, A., & Duarte, C.M. Effect of environmental factors (wave exposure and depth) and anthropogenic pressure in the C sink capacity of Posidonia oceanica meadows. *Limnology and Oceanography*. In press. First published on-line 20 March 2017. doi:10.1002/lno.10510. http://onlinelibrary.wiley.com/doi/10.1002/lno.10510/full

Mupepele, A.C., & Dormann, C.F. 2016. Influence of Forest Harvest on Nitrate Concentration in Temperate Streams—A Meta-Analysis. *Forests*, 8(1), 5. doi:10.3390/f8010005

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Pedrono, M., Locatelli, B., Ezzine de Blas, D., Pesche, D., Morand, S., & Binot, A. 2016. Impact of Climate Change on Ecosystem Services. In: Climate Change and Agriculture Worldwide. Torquebiau E. (ed.). Springer and Quae, Dordrecht NL and Montpellier FR, pp.251-261. ISBN 978-94-017-7460-4. http://dx.doi.org/10.1007/978-94-017-7462-8_19

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Scholte, S.S.K., Todorova, M., van Teeffelen, A.J.A., & Verburg, P.H. 2016. Public support for wetland restoration: What is the link with ecosystem service values? *Wetlands* 36(3): 467–481. http://dx.doi.org/10.1007/s13157-016-0755-6

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## Peer-reviewed Journal Papers submitted

**WP2**

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**WP3**

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**WP4**

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Claret C., Metzger M.J., ten Brink P., Kettunen M. (submitted):  Understanding the integration of ecosystem services and natural capital in Scotland

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## Book Chapters

**WP2**

**WP3**

**WP4**

## Other

**WP2**

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**WP5**

Oppla launched at the European Ecosystem Services Conference in Antwerp, October 2016. The launch was supported by a series of day long events including showcasing aspects of the content and encouraging people to join the community

Table 7 Work Package Person Months per Partner

| | PARTICIPANT NAME | WP1 PROJECT MANAGEMENT PERSON MONTHS | | WP2 PRACTICE PERSON MONTHS | | WP3 KNOWLEDGE PERSON MONTHS | | WP4 INSTRUMENTS PERSON MONTHS | | WP5 RESOURCE HUB PERSON MONTHS | | WP6 OUTREACH & DISSEMINATION PERSON MONTHS | | FOURTH PERIOD Participant total |
| | | FOURTH PERIOD | PROJECT TOTAL | FOURTH PERIOD | PROJECT TOTAL | FOURTH PERIOD | PROJECT TOTAL | FOURTH PERIOD | PROJECT TOTAL | FOURTH PERIOD | PROJECT TOTAL | FOURTH PERIOD | PROJECT TOTAL | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | UEDIN | | 44.00 | | 41.00 | | | | 21.00 | | 15.00 | | 12.00 | |
| 2 | VU-IVM | | 4.00 | | 15.00 | | 62.00 | | 6.00 | | | | | |
| 3 | KIT | | 4.00 | | 9.00 | | 44.00 | | | | | | | |
| 4 | UFZ | | | | 10.00 | | 6.00 | | | | 2.00 | | | |
| 5 | ULUND | | 4.00 | | 15.00 | | 14.00 | | 20.00 | | 5.00 | | 4.00 | |
| 6 | EFI | | 4.00 | | | | | | 53.00 | | 5.00 | | | |
| 7 | PROSPEX | | | | | | | | | | 20.00 | | | |
| 8 | WCMC | | 4.00 | | | | | | 23.00 | | 12.00 | | 12.00 | |
| 9 | TIAMASG | | | | | | | | 16.00 | | 25.00 | | 12.00 | |
| 10 | IEEP | | | | | | 21.00 | | 24.00 | | 3.00 | | | |
| 11 | UCD | | | | 9.00 | | 27.00 | | 3.00 | | | | | |
| 12 | CNRS | | | | 32.00 | | 34.00 | | | | | | 9.00 | |
| 13 | UP | | 1.00 | | 33.00 | | 11.00 | | 6.00 | | | | | |
| 14 | ETH | | | | 5.00 | | 9.00 | | 38.00 | | | | 5.00 | |
| 15 | WWF Bulgaria | | | | 15.00 | | 5.00 | | 14.00 | | | | 10.00 | |
| 16 | WWF Romania | | | | 5.00 | | | | | | | | 3.00 | |
| 17 | SGM | | | | 12.00 | | | | | | | | | |
| 18 | FFCUL | | | | 12.00 | | | | | | | | | |
| 19 | ECM | | | | | | | | 6.00 | | 7.00 | | | |
| 20 | BIOTOPE | | | | | | | | 29.00 | | | | | |
| 21 | IODINE | | | | | | | | 10.00 | | | | | |
| 22 | DENKSTATT | | | | 2.00 | | | | 24.00 | | 3.00 | | | |
| 23 | CIFOR | | | | 10.00 | | | | 3.00 | | 2.00 | | | |
| 24 | CSIC | | | | 13.00 | | 6.00 | | | | | | | |
| 25 | UEA | | | | | | 12.00 | | | | | | | |
| 26 | ALU | | | | 14.00 | | | | 6.00 | | 3.00 | | | |
| 27 | UBO | | | | 20.00 | | 6.00 | | 6.00 | | 3.00 | | | |
| | Total Months | | 65 | | 272.00 | | 257.00 | | 308.00 | | 105.00 | | 67.00 | |