



Knowledge needs for the operationalization of the concept of ecosystem services (ES) and natural capital (NC)

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Executive Summary

- This study assesses the knowledge needed to operationalise the concept of ecosystem services and natural capital across different contexts from a stakeholder perspective.
- In this study stakeholders involve researchers as well as those engaged with the project from practitioner and policy based communities.
- The cascade model developed in WP1 provides a useful entry point to begin to examine knowledge needs in the OpenNESS project. This helped stakeholders to begin to articulate their knowledge needs.
- Knowledge can be defined in different ways, more narrowly knowledge can be defined as a product or more broadly knowledge can be viewed as a process. This later, broader perspective is the one taken in this study.
- Data for this study was collected from nine case studies covering a range of different contexts. Focus group discussions with a group of case study stakeholders and/ or interviews with members of the case study coordinating teams were used to collect data. Data was also collected from two focus group discussions with EU level stakeholders. Data analysis followed an inductive, grounded theory approach which does not rely on predefined categories to organise the data.
- The findings highlight a number of knowledge need categories. These included methods, tools and their outputs, understanding and communication the concept of ecosystem services, the need for structuring and organising to facilitate action, and the need to bring knowledge and action closer together.
- The need for methods, tools and outputs was highlighted for the assessment and valuation of ecosystem services. Specifically, this involves the need to examine and integrate cultural and regulating services from different spatial scales. Furthermore, the need for clear methods to examine non-monetary value was also highlighted, for example to assess wider social values across a large geographic area.
- Another important knowledge need identified by the stakeholders involved integrating other knowledge types, for example local knowledge based on the practices and experiences of stakeholders on the ground.
- Furthermore the need to include different people and their knowledge was highlighted, particularly relating to the need to include local stakeholders, for example local people and businesses alongside the government and research stakeholders already engaged in the case advisory boards (CAB).
- Creating more multi-stakeholder processes and involving the full range of stakeholders from the start as collaborators was identified as useful to develop more relevant and therefore useful knowledge flowing out of the case study to help bridge the gap between knowledge generation, decision making and action on the ground.
- To help facilitate a better link between people, knowledge and action the need for a common understanding about the concept of ecosystem services, focusing on meaning and retaining the core principles within the concept, was identified. Effective two-way communication was identified

as important to help achieve this, but the need to translate the ecosystem services concept to better align with the terms in use by stakeholders was also emphasised.

- Policy frameworks, organisational structures and processes were also identified as important to help shape action on the ground. This included strengthening policy frameworks but also understanding existing policies. Furthermore, the need to overcome structural and cultural barriers to develop more open processes and integrated ways of planning and delivering action on the ground was also identified. However, the need to also facilitate and learn from bottom up action and exchange knowledge across contexts more easily was also emphasised.

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Background

In the OpenNESS project the overall objective for WP2 is to examine how existing and forthcoming EU regulatory frameworks can enhance or restore the benefits derived from ES and NC using multi-scale scenario approaches. Within WP2 four objectives are identified. As stated in the Description of Work (DoW) one of these objectives (Task 2.2) addresses the need within OpenNESS to “*assess the knowledge needed to take ES into account in legal, political and administrative contexts through testing how the WP1 conceptual framework on governance of ES can be applied in policy-making at different governance levels*”. In this report we examine knowledge needs for the operationalisation of the concepts ecosystem services (ES) and natural capital (NC) from the perspective of those involved either directly or indirectly in the OpenNESS project. We start by introducing the context to this task, explaining the methods used to collect and analyse the data, before presenting the findings, followed by a discussion and conclusions from this study to inform progress towards improved operationalisation of the concept of ecosystem services (ES) in both policy and practice.

Introduction

Environmental challenges and their management are increasingly recognised as complex and uncertain. As our understanding of these issues increases so does our awareness of the gaps in our knowledge and need to increase societies’ capacity to manage these issues effectively (van Kerkhoff and Lebel, 2015, Pahl-Wostl, 2009). This has highlighted the importance of understanding social and institutional processes, the interactions between governance levels, policy sectors and the need to recognise a broader range of stakeholder groups, their goals and values (Wyborn, 2014, Carmen et al., 2015). It is within this backdrop that the concept of ecosystem services, which presents a more integrated systematic view coupling social and ecological components into one system, emerged from within scientific communities and is gaining influence within policy communities (Carpenter et al., 2009). To better understand how this concept can be turned into practice it is important to examine knowledge needs from the perspective of the different social actors directly engaged with the operationalisation of ecosystem systems.

Knowledge however is not easy to define (Nutley et al., 2007) although it is widely acknowledged that knowledge extends beyond science to other types of knowledge (Adams and Sandbrook, 2013). Different categorisations of knowledge have been used. This includes distinguishing between traditional ecological knowledge and scientific knowledge (Berkes et al., 2000). Nutley et al (2007) highlight distinctions made between empirical knowledge, which is often the most explicit and based on quantitative or qualitative research, theoretical knowledge which relies on theoretical frameworks for thinking about problems either informed by research but more often than not based on intuition and informal approaches, and finally experimental knowledge based on practical or tacit knowledge built up over a number of years and more challenging to articulate. Vink et al. (2013) distinguish between organized knowledge and unorganized knowledge. Organised knowledge being characterised as involving a formal knowledge involving a wide consensus and therefore stability of understanding often crystallized in written or modelled form. Unorganised knowledge is characterised as involving puzzlement whilst moving towards wider agreement through interactive processes involving deliberation, learning and sharing. Failing et al. (2007) distinguish between fact-based claims and value based claims, the later referring to descriptive claims about the way

the world is or might be and the latter referring to normative claims about how things should be. It is however commonly agreed that knowledge is socially constructed and value laden (Adams and Sandbrook, 2013) and cannot be separated from its social and political context (Hannigan, 1995). This close connection to local contexts and practices on the ground is particularly evident in definitions of local knowledge, as its name suggest. Conversely others focus on the flow of knowledge (Fazey et al., 2014). For example, through interactions between science, policy and practitioner based communities (Waylen and Young, 2014). Or more broadly as a dynamic process, involving the coming together of people and practice relating to different social groups to co-produce usable knowledge and facilitate change (van Kerkhoff and Lebel, 2015, Rosendahl et al., 2015). Thus, from this narrower perspective of knowledge is a known, tangible product, often linked to a linear, positivist view of knowledge ready to be transfer into decision making processes (Fazey et al., 2014). However, the broader perspective of knowledge as a process of coproduction recognises the lack of any clear boundary between ‘science’ and ‘policy’ and ‘experts’ and ‘users’ with a focus on meaningful interactions between multiple stakeholders with multiple ways of knowing to share, discuss and learn together (Wyborn, 2015, Lejano and Ingram, 2009). This process-based perspective more readily recognises the not only known unknowns, but also unknown unknowns (Pawson et al., 2011). Often however coproduction is an ideal, and in reality stakeholders may be engaged in the process but their knowledge may not be perceived as equally valid within a hierarchy of knowledge which prioritises specific knowledge types. This hierarchy is often evident within scientific processes between qualitative and quantitative data (Adams and Sandbrook, 2013). This highlights the importance of factors which facilitate or hinder the development of more inclusive knowledge processes and interactions across scales. Specifically, this involves the need to explicitly recognise the role of power in shaping practices and institutions in visible but also more hidden ways (Lukes, 2005, Fazey et al., 2012, Wyborn, 2015).

Current literature relating to trans-disciplinary research processes and science-policy interface processes (Rosendahl et al., 2015, Carmen et al., 2015 (in press)) highlight the advantages of taking a broader view of knowledge as a process, rather than a more context specific product, involving broader types of knowledge and a wider range of stakeholder groups to produce more relevant outputs and outcomes (Cash et al., 2003), including new ideas, tools and method to better inform decision making and support practical action. This is the interpretation of knowledge we adopt in this report.

Methods and Materials

To examine knowledge needs to operationalise the concept of ecosystem service (ES) and natural capital (NC) a qualitative semi structured strategy was used to provide a depth of understanding of knowledge needs from the perspective of people engaged in the OpenNESS project enabling them to provide contextual accounts of knowledge needs and gaps (Mason 2002). The advantage of such an approach is the exploration of interviewees’ perspectives and feelings on topics which matter to them (Arkesy & Knight, 1999). This involved a combination of methods used across different contexts and stakeholder groups. Participation in this study by stakeholders was voluntary and included EU level stakeholders as well as stakeholders from across other levels of governance directly engaged with OpenNESS in the case studies through WP5. Stakeholders with a main focus on agriculture, water, planning, and biodiversity sectors and from across governance levels participated in this study. The EU level stakeholders were invited to a workshop in Brussels in January 2014, which also incorporated other activities related to WP2, for example

discussions to identify and explore policy frameworks (task 2.1). At the project meeting in Loch Leven in September 2013 the aims and objectives of this study (task 2.2) were explained to the cases studies and 16 case study coordinators (from a total of 27) completed a brief questionnaire outlining the context of their case and expressing their willingness to examine knowledge needs in their case in more depth. This questionnaire data provides a general overview of all the different aspects covered in each of the case studies and highlight that a wide range of different contexts have been included in this study with the only notable omission being coastal and marine socio-ecological systems (see table 1). Finally, nine case studies worked with the study team to collect data for this study.

Table 1: Reported context of the participating case studies

		Case study									
		1	2	4	8	9	14	15	16	24	
Context	Legal	✓	✓		✓				✓		
	Administrative	✓	✓	✓	✓			✓			
	Political	✓			✓						
	Planning	✓				✓	✓				
Governance level	EU				✓		✓	✓	✓	✓	
	National				✓		✓	✓	✓		
	Regional		✓	✓	✓	✓	✓	✓			
	Local	✓	✓	✓		✓	✓		✓		
Policy sector	Agriculture		✓		✓	✓	✓			✓	
	Forestry		✓		✓	✓	✓			✓	
	Freshwater						✓	✓	✓		
	Urban	✓	✓	✓			✓	✓			
	Protected area					✓	✓		✓	✓	
	Wildlife					✓			✓	✓	
	Coastal										
	Bio-energy				✓						
Policy cycle stage	Formulation			✓			✓				
	Design	✓	✓	✓			✓				
	Implementation	✓	✓		✓	✓	✓	✓	✓		
	Monitoring								✓		
	Evaluation								✓		
	Reporting								✓		
Conditions	Socio-economic	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Biophysical	✓	✓	✓	✓	✓		✓	✓	✓	

The main data collection methods used was the focus group methodology and semi structured interviewing to collect in depth accounts of knowledge needs in each of the nine case studies (see table 2).

Table 2: Data collection context and methods used to examine knowledge needs

Data collection context	Data collection	Date	Code
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		methods		
	EU Level stakeholders from different EC Directorates Generals (DG), EU agencies and NGO's	Two parallel focus groups	January 2014	EU01, EU02
Participating WP5 case studies				
1	Sustainable Urban Planning Finland	Focus groups and interview	February 2015	CS01
2	Landscape ecological planning in urban and peri-urban areas Slovakia	Interview	February 2015	CS02
4	Urban planning Spain	Interview	February 2015	CS03
8	Bio-energy production in forest and farmland Germany	Interview	February 2015	CS04
9	Cairngorms national park management, Scotland	Focus group	October 2014	CS05
14	Green infrastructure Netherlands, Belgium and UK	Interview	January 2015	CS06
15	Wetland construction and restoration Italy	Focus group report and interview	January 2015	CS07
16	Loch Leven management Scotland	Focus group	September 2014	CS08
24	Sustainable land management in forest and adjacent community Kenya	Focus group and interview	March 2015	CS09

Focus group discussions were used to gather data with EU level stakeholders from representatives from different European Commission Directorate Generals (DGs), EU agencies and NGOs. This methodology was also used to collect data from six of the nine case studies participating in this study. Semi structured interviews were used in combination with focus groups in three of these six case studies. This combination enabled data on knowledge needs to be gathered in case studies involving stakeholder groups who spoke a language other than English. Specifically, this involved case study coordinators conducting the focus group discussion in the native language of the stakeholders following which semi structured interviews were conducted with members of focus group facilitation team to explore the issues identified by within the focus group discussion and identify any additional knowledge needs from the perspective of the case study team. In a further three case studies semi structured interviews with case study coordinator team members were used to collect data when it was not possible to bring together a group of stakeholders, which is an essential requirement for the focus group methodology (Morgan 1996).

The focus group methodology involves a facilitator actively stimulating discussions within a group on a predefined topic (Morgan, 1996). Thus, group interaction is a key feature which distinguishes focus groups from other qualitative methods (Smithson, 2000). A key advantage of group interaction is that it may provide more depth knowledge by bringing together different perspectives to develop better understanding of a topic by the researcher but also within the stakeholder group (Peek and Fothergill 2009). Focus groups are also helpful to explore converging and diverging attitudes and perceptions (Kitzinger, 1995 and Morgan, 1996) with the advantage that they allow topics to be explored collectively in detail (Bryman, 2004). Interviewing as a method to gather data has the advantage of enabling a predefined topic to be explored in detail, although this is explored individually rather than collectively. The style used in all focus groups and interviews was semi structured with the researcher intervening only to probe responses and uncover more detail. Thus, the researcher surrendered a certain degree of control to the participants to take the discussions in directions which they saw as important (Smithson, 2000). Furthermore, by probing issues raised by participants what may seem at first to be a minor concern may in fact, with follow up questioning, reveal important issues, backed up with clear evidence (Rubin & Ruben, 2005). Focus group and interview guides were developed (see appendix 2 and 3), which set out a clear process for data collection methods across the different situations and different types and numbers of stakeholders in each group. These guides set out beginning the discussion by asking about the use of the cascade model (Potschin and Haines-Young, 2011). This was identified as the conceptual framework for the OpenNESS project as a whole and identifies different components of socio-ecological systems and relationships between them with a focus on ecosystem services. This helped steer the discussion towards the main topic of knowledge needs by focusing first on immediate, clear, knowledge needs which the stakeholders were likely to have already considered in organising existing knowledge into the cascade or similar conceptual frameworks.

As part of the focus group methodology audio recording was often used to ensure accurate and full identification of all issues raised, together with a written record of all issues raised during the discussion by a second member of the case study team. Before all interviews and focus group discussions participant's informed consent was obtained. Anonymity of the participants was maintained during the transcription, analysis and reporting phase of the research. Data transcription was done verbatim and qualitative data analysis was undertaken using a thematic approach, as described by Ryan (2003) following an inductive research strategy (Bryman, 2004). Grounded theory analysis does not rely on a predefined theoretical framework or priori codes, instead requiring the researcher to identify sections of data, developing themes, categorising the data into different, mutually exclusive themes and highlighting links between them from within the data in a transparent process with a clear chain of evidence (Strauss and Corbin, 1990). This requires a high level of familiarisation with the data, and a reflexive, iterative analytical process (Bryman, 2004).

The findings from the two parallel focus group discussions conducted with a total of 20 EU level stakeholders is presented in appendix 1. An additional, confidential appendix report has been developed

outlining the findings from each case study separately¹. This involves the findings from each case study beginning with a summary of the context, followed by the use of the cascade model and finally by the knowledge needs identified. The following section integrates these findings into common themes across the different contexts examined in this study to cluster the findings and move towards a better theoretical understanding of knowledge needs to operationalise the concept of ecosystem services across different contexts (Miles and Huberman, 1994). Finally, potential uses of the findings from this study in other parts of the OpenNESS project are highlighted and conclusions presented.

Integrating findings from across contexts

The data for this study was collected in a wide range of contexts, covering different governance levels, policy sectors, aspects of the policy cycle and focusing on different biophysical and socio-economic conditions. The integration of these findings from across these different contexts highlights some common knowledge needs for the operationalisation of the concept more widely. These includes specific knowledge needs relating to tools, methods and outputs, factors important for organising actions and changing practice and the needs important to facilitate the flow of knowledge more widely and to reduce the gap between knowledge and action necessary to help respond to unknown knowledge needs.

Knowledge needs relating to methods, tools and outputs

The need to develop simple, transparent methods and tools was a common knowledge need identified by stakeholders in this study. Specifically, this was highlighted as important to help assess ecosystem services, conflicts and tradeoffs within and between policy sectors and across temporal and spatial scales to inform a decision making processes across governance levels. This included the need to quantify the supply and demand of ecosystem services, particularly the need for better valuation tools to clearly identify wider values, for example to understand perceptions of different aspects of a landscape, involving a large geographic area and many stakeholders with who face to face interaction is not possible. Although some tools are already in use stakeholders were concerned that it was challenging particularly with limited resources to avoid unrepresentative information. Furthermore EU level stakeholders highlighted the challenge of applying common methodologies across political boundaries to contribute to transnational coordination and decision making.

The need to integrate the full range of ecosystem services across scales was an important knowledge need. The challenge of good methods across scales was a particular concern for valuing cultural ecosystem services. Furthermore, although at a local level cultural services are often a central focus, more often than not this only involves a narrow number of ecosystem services, for example recreation, whilst other less tangible ones may be overlooked despite their local importance, for example education and sacred values.

¹ A second appendix report has also been developed which provides the findings from the case study focus groups. This has been provided to the case study leaders to use in their work. It has not been included in this main report due to issues of confidentiality raised by some of the case study leaders. If the EU project officer would like to see this confidential report this is available from Juliette Young at jyo@ceh.ac.uk.

Whereas the need to better incorporate cultural services at larger scales was identified, at the local level the need to better integrate larger scales and regulatory services, was highlighted, particularly by the researchers involved in the case studies. Furthermore, an identified knowledge need also included the need to examine changes in ecosystem services across temporal scales, involving projections into the future but also historic data to learn from the past within a defined context, however challenges in assessing future wider social values was highlighted as challenging in one case study.

The need for better monitoring, including the development of monitoring indicators was also highlighted as an important need by stakeholders, particularly those working on the ground to implement actions. A key part of this was monitoring which focused on the connection in the system to better understand feedbacks and reduce/ avoid any negative impacts. This included between ecological components but also between ecological and socio-economic components of the system. Mostly this group of needs related to the generation of quantitative data although the need for qualitative data was also recognised, particularly to gather local knowledge from communities. The need to transform this data into quantitative information was also highlighted by stakeholders.

Valuation was often described by case study leaders and stakeholders as linked to costs and economic valuation, however stakeholders highlighted the need to take a wider view of value and emphasised the importance of non monetary valuation methods and outputs. Indeed, local stakeholders identified the importance of economic valuations to influence national decisions makers, but this was explicitly identified as problematic for some stakeholders, as it may overlook intrinsic values or may not reflect the reality on the ground.

Knowledge needs in relation to understanding and communicating the concept of ecosystem services

The need to ensure a common understanding was an important concern highlighted by stakeholders and researchers across the different contexts. This was highlighted as essential, particularly when working with other groups of society, for example with different policy sectors or across levels of governance. An important aspect of this was to ensure that the principles behind the ecosystem service concept, for example the principle of multi-functionality and multiple scales, were not diluted or lost altogether. The need for a common understanding was often linked to the need for better communication. Within this was the need to communicate with different social groups. This included communication and developing a shared understanding between researchers, particularly useful across disciplinary boundaries, for example between ecologists and economists. Case study coordinators highlighted the cascade model as particularly useful in this respect.

The need to better explain the concept of ecosystem services to the stakeholders directly involved in the case studies was also highlighted as a need, and again the cascade model was also highlighted here as a useful tool, particularly with stakeholders from organisations familiar or involved with scientific processes and to provide structure to discussions. However, the case study leaders also highlighted the need for an

adequate amount of time to ensure the stakeholders fully understood the concept. Notwithstanding this, stakeholders in the case studies highlighted the usefulness of the cascade model to change thinking from interest specific to a more integrated perspective, and thus helping communication between stakeholders.

The need for targeted communication was also an important need highlighted across the case studies and by EU level stakeholders. Specifically this related to targeting different needs and contexts, for example spatial information to inform strategic planning develop processes. The importance of framing was a key part of this, which may involve the use of language which differs from the ecosystem service terminology, but retains the principles within it, for example one case study highlighted using ‘landscape services’, at the EU level the need to link the ecosystem services concept with other policy concepts aimed at different sectors was also identified, for example the green infrastructure concept in communication with spatial planners. Furthermore, the need to include positive framing within communication messages was also highlighted, for example highlighting opportunities and synergies and not just focusing on trade offs and negative impacts from action on the ground which can hinder action. Linked to this was the need to translate messages between different groups, for example by involving experts in knowledge brokering or for researchers to translate stakeholder language to align with the ecosystem service concept in research processes. At the EU level the need to communicate with many different social groups, across sectors and governance levels was highlighted, whereas within the case studies the need for clearer definitions, for example between services and benefits in the cascade model was identified. In one case study however this ambiguity was explicitly highlighted as potentially beneficial, as it forced the case study team to discuss these terms with cross disciplinary colleagues, thus helping to develop a more integrated approach to the research process. However, within the same case study the case study coordinators suggested that this lack of clarity about the differentiation between terms was problematic for the communication process with stakeholders, and may have hindered the process. The need to communicate more widely, to reach stakeholders not engaged in the research process was also identified and this involved the development of manuals, guidance, best practice examples from a wide range of contexts and a tool box.

Knowledge needs relating to structuring and organising

The need to frame policy problems and develop policy frameworks was identified as a need, particularly by EU level stakeholders and in those case studies examining linkages across governance scales. Specifically, at the EU level there was a strong focus on the need for policy integration to operationalise the concept of ecosystem services in other policy sectors and to do this the need to consider how problems are framed was identified, thus highlighting a starting point to develop more integrated policies that are more relevant to different sectors. However, the need to understand the influence of policy frameworks on action on the ground was also highlighted, both at the EU level but also across case studies. For example, the socio-economic benefits from the EU Water Framework directive, changes related to shifts in the Common Agricultural Policy for land use in a catchment and national legislation increasing local community empowerment in managing natural resources. Indeed, developing an understanding of the wider policy frameworks and organisational changes can help strengthen the case study, for example by aligning the

engagement of stakeholders with wider process aimed at greater participation of local stakeholders and working with organisations moving towards more integrated perspectives.

Wider economic changes were also highlighted as important, for example on market prices which may affect local decision making, and these wider issues were highlighted as important but also beyond the control of stakeholders.

EU level stakeholders also highlighted the need for voluntary initiatives alongside strong regulatory frameworks, although this required the development of a common understanding (see previous) to frame voluntary initiatives and an understanding of how these initiatives may be spread to larger scales. Indeed, the need for better alignment between policy frameworks and action was also highlighted as an issue in case studies, for example the difference between integrated strategic plans for green infrastructure and a narrow, problem solving approach at the project level. Linked with this, case study coordinators highlighted the need to overcome deeply held beliefs associated with disciplines and organisations which frame ways of seeing problems and ways of acting to solve problems and may not match the integrated approach which is a central element of the ecosystem services concept. This included structural and cultural barriers hindering cooperation between government departments and government administrative units as well in disciplines, for example engineering but also the incentives within science communities to focus on policy more than informing practitioner's activities on the ground. The cascade model and similar frameworks based on the ecosystem services approach were highlighted as useful by the case study coordinators to help organise knowledge and structure discussions with stakeholders. In addition, stakeholders and case study coordinators also highlighted the need to recognise and better understand the links between policy frameworks, organisations and management decisions and how these structures and organisational units interact with action on the ground.

Knowledge into action

The need to consider both knowledge generation and action on the ground was also identified by stakeholders at the EU level and across the case studies. This involved stakeholders highlighting the need for credible, accessible data as an important part of the knowledge generation process. Stakeholders also emphasised the need for practical, usable knowledge to more easily feed into action orientated processes to inform policy making and action on the ground.

However, the need to also focus on action and decision making was also highlighted by stakeholders. Specifically, this involved the need to take action and make decisions regardless of knowledge gaps and not prioritise knowledge generation above action, but bring them closer together. The importance of action to demonstrate what can be achieved in practice was emphasised as important by stakeholders and the need for a step wise approach to collecting data, developing knowledge and taking action was also highlighted as important across the case studies. Within this however, stakeholders also stressed the importance of clearly outlining levels of uncertainty, particularly to reduce the likelihood of others misusing knowledge, for example at larger scales of decision making. The need to better align knowledge and action processes

was also highlighted by case study coordinators and many were unsure whether the knowledge flowing from the case study was being applied in the stakeholders decision making and informing their activities. However, case study coordinators did highlight that some stakeholders mentioned the potential usefulness of the process and outputs from the case study for the future and the usefulness of ideas generated as a result of their involvement in the case study process. Thus, it is important to examine the flow of knowledge and more specifically the movement of ideas between research and policy/practice potentially beyond the lifespan of the OpenNESS project. In addition, case study coordinators also highlighted the advantage in not being too closely aligned with and needing to directly feed into decision making processes within the case study process. Specifically, this involved the need for innovation, space to test a range of tools and to contribute to our knowledge and learning about what works and where.

The case study coordinators discussed the need to include a wider range of stakeholder groups in the case study process. Specifically, the involvement of government officials and research institutions were often included in the case study advisory boards (CAB), however engagement with local stakeholders, such as local residents, and businesses was mentioned as an important need. Such engagement required more resources and innovative ways of engaging stakeholders without taking too much of their time. Thus, the importance of taking time to establish multi-stakeholder engagement processes was therefore an important need. This required not focussing on only one group of stakeholders whilst overlooking others and their knowledge, even if it is readily available, for example not integrating local knowledge on community perceptions.

Scientific knowledge was seen as useful to help increase the credibility of action on the ground. However, including other types of knowledge from a range of stakeholders was highlighted as helping to increase the relevance of the processes and therefore increasingly the likelihood of producing useful knowledge. The cascade model used to outline the system with scientific knowledge was highlighted as a useful way to stimulate discussions with stakeholders to identify and fill some knowledge gaps and understand their needs, thus integrating scientific and local knowledge to frame the case study in the early stages of the case study process. Notwithstanding this, case study coordinators and stakeholders mentioned the need to improve the cascade model, and similar frameworks, to allow them to include a wider range of perspectives. Specifically, the cascade layout highlights the relationships between different components but currently suggests linearity from one component to the other. Furthermore, although a feedback arrow has now been included in the model between the ecological and socio-economic components in the model, the model still presents an ecological perspective of the system, using biophysical structures and processes as the starting point. Although this aligns with the perspectives of ecologists, it may be less intuitive for social scientists and therefore the need to present a more circular model with multiple starting points was highlighted as important. Furthermore, the need to include local nomenclature in the case study process and its outputs was also highlighted as helpful to engage local stakeholders.

Building trust between stakeholder groups was also highlighted as important by case study coordinators as lack of trust could hinder knowledge exchange between stakeholders and the integration of some types of knowledge. Such lack of trust was often linked to the wider political economy, for example as a relic from years of communism which closed down discussions, or experience of involvement in similar processes in neighbouring areas characterised by a high level of conflict between stakeholders. The need for

transparency was identified to help balance different stakeholder interests and reduce the likelihood of powerful interests subverting processes whilst establishing clear expectations and goals.

At the EU level stakeholders highlighted the need to learn from action on the ground and bring policy and action closer together and facilitate the multidirectional flow of knowledge between sectors and across governance levels. Improving bottom up processes was seen as important to learn from successes on the ground through examples, including underlying drivers of change, and to help improve methods and tools. Facilitating collaboration and knowledge exchange between science, policy, practice and local people throughout the research process was therefore an important need. Specifically this involves jointly framing research processes, integrating knowledge, communicating effectively, learning and action, coproducing knowledge and developing more relevant and useful outputs and outcomes which improve the operationalisation of the concept of ecosystem services across policy sectors, governance levels, stakeholder groups and society more widely.

Potential uses of this study in OpenNESS and beyond

Many links with other WPs are clear based on the results from this analysis. The table below summaries some of these links, with the bullet points highlighting direct links to the findings in this report. Within this summary there are a number of cross-cutting findings, which may in practice relate to more than one WP. This table has been developed to help WP2 and other WPs to identify, understand and hopefully strengthen these links. More detailed information on these findings is available in the main sections of this report.

Table 3: Summary of links to and from other WP's to help progress towards the operationalisation of the ecosystem services concept.

WP1	Key challenges and conceptual frameworks	<p>The case study stakeholder groups and/ or case study teams were asked about the use of the cascade and its usefulness in the case study process. This included some specific suggestions on improvements to this to help it be more helpful to a wider range of stakeholder groups .This can feed back into WP1 to help identify areas to strengthen this framework (and other frameworks) for practical application. Specifically, the suggestions include;</p> <ul style="list-style-type: none"> • Include policy frameworks and beneficiaries in frameworks. • Provide guidance on using the framework in a process with stakeholders across contexts, for example flexible aspects of the framework and the need to discuss and agree locally relevant terminology. • Present the framework to enable multiple perspectives and entry points to structure and organise studies beyond not only from an ecological perspective. • Highlight the advantages of the framework to organise scientific knowledge and integrate it with local knowledge from the start to jointly frame research questions and to help knowledge exchange throughout
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		<p>the research process.</p> <p>The findings from this report can also contribute to the development of synthesis papers coordinated by WP1.</p>
WP2	Policy analysis and scenarios	Identify links with findings from EU policy analysis to highlight common recommendations to integrate WP2 in OpenNESS more widely.
WP3	Biophysical control of ecosystem services	<p>Knowledge needs for tools, methods and outputs;</p> <ul style="list-style-type: none"> • Clear processes for mapping of ecosystem service supply for all services from different scales, including cultural and regulating services, not just provisioning services. • Estimate trade-offs and synergies to inform management decisions. This is required to inform immediate management decisions but also to examine longer timeframes relevant for strategic decision making. <p>•</p> <p>Knowledge needs for bringing together knowledge and action;</p> <ul style="list-style-type: none"> • Highlight the value of and way to include local knowledge.
WP4	Valuation of the demand for ecosystem services	<p>Knowledge needs for tools, methods and outputs;</p> <ul style="list-style-type: none"> • Clear tools for mapping of ecosystem service demand supply for all services from different scales, including cultural and regulating services, not just provisioning services. • Estimate trade-offs and synergies to inform management decisions. This is required to inform immediate management decisions but also to examine longer timeframes relevant for strategic decision making. • Clear, useable tools for monetary and non monetary valuation. • Highlight the relevance of different valuation methods (monetary and non monetary) for different types of stakeholders. • Develop methods robust enough to be scaled up. <p>Knowledge needs for bringing together knowledge and action;</p> <ul style="list-style-type: none"> • Highlight the value of and way to include local knowledge.
WP5	Place-based exploration of ES and NC Concepts (case studies)	<p>Knowledge needs for tools, methods and outputs;</p> <ul style="list-style-type: none"> • Test and feedback ways to improve tools and methods to assess and value the full range of ecosystem services, particularly across scales. <p>Knowledge needs in relation to understanding and communicating</p> <ul style="list-style-type: none"> • Identify and develop tools to facilitate the flow of knowledge between stakeholders and between researchers and stakeholders to develop a shared understanding. • Understand the importance of framing in communication with stakeholders and apply positive framing in research processes and outputs. • Select language appropriate to the local context. <p>Knowledge needs in relation to structuring and organising</p> <ul style="list-style-type: none"> • Identify structural processes, for example in organisations and in policy frameworks which hinder a more integrated approach by stakeholders in practice.

		<p>Knowledge needs for bringing together knowledge and action;</p> <ul style="list-style-type: none"> • Involve a wider range of stakeholders and their knowledge, for example local people and businesses. • Recognise the need to focus on knowledge to inform stakeholder’s decision making and help reduce the gap between knowledge and action. • Understand the drivers of change within decision making to apply ES and NC thinking in practice. For example, by businesses, professional groups and within policies at different levels of governance.
WP6	Integration: Synthesis and Menu of Multi-Scale Solutions	<p>Provide recommendations highlighting;</p> <ul style="list-style-type: none"> • Tools and methods and how to apply them. • The importance of developing and common understanding and ways to facilitate this. • The importance of two way communication and the need for context specific language to help facilitate this. • Use positively framed communication highlighting advantages, benefits and contributions. • The importance of policy frameworks to organise planning and action whilst encouraging innovation and learning. • Highlight the need to include a wide range of stakeholder groups. • Highlight the advantages of including different types of knowledge from the start to increase the relevance of processes and outputs for stakeholders. • Highlight the need to focus on ‘actionable and useful’ knowledge relevant for decision makers. • Highlight the need to increase knowledge exchange across contexts and stakeholders and emphasis the need for collaboration and learning.

(NB: This is a brief summary and is not an exhaustive list. Many of the links cut across a number of WP’s.)

Conclusions

The findings identify a wider range of knowledge needs highlighted by stakeholders and members of the case study teams. From the data four main categories have been identified; 1) knowledge needs relating to methods, tools and outputs; 2) knowledge needs relating to communicating and developing a shared understanding of the concept of ecosystem services; 3) knowledge needs relating to structuring and organising practices; and 4) knowledge needs to bring knowledge generation and action closer together. The first of these relates to the need to improve and make accessible methods and tools for the assessment, valuation and integration across scales of multiple ecosystem services. These tools and methods were highlighted as necessary to provide knowledge outputs which the stakeholders and case study team members were able to specifically identify and articulate.

However, not all knowledge needs are known, indeed a bigger challenge in operationalising the concept of ecosystem services may be recognising unknown unknowns, particularly across the plethora of potentially relevant context which the concept could be used and useful. Addressing unknown unknowns requires a broader approach which views knowledge as a process. Viewing knowledge needs more broadly as a need to develop processes to facilitate the flow of knowledge brings into focus the interconnection between people, knowledge and action. From this perspective there is a need to involve multiple stakeholders with

potentially different perspectives and different types of knowledge with a focus on understanding the needs of policy/practice stakeholders to better inform decision making and shape action on the ground. However, these findings also highlight that the flow and integration of knowledge and a collaborative, inclusive approach may be hindered by a number of different factors, for example specific stakeholder groups may not be included, their knowledge may not be integrated. There is therefore a need to focus on how to make the connection between people, knowledge and action stronger. This involves developing a common understanding between stakeholders to help bring together stakeholders to examine and identify their context specific knowledge needs to shape the knowledge generation process to increase its relevance and usefulness. Importantly a ‘one size fits all’ approach is insufficient and language and tools to facilitate this will need to be agreed depending on the context. Indeed, it is evident that the cascade framework used in the OpenNESS case studies has been applied in this way to organise knowledge, stimulate discussions with others to bring in their knowledge to improve the process and outputs, whilst also increasing understanding of the concept of ecosystem services.

In addition, social structures, organisational processes and policy frameworks also influence what people do on the ground, including their motivation to come together, as well as shaping their practical actions and interactions with ecosystems on the ground. Understanding and strengthening, where appropriate, can help bring people, knowledge and action closer together to develop more robust knowledge processes aimed at turning the concept of ecosystem services into practice.

A focus on people, knowledge and action and the factors which facilitate the flow of knowledge into action also helps illuminate possible ways for the science community to begin to focus not only on ‘pushing out’ the concept of ecosystem services but also to begin to focus on processes and tools to encourage others themselves to begin ‘pulling in’ the concept of ecosystem services proactively to inform their decision making processes and action on the ground.

Acknowledgements

We would like to acknowledge and thank all the stakeholders and case study team members who worked with us in this study to examine knowledge needs in depth and from different perspectives.

Annexes

Annex 1 Knowledge needs identified by EU level stakeholders

Within the focus group discussions (EU01 and EU02) organised with EU level stakeholders a wide range of knowledge needs were identified. From this a number of themes were identified relating to knowledge needs for the operationalisation of the concept of ecosystem services. These include broad issues, which are presented first, followed by more specific issues.

Developing a common understanding of the ecosystem services concept

Participants highlighted a key concern regarding *“understanding what the concept [of ecosystem services] means”* (focus group EU01) with the *“problem [being] that at the moment in Europe we have many different definitions and understandings”* (focus group EU02). Participants highlighted that *“from every side [...] knowledge is needed to bring [different sections of society] together, so we are using a common concept [...because some sections of society] are to a certain degree providing [.....] ecosystem services [...] but they are not naming it and this makes it very difficult”* (focus group EU01). Participants emphasised the principles of *“additionality”* (focus group EU01) and the *“maximum public good”* (focus group EU01) that are key principles of the ecosystem service concept and distinguish it from other concepts. Furthermore participants emphasised the added value of the concept of ecosystem services in *“that it goes beyond sectoral perspectives”* (focus group EU02). And developing a common understanding is needed *“to get the best solution for the common good and [clearly show that] the best solution is nature”* (focus group EU01). Participants did however highlight a number of other policy concepts that could be linked to the ecosystem services concept. These concepts included *“green infrastructure”* (focus group EU01) and *“nature based solutions [...when] you organise it in such a way that it has benefits other than what it was designed for initially”* (focus group EU01). However, participants emphasised concerns about *“simplistic”* understanding of the ecosystem services concept in relation to these other concepts. For example, although better than nothing in recreating ecosystems *“you never get to as high value of biodiversity or ecosystem services as just conserving intact”* (focus group EU01).

Developing methods for ecosystem services

The need to develop “*a common methodology to quantify ecosystem services*” was emphasised by participants as currently “*all the governments are trying to put a value on things and we need to be careful that we are speaking the same language and all using the same standards*” (focus group EU02) and “*how to measure and how to map and how to assess [ecosystem services]*” (focus group EU02). Furthermore, participants highlighted developing common methodologies would also “*contribute to a common understanding and common language*” (focus group EU02). In addition to the need for consistency participants also stressed the need to improve existing methods. This included the “*quantification and mapping of ecosystems services*” (focus group EU02) and “*greening economic accounting on different levels*” (focus group EU02). In relation to the different ecosystems services participants emphasised “*the need to address the regulating [services] basically, not the provisioning, because provisioning we are doing very well*” (focus group EU02) because although “*this is a known issue, we cannot calculate that, we can calculate it indirectly, not directly [and...] we have to agree on [how to do this for regulating services]*” (focus group EU02). Furthermore, cultural services were also highlighted by participants to illustrate the need for consistent methods across political boundaries, as one participant commented “*it’s is even more complicated with the cultural services, [...] because in Europe you have different countries with different cultures, different activities, different ways of enjoying nature [...] perhaps in some countries fishing has more value than hunting in another country, does it mean that fishing is more important than hunting or that bird watching is more important than hiking?*” (focus group EU02).

The need to improve “*the potential estimation of trade-offs to make them applicable in management decisions*” (focus group EU02) was also highlighted by participants. Specifically, participants emphasized that “*we can have also negative trade-offs between different natural resources but we can also have positive trade-offs not only negative*” (focus group EU01). Furthermore, the need for knowledge on the supply and “*demand of ecosystem services [...] to adapt supply and management*” (focus group EU02) was also highlighted by participants. In addition to the direct impact on ecosystem services from policy and management decisions participants also highlighted that “*what we do not know at the moment [is] the real impact of different policy measures on those people that should provide [...] ecosystem services*” (focus group EU02).

The effectiveness of monetary valuation was queried by one participant as potentially problematic, based on parallels with the climate change issue, as “*despite the Stern report, the climate change talks are so far quite stagnated*” (focus group EU02). However, other participants in the discussion emphasised that methods for non monetary valuation were also needed alongside monetary valuation methods. Participants highlighted that only relying on methods for monetary valuation held “*a danger [that if] the value is x million euro’s [people think] here is x million, [now] let me do what I want with this ecosystem*” (focus group EU02) or if there is a “*bigger value on [...] activities then perhaps that’s more important [than others and] we should take it more into account*” (focus group EU02). As one participant commented “*this of course gives danger of destroying the intrinsic value of nature*” (focus group EU02). However, participants highlighted that methods to undertake monetary valuation of ecosystem services were needed as “*it depends on the type of group you want to reach, monetary value [...] is quite useful to sensitise some policy makers with the ecosystem and [to see] how much money you [...] keep by restoring or maintaining*”

this ecosystem” (focus group EU02). Both methods for monetary and non monetary valuation were currently seen as *“not robust enough to be scaled up [and] there is lots of science going on [...] how to value ecosystems but there are no [...practical] approaches, what would it mean in terms of indicators, new ways of putting it in to accounting systems or statistical ways?”* (focus group EU02). Participants also identified the potential usefulness of methods to visualize future scenarios, for example with and without ecosystem service based decision making. As one participant explained *“we need information to be transmitted for the future options of all aspects of society, both economic and social, cultural bearing [...] to visualise what could be done, what are the scenarios, the forward looking ideas that could motivate society”* (focus group EU02). An underlying issue common to all methods was the issue of data consistency because *“if we don’t have the same data how can we speak the same language when putting a value on [ecosystem services]?”* (focus group EU02).

Knowledge use

As highlighted in the introduction to this report, participants emphasized that the term ‘knowledge’ could encompass different elements. As one participant commented *“you need good sound data to inform policies [...] this has been lacking [...because] in absence of a good database [...] I have [had] my doubts on some of these [past] outcomes”* (focus group EU01). Participants emphasised the link between data and knowledge, with one participant commenting that *“indicators are really part of the knowledge as is the data but for me it is not the same because there is already an interpretation from [data] to [indicator]”* (focus group EU01) as *“you can have the best data in the world but not have knowledge”* (focus group EU01). Furthermore, one participant highlighted the data can also be defined differently to include not only quantitative but also qualitative data, commenting that *“we are not even sure what is data, I think if you were a qualitative researcher that is very different”* (focus group EU01).

The importance of different knowledge types in addition to scientific knowledge was also highlighted, as one participant commented *“we have [...] scientific knowledge that is definitely important but we have also the intrinsic knowledge that we need to make visible, there is much knowledge on the ground and that is often not verbalised”* (focus group EU01). Other types of knowledge were seen to include *“societal knowledge or local knowledge, [...which is] also important knowledge to take into account if you want to make the concepts useful”* (focus group EU01). Additionally, participants highlighted by not using *“this local knowledge [it may be...] lost or reduced and more and more we have to take advantage of the scientific knowledge”* (focus group EU01).

Participants also emphasised that knowledge should be useful *“so that we can have what we call evidence based policies, to facilitate the design of policy”* (focus group EU01) and for *“designing or agreeing on indicators”* (focus group EU01). To inform policy knowledge should be *“not only scientific but practical knowledge [...] to provide hints, direction, concrete references”* and be *“actionable [...to highlight] what action you can take”*. Examples provided by participants involved knowledge presented as *“figures, numbers [and] monitoring capacities”* (focus group EU01) but also to convey *“information and understanding of new concepts that help decision makers to make decisions”* (focus group EU01). In

addition to knowledge relevant for policy makers participants also emphasized that knowledge should be in *“a format that is understandable for practitioners”* (focus group EU01).

Known knowledge gaps were seen as important but participants also highlighted the need to take practical action *“at a field level [...and not wait] ten years [...] and then say ok, now we have to bring it to the field”* (focus group EU01). Thus, participants highlighted the need for *“a step by step approach [...as] the most practical approach to advance the agenda [...where we] try to really to do some lower end estimations and actually all agree that these are totally underestimates of the real deal [but...] for now this is the best we have”* (focus group EU02).

Framing problems, policy and action

The need to focus on problem framing to help operationalise the ecosystem services concept was highlighted by participants. Participants emphasized that *“scale is important and [...] there is part of political science saying to us [that] these are systemic problems so we should not ignore this bit, it’s not only planning, it’s not only environmental impacts, bigger issues come in, the governance of the whole, [...which is about] framing”* (focus group EU02). Framing of problems involves a *“consensus on the analysis of what is the real issue and how we look at that issue”* (focus group EU01). Furthermore, *“you can get full benefit of services by creating policy [...] that takes natural capital as a starting point and if you do that you get a completely different plan than if you start with for example [with] economic or demographic demands in an area. So it is very powerful concept to use it to propose the creation [of policy]”* (focus group EU01).

To operationalise the concept of ecosystem services participants suggested *“it needs to be organised in the very policy [...which] the EU is very good [at]”* (focus group EU01). One participant commented that *“voluntary initiatives can be great [but] the problem is they usually don’t scale up so we don’t get the contraction that you can get through regulation”* (focus group EU02). However, other participants did perceive up scaling from the local level as viable and useful. Notwithstanding this without a strong regulatory framework, participants highlighted that developing an understanding of the ecosystem services concept concurrent with taking action on the ground may result in operationalisation which is *“far too simple”* (focus group EU02). For example, participants raised the concern of *“how seriously [...] businesses approach the natural resource they use with their market value [and if they] are really linked to ecosystem services or is it just the market value of the resource and of the exploitation of the resource and of this scarcity of these resources”* (focus group EU02). Participants not only identified this as a broad governance issue but more specifically an ethical issue, as one participant commented *“[it comes down to] who is setting this value and who has the right to somehow influence policy decisions? [...] So there should also be some thinking, some work on how to organise such as system, how to set the values around it”* (focus group EU02). However participants highlighted that *“it’s a regulatory framework that actually has to take a step forward in pricing [...but currently] they seem to lack enough evidence to properly do it”* (focus group EU02).

Framing action was also highlighted as a need, as one participant commented *“most of the time we are talking about the negative impact of the industry or the sector like agriculture or hunting [...] but I think it is important to [...also] evaluate the positive impacts [...] to have an idea of the balance of the whole activity”*

of the whole sector, what they take from nature, what do they give back to nature” (focus group EU02) (also see section knowledge needs as methods). Furthermore, the ecosystem services approach can be “perceived as an additional burden because it is an additional request that has to be respected and I think this makes the whole discussion of ecosystem services quite difficult” (focus group EU01). However, reframing could help it be perceived as “not only [...] a burden but also something almost cheerful [...] a common good [...that] I’m proud of doing it” (focus group EU01).

Translation across different sectors and governance levels

A key issue highlighted by participants was that *“diversity brings the difficulty”* (focus group EU02). Indeed, participants highlighted cross sector differences as a challenge in operationalising the concept of ecosystem services. To help overcome this challenge participants suggested *“we [...] need sector specific instruments and tools [...because] as I understand the transport sector has a completely different understanding of how to maintain ecosystem services than the marine [...] or common agriculture sector and I think if we want to include this concept into the policies we need to look from the sector, how to make the sector understand”* (focus group EU02). Within the *“forestry or in agriculture, [and] nature conservation we have been talking about ecosystem services for some decades, [but] in other industries this is a rather new thing ...and] they have no idea what is it”* (focus group EU02). Participants agreed that we *“need to get better at getting it around, to the right people, to the decision makers and maybe not only to the ones who are already convinced”* (focus group EU02). Furthermore, one participant commented that there is a *“need to adapt terminology [and this] may be worth some pain [...] because [the concept of ecosystem services] has some advantages [...that other concepts as it is] not as sectoral”* (focus group EU02). A specific example of the different use of language which needs to be understood in the translation process came from the business sector, as one participant highlighted *“the word ‘policy’ doesn’t exist there, if it looks like policy it is called strategy”*. Indeed the need for translation across sectors was highlighted as *“this whole ecosystem services is so broad that even when there is a willingness to take it in to account and take responsibility there is not even the slightest idea of how to move about when you talk about [these] large and complex, [issues.....and] many individuals [...] don’t have the patience for this type of discussion”* (focus group EU01). Furthermore, participants emphasized *“that it is not only the knowledge but also how it is presented and how it is transferred to decision makers”* (focus group EU01) and *“for different audiences”* (focus group EU02) as being an important part of this process. Specifically this involved the need *“to start thinking from a politicians point of view [...] or from a decision makers point of view, what do they need for integrating this concept ecosystem services?”* (focus group EU01).

Different understanding, interests and terminology across levels of governance was also highlighted as a challenge by participants. This involved differences across member states and with the local level and the need to provide relevant information. Indeed, participants emphasised the importance of regional *“specificity, [as] it’s such a theoretical concept [...] but what does it mean at a regional, Belgium, UK or Hungarian level [...we need to bring] it down to exact examples which have a regional meaning”* (focus group EU01). For example, to illustrate these differences one participant commented *“in some regions it is more biodiversity [or] it is more water”* (focus group EU01). Furthermore, participants highlighted the diversity of interests at the local level as being even more challenging than incorporating the ecosystem

services concept further up the governance scales. As one participant commented *“if we talk about the European policy context or about integrated policies [the ecosystem services concept] might be a good way of communicating things [but] if you are very conceptual [and] you speak to that specific producer of specific provider [...] it may be not the right concept because [at this level] it is not so much about integration”* (focus group EU01). More specifically at this level *“those that have a problem with water, want to discuss water, those who have a problem with [...] Natural 2000 habitats they want to discuss is natural 2000 areas [...] that this all has to do something with the whole big concept of ecosystem services they don’t care about”* (focus group EU01). Indeed, one participant commented that *“[in my organisation] we are not using that term in our communication, not at all, we are using it in communication for the policy in order to link our request to show that it has a meaning but not the other way round [to the local level]”* (focus group EU01). However, participants stressed that *“the more local governance level could play a key part in starting it up”* (focus group EU02) because *“they know really well what the value is and what the service is they can translate it into their policy better than the national government”* (focus group 03). Furthermore, the data at this level is likely to be less coarse and therefore provide a *“better case of arguing and evidence making because many of the numbers we have now are very often aggregated numbers at a high level, into the billions, and people say yeah, ok and it doesn’t give the proof to really start giving some concrete policy”* (focus group EU02).

In addition to laying out the problem participants also suggested how to incorporate this concept better into local level decision making. Firstly this involved the increased use of local knowledge (as described in the section on knowledge use above) as *“it is really important what knowledge do we consider as knowledge under that concept because this local knowledge often is existing but it is not directly linked to this concept discussion”*. This can help gain an understanding of *“the local area [and] what is the actual scope for this services, based on the ecological conditions [...providing] real knowledge relevant to the area”* (focus group EU01). Secondly, differentiated tools are needed between governance levels as one participant emphasised *“at a strategic level] they need to be given the opportunity to make informed choices, [on a] big scale and at the lower scale other tools can allow informed choices, this is super important [...] so it’s not in the blind, not just because it happens, [and] the concept should not be tortured to the very detailed, the everyday manner”* (focus group EU02). In the translation process to the local level the *“broader view and the attractiveness of the ecosystem services”* (focus group EU02) should be preserved, which links to the need for a common understanding (see section above). Specific sectors involved in the implementation of policy were identified as examples by participants. These included *“the farmers or the local administration, [and] the tax payers”* (focus group EU01) who should be targeted to increase their understanding and support for the ecosystem services concept. This would help ensure that it *“is clear to everyone from politicians to the consumer and creates a sort of positive fit [.....and provides a focus on] communicating differently [and] how to agree on a common definition of ecosystem services”* (focus group EU01).

Creating a multidirectional, iterative process

Although participants highlighted the importance of a strong policy framework (see section on framing problems, policy and action) and the need to translate the ecosystem services concept across sectors and

levels of governance (see section on translation above), they emphasised that relying only on a top down process was insufficient. As one participant commented this *“starts from bottom up as well as the top”* (focus group EU01). Furthermore participants emphasized that this process should not be perceived as linear but rather as multidirectional. Exploring this issue further participants emphasized the need for an *“iterative process, because we have to come from both sides, the common understanding captures all the specificities of a sector that have to be recognised [...] and then we have to go into the details to implement”* (focus group EU02). Indeed, another participant added that this process must take *“into consideration [how each interest] could profit from the ES concept”* (focus group EU02). Learning from and feeding into the local level was seen to increase our understanding of how to move beyond *“the low hanging fruit in better provision in ecosystem”* (focus group EU02).

To facilitate a more multidirectional approach the examination and dissemination of examples was suggested by participants. This includes the need to examine examples *“at the enterprise level [...] using this balanced score card method to integrate [...] non monetary aspects [to develop knowledge for] better valuation of natural capital”* (focus group EU02).

Furthermore, participants highlighted the challenge that *“some people are doing things but they don’t know it and so what can we do so that they realise they are doing something so that we can have a lot of information on what is happening [...] and for a lot of people, I am talking especially for the local people managing the things on the ground, ecosystem services, what is it?”* (focus group EU02). Examples are already used however they often *“look in the benefit side, [but we also need...] background and [...] why these cases evolved like they are now and what is [...] the main driving force, what is the success factor for taking the ecosystem services into account”* (focus group EU02) and the *“drivers for leadership”* for organisational change towards an ecosystem services approach (focus group EU02). Also there are a number of well known examples but the detail of *“how they actually calculated [the value is not known...] we all know the scratch of it, not really how they used the methodology”* (focus group EU02).

To make better use of examples participants emphasized that *“it’s the replicability of those examples that is really important”* (focus group EU02). Furthermore, often examples are *“not sufficiently targeted to actually bring it to the people who decide in very similar cases, so a different wrapping and bringing a lot of similar examples together [is needed]”* (focus group EU02). Examining examples may also help us to understand when and where *“we should stop talking about ecosystem services and start talking about water to water managers and that might actually drive the change”* (focus group EU02). Importantly *“if [businesses] see there are applicable methods then they will be interested to utilise them because the pressure from the market, policy and society to [do so]”* (focus group EU02).

Collaboration and co-production

Participants highlighted that this process *“is not only about communication but also about collaboration”* (focus group EU01). At a local level *“the problem [...] is also to organise and co-ordinate farmers action because [...] you need to deliver ecosystem services in a wider landscape scale rather than a single parcel [...] and agree with them the objective [thus] we are coming back to involvements from the beginning of people who need to deliver these ecosystem services”* (focus group EU01). Furthermore, one participant

emphasized that *“ideas can be supported by a farming lobby if they are part of it, potentially, with the right language and the right communication, collaboration and all of that because it needs all the stakeholders involved etc and [...] if it is properly done the actual farming sector is a proud part of much bigger policies which go way beyond farming produce”* (focus group EU01). Building on this issue another participant highlighted that establishing an integrated view at the local level *“is important [...] to be able to have a valorisation [...] of the context, because indeed the farmer’s primary concern is in the field but it may help [...] to know that he is contributing to this [wider benefit]”* (focus group EU01). In addition, participants highlighted the need to bring different sections of society together to bring together different knowledge and understanding to identify *“synergies [...] for example in the forestry sector [...] different functions [are involved and ecosystem services may be] a very powerful concept to use in [forestry strategy as...] it fits very well in their language, but [...]strategy development is] a creative process”* (focus group EU01). Building on the need to use local knowledge in decision making (see section on knowledge use) participants also highlighted that *“it is very important [that this intrinsic and local knowledge] to be taken into account from science [...]for example through] trans-disciplinary research”* (focus group EU01).

Applying a collaborative process of coproduction may not only help sensitise and translate the concept of ecosystem services across different sections of society and develop a common understanding but also improve feedbacks to develop methods (see section on methods and tools) and knowledge use (see section on knowledge use above). As one participant commented, this is helpful because *“for the moment [the ecosystem services concept] is very much driven by those who are looking into the environmental aspects”* (focus group EU01).

Annex 2 Focus group guide

FOCUS GROUP GUIDE FOR FACILITATORS

This document has been written to provide case study coordinators with the necessary information to organise and undertake a focus group discussion. This involves firstly background information on focus groups and why this method is being proposed and secondly, provides a step by step guide for facilitators to plan and moderate the discussion.

We are keen to not only meet our objectives in WP2 but also to help support the case studies in their activities. Thus, we will arrange a time to discuss with you prior to the meeting any concerns you have about planning and facilitating the discussion or issue that may arise. We would also like to offer further support if this method may be useful to your case study to examine any other issues that may have been uncovered in your activities.

BACKGROUND INFORMATION FOR THOSE UNFAMILIAR WITH THIS METHODOLOGY

WHAT IS A FOCUS GROUP?

The focus group methodology creates qualitative data through group interaction on a pre determined topic of interest. The main purpose is to stimulate group discussion to examine an issue in depth and to understand from the group's perspective what underlies the views expressed in the discussion. Thus, focus groups provide a way to examine not only 'what', but also 'why' dimensions of a specific issue. Typically this involves 6-10 participants and a facilitator and sessions should be in a relaxed, quiet, neutral setting.

What is the topic of interest for the focus group to examine?

Two interlinked topics will be examined. The first is the use of the cascade model by stakeholders and the second are the perceived knowledge that is needed to use the ecosystem services concept in practice.

What are the advantages in using the focus group methodology?

- Ability to use the focus group methodology to gather data across different contexts to examine the same topic with the use of standardised procedures and understanding of the potential obstacles to avoid or overcome (outlined here in this document).
- Encourages participants to explore issues of importance to them and using their own vocabulary. Issues are not discussed in isolation but within a particular context.
- Ability to be organised to fit in with a pre planned group meeting relatively easily and provide access to a wide range of perspectives in a rather short time to explore an issue in depth.
- Allow participants to react to and build upon the responses of other group members. A comment by one individual often triggers a chain of responses from the other participants.
- Add to the understanding by participants of an issue and of the other participants.
- Encourage participants to contribute alternative ideas without necessarily being forced to defend, follow through or elaborate on it as the focus is on the group rather than the individual.
- Does not seek group consensus, differences are welcome and help stimulate discussion.

STEP BY STEP GUIDE FOR FACILITATORS

1. Organising the focus group

1.1 Obtaining stakeholders' consent to hold the focus group

It is important that the participants are asked if they would be willing to take part in the focus group before the meeting. Participation is voluntary and it is essential that no one should feel pressured to take part against their will. In pre meeting communications it is important therefore to explain what a focus group is and the topics to be discussed. Suggested text for this pre meeting communication has been prepared to help with this if necessary (see section 3 at end of this guidance). To help ensure the relevance and benefit to the participants is as clear as possible case study coordinators are asked to supplement this with examples of activities that the stakeholders are or plan to undertake (see highlighted yellow text). **The aim of this text is to express our genuine interest in listening to and understanding the stakeholder's unique perspectives and opinions and to ask each group member if they would be willing to take part.**

To accurately record all the issues raised by participants the discussion should be audio recorded and then transcribed. This also allows the facilitator to concentrate on understanding the issues being raised and to ask for more information if necessary when appropriate. It is important that participants are made aware that the discussion will be recorded before arriving at the meeting and that they agree to this. **Please discuss with Esther Carmen (email: estcar@ceh.ac.uk or telephone: +44 131 4458443) if you are unable to locate a recording device for use in the focus group.**

1.2 Focus group setting

It is important that the focus group is held in a quiet, relaxed and neutral environment. Allocating a distinct session alongside a stakeholder meeting will hopefully ensure this. 1 hour should be allocated for this discussion.

Participants should be sitting so that everyone can see each other (not all looking at the front). If sitting around a table try and avoid participants using laptops and mobile phones during the discussion as these act as barriers. Also, as a facilitator try and avoid being in the centre of the room and sit off to the side to help encourage the group to discuss issues within the group.

2. Using the focus group methodology

2.1 The role of facilitator

Using facilitators who are familiar with the case studies and the stakeholders can be very beneficial. However, there are also problems which need to be avoided. Being closely involved in a case study may result in moving from the role of facilitator to the role of participant during the discussion. It is vital that facilitators are aware of this and reflect on their role throughout the discussion. **The facilitator should remain neutral and remain in the background except when seeking clarification on issues using follow up questioning. The direction of the discussion depends on the issue as perceived by the group.**

It is also the role of the moderator to ensure all participants who wish to contribute to the discussion area able to. This can be a problem when one or two of the group dominate the discussion, and in extreme cases, silence the other group members by talking over and interrupting.

2.2 On the day – Introducing the focus group activity to the group participants

Firstly, remember to turn on the audio recorder and make sure it is positioned well to record all the participant’s voices.

Before the discussion begins the facilitator will need to introduce the focus group. Similar to the pre meeting communication this will involve stating what a focus group is, the topics for discussion and aim of understanding the stakeholder’s perspectives and views. Also explain why we would like to audio record to discussion and that confidentially will be maintained, then ask if anyone has any objections.

Basic principles to ensure the discussion provides useful data should be clearly emphasised. These are;

BASIC PRINCIPLES FOR THE FOCUS GROUP

1. The idea is to have a group discussion, so participants should address the group with issues and ideas, not the facilitator.
2. The facilitator may ask for clarification on particular issues and encourage all members of the group to contribute to the discussion.
3. All views are valid, there is no right or wrong answer. We are interested in listening to a range of different views from a range of different people in the group.
4. Please ask the participants to not talk over one another.
5. Time has been allocated to ensure the discussion explores the topic and any issues raised by participants in depth that is understandable to others.

2.3 On the day - Starting the discussion

Discussions tend to begin slowly before gaining momentum. This is because participants may not have thought much about the topic previously and/or may not immediately be able to express all their views. **As a result some prompting may be required by the facilitator to get the discussion going, after which it will become more natural.**

Prompts will be case study specific, but they are designed to get the participants to consider the topic to be discussed. For example, stakeholders in the Loch Leven case study each filled in the cascade framework, which was the start of the process to use the framework in this case study. Reminding or even showing these diagrams to the group would help bring them back to the process and consider their views on its usefulness. **The selection of suitable prompts can be discussed with Esther Carmen (email: estcar@ceh.ac.uk or telephone: +44 131 4458443).**

Explain that the first topic will focus on the groups experiences using the cascade framework and how useful they found it or not (suggested 20 minutes to this topic). The facilitator will then introduce the topic of knowledge needs focusing on what knowledge would be useful from the group’s perspective to use the concept of ecosystem services in a practical sense in the context of the case study.

2.4 On the day – During the discussion

Probing may be required to ensure the topic is covered in both breadth and depth during the allotted time. For example **“can you explain that more?”** and **“what do other people in the group think?”** or to make sure the understanding is clear, for example, **“so, in summary are you saying...”**

Remember to move the discussion on to knowledge needs after about 20 minutes.

2.5 On the day – Closing the discussion

The facilitator will need to be aware of the allotted time for the session and stick to it as much as possible. Start the process of closing the discussion a few minutes before the scheduled end (suggested 5 minutes before). **Thank all the participants** for an interesting discussion. Explain that the data will be transcribed from the audio file to a written record of the discussion. Focus groups are being undertaken in at least 10 case studies which include different types of stakeholders and different situations. This will give the OpenNESS some valuable feedback for adapting and improving the cascade framework and highlighting knowledge gaps to help undertake practical work using the an ecosystem services approach in the future (what do we need to know to do this better?).

Ask if the group would be interested in the findings from this or the combined findings on these topics – we are very happy to provide this information and support the case studies in their work.

Keep the audio recorder on until the very last minute, as often at the end participants begin to reflect on the discussion and new ideas and views may be expressed. If the audio recorded has been turned off make a note of anything new which is mentioned after the formal session has ended.

2.6 Transcribing the data from the audio file to a written record of the discussion

The decision on what to transcribe into the written record of the discussion is an important one which can constrain the level of analysis and interpretations that can be drawn from the data. The following information should be included in the written record;

1. How many participants and brief information on who they are (names are not necessary but interest and other contextual information is requested. This information will remain confidential).
2. Differentiation between speech acts - so that when a new person begins talking start a new paragraph in the written record. This lays out the structure of the discussion and maintains confidentiality.
3. Questions from the facilitator.

It is not necessary for the written record to include punctuation as people do not speak as they write, more often than not the transcript will be long sections of unbroken text. Avoid where possible putting your own interpretations into the text (although this will be inevitable with translating into English we want to reduce this as much as possible). Furthermore it is not necessary to include the introduction by the facilitator at the start of the audio recording. Please arrange to discuss this with WP2 if there are any queries regarding this.

2.7 Next steps – WP2 Analysis

WP2 researchers will analyse each individual focus group. A summary of these findings will be sent to each case study coordinator. The findings from all the cases study focus groups and focus groups with EU level stakeholders will be amalgamated and all issues across all groups will be identified and categorized. These findings will be provided to WP1 to help improve the cascade model and also to highlight knowledge gaps to the Commission to help increase the practical application of the ecosystem services concept.

3.0 Suggested text for pre meeting communication with meeting participants

Important information for participants

As time is limited to an hour the meeting participants are kindly requested to consider the topics for the discussion prior to the meeting. Particularly, this is an opportunity to highlight what you need to know (your knowledge needs) to improve the use of the ecosystem services concept in your activities. We will also discuss the ecosystem services cascade model and whether you think this may be a useful framework for your work, or not, and why. *(INSERT HERE MORE SPECIFIC INFORMATION HERE ON THE USE OF THE CASCADE MODEL BY YOUR STAKEHOLDERS IF THEY HAVE BEEN INVOLVED WITH THIS).*

Furthermore, to ensure an accurate record of the discussion I would very much like to tape record the discussion. This will be purely so I can listen back and make notes later and will make sure I don't miss any issues you raise. The recording will not be shared with anyone else and the information will be anonymized in the data storage, analysis and subsequent write up, therefore confidentially will be maintained throughout and as such no individual will be identifiable with the issues raised. This is common practice in this type of social research but I am aware that audio recording this discussion may be slightly unexpected. It is really important for me to make you aware of this before the meeting and ask that you let me know before the meeting if there are any problems with this.

WHAT IS A FOCUS GROUP DISCUSSION?

The focus group uses a facilitated group interaction to collect data on a pre determined topic of interest. The main purpose is to stimulate group discussion to examine an issue in depth and to understand from the group's perspective what underlies the views expressed in the discussion. Thus, focus groups provide a way to examine not only 'what', but also 'why' dimensions of a specific issue.

What is the topic of interest for the focus group to discuss?

Two interlinked topics will be examined. The first is the potential usefulness of the cascade model and the second part of the discussion will focus on what information and knowledge the participants feel is needed (which may be missing or unavailable) to use the concept of ecosystem services in their activities.

Why have we chosen a focus group discussion to explore these topics?

- Benefits not only the OpenNESS project but participants often enjoy and may also benefit from the discussion. For example, by adding to the understanding by participants of the issue and the knowledge may be useful for other activities. *(INSERT HERE AN EXAMPLE OF AN ACTIVITY WHICH MAY BENEFIT FROM THIS INFORMATION IF POSSIBLE, for example in the Cairngorms case study this information may help the development of a funding application by the stakeholders)*
- Encourages participants to explore issues of importance to them and using their own vocabulary. Issues are not discussed in isolation but the context of your activities.
- Ability to access different views within a short time frame (1 hour).
- Allow participants to react to and build upon the responses of other group members. A comment by one individual often triggers a chain of responses from the other participants.
- Encourage participants to contribute alternative ideas without necessarily being forced to defend, follow through or elaborate. The focus is on the group rather than the individual.
- Does not seek group consensus, differences are welcome and help stimulate discussion.

How will this information be used by the research project OpenNESS?

The information you provide will be used in two ways. Firstly, a summary of the discussion will be produced which includes all the issues raised by participants in the discussion. This can then be used by the OpenNESS researcher or other participants to inform further activities. Secondly, the information from this discussion, along with information from discussions in other case studies (approximately 10 in total) to gain an understanding of common and different knowledge needs across different situations (for example different sectors) and provide feedback on practical improvements for the cascade model (see below).

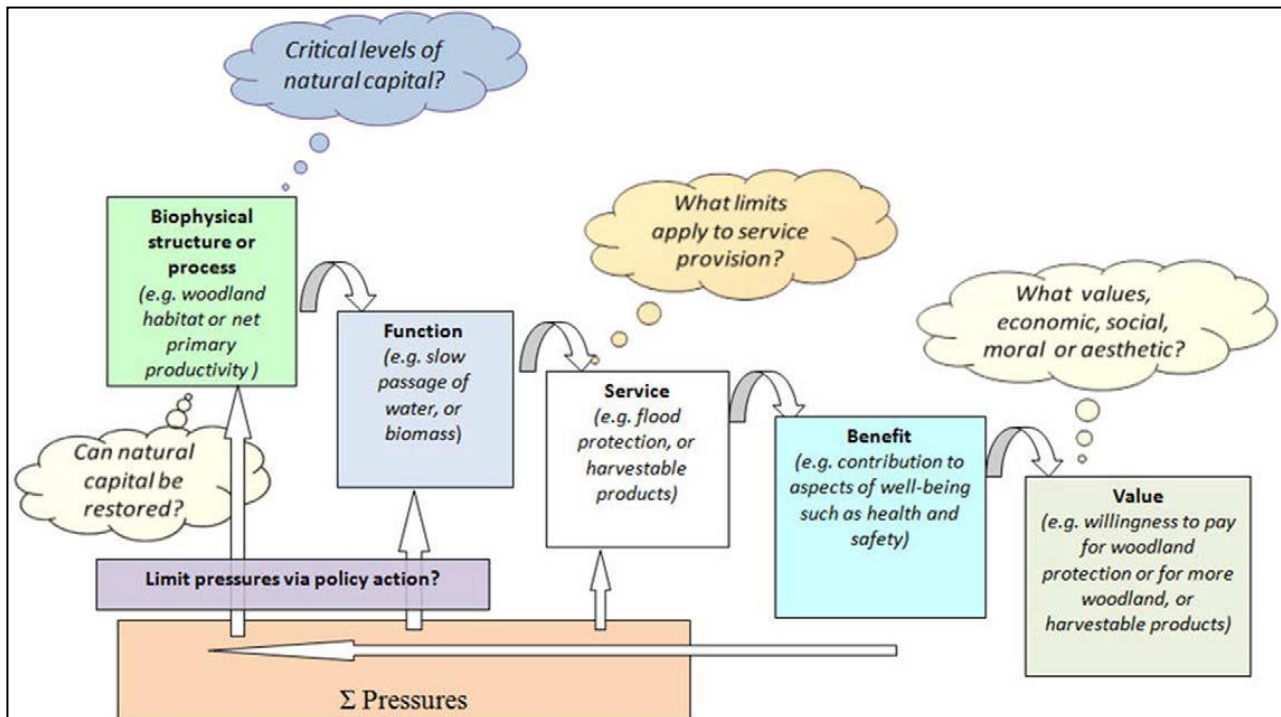


Figure 1: Cascade model (Potschin and Haines-Young, 2011)

Appendix 3: Interview guide

Explain reason for interview in context of Openness and ask for consent to record interview.

1. What is the context of the case study (where, who, is there a CAB?)
2. IF NO CAB – how do you exchange information with your stakeholders?

3. Have you used the cascade model? If yes, how? If, no why not?
4. Was the cascade useful? Why?
5. The cascade model can provide a way of organising information in a different way - Did the cascade highlight any knowledge gaps?
6. If using the cascade did it highlight any knowledge gaps/ needs for your case study?

7. Thinking more widely (beyond cascade) is there any additional knowledge that would be useful for them to operationalise the term ES in their activities (planning or doing activities)? How about if time and money weren't constraints

8. Have we discussed all the relevant issues, or have we missed anything?

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