



Methodological and Ideological Options

## Identifying Five Different Perspectives on the Ecosystem Services Concept Using Q Methodology

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## ABSTRACT

The objective of this paper is to recognize and categorize the various ways that ecosystem services researchers perceive the concept and purpose of ecosystem services (ES). To do so, we employed the discourse analysis approach of Q methodology, where 33 researchers ranked 39 statements on ES derived from the literature. Factor analysis of the Q sorts allowed for the interpretation of five main perspectives on ES: a pragmatic view on nature conservation, seeing ES as useful tool (“Non-Economic Utilitarian”), a strongly value-focused perspective with a skeptical view on ES (“Critical Idealist”), an opposition to a utilitarian approach to nature conservation but seeing ES as more encompassing approach (“Anti-Utilitarian”), a focus on a methodological rather than a critical approach to ES (“Methodologist”), and a rather economic approach to environmental decision-making, in which ES is a useful tool (“Moderate Economist”). We see this plurality as illustrating both the potential of the ES concept to serve as a boundary object for collaboration, but also the threat of ineffective collaboration due to the lack of a common conceptual ground. However, as pluralism can be fruitful if handled transparently, we suggest the need for open dialogue about underlying assumptions when using a value-laden concept like ES.

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## 1. Introduction

Research on ecosystem services has grown exponentially (Abson et al., 2014). The concept of ecosystem services (ES) has catalyzed a wide variety of innovations in interdisciplinary research (understood as a significant transformation of knowledge achieved through integrating ideas or tools from two or more research traditions) (Khagram et al., 2010), as well as transdisciplinary research conducted together with stakeholders. Ecosystem services are increasingly in demand for policy applications (e.g., the establishment of the Intergovernmental Platform on Biodiversity and Ecosystem Services by over 100 governments to provide scientific information in response to policymaker requests ([www.ipbes.net](http://www.ipbes.net))). There is a growing desire to better translate the concept into practice (e.g., Daily et al., 2009), as evidenced by the European Commission recently funding two large consortium projects, each spanning 5 years and totaling over €20 million including several hundred researchers, with the goal of operationalizing ecosystem services for policy and practice.

From the start, the ES concept aimed to label the benefits that humans derive from natural ecosystems and biodiversity in order to include their value into decision-making frameworks (Braat and de Groot,

2012). The novelty of the concept was the framing of the link between humans and nature in a pragmatic way (Potschin and Haines-Young, 2011). Utilitarianism, defined as “taking advantage of the greatest possible mix of resulting benefits [for humans]” (Daily and Ellison, 2002, p. 229), was considered an essential ingredient to the new approach. With this focus on the instrumental value of nature for humans, the ES concept has been argued to mark a shift in the perception of the human–nature relationship towards a more anthropocentric one (Braat and de Groot, 2012; Flint et al., 2013; Gómez-Baggethun et al., 2010; Lamarque et al., 2011).

However, despite this ostensibly clear conceptual core behind ecosystem services that was meant to serve as unifying framework (De Groot, 1987), the concept's rapid adoption and application to a wide variety of contexts (De Groot et al., 2002) has led to criticisms concerning its vagueness (Schröter et al., 2014). A variety of definitions and underlying paradigmatic assumptions can pose a barrier to effective interdisciplinary research (Luederitz et al., 2015) and potentially jeopardize the concept's effective implementation in practice (Ash et al., 2010; Nahlik et al., 2012; Seppelt et al., 2011). Therefore, while empirical evidence applying the ES concept is widespread, many of these examples may have proceeded with the concept uncritically or used it as a mere “buzzword” (Brown et al., 2014, p. 329). As a recent meta-analysis by Abson et al. (2014) indicates, ES research requires a stronger engagement with conceptual differences and underlying normative foundations. This is important first, for researchers to design, carry out, and

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communicate research clearly, as well as to effectively contribute to our knowledge about ecosystems and how to manage them.

A successful research concept is both specific and vague. It must be specific because the successful application of a concept in practice, in this case the operationalization of ES, starts with the clarification of conceptual differences in the scientific community (MacMynowski, 2007). However, in order for a concept to function as a “boundary object” (Star and Griesemer, 1989) between researchers, it needs a certain degree of vagueness and has to allow for diversity in understandings.

Seeing these two features as complimentary rather than contrary to each other, we understand clarification as the need to create awareness for existing differences and for actively engaging with these differences. To recognize and categorize differences in how researchers perceive the concept and purpose of ES and explore their implications, we selected a case of a large ES research consortium pursuing collaborative research projects. Within this case, we pursued two objectives: to (1) assess potential differences on ES using Q methodology, and to (2) deduce recommendations on how to handle these differences effectively, which are relevant for the wider research community around ES.

## 2. Methods

### 2.1. Case Description

In order to investigate the existing perspectives on the ES concept within the research community, we selected the case of the research project Operational Potential for Ecosystem Research Applications (OPERAs, <http://www.operas-project.eu/>). OPERAs is a European-wide five-year consortium (2012–2017) comprised of 27 partner organizations, most of which are research institutions and universities. The stated goal of the OPERAs project is to enhance “sustainable use of ecosystems by operationalizing the ecosystem services concept,” which is pursued through “a new level of engagement of scientists with practitioners” using a “highly interdisciplinary approach” (OPERAs, 2012, p. 13).

The nearly 100 OPERAs research partners come from various cultural, disciplinary, and institutional backgrounds, but all are working directly with the ES concept, including many leading researchers in the field. We expected that working on a long-term collaborative project would create opportunities for more discussions and reflections on the ES concept, and that therefore this was a good initial representation of the research community, at least based in Europe, where a great deal of research is conducted in large international consortia.

The study was conducted January–March 2014 and thus was set at a rather early stage in the project. We considered this timing as being beneficial for our study as researchers had been working on the project and with the ES concept for a while already but were not too far into the project so that we did not expect their understanding of the concept to be too project-specific.

### 2.2. Research Methodology

#### 2.2.1. Q Methodology: Background and Objectives

To identify the perspectives on the ES concept held by ES researchers, we used Q methodology, an approach designed to provide structured assessment of human subjectivity (Barry and Proops, 1999; Davies and Hodge, 2007). Q method uses factor analysis of rankings of qualitative statements to identify and understand the range of social perspectives that exist on the topic (rather than to provide a representative sample of the frequency of views held, as a quantitative survey would aim to do) (Winkler and Nicholas, 2016). Using Q method can serve to both clarify points of agreement and disagreement within groups, and to help individuals clarify their own thinking (Webler et al., 2009).

The objective of Q methodology is to identify dominant perspectives on the topic under study. For that, the basic idea is to let participants sort a number of statements into an order that reflects their individual

attitude towards a certain topic. The perspectives then result from clustering and describing similar groups of attitudes — they can therefore be defined as generalizations over comparable attitudes held by people (McKeown and Thomas, 1988). The method is especially relevant for the exploration of perspectives on environmental topics, as an area that is complex, value-laden and disputed (Dryzek, 1997; Frantzi et al., 2009; Nijnik et al., 2013). As an approach “fitting under the broad umbrella of discourse analysis techniques” (Webler et al., 2009, p. 5), it not only allows the researcher to investigate perspectives on a topic, but can also help participants to understand their own assumptions on an issue (Stephenson, 1986).

#### 2.2.2. Q Study: Set Up and Execution

The set up of a Q study typically follows four steps: the identification of the concourse, the selection of statements, the design of the study procedure, and the choice of participants. The subsequent analysis is based on the quantitative derivation of factors that are then interpreted as dominant perspectives among study participants.

#### 2.2.3. Identification of the Concourse

The so-called concourse is represented by the general discussion or discourse that exists around a topic (Brown, 1986). As a qualitative approach, identifying the concourse is a highly subjective step that reflects the researcher's perspectives. In this case, the concourse was represented by the general literature on ES. In order to cut down the vast amount of literature dealing with ES, we searched for articles specifically addressing the underlying elements of the concept, and left out the ones only mentioning ES or applying the concept to a specific case study. For a first overview, we identified peer-reviewed articles on Web of Science with the keywords “Ecosystem Services” + “concept”. We then went on with a snowball approach, reviewing further relevant articles that were referenced in the first set. In addition, we added papers suggested from a semi-structured interview with Gretchen Daily, one of the key founders and champions of the concept (Daily et al., 1996; Daily et al., 2000; Daily and Ellison, 2002). In Q methodology, once the concourse is identified, the researcher's task is to filter out opinion statements that mirror the variety of different perspectives on the topic (Davies and Hodge, 2007).

#### 2.2.4. Selection of Statements

In order to select the statements that participants will rank, the concourse is reduced to a “miniature representation” (Brown, 1986, p. 187) consisting of the minimum number of statements necessary to capture the breadth and variety of the discourse around the topic. For that it is helpful to construct a concourse matrix. A concourse matrix is a tool for categorizing selected statements in the form of a table in order to make sure that statements are as diverse as possible and that they reflect the breadth of the concourse. Therefore, it is necessary to define relevant categories that appear to be the main points or pillars in the debate around a topic. If statements fill the same category within the table, only one of them has to be taken into the study as the other fulfill the same function or present the same point of view.

Based on our literature review and the interview, we therefore developed a first typology of three initial perspectives on the ES concept that we labeled: “Pragmatic Conservationist”, “Instrumental Economic”, and “Broad Societal”. We found that these three very roughly reflected the differences that we noticed most strongly in the literature — the original pragmatic perspective on ES, the economic perspective seeing ES as a tool to put a monetary value on nature, and the reflective societal perspective discussing ES as a new form of expressing the Human–Nature relationship.

We fine-tuned this typology further by defining three sub-categories: “worldview”, “concept”, and “openings for deliberation”. Within each of the three initial perspectives, we identified four statements representing different aspects of worldviews, which captured underlying values and paradigmatic assumptions, e.g., “people are

**Table 1**

The concourse matrix resulting from classifying 39 original statements taken from the literature in the second step of the Q study. Statements were classified according to the three preliminary perspectives on ecosystem services we identified in the literature and three classifications: Worldview (underlying values and paradigmatic assumptions), Concept (definition of the concept, its purpose and its characteristics), and Openings for Deliberation (the perceived need to discuss and clarify differences in understandings, which apply equally to all perspectives as meta-statements on the use of the concept (darker shading)). We added further sub-categories to make the concourse matrix as detailed as possible in order to avoid having statements that are too similar in the final selection. The original statements were edited slightly for clarity, sources were removed and statements were randomly mixed to form the final list of statements that were ranked by participants in the Q sorts (full statements and their rankings shown in Table 3). Numbering in parentheses refers to statement numbers used in Table 3 and the text.

Concourse Matrix of statements from the literature about ecosystem services				
		Pragmatic Conservationist (PC)	Instrumental Economic (IE)	Broad Societal (BS)
<b>Worldview</b>	Ethics/ Values	Decision-making frameworks must ensure the protection of humanity's most fundamental source of well-being: earth's life-support system. (Daily, 1997) (PC2)	Maintaining stocks of natural capital allow the sustained provision of future flows of ecosystem services, and thereby help to ensure enduring human well-being. (TEEB, 2010) (IE1)	Ultimately, the level of biodiversity that survives on Earth will be determined not just by utilitarian considerations but to a significant extent by ethical concerns, including considerations of the intrinsic values of species. (MEA, 2005) (BS2)
	Human-Nature Relationship	A prerequisite to successful stewardship is knowing the basic features of the system being managed. (Daily et al., 1996) (PC1)	Nature can be seen as separate from humans and human activities as external disturbances to natural functions. (Flint et al., 2013) (IE4)	[P]eople are integral parts of ecosystems and [...] a dynamic interaction exists between them and other parts of ecosystems. (MEA, 2005) (BS7)
	Problem Framing	[T]he record shows that conservation can't succeed by charity alone. It has a fighting chance, however, with well-designed appeals to self-interest. (Daily & Ellison, 2002) (PC11)	The failure to incorporate the values of ecosystem services and biodiversity into economic decision making has resulted in the perpetuation of investments and activities that degrade natural capital. (TEEB, 2010) (IE6)	There is no simple fix to these problems [of environmental degradation] since they arise from the interaction of many recognized challenges [...] each of which is complex to address in its own right. (MEA, 2005) (BS4)
	Transformational Claim	It is at the policy frontiers that lie the brightest prospects for resolving the human predicament and converting the world's society to new and sustainable resource management regimes. (Daily, 1997) (PC3)	[We are striving towards establishing] a new economy: one in which the values of natural capital, and the ecosystem services which this capital supplies, are fully reflected in the mainstream of public and private decision-making. (TEEB, 2010) (IE7)	The academic community now has an unprecedented opportunity to lead in the development of fundamental and applied research, of policy instruments, and of regional and global institutions oriented toward sustainable Earth management. (Daily et al., 1996) (BS5)
<b>Concept</b>	Judgment	[T]he concept inevitably involves judgments about human actions with respect to nature, and about what we value in nature. 'Ecosystem services' is thus a value-laden (i.e., normative) concept. (Jax et al., 2013) (PC8)	[T]he concept of ES fits in the nexus of anthropocentrism, utilitarianism, and notions of nature as separate from humans. (Flint et al., 2013) (IE2)	[T]he broader ES framework [provides the potential] to include cultural and intrinsic motivations for conservation. (Flint et al., 2013) (BS1)
	Conceptual Descriptive	[T]he ES concept [is] a strategy to get the conservation idea across in societal discourses by appealing to peoples' own interest. (Schröter et al., 2014) (PC5)	Ecosystem Services are used as conceptual tool with the capacity to make environmental externalities explicit, and [...] to internalize the value of such externalities in market transactions and decision making processes. (Jax et al., 2013) (IE3)	The concept denote[s] a generic idea or metaphor about the contribution of ecosystems to sustain life and human well-being [...] to facilitate communication between different disciplines and interest groups and to increase awareness of dependencies of human well-being on natural systems. (Jax et al., 2013) (BS1)
	Conceptual Purpose	The ES concept provides a utilitarian framing of those ecosystem functions which are deemed beneficial to society as services in order to increase public interest. (Braat & De Groot, 2012) (PC4)	Using an economic approach to environmental issues can help decision makers to determine the best use of scarce ecological resources at all levels (TEEB, 2010) (IE9).	The position of ecosystem services at the science-society interface provides it with the capacity to promote dialogue between academic disciplines and to improve communication between interest groups. (Jax et al., 2013) (BS9)
	Valuation	Valuation is a way of organizing information to help guide decisions but is not a solution or end in itself. It is one tool in the much larger politics of decision-making. (Daily et al., 2000) (PC6)	The issue of valuation is inseparable from the choices and decisions we have to make about ecological systems [...]. We can choose to make these valuations explicit or not [...]. But as long as we are forced to make choices, we are going through the process of valuation. (Costanza et al., 1997) (IE10)	In principle, monetary [valuation] needs not exclude other value dimensions in that it may be complemented with alternative valuation languages and real processes of deliberation in ecosystem services valuation. (Jax et al., 2013) (BS10)
	Models	[I]t is impossible to classify the services into entirely distinct, independent conditions and processes [...] it thus follows that the number of services contributing to a given source of human benefits is necessarily arbitrarily specified. (Daily, 1997) (PC7)	[CICES can provide] a framework that would enable the translation between different classifications and the linking of different sources of information about economy and environment. (Haines-Young & Potschin, 2010) (IE5)	Following the MEA, Ecosystem services are broadly defined as the benefits people obtain from ecosystems and are classified in four categories. (Lamarque, Quétiér & Lavorel, 2011) (BS6)
	Terminology	[Researchers] started talking about goods and services to use a language that is familiar to people. (Daily, 2014) (PC10)	The emphasis currently placed on the economic valuation of ecosystem services is perhaps inevitable, given the financial terminology used to express the idea that people benefit from nature. (Potschin & Haines-Young, 2011) (IE11)	Choosing terms that evoke positive associations such as "services", "goods", and "benefits", shows the optimistic intention as well as the research interest of scientists working with the ES concept. (Schröter et al., 2014) (BS8)
	Critique	[A] utilitarian framing of landscape management as done with the ecosystem services concept could crowd out more affective, moralistic, intrinsic or social motivations and thus impede broader and/or longer landscape commitment. (Flint et al., 2013) (PC9)	The spreading of the ecosystem service concept has in practice set the stage for the perception of ecosystem functions as exchange values that could be subject to monetization and sale. (Gómez-Baggethun et al., 2010) (IE8)	As the number of scientific disciplines that refer to the ecosystem services concept grows, and with its incorporation into political and corporate discourse, the concept is becoming multiform and harder to grasp. (Lamarque, Quétiér & Lavorel, 2011) (BS3)
	<b>Openings for deliberation</b>	Vagueness of the concept	To effectively use the ecosystem services concept in decision-making will require a clear understanding of the concept (definition and characteristics). (Fisher, Turner & Moring, 2009) (O5)	To achieve such a unifying [ES] framework, [there is a need to make] implicit norms more explicit as well as thinking beyond existing paradigms about ecosystems and human-nature relationships. (Flint et al., 2013) (O3)
		Different contexts and purposes entail different needs for the definition of ecosystem services. (Jax et al., 2013) (O6)	I think its application has evolved a lot but the concept [...] at its heart is still the same. (Daily, 2014) (O1)	I think it would be sensible to consider ecosystem services as a core and an essential piece to the bigger sustainability problem solving but it's by no means the full kind of piece. (Daily, 2014) (O2)

integral parts of ecosystems and [...] a dynamic interaction exists between them and other parts of ecosystems" (MEA, 2005, p. v). We also identified seven categories of concepts in each initial perspective, which focused on definitions, purposes, and characteristics of ecosystem services, e.g., "[T]he ES concept [is] a strategy to get the conservation idea across in societal discourses by appealing to peoples' own

interest" (Schröter et al., 2014, p. 518). Further, independently from the initial perspectives, we identified six statements classified as "openings for deliberation" (the perceived need to discuss and clarify differences in understandings, e.g. "Different contexts and purposes entail different needs for the definition of ecosystem services"; Jax et al., 2013, p. 266).

We sorted all of the initially collected statements into the concurrence matrix in order to identify overlaps or missing aspects (Table 1). Here, we also included two statements from the interview conducted with Gretchen Daily, as it is common practice in Q methodology to use statements from conversations, interviews or focus groups (Webler et al., 2009). To develop the final 39 statements that participants would sort in the study, we edited them slightly for clarity and deleted the source, but following the advice of Brown (1986), we kept ordinary language and spelling the same as the original.

It is important to note again that the concurrence matrix is merely a tool – a mental frame – for the researcher to help leaving out those statements that overlap too much with other statements (filling the same category, i.e., the same slot in the concurrence matrix). The categories selected are subjective choices of what we found to be important. As the final selection is supposed to be a “miniature representation” of the entire concurrence, the process to identify it should not be regarded as final. Also, it might be surprising that some articles appear in several columns of the matrix. This underlines the fact that we used the concurrence matrix as a sorting tool, not as a strict categorization – as statements are taken out of their context, some of them might not resemble the core idea but only one point of discussion brought forward in an article. That is how very different statements, both regarded as important for reflecting the concurrence, might come from one and the same article.

### 2.2.5. Design of the Study Procedure

In designing the study procedure, where participants perform a Q sort, we utilized a sorting range with nine categories following the recommendation for Q samples smaller than  $n = 40$  and added labels from “least like how I think” to “most like how I think” with no explicit labels in between, as done by Webler et al. (2009). The sorting arrangement is supposed to represent a quasi-normal distribution that is symmetrical over the middle, but usually flatter than a normal distribution (Brown, 1986). For 39 statements, the best way to force this distribution was through the following arrangement of positions into which participants would sort statements (Fig. 1). The Q sort, the study procedure of Q methodology, can be conducted in person or online. Here we employed the program Qsortware, an online tool specifically designed to conduct Q studies. Participants also had the chance to answer questions and give comments on their experiences of the sort.

### 2.2.6. Selection of Participants

As a qualitative approach aiming to identify and understand perspectives, Q methodology does not aim at working with a representative number of people, but rather with a representative breadth of viewpoints given through the diversity of participants. Our selection of participants followed established Q methodology in aiming to get responses from about two to three dozen people that represent the “breadth of perspectives” (Brown, 1986, p. 260) and that are “knowledgeable about the issue and have well-formed opinions” (Webler et al., 2009, p. 21). We sent the online study out to all OPERAs participants

at that time ( $N = 97$ ) via email to the project listserv, of which 33 completed the Q sorts. Respondents met both the breadth criteria, coming from different disciplines and from various cultural backgrounds, as well as the knowledgeable criteria, with all of them working with the ES concept as a focus of their research. It is important to note here that we focused on researchers within the project only and did not include stakeholders, which could be an interesting aspect for further studies.

### 2.2.7. Factors and Perspectives: Quantitative Output and Interpretation

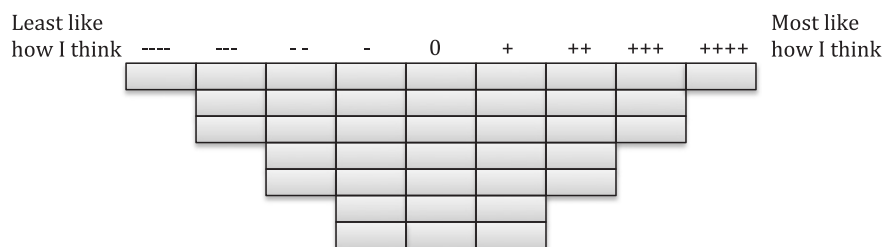
After completion, we first analyzed the Q sorts systematically using the statistical software R (<http://www.r-project.org>). The aim of the statistical analysis of a Q study is to find factors that can be interpreted as the dominant perspectives held by a group of participants on a topic. Based on a correlation matrix between all Q sorts, we identified those factors with an Eigenvalue  $> 1$  (Kaiser's criterion) that we used for further investigation. As suggested in the literature on Q methodology (Davies and Hodge, 2007; Webler et al., 2009; Winkler and Nicholas, 2016), we employed Principal Component Analysis (PCA) in order to categorize all Q sorts by the factors identified. By calculating the factor scores, the estimates of common rankings of statements among Q sorts within each factor, we were able to create an ideal sort for each factor (a sort that best represents all sorts within the factor). The factors and their variables – which are the rankings of statements in the Q sorts – provided the basis for the subsequent distinction and interpretation of five perspectives among study participants, which we named based on our interpretation of their rankings. In order to further characterize each of the perspectives, we examined the statements that were ranked most similarly and most differently across perspectives.

As recommended by Webler et al. (2009), conclusions drawn from first interpretations were backed up with follow-up interviews. We conducted one interview for each perspective we identified, choosing those participants whose Q sort loaded highest onto the factor and thus was least likely to fall into any of the other factors. In qualitative terms, these people could be regarded as the representatives of a certain perspective, being the ones furthest away with their views from any of the other perspectives. Interviews were conducted via phone and each of them was about 30 min long. As they focused on the most striking patterns within each perspective, questions varied depending on the ranking of statements, asking these representatives to explain the views they had expressed in the sorting exercise.

## 3. Results

### 3.1. Identifying Five Perspectives on Ecosystem Services

We identified five perspectives on ecosystem services from the systematic factor analysis of the Q sorts, representing clusters of Q sorts with similar rankings, summarized in Table 2 and elaborated below. The ranking of statements for each factor (Table 3) served as the basis



**Fig. 1.** Q sort study design, where participants sorted the 39 statements about ecosystem services (shown in Table 3) into a flattened normal distribution between “most like how I think” and “least like how I think,” with neutral positions in the middle, after Webler et al. (2009). For example, participants could select only one statement in the extreme right position “most like how I think,” but seven statements in the neutral position in the middle.



**Table 2**

Overview of the five perspectives identified on the ecosystem services concept within the OPERAs research consortium, based on factor analysis of Q sorts from 33 participants. Statements ranked “most like how I think” and “least like how I think” by each perspective are shown here (full statements and their rankings by participants are in Table 3).

Perspective	Non-economic utilitarian	Critical idealist	Anti-utilitarian	Methodologist	Moderate economist
Number of participants	9	7	5	7	5
Disciplinary background	Natural Sciences (7) Social Sciences (2)	Natural Sciences (4) Social Sciences (2) Engineering (1)	Natural Sciences (3) Economics (1) Information Technology (1)	Natural Sciences (7)	Natural Sciences (1) Social Sciences (1) Economics (3)
Main characteristic	Pragmatic view on nature conservation and ES as useful tool	Strong value focus and skeptical view on ES	Opposition to a utilitarian approach to conservation but ES seen as more encompassing	Methodological statements play an important role and uncritical approach to ES	Economic approach to environmental decision-making and ES as useful tool
Own values	Utilitarianism defined as including broad set of values	Emphasis on human nature relationship and paradigmatic viewpoints	Utilitarian view on nature not enough since utilitarianism defined as monetary value only	Instrumental view on nature conservation	Broad value perspective, nature more than resource to humans
Concept's promoted values	Utilitarian character of concept as useful approach to conservation	Intrinsic values of nature excluded by the utilitarian character of the ES concept	Denial of a utilitarian core of the ES concept	ES concept not regarded as excluding any values	ES concept as practical (economic) tool
“Most like how I think”	“Maintaining stocks of natural capital allows the sustained provision of future flows of ecosystem services and thereby helps to ensure enduring human well-being.” IE1	“People are integral parts of ecosystems and a dynamic interaction exists between them and other parts of ecosystems.” BS7	“Ultimately, the level of biodiversity that survives on Earth will be determined not just by utilitarian considerations but to a significant extent by ethical concerns including considerations of the intrinsic values of species.” BS2	“The concept of ecosystem services denotes a generic idea or metaphor to increase awareness of dependencies of human well-being on natural systems.” BS1	“Using an economic approach to environmental issues can help decision-makers to determine the best use of scarce ecological resources at all levels.” IE9
“Least like how I think”	“Nature can be seen as separate from humans and human activities as external disturbances to natural functions.” IE4	“Nature can be seen as separate from humans and human activities as external disturbances to natural functions.” IE4	“The ecosystem services concept provides a utilitarian framing of ecosystem functions as services in order to increase public interest in conservation.” PC4	“A utilitarian framing of landscape engagement as done with the concept of ecosystem services could crowd out more affective moralistic intrinsic or social motivations and thus impede broader and longer landscape commitment.” PC9	“As the number of scientific disciplines that refer to the concept of ecosystem services grows the concept is becoming multiform and harder to grasp.” BS3

for identifying, labeling and characterizing the five main perspectives among OPERAs researchers (statements from the concourse that were ranked by participants in the Q sort are shown in italic type and are referred to with their number, e.g. “PC1” to identify statements in Table 3). In addition to the ranking of statements, we used insights from the follow-up interviews with the representatives of each perspective (shown in quotation marks) to characterize each perspective.

3.1.1. Perspective I: The Non-Economic Utilitarian

The first perspective represents a pragmatic view on nature conservation, probably most strongly in line with the Pragmatic Conservationist foundational perspective in the concourse matrix. The utilitarian character of the ES concept is acknowledged and appreciated as a useful tool to approach conservation and to stress the link between humans and ecosystems. One of the highest ranked statements (indicating “most like how I think”) acknowledges the concept's *utilitarian framing of ecosystem functions as services in order to increase public interest in conservation* (statement PC4). The representative defined utilitarianism as being “anthropocentric” but including a “broad set of values” as opposed to being constrained to economic valuation.

Although the highest ranked statement acknowledges that *maintaining stocks of natural capital allows for the sustained provision of future flows of ecosystem services* (IE1), an economic approach to ecosystem management is strongly rejected overall, given that all the lowest ranked statements (those “least like how I think”) are those explicitly stating an economic perspective on the concept including value statements seeing *nature as separate from humans* (IE4, IE2), using economic approaches for optimal resource management (IE9) and the inevitability of economic valuation (IE11). The representative of this perspective noted that the concept is “much larger” than and goes “beyond economic values.” Surprisingly, although rejecting an economic viewpoint, the statement ranked highest uses the natural capital terminology, as

done mostly in the Instrumental Economic foundational perspective. Given that the main representative of this perspective argues that he/she does not make use of the natural capital concept very often since people are less familiar with it, natural capital as a term or concept is apparently not seen as an inherent part of the ES concept. Nevertheless, the natural capital metaphor is positively reflected on as potentially useful addition to the ES concept to stress the non-substitutability of the natural stock providing the services to humans.

3.1.2. Perspective II: The Critical Idealist

The second perspective is dominated by a strong value-focused standpoint. Two opposite statements referring to the human–nature relationship were ranked at the extremes at both ends of the spectrum. The highest-ranked statement acknowledged that *people are integral parts of ecosystems* (BS7) and the lowest-ranked statement referred to nature as *separate from humans and human activities as external disturbances to natural functions* (IE4). This perspective is mostly concerned with ethical issues, paradigmatic viewpoints and critical reflections on the valuation of nature, rather than concrete conceptual or methodological statements. Although closest to the Broad Societal perspective with regard to underlying ethical viewpoints, the important difference is that this perspective seems to be quite skeptical or “at least always a little bit critical” about the ES concept, except as expressed in the Millennium Ecosystem Assessment. However, as opposed to the explicit inclusion of intrinsic values of nature in the MA, the representative saw these values as necessarily excluded by the utilitarian character of the concept that only focuses on “what we need and what we want.”

3.1.3. Perspective III: The Anti-Utilitarian

Striking in this third perspective is the focus on ethical aspects, and the strong opposition to a utilitarian approach to nature, with the first and last statements on both ends of the spectrum referring to

utilitarianism. Ranked highest was the idea that the *level of biodiversity that survives on Earth will be determined not just by utilitarian considerations but to a significant extent by ethical concerns* (BS2), whereas the lowest ranked statement refers to the ecosystem services concept as *utilitarian framing of ecosystem functions* (PC4). The reason for such a position is, at least in the case of the representative of this perspective, obviously connected to a very narrow definition of utilitarianism as “specifically attaching a monetary value” and as only valuing “what

the market can capture.” At the same time, he/she acknowledged that there might be other views dependent on “how you define utilitarianism.” As in the Critical Idealist perspective, in this perspective ethical and value statements play a more important role than more conceptual or methodological statements referring to the ES concept itself. Since the position towards the ES concept is much less critical than the Critical Idealist perspective though, a utilitarian approach is not criticized but simply denied as being an inherent part of the concept.

**Table 3**

Edited statements derived from the concourse matrix (Table 1) used in the Q sort exercise, and their rankings by the five perspectives on ecosystem services held by OPERAs researchers. Rankings of the 39 statements by the five perspectives on ES held by OPERAs researchers. Statement ranking scores from the Q sort range between -4 (“least like how I think”) to +4 (“most like how I think”) (see Fig. 1). Increasing strength of agreement is shown by darker shades of green, and increasing disagreement by darker shades of red. “Compromise points” (statements with the greatest disagreement between perspectives) are shown in bold, and “consensus points” (those of greatest agreement between perspectives) are shown in italics. Statements were ordered randomly in their presentation to participants. Here, they are sorted by the preliminary perspectives from the concourse matrix (Table 1).

	Typology from concourse matrix (Table 1)	Statement	Non-economic utilitarian	Critical idealist	Anti-utilitarian	Methodologist	Moderate economist
PC1	Pragmatic conservationist	A prerequisite to successful stewardship of nature is knowing the basic features of the system being managed.	2	1	3	1	0
PC2	Pragmatic conservationist	Decision-making frameworks must ensure the protection of humanity's most fundamental source of well-being: earth's life-support system.	3	0	3	0	0
PC3	Pragmatic conservationist	It is at the policy frontiers that lie the brightest prospects for converting the world's society to sustainable resource management regimes.	-1	-3	2	-3	3
<b>PC4</b>	<b>Pragmatic conservationist</b>	<b>The ecosystem services concept provides a utilitarian framing of ecosystem functions as services in order to increase public interest in conservation.</b>	3	-2	-4	2	-1
PC5	Pragmatic conservationist	The concept of ecosystem services is a strategy to get the conservation idea across in societal discourses by appealing to peoples' own interest.	2	-1	-2	1	-2
PC6	Pragmatic conservationist	Valuation is a way of organizing information to help guide decisions but is not a solution or end in itself. It is one tool in the much larger politics of decision-making.	-1	3	2	1	1
PC7	Pragmatic conservationist	It is impossible to classify ecosystem services into entirely distinct independent conditions and processes. It thus follows that the number of services contributing to a given source of human benefits is necessarily arbitrarily specified.	0	2	-2	-2	-1
PC8	Pragmatic conservationist	The concept of ecosystem services inevitably involves judgments about human actions with respect to nature and about what we value in nature. Ecosystem services is thus a value-laden (i.e. normative) concept.	-1	2	0	-1	0
PC9	Pragmatic conservationist	A utilitarian framing of landscape engagement as done with the concept of ecosystem services could crowd out more affective moralistic intrinsic or social motivations and thus impede broader and longer landscape commitment.	0	1	0	-4	-2
PC10	<i>Pragmatic conservationist</i>	<i>Researchers started talking about ecosystem goods and services to use a language that is familiar to people.</i>	-1	-2	-2	-1	-1
PC11	Pragmatic conservationist	The record shows that conservation cannot succeed by charity alone. It has a fighting chance however with well-designed appeals to self-interest.	1	-2	-2	0	-1
<b>IE1</b>	<b>Instrumental economic</b>	<b>Maintaining stocks of natural capital allows the sustained provision of future flows of ecosystem services and thereby helps to ensure enduring human well-being.</b>	4	-3	1	3	1
IE2	Instrumental economic	The concept of ecosystem services fits in the nexus of anthropocentrism, utilitarianism, and notions of nature as separate from humans.	-3	1	1	0	-3
IE3	Instrumental economic	Ecosystem services are used as tool to make environmental externalities explicit and to internalize the value of such externalities in market transactions and decision-making processes.	-2	-1	2	2	1
IE4	Instrumental economic	Nature can be seen as separate from humans and human activities as external disturbances to natural functions.	-4	-4	0	0	-3
IE5	Instrumental economic	The Common International Classification of Ecosystem Services (CICES) provides a good framework to enable the translation between different classifications and the linking of different sources of information about economy and environment.	-1	-1	3	-1	0
IE6	Instrumental economic	The failure to incorporate the values of ecosystem services and biodiversity into economic decision-making has resulted in the perpetuation of investments and activities that degrade natural capital.	0	-2	2	-1	3
IE7	Instrumental economic	The goal is a new economy: one in which the values of natural capital and the ecosystem services which this capital supplies are fully reflected in the mainstream of public and private decision-making.	1	-3	1	2	2
IE8	Instrumental economic	The spreading of the concept of ecosystem services has in practice set the stage for the perception of ecosystem functions as exchange values that could be subject to monetization and sale.	-1	1	-3	-3	-2
<b>IE9</b>	<b>Instrumental economic</b>	<b>Using an economic approach to environmental issues can help decision-makers to determine the best use of scarce ecological resources at all levels.</b>	-3	-1	-1	1	4
IE10	Instrumental economic	The issue of valuation is inseparable from the choices and decisions we have to make about ecological systems. We can choose to make these valuations explicit or not. But as long as we are forced to make choices we are going through the process of valuation.	-2	2	-1	3	2
IE11	Instrumental economic	The emphasis currently placed on the economic valuation of ecosystem services is perhaps inevitable given the financial terminology used to express the idea that people benefit from nature.	-3	-1	-2	0	2
BS1	Broad societal	The concept of ecosystem services denotes a generic idea or metaphor to increase awareness of dependencies of human well-being on natural systems.	3	-1	-1	4	2
<b>BS2</b>	<b>Broad societal</b>	<b>Ultimately the level of biodiversity that survives on Earth will be determined not just by utilitarian considerations but to a significant extent by ethical concerns including considerations of the intrinsic values of species.</b>	0	0	4	0	-3
BS3	Broad societal	As the number of scientific disciplines that refer to the concept of ecosystem services grows the concept is becoming multiform and harder to grasp.	0	0	-1	-2	-4
BS4	Broad societal	There is no simple fix to the problems of environmental degradation since they arise from the interaction of many recognized challenges each of which is complex to address in its own right.	2	2	2	-3	1

Table 3 (continued)

	Typology from concourse matrix (Table 1)	Statement	Non-economic utilitarian	Critical idealist	Anti-utilitarian	Methodologist	Moderate economist
BS5	Broad societal	The academic community now has an unprecedented opportunity to lead in the development of fundamental and applied research of policy instruments and of regional and global institutions oriented toward sustainable Earth management.	1	-2	0	-2	2
BS6	Broad societal	The Millennium Ecosystem Assessment provides a good framework to define and classify ecosystem services.	2	-1	0	-1	-1
BS7	Broad societal	People are integral parts of ecosystems and a dynamic interaction exists between them and other parts of ecosystems.	2	4	1	-1	3
BS8	Broad societal	Choosing terms that evoke positive associations such as “services”, “goods”, and “benefits” shows the optimistic intention as well as the research interest of scientists working with the ecosystem services concept.	0	0	-3	-2	2
BS9	Broad societal	The position of ecosystem services at the science–society interface provides it with the capacity to promote dialogue between academic disciplines and to improve communication between interest groups.	1	1	-1	2	0
BS10	Broad societal	In principle monetary valuation needs not exclude other value dimensions in that it may be complemented with alternative valuation languages and real processes of deliberation in ecosystem services valuation.	-2	2	1	3	-1
BS11	Broad societal	The broader ecosystem services framework provides the potential to include cultural and intrinsic motivations for conservation.	0	1	-1	1	1
O1	Openings for deliberation	The application of ecosystem services has evolved a lot but the concept at its heart is still the same.	-2	0	1	1	0
O2	Openings for deliberation	It is sensible to consider ecosystem services as a core and an essential piece to the bigger sustainability problem solving but it’s by no means the full piece.	-2	3	0	2	0
O3	Openings for deliberation	To achieve a unifying ecosystem services framework there is a need to make implicit norms more explicit as well as thinking beyond existing paradigms.	-1	0	-1	1	-2
O4	Openings for deliberation	Successful inter-and transdisciplinary research requires an explicit reflection on shared concepts.	0	0	0	0	-1
O5	Openings for deliberation	To effectively use the ecosystem services concept in decision-making will require a clear understanding of the concept (definition and characteristics).	1	0	0	-1	1
O6	Openings for deliberation	Different contexts and purposes entail different needs for the definition of ecosystem services.	1	3	-3	-2	1

3.1.4. Perspective IV: The Methodologist

As opposed to all previous perspectives, two of the highest-ranked statements in this perspective (BS10 and IE10) refer to methodological aspects of valuation specifically, rather than underlying values. Surprisingly, the statement that there is *no simple fix to the problems of environmental degradation* (BS4) was ranked on one of the lowest positions, suggesting a rather mechanistic view on ecosystem management. Criticism on the concept that it can potentially *crowd out more affective moralistic intrinsic or social motivations and thus impede broader and longer landscape commitment* (PC9) is ranked last, which alludes to a rather uncritical attitude towards the ES concept. A reason for that could be a very instrumental view on the concept that is less sensitive to terminological nuances or underlying ethical stances. In line with that assumption, the representative of this perspective stated that s/he has “not really come across differences in the conceptualization of ES” yet.

3.1.5. Perspective V: The Moderate Economist

The fifth perspective represents the only one with an obvious economic focus, thus getting closest to the Instrumental Economic perspective in the concourse matrix. The highest-ranking statements reflect a focused economic conceptual paradigm supporting the idea that an *economic approach [...] can help decision-makers to determine the best use of scarce ecological resources* (IE9) and that including monetary values of ecosystem services would improve economic decision-making (IE6). As opposed to all other perspectives, this one strongly disagrees with the idea that the ES concept is *becoming multiform and harder to grasp* with a growing number of users (BS3). This observation could be assigned to a narrow economic view on the concept that lowers the awareness for the possibility of other existing understandings and uses. Despite the economic focus of this perspective though, two of the most disagreed with statements were still the one denoting humans as separate entities from nature (IE4) and the one positioning the ES concept at the *nexus of anthropocentrism, utilitarianism, and notions of nature as separate from humans* (IE2). This is interesting since it seems

to contradict the view supported above, of nature as an “ecological resource” for humans. Thus, while the “worldview” category statements reflect a broad value perspective, the “concept” category is clearly dominated by economic statements. This is reflected by the representative, who saw the concept as being “highly compatible with economics” but at the same time emphasized that there are “diverse ways in which people gain well-being.” Therefore, while seeing his/her own view as going “down the practical line,” this perspective does not reflect an exclusively economic view on nature.

3.2. Comparison Between Perspectives

Similarities between perspectives, termed “consensus points” in Q methodology (Webler et al., 2009, p. 35), as well as striking differences or “compromise points,” were revealed by the range between ranks of statements across factors. In addition, the sum of the factor ranks shows which statements elicited the strongest opinions in one direction. Interlacing these findings with insights from the follow-up interviews and the comments given by participants allowed for a more comprehensive picture of key points that constituted the different perspectives.

3.2.1. Consensus Points

Consensus points are the main similarities between perspectives. They are drawn from those statements that are ranked similarly across all perspectives, here statements PC10 (which all perspectives ranked –1 or –2) and O4 (which all perspectives ranked 0 or –1) (Table 3). We note that no statements were strongly agreed or disagreed with across the perspectives, instead it is these rather neutral rankings that are shared.

3.2.2. Importance of Terminology

With a slightly negative ranking of statement PC10 (“Researchers started talking about ecosystem goods and services to use a language

that is familiar to people”), OPERAs researchers across all factors did not prioritize the idea that the ES concept was supposed to create awareness for conservation through the specific terminology of goods and services. This is surprising since the terminology, as the framing of the problem in terms that people would understand, has been pointed out as one key aspect of the concept in the literature (Daily, 1997; Schröter et al., 2014). It is even more surprising since all interviewees agreed on the concept's essential function, with representatives saying they thought it served to “highlight,” (Moderate Economist), to “make people more aware of,” (Critical Idealist), to “clarify to people,” (Non-economic Utilitarian) to “make clear” (Anti-Utilitarian) or to “emphasize” (Methodologist) the importance of the link between nature and human well-being. This seems to imply that OPERAs researchers believe that the ES concept has an important educational goal, but that the terminology of goods and services is not essential to achieving this goal.

### 3.2.3. Reflection on Concept

Drawing on the neutral rankings of the other consensus statement, “Successful inter- and transdisciplinary research requires an explicit reflection on shared concepts” (O4), one could assume a general indifference or even a lacking willingness to actively reflect on differences. However, and as opposed to the apparent indifference, all interviewees stated that differences in understandings can develop into a problem if people get “confused by this diversity” (Non-economic Utilitarian) due to a lack of transparency. Thus, they saw the need to “discuss these differences in understanding” (Moderate Economist) and to “acknowledge that your way of doing things is not the only way of doing things” (Anti-Utilitarian) in order to be able to “build upon each other” (Methodologist) and to “co-design a common understanding of what we really mean by ecosystem services” (Critical Idealist).

### 3.2.4. Compromise Points

As defined in the Q methodology literature, compromise points are the main points of contestation between perspectives in Q methodology and are therefore important points of differentiation between perspectives (Webler et al., 2009). In contrast with the two statements that did not evoke strong reactions (consensus points), there were four statements that received a ranking spread over six points out of a possible seven, meaning we found striking differences in reactions from the interviewees to the specific topics addressed in these statements: utilitarianism (statements PC4 and BS2), economic approach (IE9), and natural capital (IE1).

### 3.2.5. Utilitarianism

Substantial differences came up in the realm of utilitarianism, shown in the widely disparate rankings of statements PC4 (“The ecosystem services concept provides a utilitarian framing of ecosystem functions as services in order to increase public interest in conservation”) and BS2 (“Ultimately the level of biodiversity that survives on Earth will be determined not just by utilitarian considerations but to a significant extent by ethical concerns including considerations of the intrinsic values of species”). Apparently being aware of these differences, interview representatives indicated “different ways” (Non-economic Utilitarian) or “big discussions” (Anti-Utilitarian) that exist around the definition of utilitarianism. Whereas the Non-Economic Utilitarian perspective ranked PC4 highly, and the representative of this perspective stressed the utilitarian framing of the ES concept as essential to highlighting also the “intangible” or “non-economic” benefits that humans derive from nature, the Anti-Utilitarian strongly rejected a utilitarian character of the concept (giving PC4 the lowest rating) since, by definition, utilitarianism would exclude any non-monetary values of nature. The Anti-Utilitarian perspective most strongly agreed with the intrinsic value of species (BS2), putting it in conflict with the Moderate Economist perspective, which ranked this statement -3.

### 3.2.6. Economic Approach

The statement referring to an economic approach as the best way to guide decision-making (IE9, “Using an economic approach to environmental issues can help decision-makers to determine the best use of scarce ecological resources at all levels”) showed disagreement between the Moderate Economist perspective, which ranked it first place, and all other perspectives, most strongly the Non-economic Utilitarian perspective (rating -3). The Moderate Economist representative reflected on ES as being “highly compatible with economics.” As opposed to their negative ranking of this statement, all the other representatives did not directly reject an economic connotation to the concept but stressed that it should be only one way out of many of looking at it. Even the Critical Idealist representative acknowledged that an economic approach is “not by definition wrong or something that we should not do but [...] just not the only thing.” Still it is striking that the first impulse of most participants seemed to be the rejection of an economic connotation as their ranking (in four out of five perspectives) suggests.

### 3.2.7. Natural Capital

With regard to the natural capital terminology, the compromise statement referring to maintaining stocks of natural capital (IE1, “Maintaining stocks of natural capital allows the sustained provision of future flows of ecosystem services and thereby helps to ensure enduring human well-being”) was ranked positively in all perspectives except for the Critical Idealists. In the interview, the representative rejected using the natural capital concept as it is “framed in a very economic way that makes it sound as if you have a stock somewhere and you can easily replace it with a stock somewhere else.” In contrast, the Non-Economic Utilitarian (rating +4) and the Methodologist (+3) both stressed the importance of the natural capital metaphor to denote the stock providing the flow of services. The Anti-Utilitarian and the Moderate Economist perspectives both rated the natural capital concept as having little meaning for their work with ES (both rated +1).

## 3.3. Strongest Reaction

A point of reference for discussion is additionally provided by those statements that evoked the strongest reactions in some perspectives, whereas others treated them with indifference (Webler et al., 2009). Interestingly, both statements found here (IE4, “Nature can be seen as separate from humans and human activities as external disturbances to natural functions,” and BS7, “People are integral part of ecosystems and a dynamic interaction exists between them and other parts of ecosystems”) refer to the human–nature relationship. According to rankings here, the Critical Idealists react most strongly to these statements, strongly disagreeing with the former (rating of -4) and strongly supporting the latter (+4), whereas the Anti-Utilitarians and Methodologists show indifference towards them, rating them within one point of zero.

## 4. Discussion

In line with claims in the ES literature, the results generally confirm that there are clear differences in the understanding and use of the ES concept within the research community we studied. As suggested by the Q methodology literature, we conducted our study with a sample we assumed to represent the breadth of perspectives on the ES concept. In the following discussion, we discuss the content of differences in order to draw conclusions on how we think they could be handled in the research community around ES. We therefore generalize some of our findings to the wider research community, though we are aware of potential limitations of this approach and therefore make some suggestions for further research initiatives that could address some of them.



#### 4.1. Differences in Perspectives

Originally, the ES concept has been argued to be a pragmatic approach to and an explicitly utilitarian framing of the human–nature relationship in order to make the need for conservation clear to people (Daily, 1997). Our results support the claim that the concept is now understood in different ways that are not necessarily in line with these original definitions any longer (Schröter et al., 2014). Whereas some of our study participants saw the utilitarian framing as a core aspect of the ES concept, others rejected such a framing completely. And whereas some regarded the concept as having an economic core, others saw it as being far more encompassing. These findings seem to be strongly interlinked with different ideas on values underlying the concept. Whereas the Critical Idealist perspective for example showed a strong value focus with regard to the human–nature relationship and at the same time a rather critical attitude towards the ES concept, the Methodologist perspective reacted much less to value statements and at the same time showed a rather uncritical attitude towards the concept.

Our findings support the notion that the ES concept is “value-laden” (Jax et al., 2013) and that it “inevitably involves judgments about human actions with respect to nature” (Jax et al., 2013, p. 261). As it touches on “contentious issues” (Turnhout et al., 2013, p. 157), it is quite likely that individual attitudes towards the concept arise from an interplay of one’s social, economic, cultural, and political backgrounds that form individual paradigmatic standpoints. We therefore believe that dealing with these value-induced differences will be key in the successful operationalization of the concept. The solution is not standardization (of definitions) in order to create common ground, as this would simply avoid discussions. Instead, we support the claim of Abson et al. (2014), who note that a stronger focus on normative knowledge in the conceptualization of ES is necessary in order to “further consolidate its place as a key concept in the service of creating a more sustainable world” (p. 37). This supports findings from a Q study identifying four distinct perspectives among conservation professionals, and cautioned that “attempts to forge an artificial consensus may be counterproductive to the overall goals conservation professionals are pursuing” (Sandbrook et al., 2011, p. 285).

#### 4.2. Implications for the Research Community around ES

##### 4.2.1. Boundary Objects and the Need for Guided Pluralism

Differences in perspectives on the ecosystem services concept are not necessarily a barrier. Interviewees described them as “very normal, not a problem in itself” and sometimes even “more of an advantage” to the concept and that naturally comes about when working with the concept on a more concrete level. Participants therefore pointed to an important insight that has been discussed in the literature and that Star and Griesemer (1989) have captured with the notion of boundary objects. In order for concepts to facilitate communication in interdisciplinary research, they argue, conceptual understandings do not necessarily have to be the same. Quite to the contrary, flexibility has been described as essential for allowing concepts to be used by different disciplines (Becker, 2006; Thorén, 2014; Star and Griesemer, 1989). As our research has shown, perspectives on ES show some consensus and some contested points and thus might meet the definition of a boundary object being “both plastic enough to adapt to local needs and the constraints of the several parties employing them, yet robust enough to maintain a common identity across sites” (Star and Griesemer, 1989, p. 393). In that sense, diversity in perspectives on ES is appreciated and enriches the research community.

The core question however is not if a concept can theoretically serve as a boundary object, but rather, under which circumstances it can actually facilitate communication (Strunz, 2011). Put differently, the crux of the matter lies in the question of how differences in the sense of “arbitrary openness” (Baumgärtner et al., 2008, p. 391) can be turned into “reflexive and guided pluralism” (Baumgärtner et al., 2008, p. 392).

Coming back to Abson et al., 2014 and their claim for the integration of normative knowledge into the conceptualization of ES, there needs to be an acknowledgment that the ES concept cannot be taken for granted as a shared value base or what Ratner (2004) refers to as “unifying ethic” (p. 61). Instead, establishing a common ground for research will require the explication and discussion of underlying values and assumptions. Therefore, as opposed to a mere standardization of terminology and procedures, an open dialogue is needed for researchers to truly understand each other’s perspectives and develop a shared way of working together effectively from these different perspectives.

##### 4.2.2. Transparency and an Open Dialogue

With our study, we aimed at providing the starting point for a more open discussion on values underlying the ES concept on the level of the research community around ES. In order to do so, we started with a sample of ES researchers collaborating on a large, long-term project to showcase the variety of perspectives that exist even within a seemingly small scale of investigation. We now discuss our findings with implications at the level of individual researchers, our case study research consortium, and for the broader ES research community.

Starting on the individual level, “Q help[s] individuals understand their own thinking on an issue” (Webler et al., 2009, p. 35). Confirming this assumption, everyone that was interviewed reported that they found the sorting exercise useful as a tool to explore perceptions on the concept and as a way to reflect on the concept more in depth. In addition, the comments given in the free-text space by all participants after completing the Q sorts were overwhelmingly appreciative and reflexive, stating for example that the sorting exercise “helped understanding [one’s] own perspective in a better way”, that it was “interesting to reflect on [one’s] own view” and that it “created awareness for [one’s] assumptions”.

On the case study level, as Webler et al. (2009) note, the “intriguing use of Q is to help groups clarify what they agree and disagree about” (p. 35). Generally, participants seemed to be aware that differences in perspectives on ES exist between OPERAs research partners, but did not agree on where they came from or what they looked like. Hence, displaying and summarizing points of agreement and disagreement in a succinct number of perspectives is a way of creating awareness for the nuances between perspectives that exist and that they entail more than the simple distinction of disciplinary worldviews.

Finally, on the meta-level of the broader ES research community, this study can be used to spark reflections on one’s own assumptions when using the ES concept, and on differences that exist in other research groups. In order to allow for these reflections, Gardner (2012) suggests the need for “creat[ing] space, time and a corresponding reward system” (p. 250) to encourage a more reflective research approach where values are explicitly discussed and explored. O’Hara (1996) has already called for such an “arena where normative values are explicitly called for” (p. 104). Such an arena could take on many forms including face-to-face as well as digital solutions, and discussions in publications. In this way, each participant in the scientific community can contribute to reflecting, questioning, and consciously applying the ES concept. As one of the interviewees stated: “I think it is an iterative process [...]. So every step we are doing, everybody has to reflect again what the contribution to the bigger context is and how we can adapt our next steps to contribute to it [...] In order to work together we really need to understand what others are doing.” While this quote was in reference to the context of the OPERAs research project, it equally applies to other collaborations within the research community as a whole.

#### 4.3. Further Research

We see several opportunities for further research based on our findings. First, this study focused only on the perspectives of researchers working with ES in one large European consortium project at one point in time. It would be interesting to test how broadly these views

are shared in the research community in different geographical and disciplinary settings. It would also be valuable to make such assessments an explicit part of collaborative projects, which would better enable monitoring of perspectives over time. Also, conducting a similar study with practitioners, as opposed to researchers only, could reveal important insights concerning the effect that the framing of the ES concept has on managers and policymakers who are using it. Finally, it would be useful to explore more literature from fields such as psychology and risk assessment to better understand best practices to share diverging views, and why these practices work.

Second, it would be interesting to look more closely into drivers for differences in perspectives. This would require a more quantitative survey approach designed for statistical generalizability based on a large sample size, rather than the qualitative approach of Q methodology. Such a survey would enable studying the influence of demographics, disciplines and other factors on the perspective on the ES concept. Here we assume that perspectives are largely driven by values and normative assumptions, but further research could assess paradigmatic drivers of perspectives more systematically. A more quantitative analysis would also compliment the depth but inherent subjectivity of Q method, which we have endeavored to communicate transparently, but certainly leaves room for further investigation.

## 5. Conclusion

Taking OPERAs as a “microcosm” for the research community around ES, our objective was to identify differences in perspectives on the ES concept in order derive recommendations on how to handle these differences as a basis for the effective operationalization of the concept. Using Q methodology we were able to identify five clearly different perspectives in the research community represented by OPERAs. Comparing their rankings and backing up interpretations with follow-up interviews, we found that perspectives are strongly driven by different values and normative assumptions underlying the concept.

At the same time, we found a strong sense of participants for the need for a certain degree of diversity in perspectives and understandings of the concept. Consequentially, we believe that the standardization of definitions is not the way forward but rather acknowledge the need for plurality in order for the concept to function as a boundary object. At the same time, however, diversity can only work as “guided pluralism” (Baumgärtner, et al. 2008), meaning that differences should be made explicit in open discussions on underlying assumptions.

What is needed is the acknowledgment that the ES concept cannot be taken for granted as a shared objective or what Ratner (2004) refers to as “unifying ethic” (p. 61). Instead, establishing a common ground for research will require the explication and discussion of underlying values. If that is done, we do believe that the ES concept can serve an important function for research and practice alike in supporting sustainable ecosystem management.

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