

Reinterpreting Ecosystem Services

– A governance perspective on what 'ecosystem services' mean in practice for different socio-political actors

Ana Calvo Robledo



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Keywords: Boundary object, ecosystem services, governance images, operationalization, working practices

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Abstract

To govern ecosystem services encompasses interactions among many different sociopolitical actors, from local to international levels. The ecosystem services (ES) approach to biodiversity and ecosystem management intends to highlight human-environment interrelationships. To integrate the ES approach into organizational structures and working practices, various implementation pathways may appear. The aim of this study is to explore how different societal actors understand and operationalize the concept of ecosystem services. Choosing actors who operate in different practical settings could provide insights of the ways socio-political actors balance interests and perceived values on ES in the local social context. In addition, it may highlight forms ES take as a boundary object.

A governance framework for empirical analysis was applied to qualitative material from five semi-structured interviews. Participants of this study were individual actors from two countries who worked in consultancies, NGOs and local authorities. Results showed that actions were oriented to knowledge production, communication with other actors and development of tools seeking to adapt the ES approach to the local context. However, adaptations to the context took differed in forms. The municipality and consultants were goal oriented, having established a set of procedures and tools to operate ES. In contrast, NGO practitioners' actions and tools were rather oriented to stakeholder engagement and knowledge management. These results may be explained by organizational structures and dependencies influencing working practices. Limiting factors for interviewees were sometimes linked to time and economic resources. Similarities in arguments used among interviewees were the use of ES to communicate environmental values to other actors, balance project alternatives and negotiate. In terms of communication with decision makers, NGOs and consultancy practitioners used economic framing in their results. These differences and similarities may respond to adaptations and identify the ES concept takes when operated by different actors.

Keywords: Boundary object, ecosystem services, governance images, operationalization, working practices.

“Often I see that instead of talking about real things one ends up talking about categories or a term that doesn’t really mean anything. One would have to really look at each of these categories in detail, and understand them”

*- Marie Kvarnström.
Pilot interview, February 2019*

Marie is a SLU Researcher who has worked on Ecosystem Services since 2003 and took part of meetings at the Millennium Ecosystem Assessment (MA). She also works with the local knowledge of land users and traditional communities.

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Abbreviations

Economics of Ecosystems and Biodiversity (TEEB)
Ecosystem Services (ES)
Enhancing ecoSystem sERvices mApping for poLicy and Decision mAking (ESMERALDA)
European Union (EU)
Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES)
Millennium Ecosystem Assessment (MA)
Operational Potential of Ecosystem Research Applications (OPERAs)
Operationalization of Natural Capital and Ecosystem Services (OpenNESS)
Toolkit for Ecosystem Service Site-Based Assessment (TESSA Toolkit)

1 Introduction

In the early 2000s, scientists and policymakers approached the problematic of ecosystems degradation developing a set of reports on ecosystems' state: the Millennium Ecosystem Assessment (MA). This was an international ecosystem assessment addressing knowledge gaps and providing guidance to policymakers (MA, n.d.). The MEA focused on identifying drivers change in ecosystems and their link to economic development and human-wellbeing. Since then, the term Ecosystem Services (ES), defined as 'the functions and products of ecosystems that benefit humans, or yield welfare to society' (MA, 2005), has become an increasingly institutionalised approach to global environmental governance.

The term '*governance*' recognizes the emergence of actors other than the state playing a role in environmental problem-solving at different scales (Kjær, 2004 p.192). It is a term for acknowledging "the role of networks in the pursuit of common goals", and emphasizing the importance of civil-society actors (Kjær, 2004 p. 3). At the international level, environmental governance initiatives have taken different angles on how to approach decision makers. The MA (2005) has contributed providing information about the potential consequences of ecosystem services degradation to human wellbeing (Grunewald and Bastian, 2015, p.25). Similarly, the Economics of Ecosystems and Biodiversity (TEEB) global initiative has put emphasis on the importance of recognizing the benefits and costs derived from ES loss (ibid.), and has encouraged to express ES values in economic terms (TEEB, n.d.). More recently, in 2012, the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) has put focus on knowledge-systems in order to support decision-making processes, with special attention to stakeholder involvement (Löfmarck and Lidskog, 2017) instead of economic valuation. Based on these examples, it is apparent that at the international level exist different views on how to act to support decision makers. Therefore, different forms of framing how to work with ES can be expected at the local level as well.

At the local level, individual and groups of actors have also become part of implementing ES approach into their context of action. Recent research on ES operationalization pointed out to several obstacles for its implementation, such as the lack of integration among political levels and individuals' previous working practices (Saarikoski et al., 2018). Results have also indicated that ES knowledge can assist and even influence decision-making when it matched already available intellectual resources like data-bases, there were long term working relationships between researchers and planners, and research actions were integrated in the planning process from an early stage (Saarikoski et al., 2018). This may indicate that the circumstances at the local level may influence how ES-oriented actions are integrated and used in practice. In fact, research on how ES approach is put in practice (Hermelingmeier and Nicholas, 2017; Schröter et al., 2014; Steger et al., 2018) has been compared to a '*boundary object*' (Star and Griesemer 1989). Boundary objects are characterized for 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) cited in Hermelingmeier and Nicholas, 2017, p.393). In academia, the concept can be used to theorize about interactions and communication among heterogeneous actors, and to foster transdisciplinary research (Schröter et al., 2014; Steger et al., 2018). Boundary objects can be both abstract, like ideas and classification systems, and concrete, like maps and tools (Star and Griesemer (1989) in Steger et al., 2018).

Coming from environmental communication background and its constructivist view of society (Cox & Pezullo, 2015, p.16), it can be assumed that individuals may have different standpoints and possibly diverse practical understandings of working with ES approach in planning. These differences may be influenced by their societal positions, and construction of different frames or patterns of interpretation of reality (Erving Goffman (1974) cited in Cox & Pezullo, 2015, p.62). Environmental communication can assist in highlighting

understandings behind interpretations and actions. Taking into consideration that the concept of ES has been compared to work as a boundary object in practice (Hermelingmeier and Nicholas, 2017; Schröter et al., 2014; Steger et al., 2018), it becomes important to look at what identity and adaptations ES may develop in specific contexts. In order to explore this, a governance approach could assist in highlighting the role different actors play in putting ES approach into practice in particular working contexts.

1.1 Problem formulation and research questions

ES is a relatively new international conceptualization on how to integrate environmental, social and economic aspects for safeguarding human wellbeing. It is the purpose of this study to investigate how the ES concept is being re-interpreted by different actors seeking to implement ES perspective into planning at the local scale.

ES approach may work like a global ‘governance image’, guiding actors in the decision-making processes. Images can be knowledge, goals, presuppositions and judgements (Kooiman et al., 2008). Governance images are ultimately translated into instruments and actions by societal actors. Individual actors involved in ES governance at the local level can presumably deal with diverse interests on land use management, other actors and practical realities. Exploring differences at the local level could provide relevant insights about how reinterpretation occurs, and how ES approach adaptations are translated into actions.

In practice, the conditions in which implementation actions are adapted to the context, and maintained, could represent distinct modes of governance (Primmer et al., 2015). Accordingly, investigating how different societal actors employ ES perspective in practice can assist to empirically explain the different implementation paths at the local level.

The aim of this study is to explore how different societal actors understand and operationalize the concept of ecosystem services from a governance perspective. In order to achieve this, I will focus on the rationales and arguments driving actors to take specific governing actions, as well as on the possible structures in place limiting or allowing actions in the actors’ practical realities.

Based on the aim, there are three research questions to address in this study:

- 1) What are the rationales and arguments actors relate to specific actions and operationalization of ES?
- 2) What structures are in place that limit or allow specific actions?
- 3) What are the identity and adaptations ES take when different sociopolitical actors reinterpret the concept?

Results may contribute in rising awareness of the different ES governance modes, and the challenges practitioners may face when trying to adapt this approach into a specific context of action. In addition, results may point to diverse reinterpretations and differences in directions ES concept is taking in practice. For instance, results could indicate how different perspectives, individual and collective values are included and prioritized in the process. This could provide a better understanding of how socio-political actors balance interests and perceived values on ES in the local social context.

1.2 What are the ES concept implications for practice?

ES could introduce sustainable use of ecosystems and resources by becoming integrated in public policies, as well as in private decision-making (Grunewald and Bastian, 2015, p.146). However, ES can be interpreted differently depending on the context it is being used. Steger

et al. (2018) argue that ES may operate in practical settings as both tool and concept. It may be a tool when it is used in a particular way, such as in working practices, terms and technologies. Whilst, when working as an abstract concept, such as a type of boundary object, it may allow communication and cooperation (Steger et al., 2018).

While ES development and integration in the workplace occurs, classification and standardization processes also take place. This may make ES constrain its boundary object features, such as flexibility and facilitating communication (Steger et al., 2018). Additionally, the form in which the concept is designed can lead to difficulties in operationalization due to its mixed methods, varied disciplines and methodologically unresolved questions (Grunewald and Bastian, 2015, p.127; Jax et al., 2018). As an example, ES encompass supply, regulation and sociocultural ecosystem functions, yet they can differ in the form they deliver benefits to humans. These benefits can be direct, indirect and interrelated between the environment and humans (Grunewald and Bastian, 2015, p.127). In fact, research approaches may include interdisciplinary and transdisciplinary methods to adapt to the local context, where there is a greater social complexity (Keune et al., 2015).

At the same time, the way ES is oriented to 'usefulness of nature to people' involves studying the demand for services, which depends on the societal conditions (Grunewald and Bastian, 2015, p. 41). In this context, because there are alternative ES provided in exchange for others, balancing individuals' interests becomes part of the evaluation process (ibid., p.127). Some case studies have shown that there can be differences in how ES users, researchers and managers of protected areas prioritize ES (García-Llorente et al. (2016) cited in Jax et al., 2018). Therefore, depending on what actors are included in the process, results in an ES assessment may change. In fact, ES application could have detrimental effects on ES if it focuses on maximizing a single benefit, reflecting the interests and values of powerful actors, instead of fostering the values of multiple services (Schröter et al., 2014).

Thus, applying ES perspective into practice may entail challenges for practitioners in many forms. Consequently, operationalizing the concept of ES is related to governance because of the potential presence of a diverse range of actors, interests, academic disciplines and decision-making processes at different levels.

1.3 Background and key actors in ES governance

The term Ecosystem Services (ES) was introduced in the late 70s by Ehrlich and Ehrlich (1981). It was in the 90s, with authors such as Groot (1992), Daily (1997) and Costanza et al. (1997), when the term was mainstreamed in the scientific literature (Grunewald and Bastian, 2015, p.14). ES can be generally understood as "the benefits an organic system creates through its function, including food resources, clean air or water, pollination, carbon sequestration, energy and nutrient cycling, among many others" (Robbins et al., 2014, p. 169). They can be classified into supporting services, provisioning services, regulation services and cultural services (MA (2005) cited in Grunewald and Bastian, 2015, p.3).

The relevance of ES related to governance started by the mid-1990s. International interest in applying the concept in policy grew because of its potential in highlighting linkages between ecosystem changes and the effects for human-wellbeing. It was in 2001, in connection with the United Nations system, when the Millennium Ecosystem Assessment (MA) was initiated. The assessment involved reviewing natural and social knowledge available. It aimed to improve decision-making providing information to be balanced with other economic and social concerns (MA, n.d.). Although there may exist limitations in distinguishing ES (Grunewald and Bastian, 2015 p.14), one well established definition precisely derived from the MA (2005) report. ES were defined as 'the functions and products of ecosystems that benefit humans, or yield welfare to society' (MA 2005). The ES concept

attempts to integrate socio-economic elements with environment. One of its strong points is that in order to ensure sustainable land use, it takes into account ecological processes assumed to be free of charge into decisions (ibid., p.2). Among its practical characteristics are that it is an integrative, interdisciplinary and transdisciplinary concept, which links environmental and socio-economic elements seeking sustainable land use (Müller and Burkhard (2007) in Grunewald and Bastian, 2015, p.2).

At the international level, initiatives and projects aiming to ‘operationalize’ and apply ES concept at the national and local scales have emerged. One important actor in biodiversity governance is the Intergovernmental science-policy platform for ecosystem services (IPBES). IPBES aim is to assist decision-making by bringing science closer to policy. States members of the United Nations (UN), NGOs and other civil society groups are part of this intergovernmental body, established in 2012. IPBES develops assessments on the biodiversity and ecosystem services state. The last assessment has been released in 2019, reporting around 1 million animal and plant species are now threatened with extinction (IPBES, n.d.). One of this platform characteristics is how great importance is placed on stakeholder involvement for being able to integrate scientific and other forms of knowledge, such as traditional and indigenous knowledge (Löfmarck and Lidskog, 2017).

Within the European Union (EU), the ES concept has been included in at least six out of twelve EU policies, and details for its operationalization are either not given or left to choose by the member states (Bouwma et al., 2018). In addition, implementation of the concept has been promoted within the EU through the financing of pilot projects targeting the operationalization of ES and ES mapping (Burkhard et al., 2018; Carmen et al., 2018; Saarikoski et al., 2018), such as OpenNESS (Operationalization of Natural Capital and Ecosystem Services) and ESMERALDA (Enhancing ecoSystem sERvices mApping for poLicy and Decision mAking). However, the development of ES knowledge and resources promoted through a top-down approach can generate frictions at the local level, where more heterogeneity can be assumed.

1.4 The ecosystem services approach and its criticism

The ecosystem services approach has faced both enthusiasm and criticism for its application. Several authors have reviewed what arguments are used for and against ES approach (Schröter et al., 2014), and three arguments related to decision-making in governance are shortly introduced in this section.

Academic authors have criticized the ambiguity around the definitions and classifications of ES. Arguments used against were issues such as that it has being used inconsistently to refer to functions, contribution to human well-being or economic benefits (Nahlik et al. (2012) cited in Schröter et al., 2014). In terms of the implications this ES ‘vagueness’ in its definition may have for decision-makers and biodiversity governance, Hysing and Lidskog (2018) pointed out that different meanings can be attached to ES by an organization in order to advance their values and beliefs.

Similarly, ES has been problematized for having an anthropocentric framing, which encompasses instrumental or utilitarian values of nature with direct benefits to humans. Thus it can be excluding intrinsic values, linked to appreciation of something for its mere existence (Grunewald and Bastian, 2015, p.26, 78; Schröter et al., 2014). However, it is argued that cultural ES may show overlaps between intrinsic values and anthropocentric ones, such as in the case of landscape aesthetics (Schröter et al., 2014). As human values are now used for conservation whilst before it was dominated by intrinsic values of nature, a human-centered framing may have implications for practice. For instance, according to recent research on personal and collective values, decision-makers in Europe whose “personal perspective

highlighted general conservation or intrinsic arguments, perceived the collective decision-making to rest on a utilitarian perspective” and experienced dissonance or conflict as a consequence (Primmer et al., 2017).

Another controversial aspect in ES governance is the economic valuation. It is seen as opening the door for commodification or trading with nature (Schröter et al., 2014). Some authors argue that valuation of ES, which do not necessarily need to be expressed monetary terms, can lead to informed decisions. Therefore, when ES valuation is done in monetary values, these are considered additional arguments to decision-making (De Groot et al. (2012), cited in Schröter et al., 2014). Contrarily to this view, Gómez-Baggethun et al. (2010) argues that monetary valuations are a step forward to nature commodification in markets, and able to shift communities towards individualistic behaviours (Vatn (2005) cited in Gómez-Baggethun et al. 2010). In addition, Gómez-Baggethun et al. (2010) explains scientist using economic terminology because of failing to influence decision-making with traditional conservation arguments whilst ES language reflects dominant political and economic views.

In addition, concerns can also relate to that ES being included in policies may displace or not be coherent with other agendas (Bouwma et al., 2018). However, these concerns may be linked to the preferences of different stakeholders on biodiversity governance, and the roles of the state, market, and civil society (Hysing and Lidskog, 2018). Therefore, exploring stakeholders’ preferences and interpretations on what ES mean in practical terms may assist in understanding the cause of its controversy (ibid.).

2 Theoretical Framework

2.1 Governance and Ecosystem Services

Governance is a term which etymologically refers to “piloting, rule-making or steering”, and it is used to refer to “something more than government” involving non-state actors and networks (Kjær, 2004 p.1-7). The interactive perspective on governance is based on the assumption that governance are responses to societal problems in a combination of governing efforts. This includes all kinds of arrangements between public and private entities (Kooiman et al., 2008). Actors can be “any social unit possessing agency or power of action”, such as individuals, firms and international bodies (ibid.). Besides, a key element of this approach is the assumption of constant change, which leads to understanding interactions among societal actors as opportunities for finding context-sensitive solutions to problems (ibid.).

Therefore, different sociopolitical actors and individuals are part of governance of ecosystem services (ES) in their capacity to act and interact with other actors. Kooiman et al.(2008) considers that when an activity is intentional, there are three elements present: images, instruments and action. Knowledge, goals, presuppositions and judgements are examples of ‘*governance images*’ guiding actors in the decision-making processes. Instruments are the means through which actors act, which have been chosen and designed for the action’s aim. Frameworks may include “culture, law, agreements, material and technical possibilities” (Kooiman et al., 2008). However, the structuration theory describes actors’ actions as both being able to change and being influenced by frameworks, which are also called ‘*structures*’ limiting or fostering actions’ potential (Giddens (1984) cited in Kooiman et al., 2008). Because actions partly depend on the understanding and position of the observer (Kooiman et al., 2008), it is important to investigate in detail how different actors re-interpret ES as a governing image. Similarly, there may be ‘*structuration processes*’ reinforcing how the practice of including ES in planning is framed in a particular social context, and which actions are enabled or suppressed on the ground to balance economic, social and environmental interests.

Consequently, investigating what are the individuals’ experiences and understandings may highlight social aspects to be aware about ES implementation at the local level. In fact, under the assumption that ES concept can take different forms when operated, such as a ‘*boundary object*’ (Star and Griesemer 1989), participants of its operationalization may influence how it is re-interpreted and adapted to particular social contexts. Consequently, empirically investigating how actors work with ES in any form could explain what interpretations and actions are part of ES governance at the local level.

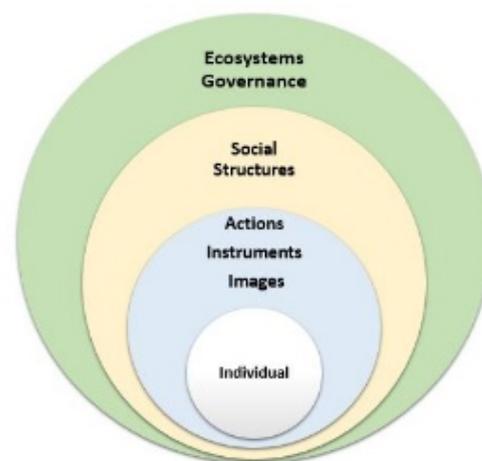


Figure 1. Ecosystem services governance

2.2 What governance modes are operationalizing ecosystem services?

The conditions in which ecosystem services' arguments are evaluated by individual actors and organizations can constitute the "implementation mechanisms that represent distinct modes of governance" (Primmer et al., 2015). Primmer et al. (2015) is a review of empirical analyses. They developed a theoretical framework taking into account people and organizations making decisions, and in particular, the different arguments used when implementing policies. The importance of this angle to governing ES and implementing biodiversity policy is to better understand what arguments filter into decisions. For instance, how economic arguments, involvement of those affected, and other value arguments are part of decision making (ibid). Similarly, ES knowledge is expected to be integrated in different decision-making levels. Therefore, this framework focuses on aspects such as the actors involved in the implementation, knowledge users and producers, and communication across levels (ibid).

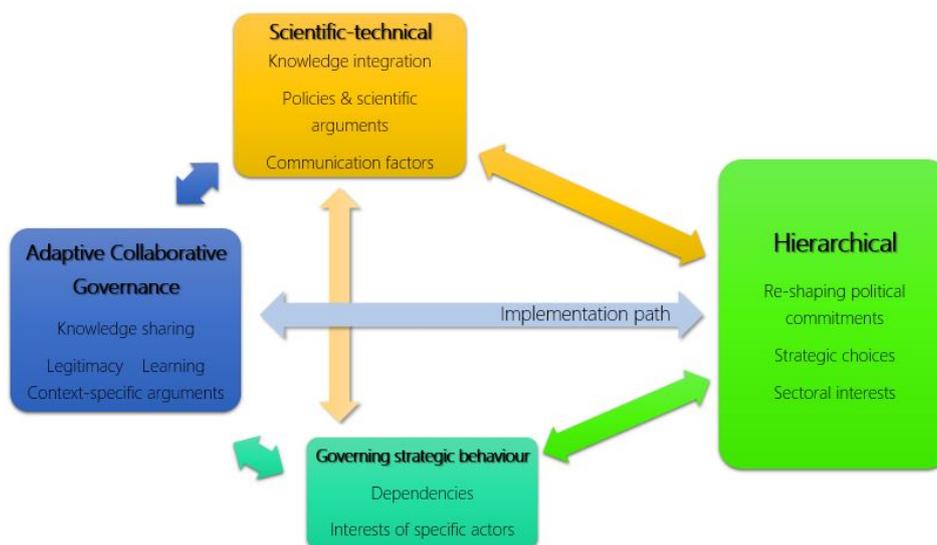


Figure 2: Implementation paths to governance modes

Primmer et al. (2015) analytical framework assists in identifying implementation paths, which may fall within different governance modes.

This framework acknowledges that governance modes can work in parallel, implying that several modes may be detected in a policy implementation process. Accordingly, the framework is designed to deal with complexity, and to direct attention towards specific aspects differentiating governance modes. Thus, its application can explain the form of how ES are governed, and assist in explaining why these differences exist.

The four governance modes function as analytical lenses to highlight governance aspects from different angles:

Hierarchical governance put emphasis on how political commitments at the international level are implemented at lower levels. Contrary to interactive governance (Kooiman et al., 2008), this hierarchical governance mode does not express in policies and laws. Instead, it uses science-based knowledge to inform about ES management actions. In fact, hierarchical governance modes can produce effects on ES through the three other governance modes. Taking a hierarchica analytical perspective, issues at focus are how a political initiative is re-shaped or re-defined by actors involved in the implementation process through strategic

choices (Morris (2011) cited in Primmer et al., 2015). This can assist in understanding how agreements are implemented into practical actions. Thus, it acknowledges that different interests can appear at the lower levels, shaping in what ES implementation materializes. Additionally, because knowledge is created, attention is paid to how arguments, level of ambition (Kanowski et al. (2011) cited in Primmer et al., 2015), and sectoral interests may influence actors' interpretations (Dekker et al. (2007) cited in Primmer et al., 2015).

Scientific-technical governance is centered on practical aspects in work dynamics and communication in the process of "construction of knowledge and support systems" for effectively meeting policy goals (Primmer et al., 2015, p.161). It can be used to examine how new arguments emerge at the local level, where existing practices may interfere with the integration of new knowledge (ibid.). This can allow to highlight what actors may experience to be hindering or enabling ES to fit into their working context. Problems can be related to knowledge and resources availability unmatching the implementation process for meeting policy goals at the local context (Mendes (2006) cited in Primmer et al., 2015) and professional and communication factors shaping governance (Primmer et al., 2015 p.161). Taking this perspective is relevant for this study because it could help to discover what obstructs or facilitates working practically with ES in the practitioners' experience, which could point to mismatches between political goals and practical realities.

Adaptive Collaborative Governance is used to target on social aspects surrounding decisions, such as actors exchanging views during the implementation process, stakeholder participation and arguments linked to the local context. It is generally presented as a 'bottom-up' governance, carrying out practices such as inclusive stakeholder participation, integration of knowledge and direct interactions. Knowledge accumulation and sharing are some of its key elements, and these are considered to affect positively to ecological outcomes (Reed (2008); Williams (2011) cited in Primmer et al., 2015). However, this governance mode is not exclusively focused on conservation outcomes. Rather, it focuses on the connection between ecosystem services and people. Thus, one of its core goals is to find a sustainable and context-sensitive governance to overcome conflicts.

Governing strategic behaviour can be used to identify interests and dependencies which sectors implementing policies may have. This assumes that, even in cases when operationalization may be straightforward, the way in which natural resource dependent sectors choose to implement policy-driven actions could influence the implementation process (Primmer et al., 2015, p.162). In this governance mode, actors' positions are the focus of analysis, investigating the possibility of experiencing economic losses because of biodiversity policies as well as how they can shape the discourse around policy implementation (ibid.). Decision-making processes and policy implementation may occur in different stages, decision levels and societal contexts. Therefore, governing strategic behaviour focusing on how actors perceive policies as opportunities or challenges can be a way of doing research on this governance mode (Oliver (1991) cited in Primmer et al., 2015).

3 Research Design

Environmental communication originates from a constructivist view. In social research, a constructivist perspective is based on the idea that individuals' understandings of the world are created through experiences and interactions with other persons (Creswell, 2014, p.37). A constructivist approach would argue that there can be different understandings of how ES approach could be operationalized, and these could be studied through individuals' views and experiences. This particular perspective can help in understanding meanings behind interpretations and actions.

3.1 Actors selection

Individuals' experiences and social context are the source of meanings they orientate when working with ES in practice. Therefore, I decided on interviewing individuals from three differentiated groups of sociopolitical actors: consultants, conservation NGOs and municipalities. This approach to data collection aimed to reach a high degree of differences in responses.

The interviewees selection was done based on the organizations where interviewees were working at, as well as their familiarity with ES. I used snowballing sampling method, or person to person connections, to select the interviewees because of the limited number of practitioner working with this concept. This method resulted in positive responses to interview invitations, whereas contacting of potential interviewees through web-based research did not.

The two lines of sampling were, first through an interviewee working in a municipality in Sweden, who provided contacts to two consultants of the same company based in two different locations. Second, a person working for an international NGO focused on conservation facilitated the contact of a fifth interviewee working in a collaboration centre of UNEP.

3.2 Interview design and questionnaire

Regarding the methods used for data collection, the process involved semi-structured interviews with different sociopolitical actors. The interview questionnaire contained open-ended questions, allowing interviewees to reflect and provide personal answers (Crang & Cook, 2007). The questionnaire sought to illustrate different actions and framings related to working with ES within the actors' organizations (Appendix 1). In February, one pilot interview was done to understand how ES were operated in academia and test the interview questionnaire.

The questionnaire had two sections (Appendix 1). First, questions were directed towards the interviewees' understanding of ES concept and use. This section sought to know the purpose of using this approach in the interviewees' eyes, and the experiences in which they had worked with ES individually and with others. The second section sought to inquire about working practices. Thus, questions were about methodologies used to assess ES, challenges, interactions with other actors and reasoning behind decisions.

3.3 Interview process

Some of the questions were formulated differently during the interview process to match experiences interviewees touched upon. Primmer's (2015) theoretical framework on governance modes was used to further inquire in the interviewees' argumentations and actions.

A total of five interviewees participated in this study. Two interviews were conducted face to face, and three over Skype. Interviews lasted between 40 min and 1 hour, and were recorded and transcribed. Interviewees explained their experiences working with ES in a very open way, generally using as a starting point projects where they have been actively involved. It was not until they had introduced details on how they worked with ES when I steered the conversation to explore reasonings in their arguments and specific ES assessment areas, such as cultural services, economic valuation and decision-making.

3.4 Interview analysis

As a first step, interviews were coded in the order they were carried out (Table 1). Governing modes in Primmer et al. (2015) were used to analyze empirical data obtained from the interviews to practitioners. The description and characteristics of different modes of governance were obtained from reviewing Primmer's et. al (2015) framework. Distinctive characteristics were used as a guide for creating a set of codes (Appendix 2), and codes were matched with parts of the interview's extracts showing similarities a governance mode. Following this, several extracted quotes from the interview material were used to exemplify individuals' responses providing answers to the research questions.

Table 1. Interviewees' code number, organization and role

I1	Local Authority, Municipality	Project leader, Environmental Specialist
I2	Consultancy	Environmental Consultant, Tool developer
I3	Consultancy	Risk Management and Environmental Engineer
I4	International Conservation NGO	Ecosystem Services Officer
I5	Collaboration centre of UNEP	Ecosystem Assessment and Policy Support

This study used Primmer's et. al (2015) framework for identifying '*Hierarchical governance*' modes in the analysis, focusing on empirical material obtained from interviews. Thus, policy documents were not analysed as it was suggested for this governance mode. Only the ecosystem management plans and strategies elaborated by the municipality were reviewed previous to the interview process. Primmer's et. al (2015) suggest that '*Scientific-technical governance*' and '*Adaptive collaborative governance*' analysis can rely on multiple methods. '*Scientific-technical governance*' analysis could apply qualitative methods, such as guidelines reviews, interviews and focus-groups. '*Adaptive collaborative governance*' would use other qualitative methodologies, such as analysis of participatory processes. For '*Governing strategic behaviour*' analyses, it can be used multiple data sources for the analysis, such as interviews, while keeping focus on dependencies or conflict of interests.

Different governing modes were partially detected due to the methodologies interviewees expressed to use in their work. For instance, individuals' responses were coded within '*Hierarchical governance*' modes when they referred to legislation and top-down decisions affecting practices in local contexts; '*Scientific-technical governance*' modes were identified when interviewees pointed at professional, communication factors, and scientific knowledge support for decisions. Actions such as direct interactions with actors at different levels and

participation of communities were considered part of '*Adaptive collaborative governance*' modes. In this mode, knowledge derives from the local users, whereas in other modes knowledge can originate from other sources. Different communication purposes towards other actors were considered in the analysis as part of '*Governing strategic behaviour*' modes. This was particularly the case when interest of specific actors were mentioned.

3.5 Limitations

The study design involved contacting actors who are participants in governance of ecosystem services at the local level. Actors from different sectors were preferred because of the interest in finding differences and similarities in actions at the operational level.

Selecting actors in different socio-political positions and countries may have enriched the material with diverse experiences, practices and arguments on ES governance. Nevertheless, these results can only be applied to the responses given by five interviewees. Because of this reason, organizations where interviewees work were anonymized. Similarly, the limited number of respondents can also affect the ability to use conclusions in a more general level.

Therefore, even though it is possible to draw a picture of ES governance from the material and distinguish different implementation paths in the individuals' responses, results cannot be seen as representative of a sector or an organization.

4 Results

4.1 What are the adaptations ES take when different sociopolitical actors reinterpret it?

4.1.1 Operationalization of ES within the municipality

In Sweden, the government is committed to integrate ecosystem services (ES) in their planning as part of the environmental policy in line with EU. Integrating ES is expected to support decision making, and to promote knowledge and learning about tradeoffs between societal goals (Hysing and Lidskog, 2018). Valuation of ES in monetary terms is not encouraged for taking complex decisions (ibid.).

The following section will cover the responses and results from one interview conducted to the project leader working with ES in a municipality in Sweden. The municipality's actions regarding the implementation of ES in their planning responded mainly to 'scientific-technical' and 'hierarchical' governance modes. However, results show that it is in the interaction with other actors, such as building companies, when 'governing strategic behaviour' governance modes may take place.

Rationales and arguments in the municipality

The municipality was clearly goal-oriented, working on action plans and strategies containing concrete steps to meet its targets. The creation of ES plans by the municipality was identified as a '*scientific-technical*' mode. It was found that actions were focusing on the construction of knowledge about local ES and that they established measurable objectives. When responding about drivers of their initiatives, it could be assumed that the municipality team took the lead in designing how they could include ES-oriented actions. When asked about examples, actions planned were information projects to the inhabitants targeting biodiversity:

“How they (inhabitants) can manage their gardens to make them more diverse. Or uncultivated land, that can be managed by the municipality in different ways contributing to ES for pollinators” (I1).

Other actions planned were organizing a workshop to gather ideas, inviting environmental planners, managers, people working more in a practical way like in planning for the management on the field. When asked about participation of the general public in meetings, the interviewee explained that

*“In this stage, it is **no contact with the public**. Maybe later, depending on which types of actions we have to take to move it forward” (I1)*

The municipality's ES mapping included some on-site interviews and ES were not economically valued. Environmental consultants contributed to the mapping process, and it resulted in the creation of knowledge in the form of ES maps and strategies. Additionally, the municipality's team set what the interviewee described as “ambitious targets” within the municipality boundaries. However, it must be noted that questions regarding how the municipality and consultants agreed upon ES plans' design remain unknown. The reason for this is that the interviewee expressed that she did not lead the ES project at the time.

Structural factors limiting or allowing the municipality's actions

In terms of what influenced the municipality to take the initiative of including ES in their planning, the interviewee pointed out to trends in legislation:

*“ES started to have a bigger role in the **legislation**, not maybe the legislation that it was then, but the legislation which was coming” (I1)*

Primmer et al. (2015) suggest that ‘*Hierarchical governance*’ modes can imply ‘*obstacles*’ when implementing agreed decisions and initiatives in a top-down approach. When asked about what improvements could be done, the interviewee referred to challenges linked adapting available ES knowledge to the municipality’s context. The following interview extracts illustrate two, such as using an ES list to start designing ES plans and team-work confusion about the suitability of the methods:

*“We just had this list (of ES). This is not something we’ve made up, this is something bigger (...) I think maybe **some of the mappings were not necessary** to do... like genetic resources doesn’t say so much, it doesn’t help us...” (I1)*

*“They (team) did not see this result (ES mapping and strategies) in the beginning, like... **how is this going to be a survey**, what is this going to show, I don’t know strategies, what do you mean...” (I1)*

Similarly, the municipality interviewee mentioned structural constraints working towards their goals, such as when discussing the detail urban planning. According to the municipality’ pre-set targets, there were ES shortcomings of green areas. They used inhabitants’ distance to green areas and green areas size to measure how they could amend ES shortcomings. In order to amend shortcomings of ES delivered by green areas, the interviewee expressed that

“It has to be in the project, it can’t really go outside and make new parks where there are no projects, because you need money” (I1).

According to the interviewee, the municipality’ advancement on ES goals indirectly rely on projects, negotiations and agreements with other actors, such as building companies. In these negotiations, ‘*Governing strategic behaviours*’ governance modes may occur when ES goals depend on the agreements reached with building companies’ projects. This situation can explain, perhaps, how sectoral interests could influence the municipality’ ES implementation. To exemplify this I will refer to when the interviewee recalled negotiations with building companies concerning new construction projects. During these conversations the municipality’s ES goals were the standards they aimed to achieve. However, according to the practitioner’s view and experience, the ownership nature of the land had an impact on their expectations:

*“If the municipality owns the land itself, then we have a lot to say in what we want, and what we have to do. But many times we don’t own the land (breaths), and then we don’t have as much to say, so then it is more like **arguing for the cause**.” (I1)*

When asked about if the building company needed their agreement, the interviewee referred to that the municipality was backed by “Planmonopolet”. This meant that the municipality has a monopoly in planning. Thus, a building company requires the municipality’s approval to any new construction and the municipality needs new projects to finance needed green areas within those projects.

It is precisely on the dependencies between both actors where the municipality has space to argue for ES goals. However, as exemplified above, the expectations about negotiation outcomes that actors may have also played a role in how ES policies could be implemented.

4.1.2 Consultants’ actions towards ES operationalization

Consultants attend needs from both public sector and private clients. This section illustrates how two consultants are working with ES assignments and how they experience interactions with their clients, such as municipalities and building companies. Both consultants worked

at Sweco, one worked on tool development for ES assessments in detail planning (I2), whereas the other worked with ES assessments of projects (I3). Both interviewees appeared to match ‘*scientific-technical*’ governance modes, especially when bearing in mind responses about challenges related to knowledge, resources and professional communication factors.

Rationales and arguments in consultants’ actions

Both consultants considered that ES concept could work as a tool for explanation or communication with people not primarily interested in nature, such as showing the values nature has in cost-benefit assessments. Consultants saw themselves able to help municipalities and building companies to implement ES and sustainability strategies in their projects.

In small-scale detail planning, ES assessments were understood by one of the consultants as a way to measure both positive and negative impacts the company had on the environment:

“...or to implement new ES that are not present at all... I mean some of the land they (building company) use can be a car parking, so... there’s nothing there, which means they can do a 100% better...” (I2)

According to I2, these results would filter into the company for decision-making. However, one of the consultant interviewees experienced differences in the impact her work could make depending on the stage she was included in ES assessments projects:

“In some of the other projects **I have been involved too late in the process**, so it was more showing these are the values and this is how you will affect them. But I didn’t have any chance to change the plans.” (I3)

These two ways of viewing how ES can be operationalized imply differences in the position actors have in the decision-making chain. Whereas the first may design tools to assess pre-determined areas within building companies’ plans, the second may be able to influence choices, alternatives and decisions more directly. Additionally, I3 points out that ES-oriented projects and actions partly depend on the municipality’s interest:

“I feel like right now I have a project where I think we can help them (municipality) to make the decision by showing the ES. But it is because the municipality actually did see the need and asked for an ES-assessment in this case.” (I3)

Similarly, I2 expressed depending on the building company to implement initiatives. As an example, when I2 was asked about other methods used in ES assessments closer to ‘*Adaptative collaborative governance*’ modes, such as participation of ES users, the interviewee referred to it was not part of ‘their normal process’

“We have talked about public participation in the planning process and if that would be possible... I mean, they are building for kids, is it possible for them to impact the planning of the actual schools and playgrounds? So I think they are thinking about it, but as for now, I don’t think that’s part of **their normal process**... yeah.” (I2)

These results may indicate that implementing ES approach in projects involve both consultants and clients in the process. Therefore, they need to be both willing and aware of changes in actions needed to adopt an ES perspective in their planning.

Structural factors limiting or allowing limiting or allowing consultants’ actions

One interviewee recently incorporated to the consultancy pointed out to organizational challenges to meet municipalities’ objectives. Some of the limitations encountered were identified within ‘*scientific-technical*’ governance modes, such as previous working practices influencing how ES practice is developed. Procedural challenges were related to previous working practices, and specialized participants interfering with the ES approach being integrated into projects:

“They (experts) are more **used to work in their way**, like... - we are doing this, and then we get exactly this order from the municipality, and that’s how they are used to -... but now,

that ES are coming, like, how do we include them in the chain of how we are used to do things?” (I3).

The same interviewee described other internal challenges, such as going from a general picture to working with ES perspective in water management solutions. The practitioner reflected on those situations, and referred to struggles dealing with specific questions the technical team seeks to answer and while still keeping the ES perspective:

“So exactly how much can we clean from the water, and how much pollutants, how big does this need to be to take all the pollutants away... and I feel like we have that knowledge at Sweco (the consultancy) there are people that work with that... but also, to take the step from a general part to the more detailed one, and to keep the ES perspective” (I3)

When it comes to interactions between the consultancy and building companies, one interviewee mentioned that there was a lack of expertise in ES to do assessments for projects in detail planning. This shortcoming was complemented with the development of guidelines and tools for their clients, which is further discussed in section 4.4.2. Detail planners would use these tools to overcome a shortage of resources:

“What you really really want is for ES Experts to be involved in these projects but that isn't possible for most companies economically...”(I2)

Therefore, technical, economic and social factors play a role in the ES practice. ES practitioners have to make their way through previously established working routines and shortcomings to resolve procedural questions.

4.1.3 NGOs and operationalization of ES

In this section, I will focus on what arguments and limitations expressed by the two practitioners based in the UK. The interviews encompassed reflections from their international experiences as well as from their current work within Europe.

Both interviewees gained first-hand experience working in ES related projects outside Europe, such as Indonesia in Asia and Guyana in South America. In Europe, I5 has worked on the EU projects focused on operationalization of ES (OPERAS), and in developing cultural ecosystem services assessment tools. Similarly, I4 role involves providing technical expertise to other NGO partners in the Mediterranean Basin to use an ES assessment tool at the local level.

NGO practitioners' actions outside Europe

Rationales and arguments

When reflecting on international projects in Indonesia and Guyana, the rationalities and arguments used by the two NGO practitioners were quite similar. Both interviewees considered important to engage stakeholders, such as local communities, in ES assessments. Engagement with local communities was done through qualitative research methods, such as discussions in focus groups, interviews and questionnaires.

By analyzing how NGO practitioners described the ES projects they were involved in, it is possible to find linkages between projects' actions and the *'Adaptive collaborative governance'* mode. As exemplified in the following interview extracts, the inclusion of different stakeholder in participation processes, integration of different forms of knowledge and direct interactions (Primmer et al., 2015) were important actions in their work. Additionally, identification of ES was done through participation processes, thus they took a *'bottom-up'* approach to manage ES knowledge.

According to the interviewee with experience in Indonesia, actions were aimed at understanding the social context and identifying priority areas to be restored. Engaging with

policy decision-makers, such as the Ministry of Environment, was key in all the steps to carry out on-site actions. Similarly, the communities in a village were directly involved in restoration actions. Direct interactions with local communities were once justified because of the need for finding local knowledge and sustainable human-environment interactions in the long term:

*“We started to do these focus groups within the villages first, understanding the sites and having lots of different **meetings with stakeholders**, and then assessing a few ES, such as flood protection with questionnaires (...)*

What they (local communities) did not understand at the beginning was that actually mangrove trees were protecting them from flooding, but there are a lot of people working at the coastal line that actually knows that, and these are the fisherman. (...)

We did questionnaires with fisherman and they said – Well, since the mangroves are gone, fish population has dropped. We are not finding fish where there were before ” (I4)

In general terms, assessments were focused on qualitative and quantitative data collection from wetlands, cultivated and forested areas. For instance, calculating carbon sequestration. In terms of how information was managed, ES assessments were not focused on economic valuation when interacting with local communities. However, both interviewees perceived economic assessments were needed when talking to decision-makers. As an example, one interviewee mentioned avoiding economic framing in order to prevent communities to act in a way that would harm the environment:

*“I think **economic valuation** is very good when you want to influence decision makers. Now, when you work with local communities, if you really want to provide them with the findings then you kind of need to be quite careful, with more qualitative findings, and a presentation would be better as well... When you present an ES, such as cultivated goods, you need to provide a value in terms of money. If you present it to local communities, they may choose not to go for preserving the environment, but maybe to expand crops and also monoculture as well.” (I4).*

The previous interview extract could exemplify how NGO practitioners may encounter and manage conflicting interests when working with ES. The practitioner approach appeared to be subjected to interests in conservation outcomes, and these were dependent on stakeholders’ actions. Therefore, when sharing assessment results with different stakeholders, ‘*Governing strategic behaviour*’ modes were focused on influencing conservation-oriented behaviours in both decision-makers and local communities.

Structural factors limiting or allowing actions

Both interviewees expressed limiting factors in the interactions between practitioners and local communities. For instance, practitioners had to take into consideration gender issues in countries where there are social norms and pressure put on women. I4 expressed the need of time to build trust with the communities, and to detect social factors preventing or allowing genuine answers from individuals:

“I found this (possible biases to answers) when interviewing women, and the husband wanted to be there, but obviously this woman was all the time looking at her husband before answering anything...” (I4)

Similarly, the ES research project developed in Guyana aimed to assist communities in valuing ES, and compare what ES were valued at the local and national level (I5). In this ES assessment case, national and local preferences for ES were very different among groups. In addition, challenges were related to adapting the research to the community’s way of living and interacting with the environment. Thus, some of the decided actions were to establish a common language to make communities talk uninfluenced about ES:

*“I got advice on what **terminology and language** to use to make people talk about it and... you have to do some of your own interpretations of what they are saying, isn't it? rather than trying to kind of say - Are you using this ES?- which I came across in some studies that they may want them to say yes or no (...) I wanted them to be able to talk, and also because of the **westernized way of thinking about nature**, I didn't want to impose that on them, I wanted them to be able to talk freely about their way of life...” (I5)*

In the two cases, interviewees described social structures, local practices and terminology were aspects taken into account during the assessment process. In addition, it was required permission from authorities to carry out the projects. Therefore, results may show that researchers adapted the assessments to social circumstances, such as language, gender and power issues within communities. Therefore, adaptation of the ES approach to the local context assisted to overcome biases and obtain results close to reality.

NGO practitioners' actions in Europe

Rationales and arguments

In terms of how interviewees justified actions needed to operationalize ES in a European context, an important part of the assessment process continues being to engage other stakeholders. The arguments for this action is the need to gather information about local users of ES in an area. In addition, it is seen as important to assess cultural services, especially other than recreational, in the local context.

Therefore, according to the interviewees' ways of framing actions not being implemented, it appeared that '*Scientific-technical governance*' issues arose from diverse levels. From an individual level, interviewees perceived other practitioners lacking practical knowledge on how to apply methodologies on ecosystem services research:

*“There is a tendency for natural scientist to do ES assessment, so they don't feel comfortable doing **cultural services** assessments because it is **not as tangible**, they've just been **omitting them** (...) and if there is, it is going to be recreational tourism because that's a fairly easy one.” (I5)*

*“I think they do not understand how **stakeholder engagement** can provide them with so much information. (...) These NGOs have been working in the area for several years, so they are really experienced (...) I think it is all about providing them with some **motivation** on doing that.” (I4)* About other NGO practitioners trying to do ES assessments.

Structural factors limiting or allowing actions

NGO interviewees suggested structural problems in the implementation process of ES, such as conflicting with other tasks, shortage in knowledge and resources. The lack of familiarity of individuals with ES methodologies could be linked to '*scientific-technical governance*'. It was criticized the lack of depth and detail in ES assessments derived from this situation:

*“They make conclusions of those assessments when it is not, it is not the true case of what ES are contributing, just because of **limitation of data and time and resources** you know...” (I5)*

When reflecting on the possible source of this delay in effectively doing ES assessments, interviewees pointed out to lack of time, data, resources and conflict with other activities. In fact, I4 explained how the capacity of staff in NGOs to deal with multiple projects may be in conflict with start using ES assessment tools, because of lack of time and staff.

It was also highlighted the lack of implementation of the ES approach within local authorities in the UK. One interviewee specifically referred to more training and regulations needed in order to foster its implementation:

*“ I think it has to do a lot with **capacity building** (...) it is very hard for local decision-makers to find the time to include something that they don't have to include... (...) we need **regulations** as well,.. because it is a very much stronger framework than voluntary” (I5)*

In addition, it was particularly acknowledged the challenge of integrating ES approach within other regulatory processes already in place, such as Environmental Impact Assessment (EIA):

“The planners approving developments, and all of these land use changes, they are not trained as much as they should be in this concept, and particularly the planning project applications they are using are not particularly fit to the purpose either, and the same for the EIA, they need to be updated and included more in terms of ES.” (I5)

Hence, the two interviews with NGO practitioners indicate that individual and organizational structures could be influencing the form ES assessments materialize.

4.2 What identity ES concept maintains when different sociopolitical actors reinterpret it?

4.2.1 Communication tool

When asked about how they understood ES concept, consultants and NGO interviewees expressed similarities in their conceptualization of ES approach: it was described as a **communication tool**. For instance, using ES was described as a way of communicating nature values in the context of planning. However, the form of how communication occurred varied across interviewees' responses: in its purpose, stakeholders it was directed, and means. As an example, interviewees reported achieving 'educational' outcomes, as well as 'learning' processes resulting from working on ES along with other stakeholders. This occurred in very different contexts, such as when applying tools designed to identify ES (I2), in decision boards while balancing project alternatives (I3), and as part of interactive processes between practitioners and local communities (I4;I5):

*“A lot of people doing the detail planning they don't have extensive or any education on ES or the natural environment for sustainability...” “You have to build a tool that explains, that **educates** at the same time are you are using it” (I2) – A tool designed to learn about ES by doing.*

*““She (the client at the municipality) saw all of the values (of the green solutions), for her it was quite clear what is the best to do here, but then her boss maybe did not... she (the boss) needs to take more things into perspective, maybe she does not see these values as clearly but then she found the ES report I did really... **pedagogic**”” (I3) – Balancing alternatives for the municipality*

“We did look in the connection to nature right in the beginning and at the end to see any change (...) what we found is that with children that changed, in raising awareness” (I4) – Collective learning within local communities.

Other communication forms mentioned were focused on 'influencing' and 'advising' powerful actors, who interviewees' projects partially depended on. When taking 'influencing' and 'advising' approaches, interviewees considered to include results from economic assessments as part of the communication of ES values. Consultants acknowledged the importance of including uncertainty measures and being transparent in expressing ES in monetary values. One of the consultants reflected on why doing economic valuation, suggesting that communicating ES values in economic terms was done with the purpose of reaching specific actors' interest:

“You can use monetary... but that's really really hard, to put money on ES that's the hardest way to evaluate, but that's also maybe.. sometimes the most wanted one...” (...)

“Clients want to know what it would cost them and also what they have to gain monetarily from protecting environmental services and the ecosystem.” (I2)

Similar situations occurred in the context of interacting with decision-makers, when ES monetary valuation was perceived as appropriate to use by consultants and NGOs. Extracts from the interview with one NGO practitioner can exemplify how decision makers’ interests are perceived when it comes to valuation terms of a service:

*“I would say the incentive for them (decision makers) to change something and provide the best efficient urban management plan would be to tell them **how much money they are going to lose or gain** from the best options they have.” (I4).*

In other case, balancing ES with other economic arguments were part of communication between decision makers and consultants. In the context of urban planning, a consultant explained she used ES valuation to advise decision-makers on benefits from expensive and sustainable solutions in a municipality in Sweden:

*“If you have an option of two different alternatives, one is more technical, for example, and another is to build something that is more natural-based... but then you see that the **natural-based is more expensive**, and we cannot choose it... Then, you can add the ES values to show that it is actually **beneficial for society in the long term**” (I3).*

Therefore, communication about ES is directed to address decisions and awareness on sustainable practices. It has the capacity to adapt to target groups, such as local communities, local decision-makers or consultancy’ clients. The economic valuation is used by practitioners from NGOs and consultancies as a way of communication directed to specific set of actors with *an interest* in monetary values. However, interviewees applying economic valuation methods also expressed concerns about commodification of nature. For instance, one interviewee personally rejected the hypothetical situation of valuing nature economically to become part of the market:

“In the case that it (the ES) is only worth ‘this’ much money through the economic valuation, but if they exploit they can gain so much more than we can show the ES is worth. Then, I don’t think it is right to use it in those situations” (I3)

4.2.2 Technical tool

The adaptability of ES to local contexts is not only in terms of communication with different actors. When ES assessments are carried out by practitioners, it is possible to identify ‘*Scientific-technical governance*’ modes in the creation of knowledge, and integration of ‘ES approach’ into previous practices. One way all practitioners have used to integrate this new knowledge into their working practices is either creating or using technical tools.

All interviewees mentioned different tools they have come across, applied or developed to assess ES:

The municipality developed their own tools to structure how they worked with ES, and they used these tools internally. They used a tool developed in an Excel file to, according to the interviewee I1, analyze shortcomings and assets in areas and how it is its quality in terms of the ecosystem.

Besides, a consultant (I2) actively worked developing ES assessment tools for the consultancy’ clients, such as a building company in Sweden. TEEB (2007) was mentioned as a guiding document for working with ES. Some tools the interviewee mentioned were relatively simplified, such as excel sheets in a pdf (C/OCity, 2014). with descriptive questions to which answer ‘yes’ or ‘no’ for detail planners. The following extract illustrates the interviewee’s reflections when asked about the development process:

“That’s kind of the challenge to build an easy enough tool for people to use, but at the same time ES are so complex... if you make it too easy, you may miss the value of them. So the balance there is hard.” (I2)

The two NGO interviewees worked with ES assessments ten years ago, when there weren’t many available tools to assess ES, and they reviewed research done till then on the ES field. However, both mentioned a ES assessment tool called TESSA Toolkit (Peh et al., 2013), and other free available tools in Oppla platform. One of the interviewees had actively worked on projects concerning the operationalization of ES, and developing a cultural services module for ES assessment tools.

5 Discussion

Governance of ecosystem services (ES) relies on social processes, actions and interactions in decision making (Keune et al., 2015). Social processes may occur in settings other than governmental authorities, such as groups of societal actors coordinating interactions to solve problems (ibid.). ES are also a theoretical way of explaining links between the environment and humans. In addition, ES approach is put in practice through operationalization processes. This process involves conceptual, procedural, methodological aspects (Jax et al., 2018) and interpretation processes (Steger et al., 2018).

In practice, ES concept is viewed as a ‘contested concept’ and ‘*boundary object*’ (Star and Griesemer 1989). It can be contested because of the assumption of agreement by its users on what kind of use is made of it (Gallie, 1955; Schröter et al., 2014). Similarly, the emerged ‘*boundary object*’ qualities of the ES concept imply that the concept adapts to the context and keeps its identity (Hermelingmeier and Nicholas, 2017). Therefore, studying ES in different settings can help to better understand how this adaptation process occurs, and what implications it may have. This in turn allows for the identification of what reasoning individuals make when choosing specific actions. It can also help to highlight differences and similarities in the adaptations the ES approach can take in distinct socio-political contexts.

The empirical data analysis focused on exploring possible adaptations and identities ES takes. Focusing on interviewees’ experiences of how ES worked in practice helped to achieve this. The interviews encompassed different aspects, such as preferred actions, actors involved, methods, challenges and perceptions of their experiences with ES. In general terms, results showed that arguments behind actors’ actions were very different amongst interviewees as well as dependent on the context they were engaged within ES governance.

When considering the different implementation pathways ES approach can take in the municipality, it was identified that there was a strong focus on ‘*scientific-technical*’ driven actions. The municipality’s argument for these actions were a need for knowledge creation in the form of ES maps. The mapping process included on-site interviews to gather knowledge about the relationship between ES and locals. On-site interviews could be considered as an attempt to take into account individuals’ perceptions of ES benefits in the local social contexts (Blicharska et al., 2017). However, further engagement of locals was not continued to date. In this municipality, it could be assumed that the foreseen national legislation may have influenced the municipality’s initiative of developing ES plans, tools and strategies. For instance, valuation of ES in monetary terms was not encouraged when making complex decisions in Sweden (Hysing and Lidskog, 2018), and this municipality did not include ES valuation in economic terms in their ES strategic planning. Nevertheless, ‘*Hierarchical governance*’ obstacles were related to adapting ES knowledge externally developed to fit the municipality’s needs (Primmer et al., 2015).

In terms of possible improvements, the inclusion of other actors’ preferences and interests could be beneficial to manage possible conflicts (García-Llorente et al. (2016) cited in Jax et al., 2018; Perni and Martínez-Paz, 2017). According to the interviewee, negotiation with building companies was necessary for achieving ES goals. However, the implementation process did not contemplate further opportunities for local users of green areas yet to influence ES planned actions. Perhaps, this could be achieved by combining current strategies with ‘*Adaptative collaborative governance*’ actions. It may assist to adapt ES approach to a heterogeneous group of users through gathering context-sensitive knowledge (Primmer et al., 2015).

Consultants’ experiences were mostly identified with ‘*scientific-technical*’ governance modes. They pointed out shortcomings in knowledge and resources, as well as professional communication aspects. However, the two consultants expressed very different perspectives

on the problems when working with ES. One interviewee (I3) brought up issues concerning organizational challenges to integrate ES approach into already existing working practices. Additionally, I3 perceived a higher capacity to impact plans when being included early in the projects. Results are in line with other studies showing that professional norms and routines can be a source of friction when using ES in practice (Saarikoski et al., 2018). Similarly, early integration of ES related actions in the planning processes can influence decision makers (ibid.). The other interviewee (I2) did not refer to the ability to change detail plans with ES assessments, but rather to show the positive and negative impacts on ES derived from a project. One interviewee (I2) was familiar with tools the consultancy designed, used and sold to clients, such as to building companies.

Both interviewees were aware of the possibility to express ES in monetary terms, such as cost and gains. While I3 highlighted the need for transparency when she used economic valuations, I2 referred to clients' interests in those assessments. In contrast, the participation of other actors in the ES assessment process appeared not to be seen as a priority. Thus, results may indicate that because the municipality and building companies are the consultancy's clients, the consultancy practitioners tend to adapt to their demands. As a consequence, dependencies on clients' interests and use of resources may condition practitioners' actions to operationalize ES in one or another way.

NGO practitioners had diverse experiences implementing ES approach. Interacting with very different actors, at different decision levels was central in their process. Both practitioners were familiar with participatory approaches, which matched '*Adaptative collaborative governance*' modes. In Indonesia and Guyana, both practitioners experienced issues dealing with knowledge modes, language. Furthermore, in certain occasions there were mismatches in how ES were perceived and valued among different groups of people. Transdisciplinary approaches, such as participatory, involving different stakeholders, knowledge and interests may secure legitimacy in the identification of ES and decisions (Jax et al., 2018). These research methods could be interpreted as more adapted to reality (Keune et al., 2015), taking an interactive approach to collect data, and prioritizing action over knowledge production (Carmen et al., 2018). However, among the challenges of involving non-scientist actors in the ES assessment process can be risking the researcher's independence and encountering a higher degree of social complexity (ibid.). Conflict of interest among participants was managed in different ways, such as strategically choosing how to deliver the assessment results. Similarly, great importance was placed on stakeholder engagement to gather context-sensitive information for the ES assessments in Europe. However, among structural factors impeding implementation were time, resources, data availability and how comfortable practitioners felt employing qualitative methods.

Similarities in ES identity among interviewees were the use of ES as a tool to communicate environmental values to other actors, balance project alternatives and negotiate. Both NGOs and consultancy' interviewees reported learning outcomes interacting with actors from different backgrounds and positions in ES assessments' processes. The learning form varied from being individual to collective, which may be linked to the different ways ES knowledge was translated and enacted (Lave and Wenger (1991) cited in Westberg and Polk, 2016). Other communication forms had both 'influence' and 'advisory' intents. One NGO practitioner and one consultant explicitly expressed that ES approach was used to advocate for long term solutions. Besides, working with an ES approach can imply using different methodological approaches. In this sense, the development of methods and tools can be part of knowledge production processes (Carmen et al., 2018). For instance, it's been suggested that aligning with a transdisciplinary research approach requires that methods and tools are designed and applied in the form of '*boundary objects*' (ibid.). Interviewees mentioned different tools they employed to assess ES qualitatively and quantitatively. In fact, the two NGO interviewees mentioned TESSA Toolkit (Peh et al., 2013).

The interviewees were familiar with descriptive assessments, and also economic assessments were part of ES practice. Only the municipality didn't mention ES assessed in economic terms. Trying to 'influence' decision makers involved expressing ES in monetary terms. Interviewees from the NGOs and the consultancy used costs-benefits' balances to present results to decision makers. These actions are in line with the TEEB international initiative (TEEB n.d.). However, Gómez-Baggethun et al. (2010) argue that expressing ecosystem and biodiversity values in an economic language, such as costs and benefits, only reflects the dominant political and economic views. Society and science-based arguments could take a secondary position in decision-making when results are presented in business-friendly form (Grunewald and Bastian, 2015, p.129). In addition, these tools may become part of the organizational norm for carrying out ES practice. Carmen et. al (2018) pointed out that there is little discussion about assumptions shaping how the tools are applied and its outcomes. Therefore, it is important to study how knowledge creation on ES occurs, actors involved, methods and tools that promote its operationalization and the effective adaptation of the ES approach to the local level.

6 Conclusions

Governance of ecosystem services (ES) is interconnected with social structures, actors' actions and framings of how to work with ES. The individuals interviewed stand in differentiated socio-political positions, and work with ES at the operational level of governance.

The selection of different socio-political actors has assisted in obtaining a wide variety of responses in the interview material. The analysis identified the four implementation paths or governance modes across the interviewees' responses. However, '*Scientific-technical*' actions were rather dominant in practitioners working in consultancy and municipality settings, whereas practitioners working in NGOs enacted '*Adaptive collaborative governance*' actions.

The majority of actions focused on gathering and creating knowledge about ES. Regarding the arguments actors used when putting ES in practice, the key difference among interviewees was how they viewed stakeholder engagement. Whereas NGO practitioners argued that gather ES-related information from local people was important to understand real contexts, other practitioners did not seem to portray stakeholder engagement actions in the same way. Similarly, reasons to interact with other actors laid on interdependencies.

Regarding structures that may limit or allow specific actions, the study results indicated that adaptations form the ES approach was linked to the context of action. Specifically, actions could have been influenced by the dependencies with other actors and governance images actors may have about what is necessary for implementation. In this sense, differences and similarities among interviewees may respond to adaptations and identity that the ES concept takes when operated by a different group of actors.

However, these results only are representative of individual experiences in a particular social setting, and cannot be generalized to an organization or sector. Therefore, future research may need to be focused on specific organizations and sectors to investigate the underlying source of those how ES are being used in practice.

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Appendix 1. Interview questionnaire

Section 1. ES concept

Could you shortly introduce yourself and explain what do you do?

How/On what setting did you come across with the ES concept?

What do you think it is the purpose behind ES?

Why do you believe its application is important/relevant?

Have you been involved in ES assessments in any way?

If so, could you tell me about it?

Section 2. Practicalities about ES application

Could you roughly explain how you assessed the different services?

What methods or available resources did you use?

How do you assess cultural services?

Do you use economic valuation?

Did you/your team faced obstacles or challenges when applying the concept?

Thinking about the process, what stakeholders were involved?

Did you deal with different interests in the process? How did you manage them?

In your view, in what way ES assessments could help/helped to make decisions?

What parts of your job do you find more challenging? And more rewarding?

Is there anything you would like to add?

Appendix 2.

Table 2. Applying Primmer et al. (2015) analytical framework: coding the interview material.

Interview extracts were coded according to its perceived proximity to governance modes: ‘*Hierarchical governance*’, ‘*Scientific-technical*’, ‘*Adaptative collaborative governance*’ and ‘*Governing strategic behaviour*’ (Primmer et al., 2015). The following coding system was used to analyse the interview material:

Hierarchical governance	Influence of higher policy level	The way in which international principles become part of national and local governance levels
	Strategic choices	How powerful actors narrowed down international initiatives into implementation actions.
	Obstacles	Barriers to generating effects related to interests, or very technical argumentation.
Scientific-technical governance	Shortage	New knowledge and other resources used for implementation
	Operationalization	Policies and scientific arguments being operationalized, simplified and measured.
	Professional and communication factors	Previous working practices, and ways to integrate different goals reaching effectiveness
Adaptive Collaborative Governance	Legitimacy in decisions	Implementation processes and securing legitimacy
	Direct interactions with locals	Participation or direct interactions; positive effects.
	Learning	Collective learning and “Bottomup” governance actions.
	Context specific arguments	Context-specific arguments, overcoming conflicts, quality of decision making
Governing strategic behaviour	Dependencies	Interests in arguments and influence on operationalization of policies
	Interests of specific actors	Influence by interests of specific actors surrounding the policy implementation.