

**THE POTENTIAL OF ECOSYSTEM SERVICES AS AN APPROACH
FOR MARINE STAKEHOLDER ENGAGEMENT**

by

LAURA AMPARO FRIEDRICH

A thesis submitted to Plymouth University
in partial fulfilment for the degree of

DOCTOR OF PHILOSOPHY

Marine Science and Engineering Doctoral Training Centre
School of Biological and Marine Sciences

March 2017

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Author's declaration

At no time during the registration for the degree of Doctor of Philosophy has the author been registered for any other University award. Work submitted for this research degree has not formed part of any other degree either at Plymouth University or at another establishment.

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In their role as VALMER research assistant, the author was further responsible for conducting an extensive literature review on the topic of the international application of ecosystem service valuation in marine governance. This literature review was published as a working paper, which is included in Appendix 2 (Friedrich et al. 2013), and as a topic paper (Friedrich et al. 2014), both written by the author of this thesis. Finally, the author also contributed to the other deliverables of Work Package 4; in particular, the author wrote chapter 9.3, and parts of chapter 9.2 and 9.5, of the Work

Package 4 evidence base report, and did part of the report editing (Dodds and Friedrich 2015). The full references of the VALMER publications that the author wrote or contributed to are listed below.

Relevant scientific seminars and conferences were regularly attended at which work was often presented. Three papers are in preparation based on Chapters 3, 4 and 5.

Publications

Friedrich, L.A., Dodds, W., Philippe, M., Glegg, G., Fletcher, S. and Bailly, D. 2015. *Improving stakeholder engagement in marine management through ecosystem service assessment. A guide for practitioners based on experience from the VALMER project.* VALMER project.

Dodds, W. and **Friedrich, L.A.** (Eds.) 2015. *The potential role of ecosystem service assessment in marine governance in the western Channel.* VALMER Work Package 4 evidence base report. VALMER project.

Dodds, W., Philippe, M., **Friedrich, L.**, Fletcher, S., Glegg, G. and Bailly, D. 2015. *Advice note for using ecosystem service assessment to support marine governance.* VALMER project.

Friedrich, L.A., Dodds, W., Philippe, M., Glegg, G., Fletcher, S. and Bailly, D. 2014. *The ecosystem service approach as a marine management tool. Using ecosystem service valuation for marine management.* Topic paper 4. VALMER project.

Friedrich, L.A., Dodds, W., Glegg, G. and Fletcher, S. 2013. *International review of the application of Ecosystem Service Valuation in marine governance.* Working paper. VALMER project.

Conference presentations and posters

Friedrich, L.A., Glegg, G. and Fletcher, S. 2017. The marine engagement potential of the ecosystem services approach. Poster presented (by G. Glegg) at: 2nd International Conference on Marine/Maritime Spatial Planning, Paris, France, 15th-17th March 2017.

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Friedrich, L.A., Dodds, W., Glegg, G., Fletcher, S., Philippe, M. and Bailly, D. 2015d. Ecosystem services and stakeholder engagement in marine governance. Oral presentation at: Plymouth Marine Science and Education Foundation (PlyMSEF) Annual Student Conference, Plymouth, UK, 12th February 2015.

Friedrich, L.A., Dodds, W., Glegg, G., Fletcher, S., Philippe, M. and Bailly, D. 2014b. Ecosystem services and stakeholder engagement in marine governance. Oral presentation at: 3rd International Symposia on Integrated Coastal Zone Management, Belek-Antalya, Turkey, 14th-17th October 2014.

Friedrich, L.A. 2014. You, me and the sea – an ocean full of values. Oral presentation at: Three Minute Thesis Competition, rounds one and two, Plymouth University, 2014.

Friedrich, L.A., Dodds, W., Fletcher, S. and Glegg, G. 2013b. Ecosystem Service Valuation: an international review of application in marine governance. Oral presentation at: RGS-IBG Annual International Conference, Royal Geographical Society, London, UK, 28th-30th August 2013.

Oral presentations have also been given at VALMER project meetings, and at research group meetings of the Centre for Marine and Coastal Policy Research and the Sustainability Research Group in the School of Psychology, at Plymouth University.

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Signed _____

Date _____

Abstract

The potential of ecosystem services as an approach for marine stakeholder engagement

by Laura Amparo Friedrich

With growing human pressures on the oceans and seas, the resulting decline of ecosystem health and biodiversity is increasingly limiting the ability of marine ecosystems to provide essential functions and resources for human wellbeing. To prevent further marine degradation, an ecosystem based approach to marine management is needed. An integral part of this is constructive stakeholder engagement. However, in a marine context, engagement is often difficult due to traditionally sectoral management and the complexity of marine issues.

This thesis presents an interdisciplinary study that evaluates the potential of the ecosystem services approach to support and improve marine stakeholder engagement. First, opportunities and challenges of using the approach in participatory marine management processes were explored through interviews with 39 stakeholders who participated in the application of ecosystem service assessment to marine management in six French and UK case studies. The interviews revealed that the ecosystem services approach can facilitate participatory engagement by improving understanding of complex ecological-socioeconomic systems and fostering constructive dialogue. Second, the potential of the approach for communicating marine management decisions to marine users was tested with a scenario based survey. Responses to three versions of the survey, two with and one without ecosystem services content, were compared, showing that the ecosystem services information did not increase agreement with the management measures proposed in the scenario.

An evaluation of the results in the context of environmental behaviour research suggests that the novelty and complexity of the ecosystem services approach might limit its usefulness for top down communication. In contrast, if the approach is integrated in participatory processes, it was concluded that this could have multiple benefits for ecosystem based marine management. From these findings, a conceptual model was developed that provides a normative framework for the effective use of the ecosystem services approach to support constructive participatory engagement in marine governance.

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Abbreviations

ANOVA	Univariate Analysis of Variance
BSE	Bovine Spongiform Encephalopathy
CBD	Convention on Biological Diversity (also used as UNCBD)
CINMS	Channel Islands National Marine Sanctuary
Defra	Department for Environment, Food and Rural Affairs
DPSIR	Drivers-Pressures-State-Impact-Response
EC	European Commission
ESA	Ecosystem service assessment
ESAV	Ecosystem service assessment and/or valuation
ESV	Ecosystem service valuation
EU	European Union
FAO	Food and Agriculture Organization (of the United Nations)
GdM	Golfe du Morbihan
GNM	Golfe Norman Breton
IAP2	International Association for Public Participation
ICO	Intergovernmental Oceanographic Commission
IPCC	Intergovernmental Panel on Climate Change
MCZ	Marine conservation zone
MEA	Millennium Ecosystem Assessment
MMO	Marine Management Organisation
MPA	Marine protected area
MSP	Marine spatial planning
ND	North Devon
NGO	Non-governmental organisation
NOOA	National Oceanographic and Atmospheric Administration
PES	Payment for ecosystem services
PF	Plymouth to Fowey
PH	Poole Harbour
PHSG	Poole Harbour Steering Group

PNMI	Parc naturel marin d'Iroise
TEEB	The Economics of Ecosystems and Biodiversity
UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
UNWCED	United Nations World Commission on Environment and Development
UK	United Kingdom
UK NEA	United Kingdom National Ecosystem Assessment
USA	United States of America

Context and conceptual background

1 Introduction

1.1 Setting the scene: ecosystem based marine management, stakeholder engagement and ecosystem services

“People are dependent on the ocean and coasts and their resources for their survival and well-being.” (UNEP 2006, p.1)

1.1.1 The state of the oceans

The oceans and seas play an essential role for life on Earth. They cover more than two thirds of the planet’s surface and produce about 70 percent of the oxygen on Earth. Oceans and seas are home to a large part of global biodiversity, including the largest animal on the planet – the blue whale – as well as some of the smallest living organisms (UN 2016). Marine ecosystems also support human life and wellbeing through a wide range of functions and resources. They provide food, raw materials and energy, storm and flood protection; they remediate waste, control diseases, maintain water quality and regulate the Earth’s climate (Beaumont et al. 2007, Fletcher et al. 2012a, UNEP 2006). Moreover, the marine environment is an important setting for recreation, cultural identity, aesthetic and spiritual experiences and cognitive development (Beaumont et al. 2007, Fletcher et al. 2012a, UNEP 2006).

Globally, around 60 percent of the world’s population lives on the coast (UN Atlas of the Oceans 2016). The economies, livelihoods, societies and cultures of maritime nations and coastal communities are often closely connected to the marine environment (FAO 2016, UNEP 2006). The oceans and seas are used for commercial

and subsistence fisheries, extraction of oil, gas and aggregates, waste dumping, laying pipelines and communication cables, shipping, bioprospecting and collection of ornamental resources, tourism, recreational activities and cultural rituals (UN 2016, UNEP 2006). In addition, new marine uses, such as marine renewable energies, marine aquaculture and deep sea mining, have emerged in recent years (Borthwick 2016, Hoagland et al. 2010, Kapetsky et al. 2013, NOAA 2015, Petersen et al. 2016, Rodríguez-Rodríguez et al. 2016, Wedding et al. 2015). With growing populations and demand for resources, energy and recreation, new and existing marine uses are intensifying and expanding (Ritchie and Ellis 2010, Soma and Haggett 2015). These trends are further driven by policies like the European Union's (EU) Blue Growth strategy that promote the development of marine industries (EU 2012a).

The result of this human reliance and dependence, and growing human pressure, on the marine environment is an increasingly rapid decline in marine ecosystem health and loss of marine biodiversity (Butchart et al. 2010, Dulvy et al. 2003, Friedrich et al. 2013, Halpern et al. 2008, UN 2016, UNEP 2006, 2011). Overfishing has brought many fish stocks to the brink of collapse, or beyond, with uncertain consequences for the balance of marine ecosystems (FAO 2016, Myers and Worm 2003, Pauly et al. 1998, Worm et al. 2006). Destructive fishing and resource extraction methods, oil spills and chemical pollution have degraded or destroyed many marine habitats, causing declines in richness and abundance of marine species (Airoldi et al. 2008, Dulvy et al. 2003, Halpern et al. 2008, Jones et al. 2004, Rothschild et al. 1994). Large plastic islands float around in Atlantic and Pacific gyres, and plastic waste has reached the deepest parts of the world's oceans, causing harm to marine organisms (Derraik 2002, Eriksen et al. 2013, Gall and Thompson 2015, Pham et al. 2014). Noise pollution from ships and

boats, as well as from marine construction activities and offshore wind farms, also has negative impacts on many marine species (Bailey et al. 2010, Firestone and Jarvis 2007, Simmonds et al. 2014, Slabbekoorn et al. 2010). These are some of the main human pressures on the marine environment. On top of these direct pressures, marine ecosystems have to adapt to the effects of climate change such as sea temperature rise and ocean acidification (IPCC 2014, UNEP 2006).

As the demand for marine resources grows and new and existing marine activities intensify, the human pressures on the oceans and seas will also increase. The degradation of marine habitats and loss of biodiversity limit the ability of marine ecosystems to provide the functions and resources that are essential for supporting human life and wellbeing (UN 2016, Worm et al. 2006). Thus, the degradation of the marine environment poses a direct threat to human welfare.

1.1.2 Ecosystem based marine management

Traditional sectoral marine management has failed to prevent the rapid decline in marine ecosystem health and biodiversity (Curtin and Prellezo 2010, Katsanevakis et al. 2011). To stop the ongoing deterioration and mitigate the increasing human pressures, an ecosystem approach to marine management is needed (Curtin and Prellezo 2010, Douvere and Ehler 2008, Katsanevakis et al. 2011, UNEP 2011). Ecosystem based marine management requires the consideration of all aspects of ecological systems, and the socioeconomic systems that interact with them, in one comprehensive strategy. Marine protected areas (MPAs), marine zoning and, in particular, marine spatial planning (MSP) have been adopted as mechanisms to implement ecosystem based marine management (Curtin and Prellezo 2010, Dalton 2005, Douvere and Ehler

2009, Katsanevakis et al. 2011). Given the central role of human activities and the diversity of socioeconomic interests involved in marine issues, stakeholder engagement has been established as a key principle of ecosystem based marine management approaches (Dalton 2005, Ritchie and Ellis 2010, UNEP 2011). As Pomeroy and Douvère (2008) explain,

“[management] of the marine environment is a matter of societal choice. It involves [...] allocating parts of three-dimensional marine spaces to specific uses to achieve stated ecological, economic and social objectives. People are central to this decision-making process and are the agents for change. As such, stakeholder participation and involvement is integral to the success of MSP.” (Pomeroy and Douvère 2008, p. 816).

1.1.3 Marine stakeholder engagement

The United Nations Educational, Scientific and Cultural Organization (UNESCO) describes marine spatial planning as

“a public process of analyzing and allocating the spatial and temporal distribution of human activities in marine areas to achieve ecological, economic, and social objectives” (Ehler and Douvère 2009, p. 18).

Stakeholder participation is included as a key step in the UNESCO marine spatial planning step-by-step guide (Douvère and Ehler 2009, see also Gilliland and Laffoley 2008). Moreover, stakeholder engagement has proved to be an essential prerequisite for successful marine protected areas (Dalton 2005, Fernandes et al. 2005, Gall and Rodwell 2016, Sayce et al. 2013).

Involving the public and local stakeholders in management and planning processes provides access to local knowledge and enables identification and consideration of all relevant interests and views. Constructive engagement can increase the accountability

and transparency of decision making processes and lead to more legitimate, better informed decisions (Fiorino 1990, Richardson and Razzaque 2006, Rowe et al. 2008). Moreover, it can reduce stakeholder conflicts, generate a greater sense of responsibility and ownership, and increase the acceptance of management decisions (Fiorino 1990, Richardson and Razzaque 2006, Rowe et al. 2008). Thus, good participatory engagement has the potential to improve the quality of management and planning decisions, and to facilitate the implementation of management measures, supporting more effective ecosystem based marine management (Dalton 2005, Gleason et al. 2010, Pomeroy and Douvère 2008). In recent years, calls for public and stakeholder participation in marine management and planning have been included in a number of EU directives, national policies and legislations (EU 2008, 2014b, UK 2009, 2010).

However, in a marine context, effective engagement is often difficult. The lack of clearly defined physical and jurisdictional boundaries, and fragmented management structures, often make it difficult to identify all relevant stakeholders (Maguire et al. 2012, Ritchie and Ellis 2010, Sutherland and Nichols 2006). As a result of traditionally sectoral management approaches, there is little culture of collaboration and relationships between different stakeholder groups are often conflictual (Douvère and Ehler 2009, Maguire et al. 2012, Mason et al. 2015). Moreover, the large number of different and conflicting interests in the marine environment makes consensus difficult to achieve (Douvère and Ehler 2009, Fleming and Jones 2012). In addition, there is often a lack of understanding of the marine environment. Most people know very little about what goes on under the surface of the sea, about the connectivity and dynamic complexity of interactions in marine ecosystems, about the diversity of marine habitats

and species, or about how marine ecosystems support human wellbeing (Jefferson et al. 2014, Jones 2002, Rose et al. 2008, Steel et al. 2005).

Considering the central role that stakeholder engagement plays in implementing ecosystem based marine management, it is important to find ways to address these challenges. One method that has the potential to support and improve marine stakeholder engagement is the ecosystem services approach (Granek et al. 2010).

1.1.4 The engagement potential of ecosystem services

The concept of ecosystem services emerged in the 1970s, when ecologists started framing ecological functions in economic terms to raise awareness of the societal importance of healthy ecosystems and gain support for biodiversity conservation (Gómez-Baggethun et al. 2010). Since then, the ecosystem services approach has developed into an important tool to promote effective conservation and support sustainable development (CBD 2000, Costanza et al. 2014, Daily et al. 2009, MEA 2005). In recent years, interest has also been growing in the potential of the ecosystem services approach to support coastal management, marine spatial planning and the designation and management marine protected areas (for example Böhnke-Heinrichs et al. 2013, Börger et al. 2014, Fletcher et al. 2012b, Kushner et al. 2012, Marre et al. 2015).

Ecosystem services can be explained as “the conditions and processes through which natural ecosystems [...] sustain and fulfil human life” (Daily 1997, p. 3), or as “components of nature, directly enjoyed, consumed, or used to yield human wellbeing” (Boyd and Banzhaf 2007, p. 619), or simply as “the benefits people obtain from

ecosystems” (MEA 2005, p. v). In other words, ecosystem services draw an explicit link between ecosystems and human wellbeing. Assessment and valuation of ecosystem services reveals how healthy, functioning ecosystems support economic prosperity, societal cohesion, human health, cognitive development, cultural identity and spiritual fulfilment (MEA 2005, TEEB 2010). Ecosystem service assessment and valuation can inform environmental management and planning decisions, the design of environmental policies and management instruments, as well as legal processes arising from environmental damage (Costanza et al. 2014, Daily et al. 2009, Farber et al. 2006, Granek et al. 2010, Laurans et al. 2013a, Liu et al. 2010). Furthermore, ecosystem service assessment and valuation is seen as a tool to communicate the human wellbeing implications of ecological change, provide understandable arguments for management decisions, foster interdisciplinary dialogue and facilitate stakeholder engagement in environmental governance (Berghöfer et al. 2016, Granek et al. 2010, Klain et al. 2014, Luck et al. 2012).

Coming back to the marine context, the ecosystem services approach has the potential to address some of the difficulties of effective marine stakeholder engagement. Ecosystem service assessment and valuation can help identify relevant stakeholders, it can provide opportunities for stakeholders to contribute their knowledge and views to decision making processes, and it can enable stakeholders with different interests to develop a shared understanding of marine management issues (Berghöfer et al. 2016, Cork and Proctor 2005, Slootweg and van Beukering 2008). Thus, the use of the ecosystem services approach in engagement processes can potentially contribute to better stakeholder dialogue and relationships, reduce conflict between stakeholders with different interests, and foster greater acceptance and ownership of marine

management decisions (Berghöfer et al. 2016, Cork and Proctor 2005, Granek et al. 2010). Evidence from case studies, in which ecosystem service assessment and valuation was used in marine management, shows that the ecosystem services approach can indeed have positive effects on marine stakeholder engagement. For example, in different marine protected areas across the Caribbean, ecosystem service valuation studies helped facilitate and improve dialogue and cooperation between local stakeholders and MPA managers (Kushner et al. 2012, van Beukering et al. 2008).

1.1.5 The ecosystem services approach as a marine engagement tool?

To sum up the context of this study, the ability of the world's oceans and seas to support human life and wellbeing is increasingly jeopardised by the rapid decline in marine ecosystem health and biodiversity, which is a direct consequence of growing human pressures. To stop this trend and secure a sustainable future for marine ecosystems, an ecosystem based approach to marine management is needed. Stakeholder engagement plays a central role in implementing ecosystem based marine management; however, marine engagement is faced with a number of challenges that often limit its effectiveness. The ecosystem services approach has the potential to address some of these difficulties, and evidence from marine case studies suggests that the use of ecosystem service assessment and valuation in marine management can facilitate stakeholder dialogue and engagement.

However, there is little or no evidence on why, how and under what conditions the ecosystem services approach helps improve marine stakeholder engagement. Gaining a better understanding of this is important if the ecosystem services approach is to be used effectively to support and improve stakeholder engagement in ecosystem based

marine management. The study presented here contributes to filling this evidence gap and develops a conceptual model of the marine engagement potential of the ecosystem services approach.

1.2 Aim and objectives

The aim of this study is to critically evaluate the potential of using the ecosystem services approach to support and improve stakeholder engagement in marine management. To address this aim, the study has the following five objectives:

- a) To examine the theoretical context of stakeholder engagement and its application in marine management through a critical review and analysis of relevant literature;
- b) To examine the theoretical context of the ecosystem services approach and its application in marine management through a critical review and analysis of relevant literature;
- c) To explore the opportunities and challenges of using the ecosystem services approach in a stakeholder engagement process for marine management through an evaluation of the experiences of stakeholders who participated in six case studies in which ecosystem service assessment and valuation was applied in different marine management contexts;
- d) To investigate the potential of the ecosystem services approach as a tool to communicate marine management decisions to marine users through a survey of multiple marine user groups;
- e) To synthesise the factors that constitute the engagement potential of the ecosystem services approach and the conditions under which it can support and improve marine stakeholder engagement.

1.3 Methodology

This thesis presents an interdisciplinary research study that branches out into a number of social sciences. The different components of the study draw from theory and practice in the fields of environmental and marine governance, environmental and ecological economics, sociology, behavioural and environmental psychology. This reflects the interdisciplinary nature of the two central concepts, stakeholder engagement and ecosystem services, as well as the fundamental importance of interdisciplinary research for the advancement of ecosystem based marine management, sustainable development and effective biodiversity conservation.

The study applied a mix of social research methods, including comprehensive and systematic literature review and analysis, qualitative and quantitative survey techniques involving thematic and statistical data analysis, as well as evidence based and deductive reasoning. The various social research methods have different benefits and drawbacks (Bryman 2012, Creswell 2014, Punch 2005, Sarantakos 2013). For example, qualitative survey methods, such as interviews or focus groups, allow the exploration of a topic in great detail; however, they are time and resource intensive, which often limits the number of participants. Quantitative, questionnaire surveys can be conducted with large numbers of people and enable comparisons between different groups; on the flip side, they offer little flexibility to adapt to different contexts or opportunity to investigate the reasons behind people's responses. Thus, on their own, these methods can often capture only part of the picture. A mixed methods approach that combines different methods can draw on the strengths of the individual methods and mitigate, to an extent, their limitations (Bryman 2012, Creswell 2014,

Sarantakos 2013). It allows a topic to be explored from different perspectives and to triangulate findings from different sources, thus gaining a more complete and robust picture.

In this study, the review and analysis of relevant literature provided the context of marine stakeholder engagement and the ecosystem services approach, highlighting previous findings and identifying gaps in the existing evidence. Two empirical studies were then conducted to address these evidence gaps. Qualitative interviews were used to explore marine stakeholders' experiences of participating in case study applications of the ecosystem services approach to marine management. This was followed by a quantitative survey to investigate the use of the ecosystem services approach as a communication tool for marine management decisions with a wide range of marine user groups. The rationales for choosing qualitative and quantitative methods in the two studies will be further explained in Chapters 3 and 4. In the qualitative study, exploratory interviews were assessed against a set of criteria. The quantitative survey tested a pre-established hypothesis, as well as including several exploratory elements. Finally, the findings from the two studies were evaluated in the context of relevant literature and synthesised to develop a conceptual model of the marine engagement potential of the ecosystem services approach.

1.4 The VALMER project

The qualitative interview study presented in Chapter 3 is based on research that was conducted by the author of this thesis as part of the VALMER project. VALMER was a collaborative project, with partners in France and the UK, which explored the potential

of using ecosystem service assessment and valuation to support effective marine management and planning in the English Channel. The project had six case studies in the western English Channel region, three in France and three in the UK. In these case studies, the ecosystem services approach was applied in participatory processes, involving local marine stakeholders, to address different marine management and planning objectives. The project was funded by the EU Interreg programme for interregional cooperation across Europe and ran from September 2012 to March 2015. The VALMER project and its six case studies will be introduced in more detail in Chapter 3.

The study presented in Chapter 3 was developed and conducted by the author of this thesis as part of the VALMER research team at Plymouth University and the University of Brest in France. While other team members contributed to development, translation, execution and transcription of the interviews, the analysis of the interview results and interpretation of findings are exclusively the work of the author of this thesis. All contributions of other members of the VALMER team to the interview study are clearly identified and explained in Chapter 3.

1.5 Outline of the thesis

Having set the scene and outlined the aim, objectives and methodology in this introductory chapter, **Chapter 2** presents the two central concepts of the thesis, stakeholder engagement and ecosystem services. Part one of Chapter 2 reviews the historical development, rationales, typologies and mechanisms, benefits and challenges of stakeholder engagement and its application in the context of marine

management. In the second part of Chapter 2, a historical review of the ecosystem services approach is followed by an overview of ecosystem service definitions and classifications and a discussion of different value concepts, assessment and valuation methods. The objective and purposes of ecosystem service assessment and valuation, and its application in environmental and marine governance, are then reviewed. Part 2.2 concludes with different outlooks on the methodological limitations and ethical challenges of the ecosystem services approach. The third and final part of Chapter 2 draws out the parallels between stakeholder engagement and the ecosystem services approach, and begins to explore the relationship between the two approaches.

Chapter 3 presents the first of the two empirical studies in this thesis. The study is based on interviews with marine stakeholders who took part in the six case studies of the VALMER project. It explores the potential opportunities and challenges of using the ecosystem services approach in a participatory marine management process.

Leading on from VALMER interview findings, **Chapter 4** investigates the usefulness of the ecosystem services approach as a communication tool for marine management decisions. This second empirical study is based on an online survey of French and UK marine user groups along the French and UK coasts of the English Channel.

Chapter 5 begins with a discussion of the findings from the VALMER interviews and the marine user survey in the context of existing environmental behaviour research to assess the pedagogic value of the ecosystem services approach. This is followed by a synthesis of the findings, answering the question why, how and under what conditions the ecosystem services approach can support and improve marine stakeholder engagement. The results of this synthesis are presented in a conceptual model of the

marine engagement potential of the ecosystem services approach. Lastly, Chapter 5 discusses the potential benefits for ecosystem based marine management that could be gained from using the ecosystem services approach in participatory engagement processes.

Chapter 6 summarises the key findings from across the thesis and discusses how these address the research aim of the study. The chapter concludes with an outlook on further research into the relationship between marine stakeholder engagement and the ecosystem services approach, and their contribution to ecosystem based marine management.

2 Ecosystem services and stakeholder engagement in the context of marine management: a literature review

This chapter introduces the two central concepts of the thesis, stakeholder engagement and ecosystem services. The chapter is divided into three parts. The first part presents the concept of stakeholder engagement in the context of environmental and marine governance. It starts with a brief history of engagement (2.1.1) and the reasons for why it is so closely related to environmental governance (2.1.2). This is followed by an overview of different engagement typologies and mechanisms (2.1.3), the challenges of engagement, benefits and rationales, definitions of effectiveness and evaluation criteria (2.1.4). These sections also explain some of the engagement terminology used in this thesis. Lastly, 2.1.4 considers the role of stakeholder engagement in marine management and the difficulties of marine stakeholder engagement. The second part of Chapter 2 gives an overview of the ecosystem services approach. It begins with a historical perspective (2.2.1), followed by a discussion of different ecosystem service definitions and classifications (2.2.2), different value concepts, assessment and valuation approaches (2.2.3). These sections also clarify the interpretation of the terms 'ecosystem service' and 'ecosystem service assessment and valuation' used in this thesis. Section 2.2.4 explores the objective and purposes of the ecosystem services approach as well as its practical application in environmental and marine governance. Finally, 2.2.5 addresses the methodological limitations and ethical debates surrounding the ecosystem services approach. The third part of Chapter 2 draws out the parallels (2.3.1) and interactions (2.3.2) between stakeholder engagement and the ecosystem services approach.

2.1 Marine stakeholder engagement

2.1.1 A brief history of engagement in environmental governance

Emergence of environmental governance in the 1970s and 1980s: public information and consultation

Over the last five decades, stakeholder engagement has become an integral element of environmental governance around the world (Renn 2006, Richardson and Razzaque 2006, Rowe and Frewer 2005, Saarikoski et al. 2010, Wesselink et al. 2011). In the United States of America (USA), provisions for public access to information, government decision making and judicial review were included in nearly all environmental policies, legislation, regulations and programmes since the passage of the 1969 National Environmental Protection Act (Beierle and Cayford 2002, Chess et al. 1998, Haklay 2003, Palerm 1999). The 1969 National Environmental Protection Act was the first major environmental legislation in the United States, and it included requirements for government agencies to inform the public about proposed actions and involve all interested parties in early problem scoping (Dietz and Stern 2008, Haklay 2003, Palerm 1999).

In Europe, uptake of stakeholder engagement in environmental governance was slower (Appelstrand 2002, De Marchi and Ravetz 2001). Edwards et al. (1997) argue that many European countries, including the UK, have “a long political history of command-and-rule” which resulted in a greater acceptance of top down environmental governance (Edwards et al. 1997, p. 163). In particular in the UK, government resisted calls for information sharing and public involvement for a long time (Bloomfield et al. 2001, Walker et al. 1999). The only exception was land use

planning legislation which included provisions for public information and limited public consultation (Bloomfield et al. 2001, De Marchi and Ravetz 2001, Reed 2008).

In this early stage of environmental governance, engagement was mostly limited to informing the public about proposed actions and expected consequences, and gathering public opinions and input in consultations and public hearings (Beierle and Cayford 2002, Haklay 2003, Reed 2008). The concept of governance is not clearly defined and is interpreted differently in varying contexts (for example Ehler 2003, Juda 1999). In this thesis, environmental and marine governance encompass all government instruments and related processes for the management of the (marine) environment, including policies, legislation, regulations, management of resources and activities (including conservation measures and development projects), spatial and strategic planning, and government initiatives (for example public information and consumer campaigns).

The sustainability agenda of the 1990s: international calls for deliberative participation

With the emergence of the sustainability agenda in the 1990s came strong international calls for more deliberative, participatory governance (De Marchi and Ravetz 2001, Eden 1996, Palerm 1999, Reed 2008). In the 1987 report *Our Common Future*¹, the United Nations World Commission on Environment and Development (UNWCED) first recognised the importance of participatory engagement for sustainable development (UNWCED 1987). Following this, at the 1992 United Nations Conference on Environment and Development (UNCED) in Rio, involving those who are

¹ The WCED report *Our Common Future* is often referred to as the Brundtland Report after the chair of the Commission Gro Harlem Brundtland (see Carter 2007).

potentially affected by, or interested in, a decision in the decision making process was recognised as an integral principle of sustainable development (UNCED 1992a, 1992b).

Principle 10 of the Rio Declaration says:

“Environmental issues are best handled with participation of all concerned citizens, at the relevant level. At the national level, each individual shall have appropriate access to information concerning the environment [...], and the opportunity to participate in decision-making processes. States shall facilitate and encourage public awareness and participation by making information widely available. Effective access to judicial and administrative proceedings, including redress and remedy, shall be provided.” (UNCED 1992a)

Empowerment and participation of communities, the public, various stakeholders and minority groups were included as key elements in the UNCED Agenda 21 action plan for sustainable development that was adopted in Rio (Eden 1996, UN 1992b).

The Rio Conference established stakeholder engagement on the international environmental governance agenda (Appelstrand 2002, Eden 1996, Haklay 2003, Hartley and Wood 2005, Mauerhofer 2016, Palerm 1999, Reed 2008). The 1998 Aarhus Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters (UNECE 1998) translated Principle 10 of the Rio UNCED Declaration into international law (De Santo 2016, Wates 2005). The Aarhus Convention sets out rights for public access to information, public participation in decision making and public access to justice in environmental matters (policies, programmes, plans or projects) (Appelstrand 2006, De Marchi and Ravetz 2001, Hartley and Wood 2005, Mauerhofer 2016, Richardson and Razzaque 2006, Wates 2005).

Implementing deliberative participation in Europe and the UK from the 1990s on

The European Union (EU) is a signatory to the Aarhus Convention. Following ratification of the convention in 2005, the EU has implemented the three pillars of the agreement (public access to information, decision making and justice) through the EU Directive on public access to environmental information, the EU Public Participation Directive and the EU Regulation on the application of the Aarhus Convention. Requirements for public participation in environmental matters have also been included in several environmental EU directives and regulations, such as the Water Framework Directive, the Strategic Environmental Assessment Directive, the Marine Strategy Framework Directive, the Seveso III Directive on hazard regulation, the Environmental Impact Assessment Directive and the Maritime Spatial Planning Directive (for further details see Table 2.1 and De Santo 2016, De Stefano 2010, Hartley and Wood 2005, Mauerhofer and Larsson 2016, Newig et al. 2005, Videira et al. 2006, Walker et al. 1999).

In the UK, the political rhetoric also changed towards greater public engagement, for example in the 1990 White Paper on the environment, the 1994 sustainable development strategy and the 1995 Going for Green public campaign (Eden 1996). However, throughout the 1990s, the emphasis remained on top down provision of information and calls for individual action to contribute to environmental change and sustainable development (Eden 1996). This began to change in the late 1990s and 2000s when government, regulators and management practitioners started to show increasing interest in public participation (Rowe and Frewer 2004). Irwin (2006) notes a “rhetorical shift towards a style of scientific governance based on public dialogue, transparency and democratic engagement” (Irwin 2006, p. 300).

Table 2.1: International agreements, EU directives and regulations, and UK legislation that call for the integration of participatory approaches in environmental and marine policy making and management

Agreement/directive/regulation/legislation	Purpose or content referring to participatory approaches	Refs
1992 UN Conference on Environment and Development (UNCED) Rio Declaration on Environment and Development	Principle 10: "Environmental issues are best handled with participation of all concerned citizens, at the relevant level. At the national level, each individual shall have appropriate access to information concerning the environment [...], and the opportunity to participate in decision-making processes. States shall facilitate and encourage public awareness and participation by making information widely available. Effective access to judicial and administrative proceedings, including redress and remedy, shall be provided."	UNCED 1992a
1992 UNCED Agenda 21	Calls for empowerment and participation of communities, the public and various stakeholder and minority groups in all aspects of sustainable development Preamble: "[...] The broadest public participation and the active involvement of the non-governmental organizations and other groups should also be encouraged. [...]"	UNCED 1992b
1998 UN Economic Commission for Europe (UNECE) Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters (Aarhus Convention)	Article 1 Objective: "In order to contribute to the protection of the right of every person of present and future generations to live in an environment adequate to his or her health and well-being, each Party shall guarantee the rights of access to information, public participation in decision-making, and access to justice in environmental matters in accordance with the provisions of this Convention."	UNECE 1998
EU Directive on public access to environmental information 2003/4/EC	Implement the Aarhus Convention in the EU (public access to information, decision making and justice regarding policies, programmes, plans or projects related to environmental matters)	EU 2003a
EU Public Participation Directive 2003/35/EC		EU 2003b
EU Regulation on the application of the Aarhus Convention EC 1367/2006		EU 2006

Table 2.1 continued

EU Water Framework Directive 2000/60/EC	Include requirements for public participation in environmental impact assessments of public and private projects, in strategic environmental assessments of public plans and programmes, and in the establishment, implementation and updating of river basin management plans and marine strategies in the EU, and for public access to information and participation in decision making regarding hazard management projects and plans	EU 2000
EU Strategic Environmental Assessment Directive 2001/42/EC		EU2001
EU Marine Strategy Framework Directive 2008/56/EC		EU 2008
EU Directive on the control of major-accident hazards involving dangerous substances 2012/18/EU (Seveso III)		EU 2012b
EU Environmental Impact Assessment Directive 2014/52/EU		EU 2014a
EU Maritime Spatial Planning Directive 2014/89/EU	Article 9: "Member States shall establish means of public participation by informing all interested parties and by consulting the relevant stakeholders and authorities, and the public concerned, at an early stage in the development of maritime spatial plans, in accordance with relevant provisions established in Union legislation."	EU 2014b
UK Environmental Information Regulations 2004	Implement the EU Directive on public access to environmental information in the UK	UK 2004
UK Marine and Coastal Access Act 2009	Includes requirements for public participation in the preparation of marine plans and for consultation before designation of Marine Conservation Zones Schedule 6 Marine Plans: preparation and adoption: "[...] (1) Before preparing a marine plan for any marine plan area, a marine plan authority must prepare and publish a statement of public participation (an "SPP"). (2) An SPP is a statement of the policies settled by the marine plan authority for or in connection with the involvement of interested persons in the preparation of the proposed marine plan."	UK 2009
UK Marine Strategy Regulations 2010	Implement the EU Marine Strategy Framework Directive in the UK, including requirements for public notice and participation	UK 2010

Prominent examples of this new interest to engage stakeholders in marine governance are the marine planning and marine conservation zone designation processes following the adoption of the Marine and Coastal Access Act in 2009. The Marine and Coastal Access Act requires marine planning authorities to prepare a statement of public participation which delineates with whom, how and when stakeholder engagement will take place in the marine planning process (UK 2009). For example, the statements of participation for the East and South plan areas² set out provisions for stakeholder engagement to take place in all key stages of the planning process, including the scoping phase (identification of issues, evidence gathering, definition of objectives), plan development and revision (MMO 2013, MMO 2015). The Marine and Coastal Access Act also includes provisions for the designation of new marine conservation zones (MCZ). As part of the MCZ designation process, four regional projects³ were set up around the coast of England, Wales and Northern Ireland to develop recommendations for MCZs in stakeholder led processes between 2009 and 2011 (De Santo 2016, Fleming and Jones 2012).

Overall, as Table 2.2 illustrates, stakeholder engagement is now being applied in various contexts related to environmental governance around the world (Mauerhofer 2016).

² The UK is divided into four marine planning regions: Scotland, Northern Ireland, Wales and England. In England there are 11 plan areas. The East and South plan areas were the first in which marine planning took place. <https://www.gov.uk/government/publications/marine-plan-areas-in-england>

³ The four regional projects, that were part of the Marine Conservation Zone Project, were: 1) Finding Sanctuary (South West), 2) Balanced Seas (South East), 3) Net Gain (North Sea), and 4) Irish Sea Conservation Zones (Irish Sea). <http://jncc.defra.gov.uk/page-2409>

Table 2.2: A summary of environmental governance contexts in which stakeholder engagement is being applied and related literature references (in alphabetical order)

Environmental governance contexts in which stakeholder engagement is being applied	References
Aquaculture	Melaku Canu and Solidero 2014
Dredged material management	Collier et al. 2014
Ecosystem based management	Curtin and Prellezo 2010, Samhoury et al. 2014, Tallis et al. 2010
Energy policy	Adams et al. 2011, Ricci et al. 2010, Stagl 2006
Environmental impact assessment	Bond et al. 2004, O’Fairchallaigh 2010, Palerm 1999, Soneryd and Weldon 2003
Fisheries management	Mikalsen and Jentoft 2008
Forest management	Ananda 2007, Appelstrand 2002, Buchy and Hoverman 2000, Saarikosky et al. 2010
Hazard regulation	Walker et al. 1999
(Integrated) coastal zone management and coastal resource management	Areizaga et al. 2012, Edwards et al. 1997, NOAA 2007, O’Hagan and Ballinger 2009
Local environmental planning	Rydin and Pennington 2000
Marine conservation	Lundquist and Granek 2005, McDonald and Rigling-Gallagher 2015
Marine protected area planning and management	Guénnette and Alder 2007, Charles and Wilson 2009, Dalton 2005, De Santo 2016, Fernandez et al. 2005, Fleming and Jones 2012, Gall and Rodwell 2016, Gleason et al. 2012, Lopes et al. 2013, Mascia 2003, Sayce et al. 2013, Syakur et al. 2012, White and Courtney 2002
Marine spatial planning	Calado et al. 2012, Douvere and Ehler 2008, 2009, Ehler and Douvere 2009, Flannery and Ó Cinnéide 2012, Gilliland and Laffoley 2008, Gopnik et al. 2012, Katsanevakis et al. 2011, Leslie and McLeod 2007, Maguire et al. 2011, 2012, Nutters and Pinto da Silva 2012, Pomeroy and Douvere 2008
Offshore renewable energy developments	Haggett 2011, Portman 2007, 2009, Soma and Haggett 2015
Public land planning	Moote et al. 1997
Sustainable development	Fraser et al. 2006, Richardson and Razzaque 2006
Waste management	Hartley and Wood 2005
Water resources management	Benson et al. 2014, De Stefano 2010, Korfmacher 2001, Newig et al. 2005, Videira et al. 2006

2.1.2 Reasons why environmental governance is tied to engagement

As this brief historical overview shows, stakeholder engagement has been an important element of environmental governance from the beginning, with increasing calls for more deliberative participation in recent decades. There are various reasons for this, including the evolving societal and political context, paradigm shifts in democratic theory and practice, the rise of the sustainability agenda as well as the intrinsic characteristics of environmental problems.

The societal and political context

The emphasis on stakeholder engagement in environmental governance is in part the result of the evolving societal and political context since the 1960s. In the late 1960s and 1970s, several factors came together that led to growing public awareness and concern for the environment. A number of environmental catastrophes brought environmental degradation to public attention and raised concern about toxic hazards, for example the Torrey Canyon oil spill off the coast of Cornwall in 1967, the Amoco Cadiz oil spill off the French coast in 1978, several oil spills in the Gulf of Mexico and hazardous waste scandals like the Love Canal⁴ disaster in Niagara Falls (Andrews 2006, Buckingham 2008, McCormick 1995). These events were made highly visible to the broad public through the mass media and in particular through increasing television reporting (Andrews 2006, Buckingham 2008). The expansion of higher education that came with material security and economic prosperity further contributed to increasing

⁴ Love Canal is a canal in Niagara Falls, USA, that was used for the disposal of chemical and toxic waste by a local chemical company in the 1940s and 1950s. In the following years, the land around the canal was developed into a residential neighbourhood, including a school. In the late 1970s, the toxic waste contaminated the ground water and started causing illnesses and miscarriages in the neighbourhood. The Love Canal disaster gained national media attention and led to the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 which set up a Superfund for the clean-up of contaminated sites. (Andrews 2006, McCormick 1995)

political and environmental awareness (Buckingham 2008, Palerm 1999). Finally, a number of influential books such as Rachel Carson's *Silent Spring* (Carson 1962) and *The Limits to Growth* (Meadows et al. 1972) further raised public concern about the environment (Andrews 2006, Buckingham 2008). This growing public concern gave rise to the environmental movement and to the emergence of an increasing number of environmental non-governmental organisations (NGO) (Andrews 2006, Buckingham 2008). NGOs play an important role in the environmental movement. They are a key stakeholder in environmental policy making and management and a strong advocate of more democratic, participatory environmental governance. While a detailed exploration of the role of NGOs in environmental governance goes beyond the scope of this thesis, more information about this topic can be found in Carter (2007) and McCormick (1995).

The environmental movement was part of a larger set of social movements that demanded more democratic governance, social and environmental justice, human rights and environmental protection (Bishop and Davis 2002, Palerm 1999, Wesselink et al. 2011). These movements reflected the declining public trust in government institutions; they questioned the legitimacy of hierarchical government structures and demanded more direct democracy and public participation (Bishop and Davis 2002, Palerm 1999, Wesselink et al. 2011). Many policy developments in the 1970s and 1980s were driven by these social movements, including the establishment of environmental concerns on national and international policy agendas, public rights to access government information and decision making and the growing human rights agenda (Andrews 2006, Beierle and Cayford 2002, Richardson and Razzaque 2006).

Thus, calls for greater stakeholder engagement and participation were driven by increasing environmental awareness, interest and concern, declining public trust in government institutions and social movements that were questioning the legitimacy of existing government structures (Palerm 1999, Reed 2008, Richardson and Razzaque 2006). As Bishop and Davis (2002) put it, “[in] an era of democratic discontent, more and better participation in policy making has become a standard expectation” (Bishop and Davis 2002, p. 14). A number of controversies in the 1990s and 2000s, for example the Bovine Spongiform Encephalopathy (BSE) crisis in the UK, led to further public scepticism and loss of confidence in expert based decision making and a rejection of the “‘experts’ know best” (Bond et al. 2004, p. 621, see also Rowe et al. 2008, Stirling 2006). In this context, stakeholder engagement in environmental governance is in part a response to calls for more transparent, accountable and participatory decision making and an effort to restore policy legitimacy and public trust (Irwin 2006, Mah and Hills 2014, Rowe and Frewer 2004).

Democracy and participation theory

The demands of the social movements for more democratic governance are also supported by contemporary democracy and participation theories. In traditional democratic governance systems, decisions were made by elected representatives and elite experts (Fiorino 1996, Richardson and Razzaque 2006). However as Bloomfield et al. (2001) point out, these representative, elitist democracy models have increasingly been challenged by the complexity of fast evolving modern societies, the diversity of social values and the inherent uncertainty of new threats. To address these challenges, more liberal and increasingly deliberative forms of democracy are necessary

(Richardson and Razzaque 2006). This reflects the views of one of the most prominent and influential philosophers of the late 20th century, Jürgen Habermas, who in his theory of communicative action advocates the normative ideal of deliberation (Bloomfield et al. 2001, Palerm 1999, Renn 2006, Richardson and Razzaque 2006). Fiorino (1996) argues that participation is a fundamental element of democratic environmental governance. Democratic participation leads to more legitimate decisions and better social choices and is essential in environmental contexts where the lay public might have different perceptions of the risks involved in a decision than experts (Fiorino 1996).

The argument about risks is also picked up by Palerm (1999) who points to Ulrich Beck's *Risk Society* (Beck 1992). Palerm (1999) explains that according to Beck, social movements and calls for participatory engagement are "a logical outcome of reflexive modernity" that "has resulted in the creation of global and intangible risks which have led to a demystification of science and technology" (Palerm 1999, p. 231). Fiorino (1990) argues that the technocratic approach that risk decisions are best left to the experts is not compatible with democratic ideals and not legitimate in a context where "people increasingly lack control over social decisions that affect them" (Fiorino 1990, p. 228). Instead, he points to participatory theory according to which "[participation] engenders civic competence by building democratic skills, overcoming feelings of powerlessness and alienation, and contributing to the legitimacy of the political system" (Fiorino 1990, p. 229).

The sustainability agenda

These normative arguments for the empowerment of civil society were also reflected in the international governance context of the 1990s where, with the rise of the sustainability agenda, participatory engagement was seen as a way to strengthen social capital and empower civil society to contribute to good environmental governance (Beierle and Cayford 2002, Richardson and Razzaque 2006). As mentioned above, the 1987 UNWCED report *Our Common Future* and the 1992 Rio UNCED Declaration recognised participatory engagement of those who are potentially affected or interested in the decision making process as an integral principle of sustainable development (UNCED 1992a, UNWCED 1987). The concept of sustainability came up in the late 1980s and 1990s in response to growing global environmental issues and related social problems such as global population growth, food security and poverty (Carter 2007, van den Hove 1999, UNWCED 1987). Sustainable development requires the integration of economic, social and environmental considerations as well as intra and intergenerational needs and interests in development decisions (Carter 2007, Richardson and Razzaque 2006, UNCED 1992a, 1992b, UNWCED 1987). Environmental protection and intra and intergenerational equity are key principles of sustainable development, as is the precautionary principle which requires decisions about the acceptability of risk (Richardson and Razzaque 2006, UNCED 1992a, 1992b). These principles further evidence the integral role of participatory engagement in the context of sustainability (Richardson and Razzaque 2006).

The nature of environmental problems

Last, but perhaps most importantly, Reed (2008) and van den Hove (2000) argue that the intrinsic nature of environmental problems calls for participatory approaches to policy and management decision making. Environmental issues are characterised by complexity, uncertainty, large temporal and spatial scales and often also irreversibility (Reed 2008, van den Hove 2000). Coupled to these physical characteristics are a series of social characteristics of environmental issues: multiple levels of conflict (between different interests and issues, or over problems and solutions); multiple actors from different sectors and aspects of life; scientific uncertainty, limited knowledge and multitude of values; widespread impacts and responsibilities; interactions between local and global levels; differences between short and long term interests; implications of irreversibility (van den Hove 2000). This requires decision making processes and solutions that are adaptive, flexible and innovative, transparent and democratic, and integrate different knowledge, information and values from a diversity of stakeholders (Reed 2008, van den Hove 2000). Reed (2008) and van den Hove (2000) argue that participatory stakeholder engagement can address these requirements and thus ensure effective policy and management solutions to environmental problems.

Several other authors also argue that traditional top down approaches based on technical information and expert knowledge cannot adequately address complex environmental issues (Adams et al. 2011, Appelstrand 2002, Beierle and Cayford 2002, De Marchi and Ravetz 2001, Mah and Hills 2014, Renn 2006, Rowe and Frewer 2000). Dietz and Stern (2008) point out that, while environmental issues do require technological expertise, they also involve complex choices between different political, social cultural and economic interests and values. Moreover, environmental decisions

are often decisions about risks, and these risks might be perceived differently by experts and lay people (Eden 1996, Fiorino 1990, 1996, Mah and Hills 2014, Richardson and Razzaque 2006). Given the uncertainty of environmental issues and gaps in scientific and expert knowledge, decisions about environmental issues and risks often involve value judgements (Richardson and Razzaque 2006, Rowe and Frewer 2000). Therefore, the integration of different values, views and lay knowledge alongside scientific, technical and expert knowledge in decision making is seen as essential to ensure the effectiveness and legitimacy of environmental policies and management (Adams et al. 2011, Dietz and Stern 2008, Mah and Hills 2014, Renn 2006).

2.1.3 Typologies and mechanisms of engagement

As became apparent in the historical overview, there are different types of engagement with different underlying rationales and objectives. In the 1970s and 1980s there was the public information and consultation approach aimed at informing the public about policies, plans or projects and giving them a voice in the decision making processes. This was slowly replaced by a more participatory governance approach in the 1990s and 2000s to strengthen civil society and restore democratic legitimacy. The context and underlying rationales and objectives of engagement determine which type of engagement is most appropriate, who should be engaged and how, and what the criteria for an effective engagement process are.

Typologies of engagement

Three main groups of engagement typologies can be identified in the literature (see also Dalton 2005, Reed 2008, Richardson and Razzaque 2006). The first group of

typologies distinguishes between the different levels of involvement and influence in decision making that stakeholder engagement in governance processes can entail (Figure 2.1). In her 'ladder of participation' Arnstein (1969) describes the different levels of participation as a hierarchy of empowerment, ranging from passive reception of information or consultation to different levels of active participation in and control over decision making. She argues that meaningful participation requires a redistribution of power towards sharing decision making authority or handing over managerial control (Arnstein 1969). The International Association for Public Participation (IAP2) takes a similar approach. The IAP2 spectrum of participation includes a range of engagement forms with different objectives and increasing levels of impact on decisions. The spectrum goes from information and consultation at the lower end to collaboration and empowerment at the high end of public influence (IAP2 2014).

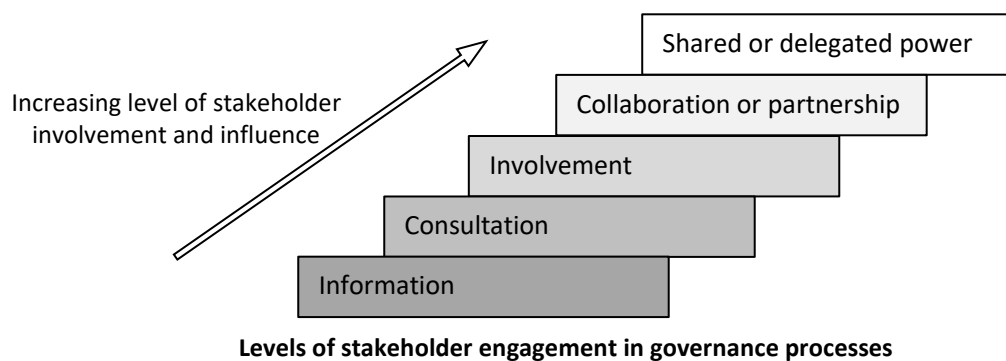


Figure 2.1: Illustration of engagement typologies that distinguish between different levels of stakeholder involvement and influence in governance processes (based on Arnstein 1969 and IAP2 2014)

Other typologies consider the direction of the flow of information between engagement organisers and participants (Figure 2.2). For example, Rowe and Frewer

(2000, 2005) distinguish three types of engagement based on the direction of the information flow:

- 1) Communication: a one way flow of information from the organisers to the participants with no opportunity for feedback;
- 2) Consultation: information is solicited from the participants and flows to the organisers;
- 3) Active participation: the participants are actively involved in a dialogue with the organisers and information is exchanged both ways.

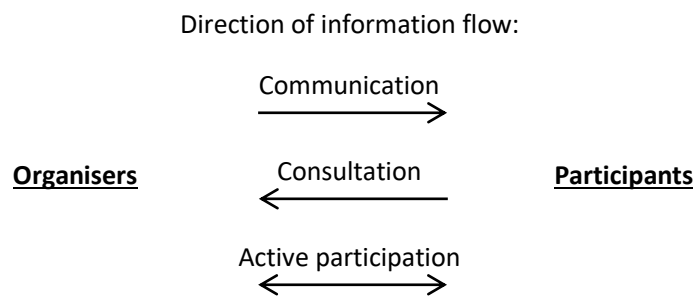


Figure 2.2: Illustration of engagement typologies that consider the direction of the flow of information (arrows) between engagement organisers and participants (based on Rowe and Frewer 2000, 2005)

Finally, a third group of typologies distinguish different approaches based on the objective of engagement. Beierle (1998) identifies six 'social goals' for public participation (see also Beierle and Cayford 2002):

- educating and informing the public,
- incorporating public values into decision making,
- improving the quality of decisions,
- increasing trust in institutions,
- reducing conflict,
- achieving cost effectiveness.

Similarly, O’Faircheallaigh (2010) identifies three purposes of engagement in environmental impact assessments: 1) to obtain input for decision making, 2) to share decision making authority with the public, or 3) to change existing power distributions and decision making structures (O’Faircheallaigh 2010).

Studies of engagement in specific governance contexts tend to combine different typology approaches. For example, De Stefano (2010) identifies three levels of increasing engagement in the context of the EU Water Framework Directive: 1) *information supply* (public access to information), 2) *consultation* (opportunity to react to plans), and 3) *active involvement* (participation in decision making). While this reflects the three types of engagement in Rowe and Frewer’s (2000, 2005) framework, De Stefano (2010) does not refer to information flow; instead his distinction is based on the level of involvement in the decision making process, similar to the first set of typologies (Arnstein 1969, IAP2 2014). Another example is a study on the social acceptability of offshore wind parks in which the authors combine level of involvement and objectives (Soma and Haggett 2015):

- 1) Awareness raising: provision of information to increase public acceptance and legitimacy of decisions;
- 2) Consultation: opportunity for public feedback to ensure socially acceptable policy decisions;
- 3) Empowerment: participation in decision making to increase democracy and social capital.

Finally, in the context of marine spatial planning, Pomeroy and Douvere (2008) present a framework that considers objectives of engagement as well as the direction of information flow. They distinguish between 1) *communication, information and*

consultation, which involve different levels of one directional information flow, and 2) *dialogue, concertation and negotiation*, which involve more active participation and multidirectional information flows and have specific objectives (creating proximity, agreement on objectives and actions, and decision making) (Pomeroy and Douvere 2008).

In line with this, Bishop and Davis (2002) argue that engagement approaches are shaped by the context in which engagement takes place, specifically the policy problem, the available resources and engagement techniques and judgements on the importance of involvement. They distinguish five contemporary types of engagement and related mechanisms (Bishop and Davis 2002):

- 1) Consultation: comment on policy proposals, for example in public meetings, formal consultations or discussion papers;
- 2) Partnerships: for example advisory bodies that contribute to decision making but have no final decision authority;
- 3) Standing: judicial intervention in policy processes for example through administrative reviews;
- 4) Consumer choice; and
- 5) Control over policy through referenda.

Engagement mechanisms and definitions

As Bishop and Davis (2002) and several other authors point out, who should be engaged and how they should be engaged depends on the context and objectives of the engagement (see also IPA2 2014, Rowe and Frewer 2000, Videira et al. 2006).

Using the three types of engagement identified by Rowe and Frewer (2000) (communication, consultation, active participation), Table 2.3 gives an overview of some of the main engagement mechanisms in environmental governance and related objectives and target participants. Further lists and reviews of engagement mechanisms can be found in Beierle and Cayford (2002), Fiorino (1990), De Marchi and Ravetz (2001) and Rowe and Frewer (2000). Pomeroy and Douvère (2008) argue that it can be difficult to decide who should be engaged and present stakeholder analysis as an approach to identify key actors and relevant stakeholders (see also NOAA 2007).

The engagement literature discusses the engagement, participation or involvement of the *public*, *citizens* and *stakeholders*. These terms are often defined differently or used synonymously. For example, some authors talk about engagement or participation of the public or citizens, without further specification (Beierle 1998, Halvorsen 2001, 2003, McCool and Guthrie 2001, Rowe and Frewer 2005, Rowe et al. 2008). Fiorino (1990) and Conrad et al. (2011) refer to the public in their quality as lay people and citizens as “people in their capacities as amateurs” (Fiorino 1990, p. 229), as opposed to experts. Portman (2009) discusses public participation as the involvement of public “stakeholders and interested parties” (Portman 2009, p. 333). Dietz and Stern (2008) distinguish between different types of public, including the general public, observing public, affected public and stakeholders. Reed (2008) focuses on stakeholders “who are affected by or can affect a decision” (Reed 2008, p. 2418), arguing that most conservation engagement efforts target stakeholders rather than the wider public.

Table 2.3: Summary of the most common engagement mechanisms in environmental governance, including engagement objectives, type of participants and type of access (sources: Beierle and Cayford 200, IAP2 2014, Rowe and Frewer 2000)

Engagement objectives	Engagement mechanisms	Type of participants	Access
Communication			
Provision of information	Fact sheets	General public	Open to all
<ul style="list-style-type: none"> to keep participants informed about policies, management processes and decisions to enable understanding of problems, alternative solutions and/or decisions 	Information material	Specific stakeholders (for example interest or user groups)	
	Web sites		
	Open house events		
Consultation			
Gathering of feedback and input	Online consultations	General public	Open to all
<ul style="list-style-type: none"> to acknowledge and integrate participants' concerns and interests in decision making processes to fill information gaps 		Specific stakeholders (for example NGOs, scientific community)	
	Public surveys	General public	Open to all
	Public meetings	General public	Open to all but limited access
		Specific stakeholders	
	Focus groups	Members of the general public	Limited number of targeted participants
		Representatives of stakeholder groups	
Active participation			
Active participation in policy and management decision making processes	Workshops	Members of the general public	Limited number of targeted participants
<ul style="list-style-type: none"> to integrate participants' views, concerns, interests, values and information in decisions to share decision making and/or management authority to empower participants and build social capital 	Advisory committees	Representatives of stakeholder groups	
	Citizens' juries/panels		
	Negotiations and consensus building		

Some authors talk about stakeholders as representatives of the wider public (Beierle 1998), while others also include business interest representatives (Flannery and Ó Cinnéide 2012) and other non-governmental actors (van den Hove 2000). Gopnik et al. (2012) focus on different commercial “ocean users” and scientists (Gopnik et al. 2012, p. 1142) while Ritchie and Ellis (2010) involved government officials, statutory bodies, private interest groups, environmental NGOs, policy advisors and academics in their engagement study. This reflects more general definitions of stakeholders as individuals, groups or organisations that are interested in, involved in or affected by a policy, project, plan or decision (NOAA 2007, Pomeroy and Douvère 2008).

Similarly, as Beierle and Cayford (2002) and others point out, there are several different definitions of engagement and participation in the literature (see also De Stefano 2010, Dietz and Stern 2008). Beierle and Cayford (2002) use public participation as an umbrella term for “any of several “mechanisms” in administrative decisionmaking”, focusing on “organised bureaucratic processes” and using a wide definition of the public (Beierle and Cayford 2002, p. 6). Whereas, other authors often distinguish between public participation, as a democratic notion of citizen involvement, and stakeholder participation, as a wider notion of interest group involvement (Beierle and Cayford 2002). For example, Arnstein (1969) sees citizen participation as “a categorical term for citizen power” (Arnstein 1969, p. 216). Bishop and Davis (2002) understand participation as “the expectation that citizens have a voice in policy choices” (Bishop and Davis 2002, p. 14). Reed (2008) focuses on participation “as a process where individuals, groups and organisations choose to take an active role in making decisions that affect them” (Reed 2008, p. 2418). Conversely, Benson et al. (2014) define participatory governance as “the involvement of state and non-state

actors in policy making” (Benson et al. 2014, p. 213). Similarly, Dietz and Stern (2008) discuss public participation in terms of “organized processes adopted by elected officials, government agencies, or other public- or private-sector organizations to engage the public in environmental assessment, planning, decision making, management, monitoring, and evaluation” (Dietz and Stern 2008, p. 11). Finally, engagement can also be understood in terms of marine citizenship. Marine (or ocean) citizenship is the notion that “all members of society should contribute to the achievement of collective social, political, and environmental goals” (Fletcher and Potts 2007, p. 511) by becoming involved in policy development and in policy implementation, through behaviour and lifestyle choices (McKinley and Fletcher 2010).

Interpretation of stakeholder engagement in this thesis

This thesis focuses on stakeholder engagement in marine management. Marine management is understood as the management of all marine activities, resource uses and interests through marine policies, regulations and management measures, marine spatial planning, marine protected areas (MPA) and other conservation measures. In this context, stakeholders are defined as all those who are involved in, potentially affected by or interested in a marine management process or decision. This includes representatives of user and interest groups, businesses and industries, NGOs and non-profit organisations, public bodies and authorities, as well as individual members of the public. For example, interested or affected members of the public include marine users, which are the focus of Chapter 4. The thesis evaluates two types of stakeholder engagement: 1) active involvement in participatory marine management processes

(Chapter 3), and 2) top down written communication of marine management decisions to marine users (Chapter 4).

2.1.4 Benefits, challenges and effectiveness of engagement

Challenges of participatory engagement

Stakeholder engagement, and in particular participatory approaches, present several challenges for policy makers, managers and governance practitioners. The most frequently discussed challenge is that involving stakeholders in governance and decision making processes is time intensive, costly and requires considerable material and human resources (Fraser et al. 2006, Mah and Hills 2014, Pomeroy and Douvere 2008, Ran 2012, Ricci et al. 2010, Richardson and Razzaque 2006). Another important challenge is the need to ensure representativeness and equal access for all relevant, affected and interested parties (Dietz and Stern 2008, Richardson and Razzaque 2006). Concerns are frequently raised that participatory processes might be captured by existing power structures and dominated or manipulated by more powerful interests, while minority perspectives have little influence (Dietz and Stern 2008, Irvin and Stansbury 2004, Reed 2008). In this context, the accountability and legitimacy of participants and the interests they represent is often questioned (Dietz and Stern 2008). Further, Dietz and Stern (2008) point out that practitioners and experts often question the scientific competence of non-expert stakeholders and their ability to understand complex scientific issues. Related to the nature of modern societies and environmental problems that were discussed in section 2.1.2, reaching a meaningful consensus between the different interests and values in this complex social and political context presents another challenge for participatory decision making (Dietz

and Stern 2008, Mah and Hills 2014). Finally, if participatory engagement is only used to avoid opposition, prevent action, meet legal requirements or seek approval for decisions that have already been taken, or if the outcomes of the engagement process are ignored in the final decision, this holds the danger of causing frustration and distrust among stakeholders and the wider public (Dietz and Stern 2008, Irvin and Stansbury 2004, Mah and Hills 2014, Richardson and Razzaque 2006).

Nonetheless, Appelstrand (2002) and Irvin and Stansbury (2004) argue that the challenges of participatory engagement have to be considered against the benefits that it generates. In particular the cost and time requirements are often offset by the gained increase in democracy, effectiveness and future efficiency of governance (Appelstrand 2002). Moreover, many of the challenges can be addressed by effective design of the participation process (this will be discussed in more detail further on in this section).

Rationales and benefits of participatory engagement

The engagement literature provides normative and pragmatic rationales for participatory stakeholder engagement in environmental governance processes. From a normative perspective, participatory engagement is considered as a human right (Appelstrand 2002, Arnstein 1969, Rowe and Frewer 2000) and an integral part of democratic governance (Dietz and Stern 2008, Fiorino 1990). Stakeholder participation fosters democratic ideals of legitimacy, transparency and accountability (Abelson et al. 2003, Fiorino 1990), equity, justice and fairness (Fiorino 1990, Reed 2008, Rowe and Frewer 2000, Rydin and Pennington 2000, Stirling 2006), social learning, capacity

building and empowerment (Fiorino 1990, Mah and Hills 2014, Ran 2012, Reed 2008, Stirling 2006).

The pragmatic perspective refers to the benefits of stakeholder engagement for the quality of governance processes, decisions and outcomes. Many authors distinguish between substantive and instrumental rationales for engagement (for example Dietz and Stern 2008, Fiorino 1990, Mah and Hills 2014, Ran 2012, Stirling 2006, Wesselink et al. 2011). The main substantive rationale for stakeholder participation in decision making processes is that it improves the information base and quality of decisions (Dietz and Stern 2008, Mah and Hills 2014, Reed 2008, Rowe et al. 2008, Saarikoski et al. 2010, Stirling 2006, Wesselink et al. 2010). Participatory decision making enables the integration of 1) factual expert and lay knowledge, 2) social, economic and environmental considerations, as well as 3) different interests, perspectives and values (Conley and Moote 2003, Dietz and Stern 2008, Ran 2012, Reed 2008, Richardson and Razzaque 2006, Stirling 2006). As discussed in section 2.1.2, this is particularly important in environmental contexts that involve a multitude of values and are often characterised by uncertainty, gaps in scientific knowledge and high risks (Conrad et al. 2011, Dietz and Stern 2008, Fiorino 1990, Richardson and Razzaque 2006, Rowe and Frewer 2000). Stakeholders may hold important local knowledge that can contribute to filling information gaps and support or disprove expert opinions (Korfmacher 2001, O’Faircheallaigh 2010, van den Hove 2000, Rowe et al. 2005, Webler et al. 1995). Moreover, non-experts might see issues and solutions that experts might not have considered (Fiorino 1990, O’Faircheallaigh 2010, Wesselink et al. 2010). Local input also contributes to ensuring that decisions are locally relevant (Fraser et al. 2006). Thus, participatory decision making can potentially lead to better, more informed decisions

and innovative solutions that are better adapted to the specific social and cultural context (Adams et al. 2011, Innes and Booher 2004, O’Faircheallaigh 2010, Reed 2008, Renn 2006).

A second potential substantive benefit of participatory engagement is that it promotes social learning and develops democratic skills (Fiorino 1990, Mah and Hills 2014, Reed 2008, Webler et al. 1995). Mutual exchange and learning improve shared knowledge and understanding of the issues and each other’s interests, values and perspectives (Innes and Booher 2004, Renn 2006, Rowe et al. 2008). Enhanced understanding and democratic capacity foster trust and build social capital (Adams et al. 2011, Innes and Booher 2004, Renn 2006), thus strengthening and empowering civil society to address future challenges (Adams et al. 2011, Fiorino 1990, Mah and Hills 2014, O’Faircheallaigh 2010, Reed 2008, Saarikoski et al. 2010, Stirling 2006, Webler et al. 1995).

The instrumental rationale for stakeholder engagement refers to improved governance processes and institutional capacity (Dietz and Stern 2008, Mah and Hills 2014, Saarikoski et al. 2010). Involving a wide range of relevant, affected and interested stakeholders increases the transparency and legitimacy of decision making processes (Fiorino 1990, Ran 2012, Reed 2008, Richardson and Razaque 2006, Saarikoski et al. 2010, Wesselink et al. 2010). This can 1) enhance public trust and credibility, 2) increase the social acceptance of decisions, 3) reduce conflict and 4) limit potential future opposition by generating a sense of ownership among stakeholders (Adams et al. 2011, Appelstrand 2002, Fiorino 1990, Mah and Hills 2014, Ran 2012, Reed 2008, Rowe and Frewer 2000, Rowe et al. 2008, Saarikoski et al. 2010, Stirling 2006, Wesselink et al. 2010).

In summary, participatory engagement is expected to:

- 1) increase the democratic legitimacy of environmental governance,
- 2) improve the transparency and legitimacy of decision making processes, thus enhancing trust in institutions and social acceptance of decisions, reducing conflict and opposition and generating ownership,
- 3) lead to better informed and more socially acceptable decisions by integrating local knowledge, interests and values,
- 4) and build social and institutional capital to address future challenges.

More legitimate and better informed decision making processes and decisions, and ownership of decisions, are expected to facilitate the implementation of policies, management or regulations (Adams et al. 2011, Korfmacher 2001, Reed 2008, Richardson and Razzaque 2006, Saarikoski et al. 2010). Thus, participatory stakeholder engagement is expected to lead to more democratic and effective governance with better outcomes for society and the environment (Appelstrand 2002, Bloomfield et al. 2001, Fiorino 1990, Irvin and Stansbury 2004, Mah and Hills 2014, Reed 2008, Richardson and Razzaque 2006, Stirling 2006).

Finally, Wesselink et al. (2011) argue that, besides normative, substantial and instrumental rationales, there is a fourth 'legalistic' rationale that stakeholder engagement is a legal or policy requirement. They found that for governance practitioners, legalistic reasons are often the main motivation for engaging stakeholders, besides instrumental objectives of increasing the legitimacy of decisions (Wesselink et al. 2011). Similarly, Innes and Booher (2004) also identify legal requirement as one of five purposes for participation (the other four being:

identification of public preferences, improvement of decisions through local knowledge, advancement of fairness, and justice and legitimacy for public decisions).

While many authors discuss the rationales for participatory stakeholder engagement from a theoretical perspective, there are also studies that have found or present empirical evidence for the expected benefits (Bond et al. 2004, Dietz and Stern 2008, Reed 2008). For example, stakeholder and public participation are important elements in many MPA success stories. Participation of the public, local communities and stakeholders played a central role in California's MPA planning process as part of the California Marine Life Protection Act Initiative (Gleason et al. 2010, Sayce et al. 2013). Sayce et al. (2013) report that collaborative and inclusive participation helped involve a wide range of stakeholders and increase interactions between the public and policy makers; it improved mutual understanding and relationships and generated new ideas and solutions; and it ensured that the interests of local communities were considered in the in the MPA planning and decision making (Sayce et al. 2013). Experiences from MPAs and integrated marine management initiatives in Canada showed that stakeholder engagement led to greater social capital, a more extensive collective knowledge base and improved leadership capacity (Gu nette and Alder 2007). In Indonesia, stakeholder participation in locally managed MPA programmes generated a strong sense of ownership among local stakeholders, which ensured sustainable and equitable MPA management and reduced the risk of future conflict (Syakur et al. 2012). Other examples, in which stakeholder engagement was found to generate important benefits for MPA planning and management, are the Florida Keys National Marine Sanctuary (Mascia 2003, Suman et al. 1999) and the Great Barrier Reef in Australia (Fernandes et al. 2005).

Definition of effectiveness and evaluation criteria

Several authors highlight that the success and effectiveness of participatory stakeholder engagement depends to a large extent on the design and quality of the engagement process (Adams et al. 2011, De Stefano 2010, Dietz and Stern 2008, Reed 2008, Saarikoski et al. 2010). In the absence of universally agreed best practice guidelines and evaluation criteria for effective engagement, a large number of process design principles and evaluation frameworks have been developed. Table 2.4 presents some of the main best practice and evaluation criteria frameworks that were identified in this review of the marine and environmental engagement literature (a full summary of all identified frameworks can be found in Appendix 1). These frameworks are based on theoretical considerations and empirical studies; some frameworks are also designed for specific contexts (for example De Santo 2010).

As discussed above, there are several objectives and expected outcomes for participatory stakeholder engagement. Consequently, there are also different ideas on what constitutes successful engagement. For this reason, defining effectiveness is the first step in Rowe and Frewer's (2004) engagement evaluation agenda. In fact, many of the evaluation frameworks presented in Table 2.4 are based on goals and objectives and several include process as well as outcome criteria (see also Chess 2000). Reviews of some of the different frameworks can be found in Rowe and Frewer (2004), Conley and Moote (2003) and Conrad et al. (2011). Many of the frameworks have been applied and validated in empirical studies (for example Bond et al. 2004, De Stefano 2010, Mah and Hills 2014, McDonald and Rigling-Gallagher 2015, Rowe and Frewer 2005, 2008, Saarikoski et al. 2010).

Table 2.4: A selection of the main best practice and evaluation criteria frameworks identified in a review of the marine and environmental engagement literature, including whether the frameworks are based on theory, empirical evidence, context or other information sources (in chronological order of publication; in the framework headings, (o) indicates original wording and (a) indicates author’s adaptation; see Appendix 1 for a full list of all identified frameworks)

Authors	Best practice and evaluation criteria frameworks	Based on
Fiorino 1990	<p>Democratic process criteria for evaluating institutional mechanisms as democratic processes (o)</p> <ol style="list-style-type: none"> 1) Allow for the direct participation of amateurs in decisions 2) Enable citizens to share in collective decision making [shared authority] 3) Provide a structure for face to face discussion over some period of time 4) Offer citizens the opportunity to participate on some basis of equality with administrative officials and technical experts 	Democratic and participation theory
Rowe and Frewer 2000	<p>Framework for evaluation of public participation methods (normative model) (o)</p> <p>Acceptance Criteria:</p> <ul style="list-style-type: none"> • Representativeness: the public participants should comprise a broadly representative sample of the population of the affected public • Independence: the participation process should be conducted in an independent, unbiased way • Early involvement: the public should be involved as early as possible in the process as soon as value judgments become salient • Influence: the output of the procedure should have a genuine impact on policy • Transparency: the process should be transparent so that the public can see what is going on and how decisions are being made <p>Process Criteria:</p> <ul style="list-style-type: none"> • Resource accessibility: public participants should have access to the appropriate resources to enable them to successfully fulfil their brief • Task definition: the nature and scope of the participation task should be clearly defined • Structured decision making: the participation exercise should use/provide appropriate mechanisms for structuring and displaying the decision-making process • Cost effectiveness: the procedure should in some sense be cost-effective 	Theory

Table 2.4 continued

Dalton 2005	Framework for involving the public in planning of US MPAs (o)					Theory and empirical evidence
	<p>1. Active participant involvement</p> <ul style="list-style-type: none"> • Opportunity for input • Early involvement • Motivated participants • Influence over the final decision 	<p>2. Decisions based on complete information</p> <ul style="list-style-type: none"> • Best available information exchange • Constructive dialogue • Adequate analysis 	<p>3. Fair decision making</p> <ul style="list-style-type: none"> • Transparency • Representative participation 	<p>4. Efficient administration</p> <ul style="list-style-type: none"> • Cost effective • Accessible • Limited influence of sponsoring agency 	<p>5. Positive participant interactions</p> <ul style="list-style-type: none"> • Positive social conditions • Constructive personal behaviour • Social learning 	
Reed 2008	Best practice stakeholder participation (o)					Theory and empirical evidence
	<ol style="list-style-type: none"> 1) Stakeholder participation needs to be underpinned by a philosophy that emphasises empowerment, equity, trust and learning 2) Where relevant, stakeholder participation should be considered as early as possible and throughout the process 3) Relevant stakeholders need to be analysed and represented systematically 4) Clear objectives for the participatory process need to be agreed among stakeholders at the outset 5) Methods should be selected and tailored to the decision-making context, considering the objectives, type of participants and appropriate level of engagement 6) Highly skilled facilitation is essential 7) Local and scientific knowledges should be integrated 8) Participation needs to be institutionalised 					

While success and effectiveness are framed differently by different authors, some key criteria and principles for 'good engagement' can be identified that are repeated in most frameworks. These include:

- 1) Early and continuous engagement: Engagement should start early, ideally at the problem scoping stage, and continue throughout the development (of policies, plans, management measures, problem solutions, etc.), decision making, implementation of decisions and evaluation of outcomes.
- 2) Representativeness and inclusiveness: All relevant, affected and interested stakeholders should be actively invited and given the opportunity to participate to ensure that all interests related to an issue are represented and included.
- 3) Dialogue and discussion: The engagement process should be interactive and enable dialogue and discussion to foster mutual learning and exchange.
- 4) Resources and capacity building: Stakeholders should have access to and be provided with relevant and adequate information, material resources, sufficient time and necessary skills to participate and make informed decisions.
- 5) Clear objectives and roles: The engagement process should be transparent and have clearly defined and mutually agreed objectives and roles from the start to avoid false expectations.
- 6) Trust and respect: The engagement process should generate an atmosphere of trust and respect among all participants and foster good relations between stakeholders.
- 7) Integration of different knowledge and values: The knowledge, values, interests and concerns of all stakeholders should be considered and integrated in the process.
- 8) Real influence on decisions and outcomes: Stakeholders should have real opportunities to contribute to the decision making, and the outcomes of the participatory process should be implemented or have a real impact.

In particular the importance of early and continuous engagement has been highlighted in several empirical studies (for example Gopnik et al. 2012, Maguire et al. 2012, Samhoury et al. 2014, Sayce et al. 2013, Soma and Haggett 2015). Further, Sayce et al. (2013) found that the public participation experience in California's MPA planning process also confirmed the relevance of enabling stakeholders to influence both process and outcomes. Dietz and Stern (2008) emphasise that, to ensure effectiveness, "[stakeholder engagement] should be recognized by government agencies and other organizers of the processes as a requisite of effective action, not merely a formal procedural requirement" (Dietz and Stern 2008, p. 226). Another example of the importance of real influence and the dangers of tokenistic engagement is the UK's marine conservation zone process. As described in section 2.1.1, the MCZ site selection process was conducted through four stakeholder led regional projects. The projects ran between 2009 and 2011 and came up with 127 proposed MCZs that were agreed by the local stakeholders in the four regions. However, claiming budgetary constraints and a lack of scientific evidence, the UK Government initially only designated 27 MCZs in 2013 and 17 more in 2016. While at first, the MCZ projects were celebrated as an example of good stakeholder engagement, the failure of the UK Government to implement the stakeholders' recommendations and designate all 127 proposed sites quickly led to frustration and disillusionment among the stakeholders (De Santo 2010).

Finally, while these normative criteria serve as best practice guidance for participatory engagement processes, many authors point out that the context, in which engagement takes place, is also important in determining the success of engagement (Bond et al. 2004, Chess and Purcell 1999, Saarikoski et al. 2010). Therefore, contextual factors need to be considered in the process design (De Marchi and Ravetz 2001, Dietz and

Stern 2008, Sayce et al. 2013). These contextual factors can include the nature and history of the issue, the political culture and democratic capacity of society, as well as the attitudes, experience, skills and resources of the organisers and participants (Bond et al. 2004, Chess and Purcell 1999, Dietz and Stern 2008).

2.1.5 Engagement in the marine context

The role of stakeholder engagement in ecosystem based marine management

As the examples of stakeholder engagement benefits in practice given in the previous section illustrate, involving stakeholders, local communities and the public plays a central role in successful planning, implementation and management of MPAs (Guénette and Alder 2007, Fernandes et al. 2005, Sayce et al. 2013, Syakur et al. 2012, White and Courtney 2002). Gall and Rodwell (2016) found that the social acceptability of MPAs, once they are put in place, also depends, among other factors, on ongoing and effective stakeholder engagement in the planning, implementation and management.

Besides MPAs, public and stakeholder engagement has been identified as an important element in integrated coastal zone management (Areizaga et al. 2012, Edwards et al. 1997), shoreline and coastal resource management (NOAA 2007, O’Riordan and Ward 1997), planning and environmental impact assessments of offshore renewable energy development (Haggett 2011, Portman 2009), dredged material management (Collier et al. 2014), marine mammal take regulation (McDonald and Rigling-Gallagher 2015), and marine conservation (Lundquist and Granek 2005). For example, Soma and Haggett

(2015) point out that failure to communicate with local communities and consider local interests in offshore wind energy developments is likely to lead to opposition.

Finally, participatory stakeholder engagement is a key principle of marine spatial planning (MSP). Pomeroy and Douvère (2008) argue that

“[management] of the marine environment is a matter of societal choice. It involves decision making in terms of allocating parts of three-dimensional marine spaces to specific uses to achieve stated ecological, economic and social objectives. People are central to this decision-making process [...]. As such, stakeholder participation and involvement is integral to the success of MSP.” (Pomeroy and Douvère 2008, p. 816)

Several other authors also note the importance of stakeholder engagement, in particular of deliberative, participatory approaches, for successful marine spatial planning (Douvère and Ehler 2009, Gilliland and Laffoley 2008, Katsanevakis et al. 2011, Maguire et al. 2012, Ritchie and Ellis 2010)⁵. The marine spatial planning guide of the UN Educational, Scientific and Cultural Organization (UNESCO) and the Intergovernmental Oceanographic Commission (IOC) includes stakeholder participation in almost all steps of the planning process (Ehler and Douvère 2009). In the USA, coastal and marine spatial planning is one of nine priorities of President Obama’s National Ocean Policy and participatory stakeholder involvement is seen to be “at the heart of effective marine spatial planning” (Nutters and Pinto da Silva 2012, p. 2012, see also US Institute for Environmental Conflict Resolution 2011). Gopnik et al. (2012) found this to reflect the views of US ocean stakeholders who thought that stakeholder engagement, which brings different stakeholders together early and often to “learn, talk and listen to [each other]” in a meaningful and transparent process, plays a key role in marine spatial planning (Gopnik et al. 2012, p. 1139). Early

⁵ See Calado et al. (2012) for a study on the role of NGOs in marine spatial planning.

prominent examples of participatory marine spatial planning in the USA are the Massachusetts Ocean Management Plan and the Rhode Island Ocean Special Area Management Plan (Nutters and Pinto da Silva 2012). Another example often cited in the marine spatial planning literature is the Channel Islands National Marine Sanctuary (CINMS) (Douvere 2008, Flannery and Ó Cinnéide 2012). In 1998, a sanctuary advisory council was set up to involve local stakeholders in the review of the CINMS management plan and in the management of the sanctuary (Flannery and Ó Cinnéide 2012). The engagement through the advisory committee fostered mutual understanding and trust among the stakeholders and generated new relationships; it facilitated social learning, leading some stakeholders to change their practices and attitudes towards the CINMS; and finally, it enabled the stakeholders to gain a better understanding of the marine socioecological system and the role they play within this system (Flannery and Ó Cinnéide 2012).

In the EU, marine spatial planning was legally established in 2014 with the Maritime Spatial Planning Directive, which in Article 9 includes requirements to “[inform] all interested parties and [consult] the relevant stakeholders and authorities, and the public concerned” (EU 2014b, p. 142). Some EU Member States had already started using marine planning before the EU directive, for example Belgium (Douvere et al. 2007), Germany (Douvere and Ehler 2009) and the UK. In the UK, marine planning was introduced by the 2009 Marine and Coastal Access Act, which includes provisions for public participation (UK 2009). As discussed in section 2.1.1., stakeholder engagement plays a central role in the UK’s marine planning process.

Marine protected areas, integrated coastal zone management and, in particular, marine spatial planning were introduced in response to the recognition that an

ecosystem based approach to marine management was necessary to halt the rapid decline of marine ecosystems and biodiversity (Curtin and Prellezo 2010, Dalton 2005, Douvère and Ehler 2009, Katsanevakis et al. 2011, Leslie and McLeod 2007, Ritchie and Ellis 2010). Ecosystem based management requires taking a more holistic, comprehensive view and integrating ecological, economic and social considerations in management decisions. As Flannery and Ó Cinnéide (2012) point out, ecosystem based management is about recognising the connections and interactions between the different elements of these ecological and socioeconomic systems. Given the central role that human activities and socioeconomic interests play in this, participatory stakeholder engagement is a key principle of ecosystem based management (Curtin and Prellezo 2010, Flannery and Ó Cinnéide 2012, Pomeroy and Douvère 2008, Ritchie and Ellis 2010, UNEP 2011). As Dalton (2005) says,

“[if] MPAs are to be used as an ecosystem-based management tool, both natural systems and the human systems that interact with them must be considered. To effectively manage human activities in the ocean [...] we need to engage in dialog that crosses disciplinary boundaries.” (Dalton 2005, p. 1400)

The marine problem

As discussed in section 2.1.2, stakeholder engagement is seen as a necessary prerequisite for environmentally and socially sound environmental policies and management because of the intrinsic nature of environmental problems: complexity, uncertainty, limited knowledge and multiple interest and values (Reed 2008, van den Hove 2000). This is particularly true for the oceans and seas, where the complexity is increased by the three dimensionality of the marine environment, the connectivity of marine ecosystems, the lack of physical boundaries and the mobility of marine species

(Jones 2002, Mason et al. 2015, Portman 2007). Rough seas and the remoteness, pressure and light conditions of the marine environment make many marine habitats and species difficult or impossible to access and study, presenting major challenges for marine research; as a result of which scientific knowledge of the marine environment is still very limited, in particular in the deep sea (Fleming and Jones 2012, Jones 2002, UN 2016).

At the same time, the marine environment plays an important role in many national and local economies, societies and cultures around the world. Coastal communities often build their economies around marine activities (Flannery and Ó Cinnéide 2008, Natale et al. 2013, Surís-Regueiro and Santiago 2014), depend on the marine environment for subsistence (Sowman 2006) or define their cultural identity through their relationship with the sea, for example as seaside towns or fishing communities (Reed et al. 2013, Urquhart and Acott 2013). On a national scale, marine economies are rapidly growing, with policies like the EU Blue Growth Strategy driving the expansion of traditional uses, such as fisheries, oil exploitation and shipping, and new activities, for example renewable energy developments, marine aquaculture and deep sea mining (EU 2012a, Ritchie and Ellis 2010, Soma and Haggett 2015). On top of this come an increasing number of marine recreational activities and recreational users. Thus, in addition to the physical complexity and scientific uncertainty, there is a multitude of different interests and values attached to the marine environment (Fleming and Jones, 2012, Mason et al. 2015, Rees et al. 2010).

Finally, the lack of physical boundaries, different dimensions of space and time, diversity of interests and public nature of the marine environment create particular challenges for jurisdiction and management (Edwards et al. 1997, Jones 2002, Soma

and Haggett 2015, Sutherland and Nichols 2006). The historically sectoral approach to marine management has resulted in fragmented systems with multiple, sometimes overlapping jurisdictions and management authorities (Curtin and Prellezo 2010, Fleming and Jones 2012, Maguire et al. 2012, Mason et al. 2015, Ritchie and Ellis 2010, Sutherland and Nichols 2006). With increasing competition for space and resources, this fragmented, sectoral management approach has led to growing conflicts between different user groups and between resource use and conservation interests (Douvere and Ehler 2009, Fleming and Jones 2012, Jones 2002, Maguire et al. 2012, Mason et al. 2015, Ritchie and Ellis 2010). Moreover, large parts of the oceans lie beyond the jurisdiction of national states. These areas are governed by an array of international treaties, regional conventions and sector specific agreements (Ardron et al. 2014). However, the lack of clear, universally recognised authorities and the remoteness of the high seas make it difficult to implement and enforce effective management and regulation, in particular as different national and sectoral stakeholders pursue different interests (Ardron et al. 2014, Englender et al. 2014, Merrie et al. 2014).

In this context of ecological, scientific, economic, social, cultural and governance complexity, uncertainty and diversity, participatory stakeholder engagement is expected to bring the same benefits as those described in the context of environmental governance (see section 2.1.4). These include (Dalton 2005, De Santo 2016, Mason et al. 2015, NOAA 2007, Ritchie and Ellis 2010):

- improved, better informed decisions and innovative solutions,
- more socially acceptable decisions and public support,
- reduced conflict and future opposition,

- enhanced ownership and stewardship,
- increased trust and democratic legitimacy,
- and, as a result, facilitated implementation, better compliance and improved marine management outcomes, for example more effective resource management and MPAs.

At the same time, the nature of the marine problem also poses specific challenges for marine stakeholder engagement:

- 1) The vast spatial dimensions and lack of clear boundaries, the multiple international, national and local jurisdictions and fragmented management authorities, the public nature of the oceans, and the vast diversity of old and new marine uses, interests and values attached to the marine environment make it **difficult to identify all relevant, potentially affected and interested stakeholders** (Jones 2002, Maguire et al. 2012, Ritchie and Ellis 2010, Sutherland and Nichols 2006).
- 2) As a result of the historically sectoral approach to marine management, there is no tradition of collaboration between sectors and **relationships between different stakeholder groups are often conflictual** (Douvere and Ehler 2009, Maguire et al. 2012, Mason et al. 2015, Ritchie and Ellis 2010).
- 3) Moreover, Mason et al. (2015) argue that **strong social identity effects and stereotypical views** of other sectors further inhibit cooperation between different marine stakeholders. Social identity theory states that a person's perceptions and behaviour are influenced by the social identity, values, beliefs and stereotypical views of the groups that they are part of (Mason et al. 2015). This social identity effect is particularly strong in conditions of uncertainty and competition for limited

resources, such as the marine context (Mason et al. 2015). Social identity effects and stereotypes can hinder marine stakeholder engagement; in particular as, due to the sectoral management, most stakeholders have a narrow focus on their own interests rather than pursuing more strategic objectives (Mason et al. 2015). For example, Fleming and Jones (2012) and Gleason et al. (2010) discuss that in the context of MPAs, stakeholders, and in particular fishermen, often have strong opinions for or against designations as well as stereotypical views of the intentions of governments and the public.

- 4) Due to the inherent complexity of marine ecological and socioeconomic systems, marine issues are **difficult to understand**. In addition, most non-experts have **limited knowledge about the marine environment** and **limited understanding of the interactions and dependencies between human activities and marine ecosystems** (Jefferson et al. 2014, Jones 2002, Rose et al. 2008, Steel et al. 2005).
- 5) From a practical perspective, it is difficult to gather all relevant stakeholders around one table, as they are often scattered along long stretches of coast or might not be based locally. In addition, especially issues related to offshore areas or the high seas often involve international stakeholders (Ritchie and Ellis 2010).

Given the urgent need for more effective and efficient ecosystem based marine management, and the central role of stakeholder engagement in this, it is important to find tools that can address these challenges and make marine stakeholder engagement more effective. One approach that has potential for this is the ecosystem services approach.

2.2 The ecosystem services approach

The concept of ecosystem services draws an explicit link between ecosystems and human wellbeing (MEA 2005). Ecosystems are dynamic communities of living organisms (plants and animals), their non-living habitats, and the interactions between the different living and non-living components (MEA 2005). The ecosystem services concept highlights the essential role of ecosystems as life support systems. It also illustrates the many ways in which society depends on and benefits from ecosystems for its economic, social and cultural wellbeing (MEA 2005).

Since its origins in the 1970s, the ecosystem services concept has evolved into a complex, interdisciplinary, multifaceted approach that has found its way from the realms of science and academia onto the agendas of governments, NGOs and non-profit organisations, as well as private and financial sectors (Gómez-Baggethun et al. 2010, Liu et al. 2010). The result is a multitude of definitions and classification systems, differing perspectives from various scientific disciplines, ethical controversies and conceptual debates about value and valuation, numerous assessment and valuation frameworks, methodologies and studies, as well as theoretical discussions and empirical case studies on practical application and influence in different environmental governance contexts. While an in depth analysis of this complex and multifaceted approach lies beyond the scope of this thesis, the following sections will give an overview of the different aspects of the ecosystem services approach.

2.2.1 A historical perspective on the ecosystem services approach

Ecological and economic origins in the 1970s and 1980s

In the 1970s, ecologists called attention to growing concerns about the consequences of species extinctions and ecosystem degradation. They began framing ecological functions in economic terms of ‘services’ to highlight the importance of biodiversity and functioning ecosystems to society, and to raise public and political support for conservation (Braat and de Groot 2012, Danley and Widmark 2016, Ehrlich and Mooney 1983, Gómez-Baggethun et al. 2010). As Gómez-Baggethun et al. (2010) point out, ecosystem services started as a pedagogic concept used by ecologists “to demonstrate how the disappearance of biodiversity directly affects ecosystem functions that underpin critical services for human well-being” (Gómez-Baggethun et al. 2010, p. 1213).

In parallel to the adoption of economic framing by ecologists, the environment began to regain recognition in economic theory. The classic economists of the 18th and 19th century, like Adam Smith, David Ricardo, Thomas Robert Malthus and Karl Marx, did recognise the important contribution of natural resources to the production of wealth (Braat and de Groot 2012, Gómez-Baggethun et al. 2010, Mannsfeld and Grunewald 2015). However, in the wake of the industrial revolution and rapidly growing technological development, neoclassical economists lost touch with nature, focusing increasingly on monetary exchange values and the idea of substitutability (Braat and de Groot 2012, Gómez-Baggethun et al. 2010). As Gómez-Baggethun et al. (2010) illustrate, the idea that natural resources could be substituted by other forms of capital led neoclassical economists to believe that “[the] world can, in effect, get along

without natural resources” (Solow 1974, p. 11, cited from Gómez-Baggethun et al. 2010, p. 1212). In this context, the environmental movement of the 1960s and 1970s led to the development of environmental (and resource) economics. Environmental economists argue that because most resources and services provided by nature are public, open access and not traded on markets, their value is not included in economic calculations and, consequently, undervalued or not considered in decision making (Daily 1997, Gómez-Baggethun et al. 2010). To address this issue and internalise environmental costs and benefits in economic decision making, a range of valuation methods have been developed since the 1960s to value ecosystem services in monetary terms (Gómez-Baggethun et al. 2010, Schweppe-Kraft and Grunewald 2015). Moreover, the concept of total economic value was framed to capture the different use and non-use values of the environment (de Groot et al. 2010, Gómez-Baggethun et al. 2010, Schweppe-Kraft and Grunewald 2015).

In the United States, environmental cost-benefit analysis was quickly adopted by the Government in response to societal demands for better consideration of environmental concerns in decision making. Requirements for cost-benefit analysis were included in major environmental legislations and in 1981 a presidential executive order required cost-benefit analyses of all new major regulations (Börger et al. 2014, Liu et al. 2010). Moreover, monetary valuation of ecosystem services (in particular contingent valuation methods which will be explained further on in this chapter) played a central role in the court cases following the Exxon Valdez oil spill in the Prince William Sound, Alaska, in 1989. This led contingent valuation of ecosystem services to become a recognised method for environmental damage assessment in the United States (Börger et al. 2014, Liu et al. 2010).

In the late 1980s, a group of environmental economists split from the main theory and started developing the theory of ecological economics (Gómez-Baggethun et al. 2010, Daly and Farley 2011). As Gómez-Baggethun et al. (2010) point out, environmental and resource economics and ecological economics are similar in some respects but differ significantly in the underlying qualitative frameworks. Environmental and resource economics recognises the economic contribution of ecosystems but continues to operate within the neoclassical paradigms of economic growth and efficient allocation. Ecological economics understands the economy as an open subsystem of the ecosphere which supports a limited flow of energy, resources and waste and therefore requires a steady-state economy (Daly and Farley 2011). Thus, ecological economics questions the neoclassical paradigm of economic growth and instead advocates a steady-state economy based on sustainable scale of production, just distribution of access to resources and efficient allocation of resources (Daly and Farley 2011). Ecological economists also criticise the monetary valuation and cost-benefit approach of environmental economics, arguing that biophysical and social values of ecosystems cannot be adequately translated into monetary terms and require alternative non-monetary valuation languages (Gómez-Baggethun et al. 2010, Martinez-Alier et al. 1998). Instead of monetary valuation of ecosystem services, they propose deliberative and multi-criteria based decision making tools (Gómez-Baggethun et al. 2010, Martinez-Alier et al. 1998).

Transdisciplinary mainstreaming and appearance on the policy agenda in the 1990s and 2000s

In the 1990s, ecosystem services research grew rapidly and became increasingly transdisciplinary (Braat and de Groot 2012, de Groot et al. 2002, Gómez-Baggethun et al. 2010, Liu et al. 2010). The focus of much of this research was on economic valuation (Braat and de Groot 2012, for example Costanza et al. 1998, Pearce 1993, Pimentel et al. 1997). In 1997, two publications came out that are often referred to as milestones of the ecosystem services approach (Braat and the Groot 2012, Gómez-Baggethun et al. 2010, Liu et al. 2010). One was Gretchen Daily's book *Nature's services: societal dependence on natural ecosystems* (Daily 1997), and the second was Costanza et al.'s (1997) paper in the journal *Nature* in which they presented an estimate valuation of the economic value of global ecosystem services. In particular Costanza et al.'s (1997) paper raised considerable attention both in the scientific and the policy world (Gómez-Baggethun et al. 2010). By the early 2000s, ecosystem services research began to develop different ecosystem service definitions and classifications (de Groot et al. 2002) and to address the issue of different value concepts (Chee 2004, Clark et al. 2000, Daily et al. 2000, Farber et al. 2002, Turner et al. 2003).

One outcome of the increasing research on monetary valuation of ecosystem services was the introduction of market based instruments to regulate greenhouse gas emissions and promote conservation (Gómez-Baggethun et al. 2010, Sattler and Matzdorf 2013). These mechanisms included markets for ecosystem services, such as the carbon emission trading schemes in the EU and various US states (Gómez-Baggethun et al. 2010, Sattler and Matzdorf 2013), and payment for ecosystem services (PES) schemes, which have been set up in many Latin American countries

(Grima et al. 2016, Gómez-Baggethun et al. 2010, Guerry et al. 2015, Sattler and Matzdorf 2013). Emissions trading has been adopted as one of three mechanisms to support the implementation of the 1997 UN Framework Convention on Climate Change, the Kyoto Protocol (UNFCCC 1998).

Another UN agreement that played a significant role in introducing the ecosystem services concept to the international policy agenda, by establishing it as a key principle of the ecosystem approach, was the 1992 UN Convention on Biological Diversity (CBD) (Atkins et al. 2011, Crowe et al. 2015a, Gómez-Baggethun and Pérez 2011). In 1995, the Conference of the Parties to the CBD adopted the ecosystem approach as the primary framework for action under the convention (CBD 1995). Under the CBD, the ecosystem approach is defined as:

“a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way” (CBD 2000, p. 103-104).

Principle 5 of the 12 subsequently developed Malawi Principles to guide the implementation of the ecosystem approach states that:

“[conservation] of ecosystem structure and functioning, in order to maintain ecosystem services, should be a priority target of the ecosystem approach” (CBD 2000, p. 106).

While the concept of ecosystem services had been closely tied to biodiversity conservation from the beginning, with the establishment of the ecosystem approach as framework for sustainable resource management the scope of the ecosystem services approach also broadened. In 2005, the UN published the report of the Millennium Ecosystem Assessment (MEA) that had been launched four years earlier

and led by the UN Environment Programme (UNEP) (MEA 2005). The Millennium Ecosystem Assessment drew an explicit link between ecosystems and human wellbeing, with a particular focus on ecosystem services. The objective was to assess the consequences of changes in ecosystems, and thus in the provision of ecosystem services, for human wellbeing (MEA 2005). The synthesis report of the Millennium Ecosystem Assessment opens with a clear statement:

“Everyone in the world depends completely on Earth’s ecosystems and the services they provide, such as food, water, disease management, climate regulation, spiritual fulfilment, and aesthetic enjoyment. Over the past 50 years, humans have changed these ecosystems more rapidly and extensively than in any comparable period of time in human history [...]. This transformation of the planet has contributed to substantial net gains in human well-being and economic development. [...] [The] full costs associated with these gains are only now becoming apparent.” (MEA 2005, p. 1)

The Millennium Ecosystem Assessment is widely recognised as the key milestone that firmly established ecosystem services on the international policy agenda (Balmford et al. 2008, Barnes-Mauthe et al. 2015, Daily et al. 2009, Danley and Widmark 2016, de Groot et al. 2010, Gómez-Baggethun et al. 2010, Grunewald and Bastian 2015, Liu et al. 2010, Tallis et al. 2008).

In the wake of the Millennium Ecosystem Assessment, the ecosystem services approach has been used to frame some of the major global environmental problems in economic terms (Braat and de Groot 2012, Gómez-Baggethun et al. 2010). In the UK, the Government responded to the MEA by launching the UK National Ecosystem Assessment (UK NEA) in 2009, the first comprehensive assessment of the contribution of the environment to societal wellbeing and economic prosperity in the UK (Austen et al. 2015, Jax et al. 2013, UK NEA 2011). Another prominent example from the UK that

gained considerable international attention was the Stern Review which highlighted the economic implications of climate change (Stern 2006). In 2007, the German Federal Ministry for the Environment and the EU Commission set up The Economics of Ecosystems and Biodiversity (TEEB) initiative. The objectives of the TEEB initiative were to assess the global economic benefit of biodiversity and the cost of biodiversity loss, and to provide a framework for integrating biodiversity and ecosystem service values into decision making (Balmford et al. 2008, TEEB 2010).

The MEA also fuelled the scientific debate about ecosystem service definitions and classification systems (Balmford et al. 2008, Beaumont et al. 2007, Boyd and Banzhaf 2007, Costanza 2008, Fisher and Turner 2008, Fisher et al. 2009, Wallace 2007, 2008), and about different value concepts and ethical concerns regarding monetary valuation (Armsworth et al. 2007, Kumar and Kumar 2008, Gómez-Baggethun et al. 2010, Gómez-Baggethun and Pérez 2011, Kosoy and Corbera 2010, McCauley 2006). Further, a growing body of research started addressing the issue of translating ecosystem services theory into policy and management practice, for example by developing operational valuation and assessment frameworks (Cowling et al. 2008, Daily and Matson 2008, Daily et al. 2009, Farber et al. 2006, Goldman et al. 2008, Granek et al. 2009, Hein et al. 2006, Tallis et al. 2008).

Multidisciplinary perspectives and implementation in environmental governance in the 2010s

Questions about ecosystem services definitions, classifications and, in particular, about ethical controversies and the limitations of the ecosystem services concept remain unresolved (Danley and Widmark 2016, de Groot et al. 2010, Jax et al. 2013, Kallis et al.

2013, Klain et al. 2014, Luck et al. 2012, Martín-López et al. 2014, Meinard et al. 2016, Nahlik et al. 2012, Norgaard 2010, Peterson et al. 2010, Schröter et al. 2014, Stapleton et al. 2014). However, in recent years, the attention of ecosystem services research has shifted to the practical application of the approach in environmental policy, management and planning generally (Chan et al. 2012a, Martinez-Harms et al. 2015, Nahlik et al. 2012), or in specific environmental governance contexts, for example landscape planning (de Groot et al. 2010, Koschke et al. 2012, Opdam et al. 2015), forest management (Saarikoski et al. 2015), or marine management, planning and conservation (see Table 2.5 for a summary of marine studies). A number of studies explored the uptake and influence of the ecosystem services approach or monetary valuation studies in policy and management (Guerry et al. 2015, Hansen et al. 2015, Ruckelshaus et al. 2015, Verburg et al. 2016). Considerable research attention was also directed towards the conceptualisation, assessment and valuation of cultural and social ecosystem services (Chan et al. 2012a, 2012b, Daniel et al. 2012, Iniesta-Arandia et al. 2014, Langemeyer et al. 2015, La Rosa et al. 2016, Plieninger et al. 2013, Scholte et al. 2015, Tratalos et al. 2016, Winthrop 2014, Zoderer et al. 2016a, see Table 2.5 for marine studies).

Table 2.5: Summary of selected marine ecosystem service studies from 2010 to 2016 (in chronological order of publication and alphabetical order per year)

References	Brief description of study
Gee and Burkhard 2010*	A cultural ecosystem service valuation study in the context of offshore wind farming on the German North Sea coast
Atkins et al. 2011	Development of a conceptual systems approach integrating ecosystem services, societal benefits and the Drivers-Pressures-State-Impact-Response (DPSIR) framework and application in UK marine management case studies
Luisetti et al. 2011	Review of the usefulness of monetary ecosystem service valuation as part of decision support systems for integrated coastal zone management in the context of a UK managed realignment case study

Table 2.5 continued

Raheem et al. 2011	A non-market monetary valuation study of coastal ecosystem services in California to inform coastal policy decisions
Fletcher et al. 2012a	A literature review of marine ecosystem services provided by marine habitats and features in the UK likely to be protected by the new marine conservation zones to be designated under the UK 2009 Marine and Coastal Access Act
Fletcher et al. 2012b (also Rees et al. 2014)	An assessment of the ecological and socioeconomic benefits that would be provided by the designation of a network of marine conservation zones under the UK 2009 Marine and Coastal Access Act
Tallis et al. 2012	A study presenting a practical framework for ecosystem service measurement to inform marine spatial planning
Böhnke-Heinrichs et al. 2013	A study presenting a typology and indicators for marine ecosystem services to inform marine spatial planning and ecosystem based marine management
Lester et al. 2013	A review of an ecosystem service trade off analysis framework to inform marine spatial planning and ecosystem based marine management
Lopes and Videira 2013	A study presenting an integrated participatory framework for valuing marine and coastal ecosystem services
Potts et al. 2013	A study on the potential relationships between marine and coastal ecosystem service provision and marine protected area designations
Börger et al. 2014	A study examining the use of monetary ecosystem service valuation for marine spatial planning
Cárcamo et al. 2014	A study on marine stakeholders' perceptions and priorities for marine ecosystem services as basis for planning and implementation of marine protected areas
Fletcher et al. 2014*	An assessment of marine cultural ecosystem services in the Black Sea
Jobstvøgt et al. 2014a	A valuation study of deep sea ecosystem services in the context of deep sea marine protected areas in Scotland
Jobstvøgt et al. 2014b*	A marine cultural ecosystem service valuation study in the context of marine protected areas in the UK
Werner et al. 2014	A study presenting a practical framework for the application of ecosystem service assessment and valuation in ecosystem based marine management, using the Gulf of Mexico as an illustrative case study
Barnes-Mauthe et al. 2015*	A literature review on the role of social capital in ecosystem service frameworks and a qualitative and quantitative assessment of social capital as a marine ecosystem service in a Malagasy locally managed marine protected area case study
Rivero and Villaante 2016	A global study on marine management practitioners' research priorities for ecosystem services
Yoskowitz et al. 2016	A non-monetary participatory valuation study of offshore marine ecosystem services in the Gulf of Mexico
Gee et al. 2017	A study presenting a community based method and criteria framework to identify culturally significant areas for marine spatial planning

*Studies on cultural and social marine ecosystem services

In 2010, the Conference of Parties to the Convention on Biological Diversity adopted a strategic plan with 20 targets for biodiversity between 2011 and 2020. These so called Aichi targets include the requirement to consider ecosystem services in the designation of protected areas. In response to this, the EU Biodiversity Strategy to 2020 includes provisions to support EU member states in the mapping and assessment of ecosystem services (EU 2011, Maes et al. 2012). This is also reflected in growing research interest in ecosystem service mapping and modelling (Grêt-Regamey et al. 2013, 2015, Hauck et al. 2013, Crossman et al. 2013).

Finally, as Braat and de Groot (2012) point out, ecosystem services are “a bridging concept with natural and social science notions” (Braat and de Groot 2012, p. 4). While previously this transdisciplinarity was mainly limited to ecological and economic sciences, in recent years, ecosystem services have generated interest across a multitude of scientific disciplines. For example, Potschin and Haines-Young (2011) explore the concept from a physical geography perspective, while others have started investigating the links between ecosystem services and behaviour psychology (Asah et al. 2011, Opdam et al. 2015, Van Riper and Kyle 2014).

2.2.2 Ecosystem service definitions and classifications

Ecosystem service definitions

Ecosystem services have been defined as “the conditions and processes through which natural ecosystems, and the species that make them up, sustain and fulfil human life” (Daily 1997, p. 3), as “the benefits human populations derive, directly or indirectly, from ecosystem functions” (Costanza et al. 1997, p. 253), or in short, “the benefits

people obtain from ecosystems” (MEA 2005, p. v), and as “components of nature, directly enjoyed, consumed, or used to yield human well-being” (Boyd and Banzhaf 2007, p. 619). These are some of the most frequently quoted definitions (Table 2.6 lists further definitions).

Table 2.6: Definitions of ecosystem services identified in the reviewed literature

Definitions of ecosystem services	References
“Ecosystem services are the conditions and processes through which natural ecosystems, and the species that make them up, sustain and fulfil human life”	Daily 1997, p. 3
“Ecosystem goods [...] and services [...] represent the benefits human populations derive, directly or indirectly, from ecosystem functions”	Costanza et al. 1997, p. 253
“Ecosystem services are the benefits people obtain from ecosystems”	MEA 2005, p. v
“Goods and services are defined as the direct and indirect benefits people obtain from ecosystems”	Beaumont et al. 2007, p. 254, based on MEA 2005
“Final ecosystem services are components of nature, directly enjoyed, consumed, or used to yield human well-being”	Boyd and Banzhaf 2007, p. 619
“Ecosystem services are the wide range of valuable benefits that a healthy natural environment provides for people, either directly or indirectly”	Defra 2007a, p. 8, based on MEA 2005
“Ecosystem services are the aspects of ecosystems utilized (actively or passively) to produce human well-being”	Fisher and Turner 2008, p. 1168, and Fisher et al. 2009, p. 645, based on Boyd and Banzhaf 2007
“The outputs of ecosystems from which people derive benefits”	UK NEA 2011, p. 12, based on MEA 2005
“Ecosystem services are the direct and indirect contributions of ecosystems to human well-being”	Böhnke-Heinrichs et al. 2015, p. 138, based on de Groot et al. 2010
“[Ecosystem services] can be defined in terms of the contributions of ecosystems to human well-being, encompassing both tangible goods [...], but also more intangible services [...]”	Crowe et al. 2015b, p. 5, based on de Groot 2010 and TEEB 2010
“Ecosystem Services (ES) describe the services rendered by nature and used by humankind.”	Grunewald and Bastian 2015, p. 3

Danley and Widmark (2016) describe ecosystem services as “a phrase with many meanings” (Danley and Widmark 2016, p. 132). At the same time, all ecosystem service definitions have common elements (Fletcher et al. 2012a, 2012b, Jax et al. 2013, Kull et al. 2015, Nahlik et al. 2012, Potschin and Haines-Young 2011). Kull et al. (2015) argue that all definitions of ecosystem services are based on four elements: “something out there [...] provides things [...] useful to people and/or nature [...] and this should be valued [...]” (Kull et al. 2015, p. 122). Jax et al. (2013) clarify that, in all definitions, ecosystem components only become or generate ecosystem services if they are required or used by humans. Similarly, Nahlik et al. (2012) identify the association of ecosystem services with human benefits as the common element. More generally, the common theme of all ecosystem service definitions and interpretations is that they link ecosystems and human wellbeing (Fletcher et al. 2012b, Jax et al. 2013, MEA 2005, Potschin and Haines-Young 2011).

The point on which the definitions fundamentally differ is the relation between ecosystem services and human benefits (Jax et al. 2013, Nahlik et al. 2012): some authors understand ecosystem services as human benefits (for example Costanza et al. 1997, de Groot et al. 2002, MEA 2005), while others see ecosystem services as part of the biophysical structures, processes and functions that lead to human benefits (for example Boyd and Banzhaf 2007, Daily 1997, UK NEA 2011). The interpretation of ecosystem services as benefits, or as leading to benefits, determines how ecosystem services are described and classified; and both definitions and classification systems are often determined by the purpose for which the ecosystem services approach is being applied.

Ecosystem service classification frameworks

The first to provide a conceptual framework for describing, classifying and valuing ecosystem services were de Groot et al. (2002). Their framework is based on the concept of ecosystem functions, which they define as “the capacity of natural processes and components to provide goods and services that satisfy human needs, directly or indirectly (de Groot et al. 2002, p. 394). They identify four types of ecosystem functions that are the result of the natural processes within an ecosystem and that provide goods and services of benefit to humans (de Groot et al. 2002):

1. **Regulation functions** regulate essential ecological processes and life support systems, providing, for example, clean air, water, soil and storm protection;
2. **Habitat functions** contribute to the conservation of genetic and biodiversity;
3. **Production functions** produce living biomass and provide resources, for example food, raw materials and energy;
4. **Information functions** provide opportunities for recreation, cognitive development, spiritual enrichment, cultural and aesthetic experience.

Regulation and habitat functions are seen as essential preconditions for production and information functions (de Groot et al. 2002). The goods and services that these ecosystem functions provide have ecological values (related to ecological sustainability), sociocultural values (related to equity and cultural perceptions) and economic values (related to efficiency and cost effectiveness) (de Groot et al. 2002). De Groot et al. (2002) clarify that “observed ecosystem functions are reconceptualised as ‘ecosystem goods and services’ when human values are implied” (de Groot et al. 2002, p. 395), which is in line with the point raised by Jax et al. (2013) on the commonality of definitions (see p. 70). The purpose of this conceptual framework was

to enable the comparative analysis of ecological, economic and sociocultural values of ecosystems to inform policy and management decisions (de Groot et al. 2002).

The most prominent classification framework was provided by the Millennium Ecosystem Assessment, which defines four categories of ecosystem services (MEA 2005):

1. **Supporting services** provide the basic ecological structures and processes that underpin all other ecosystem services, for example nutrient cycling, soil formation and primary production;
2. **Regulating services** regulate ecological systems, for example climate regulation, disease control, waste remediation, water purification and flood regulation;
3. **Provisioning services** provide material resources, for example food, water, fuel and other raw materials;
4. **Cultural services** provide non-material services, for example recreation, education, spiritual and aesthetic opportunities.

In the MEA framework, these ecosystem services are identified to contribute to five constituents of human wellbeing: personal and material security, basic material for a good life, physical and mental health, good social relations and freedom of choice and action (MEA 2005). This framework was used to assess how different drivers of ecosystem change are affecting the provision of ecosystem services, and the consequences this has for human wellbeing (MEA 2005).

As Balmford et al. (2008) and Fisher and Turner (2008) point out, the main purpose of the Millennium Ecosystem Assessment was to highlight the links between ecosystems and human wellbeing; the MEA framework was not developed for ecosystem service valuation. The MEA framework is criticised for two reasons that make it unsuitable for

economic valuation. The first is the issue of double counting of supporting services: since they underpin the provision of all ecosystem services, treating them as a separate service category bears the risk that their wellbeing contribution is valued twice (Balmford et al. 2008, Boyd and Banzhaf 2007, Fisher et al. 2009, Wallace 2007). The second issue is that the MEA framework does not clearly distinguish between ecological features that can be measured and quantified and human benefits that can be valued (Balmford et al. 2008, Boyd and Banzhaf 2007, Fisher et al. 2009, Wallace 2007). In recognition of these limitations, a number of ecosystem service frameworks were developed aimed at facilitating economic valuation.

The first were Boyd and Banzhaf (2007), who developed a description of ecosystem services based on economic principles to enable their comparison with conventional goods and services in environmental accounting. They introduce the concept of **final ecosystem services**, defined as “end-products of nature”, and distinguish these from **intermediary products** (Boyd and Banzhaf 2007, p. 619). They further distinguish final ecosystem services from benefits, explaining that human benefits and consumer products are generated through “the joint use of final ecosystem services and conventional goods and services” (Boyd and Banzhaf 2007, p. 619).

While Boyd and Banzhaf (2007) focus on environmental accounting, Wallace (2007) argues that classifications that mix ecosystem processes, functions and services are not useful for decision making more broadly as they do not allow comparisons and trade-offs. Wallace (2007) proposes a framework in which ecosystem services are **ecosystem processes and assets** (biotic and abiotic elements) that are **experienced by humans** on an individual level and that can be classified according to the **specific human values** they support. He identifies four categories of human values: 1) adequate resources,

2) protection from predators, disease or parasites, 3) benign physical and chemical environment, and 4) sociocultural fulfilment (Wallace 2007).

In their scoping study for the TEEB project, Balmford et al. (2008) propose a further framework for economic valuation similar to that developed by Boyd and Banzhaf (2007). Balmford et al. (2008) distinguish between **core ecosystem processes** (basic ecosystem functions, for example water and nutrient cycling), that support **beneficial ecosystem processes** (specific processes, for example water purification), that directly underpin **human benefits** (the products of beneficial ecosystem processes, for example clean water), that can be **valued** in monetary terms. Leading on from this, the final TEEB study adopted the cascade model that was developed by Haines-Young and Potschin (2009) (TEEB 2010). In the cascade model, ecosystem services represent the link between the ecosphere (ecosystems and biodiversity) and human wellbeing (benefits and economic values): ecosystem services are provided by ecosystem functions, which are subsets of biophysical structures and processes, and they generate sociocultural benefits, which have economic value (Figure 2.3).

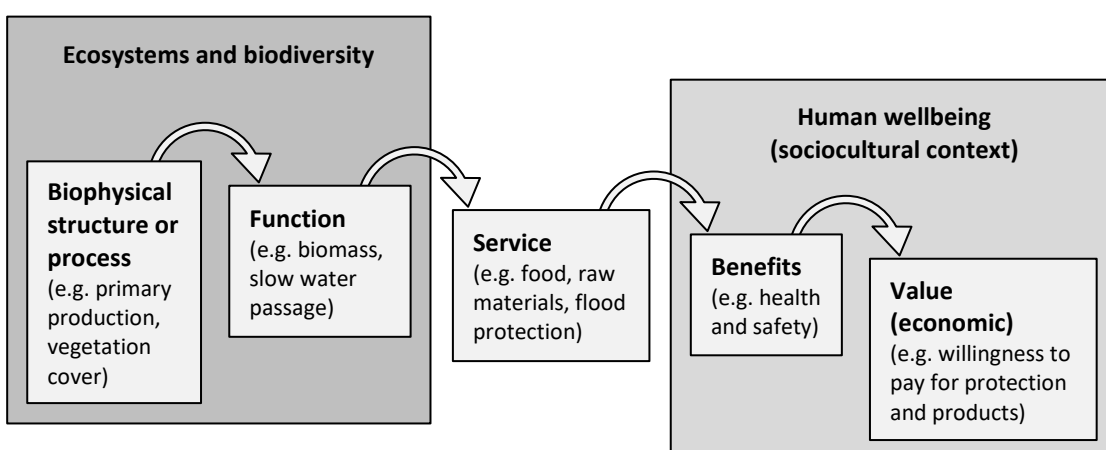


Figure 2.3: Simplified representation of the cascade model used in TEEB (2010), based on Haines-Young and Potschin (2009)

The examples presented here show how ecosystem services have been defined and classified in different ways depending on the authors' objectives. Some authors argue that the multitude of ambiguous definitions and classifications and inconsistent use of terminology hinder the practical application of the ecosystem services approach in decision making; they call for a single, standardised and consistent framework (Boyd and Banzhaf 2007, de Groot et al. 2010, Nahlik et al. 2012, Wallace 2007). Others argue that a single, generic framework cannot adequately address the complexity of ecological systems and human-ecosystem interactions which generate ecosystem services (Bastian et al. 2015, Costanza 2008, Fisher and Turner 2008, Fisher et al. 2009). For example, one ecosystem service can be related to multiple benefits with different values (Böhnke-Heinrichs et al. 2013, Chan et al. 2012b, Fisher and Turner 2008), depending on different use patterns and perspectives (Asah et al. 2014, Fisher and Turner 2008, Fisher et al. 2009), as well as on different spatial, institutional and temporal scales (Austen et al. 2015, Grunewald et al. 2015, Hein et al. 2006, Potschin and Haines-Young 2011). Therefore, Costanza (2008) and others maintain that ecosystem service definitions and classifications are context dependent and multiple classification systems are needed (Bastian et al. 2015, Fisher and Turner 2008, Fisher et al. 2009, Luisetti et al. 2011). Fisher et al. (2009) propose a framework for designing context dependent classification systems based on 1) a clear ecosystem service definition that determines the system boundaries, 2) a characterisation of the ecosystem and related ecosystem services of interest, and 3) clarification of the decision making context in which the ecosystem services approach is being applied.

A number of studies have applied the classification frameworks presented above to the marine context, developing specific marine classifications for the assessment and

valuation of marine ecosystem services, with the purpose of supporting marine management and planning (Atkins et al. 2011, Austen et al. 2015, Beaumont et al. 2007, Böhnke-Heinrichs et al. 2013, Fletcher et al. 2012a, 2012b, Hattam et al. 2015). Table 2.7 presents three examples of marine ecosystem service classification systems.

Interpretation of ecosystem services in this thesis

The multitude of disciplines involved in the ecosystem services approach, and the different purposes and application contexts that were highlighted in the historical review, explain why it has proved so difficult to come to a consensus over the definition and classification of ecosystem services (Grunewald and Bastian 2015). In this thesis, ecosystem services are broadly understood as a concept linking ecosystems and human wellbeing. This interpretation encompasses the beneficial services described by the Millennium Ecosystem Assessment as well as the beneficial ecosystem processes and human benefits of the TEEB model. As no ecosystem service assessment or valuation is undertaken in this thesis, a more specific definition or classification is not required. Part of the thesis is based on case studies in which different approaches were taken to describe marine ecosystem services; these will be presented in more detail in the case study descriptions in Chapter 3. The study presented in Chapter 4 is based on a fictitious scenario which includes the following explanation of ecosystem services:

“Ecosystem services are the benefits that humans get from the natural environment. Examples of marine ecosystem services are: nutrition from fish and seafood, coastal protection from storm waves, renewable energy and opportunities for recreational activities.”

Table 2.7: Summary of three marine ecosystem service classifications (in their original wording), including references for the ecosystem service frameworks on which the marine classifications are based, and references for studies in which the three classifications were adapted or applied (modifications that were made in these studies are included in red)

Authors	Adapted/applied by	Marine ecosystem service classifications	
Beaumont et al. 2007 (based on MEA 2003 and Hein et al. 2006)	Adapted by Atkins et al. 2011 (modifications in red)	Goods and services provided by marine biodiversity /Ecosystem services provided by the marine environment	
		Production services	Food provision Raw materials Transport and navigation Energy Residential and industrial water supply
		Regulation services	Gas and climate regulation Disturbance prevention (flood and storm protection) Bioremediation of waste
		Cultural services	Cultural heritage and identity Cognitive benefits/values Leisure and recreation Feel good or warm glow (non-use benefits)
		Option use value	Future unknown and/or speculative benefits
		Over-arching support services	Resilience and resistance (life support) Biologically mediated habitat Physical habitat Nutrient cycling

Table 2.7 continued

Fletcher et al. 2012a

(based on Balmford et al. 2008)

**Applied by
Fletcher et al. 2012b**

Classification system applied to the ecosystem services provided by Marine Features

Core ecosystem processes	Beneficial ecosystem processes	Beneficial ecosystem services
Production	Primary production	Food
Decomposition	Secondary production	- Fisheries
Nutrient cycling	Larval/gamete supply	- Other wild harvesting
Hydrological processes	Biological control	- Aquaculture
Ecological interactions	Food web dynamics	- Fertiliser/feed
Evolutionary processes	Species diversification	Raw materials
Water cycling	Genetic diversification	- Salt
	Waste assimilation	- Ornamental materials (shells)
	Erosion control	Energy
	Formation of species habitat	- Biofuels
	Formation of physical barriers	Physical wellbeing
	Formation of pleasant scenery	- Medicines
	Climate regulation	- Natural hazard protection
	Air quality regulation	- Environmental resilience
	Biogeochemical cycling	- Regulation of pollution
	Water cycling (regulation)	Psychological/social wellbeing
	Water purification (quality)	- Tourism
		- Recreation/sport
		- Spiritual/cultural wellbeing
		- Aesthetic benefits
		- Nature watching
		- Aquaria
		Knowledge
		- Research and education

Table 2.7 continued

Böhnke-Heinrichs et al. 2013	Adapted by Hattam et al. 2015 (modifications in red)	Typology of marine ecosystem services/ Proposed classification of marine ecosystem services		
(based on Beaumont et al. 2006, de Groot et al. 2002, and TEEB 2010)		Provisioning services	Sea food Sea water Raw materials Genetic Resources Medicinal resources Ornamental resources	Food provision a) Wild capture sea food b) Farmed sea food Biotic raw materials (non-food) a) Genetic resources b) Medicinal resources c) Ornamental resources d) Other biotic raw materials
		Regulating services	Air purification Climate regulation Disturbance prevention or moderation Regulation of water flows Waste treatment and assimilation Coastal erosion prevention Biological control	
		Habitat services	Lifecycle maintenance/ Migratory and nursery habitat Gene pool protection	
		Cultural and amenity services	Recreation and leisure/ Leisure, recreation and tourism Aesthetic information/ experience Inspiration for culture, art and design Spiritual experience Information for cognitive development Cultural heritage (and identity) Cultural diversity	

2.2.3 Value concepts, assessment approaches and valuation methods

Different perspectives on ecosystem values

The value that the natural environment holds for human wellbeing is a central element of the ecosystem services approach. The common notion of all ecosystem service frameworks is that ecosystems provide benefits to humans and these benefits have value for human wellbeing (Jax et al. 2013, Kull et al. 2015, MEA 2005, Nahlik et al. 2012, TEEB 2010). Value is in itself a broad and complex concept, spanning from intangible, intrinsic dimensions and societal principles to individual preferences and instrumental utility (Chan et al. 2012a, Klain et al. 2014, Turner et al. 2003). In the context of ecosystem services, value is described as “[the] importance [...] of ecosystems and their services” (de Groot et al. 2010, p. 262), or in more economic terms as contribution to a specific goal:

“The value of ecosystem services is [...] the *relative* contribution of ecosystems to that goal [of human wellbeing]” (Costanza et al. 2014, p. 153, see also Farber et al. 2002, Liu et al. 2010).

As the historical overview and different classification frameworks suggest, there are various perspectives on the value of ecosystems and ecosystem services. Three types of value, which reflect the three pillars of sustainability, are discussed in the ecosystem services literature: 1) ecological value, 2) sociocultural value, and 3) economic value (de Groot et al. 2002, 2010, Farber et al. 2002, Martín-López et al. 2014, Scholte et al. 2015). Ecological value refers to the health and integrity of an ecosystem and the functional interactions between its components (de Groot et al. 2002, 2010, Farber et al. 2002, Martín-López et al. 2014). It relates to the supporting and regulating services in the MEA classification, or the ecosystem processes and functions in the TEEB model,

that underpin all ecosystem benefits to human wellbeing. Thus, ecological value reflects the ability of an ecosystem to generate benefits of sociocultural and economic value (de Groot et al. 2002, 2010, Farber et al. 2002, Martín-López et al. 2014).

Sociocultural values reflect social needs and preferences and the importance that people attribute to non-material benefits like health, education, cultural identity or spirituality (de Groot et al. 2002, 2010, Iniesta-Arandia et al. 2014, Martín-López et al. 2014, Scholte et al. 2015).

The third value dimension is the economic contribution of ecosystems to human wellbeing (de Groot et al. 2002, 2010, Farber et al. 2002, Martín-López et al. 2014). As mentioned in section 2.2.1, the economic value of ecosystem services is generally discussed in terms of total economic value, which encompasses use values and non-use values (de Groot et al. 2010, Hein et al. 2006, Schweppe-Kraft and Grunewald 2015, Turner et al. 2003). The concept of total economic value is further explained in Table 2.8. The economic value of ecosystems is often related to monetary valuation of ecosystem services. However, as Balmford et al. (2008) point out, economic value is not exclusively about money; it also includes things like livelihood conditions, economic infrastructure and job security, and social aspects of distribution and equity (see also Schweppe-Kraft and Grunewald 2015).

Table 2.8: Explanation of the concept of total economic value: the overall economic value of an ecosystem or ecosystem service is the sum of its use values (direct, indirect), option values and non-use values (bequest, existence) (based on Schweppe-Kraft and Grunewald 2015)

Total economic value		Examples and explanations
Use values	Direct use values	For example use of food or raw materials for consumption and production (MEA provisioning services), use of nature for recreation or education (MEA cultural services)
	Indirect use values	For example flood protection through biophysical structures, or provision of clean water (MEA regulating services)
Option values		Availability for future use
Non-use values	Bequest values	Willingness to pay to preserve something for future generations (for example natural heritage)
	Existence values	Willingness to pay to preserve the existence of something (for example wildlife), often related to intrinsic values

Ecosystem service assessment and valuation

The different scientific disciplines and value perspectives involved in the ecosystem services concept are reflected in various assessment and valuation approaches and methodologies. Abson et al. (2014) present ecosystem services as a concept with two dimensions: first, it is a descriptive framework to illustrate the interdependencies and interactions between humans and ecosystems; and second, it is a normative concept to ascribe value to these relationships. As discussed above, this value has ecological, sociocultural and economic dimensions (de Groot et al. 2002, 2010, Farber et al. 2002). To capture the different dimensions and values of the concept, ecosystem service assessment and valuation approaches encompass a wide spectrum of ecological and socioeconomic analyses, in qualitative and quantitative terms, of human-ecosystem relationships (Böhnke-Heinrichs et al. 2013, Granek et al. 2010, Cárcamo et al. 2014).

Qualitative analysis involves the identification, spatial definition and qualitative description of ecosystem services, based on biophysical assessments of ecosystem services and an analysis of the relationships between the ecological and socioeconomic systems under investigation. Biophysical assessments include the quantitative measurement of services in biophysical units (for example tonnes per year of carbon sequestration, size of fish stocks or tonnes of fish caught), as well as spatial mapping and temporal modelling of service provision (Scholte et al. 2015). The qualitative analysis of human-ecosystem relationships can be based on conceptual descriptions (Granek et al. 2010), or on social research methods such as interviews and surveys (Sagie et al. 2013). Biophysical assessments and qualitative descriptions provide the basis for ecosystem service valuations (Daily et al. 2009, Fletcher et al. 2012b, Hein et al. 2006, Martín-López et al. 2014).

The ecological value of an ecosystem can be determined by measuring its ability to provide services that contribute to human wellbeing, for example by using ecological indicators for ecosystem health and functionality to quantify the provision of ecosystem services (Böhnke-Heinrichs et al. 2013, de Groot et al. 2010, Martín-López et al. 2014).

From an economic perspective, valuation means assessing the contribution of something to a specific goal; it implies choices between alternatives which are expressed in comparable units of measurement (Costanza et al. 2014, Farber et al. 2002, Liu et al. 2010, Schwappe-Kraft and Grunewald 2015). The most common economic measurement unit in the context of ecosystem service valuation is money (de Groot et al. 2010, Granek et al. 2010). Daily et al. (2009) explain that economic valuation methods translate changes in ecosystem service provision into monetary

terms, reflecting changes in human wellbeing. As mentioned in the historical overview, a number of methods have been developed to value ecosystem services in monetary terms. These include revealed preference and cost based approaches that deduce the economic value of an ecosystem service from related market prices, costs or observed willingness to pay; and stated preference approaches that are based on people's stated willingness to pay or trade-off choices (Daly and Farley 2011, de Groot et al. 2010, Farber et al. 2006, Liu et al. 2010, Schweppe-Kraft and Grunewald 2015). Table 2.9 gives an overview of the most commonly cited monetary ecosystem service valuation methods.

Some of the valuation methods presented in Table 2.9 attempt to extend monetary valuation to economic non-use values and to the more intangible cultural ecosystem services and benefits, for example travel cost, hedonic pricing or contingent valuation methods. However, there is growing recognition that it is not possible, or appropriate, to express the sociocultural value of ecosystems in money (Balmford et al. 2008, Chan et al. 2012a, Daily et al. 2009, Farber et al. 2006, Granek et al. 2010). In view of the relevance of these sociocultural benefits, for people's health, social cohesion and relationships, intellectual, cultural and spiritual fulfilment, there is growing interest in alternative, non-monetary value indicators and valuation methods (Farber et al. 2006, Fletcher et al. 2014, Gee and Burkhard 2010, Granek et al. 2010, Klain et al. 2014, Milcu et al. 2013). These include, for example, indicators for sociocultural importance, health, cultural identity or sense of place (de Groot et al. 2010, Martín-López et al. 2014, Tratalos et al. 2016), participatory rating or ranking exercises (Farber et al. 2006, Yoskowitz et al. 2016), participatory mapping of cultural ecosystem services (Klain and Chan 2012, Plieninger et al. 2013, Scholte et al. 2015, Van Riper and Kyle 2014, Zoderer

et al. 2016a), or social research methods such as interviews, surveys and focus groups (de Groot et al. 2010, Iniesta-Arandia et al. 2014, Klain et al. 2014, Martín-López et al. 2014, Sagie et al. 2013, Scholte et al. 2015, Van Riper and Kyle 2014).

Table 2.9: Overview of the most commonly cited monetary valuation methods for ecosystem services (based on Daly and Farley 2011, Farber et al. 2006, Schweppe-Kraft and Grunewald 2015)

Valuation methods	Explanation and examples
<i>Revealed preference and cost based methods:</i>	
Market price method	Economic valuation based on the market price of traded ecosystem services For example market price of fish or timber
Production methods	Economic valuation based on changes in the production costs or profits for products produced with the input of ecosystem services, depending on the availability of, or effort required to obtain, these inputs For example changes in the cost of processed food products
Avoided damage cost method (or similar)	Economic valuation based on the cost of damage prevented by an ecosystem service For example the cost that would have occurred from avoided flooding or storm damage
Replacement cost method	Economic valuation based on the cost of replacing an ecosystem service For example the cost of water treatment or flood defences
Travel cost method	Economic valuation of ecosystems or nature sites used for recreation based on people's observed willingness to pay for travel, accommodation and use of these sites (including money spent, distance travelled, time and effort)
Hedonic pricing method	Economic valuation of sociocultural ecosystem services based on market prices that are directly affected by these services For example differences in real estate prices due to the availability of green spaces or sea views as an estimate of the economic value of recreational or aesthetic benefits
<i>Stated preference methods:</i>	
Contingent valuation method	Economic valuation based on people's stated willingness to pay for the provision of, or to receive compensation for the loss of, an ecosystem service in a hypothetical scenario For example asking people how much money they would be willing to contribute to a shark conservation programme as an estimate of the economic existence value of sharks
Contingent choice method	Economic valuation based on people's trade off decisions between, or ranking of, different ecosystem conditions or ecosystem service scenarios (which are related to different economic costs and benefits)

In recent years, spatial mapping and dynamic modelling are increasingly being applied in ecosystem service assessment and valuation to address the spatial and temporal dimensions of ecosystem service provision and demand (Crossman et al. 2013, Daily et al. 2009, de Groot et al. 2010, Hauck et al. 2013, Häyhä and Franzese 2014, Maes et al. 2012). Mapping provides a spatial illustration of where ecosystem services are generated, where the benefits occur, and where potential costs of securing the provision of these services arise (Crossman et al. 2013, Grêt-Regamey et al. 2015, Maes et al. 2012). Dynamic ecological and socioeconomic models can be applied to assess how the provision of ecosystem services might change over time, for example under different environmental conditions, socioeconomic contexts or management scenarios, and thus how the ecological economic and sociocultural values of ecosystems might change over time (de Groot et al. 2010, Farber et al. 2006, Grêt-Regamey et al. 2013, Guerry et al. 2015). Daniel et al. (2012) propose to use socioecological models to link cultural ecosystem services to ecological structures and functions.

Interpretation of ecosystem service assessment and valuation in this thesis

In this thesis, ecosystem service assessment and/or valuation will be referred to as ESAV and used as an umbrella term to encompass any or all qualitative and quantitative analysis approaches; unless further specified, for example when distinguishing between ecosystem service assessment (ESA) and ecosystem service valuation (ESV), or when referring explicitly to monetary ESV (or monetary valuation). Again, the different approaches taken in the case studies will be described in Chapter 3.

2.2.4 Objective, purpose and application in governance

Objective and purpose: contributing to sustainability through communication and decision support

Summarising the previous sections, the ecosystem services concept redefines the human relationship with nature by drawing the link between human wellbeing and ecosystems. Ecosystem service assessment and valuation explicitly describes, measures and values this relationship. The overarching objective of the ecosystem services approach is to promote effective conservation and achieve sustainable development (Abson et al. 2014, Costanza et al. 2014, Daily et al. 2009, Guerry et al. 2015, Luck et al. 2012). In practical terms, ecosystem service assessment and valuation is seen to contribute to this objective in two ways: 1) as a communication tool to raise awareness, provide strategic policy guidance and foster interdisciplinary dialogue, and 2) as decision support tool for policy design, management and planning decisions, and legal processes (Costanza et al. 2014, Jax et al. 2013, Laurans et al. 2013a, Luck et al. 2012, Marre et al. 2015).

As a communication tool, the main potential of the ecosystem services approach lies in raising awareness and understanding, among policy and decision makers, stakeholders and the public, about human dependence on nature, about the ecological impacts of different activities or management options and about the consequences for human wellbeing (Granek et al. 2010, Jax et al. 2013, Luck et al. 2012). Klain et al. (2014) describe the ecosystem services concept as “a primary vehicle for communicating human consequences of ecological change” (Klain et al. 2014, p. 310). Others see the ecosystem services approach as “a framework for promoting the societal benefits of

ecosystem conservation” (Luck et al. 2012, p. 1020); as a way of integrating conservation into all policy agendas and getting a wider range of people and institutions involved (Armsworth et al. 2007, Daily and Matson 2008, Goldman et al. 2008), by showing that conservation has the potential to deliver ecological, economic and societal benefits rather than necessarily being a trade-off between environment and development (de Groot et al. 2010). ESAV provides strategic arguments to guide the formulation of high level policies, such as the EU Biodiversity Strategy (Luck et al. 2012). Besides policy guidance, ESAV is also seen as a way to motivate people to get involved in conservation and change their behaviour (Asah et al. 2014, Fletcher et al. 2014). Finally, the interdisciplinary nature of the approach fosters dialogue and collaboration among different scientific disciplines, different professional sectors and different interest groups (Granek et al. 2010, Luck et al. 2012).

The second way in which the ecosystem services approach is seen to contribute to sustainable development is by supporting decision making processes for ecosystem based management. Ecosystem service assessment and valuation can foster more sustainable and socially acceptable policy, management and planning decisions by integrating ecological, economic and sociocultural considerations and values (Cárcamo et al. 2014, Daily et al. 2009, Fletcher et al. 2014, Iniesta-Arandia et al. 2014). More specifically, ESAV can support the evaluation and comparison of policy and management alternatives by linking the different policy options or management actions to ecosystem changes and resulting changes in human wellbeing (Crowe et al. 2015a, 2015b, Daily et al. 2009, Farber et al. 2006, Fisher et al. 2009, Granek et al. 2010). For example, combined ecological and socioeconomic ecosystem service models are proposed as method for assessing alternative management options (Daniel

et al. 2012, de Groot et al. 2010). Dynamic modelling and spatial mapping of ecosystem service distribution and provision can also support more effective policy design, spatial and strategic planning, and resource management decisions (Crossman et al. 2013, Luck et al. 2012, Plieninger et al. 2013, Zoderer et al. 2016a). Further, valuation, in economic or sociocultural terms, enables a more consistent and transparent evaluation of trade-offs by describing and quantifying the contribution of ecosystems to human wellbeing in values that are comparable to other wellbeing factors (Böhnke-Heinrichs et al. 2013, Daily et al. 2009, Farber et al. 2006, Granek et al. 2010, Jax et al. 2013, Liu et al. 2010). Again, mapping and modelling provide useful illustrations of ecosystem service trade-offs (Crossman et al. 2013, Daniel et al. 2012). Valuation also facilitates the integration of different ecological, economic and social considerations in cost-benefit or impact analyses of policies, management programmes or development projects (Fisher et al. 2009, Liu et al. 2010, Luck et al. 2012). Finally, economic valuation in particular can be used to design financial policy instruments (for example taxes, entrance or user fees) or market based management mechanisms (for example PES schemes), or to inform legal decisions on environmental damage fines or compensation payments (Laurans et al. 2013a, Liu et al. 2010, Luck et al. 2012, Marre et al. 2015).

As with the definitions and classification frameworks, which type and method of assessment and valuation is appropriate depends on the purpose for which the ecosystem services approach is being applied (Costanza et al. 2014, Fisher and Turner 2008, Jax et al. 2013, Liu et al. 2010). For example, different uses of ESAV on a spectrum from awareness raising to decision making require different levels of accuracy and different spatial scales (Costanza et al. 2014, Liu et al. 2010). Total values,

such as the ones presented by Costanza et al. (1997, 2014), are not useful for specific decision making contexts as policy and management decisions are based on marginal changes and values (Costanza et al. 2014, Daily et al. 2000, Turner et al. 2003). However, Costanza et al. (2014) argue that their global monetary estimates of ecosystem service values are useful for communicating the magnitude of ecosystem services.

Actual application and influence of ESAV in environmental governance

With the shift in ecosystem services research, in recent years, towards practical applicability, several authors have started looking into where and how ESAV is being used in environmental governance, whether it is having an influence on policy and management decisions, and what the enabling factors or barriers for uptake and influence are (for example Guerry et al. 2015, Kushner et al. 2012, Laurans et al. 2013a, 2013b, Marre et al. 2015, Ruckelshaus et al. 2015, Slootweg and van Beukering 2008, Waite et al. 2015). The general conclusion that can be drawn from these studies is that, on one hand, the ecosystem services approach is being applied in different environmental governance contexts by different international, national and local, governmental and non-governmental bodies. Examples include payment for ecosystem services schemes in Latin America and China (Guerry et al. 2015, Grima et al. 2016), ecosystem service conservation projects (Goldman et al. 2008), uptake of the ecosystem services concept in urban planning policies in Europe and North America (Hansen et al. 2015), integration of ESAV information in the decision making and environmental damage assessments of US federal agencies (Guerry et al. 2015, Rea et al. 2012), use of ESAV in strategic impact assessments (Slootweg and van Beukering

2008), establishment of user fee systems for marine protected areas in the Caribbean (Kushner et al. 2012), and incorporation of ESAV in coastal zone management (Guerry et al. 2015, Marre et al. 2015).

However, the overall global uptake and influence of ESAV in policy and management remains low (Guerry et al. 2015, Liu et al. 2010, Marre et al. 2015). For example, Waite et al. (2015) analysed the policy influence of 100 ESV studies in the Caribbean and found that only 16 of these studies had directly influenced decision making. Turner et al. (2003) reviewed the ESV literature for the policy relevance of ESV studies and found that most studies focus on single ecosystem services, which limits their usefulness for decision making. Others argue that the multitude of inconsistent classification frameworks and lack of clarity about how ESAV information can be used is hindering the use of ESAV in decision making contexts (Martinez-Harms et al. 2015, Nahlik et al. 2012, Wallace 2007). More generally, Liu et al. (2010) identify the main factors limiting the contribution of ESAV to policy and management as:

- the complexity of ecological systems and values,
- methodological limitations of assessment and valuation,
- and institutional barriers to application (for example lack of enabling policies or legislation).

Application of monetary ESV in marine governance

As part of the PhD project presented in thesis, a comprehensive literature review was conducted in 2013 on the application and influence of monetary ESV in marine governance around the world. Here, a summary of the key findings is given; the

working paper presenting the full results and analysis of this literature review, including a complete list of references, can be found in Appendix 2.

Two thirds of the 38 identified case studies⁶ were located in the Caribbean as well as the South and West Pacific, nine case studies were from the USA, while only six European case studies were found. Marine governance interests and applications of monetary ESV varied across geographical regions:

- Caribbean: financing of marine protected areas using monetary ESV to determine and introduce MPA user fees (for example: Bonaire National Marine Park user fee system, Slootweg and van Beukering 2008);
- South and West Pacific: use of monetary ESV to inform and justify management and regulation of marine resource exploitation (for example: aquaculture and logging bans in Palawan Island, Philippines, Kushner et al. 2012; coral mining ban in Sri Lanka, White et al. 1997);
- Europe: use of monetary ESV for environmental impact assessments of development projects, and to inform coastal risk management strategies and MPA policies (for example: cost-benefit analysis of Rotterdam Port development, Schuijt 2003; Lyme Bay MPA designation, Rees et al. 2010);
- USA: use of monetary ESV to determine fines and compensation payments for ecosystem damage (for example: Exxon Valdez oil spill court ruling, Liu et al. 2010; Florida Keys National Marine Sanctuary reef damage penalty system, Kushner et al. 2012).

Overall, nine areas of application in marine governance were identified: 1) marine ecosystem conservation and management, 2) MPA financing, 3) marine resource

⁶ Originally, 44 case studies were included in the review. However, six studies were taken out during later analysis because the context was not explicitly marine or no evidence for ESV influence could be found.

exploitation, 4) marine economic benefits for small island states, 5) coastal or flood management, 6) fines and compensation payments for ecosystem damage, 7) public access to beaches, 8) land reclamation and compensation areas, and 9) terrestrial resource use impacts. Table 2.10 gives a more detailed overview how monetary ESV was used or influenced marine governance in the 38 case studies. The different types of use and influence were categorised, following a typology proposed by Laurans et al. (2013a), into:

- 1) Informative: to support policy and decision making in general;
- 2) Decisive: to inform a specific decision, legislation, regulation or project;
- 3) Technical: to design economic instruments, for example fees or taxes.

The literature review also revealed a number of factors that enabled or hindered the use and influence of monetary ESV in the identified marine governance case studies. These included factors related to the general context in which ESV was applied, the ESV methodology and procedures (design, implementation and communication), the nature of the ESV results, and the specific context in which the final decision was made (Table 2.11). These enablers and barriers were similar to those identified in other studies (for example Kushner et al. 2012, Liu et al. 2010, Waite et al. 2015). Key enablers for the use and influence of monetary ESV in marine governance were found to be:

- 1) transparent and participatory decision making structures, involving local stakeholders,
- 2) a clear policy question to which ESV is applied,
- 3) and a good communication strategy tailored for the right audience.

The most frequently documented barriers were inadequate communication strategies, methodological issues, lack of financial resources for site specific ESVs and limited scientific data on marine ecosystems.

Table 2.10: Overview of the use and influence of monetary ESV in the 38 marine governance case studies, including classification of use and influence types based on Laurans et al. (2013a) and number of case studies in which each use and influence was found

ESV use and influence	Type of use	Number of case studies
Supported and improved the management and financing of MPAs (for example through user fee systems)	Informative Technical	10
Led to or supported government decisions to prevent or ban ecosystem damaging resource exploitation	Informative Decisive	10
Used for information, awareness raising, advocacy and campaigning	Informative	8
Led to, supported or justified decisions for ecosystem conservation (for example MPAs, ecosystem restoration)	Informative	6
Supported ecosystem damage assessment and determining of fines or compensation payments	Decisive Technical	6
Informed or supported the design of policies, regulations, management tools (for example user fees, fine systems)	Informative Decisive Technical	5
Led to or supported the introduction of new regulations, legislation, policies, etc.	Informative Decisive	4
Helped facilitate dialogue and support collaboration with stakeholders	Informative Decisive	4
Helped advance the national conservation agenda	Informative	3
Led to investment in MPA management	Informative	2
Supported local or community based management	Informative	2
Led to or supported government investment in projects to enhance public recreational ecosystem services	Informative	2
Encouraged private sector involvement and investment in ecosystem management and conservation	Informative	2
Encouraged eco-tourism development	Informative	2
Informed budget decisions	Decisive	1
Informed national infrastructure planning process	Decisive	1
Informed policy appraisal process	Informative	1

Table 2.11: Summary of enabling conditions and barriers for the use and influence of monetary ESV in marine governance identified in the 38 case studies

	Enablers	Barriers
	<p>General context</p> <ul style="list-style-type: none"> Transparent, participative governance and decision making structures High dependence on coastal or marine resources Clear policy question to which ESV is applied Local, in country support for ESV Local interest in or request for ESV Visible threats to ecosystem resource and economic health Decision makers' understanding of and interest in ESV Small country size (population, geographic extent) Government or organisational stability 	<ul style="list-style-type: none"> Little or no dependence on coastal and marine resources Lack of political interest in ESV or in the issue that ESV addresses No government or organisational stability (high turnover of employees and officials) Overburdened conservation community, lack of NGO outreach or public conservation forum Corruption in government Decision makers' limited understanding of ESV
95	<p>Methodology and procedure</p> <ul style="list-style-type: none"> Involvement of local stakeholders and experts Simple, easy to do valuation methods Cooperation by public and private stakeholders Timing and 'windows of opportunity' (for example important local events) 	<ul style="list-style-type: none"> Capturing ecosystem service and resource values for subsistence cultures No adequate, targeted, stakeholder specific outreach Methodological issues (double counting, benefit transfer, etc.) Apparent lack of involvement of local experts Development of new project specific valuation method Difficulty in linking ecosystem service impact to event or activity Controversy around contingent valuation method Economic rhetoric difficult to understand for policy makers and stakeholders
	<p>Valuation results</p> <ul style="list-style-type: none"> ESV results identify causal links between ecosystems and users ESV results identify economic implications of decision, catching decision makers' attention Money as key issue in the debate (for example damage compensation) Recognition that absolute values are not always necessary 	<ul style="list-style-type: none"> Small values that fail to capture decision makers' attention Valuation results that vary with different methodologies and assumptions No clear strategy or tangible examples on how to use the results Hypothetical nature of the study, not related to real-life circumstances Valuation criticised by scientists and experts as scientifically unsound
	<p>Decision context</p> <ul style="list-style-type: none"> External conditions supporting the decision that is in line with the ESV results 	<ul style="list-style-type: none"> Economic valuation unlikely to play decisive role in political decisions in contested policy areas Valuation study not or no longer in line with political climate

2.2.5 Methodological limitations and ethical debates

Methodological limitations

The review of the application of the ecosystem services approach in environmental and marine governance shows that the uptake and influence of the approach is hindered, at least in part, by methodological difficulties and limitations of ESAV. Some of the main methodological issues, which stem largely from the complexity of ecological and socioeconomic systems, are:

- The connectivity and interdependences within and between ecological and socioeconomic systems, the multiple spatial and temporal scales at which ecosystem services are provided, and the diversity of benefits and values that can stem from one single ecosystem service, make it difficult to define system boundaries and determine what is being valued (Böhnke-Heinrichs et al. 2013, Chan et al. 2012b, Chee 2004, Costanza 2008, Costanza et al. 2014, de Groot et al. 2010, Fisher and Turner 2008, Fisher et al. 2009, Wallace 2007, 2008).
- Ambiguous definitions and classifications cause problems of double counting of ecosystem service values (Balmford et al. 2008, Boyd and Banzhaf 2007, de Groot et al. 2010, Turner et al. 2003, Wallace 2007).
- Scientific uncertainty and lack of data limit the accuracy of qualitative and quantitative ecosystem service assessments and economic valuations (Börger et al. 2014, Daily et al. 2000, Granek et al. 2010, Liu et al. 2010).
- Original valuation studies are expensive and time consuming; however valuations based on benefit transfer from existing studies raise issues of comparability and reliability (Börger et al. 2014, Guerry et al. 2015, Liu et al. 2010, Turner et al. 2003, Schweppe-Kraft and Grunewald 2015).

- The different economic valuation methods are only suitable for specific ecosystem services and benefits; they can only capture part of their total economic value; and their accuracy and reliability is limited by data availability and underlying assumptions (Börger et al. 2014, Daily et al. 2000, de Groot et al. 2010, Farber et al. 2006, Granek et al. 2010, Liu et al. 2010).
- Sociocultural values are difficult to measure in meaningful and comparable ways (Chan et al. 2012a, Gee et al. 2017, Guerry et al. 2015, Pröpper and Haupts 2014).

Besides methodological issues, there are a number of conceptual issues and ethical debates surrounding the ecosystem services approach.

Issues of complexity and value plurality

Some authors warn that breaking down the complexity of ecosystems and their interactions with human wellbeing into seemingly independent ecosystem services bears the risk of overlooking the complex ecological, economic and social realities of policy and management contexts (Martín-López et al. 2014, Norgaard 2010). Beaumont et al. (2007) stress that it is important not to forget that single ecosystem services are interconnected and dependent on the functioning of the system as a whole. In particular the bias towards economic valuation is criticised for concealing the value plurality of human-ecosystem relationships (Chan et al. 2012b, de Groot et al. 2010, Kosoy and Corbera 2010, Martín-López et al. 2014), and for being too narrow focused to inform multifaceted and socially contentious management decisions regarding complex, interconnected, dynamic and unpredictable ecosystems (Chee 2004).

Ethical debates

Anthropocentric perspective. One central critique in the ethical debate surrounding ecosystem services is the anthropocentric nature of the approach (Jax et al. 2013, Liu et al. 2010, Luck et al. 2012, Schröter et al. 2014). As de Groot et al. (2002) explain,

“[the] concept of ecosystem goods and services is inherently anthropocentric: it is the presence of human beings as valuing agents that enables the translation of basic ecological structures and processes into value-laden entities.” (de Groot et al. 2002, p. 395).

This focus on human benefits causes considerable controversy in the conservation community, between those who see ecosystem services as a way to promote environmental stewardship and conservation and those who think that conservation should be based on ecocentric, intrinsic values and moral arguments (Armsworth et al. 2007, Farber et al. 2006).

Commodification of ecosystems. Another critique centres on the commodification of nature (Jax et al. 2013, Luck et al. 2012, Schröter et al. 2014), or as McCauley (2006) puts it, “[selling] out on nature” (McCauley 2006, p. 27). Gómez-Baggethun and Pérez (2011) explain that economic framing is the first step in the process of commodification, which expands the principles of commercial relationships and market trading to areas to which these did not previously apply. Thus, economic framing of ecological functions, and in particular monetary valuation, set the stage for the commodification of ecosystem services (Gómez-Baggethun and Pérez 2011, Gómez-Baggethun et al. 2010). The potential side effects of this commodification process could have serious detrimental consequences for conservation efforts: for example, the motivation for conservation could shift from moral obligation, social

desirability and community interest to personal economic self-interest; another example are potentially negative sociocultural impacts of schemes that introduce economic rationales to cultures and communities in which these did not previously exist (Gómez-Baggethun and Pérez 2011, Gómez-Baggethun et al. 2010, Luck et al. 2012).

Moral limits of monetary value. Related to the critique of economic framing and commodification, many authors argue that monetary valuation cannot capture the full range of ecosystem values, in particular intangible social, cultural and intrinsic values; and that reducing the value diversity of an ecosystem to a monetary value is not morally justified (Jax et al. 2013, Luck et al. 2012).

Equity and justice. Besides ethical debates about the appropriateness of different value systems and frames, Jax et al. (2013) argue that the normative nature of the ecosystem services concept, spanning ecological and socioeconomic value spheres, gives rise to ethical issues of equity and justice. This relates to the just and equitable distribution the benefits of ecosystem services, as well as the potential costs incurred in securing the provision of these services. These issues are further amplified by the complex public and private property rights and different temporal and spatial dimensions of ecosystem services, which add considerations of ecologically sustainable scale and intergenerational justice (Farber et al. 2006, Jax et al. 2013, Turner and Daily 2008).

A political concept. Finally, Kull et al. (2015) warn that the ecosystem services approach is not as neutral and objective as is often implied, but rather “a highly political concept [that] is used in diverse ways by different interests to justify different

kinds of interventions that at times might be totally opposed” (Kull et al. 2015, p. 122).

Counterarguments and suggested solutions

While the methodological limitations and ethical issues of the ecosystem services approach are widely recognised, many authors maintain that ESAV, including monetary valuation, is necessary to achieve sustainability through ecosystem based management and effective conservation (Costanza et al. 2014, Farber et al. 2006, Jax et al. 2013, Liu et al. 2010, Luck et al. 2012, Schröter et al. 2014, Turner and Daily 2008). They provide counterarguments and suggest solutions to address the ethical critiques and methodological issues. With regard to methodological limitations, as already discussed in section 2.2.4, the requirements, for example for the accuracy and ESAV and type of value, depend on the specific context and purpose for which the ecosystem services approach is being applied (Costanza et al. 2014, Fisher and Turner 2008, Jax et al. 2013, Liu et al. 2010). Therefore, argue Liu et al. (2010) and Abson et al. (2014), ecosystem services research should be driven by policy and management problems and less by the development of assessment tools.

In view of the complexity of ecological and socioeconomic systems and management contexts, and the value plurality of ecosystem services, some authors propose to use ESAV frameworks that integrate ecological, economic and sociocultural values and information (Martín-López et al. 2014, Scholte et al. 2015). For example, Martín-López et al. (2014) present a methodological framework that combines biophysical indicators, indicators of sociocultural importance and monetary valuation.

According to Luck et al. (2012), the ethical issues of the ecosystem services approach also depend on the context of its application. They suggest a number of options for

addressing the ethical considerations of the ecosystem services approach, such as for example employing multiple metaphors and measures of valuation, highlighting community instead of individual benefits or ensuring that intrinsic motivations for conservation are not undermined (Luck et al. 2012). Schröter et al. (2014) present a similar list of critiques and counterarguments and propose ways to bridge the divergent views. For example, they suggest that the anthropocentric framing of ecosystem services should be used as an argument in support of conservation. Liu et al. (2010) take a similar view, making the point that the difference between anthropocentric and ecocentric conservation concepts is a theoretical one because “[in] the end, the well-being of people and ecosystems are interdependent” (Liu et al. 2010, p. 55). Costanza et al. (1997) and Balmford et al. (2008) further state that economic values and intrinsic values are not mutually exclusive but complementary: intrinsic values provide moral arguments for conservation and economic values supplement these with economic arguments. According to Armsworth et al. (2007), the ecosystem services approach can expand the conservation debate into different policy agendas beyond the reach of moral arguments.

In their seminal paper on the value of global ecosystem services, Costanza et al. (1997) acknowledge that the total economic value of essential ecological life supporting systems is infinite and that ecosystem service valuation “is certainly difficult and fraught with uncertainties” (Costanza et al. 1997, p. 253). However, they argue, every societal decision concerning the natural environment implies valuation. Thus, the choice is not whether to value or not to value ecosystem services but whether to make this value explicit or not (Costanza et al. 1997). If not made explicit, the value of

ecosystems and their services is often overlooked or given too little weight by society and in policy decisions (Costanza et al. 1997, Daily 1997).

Economic valuation, in particular in monetary terms, is one way to reveal the value that is implied in ecosystem service decisions (Liu et al. 2010). According to Kallis et al. (2013), the question is not “[to] value or not to value” but rather “when and how to value with money [and] under what conditions” (Kallis et al. 2013, p. 97). They propose a decision framework for the use of monetary valuation guided by goals of environmental improvement, distributional justice and equity and value plurality, and critical consideration of commodification and neo-liberalism (Kallis et al. 2013). Meinard et al. (2016) take a similar approach, presenting a glossary of ethical concepts to support the decision whether monetary valuation is appropriate or not in a specific context.

Other authors clarify that monetary valuation is one possible way of organising information for decision making, one decision aid tool among many (Daily et al. 2000, 2009, Liu et al. 2010, Schweppe-Kraft and Grunewald 2015). Farber et al. (2006) suggest that ecocentric values and moral norms can serve as constraints within which anthropocentric, utilitarian values can be used for decision making, based on criteria of efficiency, equitable distribution of costs and benefits, ecological sustainability and social acceptability. Similarly, Liu et al. (2010) propose sustainable scale, fair distribution and efficient allocation as goals against which to assess the value of ecosystem services to address some of the ethical obstacles of ESV.

Finally, Jax et al. (2013) argue that addressing the ethical issues of the ecosystem services approach requires increased transparency and clarity about 1) context and

purpose, 2) different value dimensions and valuation languages, and 3) potential trade-offs and conflicts. Integration of different scientific disciplines and involvement of stakeholders play a central role in increasing the transparency of the ecosystem services approach (Jax et al. 2013). The importance of stakeholder involvement for increasing and securing the legitimacy and usefulness of ecosystem service assessment and valuation is also emphasised by other authors (Chee 2004, Cowling et al. 2008, Hein et al. 2006, Iniesta-Arandia et al. 2014, Lopes and Videira 2013, Spangenberg et al. 2015, Verburg et al. 2016). According to Spangenberg et al. (2015), for example, representative participation of stakeholders affected by changes in ecosystem services is necessary to capture the multiple different values attached to these services and to address the subjectivity of valuation processes.

In conclusion, the practical application of the ecosystem services approach is faced with many difficulties and critiques. At the same time, the approach is seen by many as a valuable, or even necessary, tool for achieving sustainability. To unlock this potential, the ethical critiques and methodological limitations need to be addressed, and ways need to be identified in which ESAV can support ecosystem based management and effective conservation. At various points in the previous sections, the reviewed ecosystem services literature suggested that stakeholder engagement might play an important role in this.

2.3 Marine stakeholder engagement and the ecosystem services approach

Looking back at the historical developments, rationales, objectives and purposes of stakeholder engagement and the ecosystem services approach, it becomes apparent that there are several parallels and interactions. The concluding part of Chapter 2 begins to explore the relationship between these two approaches, with a particular focus on the marine context.

2.3.1 Parallels between stakeholder engagement and the ecosystem services approach

The two stories begin in the 1970s, when stakeholder engagement and the ecosystem services concept emerge in the wake of growing environmental awareness, social and environmental movements, and the institutional establishment of environmental law and policy (Andrews 2006, Bishop and Davis 2002, Gómez-Baggethun et al. 2010, Liu et al. 2010). In the 1990s, both approaches are firmly established on the international policy agenda as key principles and tools for sustainable development and biodiversity conservation (CBD 1995, 2000, Gómez-Baggethun and Pérez 2011, Reed 2008, UNCED 1992a, 1992b). In particular, ecosystem service assessment and valuation and participatory engagement are seen as important tools for informing and implementing ecosystem based management and effective conservation (Curtin and Prellezo 2010, Granek et al. 2010, Tallis et al. 2010, Werner et al. 2014). In the marine governance context, participatory engagement, and increasingly ESAV, play a key role in supporting marine spatial planning, as well as in the planning, implementation and management

of marine protected areas (for example Böhnke-Heinrichs et al. 2013, Börger et al. 2014, Charles and Wilson 2009, Dalton 2005, Fletcher et al. 2012b, Gopnik et al. 2012, Kushner et al. 2012, Pomeroy and Douvère 2008, Sayce et al. 2013, Slootweg and van Beukering 2008, Tallis et al. 2012).

From a conceptual perspective, stakeholder engagement and the ecosystem services approach are equally tied to the intrinsic nature of environmental problems, defined by the complexity, connectivity, interdependencies and interactions, different spatial scales and time dimensions of ecosystems and related socioeconomic systems (Böhnke-Heinrichs et al. 2013, Chee 2004, Costanza 2008, Fisher et al. 2009, Reed 2008, van den Hove 2000). In this context of ecological and socioeconomic complexity, both approaches reflect and represent the multitude of interests and diversity of values that are involved in environmental and marine governance (de Groot et al. 2010, Dietz and Stern 2008, Farber et al. 2002, Jax et al. 2013, Liu et al. 2010, Martín-López et al. 2014, Reed 2008, Richardson and Razaque 2006, Sayce et al. 2013, van den Hove 2000).

2.3.2 Interactions between stakeholder engagement and the ecosystem services approach

Sociocultural and economic valuation using participatory methods

The most apparent interaction between stakeholder engagement and the ecosystem services approach is the use of participatory methods in sociocultural valuation of ecosystem services. While Scholte et al. (2015) also present a number of non-participatory, revealed value methods for sociocultural valuation, such as observation, document research or expert based approaches, the sociocultural valuation studies

identified in this review all applied participatory social research methods. For example, Yoskowitz et al. (2016) engaged a wide range of marine stakeholders in two workshops to conduct a non-monetary valuation of deep sea ecosystem services in the Gulf of Mexico. Fletcher et al. (2014) used scoping interviews and workshops to assess the value that marine ecosystem services in the Black Sea hold for people in Turkey. They conclude that stakeholder perspectives on cultural ecosystem services contribute valuable information for policy design and management decisions (Fletcher et al. 2014, see also Iniesta-Arandia et al. 2014). Gee and Burkhard (2010) conducted a valuation of cultural ecosystem services on the west coast of Schleswig-Holstein, Germany, in the context of offshore wind farms, using a questionnaire based survey of local residents. A recent study by Gee et al. (2017) emphasises the need for participatory, community based methods to identify culturally significant areas for marine spatial planning. In two sociocultural ecosystem service valuation studies on the west coast of Canada, Klain and Chan (2012) and Klain et al. (2014) used map-based interviews and participatory mapping exercises. Participatory mapping approaches have also been applied in several other sociocultural valuation studies (for example Plieninger et al. 2013, Van Riper and Kyle 2014, Zoderer et al. 2016a).

Finally, besides non-monetary sociocultural valuation studies, it can be argued that some monetary valuation approaches also contain an element of stakeholder engagement, for example contingent valuation methods or choice experiments that elicit people's willingness to pay through surveys or interviews. For example, Jobstvogt et al. (2014a, 2014b) conducted surveys with British marine recreational users and Scottish households, based on choice experiments and contingent valuation, to investigate the economic use and non-use value of marine recreational ecosystem

services in the UK (2014b), and economic existence and option values of deep sea ecosystem services in Scotland (2014a).

Stakeholder engagement as a way of improving ESAV and its usefulness

Another connection between the two approaches is the use of stakeholder engagement to improve the quality and usefulness of ecosystem service assessment and valuation. The rationale behind this lies in the ecological, sociocultural and economic value plurality of ecosystem services (Chan et al. 2012b, Martín-López et al. 2014), as well as in the fact that different people may perceive different benefits and hold different values for the same ecosystem services (Asah et al. 2014, Hein et al. 2006, Turner and Daily 2008). As already mentioned in section 2.2.5, Jax et al. (2013) see stakeholder involvement in ESAV as important requirement for increasing transparency and addressing ethical issues of equity and justice; and Spangenberg et al. (2015) consider participation of potentially affected stakeholders as necessary to address the value plurality and subjectivity of valuation processes.

In this context, Hein et al. (2006) propose a framework for ESAV that specifically takes into account the interests and values of stakeholders at different spatial, ecological and institutional scales. Lopes and Videira (2013) present a participatory valuation framework for marine and coastal ecosystem services to facilitate the identification and integration of ecological and socioeconomic values in decision making processes for marine and coastal policy and management. Sagie et al. (2013) stress the importance of including participatory social research methods in ESAV to ensure that in particular sociocultural perspectives and values are not overlooked. In line with this, questionnaire based interviews are part of the integrated ecological, sociocultural and

economic valuation framework presented by Martín-López et al. (2014). Lastly, Verburg et al. (2016) conclude that improving the policy uptake of the ecosystem services approach requires, among other factors, societal involvement and participatory governance structures. The importance of participatory governance structures and local stakeholder involvement as key enabling factors for the use and influence of ESAV was also highlighted by the findings of the case study review of monetary ESV influence in marine governance (see section 2.2.4).

Thus, stakeholder participation is an integral part of sociocultural, and some economic, ecosystem service valuation, and it appears to play an important role in improving the usefulness and influence of ESAV in environmental and marine governance. Furthermore, the ecosystem services literature suggests a third type of interaction between the ecosystem services approach and stakeholder engagement: the potential of ESAV to support better engagement.

ESAV as a way of improving stakeholder engagement

Going back to its origins, the ecosystem services approach started as a pedagogic concept to communicate the societal value of biodiversity and the negative consequences of biodiversity loss for human wellbeing (Braat and de Groot 2012, Gómez-Baggethun et al. 2010). Four decades later, raising awareness and understanding of the human dependence on ecosystems and the wellbeing consequences of ecological change is still seen as one of the main purposes of the ecosystem services approach (Jax et al. 2013, Klain et al. 2014, Luck et al. 2012, see section 2.2.4). Looking back at the typologies of engagement in section 2.1.3, communication for the purpose of informing, educating or raising awareness is

included at the lower end of the engagement spectrum. In this sense, the ecosystem services approach is in itself an engagement tool. In fact, a number of studies reveal widespread expectations with regard to the pedagogic potential of the ecosystem services approach for environmental governance: it is seen as a way of effectively communicating the importance of ecosystems, of providing convincing arguments, and thus raising acceptance and support, for management and conservation among politicians and policy makers, different stakeholders and the public (Albert et al. 2014, Beery et al. 2016, Berghöfer et al. 2016, Böck et al. 2015, Klein et al. 2015, Lamarque et al. 2011, Luck et al. 2012, Orenstein and Groner 2014). However, these studies present little to no empirical evidence to confirm the expectations that the ecosystem services approach would be a useful communication tool for environmental governance.

Again recalling the different engagement typologies, at the other end of the spectrum is active participation, characterised by dialogue, exchange and shared decision making authority (see section 2.1.3). Stakeholder and public participation has been established as a key requirement for sustainable development in general (UNCED 1992a, 1992b), and for effective ecosystem based marine management in particular (Curtin and Prellezo 2010, Pomeroy and Douvere 2008, Tallis et al. 2010). Some of the reviewed ecosystem services studies suggest that ESAV could support constructive stakeholder dialogue and effective participatory engagement in policy and management processes. According to Granek et al. (2010), ESAV provides “a common language for coastal ecosystem-based management” (Granek et al. 2010, p. 207), understandable information that contributes to more transparent decision making by:

- drawing links between policy and management choices, changes in ecosystems and impacts on human wellbeing,

- integrating ecological and socioeconomic considerations and interests,
- and enabling the comparison of management alternatives.

This “common language” and increased transparency can facilitate stakeholder engagement and foster dialogue between groups with different interests and values (Granek et al. 2010, Iniesta-Arandia et al. 2014, Jax et al. 2013). Other authors point out that involvement in ESAV enables stakeholders to contribute their views and knowledge, and to develop a shared understanding of management issues (Berghöfer et al. 2016, Cork and Proctor 2005). Spangenberg et al. (2015) argue that participation in ESAV helps motivate and empower people to become involved in decision making and implementation of ecosystem management.

From a more practical perspective, Chee (2004) proposes to use ecosystem service mapping and modelling to help stakeholders involved in decision making processes understand ecological systems and evaluate management options. As pointed out by Crossman et al. (2013), ecosystem service maps and models provide useful visual illustrations of the spatial and temporal distribution of services and values.

Evidence from environmental governance case studies appears to confirm the engagement potential of the ecosystem services approach. Drawing from the experience of ten case studies in which ESAV was used to support strategic environmental assessments, Sloomweg and van Beukering (2008) conclude that ESAV can help identify relevant stakeholders and facilitate stakeholder participation. Positive effects on local stakeholder engagement from using monetary ESV studies in marine policy and management processes were also found in four of the 38 marine governance case studies. In the Gladden Spit Marine Reserve, in Belize, the valuation

study helped improve the historically strained relationship between marine reserve managers and local fishermen and dive tour operators (Kushner et al. 2012). Similarly, the use of ESV to inform management helped facilitate the dialogue with local stakeholders in the Hol Chan Marine Park, Belize (Kushner et al. 2012), and in the Bonaire National Marine Park (van Beukering et al. 2008). Finally, in the Florida Keys National Marine Sanctuary, the economic assessment and valuation of ecosystem services supported the establishment of a collaborative management process with local stakeholders (Kushner et al. 2012).

ESAV in the marine context: potential for improving stakeholder engagement?

The potential of the ecosystem services approach for facilitating and improving stakeholder engagement is of particular interest in the context of marine governance. As discussed earlier, participatory engagement plays a central role in effective ecosystem based marine management; at the same time, marine stakeholder engagement faces a number of marine specific challenges that limit its effectiveness (see section 2.1.5). This view is shared by Granek et al. (2010) who point out that the potential of ESAV to support transparent decision making and facilitate stakeholder dialogue and engagement is particularly relevant for coastal management, where the multitude of affected interests is likely to lead to disagreement about different management approaches. The relevance of ESAV for marine stakeholder engagement is also reflected in marine governance practitioners' interest in the ecosystem services approach (Rivero and Villasante 2016). In a global study on research priorities for marine ecosystem services, Rivero and Villasante (2016) report that "stakeholder

engagement and effective participation” was one of the key topics specifically mentioned by marine practitioners (Rivero and Villasante 2016, p. 109).

In fact, while there is evidence that the use of ESAV studies in marine policy and management processes can have positive effects on marine stakeholder engagement (Kushner et al. 2012, Slootweg and van Beukering 2008, van Beukering et al. 2008), there is little or no evidence on why, how and under what conditions the ecosystem services approach supports better marine stakeholder engagement. The studies presented in the following two chapters begin to fill this gap, providing empirical evidence for the benefits, opportunities, challenges and limitations of using ESAV as a marine engagement and communication tool. This will be followed by a conceptual discussion about how the ecosystem services approach can be used to support and improve marine stakeholder engagement, with a particular focus on the questions: what is it about the concept of ecosystem services or ESAV that facilitates dialogue and engagement; and what are the enabling factors, obstacles and limitations for effectively using the ecosystem services approach to support and improve stakeholder engagement in marine management?

Data collection and analysis

3 Stakeholder views on the ecosystem services approach: the VALMER interviews

3.1 Introducing the study

As discussed in Chapter 2, stakeholder engagement and the ecosystem services approach play an increasingly important role in marine management. Several recent international policies, EU directives and national legislation include requirements to adopt the ecosystem services approach and involve stakeholders in environmental and marine decision making and management processes (for example UNECE 1998, EU 2000, EU 2008, EU 2014a, EU 2014b, UK 2009). Good stakeholder engagement can contribute to better informed decisions, reduce stakeholder conflicts and facilitate the implementation of management measures by securing stakeholder acceptance and support (Dalton 2005, Fiorino 1990, Korfmacher 2001, Reed 2008, Richardson and Razzaque 2006, Rowe et al. 2008). However, in the marine context, effective engagement of stakeholders is often difficult. There are a large number of different interests in the marine environment, which makes consensus difficult to achieve (Fleming and Jones 2012). Traditionally sectoral marine management approaches have often resulted in conflictual relationships between these different user and interest groups (Douvere and Ehler 2009, Fleming and Jones 2012, Maguire et al. 2012, Mason et al. 2015, Ritchie and Ellis 2010). Moreover, due to fragmented management structures, and because of the lack of clearly defined physical and jurisdictional borders in the marine environment, it is not always obvious who the interested or affected parties are (Maguire et al. 2012, Ritchie and Ellis, 2010, Sutherland and

Nichols 2006). In addition, there is often a lack of understanding of the marine environment, of the connectivity and interdependencies in marine ecosystems, and of the interactions and dependencies between human activities and marine ecosystems (Jones 2002, Rose et al. 2008, Steel et al. 2005).

The ecosystem services approach has emerged as a key tool to support integrated, ecosystem based marine management (Kushner et al. 2012, Laurans et al. 2013b, MEA 2005, Slootweg and van Beukering 2008). It also has the potential to address some of the difficulties of effective stakeholder engagement in marine management. Ecosystem service assessment and/or valuation (ESAV) can help identify relevant stakeholders (Slootweg and van Beukering 2008). Involvement in ESAV provides opportunities for stakeholders to contribute and exchange their knowledge and views and develop a shared understanding of management issues (Berghöfer et al. 2016, Cork and Proctor 2005). This can potentially contribute to better dialogue and relationships between different stakeholders and with managers, better informed decisions and greater acceptance of the resulting management measures by the stakeholders (Albert et al. 2014, Berghöfer et al. 2016, Böck et al. 2015, Cork and Proctor 2005). Evidence from marine case studies suggests that the use of ESAV in marine management processes can have positive effects on marine stakeholder engagement, fostering constructive dialogue and collaboration between stakeholders and marine managers (Kushner et al. 2012, van Beukering et al. 2008). However, as pointed out in Chapter 2, there is little or no evidence on why, how and under what conditions the ecosystem services approach can support improved participatory engagement in marine management.

Addressing this evidence gap, the study presented in this chapter explores the potential opportunities and challenges of using the ecosystem services approach in a stakeholder engagement process for marine management. The study is based on interviews with stakeholders from the VALMER⁷ project. As well as being part of the empirical research presented in this thesis, the study contributed to three of the key outputs of the VALMER project: the VALMER guide on *Improving stakeholder engagement in marine management through ecosystem service assessment* (Friedrich et al. 2015), the VALMER *Advice note for using ecosystem service assessment to support marine governance* (Dodds et al. 2015) and the VALMER evidence base report *The potential role of ecosystem service assessment in marine governance in the western Channel* (Dodds and Friedrich 2015). The interviews were designed and conducted in collaboration with the VALMER research team at Plymouth University and the University of Brest in France. In the methods (section 3.3) it will be made clear in how far other members of the team contributed to developing and conducting the interviews. The analysis of the interview results and interpretation of findings that are presented in this chapter are exclusively the work of the author of this thesis, unless otherwise referenced.

The chapter continues with a brief introduction to the VALMER project and its six case studies. This is followed by a description of the study methods and presentation of the interview analysis results. The chapter concludes with a discussion of the key findings and identification of the research questions that will be addressed in Chapter 4.

⁷ VALMER is an acronym combining the terms 'valuation' and 'mer', the French word for sea. Further information about the VALMER project can be found at www.valmer.eu.

3.2 The VALMER project

The VALMER project explored the potential of ESAV for supporting effective marine management and planning in the English Channel. VALMER was a collaborative project with partners in the UK and France; it ran from September 2012 to March 2015 and was funded by the EU Interreg programme⁸. The project had six case studies in the western English Channel region, three in France and three in the UK (Figure 3.1).

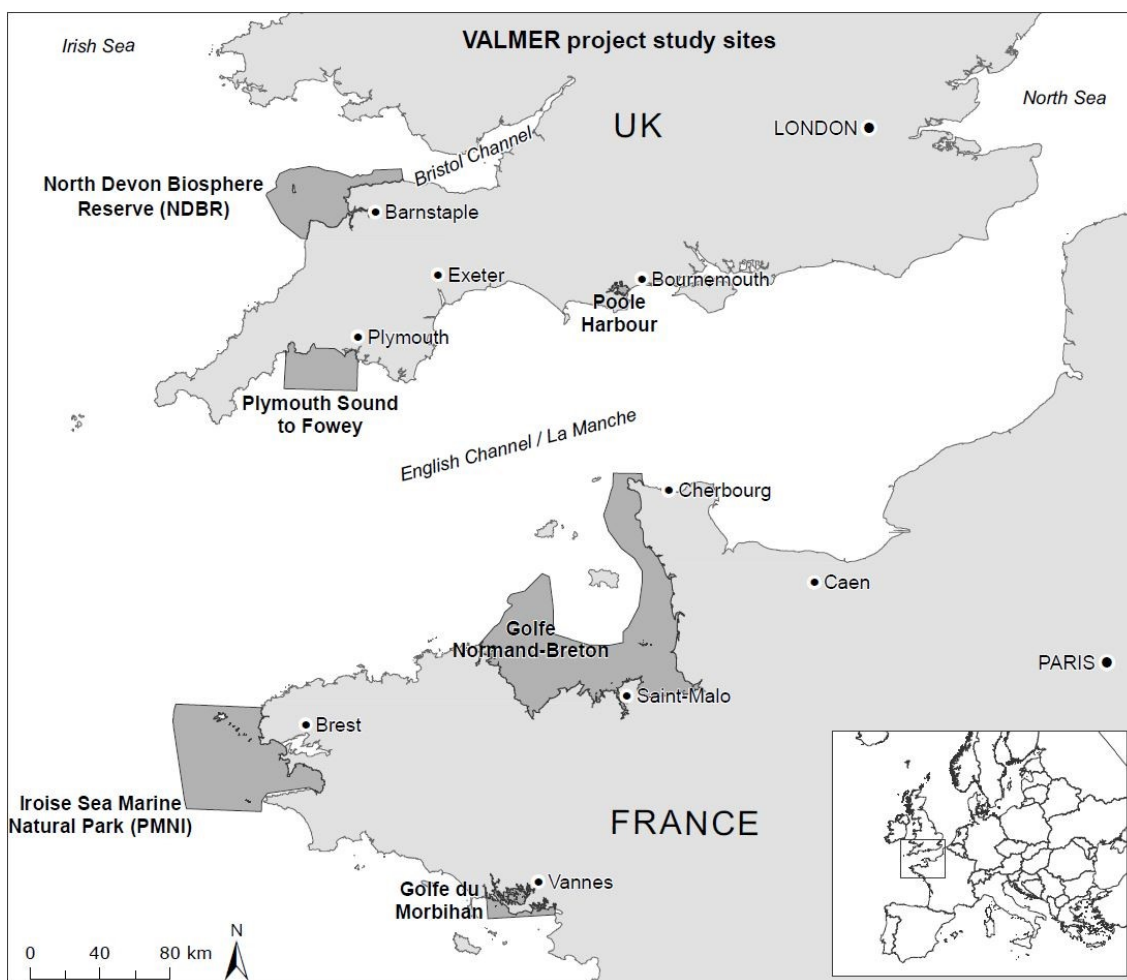


Figure 3.1: A map of the six VALMER project case study sites, illustrated in dark grey: Poole Harbour, North Devon, Plymouth Sound to Fowey, Golfe Normand Breton, Golfe du Morbihan, Iroise Sea Marine Natural Park (source: Marine Biological Association, VALMER Work Package 2, reproduced here with permission)

⁸ The EU Interreg programme provides funding for projects that promote interregional cooperation across Europe. The programme is financed through the European Regional Development Fund.

The six VALMER case study sites were:

- Poole Harbour (PH),
- the North Devon Biosphere Reserve (from now on North Devon, ND),
- Plymouth Sound to Fowey (from now on Plymouth to Fowey, PF),
- the Golfe Normand Breton (GNB),
- the Golfe du Morbihan (GdM),
- the Parc naturel marine d'Iroise (from now on Iroise Sea, PNMI).

Each case study was led by a VALMER case study team and was supported by a local marine stakeholder group. All six case studies followed a similar process (Figure 3.2). Active stakeholder engagement played a central role at four of the sites, while in Poole Harbour and the Iroise Sea engagement of the local stakeholders was more passive (which will be explained in more detail in the following sections 3.2.1 to 3.2.6).

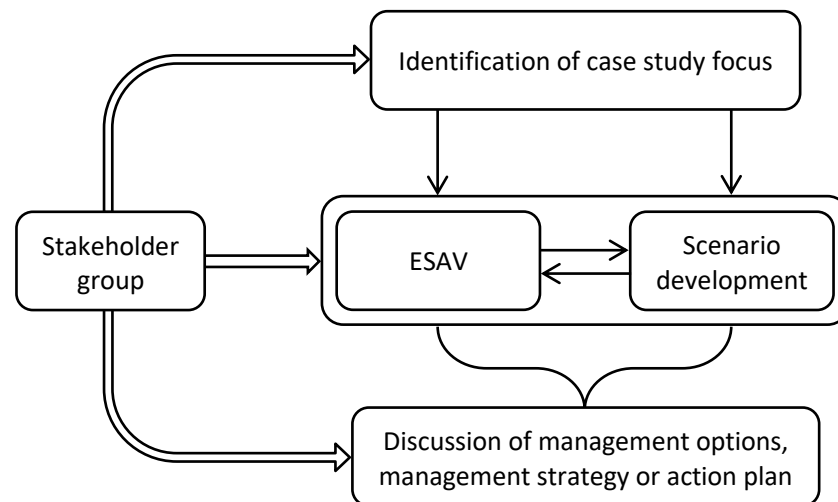


Figure 3.2: Simplified illustration of the VALMER case study process and involvement of the stakeholder groups in the different steps

The first step of the process was the identification of a case study focus for the ESAV. Next, the case study team conducted the ESAV with the support of the local stakeholders who contributed local knowledge and validated the information that went into the ESAV. In parallel, the stakeholders participated in a scenario building exercise. The resulting management scenarios were combined with the outputs of the ESAV and handed back to the stakeholder group for a discussion on how ESAV could inform local management decisions or support the development of local action plans.

The six case studies differed in terms of marine ecosystems, ESAV focus and methods, the local governance context and management issue that was addressed, the stakeholder groups and the degree to which they were involved in the process. A detailed description of the six case studies can be found in Dodds and Friedrich (2015). Here, a short introduction to each case study is given, describing the ESAV focus and approach, the stakeholder group and engagement process and the way in which the ecosystem services approach was explained at each site.

3.2.1 Poole Harbour

ESAV focus and approach

The Poole Harbour case study focused on the value of recreational ecosystem services from marine ecosystems in the harbour in terms of contribution to the local economy and importance for recreational users. Six recreational activities were valued using the travel cost method (monetary valuation based on travel expenses) and an analytic hierarchy process (method that establishes a hierarchy of importance for different factors). In this case study, no management scenarios were developed.

Stakeholder group and engagement

The case study stakeholders were members of the Poole Harbour Steering Group (PHSG), a voluntary partnership of local government authorities and statutory bodies that provides a framework for coordinated management of the harbour. In Poole Harbour, engagement of the stakeholders was limited to passive reception of information through VALMER presentations at two Steering Group meetings as well as one public meeting (Table 3.1). At the first meeting, the stakeholders were introduced to the VALMER project as well as the ESAV approach in the Poole Harbour case study. At the second Steering Group meeting and the public meeting, the results of the ESAV were presented. The Poole Harbour stakeholders were not actively involved in the selection of the case study focus or the ESAV process.

Table 3.1: The stakeholder participation process in the Poole Harbour case study, including the main activities at each workshop or meeting

Workshop	Main activities
PHSG May 2013	Introduction of VALMER and the case study Presentations on ESV methods and preliminary ESV results
PHSG Nov 2013	Presentation of final ESAV results

Explanation of ecosystem services approach

In the Poole Harbour case study, the ecosystem service approach was not explained to the stakeholders. The information provided by the case study team focused on the ESAV done in the case study, thus on monetary valuation and analytical prioritisation of factors related to recreational activities.

3.2.2 North Devon

ESAV focus and approach

The North Devon case study focused on the value of subtidal sedimentary habitats in supporting commercial fisheries, carbon sequestration and waste remediation. Three ecosystem services (nursery habitats, carbon storage, waste processing) were assessed through ecosystem service mapping and weighing. The ESAV was fed into a socioecological Bayesian belief network model, revealing value changes in ecosystem service provision under three different management scenarios: 1) designation of Marine Conservation Zones, 2) aggregate extraction, 3) aquaculture development. The changes in ecosystem service values under different management scenarios were illustrated using maps showing changes in the spatial distributions of the services and quantified in terms of percentage of service increase or decrease. No monetary valuation was done in North Devon.

Stakeholder group and engagement

The case study was closely linked to the North Devon Biosphere Reserve⁹. The management of the Biosphere Reserve is coordinated by a partnership of local authorities, organisations and groups with an interest in or responsibility for the management of the site. The North Devon stakeholders included members of the Biosphere Reserve Management Partnership as well as the Northern Devon Fisheries Local Action Group. Stakeholder engagement in the North Devon case study took place in two steps. At the beginning of the case study process, an informal stakeholder

⁹ The North Devon Biosphere Reserve is part of the Man and Biosphere programme of the United Nations Educational, Scientific and Cultural Organization.

consultation supported the identification of a relevant focus for the North Devon ESAV through the Triage process (Pendleton et al. 2015). In a second step, the stakeholders were then engaged in a series of four workshops (Table 3.2). At these workshops, the stakeholders received information about the ecosystem services approach in general as well as the ecosystem services under consideration in the case study. They were asked to validate the data that the case study team had collected and to contribute any additional information and knowledge that might support the ESAV. Further, the stakeholders were actively involved in the selection and development of management scenarios and pressure maps for the case study site.

Table 3.2: The stakeholder participation process in the North Devon case study, including the main activities at each workshop or meeting

Workshop	Main activities
WS 1 Dec 2013	Introduction of VALMER and the case study Reengagement of stakeholders after initial consultation in Jan 2013 Presentations on ecosystem services and ESAV, scenario building and socioecological modelling Breakout sessions: validation of data for the ESAV, gathering of information and local knowledge to support the ESAV
WS 2 Jan 2014	Introduction to scenario building Presentations on management scenarios and case study scenario building approach Stakeholder suggestions and selection of scenario themes Breakout session: initial development of scenario narratives and pressure maps
WS 3 Apr 2014	Presentation and discussion of scenario proposals Scenario scoring exercise: selection of three priority scenarios Explanation of case study ESAV approach ESAV scorecard exercise Introduction to the socioecological model used in the case study
WS 4 Sept 2014	Presentation and discussion of ESAV and socioecological modelling outcomes for the three priority scenarios Breakout session: discussion of the use of ESAV in marine and coastal governance

Explanation of ecosystem services approach

In North Devon, ecosystem services were introduced as nature's benefits for humans and different examples of provisioning, cultural and regulating services were provided. The ecosystem services assessed in the case study were explained as services provided by subtidal sedimentary habitats that support commercial fisheries, carbon sequestration and waste remediation (benefits). The ecosystem services approach was presented as a management tool 1) to understand the links between the environment and people and communicate the importance of nature, and 2) to determine the value of the environment in order to compare it to the value of proposed developments.

3.2.3 Plymouth to Fowey

ESAV focus and approach

The Plymouth to Fowey case study focused on the value of the ecosystem services provided by intertidal and subtidal habitats. Four ecosystem services (nursery habitats, coastal defence, waste processing, carbon storage) were assessed and valued using habitat mapping and benefits transfer (method that uses values from comparable studies). In addition, cultural ecosystem services (recreation and wellbeing) were assessed separately through a survey of local residents. The ESAV results were fed into three management scenarios: 1) change of recreational moorings, 2) increased conservation in Marine Protected Areas, 3) dredge disposal.

Stakeholder group and engagement

The Plymouth to Fowey stakeholders were formally organised in a task and finish group that included key individuals and organisations with responsibilities for the management of marine and coastal areas within the site. The task and finish group came together for four workshops (Table 3.3). In this case study the case study team proposed a focus for the ESAV and the stakeholders had the opportunity to comment and provide suggestions. The stakeholders were also asked to help fill data gaps to support the ESAV and were actively involved in the scenario building.

Table 3.3: The stakeholder participation process in the Plymouth to Fowey case study, including the main activities at each workshop or meeting

Workshop	Main Activities
WS 1 May 2013	Introduction of VALMER and the case study Presentations on ecosystem services approach and ESAV, use of ESAV for governance and visualisation of spatial data Agreement of Terms of Reference for task and finish group Discussion and selection of ESAV scope and focus Request for stakeholder-held data
WS 2 Mar 2013	Presentations on baseline mapping, cultural ecosystem services research and case study scenario building approach Validation of scenario focus and start of scenario building process Breakout sessions: validation and improvement of socioecological model and governance modelling; PESTLE10 analysis
WS 3 Jun 2014	Scenario building: development of actions for three scenarios
WS 4 Oct 2014	Presentation and discussion of scenario and ESAV results Presentation on findings of Cultural Ecosystem Services project

Explanation of ecosystem services approach

At the start of the engagement process in the Plymouth to Fowey case study, the ecosystem services approach and its use in marine governance were explained to the

¹⁰A PESTLE analysis is the analysis of political, economic, socio-cultural, technological, legal and environmental factors to support strategic decision making.

stakeholders. Ecosystem services were presented as the beneficial role that ecosystems play in enhancing or maintaining aspects of human wellbeing and society. Different examples were given, such as food production, climate regulation, flood protection, pollution sinks, recreational and aesthetic benefits. The concept of monetary valuation was also explained.

3.2.4 Golfe Normand Breton

ESAV focus and approach

The case study focused on the assessment of food provision and recreational services provided by tidal and subtidal habitats in the Golfe Normand Breton. The ESAV involved mapping of habitats, functions and services, socioeconomic and cumulative impact risk modelling, as well as an analysis of human-ecosystem interactions in the gulf, but no monetary valuation. The initial ESAV was conducted by the case study team. This was followed by the stakeholder led scenario building process which qualitatively explored how the provision of ecosystem services would change under four different management scenarios: 1) rapid industrialisation, 2) harmonious development in a protected environment, 3) reactive enforcement of environmental policy, and 4) deliberate ignoring of economic and environmental constraints.

Stakeholder group and engagement

The stakeholder group in the Golfe Normand Breton included a range of local authorities, organisations and groups with an interest in or responsibility for the management of the site. The case study was set in the context of the development of a new marine park in the gulf. At the start of the engagement process in the Golfe

Normand Breton, the stakeholders were invited to a ‘common culture’ workshop which aimed to share understanding and knowledge about the ecosystem services approach in general and ecosystem services in the gulf. This was followed by three scenario workshops and a series of separate expert meetings with different stakeholder groups (Table 3.4). In these workshops and meetings the stakeholders were actively involved in the identification of an ESAV focus and of the management questions to be addressed in the case study, as well as the development of different scenarios for these management questions.

Table 3.4: The stakeholder participation process in the Golfe Normand Breton case study, including the main activities at each workshop or meeting

Workshop	Main Activities
Common culture WS Nov 2013	Generation of a common understanding of ecosystem services of the relevance of ESAV for marine management Presentations on ecosystem services in general and at the case study site Discussion on ecosystem services Opportunity to comment on and contribute information to ESAV Breakout sessions: identification and formulation of themes of common interest for scenario building
Scenario WS 1 Feb 2014	Presentation of ESAV focus Discussion of scenario topics and identification of priority topics for scenario building Breakout session: identification of scenario parameters, PESTLE analysis Questionnaire on the importance of human activities in the gulf Activity mapping and weighting exercise
Scenario WS 2 Apr 2014	Breakout session: initial outlining of scenario narratives
May/Sept 2014	Expert meetings: meetings with local experts to consolidate the scenario narratives
Scenario WS 3 Nov 2014	Validation of the scenarios
Final WS Jan 2015	Presentation of the ESAV results Discussion of the use of ESAV for marine management

Explanation of ecosystem services approach

In the Golfe Normand Breton, the information that the stakeholders received on the ecosystem services approach at the start of the engagement process was very comprehensive. The ecosystem services approach was described as an approach that takes into consideration both the ecological functioning of an ecosystem and the social demand on this ecosystem. Ecosystem services were explained as the benefits that humans get from an ecosystem. These services were linked to ecological functions and habitats. The stakeholders were introduced to the Millennium Ecosystem Assessment (MEA 2005) and TEEB (2010) classifications and were given examples of provisioning, regulating, cultural and supporting ecosystem services. The concept of economic valuation was also explained as well as the potential uses of valuation in management. Finally, some of the ecosystem services provided by the habitats in the Golfe Normand Breton were presented.

3.2.5 Golfe du Morbihan

ESAV focus and approach

The case study in the Golfe du Morbihan focused on the assessment of the ecosystem services provided by local seagrass beds. Three sets of ecosystem services, linked to three different ecosystem functions of seagrass beds, were assessed using a multi-criteria approach including mapping of habitats, activities, benefits and pressures. No monetary valuation was conducted.

Stakeholder group and engagement

The Golfe du Morbihan stakeholder group included representatives from a range of local authorities, organisations and groups with an interest in or responsibility for the management of the site. The case study was set in the context of the management and protection of seagrass beds in the gulf. Similar to the Golfe Normand Breton, the case study in the Golfe du Morbihan started with a 'common culture' workshop to introduce the VALMER project and share knowledge about the ecology and regulations for the protection of seagrass beds. This was followed by a knowledge-sharing workshop for ecologists and managers and six thematic focus groups with six user groups of the Golfe du Morbihan (Table 3.5). In these workshops the different stakeholder groups had the opportunity to share their expert or local knowledge and explain the interaction of their activities with the seagrass beds in the gulf. On this point the engagement process in the Golfe du Morbihan differed from the UK case studies, where the knowledge exchange took place with a mixed group of stakeholders, and from the Golfe Normand Breton, where a combination of mixed and expert meetings was used. For the scenario development in the Golfe du Morbihan, the different stakeholders were brought together in one scenario building workshop.

Explanation of ecosystem services approach

In the Golfe du Morbihan, ecosystem services were explained in the context of seagrass beds as the benefits that humanity, society or different stakeholders get from the seagrass beds through ecological functions and processes. However, the focus of the case study work was on human interactions with seagrass beds and the management of pressures from human activities. The broader context of ecosystem

services and assessment as an approach to support ecosystem based management was only presented at the final event. Two assessment options were presented to the stakeholders: monetary valuation and multi-criteria assessment.

Table 3.5: The stakeholder participation process in the Golfe du Morbihan case study, including the main activities at each workshop or meeting

Workshop	Main activities
Common culture WS Sept 2013	Introduction of VALMER and the case study Presentations on regulations relevant for the protection of seagrass beds and on the ecology of seagrass beds Introduction of the seagrass online platform under development as part of the case study General discussion and opportunity for suggestions
Ecologists and managers WS Feb 2014	Workshop for seagrass ecologists, local managers and policy makers Sharing of scientific seagrass knowledge and information about issues at different seagrass sites Identification of the knowledge, evidence and tools needed to support sustainable seagrass management Identification, discussion and agreement on ecosystem functions and services of seagrass beds in the Golfe du Morbihan
6 thematic focus groups Jan-Jun 2014	Recreational fishing (Jan 2014); Sailing and mooring (Feb 2014); Recreational activities (Mar 2014); Professional fishing (May 2014); Shellfish farming (Jun 2014); Water quality (Jun 2014) Stakeholder consultation and discussion: gathering and sharing of knowledge about seagrass beds and interactions of marine activities with seagrass beds Identification of new management options or improvements Mapping exercise to visualise ecosystem services of seagrass beds and potential pressures from human activities
Scenario and management options WS Sept 2014	Presentation of seagrass distribution maps and seagrass ecosystem services in the Golfe du Morbihan Identification and discussion of possible seagrass management strategies and management measures for the gulf
Seagrass event WS Dec 2014	Sharing of case study results with stakeholders, scientists and managers from France and the UK, including presentations on the ecosystem approach and ecosystem services Round table discussions on local stakeholders' points of view on seagrass and seagrass management around France

3.2.6 Iroise Sea

ESAV focus and approach

The Iroise Sea case study assessed the ecosystem services provided by local kelp forests. Again, a Triage process was applied to identify the ESAV focus which was on kelp, commercial fish species and heritage species (seals) and their role in supporting maintenance and regulation services (habitat, trophic network), provisioning services (commercial fisheries, alginates) and cultural services (symbolic value, ecotourism). The ESAV was integrated into a dynamic socioecological model to simulate changes in provision of ecosystem services under different fisheries management options. This was followed by a multi criteria ecosystem services assessment under different fisheries management scenarios. The ESAV approach in the Iroise Sea case study did not include monetary valuation.

Stakeholder group and engagement

Similar to Poole Harbour, in the Iroise Sea case study no active stakeholder engagement took place. The case study was set in the context of the management of kelp harvesting in the Iroise Sea marine park and focused on the technical aspects of ESAV and socioecological modelling. The different stakeholders involved in the marine park were informed about the case study work at meetings of the management council of the marine park, local fisheries stakeholder meetings and in one to one conversations between members of the case study team and stakeholders.

Explanation of ecosystem services approach

As mentioned above, the ecosystem services of kelp forests in the Iroise Sea were discussed in terms of their contribution to maintenance and regulation, provision and cultural ecosystem services. Some individual stakeholders and groups were also involved in discussions about the socioecological model and management scenarios. However, due to the absence of a consistent engagement process, such as took place at other sites, not all marine park stakeholders that became involved in the Iroise Sea case study necessarily received the same information.

3.2.7 Different use of terminology in France and the UK

In all three French case studies, the terms 'ecosystem services' and 'ecosystem service assessment' were not frequently used in the stakeholder workshops and meetings. Instead, the French stakeholders were engaged in discussions about activities, uses, benefits linked to the health of local marine habitats and human pressures on these habitats. In the UK case studies, while the stakeholders did also discuss activities, benefits and impacts, the terms 'ecosystem services' and 'assessment' were frequently used in the different workshops and meetings.

3.3 Methods: stakeholder interviews

3.3.1 Rationale for using the VALMER case studies and semi structured interviews

As described above, VALMER explored the use of ESAV as a tool for marine management and planning in six case studies across the western English Channel region. The governance context, marine ecosystem and ecosystem services, ESAV approach, as well as the stakeholder group involved in the case study were different at each site. Thus, the VALMER case studies provided a good opportunity to explore the application of different ESAV approaches in different governance and engagement contexts with different stakeholders groups.

The case studies were designed to follow the same stakeholder based process, including active stakeholder contribution to and participation in the ESAV, scenario building and development of management options through a series of workshops. However, due to site specific circumstances as well as the resources and capacity of the project teams at each site, the implementation of the case study process differed considerably between the sites. In consequence, as described in section 3.2, the level and form of involvement of stakeholders in the case study process also varied from site to site. This is summarised in Table 3.6.

The diversity of contexts, ESAV approaches and engagement processes across the six case studies required a flexible approach for assessing the stakeholders' engagement experiences and capturing their views on the ecosystem services approach. For this purpose, a semi structured interview approach was applied. This allowed the questions to be easily adapted to the different case studies as well as going into detail to understand the stakeholders' responses in their respective contexts.

Table 3.6: Summary of the stakeholder groups and stakeholder engagement in the case study processes at the six VALMER case study sites

Case study	Stakeholder group	Stakeholder engagement
Poole Harbour	Poole Harbour Steering Group (managers and regulators)	No contribution to ESAV process No scenario building Stakeholders were informed about ESAV process and presented with ESAV outputs
North Devon	Biosphere Reserve Marine Working Group, relevant user and interest groups	Active contribution to ESAV process Participation in scenario building Discussion of management options
Plymouth to Fowey	Managers and regulators with marine and coastal responsibilities for the site	Active contribution to ESAV process Participation in scenario building Discussion of management options
Golfe Normand Breton	Local managers, user and interest groups involved in the marine park project	Active contribution to ESAV process Participation in scenario building Discussion of management options
Golfe du Morbihan	Local managers, user and interest groups involved in the natural park project	Active contribution to ESAV process Participation in scenario building Discussion of management options
Iroise Sea	Local managers, user and interest groups involved in the management of the marine park	No contribution to ESAV process No scenario building Stakeholders were informed about ESAV process and presented with ESAV outputs

Semi structured interviews are the most commonly used qualitative method to explore people’s perceptions, attitudes and opinions, behaviours and experiences (Barriball and While 1994, Descombe 2014, Stroh 2000). They consist of open ended questions that define the topics to be explored during the interview. The interviewer has the flexibility to adapt the wording and order of the questions to the individual interview circumstances, allowing the respondents to share their views and focus on aspects that are of importance to them (Barbour 2014, Descombe 2014, Gill et al. 2008, Sarantakos 2013, Stroh 2000). Prompts and probes can be used to explore specific aspects in more

detail (Barriball and While 1994, Burton 2000, Descombe 2014, Sarantakos 2013). Moreover, the direct dialogue between interviewer and respondent allows the explanation and clarification of questions and answers, making semi structured interviews a suitable method for discussing complex and sensitive topics (Barriball and While 1994, Burton 2000, Descombe 2014, Sarantakos 2013).

In contrast, questionnaire based, structured interviews contain standardised questions in a fixed order that require specific answers. These types of surveys do not allow any flexibility to adapt to differences between respondents or interview contexts (Barriball and While 1994, Sarantakos 2013, Stroh 2000, Valentine 1997). Thus, a questionnaire based approach would not have provided the flexibility and detail needed to address the differences between the VALMER case studies. A structured questionnaire would have had to be adapted to each case study context and would have offered limited opportunity of exploring the stakeholders' views and experiences in more depth.

Semi structured interviews are not without difficulties and limitations, including the following:

- The 'interviewer effect', referring to the potential influence of the interviewer's interviewing style and personal traits (especially age, sex and ethnicity) on the respondents' responses (Descombe 2014, Myers and Newman 2007, Sarantakos 2013, Stroh 2000);
- Interviews require a considerable time commitment (Descombe 2014, Myers and Newman 2007, Sarantakos 2013);
- Lack of anonymity for the respondents (Sarantakos 2013);
- Lack of trust between interviewer and respondents (Myers and Newman 2007);
- Interviews can be perceived as intrusive (Descombe 2014, Sarantakos 2013).

However, most of the limitations raised in the literature refer to situations in which no previous relationship between interviewer and respondents exist, for example surveys of the general public or specific subgroups of the population (Descombe 2014, Myers and Newman 2007, Sarantakos 2013). In the study presented in this thesis, a pre-established connection existed between the interviewers and the respondents by being part of the same project. Sturges and Hanrahan (2014) found that familiarity with the interviewer had a positive effect on people's readiness to take part in an interview. In some instances, the researchers who conducted the interviews and the interviewed stakeholders had previously met at the case study workshops. At the same time, the researchers conducting the interviews were not responsible for running the workshops but merely assisted in the facilitation. This limited the risk that the stakeholders would feel inhibited to openly express their views on the workshops, including criticism, in the interviews. Lastly, the fact that only two researchers conducted all interviews limited the potential implications of a possible 'interviewer effect' in so far as the potential influence of the interviewers' personality or style would have been the same for all participants (Bell 2010).

In addition to open ended questions, the VALMER stakeholder interview did include three sets of closed statements to which the stakeholders were asked to agree or disagree on a six point Likert scale (don't know, strongly disagree to strongly agree). Part of these statements addressed specific aspects regarding the use of ESAV in marine management and planning that were relevant for the VALMER project outputs (see Dodds and Friedrich 2015, Dodds et al. 2015). The purpose of the remaining statements was to support the assessment of the stakeholders' engagement

experience based on a set of criteria for 'good engagement' which will be introduced in the following section.

3.3.2 Interview design

The interview was designed to assess the implications of using the ecosystem services approach in stakeholder based marine management processes in the VALMER case studies. More specifically, the two objectives of the interview were:

- 1) to assess how the ecosystem services approach had contributed to the engagement processes in the case studies, and
- 2) to explore what the stakeholders thought about how ESAV could support marine management and planning.

The second objective was addressed by open ended questions and closed statements on the opportunities and challenges of using ESAV as a tool for marine management and planning. This part of the interview was designed in close collaboration with colleagues from the VALMER team in Plymouth and Brest and was used to inform two of the main project outputs (Dodds and Friedrich 2015, Dodds et al. 2015). Copies of the interview protocol, in English and French, can be found in Appendix 3.

This thesis chapter focuses on the first objective. The questions and closed statements for objective one were designed (by the author of this thesis) based on a set of criteria for constructive and effective stakeholder engagement, the 'good engagement' criteria presented in Table 3.7. These 'good engagement' criteria were developed from existing engagement evaluation criteria frameworks identified in the marine and environmental engagement literature (see Chapter 2.1.4 for references and

descriptions of the criteria frameworks). From these frameworks, those criteria were selected that the ecosystem services approach could potentially contribute to:

- as a concept (an ecosystem services perspective),
- as a source of information and evidence (for example ESAV outputs),
- and/or as a practical process (active involvement in ESAV through contribution, validation and exchange of information).

The idea behind this criteria based approach was to assess whether the ecosystem services approach had contributed to good engagement in the case studies by testing the stakeholders' responses against the criteria. For this purpose, the part of the interview that addressed the first objective included open ended questions and closed statements on: 1) the stakeholders' motivation for participating in the VALMER project, 2) their understanding of and views on the ecosystem services approach (including ESAV and monetary valuation) and how this had changed through the case studies, 3) what the case studies added to the stakeholders' understanding of their sites, and 4) how they found the experience of working with ESAV in the case study workshops. At the end of the interview the stakeholders were asked to explain the terms 'ecosystem services' and 'ecosystem service assessment' (or 'ecosystem service valuation, depending on the terminology used in the respective case studies) in their own words in order to test their understanding of these concepts.

Table 3.7: ‘Good engagement’ criteria for evaluating the potential contribution of the ecosystem services approach to effective stakeholder engagement, including explanations and the rationale for choosing the criteria

Criteria	Explanation of the criteria	Rationale for criteria selection: potential contribution of ESAV?
Motivation to get involved	Participation should be attractive and interesting to the stakeholders	ESAV is potentially attractive and interesting because it is innovative and relevant in the current marine policy and management context
Representativeness	All potentially affected and/or interested parties should be represented	ESAV can potentially help identify relevant, affected and/or interested stakeholders
Inclusiveness	All participants should have opportunities to contribute and participate	ESAV allows integration of different information, potentially enabling all participating stakeholders to contribute and validate information
Accessible information	The participants should have access to easy to understand and relevant information	ESAV is relevant in the current marine policy and management context and can be presented in accessible formats for different audiences
Building capacity	Participants should be enabled to acquire the skills, knowledge and confidence to participate and make informed decisions	ESAV can potentially contribute to developing a shared and improved understanding of human-ecosystem interactions and management contexts, and to fostering better understanding among different stakeholders
Dialogue and discussion	The engagement process should be deliberative and interactive	ESAV allows stakeholders to contribute and validate information and can potentially provide opportunities for exchange and discussion
Exchange of knowledge and views	The engagement process should enable multi-way exchange of knowledge and views	ESAV allows integration of different information and perspectives, thus providing a potential platform for exchanging knowledge and views
Integration of different information and perspectives	The engagement process should enable the integration of different information and perspectives	ESAV allows integration of different forms of knowledge and information and different perspectives and values
Trust and respect	The engagement process should take place in an atmosphere of trust and respect among all involved parties	ESAV can potentially foster trust and respect by contributing to developing a shared understanding of management contexts and fostering better understanding among different stakeholders

The questions and statements were adapted slightly for the Poole Harbour and Iroise Sea case studies as stakeholders at these two sites were not actively involved in the ESAVs or scenario building. Since the interview was specifically tailored to the VALMER case studies, no separate pilot study could be conducted. Instead, the interview was tested with colleagues involved in other parts of the project. Further, as the Poole Harbour case study finished slightly ahead of the other sites, it provided an opportunity to test the interview questions with case study stakeholders. Following the Poole Harbour interviews, it was decided to omit one question. Originally, to break the ice (Descombe 2014, Oppenheim 1992), at the beginning of the interview the stakeholders were asked to explain their roles. However, in the Poole Harbour interviews it was found that this took too much time, making the interview unnecessarily long and potentially reducing time and concentration for the discussion of more important questions.

3.3.3 Ethical considerations

Ethical approval for the interviews was obtained from the Human Ethics Committee of the Faculty of Science and Environment at Plymouth University. No ethical concerns were raised by the Committee. The interview included an introductory statement explaining the purpose of the study. The stakeholders were assured that all data would be analysed and presented anonymously. They were given the right to withdraw their data from the study at any time. Oral consent was obtained from the stakeholders for the interview to be recorded and their data to be used in this study.

3.3.4 Conducting interviews with French and UK stakeholders

The interview was developed in English by the author of this thesis, in collaboration with the VALMER research team in Plymouth and Brest. For the French case studies, the interview was translated into French by the author of this thesis with assistance from French VALMER colleagues. Across the six sites, 39 interviews were conducted with stakeholders that had taken part in all or most of the case study workshops and meetings. Four interviews were conducted in Poole Harbour, nine in North Devon, seven in Plymouth to Fowey, seven in the Golfe Normand Breton, eight in the Golfe du Morbihan and four in the Iroise Sea. Table 3.8 gives an overview of the 39 respondents. Stakeholders were categorised by status and function to enable a differentiated analysis. The interviews were conducted as soon as possible after the final stakeholder event or, where this was not feasible due to VALMER project deadlines, as late as possible in the case study process.

The interviews with the UK stakeholders were conducted in English over the phone by the author of this thesis and a colleague from the VALMER research team at Plymouth University. With one exception, the French stakeholders were interviewed face to face by the author of this thesis during a three week field trip to the French case study sites in November and December 2014. The interviews that took place during the field trip were conducted in French. At each interview, the thesis author was accompanied by a French colleague to help in case of language related communication issues, though their assistance was only required a few times. One French stakeholder was not available during the French field trip and was therefore interviewed over the phone by the thesis author, partly in English and partly in French.

Table 3.8: Overview of the 39 respondents, including number of stakeholders interviewed by site and a breakdown of respondents by status and function for each case study

Case study	Number of respondents	Number of respondents by status	Respondents by function
Poole Harbour	4	1 Public authority	Local governance
		1 Public authority	Navigation management
		1 Public authority	Nature conservation
		1 Commercial	Water management
North Devon	9	1 Public authority	Local governance
		1 Public authority	Fisheries management
		1 Public authority	Nature conservation
		1 NGO	Nature conservation
		1 Commercial	Navigation management
		1 Interest group	Nature conservation
		3 Interest group	Recreation
Plymouth to Fowey	7	2 Public authority	Local governance
		1 Public authority	Fisheries management
		2 Public authority	Nature conservation
		1 NGO	Nature conservation
		1 NGO	Heritage conservation
Golfe Normand Breton	7	1 Public authority	Local governance
		2 Public authority	Fisheries management
		2 Public authority	Nature conservation
		1 Commercial	Fisheries
		1 Commercial	Renewable energy
Golfe du Morbihan	8	3 Public authority	Local governance
		1 Public authority	Elected representative
		2 Commercial	Fisheries
		1 Commercial	Recreation
		1 Interest group	Recreation
Iroise Sea	4	1 Public authority	Area based management
		2 Commercial	Fisheries
		1 NGO	Nature conservation

Different views on the advantages and disadvantages of telephone and face to face interviews can be found in the literature (for example Burton 2000, Fenig et al. 1993, Holbrook et al. 2003, Sarantakos 2013). Sturges and Hanrahan (2014) conducted a literature review on the suitability of telephone interviews for qualitative research which revealed that, compared to face to face methods, telephone interviews are regarded as acceptable data collection methods. However, with regard to the quality of data their findings varied, as some studies showed significant differences and other studies showed no significant differences (Sturges and Hanrahan 2014). In their own comparative study, in which the same interview was conducted by telephone and face to face with similar numbers of respondents from the same sample group, Sturges and Hanrahan (2014) found that the interview mode had no effect on the quantity and quality of responses. The participants' preferences for one mode or the other were mainly due to convenience and privacy considerations (Sturges and Hanrahan 2014). Overall, the literature suggests that it can be assumed that the different interview approaches adopted for the UK and French case studies did not have a significant effect on the quality of the data. In the UK, a telephone based approach allowed a large number of interviews to be conducted with stakeholders spread across a wide geographical area at their convenience and at minimal cost and time requirement for both the interviewers and the stakeholders. In France, face to face interviews were the preferred approach as the direct personal contact facilitated the communication in French between the interviewer and the stakeholders.

3.3.5 Interview analysis

The theory behind qualitative analysis

As Stroh (2000) and Sarantakos (2013) point out, there are various theoretical and methodological approaches to qualitative analysis. According to Punch (2005), this diversity of analytical approaches is due to the fact that “qualitative data can be looked at from different perspectives” (Punch 2005, p. 194) and the choice of methods depends on the purpose of the research (Punch 2005, Stroh 2000). Stroh (2000) distinguishes between approaches with predetermined analytical parameters to test existing concepts or theories and approaches where the analytical parameters are determined by the data. This second type of approach can be used to explore attitudes, opinions or experiences (Stroh 2000); one example is grounded theory (first described in Glaser and Strauss 1967). Braun and Clarke (2006) and Creswell (2014) discuss analysis methods that are based on or aim to generate theory on one hand and methods that are independent from theory on the other. Examples for theory independent methods are thematic analysis (Braun and Clarke 2006) or analyses that describe a phenomenon based on people’s experiences (Creswell 2014). Table 3.9 gives a brief overview of four of the main approaches for qualitative analysis discussed in the literature.

Table 3.9: Overview of four key approaches for qualitative analysis

Qualitative analytical approaches	References
<p>Thematic analysis</p> <p>Thematic analysis is a flexible method for identifying and analysing themes and patterns in data through organisation (coding), description and interpretation of the data. Thematic analysis is not based on or aimed at developing theory and can be applied within different theoretical frameworks.</p> <p>Braun and Clarke 2006 describe six steps:</p> <ol style="list-style-type: none"> 1. Familiarisation with the data: <ul style="list-style-type: none"> - Transcribing and reading all data 2. Generating initial codes: <ul style="list-style-type: none"> - Systematically coding features of interest to the research question - Organising the data into the codes 3. Searching for themes: <ul style="list-style-type: none"> - Sorting the codes into themes - Collating all relevant data for each theme 4. Reviewing the themes: <ul style="list-style-type: none"> - Checking and refining the themes - Generating a thematic map (identifying patterns and relationships between themes) 5. Naming and defining the themes: <ul style="list-style-type: none"> - Analysing individual themes and patterns in relation to the research question - Clearly naming and defining the themes 6. Final analysis and reporting: <ul style="list-style-type: none"> - Relating the themes and patterns back to the research question and literature - Making sense of what the data does/might mean - Presenting the data and analytical narrative using examples 	<p>Barbour 2014</p> <p>Braun and Clarke 2006</p> <p>Sarantakos 2013</p>
<p>Grounded theory</p> <p>Grounded theory is a qualitative research method and analysis procedure to derive/develop theory from the interpretation of empirical data. Grounded theory analysis is based on systematic coding and categorisation of data:</p> <ol style="list-style-type: none"> 1. Substantive coding: identification of themes in the data (also open/in-vivo coding) 2. Theoretical coding: finding relationships between themes and linking them in theoretical models 3. Core coding: conceptualisation of theoretical models 	<p>Glaser and Strauss 1967</p> <p>Punch 2005</p> <p>Ryan and Bernard 2000</p> <p>Sarantakos 2013</p> <p>Stroh 2000</p>
<p>Constant comparative analysis</p> <p>The constant comparative analysis method systematically identifies similarities and differences or patterns and exceptions (through coding) and tries to explain these.</p>	<p>Barbour 2014</p> <p>Harding 2013</p>

Table 3.9 continued	
<p>Content analysis</p> <p>Content analysis is a flexible method for interpreting the content of text data through systematic coding and identification of themes and patterns.</p> <p>Hsieh and Shannon (2005) distinguish between three approaches:</p> <ol style="list-style-type: none"> 1. Conventional content analysis <ul style="list-style-type: none"> - to describe a phenomenon when existing theory/literature is limited - coding categories are derived from the data 2. Directed content analysis <ul style="list-style-type: none"> - to validate or extend an existing theory - coding is guided by theory/relevant research findings 3. Summative content analysis <ul style="list-style-type: none"> - quantitative analysis and comparison of themes in the data 	<p>Berg and Lune 2012</p> <p>Hsieh and Shannon 2005</p>

Despite different underlying theories and concepts, various authors list common features and similar steps of qualitative analysis (for example Berg and Lune 2012, Creswell 2014, Miles and Huberman 1994). What the different approaches to qualitative analysis have in common is:

- 1) The systematic organisation of the data through coding;
- 2) Interpretation of the data through the identification of themes, patterns and relationships between themes;
- 3) Consideration of the findings in relation to the research question as well as existing literature and theories.

One central element in all approaches is coding (Barbour 2014, Berg and Lune 2012, Ryan and Bernard 2000, Sarantakos 2013, Stroh 2000). Hsieh and Shannon (2005) describe coding as organising text data into content categories. Punch (2005) distinguishes between 1) basic descriptive coding to organise the data and start the analysis, and 2) advanced coding to identify patterns and themes and interpret the data. According to Braun and Clarke (2006), coding identifies features of interest to the

researcher. The main difference between qualitative analytical approaches is whether the coding framework is predetermined or data induced (Punch 2005, Stroh 2000). Braun and Clarke (2006) describe two ways of identifying themes through coding:

- 1) Inductive, bottom up coding without predetermined categories or frameworks;
- 2) Theoretical/deductive, top down coding driven by theoretical interests or by the research question.

The following sections of this chapter will describe the analysis process that was applied to the VALMER stakeholder interviews. A thematic analysis was applied, similar to that described by Braun and Clarke (2006). They argue that “thematic analysis should be seen as a foundational method for qualitative analysis” (Braun and Clarke 2006, p. 4). The main advantages of thematic analysis in the context of this study were its flexibility and independence from theory. While the study did lead to the development of a conceptual model of the potential of the ecosystem services approach to support and improve stakeholder engagement in marine management, it was designed as an exploratory study and was not based on a specific theory. In accordance with this, an inductive bottom up coding approach was used.

Open ended questions

The interview analysis process for the open ended questions roughly followed the six thematic analysis steps described by Braun and Clarke (2006) (see Table 3.9). The UK interviews were transcribed by the author of this thesis and a colleague from the VALMER research team who had conducted part of the UK interviews; the French interviews were all transcribed by the thesis author. All interviews were transcribed in English. The French interviews were directly translated from spoken French into

written English by the author of this thesis during the transcription. Quotes from French stakeholders are presented in the translated English version and marked with 'translated by LF'. Following translation and transcription, the interviews were read multiple times and a list of relevant quotes that addressed the interview objectives and questions was compiled. The initial coding of the responses to the open ended questions was determined by the interview objectives and 'good engagement' criteria framework (Table 3.7). The responses were organised into the following categories:

- 1) Motivation for participating in the VALMER project;
- 2) Understanding of and views on the ecosystem services approach (before and after participating in the VALMER case studies);
- 3) Views on working with ESAV in a participatory marine management process (in the case study workshops);
- 4) Views on the potential of ESAV to increase stakeholder acceptance of marine management decisions;
- 5) Views on monetary valuation;
- 6) Thoughts on the opportunities and challenges of using ESAV in marine management and planning.

In the first instance, the coding and categorisation was done separately for each case study. In a second step, the responses for each category were combined for a cross case study analysis. Next, prominent and recurring themes across the six case studies were identified and responses were compared between sites and stakeholder categories. Braun and Clarke (2006) define a theme as "some level of *patterned* response or meaning within the data set" that "captures something important about the data in relation to the research question" (Braun and Clarke 2006, p. 10). They go

on to say that ideally a theme occurs more than once in the text, although frequency does not imply importance. Rather, the importance of a theme depends on its relevance for the research question (Braun and Clarke 2006). The themes identified in the open question responses were then further refined and defined. Links and relationships between different themes were explored. Following this, the findings were tested against the criteria for effective engagement described in Table 3.7 to assess the contribution of the ecosystem services approach to good stakeholder engagement in the case studies. In a final step, the findings were discussed in the context of the existing literature and synthesised into a conceptual model of the potential contribution of the ecosystem services approach to good stakeholder engagement.

Closed statements

The responses to the closed statements were added up for each case study and then aggregated across all six sites. A preliminary inspection of the data revealed that the main differences in responses were between general agreement and general disagreement rather than between the specific levels of agreement or disagreement. Therefore, to increase the strength of the response groups, the 'agree' and 'strongly agree' responses were combined into one 'agree' category and the 'disagree' and 'strongly disagree' responses were combined into one 'disagree' category. 'Neutral' and 'don't know' responses were left in separate categories. The statement responses were analysed by determining the frequency of 'agree', 'disagree', 'neutral' and 'don't know' responses for each statement. With a sample size of 39 interviews, any further statistical analysis would not have been meaningful.

3.4 Results: stakeholder views and experiences

3.4.1 Motivation for participating in the VALMER project

The stakeholders from the four sites that had an active engagement process (North Devon, Plymouth to Fowey, Golfe Normand Breton, Golfe du Morbihan) were asked about their reasons for participating in the case study workshops. Five out of seven stakeholders in Plymouth to Fowey and six out of seven in the Golfe Normand Breton mentioned ESAV as a key motivation for participating. The stakeholder groups in these two case studies consisted mainly of public authority and NGO stakeholders. In North Devon and the Golfe du Morbihan, where the stakeholder groups included a mix of public authority and commercial stakeholders, NGOs and recreational interest groups, the majority of stakeholders expressed no particular interest in the ecosystem services approach.

Across all four case studies, the ecosystem services approach was of interest to all nature and heritage conservation NGO representatives, most of the public authority stakeholders involved in local governance, nature conservation or fisheries management and one commercial stakeholder from the renewable energy sector. These stakeholders were mainly interested in gaining a better understanding of ESAV and how this approach could support their work with regard to marine management in general or specific management topics, such as marine protected areas or renewable energy developments. For example, for one local governance stakeholder in the Golfe Normand Breton, “the project workshops presented an opportunity to get tools to talk about the ecosystem services concept to the marine users” (GNB5, translated by LF). One NGO and two public authority stakeholders mentioned that their organisations

had worked with the ecosystem services approach before and were interested in taking this further or applying it to different contexts.

Conversely, the commercial stakeholders from the fisheries and recreation sectors and the representatives from recreational and conservation interest groups were not motivated by the ecosystem services approach. These stakeholders participated mainly to represent their recreational or commercial interests and out of personal or professional interest in the site and case study topic. Comments by some of the recreational stakeholders suggest that the ESAV process was not directly relevant to them. For example, when asked about their understanding of ESAV, one recreational diver from North Devon said that “[a] lot of it is things that might be completely irrelevant and harder for [them] to understand” (ND1).

3.4.2 Understanding of and views on the ecosystem services approach

Before participating in the case studies

At the beginning of the interview, the stakeholders were asked whether they had heard about the ecosystem services approach before participating in the VALMER project and what their understanding of ESAV had been. Across all six sites, about two thirds of the interviewed stakeholders had at least some previous knowledge of the ecosystem services approach while one third had not heard of ecosystem services or ESAV before. Table 3.10 shows that public authority and NGO stakeholders tended to have some previous knowledge of the ecosystem services approach. Conversely, for most of the commercial stakeholders and recreational and conservation interest group representatives ecosystem services and ESAV were new concepts. The levels of pre

case study knowledge reported here are based on the stakeholders' self-reported previous knowledge and an assessment of their interview responses by the thesis author.

Table 3.10: Overview of the level of pre case study knowledge (self-reported and assessed) of the ecosystem services approach for the different stakeholder categories (by status)

Stakeholder categories by status	Number of stakeholders per category that had:		
	Good previous knowledge of ecosystem services approach	Heard of but limited/no understanding of ecosystem services approach	No previous knowledge of ecosystem services approach
Public authority	8/21	9/21	4/21
NGO	2/4	2/4	0/4
Commercial	1/9	2/9	6/9
Interest group	0/5	0/5	5/5

Of the 24 stakeholders that had previous knowledge, about half had heard of ecosystem services or ESAV before but did not know what it meant. For example, one stakeholder in Plymouth to Fowey said:

“It is a process and approach that we hear a lot about, [...] we get involved in a lot of discussions about ecosystem services, but [...] I don’t think we really know what’s involved in it.” (PF5).

Another Plymouth to Fowey stakeholder called it “a blue sky phrase” and explained that ESAV is “something that I know of, but it’s one of those phrases that doesn’t necessarily mean a great deal to me” (PF7). One stakeholder in the Golfe Normand Breton commented that ESAV is a “buzzword” (GNB2, translated by LF). Six of the stakeholders who had heard about the ecosystem services approach but had limited understanding of it, knew about ESAV in terms of monetary valuation.

The other half of those with previous knowledge had a good understanding of the basic principle of ecosystem services as the resources, services or benefits that an ecosystem or the environment provides to humans. Comments from a number of stakeholders indicate that they had acquired their knowledge of the ecosystem services concept by working in the environmental management and conservation sector. Their definitions of ecosystem services reflected to a large extent the definitions and explanations given in documents such as the UK National Ecosystem Assessment (UK NEA 2011) or the UN Millennium Ecosystem Assessment (MEA 2005). Among the most interesting definitions of ecosystem services that the stakeholders gave were:

“The four natural functioning services that allow our planet to exist, [...] defined as cultural, provisioning, regulating, maintaining [...].” (PH1);

“The things that the marine environment gives us that are important for life support on the planet.” (ND7);

“The goods and services that mankind receives from nature in all its guises, [...] for example, water quality, pollination.” (ND8);

“The range of services that humans benefit from by the existence of habitats.” (PF4);

“The functioning of an ecosystem provides different kinds of services to humans, for example as a fisheries resource [...] and thus as a food provision service, or landscapes that are part of the heritage of an area, or good quality beaches that provide opportunities for recreation [...].” (GNB5, translated by LF);

“The services that are directly or indirectly provided to humans by an ecosystem; and these services are linked to the functions of an ecosystem.” (GNB7, translated by LF).

The stakeholders' previous understanding of ESAV ranged from assessment of ecosystem functioning and state, quantitative and/or qualitative valuation in monetary and non-monetary terms to monetary valuation of ecosystem services. For example, stakeholders from Poole Harbour, Plymouth to Fowey and the Golfe Normand Breton defined ESAV as:

"[...] a way of quantifying how important those services are, quantifying how well those services are functioning [...]" (PH1);

"[using] financial figures to help identify the scale of these ecosystem services [...]" (PF4);

"Both monetary and non-monetary [...]. But mainly [...] a more qualitative description of the state of the environment: is it good and can provide good ecosystem services or is it bad and cannot provide services." (GNB6, translated by LF);

"[...] the importance of [a] service can be assessed, be it in monetary terms, or in terms of cultural or spiritual enrichment, or just in terms of benefits for the future." (GNB7, translated by LF).

After participating in the case studies

The stakeholders' explanations and definitions of ecosystem services and ESAV at the end of the interview revealed that by participating in the case studies, 20 of the 28 stakeholders with little or no previous knowledge gained a better understanding of the ecosystem services concept. Ten public authority and commercial stakeholders gained a good understanding of the basic principle of the ecosystem services approach, for example defining ecosystem services as "the things the natural environment provides for you" (PF6), "what we rely on our planet and our ecosystems to do for us" (PF7), "the services provided by the environment for society" (GNB2, translated by LF) or

“the interactions in an ecosystem on which humans depend” (GdM5, translated by LF).

The understanding gained by the other stakeholders reflects in part the context of and information presented in their respective case studies and in part their own individual perspectives and interests. For example, one recreation and two commercial fisheries interest group stakeholders understood ecosystem services in terms of the benefits provided by an ecosystem depending on its use:

“Services you get from the ecosystem depending on how you use that ecosystem.” (ND1);

“The different values that an ecosystem provides, economic values and social values [...]; these values depend on the different activities that profit from the ecosystem.” (GNB1, translated by LF);

“The interactions between [...] the environment and an activity, thus the services that the environment provides for this activity, what the activity produces from the environment.” (GdM1, translated by LF).

The focus in the Golfe du Morbihan was on the sustainable management and conservation of seagrass habitats. Here, one public authority stakeholder thought that ecosystem services were directly related to habitat conservation, explaining the concept as “[...] measuring what the protection of a species will bring to people in terms of individual benefits and not only in terms of what it will bring to society in general [...].” (GdM7, translated by LF). One Plymouth to Fowey stakeholder, who can be assumed to have worked with cost-benefit approaches as part of their management responsibility for part of the site, understood ecosystem services as “the benefits or negatives that an ecosystem gives you” (PF2). Lastly, three public authority stakeholders with management responsibilities for economic interests (commercial

fisheries and port) gained an economic view on ecosystem services in terms of “environmental asset” (PH2) or the economic value of environmental quality.

The different understandings of the concept of ecosystem services that the stakeholders gained through participating in the case studies can be divided into six different categories, which are presented in Table 3.11.

Table 3.11: The six categories of understanding of the ecosystem services concept that stakeholders had after participating in the case studies (based on their explanations and definitions), including the number of stakeholders per category and a breakdown by stakeholder status (n=39)

Stakeholder understanding of the ecosystem services concept	Number of stakeholders by	
	Category	Status
Basic understanding Ecosystem services as the resources, services or benefits that an ecosystem or the environment provides to humans	21	13 Public authority 3 NGO 4 Commercial 1 Interest group
Economic understanding Ecosystem services as environmental asset or economic value of environmental quality	4	4 Public authority
Use based understanding Ecosystem services as the services, benefits or values provided by an ecosystem depending on its use	3	2 Commercial 1 Interest group
Conservation benefit understanding Ecosystem services as the individual benefits provided by habitat conservation	1	1 Public authority
Cost-benefit understanding Ecosystem services as benefits and ‘negatives’ that an ecosystem provides to humans	1	1 Public authority
Interactions understanding Ecosystem services as human-environment interactions	1	1 Public authority
Little or no understanding	8	1 Public authority 1 NGO 3 Commercial 3 Interest group

Eight stakeholders did not improve their understanding of the ecosystem services concept. These included three commercial stakeholders and three recreational interest group representatives in North Devon, the Golfe du Morbihan and the Iroise Sea, one public authority stakeholder in North Devon and one NGO representative in Plymouth to Fowey who only attended one workshop.

The stakeholders' responses to questions about the meaning of ESAV revealed that after participating in the case studies there were various understandings of ESAV among the stakeholders. They understood ESAV in terms of:

- Monetary valuation;
- Qualitative and/or quantitative valuation (monetary and/or non-monetary);
- Qualitative or quantitative assessment of ecosystem service values for users;
- Assessment of the economic value of environmental quality;
- Environmental valuation;
- Qualitative or quantitative assessment of ecosystem state and functioning;
- A combination of assessment of ecosystem state and functioning and qualitative or quantitative valuation (monetary/non-monetary);
- Assessment of activities that use ecosystem services;
- Assessment of ecosystem service quantity and importance;
- Qualitative assessment of ecosystem service role and benefits;
- Measurement of individual benefits of conservation.

This reflects the lack of clear definitions of ecosystem service assessment and ecosystem service valuation in the literature, as discussed in Chapter 2.2, but also the variety of ESAV approaches adopted in the different case studies.

In the French case studies, eight stakeholders understood and talked about the ecosystem services approach as ecosystem approach: three in the Golfe Normand Breton, four in the Golfe du Morbihan and one in the Iroise Sea. In fact, in the French case studies the ESAV approach was presented in the context of the ecosystem approach.

3.4.3 Working with the ecosystem services approach: understanding ESAV

Challenges in understanding ESAV in the case studies

The stakeholders from the four case studies with an active engagement process were asked how they found the experience of working with ESAV in the case study workshops. Responses with regard to whether the ESAV was easy or difficult to understand varied between case studies. In Plymouth to Fowey, the stakeholders thought that ESAV was a very academic, technical and complex approach but found that it was well explained and “pitched just right” (PF6) in the workshops. These stakeholders had all heard of the ecosystem services approach before and some had a scientific background. This might have facilitated their understanding of ESAV, as suggested by one stakeholder’s comment: “I have got scientific training, so I suppose that probably helped. So I was able to understand the science.” (PF4).

Conversely, in North Devon, where most stakeholders had no previous knowledge of the ecosystem services approach, they found the ESAV process very difficult to

understand. It was pointed out by the stakeholders that many of them were not familiar with concepts and approaches like ecosystem services, ESAV, scenario building or modelling. For example, one stakeholder said:

“We had people who are very eminent in their own fields but have absolutely no background whatsoever of ecosystem services or mathematical modelling, anything like that.” (ND4).

One commercial stakeholder felt that “[some] of it was out of my depth. [...] The methods you were using I wasn’t familiar with.” (ND9). Almost all North Devon stakeholders said that the ecosystem services approach is difficult to understand for people with no academic or scientific background. As one of them pointed out, most stakeholders “are not in the academic bubble” (ND8). Two others talked about ecosystem services “jargon” (ND4, ND8), suggesting that they did not find the ecosystem services terminology easily accessible. The North Devon stakeholders found the ESAV to be very technical, complex and conceptual. Several stakeholders mentioned that the first three case study workshops in particular were difficult to follow because they remained very conceptual; the practical application of ESAV did not become clear until the fourth workshop. For example, one stakeholder commented:

“For the first three of the four workshops [the process] still seemed conceptual. And I was struggling to see how it could be applied in policy decision making [...]. The final workshop brought everything together in a way that was tangible, useable [...].” (ND2).

Comments from several North Devon stakeholders suggest that the socioecological Bayesian model, which was run as part of the ESAV in the North Devon case study, was particularly difficult to understand. This added to the complexity and conceptuality of

the ecosystem services approach. One stakeholder explained that “modelling [...] for the vast majority of people [is] an abstract process” (ND4). Another referred to the modelling as “a bit of magic” and said that “[it’s] easy for academics, but it’s not easy for people like me” (ND3). A third stakeholder pointed out that “it is harder for someone who doesn’t deal with those sort of models every day to follow it through quickly” (ND1). Finally, the stakeholders in North Devon felt that the limited time in the workshops and lack of adequate information material in between workshops made it difficult for them to follow the ESAV process. Stakeholders said that “[they] were being asked to absorb information that was highly conceptual in probably too short a time” (ND2) and that “[there] just wasn’t enough time [...] to fully understand the methodology” (ND4).

In North Devon and Plymouth to Fowey, an attempt was made to engage the stakeholders in the ESAV process. The methodology and different steps of the process were explained in detail and at different stages the stakeholders were asked for input and feedback. Conversely, in the two French case studies that had an active engagement process (Golfe Normand Breton and Golfe du Morbihan), the stakeholders were not presented with the technical details of the ESAV. Stakeholder input for the ESAV was gathered indirectly through expert meetings, thematic workshops and the scenario building discussions, without explicitly referring to the ESAV. As a consequence, the majority of stakeholders in these two case studies did not comment on the understandability of the ESAVs in the workshops. A few French stakeholders that had a good understanding of the ecosystem services approach commented on the understandability of ESAV more in general. Their comments reflect the experience of the stakeholders in the UK case studies. Two stakeholders from the

Golfe Normand Breton said that ESAV is “quite complex, theoretical and technical” (GNB7, translated by LF) and “[not] necessarily an easy concept to understand” (GNB1, translated by LF). In the Golfe du Morbihan, two stakeholders pointed out that “[the] ecosystem services terminology is quite technical” (GdM3, translated by LF) and “not easy to understand” (GdM2, translated by LF). One local governance stakeholder said:

“Speaking of ecosystems is a very scientific approach and not easily accessible to non-scientist stakeholders.” (GdM5, translated by LF).

The stakeholder went on to say that approaches like ESAV can “make the stakeholders feel out of place” (GdM5, translated by LF) if they are presented in a very technical and conceptual way. Finally, similar to the comments from North Devon, one French stakeholder pointed out that many stakeholders, especially from commercial sectors, “are not usually in contact with these kinds of concepts, for example the fishermen, and did not have an understanding of the approach at the beginning of the project” (GNB7, translated by LF).

Factors that support understanding of ESAV

Despite the difficulties that stakeholders in some of the case studies had in following the ESAV process, at all four sites stakeholders also mentioned aspects that helped them understand the case study ESAVs. In North Devon, the stakeholders talked positively about the final workshop in which the ESAV results were discussed in the context of the management scenarios. In this workshop, the *practical application* of ESAV became clear to the stakeholders, making it more *tangible*. In contrast, as mentioned earlier, the first three North Devon workshops were difficult to follow because they remained very conceptual. Similarly, stakeholders in Plymouth to Fowey

pointed out that applying ESAV at a *small scale* to *local* and *locally relevant* topics helped them “get [their] head around it a lot more easily [...]” (PF7). Stakeholders in the Golfe du Morbihan also picked up on the importance of having a *specific local focus*: “The information given in the workshops was comprehensible because it was related to a concrete habitat and subject.” (GdM2, translated by LF). Finally, the importance of *tailoring* the presentation of ESAV and the ecosystem services concept to the audience became apparent in several interviews across sites. This included using *familiar concepts and vocabulary* in the Golfe Normand Breton, or “understandable language” (PF5) in Plymouth to Fowey, as well as adapting the information “to the level of knowledge and understanding of the audience” (GdM8, translated by LF) in the Golfe du Morbihan. One stakeholder in the Golfe Normand Breton summarised this by saying:

“The VALMER team managed to communicate concepts that were quite complex, theoretical and technical in a comprehensible and accessible way to stakeholders that are not usually in contact with these kinds of concepts [...]” (GNB7, translated by LF).

In addition to the factors mentioned above (*in cursive*), some stakeholders pointed out that ESAV is a process and that understanding it required a *commitment* to participate in the full process. For example, according to one North Devon stakeholder “one or two of them might have struggled because they only came to one or two of the meetings” (ND2). Similarly, a stakeholder in Plymouth to Fowey said:

“For me it was a process, [...]. Perhaps if you had turned up to some of the latter meetings, maybe you wouldn’t have had the background to have understood; you needed the whole picture.” (PF2).

In the case studies, the ecosystem services approach was applied in combination with scenario building. Comments suggest that the stakeholders found the scenario building exercises helpful in making the ESAV locally real and relevant, and thus understandable. For example, one stakeholder in Plymouth to Fowey said that “[the] scenario building process was part of building [their] understanding” (PF2) while one North Devon stakeholder explained:

“The first meeting I think I was probably completely lost. And then it gradually became clearer as we were looking at the different scenarios.” (ND3).

3.4.4 Working with the ecosystem services approach: constructive dialogue and better understanding

ESAV as platform for exchange

Stakeholders in all four case studies with active engagement processes commented positively on the mix of different stakeholders, good dialogue and interesting exchange at the workshops. One Plymouth to Fowey stakeholder noted that the case study participants “were from a massive range of work areas and backgrounds” (PF4). In North Devon, stakeholders said that the case study brought together people that do not normally meet. According to one stakeholder, for example, the workshops “mixed up people who otherwise wouldn’t have met, for example, harbour masters, one fisherman, local subaqua sports divers [...]” (ND4). Similarly, in the Golfe Normand Breton, a stakeholder said that “there was a good mix of stakeholders, including fisheries representatives, shellfish farming representatives, managers and scientists” (GNB1, translated by LF).

Overall, the stakeholders found it “useful and interesting” (ND7) to have different kinds of stakeholders from different sectors and disciplines in the workshops. They thought that the mix of local stakeholders led to “a good exchange” (GNB1, translated by LF) and brought different perspectives into the discussion. As one stakeholder in the Golfe du Morbihan said,

“[it] led to many interesting discussions because every stakeholder had a different point of view and it was interesting to have an exchange with the other stakeholders” (GdM1, translated by LF).

Better mutual understanding

Some stakeholders commented that through the exchange with others, the ecosystem services approach supported a better understanding among the different stakeholders. In North Devon, for example, one stakeholder explained that it was useful “in terms of understanding potential impacts on different stakeholders” (ND7). Another North Devon stakeholder commented that “[everyone] was learning a bit more about the other side of things [...]” (ND1). Similarly, one stakeholder in Plymouth to Fowey thought that they “got a better feeling for what other people’s drivers were” (PF2). In the Golfe Normand Breton, stakeholders said that the ecosystem services approach “allowed to take into consideration the views of other stakeholders” (GNB7, translated by LF) and helped “getting to know the different stakeholders [...] and their perspectives [...]” (GNB4, translated by LF).

Better and shared site understanding

Stakeholder GNB4 went on to say that the ESAV also helped them gain a better understanding of “how the different activities are linked with each other and the

environment” (GNB4, translated by LF). This view was shared by other stakeholders who said that the ESAV had enabled them to gain a more comprehensive view and better shared understanding of their sites, the local ecosystems, links and interactions between the ecosystems and human activities as well as interactions between the different activities. For example, stakeholders from different case studies said that the ecosystem services approach “explains how an ecosystem works and what you get from it” (ND1) and helps understand “what one is stepping on” (GNB2, translated by LF) when using the marine environment. Referring to the interactions between ecosystems and human activities, one stakeholder explained:

“[I gained] a better understanding of the Golfe Normand Breton because ecosystem service assessment is an approach that provides a comprehensive view and an understanding of how the different activities are related to the ecosystem services.” (GNB1, translated by LF).

In Plymouth to Fowey, two stakeholders said that the ecosystem services approach offers “new ways of looking at old problems” (PF3), enabling “those sectors or groups who may have become entrenched in their views [...] to get the bigger picture” (PF3).

The potential of the ecosystem services approach to foster a shared understanding of a site, including its ecosystems and human-ecosystem interactions, as well as improving mutual understanding among different stakeholders, was also recognised by stakeholders in the two case studies with no active engagement process. One Iroise Sea stakeholder thought that ESAV “can improve the dialogue between different user groups [...] because it gives everyone the same level of understanding on a topic” (PNMI2, translated by LF). In Poole Harbour, the ESAV led the local management steering group to start a dialogue with recreational user groups that they had not previously spoken to and to engage them in the management of the harbour. Through

the ESAV, the steering group also gained a better understanding of “how other people view the harbour” (PH2), “what the other users find valuable in the harbour” (PH1) and “the value that people held on the environment” (PH4). All this helped the steering group identify and resolve some of the conflicts between different recreational user groups in the harbour.

Neutral and objective approach

Across the case studies, stakeholders referred to the ecosystem services approach with words like ‘academic’, ‘scientific’, ‘neutral’, ‘objective’, ‘rational’, ‘fact based’ or ‘evidence based’. One Poole Harbour stakeholder pointed out that it was this perceived neutrality of the ESAV approach that encouraged stakeholder dialogue:

“I think sometimes you do need a neutral person, or an academic study to come in and engage those people in a positive way [...]” (PH1).

Inclusiveness

Stakeholder comments from North Devon and Plymouth to Fowey further suggest that another factor through which the ESAV approach supported good dialogue was inclusiveness. The stakeholders mentioned that the ESAV process provided opportunities for everyone to contribute and allowed the integration of different knowledge, information and views in the assessment and valuation. For example, stakeholders said that “[there] was lots of chance for us to feed into the process” (PF2) and “opportunity for everyone to say what happened where and so on” (ND4). Another stakeholder noted that “[everybody] was chipping in, so the different strands of information were all represented” (ND3). Moreover, the stakeholders felt “that the

local knowledge was being valued and incorporated” (ND4). A similar comment from Plymouth to Fowey was: “There were equal chances for everyone to input and you felt valued when you did.” (PF7).

Scenario building

Lastly, the stakeholders also mentioned that scenario building provided opportunities and structure for stakeholder exchange and input. This supported the stakeholder dialogue, mutual learning and development of a shared understanding of the site, human-ecosystem interactions and different stakeholder perspectives. One stakeholder in the Golfe Normand Breton said:

“The scenario approach was interesting because it shows that based on their activities, the stakeholders will tend towards different scenarios [and] that all stakeholders [...] are responsible and can contribute to preserving ecosystem services.” (GNB5, translated by LF).

3.4.5 Views on monetary valuation

Monetary valuation of nature

Although the interview questions did not explicitly refer to monetary valuation, the topic was discussed in most of the interviews. The stakeholders’ views on the appropriateness and usefulness of monetary ESV varied. About one third of the stakeholders that expressed an opinion on this topic were generally positive about monetary valuation. They saw it as an interesting and useful approach, although they were also aware of the methodological and moral limitations. For example, one stakeholder said: “If one had enough confidence in those monetary values [...], then for me it’s a good thing.” (ND4). A few stakeholders objected to the use of monetary

ESV in decision making, saying that it was a dangerous approach, open to misinterpretation and bearing the risk of overlooking important non-monetary aspects. They also thought that monetary ESV was “still [...] an experimental approach” (GNB1, translated by LF) and not “robust enough yet to actually base the decision on it” (PF3).

However, the majority of stakeholders saw monetary valuation as a ‘necessary evil’, meaning that they were critical of the approach but thought it was useful or necessary under certain circumstances. One of the two key reasons that the stakeholders gave for this view was that monetary valuation is necessary or useful in the current socioeconomic governance context to make a case for environmental considerations.

Comments to this regard included:

“[...] I am not wholly in favour of reducing everything to monetary values. [But] I am reluctantly forced to admit that being able to put some kind of monetary value on ecosystem services is probably useful given the context in which we work, where most things have an economic value [...]” (ND2);

“The monetary argument is a double edged sword. On the one hand [...] it helps in the current political climate and argument. However, there is more to the story than just the money.” (ND7);

“[Valuation] is a necessary evil. That is, it is not possible to provide arguments for the environment without a minimum of [valuation].” (PNMI3, translated by LF).

The second reason was that monetary values are useful for communicating the wider benefits of conservation or the importance of natural habitats and resources to the public, politicians, policy makers and managers. For example, stakeholders in Plymouth to Fowey said: “I don’t really like the idea of it. But actually I think it is really important for the wider public to get a better understanding.” (PF4); and “If you don’t engage

with that monetary valuation approach, we don't then engage with the politicians and decision makers, it's almost a necessary evil." (PF5).

Table 3.12 shows the distribution of views on monetary ESV among different stakeholder categories. Seven out of nine nature conservation stakeholders saw monetary valuation as 'necessary evil' (as defined above), the other two were generally positive about it but recognised that the approach has limitations. While the three public authority fisheries management stakeholders also saw it as a 'necessary evil', all three commercial fisheries stakeholders were critical about the approach. Two French commercial fisheries stakeholders mentioned that qualitative information about the role and importance of ecosystem services would be more useful than monetary values.

Table 3.12: Overview of the distribution of views on monetary ESV across stakeholder categories, including the number of stakeholders per category and view

Stakeholder status	Stakeholder function	Generally positive: monetary ESV useful/interesting approach	Generally positive but recognising the limitations of monetary ESV	'Necessary evil': critical of monetary ESV but sees it as useful/necessary tool	Generally negative: critical of monetary ESV, should not be used for decisions
Public authority	Local governance	2	3	1	2
Public authority	Fisheries	1	0	3	0
Public authority	Navigation management	0	1	0	0
Public authority	Nature conservation	0	1	4	0
NGO	Nature conservation	0	0	3	0
NGO	Heritage conservation	0	0	0	1
Interest group	Nature conservation	0	1	0	0
Commercial	Water management	0	0	1	0
Commercial	Renewable energy	0	0	1	0
Commercial	Fisheries	0	0	0	3
Interest group	Recreational	1	0	0	1

One local governance stakeholder in North Devon said that monetary ESV is very technical and difficult to understand and that for managers, being able to use the valuation results is more relevant than conducting a monetary valuation themselves:

“It is a wildly techy subject, best reserved for academics and those in the know. For people like me, it’s about using the data and the information that comes out of it, rather than being able to generate it myself.” (ND8).

Two stakeholders who had previously understood ESAV only in terms of monetary valuation, said that they were glad to learn about non-monetary, qualitative ESAV approaches and recognised that quantitative, monetary values are not always more useful. For example, one North Devon stakeholder who joined the case study with concerns about monetary valuation was “reassured [to learn] that the monetary value was only one of the ways that ecosystem services would seek to evaluate the environment” (ND2).

Challenges and benefits of monetary valuation

Table 3.13 gives an overview of the benefits and challenges that the stakeholders saw with regards to monetary valuation. As mentioned above, one aspect that came up repeatedly, although from slightly different angles, was that monetary valuation provides a tool to communicate the importance of ecosystems, habitats and species, natural resources and services as well as the need for and wider benefits of conservation to commercial stakeholders, managers, policy makers, politicians and the general public. For example, one stakeholder in Poole Harbour said: “Speaking the same language is very important. I think monetary valuation provides a value as a starting point.” (PH1). Others thought that “it was a good idea in terms of explaining to

people how important the things you don't really think about, from habitats, are" (PF4) and that "[it] allows the users to become aware that the resource they are using is not banal" (GdM3, translated by LF).

Table 3.13: Summary of stakeholder views on the benefits and challenges of monetary valuation, including the number of stakeholders who mentioned each point

Stakeholder views on benefits and challenges of monetary valuation	Number of stakeholders
Benefits of monetary valuation:	
Tool to communicate with commercial stakeholders, managers, policy makers, politicians and the general public about: <ul style="list-style-type: none"> • The societal and economic importance of natural habitats and species or resources and services • The need for and wider benefits of conservation 	14
Important/necessary in current socio-political governance context (economic focus of decision making)	7
Provides arguments for environmental considerations or conservation to support communication or decision making	7
Allows integration of environmental values in decision making/planning and comparison with economic values (for better informed decisions)	6
Shared language for communicating with economic stakeholders	4
Provides clear and easily accessible information for policy makers	3
Potential tool to encourage behaviour/attitude change	2
Potentially useful for determining compensation payments	1
Challenges of monetary valuation:	
Methodological difficulties and limitations, including: <ul style="list-style-type: none"> • Data issues (availability, reliability) • Subjectivity of values • Scale related issues of relevance of monetary valuation outputs 	12
Moral concern about reducing the environment and conservation to monetary values	6
Potentially misleading or counterproductive for conservation objectives because monetary values for the environment might be: <ul style="list-style-type: none"> • Smaller than expected • Smaller than the economic value of development • Abstract compared to commercial values 	6
Concern that monetary values should not be the only relevant factor in decision making	5

Table 3.13 continued

Challenges of monetary valuation:

Potentially misleading or counterproductive for conservation objectives because not all ecosystem services, species and habitats can be valued in money:	5
<ul style="list-style-type: none">• Risk of focusing management effort on ecosystem services/species/habitats that are valued in monetary terms• Risk that ecosystem services with monetary values are seen as more important than those without• Risk of overlooking cultural, heritage, aesthetic, intrinsic, future values	
Concern about compensation payment approach	3
Difficult to understand because very technical	3
Not always appropriate/not relevant for all stakeholders	3
Potentially dangerous if used out of context without understanding the limitations (risk of misinterpretation or misuse)	2
Should not be used to assign specific values/specific values should not be used for decision making or comparisons	2
Dangerous because still experimental and might lead to arbitrary decisions	1
Anthropocentric, utilitarian view	1
What is measured and valued is often a political decision (not objective)	1

It was also suggested that economic arguments might have more relevance and meaning for some stakeholders:

“Many people, including agencies and governments, don’t actually understand the environment and what they are getting from it. And if you can put a £ value into that, that gives them something that they actually understand.” (ND8);

“It is often the only way that some people, like politicians, can make changes happen.” (PF7).

The stakeholders further said that, apart from supporting communication, monetary ESV also provides arguments for environmental considerations in decision making or to justify conservation. For example, in the Golfe Normand Breton and Golfe du Morbihan case studies that were set in the context of marine parks, stakeholders said that “[the] ecosystem services approach is interesting as a tool to raise awareness

among stakeholders and to provide additional arguments that justify protection [...]” (GNB7, translated by LF) and that “[monetary] valuation is used as justification for environmental protection” (GdM3, translated by LF). In Poole Harbour, where the main focus of the ESAV was on monetary valuation, one stakeholder pointed out that “[most] decisions are based around money [and] when it comes down to influencing decision making [...] it helps in some cases to have that monetary value” (PH1).

The third key benefit that the stakeholders saw in monetary ESV was that it allows the integration of environmental values in decision making and planning and makes them comparable for example to economic values of development projects. Stakeholders said that monetary ESV provides “an economic comparator for environmental services [...] to weigh up the advantages and disadvantages [...] between economic and environmental issues” (PH3), it gives “something to compare to” (PF2) and helps turn “intangible [ecosystem service] benefits into something hard and firm enough to be used by planning processes” (ND4).

Two main concerns that the stakeholders had with regard to monetary valuation were that not all ecosystem services or habitats and species can be valued in monetary terms and that monetary values for the environment might be smaller or too abstract compared to economic values of development. The stakeholders thought that this makes monetary valuation potentially dangerous, misleading and counterproductive for conservation objectives. In the Golfe Normand Breton, for example, one stakeholder explained:

“It remains a dangerous approach because by putting a monetary value on a species or habitat there is the risk that the management effort will focus on this species or habitat and that everything that is around it is

overlooked. Also, there is the risk of overlooking cultural and heritage values that cannot be quantified in monetary terms.” (GNB1, translated by LF).

The last argument was also picked up by another stakeholder, who said that “not all services and their present and future importance can be valued [...]. The danger is that [...] the parts that are possible to value will result in relatively small values compared to the capital of certain projects.” (GNB7, translated by LF). Similarly, one Poole Harbour stakeholder said:

“I think coming up with a monetary value for an ecosystem is quite dangerous. Because [...] when you see the economic value of the development, that would be ten times as much.” (PH4)

In Plymouth to Fowey, it was suggested that “[sometimes] the numbers don’t give you the right message [...]. It could be that something doesn’t look particularly valuable in financial terms but could be valuable in other ways.” (PF7). As one French stakeholder put it, “one needs to be careful [...] how the monetary valuation is interpreted” (GNB1, translated by LF). Two other stakeholders pointed out the risk of misinterpretation or misuse if the limitations of monetary valuation were not understood. One of them said that “these numbers can be easily be diverted from their original purpose [and] the danger is [...] attributing values that will then be used out of context and without explanation” (GNB7, translated by LF).

Other challenges that were brought up by the stakeholders included methodological difficulties and limitations as well as moral concerns about reducing the environment and decision making to monetary values. Lastly, one stakeholder pointed out that monetary valuation is still “an experimental approach and this can lead to arbitrary and dangerous decisions” (GNB1, translated by LF).

3.4.6 Opportunities and challenges of using ESAV in marine governance

Stakeholder views on opportunities and challenges

Towards the end of the interview, the stakeholders were asked what they thought were the opportunities and challenges of using ESAV in marine governance. From the stakeholders' responses, five key ways in which ESAV could potentially contribute to marine governance emerged (Table 3.14). Views on this varied slightly between French and UK stakeholders. In the UK case studies, the main benefit that the stakeholders saw was that ESAV can provide factual evidence or information for marine management, planning or decision making, for example for the management of marine activities or marine spatial planning. Although several stakeholders pointed out that methodological weaknesses and data limitations needed to be addressed and the approach further developed before ESAV could actually be used in decision making.

In the French case studies, conversely, the stakeholders saw ESAV as a tool that can support integrated management and informed decision making by:

- Taking a more comprehensive view;
- Supporting better understanding of ecosystems, different activities, human-ecosystem interactions, impacts and implications;
- Allowing consideration and integration of different factors and interests.

Table 3.14: Summary of stakeholder views on potential benefits and challenges of using ESAV in marine governance, including the number of stakeholders who mentioned these in the UK and in France

Potential benefits of using ESAV in marine governance	Number of stakeholders	
	UK	France
Can provide evidence/information for management, planning and decision making	14	5
Tool for communication about conservation, management and regulation with stakeholders and the general public	3	10
Tool to support integrated management and informed decision making	1	11
Tool to support stakeholder dialogue and engagement in decision making	2	6
Provides arguments for conservation and allows integration of environmental considerations in decision making	1	5
No comment	3	2
Challenges of using ESAV in marine governance		
Data limitations (quality/availability)	8	4
ESAV methods and outputs not robust/specific enough for decision making	4	2
ESAV is very conceptual, difficult to understand (limitations must be clear)	5	3
Danger of misinterpretation (esp. of ESAV with limited scope)	7	0
Policy constraints and lack of political will to use ESAV results	3	1
Organisations/authorities/agencies have limited capacity to adopt ecosystem services approach/conduct ESAV	4	0
No comment	2	10

Many French stakeholders also thought that ESAV would be a useful communication tool to explain the importance, wider benefits of and need for conservation measures and regulations to stakeholders as well as the general public. As one stakeholder in the Golfe du Morbihan said, the ecosystem services approach

“is more appropriate for communicating with a wider public and makes it more likely to gain the support and compliance of the wider public or [...] those stakeholders that will be affected by the regulation” (GdM7, translated by LF).

Finally, the French stakeholders mentioned the potential of ESAV to support stakeholder dialogue and engagement in decision making. For example, in the Golfe Normand Breton someone said that ESAV “could be a good tool to facilitate stakeholder discussion and consultation to allow consideration of the different issues and affected interests in a decision making process” (GNB6, translated by LF).

Potential to increase decision acceptance

One potential benefit of using ESAV in marine governance that came out of the interviews was increased decision acceptance. The majority of stakeholders across all six sites agreed with the statement ‘Using ESAV in decision making can lead to greater acceptance and buy-in of the decisions among stakeholders’. Table 3.15 gives an overview of the reasons they gave for this. The main reason was that ESAV supports better and shared understanding of various aspects concerning human-ecosystem interactions, different stakeholders and activities, environmental issues as well as management and regulations. For example, they said that:

ESAV “can help raise the stakeholders’ awareness of the role that the ecosystems play in supporting their activities and that management can help provide better quality of [resources]” (GNB6, translated by LF);

“If you can use ecosystem services to explain actually the benefits that we get from those habitats, it helps people to understand why we want to protect them” (PF4);

Through ESAV, “[each] stakeholder can better understand the interest that preserving certain habitats and species has for them and others” (GNB1, translated by LF);

ESAV helps explain that “if the seagrass is not protected, the fishermen will have less fish to catch and the water quality in the Golfe du Morbihan will deteriorate, and that thus the question of protecting seagrass concerns everyone” (GdM5, translated by LF);

ESAV helps explain that “it will have negative consequences for the users if their activities degrade the quality of the environment and the services it provides [...]. It makes the stakeholders aware that they [...] have an interest in protecting the environment [...]” (GNB5, translated by LF).

The stakeholders also said that ESAV provides an objective, fact based approach and robust, neutral evidence to support the decision making process. They explained that this can support decision acceptance as people are more likely to agree to objective, evidence based decisions: “If you can provide robust data [...] then I think you are more likely to be able to persuade people [...]” (PH3) and “If people think that a decision is made on a rational basis then it’s easier than if they think it’s being made purely on an opinion or political base.” (ND4).

A third point that was raised in the interviews is that ESAV allows different stakeholders to be involved in the discussion and decision making process and enables them to contribute their knowledge and views in a non-threatening, neutral context. For example, one stakeholder in the Golfe du Morbihan thought that “[it] is beneficial to involve all the stakeholders of the site to allow the different stakeholders to explain their activities and interactions they have with the seagrass” (GdM1, translated by LF).

In Plymouth to Fowey, one stakeholder said:

“It’s not a threatening environment, for example it’s not fisheries against conservation, as everyone is feeding into one process, so you can talk without defending your view point. It is a way of engaging people in a conversation about the bigger picture.” (PF6).

Table 3.15: Reasons given by stakeholders for why ESAV does or does not have the potential to increase stakeholder acceptance of decisions (when asked to explain why they agreed or disagreed with the statement 'Using ESAV in decision making can lead to greater acceptance and buy-in of the decisions among stakeholders; n=31, some stakeholders gave more than one reason)

Reasons why ESAV does or does not have the potential to increase stakeholder acceptance of decisions		Number of stakeholders
Agree	<p>ESAV supports better and shared understanding of:</p> <ul style="list-style-type: none"> • Wider and individual interests in/benefits of conservation • Human-ecosystem links and interactions (ecosystem role in supporting activities, impacts of activities on ecosystems, negative implications of ecosystem degradation for activities) • Decisions, regulations, management measures • Environmental issues (cumulative nature, individual responsibilities) • The need for/benefits of management measures • Different activities 	12
	<p>ESAV is an objective, rational, fact based approach that provides robust and neutral evidence:</p> <ul style="list-style-type: none"> • This keeps discussions objective and helps calm discussions dominated by different views and conflicting information • This helps persuade people • This provides a non-confrontational setting for stakeholder exchange and input 	6
	ESAV provides opportunity for stakeholder exchange and input	3
	ESAV helps justify management decisions	2
	<p>ESAV helps with the discussion and consideration of options in the decision making process:</p> <ul style="list-style-type: none"> • ESAV shows long term benefits of different approaches 	2
	ESAV supports discussion about the broader context and wider environmental values	2
	<p>ESAV allows consideration of different aspects and integration of different perspectives:</p> <ul style="list-style-type: none"> • this helps avoid entrenched views 	2
	ESAV facilitates the inclusion of different stakeholders in the discussion/decision making process	2
	Monetary ESV gives people a common interest in engagement	1
Disagree	ESAV is not solid, fact based enough	3
	The ecosystem services approach would need to be better explained to policy, management and professional stakeholders	3

3.4.7 Effective engagement criteria

In the final step of the interview analysis, the findings were tested against the set of criteria for effective engagement that had been identified in the marine and environmental engagement literature (see Table 3.7). This revealed that in the project case studies the ecosystem services approach contributed to most of these 'good engagement' criteria (Table 3.16).

Table 3.16: Summary of how the ecosystem services approach contributed to the ‘good engagement’ criteria in the six VALMER case studies

‘Good engagement’ criteria	Ecosystem services contribution?	How the ecosystem services approach contributed to the criteria in the case studies
Motivation to get involved	In part	ESAV was a motivation to participate for NGO representatives and public authority stakeholders involved in local governance, nature conservation or fisheries management ESAV was of little interest to commercial and recreational stakeholders
Representativeness	✓	ESAV provided a platform for different stakeholders, representing all interests at a site, to come together
Inclusiveness	✓	ESAV felt inclusive, everyone could contribute their views and knowledge
Accessible information	In part	Ecosystem services are an easy to grasp concept ESAV is very technical, complex, conceptual – it has to be made accessible
Building capacity	✓	ESAV supported better and shared understanding of the site, its human-ecosystem interactions and management context ESAV supported better mutual understanding among stakeholders ESAV enabled people to look at things from a new perspective and think outside the box
Dialogue and discussion	✓	Better understanding and inclusiveness supported constructive dialogue
Exchange of knowledge and views	✓	Better understanding and inclusiveness supported constructive dialogue ESAV provided a safe and neutral context for exchange
Integration of different information and perspectives	✓	ESA enabled the integration of different knowledge, views and interests into the decision making process
Trust and respect	<i>Potentially</i>	<i>Better dialogue and mutual understanding have the potential to foster trust and respect</i>

3.4.8 Closed statements: improved site understanding, positive engagement effects and usefulness of ESAV

Table 3.17 presents the responses to the three sets of closed statements, aggregated across all six case studies. The responses to the closed statements reveal a noticeable bias towards the 'agree' option for statements on improved site understanding, positive engagement effects or usefulness of ESAV; sixty to ninety percent of the stakeholders agreed with these statements. This bias is confirmed by the negatively phrased control statement ('The ESAV information was too technical, not easy to understand') with which almost eighty percent of the stakeholders disagreed. This kind of bias is not uncommon in surveys on attitudes and knowledge and might be due in part to the phrasing of the statements. Respondents do not like to admit ignorance or will give responses that they think are expected by the interviewer or seen as socially desirable (Fisher 1993, Myers and Newman 2007). Comments from the interviews also indicate that the stakeholders did not always understand the statements correctly, suggesting that they gave the responses that they thought the interviewer desired or expected.

A number of stakeholders agreed with the statement 'I have gained a better understanding of the need for management to secure a healthy, resilient and functioning local marine ecosystem', while at the same time stating that they already knew or believed this before. This implies that they did not agree with the statement but with the concept of the need for management. In other cases, the responses to the statements did not reflect the responses to the open questions, which were often more critical. This suggests that the stakeholders were more willing to share their views in the open questions than in responding to the statements. For example,

several stakeholders said that they did not gain much new knowledge about their case study site but nonetheless agreed with the set of statements on better understanding of the site. Similarly, several stakeholders that were critical about the engagement process in their case studies in the open questions then agreed with the positive statements about the engagement process. Overall, the analysis of responses to the closed statements shows that the results do not add much relevant information to the findings from the open ended questions. With one exception, these results will therefore not be further regarded and not taken forward into the discussion of the key findings.

The one interesting finding from the analysis of the statement responses refers to two statements on the use of ESAV to establish financial management instruments: 1) 'ESAV can be used to determine user fees, e.g. for natural park entrance'; 2) 'ESAV can be used in damage assessment to determine compensation payments or fines'. An exception is made for the responses to these two statements for two reasons. First, the results deviate from the 'agree' bias that was mentioned earlier. Only about forty-four percent of the stakeholders agreed with these statements, which is low compared to the sixty to ninety percent agreement with the other statements. In contrast, levels of disagreement and 'don't know' responses were higher than for the other statements. In particular, twenty percent disagreed with the use of ESAV to determine compensation payments and twenty-five percent said 'don't know' because they had not heard of using ESAV to determine user fees before. The second reason is that the results for these two statements support findings from other parts of the interviews regarding cultural differences in perceptions of the usefulness of monetary ESV. This will be further elaborated on in the following discussion.

Table 3.17: Responses to the three sets of closed statements, aggregated across all six case studies (n=39)

Statements	Agree	Neutral	Disagree	Don't know/ no response
Statements on understanding of the site and site management				
1) I have gained a better understanding of the local marine habitats and species/marine environment.	24	12	2	1
2) I have gained a better understanding of how the local marine ecosystem supports social and economic wellbeing in the area.	27	9	2	1
3) I have gained a better understanding of how different activities and management options affect the local ecosystem's ability to provide ecosystem services.	28	10	0	1
4) I have gained a better understanding of the need for management to secure a healthy, resilient and functioning local marine ecosystem, to ensure the provision of ecosystem services.	25	9	3	2
Statements on ESAV in the engagement process				
5) ESAV did support the development of a common understanding of the management question that was addressed in the case study.	30	9	0	0
6) ESAV did foster better understanding among stakeholders with different interests and perspectives.	34	5	0	0
7) The ESAV information was too technical, not easy to understand.	6	3	30	0
8) ESAV did help support the discussion and appraisal of different management options (in scenario building).	31	5	2	1
9) Using ESAV in decision making can lead to greater acceptance and ownership of the outcomes among stakeholders.	30	7	0	2
Statements on the potential use of ESAV in marine management and planning				
10) Using ESAV in marine and coastal management can support better informed decision making processes.	36	3	0	0
11) Using ESAV can support marine conservation.	33	6	0	0
12) Using ESAV can support marine planning.	31	6	1	1
13) ESAV can lead to better informed decisions, e.g. choices between alternatives, trade-off decisions, prioritisation of management effort.	33	5	1	0
14) ESAV can be used to determine user fees, e.g. for natural park entrance.	17	6	6	10
15) ESAV can be used in damage assessment to determine compensation payments or fines.	17	8	8	6
16) ESAV can raise awareness among decision makers and the public regarding the condition and value of the environment, as well as the role and relevance of ecosystem services.	35	2	1	1

3.5 Discussion: applying the ecosystem services approach to participatory marine management processes

The VALMER stakeholder interviews revealed interesting insights into the potential of the ecosystem services approach to support and improve stakeholder engagement in marine management. The findings highlight the opportunities and possible benefits of an engagement process based on the ecosystem services approach. They also point out the challenges of using ESAV as an engagement tool as well as ways to address these challenges.

3.5.1 The opportunities and benefits of ecosystem services based engagement

As illustrated by Table 3.16, the experience from the project case studies suggests that the ecosystem services approach can support effective stakeholder engagement in marine management in several ways. The potential contribution of ESAV to good marine stakeholder engagement can be summarised into three main points:

- ESAV can provide a neutral, objective and inclusive setting for engaging different stakeholders;
- ESAV can facilitate constructive dialogue, exchange and mutual learning;
- ESAV can foster a better and shared understanding of a site, its human-ecosystem interactions and management context as well as better mutual understanding among stakeholders.

A neutral and inclusive setting that supports dialogue and exchange

The VALMER case study experience shows that the ecosystem services approach provides an inclusive platform for engagement. ESAV allows the integration of different information and views into the management or decision making process, enabling and encouraging all participants to contribute their knowledge and opinions. Moreover, the interviews revealed that ESAV is perceived as a neutral and objective approach by marine stakeholders. Berghöfer et al. (2016) argue that the belief that ESAV is neutral and objective is a common misconception as the ESAV process and results tend to be influenced by the views and beliefs of those who conduct the assessment or valuation. While this might be the case, the findings from the VALMER interviews suggest that this perceived neutrality of ESAV contributes to facilitating good dialogue among different stakeholders, encouraging exchange and mutual learning. The case studies deliberately brought together a wide range of stakeholders, including “people who otherwise wouldn’t have met” (ND4) and stakeholders that tend to be in opposition to each other. Despite this, stakeholders across case studies commented positively on the good dialogue and interesting exchange in the workshops. As one stakeholder from the Golfe du Morbihan put it, “the discussion was very open, even with stakeholders with whom they would usually be in opposition” (GdM8, translated by LF).

Thus, the ecosystem services approach provides a setting for bringing different, potentially conflictual stakeholders together around the table; and it facilitates good dialogue, open discussion and exchange. Cork and Proctor (2005) came to a similar conclusion in an Australian study that explored the use of the ecosystem services concept as an integrative tool in a multidisciplinary participatory decision making

process. They found that ecosystem services help bring together people from different backgrounds, supporting interdisciplinary dialogue and mutual learning (Cork and Proctor 2005). This addresses one of the key issues of marine stakeholder engagement which is the conflictual and often confrontational relationships between different user and interest groups (Douvere and Ehler 2009, Maguire et al. 2012, Mason et al. 2015). One stakeholder from the Golfe Normand Breton raised this point in the interview, explaining that consultation processes are often confrontational and ineffective because people only attend to promote or defend their own interests; whereas, in the case study workshops the ecosystem services approach “got different stakeholders with different interests to listen to each other” (GNB3, translated by LF).

Better and shared understanding

The third way in which the interview results show the ecosystem services approach to contribute to good engagement is by supporting better and shared understanding. This was also found by Cork and Proctor (2005) who report that the ecosystem services concept helped the participants in their study gain a clearer understanding of the issues that were being addressed. The VALMER interviews suggest that there are two ways in which the ecosystem services approach can improve understanding and support good marine engagement. First, by encouraging good dialogue and exchange, the ecosystem services approach fosters a better understanding of each other’s perspectives among the different stakeholders. This confirms the point made by Albert et al. (2014) that a participatory ESAV process is likely to improve mutual understanding and social learning. Second, the ecosystem services approach gives stakeholders a more comprehensive and integrated understanding of a site, its marine

ecosystem, activities and human-ecosystem interactions. This, in turn enables them to gain a better and shared understanding of the site's management context and other stakeholders' perspectives.

For example, stakeholders from the Golfe du Morbihan talked about having “a more comprehensive approach to the question of human-seagrass interactions, looking at all the different activities and uses” (GdM1, translated by LF) and gaining “a better understanding of the interactions between the different activities [...] and seagrass” (GdM5, translated by LF). As one of these stakeholders explained, this is not usually the case in marine management engagement processes; instead, every stakeholder group would focus on their own interests and issues. This reflects the traditionally sectoral approach to using and managing the marine environment (Mason et al. 2015, Ritchie and Ellis 2010). The experience from the VALMER case studies suggests that the ecosystem services approach can help improve the resulting conflictual relationships by fostering mutual understanding and supporting a more comprehensive understanding of the marine environment that is shared by the different sectors. Berghöfer et al. (2016) come to a similar conclusion in their report on the policy impact of ESAVs. They say that if ESAV is conducted as a social process, it can generate a shared understanding of issues, which can influence the relationships between stakeholders. Looking back at the case study descriptions in section 3.2, building a ‘common culture’, in terms of a shared understanding of the sites and improved stakeholder relationships, was an important objective in the Golfe du Morbihan and Golfe Norman Breton case studies.

Further benefits for participatory marine management

Thus, if used as an engagement tool, the ecosystem services approach has the potential to build trust and respect and support better relationships between managers and stakeholders as well as among different stakeholder groups. Beyond these direct benefits for marine stakeholder engagement, three further potential benefits for participatory marine management came up in the interviews. In Plymouth to Fowey, two stakeholders said that the ecosystem services approach encourages people “to think outside the box” (PF2, PF3), to take a more comprehensive view and look at old problems in new ways. This suggests that an engagement process based on the ecosystem services approach can lead not only to better informed decisions but also to innovative management solutions.

The second point that was raised is the potential of the ecosystem services approach to increase acceptance and support of management decisions among participating stakeholders. In the interviews, several stakeholders pointed out that people are more likely to accept management measures and restrictions if they understand why these are put in place and if they feel that management decisions are objective and evidence based. According to the stakeholders, “[the] ecosystem services approach can help explain why regulations are put in place” (GNB5, translated by LF); and it can provide an “evidence base from a neutral origin [that] takes the emotion and heat out of the argument” (ND3). If stakeholders get on board with a management decision, this can potentially also encourage compliance and facilitate implementation of management measures and regulations (Dalton 2005, Reed 2008, Richardson and Razzaque 2006, Rowe et al. 2008).

Finally, as Table 3.14 shows, stakeholders do see ESAV as a useful tool for marine governance. This is an important finding in support of the ecosystem services approach as a marine engagement tool. People are more likely to engage in an ecosystem services based decision making process if they believe ESAV to be relevant and useful for informing management. The VALMER interview results on the use of ESAV for marine governance are discussed in more detail in Dodds et al. (2015) and Dodds and Friedrich (2015).

3.5.2 The challenges of ecosystem services based engagement

Accessibility of an academic and technical approach

The VALMER stakeholder experience shows that the main challenge of using the ecosystem services approach in an engagement process is making ESAV accessible. According to Berghöfer et al. (2016), ESAV is often assumed to be self-explanatory. However, while “[the] ideas behind it are simple and common sense” (GdM2, translated by LF), the ecosystem services approach is often presented and/or perceived as a very theoretical and complex concept. This was also found by Beery et al. (2016) who point out that implementing the ecosystem services approach in policy making and management processes is rendered difficult by the academic nature of the approach. The academic nature of the ecosystem services approach also came up repeatedly in the interviews. In particular in North Devon and Plymouth to Fowey, stakeholders thought that the ecosystem services approach is very academic and difficult to understand for people with no academic background.

ESAV, and in particular monetary valuation, can be very technical. It often involves complicated calculations, multiple assumptions and modelling, such as for example the travel cost valuation in Poole Harbour or the modelling in the North Devon, Golfe Norman Breton and Iroise Sea case studies. Moreover, several stakeholders mentioned that the ecosystem services terminology is very academic and full of “jargon” (ND4, ND8). These academic and technical aspects can be a limiting factor for the usefulness of the ecosystem services approach as an engagement tool. As Rowe and Frewer (2000) and Dalton (2005) point out in their criteria for good engagement, the information and resources provided to the stakeholders should be concise, understandable and free of jargon. Cork and Proctor (2005) argue that scientists often do not consider that people outside the scientific community are not necessarily familiar with scientific concepts. Stakeholders in North Devon called this “the academic bubble” (ND8); one of them said: “I think sometimes if you work in the academic world, you underestimate how little the rest of us know” (ND3).

At the same time, the experience from Plymouth to Fowey proves that, despite being very academic, the ecosystem services approach can be made accessible if “pitched just right” (PF6). Moreover, the French case studies have shown that it is possible to successfully engage stakeholders in an ESAV based process without involving them in the technical aspects, such as modelling, or exposing them to technical terminology. Instead of talking about ecosystem service assessment or ecosystem service valuation, the VALMER teams in the Golfe du Morbihan and Golfe Normand Breton used concepts and vocabulary that the stakeholders were already familiar with. For example, they framed the discussions and workshop activities around the ecosystem approach; and instead of explaining what ecosystem services are in theory, they used specific

local examples, for example talking about the role that seagrass plays in the Golfe du Morbihan without calling it ecosystem services. This last point was also picked up in Beery et al.'s (2016) study. According to the Swedish civil servants that they interviewed, "the focus should not be on a concept but upon [...] specific examples" (Beery et al. 2016, p. 125).

The importance of previous knowledge

The VALMER interviews revealed that public authority and NGO stakeholders involved in marine or environmental management tend to have some previous knowledge of the ecosystem services approach; although their understanding is not always accurate or comprehensive. In contrast, commercial and recreational marine stakeholders tend to be unfamiliar with the ecosystem services concept. Findings on this point vary between studies. For example, Böck et al. (2015) found that participants who worked in research and education, conservation or planning were familiar with the ecosystem services concept while those who worked in tourism or agriculture had no knowledge of it. Böck et al. (2015) point out that in particular to those with an academic background, ecosystem services was a buzzword, which is an expression that also came up in the VALMER interviews. Beery et al. (2016) report that Swedish civil servants and politicians tend to be familiar with the ecosystem services approach but uncertain about exact definitions or specific applications. Conversely, knowledge and understanding of the ecosystem services approach was found to be low among German regional and landscape planners (Albert et al. 2014) and professionals in public administrations and NGOs in the French Alps (Lamarque et al. 2015). These

different findings suggest that there might be regional and national as well as sectoral differences in the familiarity of the ecosystem services approach.

More importantly, in the context of ecosystem services based engagement the VALMER interviews suggest that previous knowledge of the approach, whether accurate and comprehensive or not, does appear to facilitate understanding of ESAV. In the case studies, the stakeholders who had not heard of the ecosystem services approach before found it more difficult to understand ESAV methods and terminology compared to those who were familiar with the approach. This confirms views expressed by participants in Beery et al.'s (2016) study who thought that previous knowledge is required to understand the ecosystem services concept. As one North Devon stakeholder said, “[it] is quite a difficult concept to get over to people who have absolutely no experience of that kind of academic study” (ND3).

The North Devon case study experience suggests that if the ecosystem services concept and ESAV are not made accessible, this can lead to frustration and disengagement. For example, stakeholders commented:

“I would like to have understood it better. I found it quite hard to take it all on board because I didn’t understand enough about it.” (ND1);

“I suspended judgement during the process until we reached the final outcome [...]” (ND2);

“I think it was quite a disengaging process [...]” (ND8).

When using the ecosystem services approach in an engagement process, it is therefore important to consider whether the participating stakeholders have an academic background and/or pre-existing knowledge of ecosystem services; and to adapt the

terminology and presentation of the ecosystem services concept and ESAV accordingly. In particular the involvement in more technical aspects of ESAV, such as modelling or monetary valuation methods, might not be appropriate and relevant for all stakeholder groups, as suggested by the comparison of stakeholder experiences in the UK and French case studies and between North Devon and Plymouth to Fowey.

Local governance stakeholders at different sites stressed that if the ecosystem services approach is to be used in a dialogue with policy makers, stakeholders and the public, it would have to be communicated in an accessible, practical and meaningful way. Two important factors that helped make ESAV accessible and meaningful in the VALMER case studies are 1) application of ESAV to small scale, local and locally relevant topics and issues, and 2) presentation of tangible results with a clear practical application for local management. Scenario building exercises were shown to be a useful method for engaging the stakeholders in applying ESAV to the local management context and making it tangible.

Finding the right balance of time and information

Another challenge for engaging stakeholders with the ecosystem services approach is the need to find the right balance of information and time. The literature says that access to complete, accurate and relevant information and materials is an important criterion for good engagement (Dalton 2005, Rowe and Frewer 2000). However, as Rowe and Frewer (2000) point out, it is equally important to give stakeholders enough time and opportunity to process and understand the provided information. This became particularly apparent in North Devon where the workshop participants felt overburdened by the amount of unfamiliar, highly conceptual and technical

information on ecosystem services and ESAV. As one stakeholder explained, this made it difficult to participate constructively in the process:

“The amount of information presented [...] was bewildering. I found it very hard to digest and be a positive part of the process.” (ND8).

In the North Devon case study, it was decided to limit stakeholder participation to four half day workshops spread over a nine month period in order to keep the time demand on the stakeholders to a minimum and avoid stakeholder fatigue. There was a strong awareness among the VALMER case study team that the local stakeholders had already been involved in similar participatory events over the last years as part of the Finding Sanctuary Project¹¹, which anecdotally had left many of them frustrated and disillusioned with engagement processes (see also De Santo 2016). However, at the same time, the case study team wanted to involve the stakeholders in the management scenario building as well as the socioecological modelling for the ESAV. This resulted in four very intense workshops in which the stakeholders were introduced to and asked to work with three highly conceptual and technical approaches that most of them were unfamiliar with (ecosystem services, scenario building, Bayesian network modelling), with little communication in between workshops. As one stakeholder said, “because there was so much stuff presented at each workshop, with nothing in between, just absorbing it was hard work” (ND8). This suggests that it might have been better for the engagement process not to involve the stakeholders in all technical aspects of the case study.

¹¹Finding Sanctuary (2007-2011) was one of four regional projects set up to develop recommendations for Marine Conservation Zones for the UK Government.

Alternatively, some of the stakeholders mentioned that they would have preferred more or longer workshops to be able to fully understand and participate in the process. As illustrated by comments like “I would like to have understood it better. I found it quite hard to take it all on board because I didn’t understand enough about it.” (ND1), the stakeholders did find the North Devon case study work interesting and relevant but were left frustrated by the overwhelming amount of information presented to them “in probably too short a time” (ND2).

Ambiguous ecosystem services terminology

The stakeholders’ understanding of ESAV and the concept of ecosystem services, both before and after participating in the case studies, reflect the ambiguity of the ecosystem services terminology in the literature as well as in the VALMER project. Ecosystem services have been described and categorised in many different ways (for example MEA 2005, TEEB 2010, see Chapter 2.2.2). Similarly, there are no clear, universally agreed definitions of the terms ‘ecosystem service assessment’ and ‘ecosystem service valuation’. As discussed in Chapter 2, assessment and valuation are sometimes used interchangeably while in other instances a distinction is made between the two. Assessments can be quantitative and/or qualitative. Sometimes, valuation refers to monetary valuation only while in other cases it encompasses a broader set of monetary and non-monetary, quantitative and qualitative values.

This ambiguity was also evident in VALMER. At the beginning of the project, the term ‘ecosystem service valuation’ was used and the focus was on monetary valuation. As it became apparent that monetary valuation would not be feasible or appropriate for all sites, there was a shift towards talking about ‘ecosystem service assessment’. However,

every project partner had a slightly different understanding of what this meant, a discussion that was further complicated by the fact that in French valuation and assessment translate into the same word: *évaluation*.

Lamarque et al. (2011) and Beery et al. (2016) argue that this multiformity and ambiguity of ecosystem service definitions and terminology is limiting the usefulness and practical application of the approach. The VALMER case study experience highlights that, when using the ecosystem services approach for engagement or communication, it is important to be clear about what the different terms and concepts mean. According to Lamarque et al. (2011), a broad, clear and simple definition is best suited for communication purposes. Likewise, the interview results show that it is important to be aware that different stakeholders might have different preconceptions about ecosystem services and ESAV; or that people's individual interests and perspectives on a management issue might influence how they interpret the ecosystem services approach.

Cultural differences

One aspect that became apparent in the interviews is that monetary valuation was mentioned more often by UK stakeholders than by French stakeholders. There are three factors that might explain this difference. First, comments by some of the French stakeholders suggest that monetary valuation is not very common or popular in France. Second, in line with the first point, monetary valuation was not a focus in the French case studies and the stakeholders did not receive much information about monetary valuation in the workshops. However, several North Devon stakeholders talked about

monetary valuation in the interviews despite the fact that monetary ESV did not play a central role in the North Devon case study either.

The third factor is a potential issue of terminology in the final interview question. In the UK case studies, the stakeholders were asked to define 'ecosystem service valuation'. This was chosen to avoid confusion by asking about two terms (assessment and valuation) in one question and also because the term 'ecosystem service valuation' was deemed to be more commonly known than 'ecosystem service assessment'. However, it is possible that this might have biased the stakeholders' responses because 'valuation' often has a monetary connotation. It is possible that if asked about 'ecosystem service assessment', some of the UK stakeholders might have given a different response. In the French interviews this problem did not occur given that assessment and valuation translate into the same word: *évaluation*. French stakeholders were asked to define '*évaluation des services écosystémiques*'. While the effect of the choice of terminology on French and UK mentions of monetary valuation cannot be excluded, it is likely that the cultural dimension also played a role. This suggests that concepts like ecosystem services and ESAV can have different significance and interpretations in different cultures and countries. This is an interesting finding that should be considered when deciding how to present the ecosystem services approach and whether to use monetary ESV in an engagement process, in particular in international or multicultural contexts.

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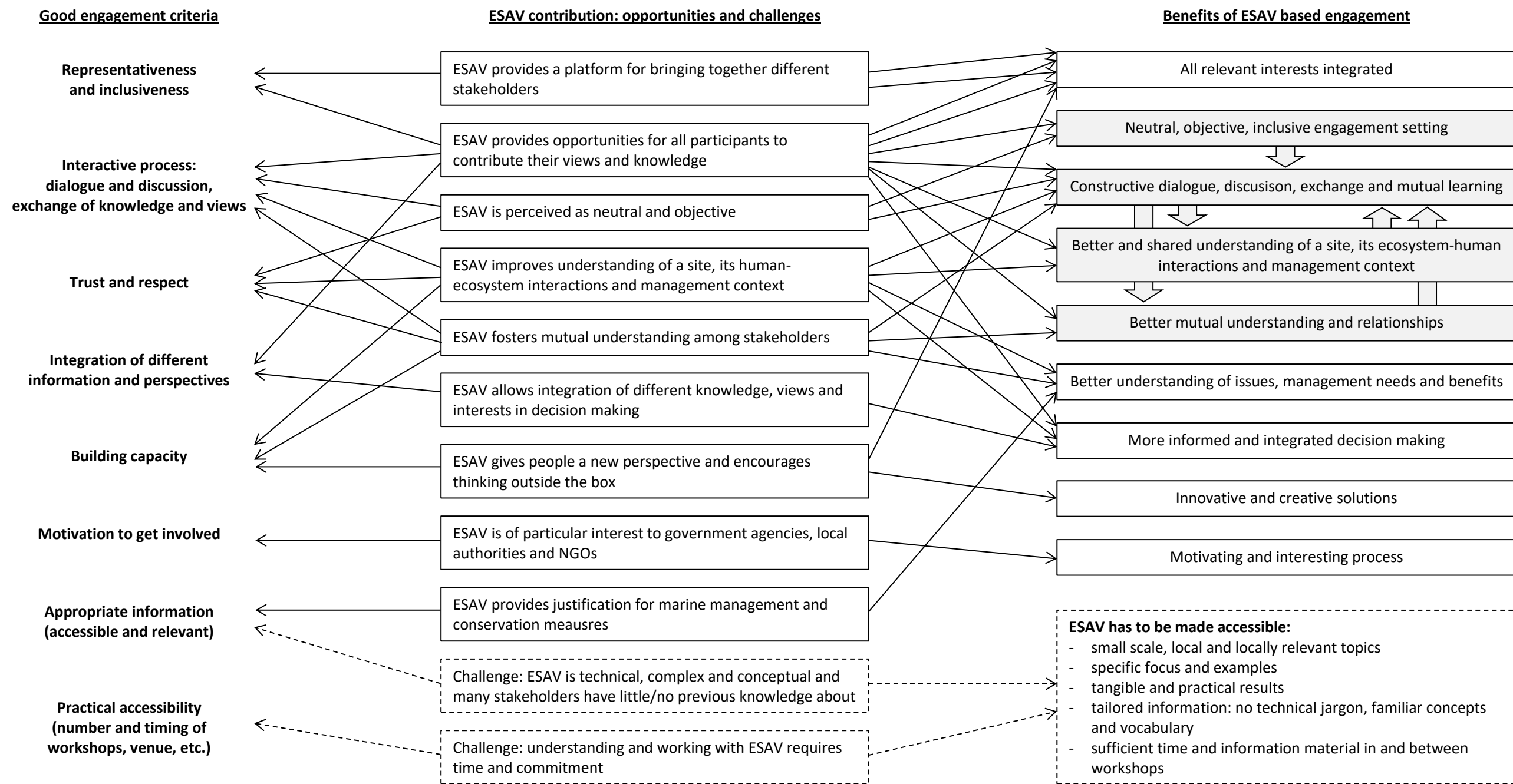


Figure 3.3: An illustration of the potential of the ecosystem services approach to contribute to good participatory stakeholder engagement in marine management; the opportunities and challenges of an ESAV based engagement process (centre) contribute to the criteria for 'good engagement'* (left) and result in potential benefits for participatory marine management (right) (key elements are highlighted, full lines indicate opportunities/benefits, dashed lines indicate challenges, thick grey arrows indicate influences between key benefits)

*The criteria have been slightly modified to improve the visual representation in the model and better reflect the preceding discussion: representativeness and inclusiveness have been integrated in one box, dialogue and exchange have been integrated into interactive process, and practical accessibility has been added

3.5.3 Bringing together the evidence: the ecosystem services approach as a participatory engagement tool for marine management

The potential of the ecosystem services approach to support good participatory stakeholder engagement in marine management, as well as the related challenges and benefits, are summarised in Figure 3.3 (inside of A3 fold out). The central element of ecosystem services based participatory engagement is improved understanding. ESAV helps stakeholders gain a better and shared understanding of a site, its marine ecosystem, activities and different user interests, as well as the human-ecosystem links and interactions. This supports constructive stakeholder dialogue and improved relationships among stakeholders and between stakeholders and managers. Better understanding, dialogue and relationships can, in turn, contribute to increased stakeholder acceptance of and compliance with management decisions. The main challenge for using ESAV as an engagement tool is making it accessible and understandable to a non-expert audience.

3.5.4 Monetary valuation: attitudes and expectations

Expected usefulness for governance and conservation

Monetary ESV was originally developed to better integrate environmental and biodiversity considerations in policy and management decisions (Gómez-Baggethun et al. 2011, Liu et al. 2010). In recent years, the number of monetary valuation studies for both terrestrial and marine environments has been growing. At the same time, the implementation in environmental and marine policy and management has been lagging behind (for example for the marine environment Kushner et al. 2012, Laurans

et al. 2013b, Marre et al. 2016, see Chapter 2.2.1 and 2.2.4). There are several reasons for this, including methodological limitations, concerns about validity, moral objections, and contextual factors such as lack of political will or regulatory frameworks that would allow the use of monetary ESV (Kushner et al. 2012, Marre et al. 2015, see Chapter 2.2.5). In response to the apparent limitations of monetary ESV, the academic ecosystem services debate has been broadened to include other forms of qualitative and quantitative assessments (Farber et al. 2006, Granek et al. 2010, see Chapter 2.2.3). This was also reflected in the VALMER project which explored a range of different ESAV approaches and their usefulness for marine management, ranging from monetary valuation to qualitative assessments of cultural significance. However, as became apparent in some of the case studies, there is still a strong interest in monetary values in governance and conservation spheres. For example, in Plymouth to Fowey the local managers and policy makers that participated in the case study repeatedly expressed expectations and requests for VALMER to produce monetary values. In Poole Harbour, where the focus was on monetary valuation, one public authority nature conservation stakeholder pointed out that monetary valuation is gaining increasing attention in environmental governance and the conservation sector. The stakeholder said that this was probably a consequence of the global economic recession and explained that it is “something that we need to consider as [a nature conservation] organisation” (PH4).

Cultural differences in attitudes and perceived usefulness

Across all VALMER case studies and stakeholder categories, the stakeholders’ thoughts on the appropriateness and usefulness of monetary ESV range from ‘good and useful’

to 'dangerous and should not be used', with the majority seeing monetary valuation as a 'necessary evil' in the current socioeconomic context of marine governance. Monetary ESV is considered to be useful mainly for communicating the societal and economic importance of nature, providing justification for conservation and integrating environmental considerations into decision making. Methodological limitations, moral concerns and the risk of misleading valuation results are seen as the main challenges.

A comparison with other studies shows that views on monetary ESV vary between countries. For example, the German planners interviewed by Albert et al. (2014) see economic valuation as potentially useful for starting a discussion or comparing alternative options; but at the same time as dangerous because of uncertainty, limited accuracy or the risk that valuation results might oppose conservation objectives. This last point is also one of the main concerns mentioned by the French and UK stakeholders in the VALMER case studies. In contrast, Beery et al. (2016) report that Swedish civil servants tend to believe that monetary valuation will support conservation and have generally positive attitudes towards the concept; they see monetary valuation as the main way of considering ecosystem services in decision making and influencing political decisions. According to Marre et al. (2015), Australian marine and coastal policy makers and managers think is monetary ESV useful or even necessary for communication, cost benefit analyses or decision making discussions.

Beery et al. (2016) argue that the positive views found in their study are partly due to a limited understanding of valuation methods or of what monetary valuation means in more detail. They point out that the participants who were more aware of valuation methods also expressed more critical views (Beery et al. 2016). However, Marre et al.'s

(2015) study suggests that Australian policy makers and managers have both good knowledge of and positive attitudes towards monetary ESV. Also, the VALMER interview results indicate that the stakeholders do not have a detailed understanding of monetary valuation methods either. Nonetheless, the majority is critical or concerned about the approach. What the interview results do show is a difference between French and UK views on monetary valuation. The comparison with studies from other countries appears to confirm this finding. Moreover, cultural differences also offer a possible explanation why studies found more positive attitudes in Australia and Sweden and more cautious attitudes in Germany, the UK and France.

One example of cultural differences is the use of monetary ESV to design and implement financial instruments. In the United States and many Caribbean countries, monetary ESV is often used to determine entrance fees to natural parks or fines and compensation payments for environmental damage (Kushner et al. 2012, Slootweg and van Beukering 2008). Similarly, financial instruments and compensation payments are two of the main uses of monetary ESV mentioned by Australian policy makers and managers (Marre et al. 2015). In contrast, responses to the related closed statements, views on monetary valuation and comments on the subject made in the VALMER interviews suggest that marine management stakeholders in the UK and France are not very familiar with this type of use. Moreover, they appear to be sceptical about the introduction of ESV based user fees and compensation payments. In fact, the use of monetary valuation, for financial instruments, as part of cost benefit analyses or to inform management more generally, is not very common in European countries (Liu et al. 2010).

Coming back to the context of marine stakeholder engagement, the existence of cultural differences in the perceived usefulness of and attitudes towards monetary ESV is an important finding. What this implies is that the cultural context should be considered when designing ESAV based marine engagement processes. The use of monetary ESV might be received positively by stakeholders in some countries, while in other countries the reactions might be more sceptical or critical.

3.5.5 Benefits beyond engagement and next steps

The ecosystem services approach as a communication tool

The findings on the contribution of the ecosystem services approach to good marine stakeholder engagement suggest that the ecosystem services approach could also offer a potential communication tool for marine managers. ESAV could be useful for communicating management decisions to marine users because it helps explain the context of management decisions and provides relevant justification for management measures and regulations. The potential use of ESAV as a communication tool was mentioned by marine management stakeholders across different case studies. The stakeholders thought that ESAV would provide relevant arguments to explain why measures and regulations are put in place and it would help illustrate what the consequences of inaction would be. They went on to say that this could potentially increase acceptance of management decisions and encourage compliance among stakeholders that do not have the opportunity to actively participate in the decision making process. The potential use of the ecosystem services approach as a tool to communicate marine management decisions will be further explored in the next chapter. Chapter 4 presents a study that compares the effects of non-ecosystem

services and ecosystem services based communication of management measures to different marine user groups on their acceptance of and support for these management measures.

Monetary valuation as a communication tool

Apart from providing justification for conservation and integrating environmental considerations into policy and management decisions, the interviewed management stakeholders also saw monetary valuation as a useful tool to communicate the need for and wider benefits of management and conservation to commercial stakeholders and the general public. As one French local manager said, “[it] shows the value to society that the protection of a habitat has, that it also involves economic issues” (GdM2, translated by LF). Others thought that monetary arguments might have more meaning and relevance for example for commercial stakeholders:

“For example, for commercial stakeholders a monetary value may have more significance. [...] If people see an economic value behind ecosystem services, they will have an interest in preserving this service.” (GNB5, translated by LF).

It is possible, however, that this might be a misconception and that managers might be overestimating the usefulness of monetary ESV for communicating with stakeholders and the public. The VALMER interview results show that commercial and recreational stakeholders, and in particular fisheries representatives, tend to be critical about monetary valuation. What is more important for them is to gain an understanding of the bigger picture of human-ecosystem interactions at their sites.

If the ecosystem services approach is to be used to engage and communicate with marine stakeholders and the wider marine user community, it is thus important to

know what different user and interest groups think about monetary valuation. Will they be receptive to monetary values or sceptical about the idea of monetising the natural environment? Will they accept management and conservation decisions based on economic arguments or are factors such as cultural identity, social wellbeing or ecological importance more relevant? As one Plymouth to Fowey stakeholder put it, “it is important to realise when it is appropriate to put values on things and when it isn’t” (PF7). In order to start answering these questions, the study presented in Chapter 4 also explores marine users’ opinions of and attitudes towards monetary valuation of ecosystem services.

4 The ecosystem services approach as a marine management communication tool: a marine user survey

4.1 Introducing the survey

The experience from the VALMER project case studies that were introduced in Chapter 3 shows that the ecosystem services approach has the potential to support and improve stakeholder participation in marine management processes. Ecosystem service assessment and/or valuation (ESAV) provides a neutral, objective and inclusive setting for engagement; it facilitates constructive stakeholder dialogue and exchange; and it enables the integration of different knowledge, values and perspectives in decision making. Most importantly, ESAV fosters a better and shared understanding of the links and interactions between marine ecosystems and human activities at a site, related issues as well as the need for and wider benefits of management. ESAV also supports improved mutual understanding among stakeholders and between stakeholders and managers. Good relationships between all involved parties and understanding of the management context are important factors for encouraging acceptance and support of marine management decisions as well as compliance with rules and regulations among marine users (Gleason et al. 2010, Lundquist and Granek 2005, Mascia 2003, Pomeroy and Douvere 2008, White and Courtney 2002).

However, in practice, not every affected or interested marine stakeholder will have the opportunity of getting involved in participatory processes for developing marine plans or making decisions about management options. Looking back at the different levels of engagement described in Chapter 2, active involvement, for example through

workshops or advisory committees, will likely be limited to key stakeholders and representatives of different interest and user groups. For the wider marine user community, engagement is more likely to take place through public consultations, provision of information and communication of outcomes once decisions have been made. In Chapter 3, some of the interviewed marine managers thought that the ecosystem services approach and ESAV would be useful for them to explain and justify management measures, such as access or catch restrictions, to their marine users. They thought that this could help increase acceptance of management decisions and encourage compliance among stakeholders that do not have the opportunity to actively participate in the decision making process.

Similar findings have also been reported by various studies in different terrestrial management and planning contexts. The Swedish civil servants and politicians interviewed by Beery et al. (2016) saw potential for the ecosystem services concept as a pedagogical tool “for raising public awareness of nature’s benefits and to communicate [...] to the public why certain plans have been made or decisions have been taken” (Beery et al. 2016, p. 126). Similarly, German landscape planners thought that ecosystem services information would facilitate communication of planning proposals to the public (Albert et al. 2014). Böck et al. (2015) report that Austrian river landscape management stakeholders thought the ecosystem services concept could raise public interest and acceptance of management measures by increasing the transparency of ecological assessments and improving understanding of societal dependence on nature. Various other authors also argue that the ecosystem services concept can effectively convey the role of ecosystems in supporting human wellbeing, as well as the importance of conservation, to politicians and policy makers, economic

stakeholders and different social groups (Berghöfer et al. 2016, Klein et al. 2015, Lamarque et al. 2011, Luck et al. 2012, Orenstein and Groner 2014). They point out that, apart from raising awareness of the importance of ecosystems, ESAV provides strategic and convincing arguments that can generate support for conservation (Berghöfer et al. 2016, Klein et al. 2015, Luck et al. 2012, Orenstein and Groner 2014).

However, despite these widespread expectations regarding the pedagogic potential of the ecosystem services approach, there appears to be little or no empirical evidence for this. None of the studies referred to above tested the use of the ecosystem services concept or ESAV information to communicate policy, management or planning decisions to user communities or the public; nor were any other studies found that did test this. The study presented here starts filling this evidence gap. It follows up on the findings from the VALMER interviews presented in Chapter 3, and the claims and expectations raised in the literature, with a survey that explores the usefulness of the ecosystem services approach for effectively communicating marine management decisions to marine users.

When considering the ecosystem services approach as a communication tool, one question that arises is whether or not to use monetary values or economic arguments. While ecosystem services are often associated with monetary valuation, this remains a very contentious topic (Gómez-Baggethun and Pérez 2011, Kosoy and Corbera 2010, Luck et al. 2012, McCauley 2006, Vatn 2000). In Chapter 3, the interviews showed that marine managers are interested in monetary valuation, among other things, for communicating the need for, and wider benefits of, management and conservation to commercial stakeholders and the general public. However, the interviews also suggested that managers might be overestimating the usefulness of monetary ESV for

communication with stakeholders. The interviewed commercial and recreational marine users tended to be critical about monetary valuation. If people are sceptical or opposed to the idea of monetising the natural environment, monetary valuation could have a disengaging effect (Bolderdijk et al. 2013, Schwartz et al. 2015).

While several studies have tested different valuation methods, conducted ESVs for various ecosystems or explored their application in different environmental management contexts, not much research has considered people's views and attitudes towards monetary valuation (Clark et al. 2000). Studies on environmental behaviour change have shown mixed results regarding the effectiveness of monetary or economic framing. Some studies found that financial considerations and arguments do have a positive influence, for example on energy saving behaviour, driving habits or compliance with environmental regulations (Dogan et al. 2014, Peterson and Diss-Torrance 2014, Spence et al. 2014, Steinhilber et al. 2015). In other studies, monetary or economic framing was less or not effective in encouraging pro environmental behaviour compared to environmental framing; and in some instances, it even had a disengaging effect. For example, Schwartz et al. (2015) found that advertisement emphasising the monetary benefits of energy saving programmes reduced respondents' willingness to take part in these programmes. Similarly, in Bolderdijk et al.'s (2014) study, appeals addressing concern about the environment did encourage car owners to have their tyres checked, while appeals promoting financial benefits were even less effective than the neutral control appeals, failing to persuade any car owners to have their tyres checked.

Research into pro environmental behaviour shows that people are influenced by many different factors related to their personal values, beliefs, attitudes and habits as well as

to the external context, morals and social norms (Hatcher et al. 2000, Howell 2013, Klöckner 2013, Steg and Vlek 2009). So when using ESAV as a communication tool in marine management, cultural identity, social wellbeing or ecological importance could potentially be more or equally relevant for raising acceptance and support of marine management decisions than monetary values and economic arguments. So far, the potential usefulness of monetary ESV in the context of communicating marine management decisions has not yet been explored. This is another evidence gap that is addressed in this chapter. For this purpose, the survey presented here also examines the attitudes and opinions of different marine users towards monetary valuation of marine ecosystem services.

The usefulness of the ecosystem services approach and monetary ESV as a communication tool for marine management was explored through a scenario based online survey. The survey was addressed at different commercial and recreational marine user groups in the UK counties and French regions along the Channel. The underlying objectives and hypotheses as well as the survey methods will be explained further in the next section of this chapter, followed by the presentation and discussion of the key results.

4.2 Survey objectives

In order to explore the usefulness of the ecosystem services approach as a communication tool for marine management, the survey was designed around three objectives.

Objective one: Effect of ESAV information on attitudes towards marine management

The first objective was to test whether using ESAV information to explain management measures has an effect on marine users' attitudes towards these management measures, more specifically on their level of agreement that the measures are justified and important. The hypothesis was that participants who received information about ESAV would rate the proposed management measures as more justified and of greater importance compared to those in the control group who did not receive such information. This hypothesis was based on findings from the VALMER interviews and from the literature that a) ESAV increases understanding of human-ecosystem interactions and management contexts, b) management stakeholders think that ESAV provides understandable and relevant justification for marine management measures, and c) better understanding and relevant arguments are assumed to facilitate greater acceptance and support of management decisions.

Objective two: Relevant ESAV based arguments for marine management

The second objective was to identify what kind of arguments for management measures marine users find relevant: ecological, economic, social, cultural and/or legal arguments. The ecosystem services approach is often associated with economic

assessments, but this is very controversial and different kinds of assessments and values are gaining increasing attention. In this context, objective two explored what kind of values or arguments are more relevant to marine users and would thus be more useful for explaining marine management decisions. This objective was exploratory in nature as there were no specific predictions about which arguments may be most relevant to marine users.

Objective three: Marine users' views on monetary valuation

Closely linked with objective two, the third objective was to find out what marine users think about monetary valuation of marine ecosystem services. This would further help determine whether monetary ESV arguments would be useful for communicating marine management decisions. This objective was also exploratory and not based on any specific predictions.

Additional research questions

In addition to these three objectives, the survey explored whether ESAV information has different effects on commercial and recreational marine users and whether views and attitudes towards monetary valuation differ between these two groups. If differences were found, this could have implications for the usefulness or design of ecosystem services based communication strategies depending on whether the target audience is commercial or recreational.

The survey also explored potential differences in reactions to the ecosystem services approach between marine users in the UK and France. One potential difference suggested by previous findings from the VALMER interviews was that respondents in

France would be more cautious and critical about monetary valuation than respondents in the UK. As discussed in Chapter 3, differences in attitudes towards monetary ESV appear to exist not only between France and the UK but between different countries or cultural contexts more generally. Again, this might be relevant for the design of ecosystem services based communication strategies in different countries.

Finally, the VALMER interviews revealed that marine stakeholders who are not involved in management tend to have little or no knowledge of the approach. Based on this, it was predicted that most marine users would be unfamiliar with ecosystem services and ESAV. To verify this, the survey included questions to investigate the level of pre-existing awareness and knowledge about the ecosystem services approach among marine users. Pre-existing knowledge, or absence thereof, could have implications for the use of the ecosystem services approach as a management communication tool. For example, it could determine the level of required explanations of ecosystem services and ESAV or choice of terminology.

4.3 Methods: a scenario based online survey approach

4.3.1 Rationale for using a quantitative scenario based online survey

The scenario approach

The survey aimed to explore the usefulness of the ecosystem services approach as a communication tool for marine management. One of the objectives was to test whether it has the potential to increase acceptance and support of management decisions among different commercial and recreational marine user groups. This required a method in which the same or comparable marine management decisions are communicated to similar sets of marine stakeholders using either ecosystem services or non-ecosystem services based information. The VALMER case studies were not suitable for this purpose as, at the time of this survey, they had not directly led to any actual management decisions. As discussed in Chapter 2, ecosystem service assessment is not yet widely applied in marine management. Consequently, no other suitable case study outside the VALMER project could be identified. In the absence of a real life case study, a scenario approach was adopted based on the vignette method frequently used in social psychology and sociology. A vignette, or scenario, is a short story that describes a hypothetical person or situation, simulating real life experiences or situations (Alexander and Becker 1978, Evans et al. 2015, Poulou 2001, Schoenberg and Ravdal 2000, West 1982). In this case, scenarios allowed the creation of a situation in which the same management decisions would be communicated in different ways to different sets of marine users.

The vignette approach can be flexibly adapted to various research contexts. While used for different purposes by various disciplines (Barter and Renold 2000, Evans et al.

2015, Poulou 2001, Renold 2002, Schoenberg and Ravdal 2000, West 1982), vignettes are particularly useful for investigating questions related to attitudes, judgements and decision making (Evans et al. 2015, Schoenberg and Ravdal 2000, West 1982). In a vignette experiment, participants are presented with a scenario and then asked to react or comment (Poulou 2001, Renold 2002, West 1982). Respondents are typically asked what they or others might do in a specific situation (Barter and Renold 2000, Hughes 1998, Renold 2002). The scenario provides the necessary information to enable the respondents to make decisions and judgements (Alexander and Becker 1978, Poulou 2001). A scenario consists of a constant background story in which key study variables can be changed to explore the effects of specific elements of the scenario on respondents' decisions and judgements (Evans et al. 2015, Poulou 2001). In the survey presented in this chapter, the respondents were asked to make judgements about a list of management options based on the scenario. The changing variable in the scenario was the provision of ESAV information. By providing a clearly defined, standardised context that is the same for all participants, scenarios allow comparison of responses between different groups (Alexander and Becker 1978, Barbour 2014, Barter and Renold 2000, Poulou 2001, Renold 2002). In the present study, comparing responses between participants that received information on ESAV and those that did not enabled an analysis of the potential effects of the ecosystem services approach on people's attitudes towards marine management.

While allowing the exploration of people's attitudes in complex and sensitive situations (Barter and Renold 2000, Bryman 2012, Barbour 2014, Renold 2002, Schoenberg and Ravdal 2000, Hughes 1998), the hypothetical nature of the vignette approach is also its main limitation (Evans et al. 2015). Scenarios are artificial

constructs and cannot fully reflect reality (Hughes 1998, Hughes and Huby 2004, Poulou 2001). Respondents' reactions to the scenario may not necessarily reflect social reality or predict future behaviour (Barter and Renold 2000, Schoenberg and Ravdal 2000) and findings cannot always be generalised (Evans et al. 2015). However, in the present context, the use of scenarios enabled the exploration of the topic in the absence of suitable real life case studies. Moreover, the vignette approach has been found to work regardless of the respondents' personal experience (Barter and Renold 2000, Renold 2002, Schoenberg and Ravdal 2000). This was an important advantage for the present study as the interview findings in Chapter 3 suggest that most marine stakeholders who are not directly involved in management are unfamiliar with the ecosystem services approach.

A second limitation of the vignette approach is the subjectivity of interpretation, referring both to the interpretation of the scenario by the respondents and to the interpretation of the respondents' reactions by the researcher (Finch 1987, Schoenberg and Ravdal 2000). To address this issue, it is important to write the scenario and related questions as clearly, precisely and carefully as possible, providing all relevant information without going into unnecessary detail, and avoiding ambiguous language. Further, in the present study, the subjectivity of interpretation of respondents' reactions was controlled as far as possible by a high level of consistency in the analysis. All responses were analysed by the same person (the author of this thesis) following the same criteria.

Quantitative online survey

The vignette approach typically involves quantitative surveys with closed Likert type questions (Barter and Renold 2000, Bryman 2012, Renold 2002). Scenarios can also be used in semi-structured interviews with open questions (Hughes and Huby 2004, Poulou 2001). Qualitative interviews offer opportunities for probing and gaining a detailed understanding of people's reactions (Hughes 1998, Barter and Renold 2000). In the present study, however, the purpose of the scenario based survey was not to gain a detailed understanding of expert views or individual stakeholders' attitudes. Rather, the survey aimed to explore the usefulness of the ecosystem services approach as a marine management communication tool with a large number of different marine users (Barter and Renold 2000, Renold 2002). In particular, the survey objectives included testing the potential positive effect of the ecosystem services approach on marine users' acceptance and support of management measures.

Likert type questions enabled the assessment of people's attitudes towards management in different scenario contexts and the comparison of attitudes between different types of marine users. Interviews and focus groups would have provided the option of collecting quantitative alongside qualitative, explanatory data (as was attempted in the VALMER interviews). However, it would not have been feasible to get a large enough sample for a statistically meaningful analysis of the quantitative elements within the time and budget constraints of this research study. The use of interviews and focus groups would also have limited the geographic scope of the study, again due to budget and time constraints.

Thus, both in terms of purpose and feasibility, a quantitative scenario based online survey was found to be the best method for this study. Furthermore, following the qualitative exploration of the topic in the interview study, the marine user survey provided an opportunity to add a quantitative perspective to the examination of the usefulness of the ecosystem services approach for marine stakeholder engagement.

4.3.2 Survey design

The survey was originally developed in English by the author of this study. It was then translated into French by a French colleague who had worked on the VALMER project and was therefore familiar with the topic and specialised terminology. Copies of the survey, with the exact phrasing of all questions in English and French, can be found in Appendix 4.

The scenario

To test whether using ESAV to explain management measures has an effect on marine users' attitudes towards marine management, respondents were first asked to read a fictitious scenario. The scenario described a marine site with a large seagrass bed to which a new management plan is introduced. Respondents were asked to imagine that they were a marine user at this site as the intention was to capture the respondents' personal views from the perspective of their marine activity.

Participants were told that in the scenario, the marine users receive a brochure which explains the new management plan and presents the information upon which the management decisions have been made. There were three versions of the scenario with the same story line: one control version with no ESAV information (Scenario 1)

and two versions with ESAV information (Scenario 2 and 3). The three scenario versions are presented in Table 4.1 (inside of A3 fold out). Each respondent received only one of the three versions, dividing the participants into three scenario groups. Respondents were not told that there were three versions of the scenario. The survey questions were the same for all three scenario versions.

Rationale behind the scenario storyline: Since the same scenario was given to different kinds of marine users, it was important not to antagonise any one user group. Therefore, the storyline was designed around three of the key marine activities in the Channel region (fishing, diving and sailing). Each activity was described to have positive and negative interactions with the local marine ecosystem. Further, the scenario had to be sufficiently realistic to capture people's interest and enable them to identify with the described situation.

Indeed, scenarios have been found more likely to be effective if they are of interest and relevance to participants and appear real (Hughes and Huby 2004, Renold 2002, Rahman 1996). According to Poulou (2001), realistic scenarios can activate respondents' imagination and interest and promote reflection and critical thinking. Seagrass was found to be a suitable habitat for the scenario as there are realistic positive interactions with, as well as realistic management issues related to, diving, fishing and sailing on seagrass beds. Seagrass beds provide interesting dive sites¹² and are important habitats for commercial fish species, for example plaice (Bertelli and Unsworth 2014, Jackson et al. 2001). Conversely, seagrass is vulnerable to damage

¹²For example, websites like the dive site directory (www.divesitedirectory.co.uk/) list a number of seagrass dive sites around the world.

Table 4.1: The three versions of the scenario; the storyline and introductory paragraph are the same for all three versions; respondents were not given the scenario titles

Scenario 1: No ESAV information	Scenario 2: Non-technical ESAV information	Scenario 3: Technical ESAV information
<p>Imagine that there is a large seagrass bed in the marine site that you use for work or recreation. According to scientists, the seagrass plays an important role in the local marine ecology. A new marine management plan is introduced to the area. You receive a brochure explaining the new management measures.</p>		
<p>The brochure says that the new plan is based on an ecological survey of the site and was informed by consultations with local stakeholders. The findings of the ecological survey and stakeholder consultation are presented in the brochure:</p> <ul style="list-style-type: none"> • The main marine activities in the area are a commercial plaice fishery and recreational diving, with regular trips being provided by local dive shops. The site is also popular for sailing. These activities are important for the local economy and identity of the local community. • In the area of the seagrass bed, the main activities are diving and sailing. Some parts of the seagrass bed are occasionally trawled for plaice; however, the main area for the local plaice fishery is outside the seagrass. • The seagrass is not in healthy condition because of the impacts of bottom trawling and anchoring from dive boats and private sailing boats. 	<p>The brochure says that the new plan is based on an integrated ecological and socioeconomic assessment of the site and its marine activities, which was informed by consultations with local stakeholders. The findings of the assessment are presented in the brochure:</p> <ul style="list-style-type: none"> • The main marine activities in the area are a commercial plaice fishery and recreational diving, with regular trips being provided by local dive shops. The site is also popular for sailing. These activities are important for the local economy and identity of the local community. • The seagrass bed plays an important role in supporting local marine activities. It is the main nursery habitat for the plaice stock which supports the local fishery. The seagrass bed also is an important dive site for local dive shops, attracting many divers to the area. Some parts of the seagrass bed are occasionally trawled for plaice; however, the main area for the local plaice fishery is outside the seagrass. • The seagrass is not in healthy condition because of the impacts of bottom trawling and anchoring from dive boats and private sailing boats. Further degradation of the seagrass bed would lead to a reduction of the local plaice stock and the site would lose its attractiveness for divers. This could have negative consequences for the local fishery and dive shops. 	<p>The brochure says that the new plan is based on an ecosystem service assessment of the site, which was informed by consultations with local stakeholders. A brief introduction to the ecosystem services approach is given:</p> <p>Ecosystem services are the benefits that humans get from the natural environment. Examples of marine ecosystem services are: nutrition from fish and seafood, coastal protection from storm waves, renewable energy and opportunities for recreational activities.</p> <p>Ecosystem service assessment is an integrated ecological and socioeconomic assessment of a site, looking at the ecosystem services that are provided and the interactions between human activities and the natural environment at the site.</p> <p>The findings of the assessment are presented in the brochure:</p> <ul style="list-style-type: none"> • The main marine activities in the area are a commercial plaice fishery and recreational diving, with regular trips being provided by local dive shops. The site is also popular for sailing. These activities are important for the local economy and identity of the local community. • The seagrass bed plays an important role in supporting local marine activities. It is the main nursery habitat for the plaice stock which supports the local fishery. The seagrass bed also is an important dive site for local dive shops, attracting many divers to the area. Some parts of the seagrass bed are occasionally trawled for plaice; however, the main area for the local plaice fishery is outside the seagrass. • The seagrass is not in healthy condition because of the impacts of bottom trawling and anchoring from dive boats and private sailing boats. Further degradation of the seagrass bed would lead to a reduction of the local plaice stock and the site would lose its attractiveness for divers. This could have negative consequences for the local fishery and dive shops.

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from the impacts of anchoring and fishing methods such as trawling (Duarte 2002). In many places, there is conflict with the boating community as seagrass beds are found in shallow, sheltered locations that often also present ideal conditions for anchoring (Cullen-Unsworth et al. 2014, La Manna et al. 2015). Further, seagrass beds were a suitable scenario habitat for the present survey because they are found in different parts of the Channel region and are not specific to one site.

Effect of ESAV information on attitudes towards marine management (survey questions 2, 3)

The scenario was followed by two closed questions on respondents' attitudes towards management (question 2) and towards the importance of management (question 3) in the context of the scenario.

Question 2 gave respondents a list of eight statements presenting different management measures, for example "Closure of the seagrass bed to bottom trawling" (see Table 4.2 for statements 2.1 to 2.8). Respondents were asked whether, in the scenario context, they would agree or disagree that these management measures were justified on a five point strongly agree to strongly disagree Likert scale (a 'don't know' option was also given). The management measures in statements 2.2, 2.3, 2.4 and 2.6 were justified in all three scenario versions. Information to justify statement 2.1 was only provided in Scenarios 2 and 3 but not in Scenario 1. Statements 2.7 and 2.8 were not justified in any of the three scenario versions and functioned as control statements.

In question 3, respondents were asked whether, in the scenario context, they would agree or disagree with nine statements on the importance of protecting the seagrass

(on a five point strongly agree to strongly disagree Likert scale with additional 'don't know' option). The statements included economic, ecological and cultural or community wellbeing reasons for protecting the seagrass in the scenario. An example of a cultural statement was "If the seagrass bed is not protected, the local community could lose part of its identity"; an example of an ecological statement was "The restriction of economic activities is justified because the seagrass is considered as ecologically important". Some statements were phrased negatively, for example "The local plaice fishery does not depend on the seagrass bed being healthy" (economic reason). All nine statements (3.1-3.9) are presented in Table 4.2.

Table 4.2: Statements for questions 2 and 3 (responses on a five point strongly agree to strongly disagree Likert scale with additional 'don't know' option)

Question 2: In the scenario, would you agree or disagree that the following management measures are justified?	
2.1	A seasonal fishing ban on and around the seagrass bed to protect juvenile fish
2.2	Closure of the seagrass bed to bottom trawling
2.3	An anchoring ban on the seagrass for commercially operated dive boats
2.4	An anchoring ban on the seagrass for private sailing boats
2.5	Closure of the seagrass bed to diving
2.6	Provision of moorings in the seagrass area
2.7	No new management measures for the seagrass bed are necessary
2.8	Ban of all boat traffic in the area of the seagrass
Question 3: In the scenario, would you agree or disagree with the following statements?	
3.1	If the seagrass bed is not protected, the local community could lose part of its identity
3.2	Measures to protect the seagrass bed are necessary
3.3	The local plaice fishery does not depend on the seagrass bed being healthy
3.4	The restriction of economic activities is justified because the seagrass is considered as ecologically important
3.5	Further damage to the seagrass bed would threaten local jobs
3.6	The seagrass needs to be maintained in a healthy state because it plays an important role in the local marine ecosystem
3.7	Loss of the seagrass would not have any impact on the wellbeing of the local community
3.8	The seagrass is a hindrance for marine activities in the area
3.9	It is irrelevant for the local economy whether the seagrass is healthy or not

Relevant ESAV based arguments for marine management (survey question 4)

Question 4 was preceded by a brief text which extended the scenario story by explaining that:

“[...] the local management team decided to introduce restrictions and regulations for anchoring and bottom trawling. In the brochure, the team explains why the new management measures were needed and provides the following arguments.”

Respondents were then given a list of ten statements presenting ESAV based arguments and asked: “How relevant to you are the arguments they present for justifying the new management measures?” (on a five point very relevant to not at all relevant Likert scale including a ‘don’t know’ option). The statements were designed to encompass ecological, cultural, legal and economic arguments, including one monetary value: “In healthy condition, the seagrass contributes around £750,000¹³ per year to the local economy” (see Table 4.3 for statements 4.1 to 4.10).

Questions 2, 3 and 4 were each followed by an open comment box in which respondents had the option to make comments related to the questions. Apart from gathering additional information, the purpose of these comment boxes was to prevent potential frustration that might arise from closed answer options by giving participants the opportunity to explain or expand on their responses.

The statements in questions 2, 3 and 4 were numbered (as presented in Tables 4.2 and 4.3) for the analysis and presentation of the survey results. In the version of the survey that was put online and accessed by the respondents, the statements were not numbered. Further, in the online format, the order of the statements in the questions

¹³The value of £750,000 was a rough estimate of the potential value of a marine site with a seagrass bed based on values presented in Fletcher et al. 2012b.

was automatically randomised for each respondent. This was done to avoid any potential effects of a fixed statement sequence on responses. Finally, the online survey was set up in a way that required respondents to give one score for each statement in questions 2, 3 and 4 to proceed to the next question and complete the survey.

Table 4.3: Statements for question 4 (responses on a five point very relevant to not at all relevant Likert scale with additional ‘don’t know’ option)

Question 4: How relevant to you are the arguments presented by the local management team for justifying the new management measures?

4.1	In healthy condition, the seagrass contributes around £750,000 per year to the local economy
4.2	Protecting the seagrass bed from further degradation will help secure local jobs
4.3	The seagrass bed plays an important role for the identity of the local community
4.4	Loss of the seagrass would significantly reduce the marine biodiversity in the area
4.5	As a nursery habitat for plaice, the seagrass has an important function for the local fishery
4.6	The economic value of a healthy seagrass bed is higher than the costs caused by the new management measures
4.7	In healthy condition, the seagrass bed attracts dive tourists to the area
4.8	Scientists say further degradation of the seagrass bed would change the marine ecosystem in the area considerably
4.9	National legislation requires protection of the seagrass because it is designated as a habitat of conservation
4.10	Failure to protect the seagrass will result in a fine from the EU because it is listed as a threatened habitat under EU legislation

Pre-existing knowledge about the ecosystem services approach (survey questions 5, 6, 7)

In question 5 respondents were asked whether they had heard of the ecosystem services approach before taking the survey. Respondents were required to select yes or no to proceed to the next question. If yes, respondents were asked where they had heard about ecosystem services (question 6). Respondents had to select one of six predetermined options (work, newspapers, TV or radio, university, internet, friends or

family) or the open 'other' option. This was followed by an optional open ended question about their understanding of the ecosystem services approach before taking part in the survey (question 7).

Marine users' views on monetary valuation (survey question 8)

Question 8 was introduced by a short explanation of the concept of monetary ESV:

“Monetary valuation of the natural environment is the idea of determining how much the environment contributes to human wellbeing in terms of economic value. For example, in our scenario we could say that the seagrass bed is worth £750,000 per year to the local economy because it supports important economic activities. Monetary valuation could potentially be used to inform management and planning decisions.”

Respondents were then asked: “What do you think about the idea of putting a monetary value on marine habitats and species based on the benefits they provide to humans?”. The question included a closed part, for which a response was required to proceed to the next question, and an optional open ended part. Respondents were asked to select one of five predetermined answer options and explain their views in a few words in a comment box. An 'other views' option was also given (“None of the above, I think...”). The predetermined answer options were derived from the categorisation of views on monetary valuation expressed by the VALMER stakeholders in the interviews (see Chapter 3 Table 3.12):

- Good idea and useful
- Useful under certain circumstances and with limitations
- 'Necessary evil', not good but necessary
- Not useful
- Dangerous and should not be used

Demographics

The survey concluded with a set of demographic questions on gender, age and highest level of education. Participants were also asked to indicate how far away from the sea they lived by selecting one of four distance categories. In the UK survey distance was described in miles while in the French survey the distance was described in kilometres. Using exact conversions would have resulted in random distances with unrounded figures in one of the two surveys. Therefore, for each version of the survey, distances were selected that made sense in the respective contexts of the countries and units of measurement, while still being roughly comparable:

- UK: within 5 miles, 5 to 10 miles, 11 to 20 miles, further than 20 miles from shore;
- France: within 10 kilometres, 10 to 20 kilometres, 20 to 30 kilometres, further than 30 kilometres from shore.

At the beginning of the survey, before the scenario, respondents were asked to select their primary use of the marine environment from a list of predetermined commercial and recreational options (question 1). To ensure that there would be similar numbers of commercial and recreational users in each scenario group, the online survey was programmed to get a balanced distribution of different kinds of marine users across the three scenario groups. For example, the first fisherman to open the survey would get Scenario 1, the second fisherman Scenario 2 and the third fisherman Scenario 3. For this purpose, the survey was set up using the Qualtrics online survey services. Qualtrics provides a function that enabled the balanced sorting of respondents into the three scenario groups. Survey monkey was considered as an alternative online survey provider but dismissed as it does not offer a similar sorting option.

4.3.3 Geographical scope, sampling and survey distribution

Geographical scope

Initially, the VALMER case study sites were used to determine the geographical scope of the survey, to establish regional coherence between the survey and the interviews. In the UK, the survey was distributed to marine users in Cornwall, Devon and Dorset. In France it was distributed in Brittany. In order to increase the statistical power of the survey, additional responses were sought by expanding the geographical scope of the survey eastwards along the Channel. A second round of survey invitations was sent out to marine users in Hampshire, Sussex and Kent in the UK, and in France to marine users in Lower Normandy, Upper Normandy and Nord Pas de Calais. This was possible because the survey was not directly tied to the VALMER case studies. Moreover, the scenario was location generic and not related to any specific area.

Sampling and survey distribution

The sampling was purposely directed at a list of key commercial and recreational marine user groups in the Channel region. The internet was searched for contact details (email addresses and online contact forms) for the following:

- Fishermen's organisations/associations
- Dive shops and centres
- Surf shops and schools
- Sailing schools
- Water sports centres
- Marinas
- Angling shops and centres
- Charter boats (diving, angling)
- Dive clubs/associations
- Surf clubs/associations
- Sailing clubs/associations
- Angling clubs/associations

Individual, personalised emails were sent to each of the identified contacts separately with an invitation to take part in the survey. The emails also included a request to forward the survey invitation to colleagues or club members, to create additional 'snowball' sampling. Where appropriate, the author's personal and professional network of contacts was used to address specific user groups. The social media platform Twitter was also used to advertise the survey, providing an opportunity to reach a broader audience of marine users in the Channel region, including individuals that are not part of a club or association or commercial users that were not directly contacted.

The invitation emails for UK contacts were sent out from mid-November 2015 to mid-January 2016. In France, a first round of invitation emails was sent in November and December 2015. This was followed by a second round in March 2016 to increase the number of French responses which at that point was considerably lower than the number of UK responses. The English version of the survey was open from November 2015 to March 2016 and the French version was open from late November 2015 to April 2016.

4.3.4 Ethical considerations

Ethical approval for the survey was obtained from the Human Ethics Committee of the Faculty of Science and Environment at Plymouth University. The Committee had no ethical concerns with regard to the survey. A brief text at the beginning of the survey introduced the study context and explained that the scenario presented in the survey was entirely fictional. Respondents were further informed that the survey was anonymous and that it would therefore not be possible to withdraw from the study

once the responses had been submitted. Before proceeding to the questions, respondents were asked to provide informed consent by ticking a box confirming that they had read the survey conditions, were 18 years or older and agreed for their responses to be used in the research presented in this thesis. Contact details for the author of this study were provided at the beginning as well as the end of the survey.

4.3.5 Survey analysis

The statistical analysis of the survey was conducted in IBM SPSS version 22. Only fully completed surveys, in which all required questions had been answered, were included in the analysis. One complete survey was excluded from the analysis as the responses and comments suggested that the respondent had not engaged properly with the survey. French open ended answers and comments were interpreted directly from French or translated to English by the author of this study.

Descriptive statistics

First, the demographic composition of the sample was examined. Frequency distributions for the demographic variables (country of residence, primary marine use category, gender, age, highest level of qualification¹⁴, distance of residence from shore) were determined for the overall sample, the French and UK subsamples and the three scenario groups. Frequencies and mean responses were also explored for questions 2 (attitudes towards management), 3 (importance of management), 4 (relevance of ESAV based arguments), 5 (pre-existing knowledge of the ecosystem services approach), and 8 (views on monetary valuation).

¹⁴Highest level of qualification and education are being used synonymously.

Testing for differences and effects

Next, parametric and non-parametric tests were applied to explore potential differences between variables, differences in mean responses and effects of different variables (including demographics and scenario group) on these responses. The Pearson Chi-Square test was used to test for significant differences between the following variables (results were interpreted as significant for $p \leq .05$):

1. Education levels in the UK and French samples;
2. Distribution of demographics (primary use category, gender, age, education, distance from shore) in the three scenario groups;
3. Differences between participants from different demographic groups (country of residence, primary use category, gender, age, education, distance from shore) in their responses to question 5 (pre-existing knowledge of the ecosystem services approach) and question 8 (views on monetary valuation);
4. Differences between participants from different scenario groups in their responses to questions 5 (pre-existing knowledge) and 8 (views on monetary valuation);
5. Comparison of responses to question 8 (views on monetary valuation) with responses to statement 4.1 (relevance of monetary argument).

Mean responses to questions 2 (attitudes towards management), 3 (importance of management) and 4 (relevance of ESAV based arguments) were compared between different demographic groups (country of residence, gender, age, education, distance from shore) and between different scenario groups using:

- Univariate Analysis of Variance (ANOVA), $p \leq .05$, parametric;
- Mann-Whitney test (for two independent samples), $p \leq .05$, non-parametric;
- Kruskal-Wallis test (for multiple independent samples), $p \leq .05$, non-parametric.

The data was checked for normality of distribution by looking at skewness, the Shapiro-Wilk test for normality (assumption met if $p > .05$), histograms and Q-Q plots. Levene's test for equality of variances was used to test for homogeneity of variance (assumption met if $p > .05$). As the assumptions of normal distribution and/or homogeneity of variance were almost never met, the ANOVA results are not reported here. In cases where the ANOVA results corresponded to the results of the non-parametric tests, ANOVAs and the Games-Howell Post Hoc test were used to further explore the effects found by the non-parametric tests. This included:

1. ANOVAs comparing mean responses to questions 2 (attitudes towards management), 3 (importance of management) and 4 (relevance of ESAV based arguments) between the UK and French samples while controlling for the effect of education (covariate 'highest level of qualification');
2. ANOVAs comparing mean responses to questions 2 and 3 between scenario groups while controlling for the effects of different demographic variables found to have had an effect on the responses when tested separately (demographic variables as covariates);
3. ANOVAs with multiple fixed factors to test for interactions between scenario groups and demographic variables (country of residence, primary use category, gender);
4. Games-Howell Post Hoc test to identify between which scenario groups responses to questions 2 and 3 were significantly different.

Given the large sample size and the fact that the ANOVA results largely coincided with those of the non-parametric tests, it was deemed appropriate to run these additional ANOVAs and Post Hoc tests. However, as the required assumptions for parametric tests were not met, the results of these additional tests were only used as indications of effects and are not reported here.

Analysis of open responses

Participants' explanations of their previous understanding of the ecosystem services approach (question 7) were categorised into 'some/good understanding', 'no understanding', 'ecosystem approach understanding' and 'no indication'. This was used as an indication of the level of knowledge about the ecosystem services approach among the participants who reported having heard about the approach before.

The open responses on participants' opinions about monetary valuation (question 8) were sorted into the six predetermined answer categories given in the question. In each category, the responses were coded by highlighting key words and themes. Responses with similar coding were drawn together and translated into simplified, standardised statements. Responses that were not relevant to the question or could not be clearly interpreted were filtered out and counted as invalid responses.

4.4 Results

4.4.1 Description of the survey sample

The final survey sample taken forward in the analysis encompassed 277 complete responses, of which 169 were from the UK and 108 from France (Table 4.4). An accurate calculation of the survey response rate was not possible due to the ‘snowball’ distribution of the survey. Approximately 1,180 survey invitations were initially sent out and the survey was opened 483 times, giving an approximate response rate of 41%. However, the actual response rate is likely to be lower due to the request for forwarding the survey invitation to colleagues and club members. The survey completion rate was 57.56%, with 205 responses remaining incomplete. The largest number of drop outs occurred when respondents were presented with the scenario, in all three versions.

Table 4.4: Distribution of gender and age across the survey sample

	Sample size (N)	Gender (count/percent of N)	Average age (Mean)	Age range
Total sample	277	Female 52 / 18.77% Male 224 / 80.87% Missing 1 / 0.36%	52	18-77
UK sample	169	Female 28 / 16.57% Male 141 / 83.43%	53	18-77
French sample	108	Female 24 / 22.43% Male 83 / 77.57% Missing 1 / 0.93%	50	21-72

Across the whole sample, 28.16% of respondents held a postgraduate degree as highest level of qualification, followed by 27.44% with an undergraduate degree and 14.44% with a professional degree. The remaining respondents had secondary level education (15.88%), primary or no formal education (1.08%), or said 'other' (13.00%, in the UK mainly Higher National Diplomas or Certificates, in France mainly engineering qualifications). Qualification levels varied significantly between participants in France and the UK (Pearson Chi-Square $p = .000$) (Figure 4.1).

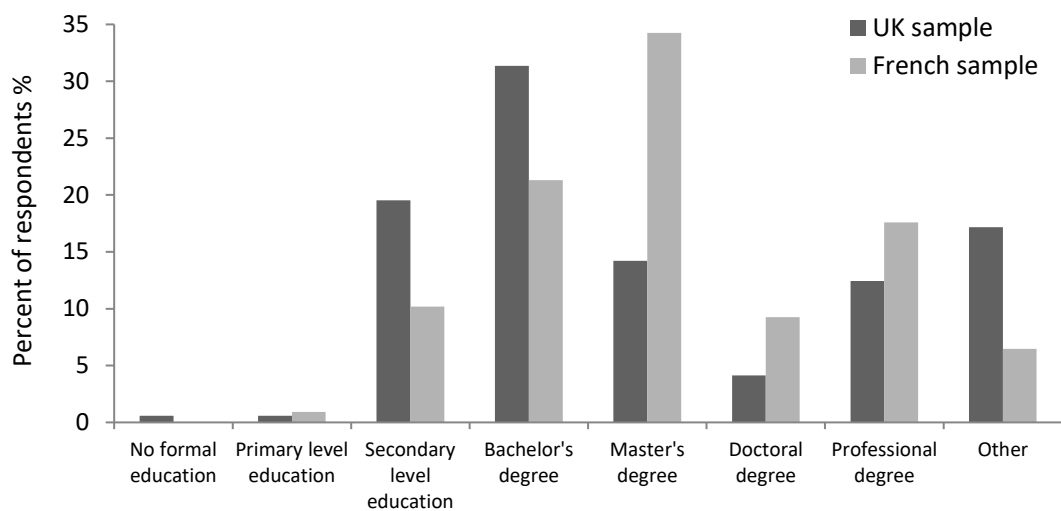


Figure 4.1: Overview of the highest levels of qualification of respondents in the UK ($N = 169$) and in France ($N = 108$)

The majority of respondents lived within 5 miles or 10 kilometres from shore (70.04%). Most respondents used the marine environment primarily for recreational purposes (79.42%), and this did not vary significantly between the French and UK subsamples. Table 4.5 presents a detailed breakdown of the distribution of respondents across different recreational and commercial marine uses. The largest groups of respondents were recreational divers, anglers and yachters.

Table 4.5: Distribution of total ($N = 277$), UK ($n = 169$) and French ($n = 108$) respondents across different commercial and recreational marine uses

Primary use of the marine environment	Total count	Total %	UK count	UK %	France count	France %
Commercial uses*	57	20.58	35	20.71	22	20.37
Dive shop or charter boat	18	6.50	8	4.73	10	9.26
Angling shop or charter boat	5	1.81	5	2.96	0	0
Surf shop or school	2	0.72	1	0.59	1	0.93
Water sports centre	5	1.81	3	1.78	2	1.85
Sailing school	11	3.97	7	4.14	4	3.70
Marina	7	2.53	4	2.37	3	2.78
Other commercial purpose	9	3.25	7	4.14	2	1.85
Recreational uses	220	79.42	134	79.29	86	79.63
Diving	67	24.19	33	19.53	34	31.48
Sailing	52	18.77	39	23.08	13	12.04
Angling	61	22.02	46	27.22	15	13.89
Surfing	7	2.53	6	3.55	1	0.93
Kayaking or similar	18	6.50	3	1.78	15	13.89
Other recreational purpose	15	5.42	7	4.14	8	7.41

*Owning or working for

Table 4.6 shows the distribution of the 277 respondents across the three scenario groups. A comparison of demographics (primary use category, gender, age, education, distance from shore) between scenario groups showed only slight variances¹⁵, none of which proved to be statistically significant (Pearson Chi-Square $p > .05$).

Table 4.6: Distribution of respondents across the three scenario groups

Scenario	Total count	Total %	UK count	UK %	France count	France %
Scenario 1	91	32.85	49	28.99	42	38.89
Scenario 2	92	33.21	58	34.32	34	31.48
Scenario 3	94	33.94	62	36.69	32	29.63
Total	277	100	169	100	108	100

¹⁵See Appendix 5 for an overview of the distribution of demographics by scenario group.

4.4.2 The effects of demographic variables on responses

Table 4.7 presents the results of the non-parametric tests comparing mean responses to questions 2 (attitudes towards management), 3 (importance of management) and 4 (relevance of ESAV based arguments) between different demographic groups.

Table 4.7: Results of Mann-Whitney and Kruskal-Wallis tests for the effects of the demographic variables on questions 2, 3 and 4 (significant effects are highlighted, $p \leq .05$; Mann-Whitney test: country of residence, gender; Kruskal-Wallis test: primary use category, age, education, and distance from shore; see Tables 4.2 and 4.3 for statement wording)

Question	Country of residence	Primary use category	Gender	Age	Education	Distance from shore
2.1	.001	> .05	> .05	> .05	> .05	> .05
2.2	.017	.029	> .05	> .05	> .05	> .05
2.3	.003	> .05	> .05	> .05	> .05	> .05
2.4	.000	> .05	> .05	> .05	> .05	> .05
2.5	> .05	> .05	> .05	> .05	> .05	> .05
2.6	.000	> .05	> .05	> .05	> .05	.039
2.7	.000	> .05	> .05	> .05	.015	> .05
2.8	.013	> .05	> .05	> .05	> .05	> .05
3.1	> .05	> .05	> .05	> .05	> .05	> .05
3.2	.000	> .05	.007	> .05	> .05	> .05
3.3	> .05	> .05	.002	> .05	> .05	> .05
3.4	.009	> .05	> .05	> .05	> .05	> .05
3.5	.007	> .05	.038	> .05	> .05	.017
3.6	.000	> .05	.015	> .05	> .05	> .05
3.7	> .05	> .05	> .05	> .05	.047	> .05
3.8	> .05	> .05	> .05	> .05	> .05	> .05
3.9	> .05	> .05	> .05	> .05	> .05	> .05
4.1	.042	> .05	.000	> .05	> .05	> .05
4.2	> .05	> .05	.010	> .05	> .05	.029
4.3	> .05	> .05	.042	> .05	> .05	> .05
4.4	.008	> .05	.024	> .05	> .05	> .05
4.5	> .05	> .05	.009	> .05	> .05	> .05
4.6	> .05	> .05	.001	> .05	> .05	> .05
4.7	> .05	> .05	.001	> .05	> .05	> .05
4.8	.049	> .05	> .05	> .05	> .05	> .05
4.9	> .05	> .05	> .05	> .05	> .05	> .05
4.10	> .05	> .05	> .05	> .05	> .05	> .05

These non-parametric tests were run to identify whether the demographic variables had any significant effects on participants' responses.

ANOVAs were also run. While the ANOVA results are not reported here because the necessary assumptions were not met, they corresponded largely to the results of the non-parametric tests. It was previously found that the level of education of respondents varied significantly between the UK and France. The Kruskal-Wallis test found that country of residence had significant effects on several of the statements in questions 2, 3 and 4. An ANOVA controlling for the effects of education was used to get an indication of whether the effects of country of residence were merely caused by the different levels of education in the UK and French samples.

The ANOVA results suggest that this was not the case and that it can be assumed that the effects on participants' responses were due to other factors related to their respective countries of residence. Moreover, an ANOVA controlling for the potential effect of the different scenario versions confirmed that the effect of country of residence also remained significant regardless of the scenario effect. On average, respondents in France agreed or disagreed more strongly with the statements in questions 2 (attitudes towards management), 3 (importance of management) and 4 (relevance of ESAV based arguments) compared to respondents in the UK (see Appendix 5).

Country of residence also had a significant effect on responses to question 8 (views on monetary valuation), with respondents in the UK expressing more positive views than respondents in France (Pearson Chi-Square $p = .035$; this result is further addressed in section 4.4.6). For question 5 (pre-existing knowledge), a significant difference was

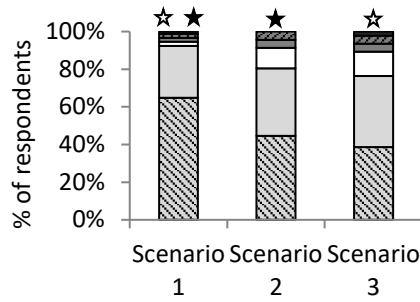
found in responses between male and female respondents, with female respondents reporting more pre-existing knowledge than male respondents (Pearson Chi-Square $p = .016$; see also section 4.4.5).

4.4.3 Effect of ESAV information on attitudes towards marine management

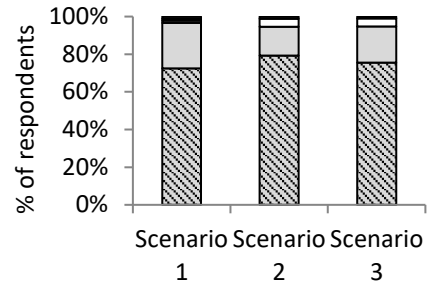
In question 2, respondents were given a list of eight management options and asked whether they would agree or disagree that these measures were justified in the scenario context. While overall, respondents' attitudes towards these management measures were similar across the three scenario groups (Figure 4.2), responses were found to be significantly different for four of the eight statements (Table 4.8). The results of the Games-Howell Post Hoc test indicate that responses for all four statements were significantly different between scenario groups 1 (no ESAV) and 3 (technical ESAV). For statements 2.1 and 2.3 the test also found a significant difference between scenario groups 1 and 2 (non-technical ESAV). The effects found by the Kruskal-Wallis test were also reflected in the ANOVA¹⁶ results and remained significant when the ANOVA was run controlling for the effects of country of residence (see Table 4.7).

¹⁶As explained in section 4.3.5, the ANOVA results are not reported because the necessary assumptions of normal distribution and/or homogeneity of variance were not met.

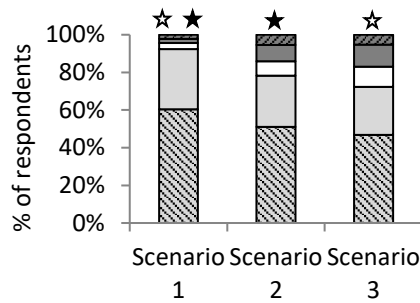
2.1 A seasonal fishing ban on and around the seagrass bed to protect juvenile fish



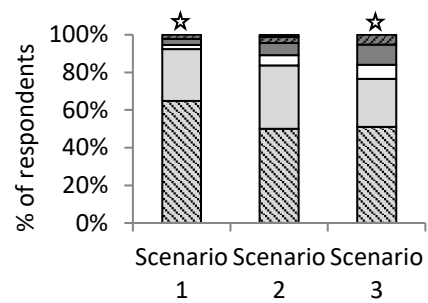
2.2 Closure of the seagrass bed to bottom trawling



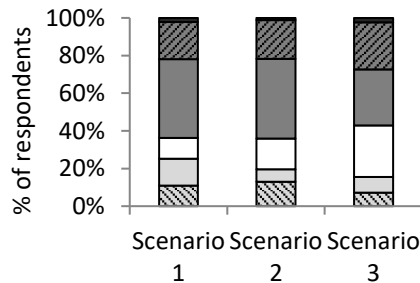
2.3 An anchoring ban on the seagrass for commercially operated dive boats



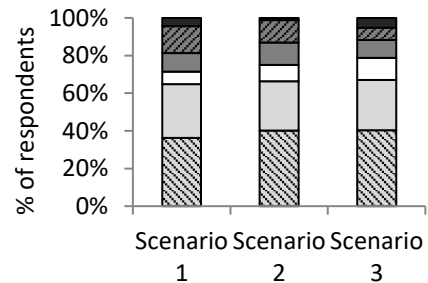
2.4 An anchoring ban on the seagrass for private sailing boats



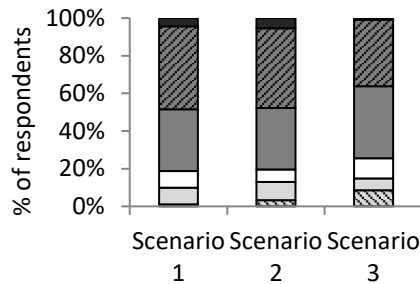
2.5 Closure of the seagrass bed to diving



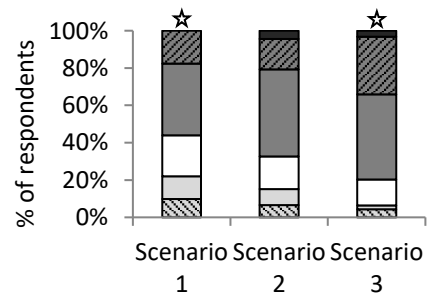
2.6 Provision of moorings in the seagrass area



2.7 No new management measures for the seagrass bed are necessary



2.8 Ban of all boat traffic in the area of the seagrass



Strongly agree
 Agree
 Neutral
 Disagree
 Strongly disagree
 Don't know

Figure 4.2: Distribution of responses to question 2 'In the scenario, would you agree or disagree that the following management measures are justified?' by scenario group (stars of the same colour indicate significant differences between two groups; N = 277)

Table 4.8: Agreement that marine management measures are justified (question 2): comparison of means between scenario groups (Kruskal-Wallis test, rows shaded in grey indicate significant results $p \leq$; mean values based on a scale of 1 strongly agree to 5 strongly disagree; minor variation in N across statements and scenario groups because 'don't know' responses were treated as missing values)

Management option statement	Implications of management option	Significant difference? (Kruskal-Wallis test)	Mean Scenario 1	Mean Scenario 2	Mean Scenario 3
2.1 A seasonal fishing ban on and around the seagrass bed to protect juvenile fish	Temporary restriction of commercial activity	< .001	1.48 ($N = 90$)	1.88 ($N = 92$)	1.99 ($N = 92$)
2.2 Closure of the seagrass bed to bottom trawling	Permanent restriction of commercial activity	.596	1.31 ($N = 90$)	1.24 ($N = 91$)	1.31 ($N = 94$)
2.3 An anchoring ban on the seagrass for commercially operated dive boats	Permanent restriction of commercial activity	.027	1.54 ($N = 91$)	1.90 ($N = 92$)	2.03 ($N = 94$)
2.4 An anchoring ban on the seagrass for private sailing boats	Permanent restriction of private recreational activity	.035	1.51 ($N = 91$)	1.78 ($N = 91$)	1.94 ($N = 94$)
2.5 Closure of the seagrass bed to diving	Permanent restriction of private and commercial recreational activity	.858	3.46 ($N = 89$)	3.52 ($N = 91$)	3.63 ($N = 92$)
2.6 Provision of moorings in the seagrass area	'Positive' measure, no restriction on commercial or recreational activities	.622	2.34 ($N = 87$)	2.29 ($N = 91$)	2.10 ($N = 89$)
2.7 No new management measures for the seagrass bed are necessary	No change in status quo	.238	4.15 ($N = 87$)	4.07 ($N = 87$)	3.86 ($N = 93$)
2.8 Ban of all boat traffic in the area of the seagrass	Permanent restriction of commercial and recreational activities	.001	3.42 ($N = 91$)	3.60 ($N = 88$)	4.00 ($N = 91$)

Thus, the comparison of mean responses shows that the scenario did have an effect on respondents' attitudes towards the restrictions of commercial and recreational activities proposed in statements 2.1, 2.3, 2.4 and 2.8. Participants who had received ESAV information in Scenarios 2 and 3 tended to agree less strongly with the first three management measures and were more critical of the last measure, compared to participants who had not received ESAV information (Scenario 1).

In question 3, respondents were asked to agree or disagree with a list of nine reasons for protecting the seagrass bed in the scenario. Again, opinions were similar across the three scenario groups and responses were found to differ significantly only for statement 3.4 (Table 4.9). As for the statements in question 2, the Games-Howell Post Hoc test indicates that responses for statement 3.4 were significantly different between scenario groups 1 (no ESAV) and 3 (technical ESAV). However, when controlling for the effect of country of residence, the ANOVA result was no longer significant. This suggests that factors relating to their countries of residence had a stronger influence on participants' responses to 3.4 than the presence or absence of ESAV information in the scenario. Thus, the analysis of question 3 found that the ESAV information did not have a significant effect on respondents' attitudes towards the importance of management.

Table 4.9: Agreement on the importance of management for protecting the seagrass (question 3): comparison of means between scenario groups (Kruskal-Wallis test, rows shaded in grey indicate significant results $p \leq$; mean values based on a scale of 1 strongly agree to 5 strongly disagree; minor variation in N across statements and scenario groups because 'don't know' responses were treated as missing values)

Management importance statement	Reasons for management	Significant difference? (Kruskal-Wallis test)	Mean Scenario 1	Mean Scenario 2	Mean Scenario 3
3.1 If the seagrass bed is not protected, the local community could lose part of its identity	Cultural/community wellbeing	.190	2.41 ($N = 87$)	2.26 ($N = 90$)	2.55 ($N = 92$)
3.2 Measures to protect the seagrass bed are necessary	No specific reason	.097	1.48 ($N = 90$)	1.49 ($N = 92$)	1.69 ($N = 93$)
3.3 The local plaice fishery does not depend on the seagrass bed being healthy	Economic (fishery)	.620	3.83 ($N = 76$)	3.98 ($N = 83$)	3.90 ($N = 86$)
3.4 The restriction of economic activities is justified because the seagrass is considered as ecologically important	Ecological	.018	1.80 ($N = 90$)	1.96 ($N = 92$)	2.17 ($N = 93$)
3.5 Further damage to the seagrass bed would threaten local jobs	Economic (jobs)	.149	2.35 ($N = 83$)	2.13 ($N = 89$)	2.41 ($N = 90$)
3.6 The seagrass needs to be maintained in a healthy state because it plays an important role in the local marine ecosystem	Ecological	.294	1.36 ($N = 90$)	1.43 ($N = 92$)	1.46 ($N = 94$)
3.7 Loss of the seagrass would not have any impact on the wellbeing of the local community	Community wellbeing	.213	3.99 ($N = 85$)	4.08 ($N = 87$)	3.78 ($N = 92$)
3.8 The seagrass is a hindrance for marine activities in the area	Management not necessary	.888	4.16 ($N = 91$)	4.20 ($N = 90$)	4.16 ($N = 91$)
3.9 It is irrelevant for the local economy whether the seagrass is healthy or not	Economic	.503	4.18 ($N = 87$)	4.29 ($N = 91$)	4.05 ($N = 92$)

ANOVAS were also used to test for interactions between scenario groups and demographic variables in order to identify whether respondents in the UK and France, commercial and recreational users, or male and female participants reacted differently to the three scenario versions, and thus to the ESAV information. The results indicate that this was not the case. The only exception was statement 3.6, where a comparison of means showed that respondents in the UK reacted differently compared to respondents in France. While in France Scenarios 2 (non-technical ESAV) and 3 (technical ESAV) led to stronger agreement with the statement than Scenario 1 (no ESAV), the opposite was the case in the UK*:

- France: Scenario 1 $M = 1.33$, Scenario 2 $M = 1.11$, Scenario 3 $M = 1.16$;
- UK: Scenario 1 $M = 1.38$, Scenario 2 $M = 1.62$, Scenario 3 $M = 1.61$.

*(Mean values based on a scale of 1 strongly agree to 5 strongly disagree; the ANOVA results are not reported because the necessary assumptions of normal distribution and/or homogeneity of variance were not met.)

4.4.4 Relevant ESAV based arguments for marine management

In question 4, respondents were asked how relevant they found different ESAV based arguments for management (see Table 4.3). While the question was asked in the context of the scenario, the information provided by the scenario was not expected to have a significant effect on responses because the question related to participants' personal values and attitudes towards management. The Kruskal-Wallis test found no significant differences in responses between scenario groups ($p > .05$ for all ten statements).

When comparing participants in the UK and France, responses were found to be significantly different for three statements (see Table 4.7), although the actual differences between means were small:

- 4.1: $p = .042$, UK $M = 2.06$ ($N = 144$) < France $M = 2.32$ ($N = 78$);
- 4.4: $p = .008$, UK $M = 1.75$ ($N = 168$) > France $M = 1.51$ ($N = 108$);
- 4.8: $p = .049$, UK $M = 1.77$ ($N = 167$) > France $M = 1.62$ ($N = 107$).

Significant effects on seven of the ten statements in question 4 were also found for gender. On average, female respondents placed greater relevance on statements 4.1 to 4.7 compared to male respondents (Table 4.10; see Table 4.11 for statements).

Table 4.10: Effect of gender on responses to question 4 (mean responses based on a scale of 1 very relevant to 5 not at all relevant)

Statement	Kruskal-Wallis test $p \leq .05$	Mean Female	Mean Male	<i>N</i> Female	<i>N</i> Male
4.1	< .001	1.61	2.28	41	180
4.2	.010	1.86	2.23	51	214
4.3	.042	2.19	2.50	52	221
4.4	.024	1.43	1.71	51	224
4.5	.009	1.37	1.68	49	220
4.6	.001	1.76	2.29	45	204
4.7	.001	1.63	2.12	51	223
4.8	.122	1.58	1.75	52	221
4.9	.787	1.92	1.92	51	221
4.10	.191	2.33	2.55	49	200

Table 4.11 presents an overview of the responses to question 4 for the overall sample. The ten statements are in order of highest average relevance (lowest mean) to lowest average relevance (highest mean).

Table 4.11: Relevance of ESAV based arguments for management measures (question 4): percent distribution of responses, sorted by lowest to highest mean (minor variation in *N* across statements because ‘don’t know’ responses were treated as missing values)

Arguments for management measures	Nature of justification	1	2	3	4	5	Don't know	Mean
		Very relevant	Relevant	Neutral	Not very relevant	Not at all relevant		
		% of respondents (N = 277)						
4.5 As a nursery habitat for plaice, the seagrass has an important function for the local fishery	Economic (fishery)	50.18	37.55	7.58	1.08	1.08	2.53	1.62 (N = 270)
4.4 Loss of the seagrass would significantly reduce the marine biodiversity in the area	Ecological (biodiversity)	51.62	35.38	8.66	3.25	0.72	0.36	1.66 (N = 276)
4.8 Scientists say further degradation of the seagrass bed would change the marine ecosystem in the area considerably	Ecolog./Scientific (ecosystem)	43.32	44.40	8.30	2.17	0.72	1.08	1.71 (N = 274)
4.9 National legislation requires protection of the seagrass because it is designated as a habitat of conservation importance	Legal (national)	36.10	41.52	14.80	5.05	1.08	1.44	1.92 (N = 273)
4.7 In healthy condition, the seagrass bed attracts dive tourists to the area	Economic (tourism)	29.60	49.10	12.27	5.42	2.89	0.72	2.02 (N = 275)
4.1 In healthy condition, the seagrass contributes around £750,000 per year to the local economy	Economic (monetary value)	23.47	29.24	21.30	4.33	1.81	19.86	2.15 (N = 222)
4.2 Protecting the seagrass bed from further degradation will help secure local jobs	Economic (jobs)	24.91	41.16	21.66	6.50	1.81	3.97	2.16 (N = 266)
4.6 The economic value of a healthy seagrass bed is higher than the costs caused by the new management measures	Economic	25.99	35.02	18.77	7.22	3.25	9.75	2.19 (N = 250)
4.3 The seagrass bed plays an important role for the identity of the local community	Cultural (identity)	18.05	37.91	27.80	11.19	3.97	1.08	2.45 (N = 274)
4.10 Failure to protect the seagrass will result in a fine from the EU because it is listed as a threatened habitat under EU legislation	Legal (EU)	17.33	33.94	20.94	11.91	6.14	9.75	2.51 (N = 250)

On average, as Table 4.11 shows, participants found ecological and fisheries arguments most relevant and cultural and EU legal arguments least relevant to them personally. Statement 4.1, which gave a specific monetary value as argument for management, caused the highest level of uncertainty among participants across all statements in questions 2, 3 and 4, with 19.86% 'don't know' responses. While not a significant difference, the number of 'don't know' responses for 4.1 tended to be higher in the French subsample (27.78% of $n = 108$) than in the UK subsample (14.97% of $n = 169$).

4.4.5 Pre-existing knowledge about the ecosystem services approach

Thirty-two UK respondents and twenty-nine French respondents (22.02% of $N = 277$) said that they had heard about the ecosystem services approach before taking the survey (question 5). Of these, 38 respondents gave an explanation of their pre-survey understanding of the ecosystem services approach. Half of the explanations confirm that the respondents were familiar with the approach. The remaining explanations indicate that not all participants who said that they had heard about ecosystem services before did also have actual knowledge about the approach. For example, some participants explained the ecosystem services approach as "preservation of important habitat [...]", "sustainable management of natural resources, in order to conserve biodiversity" or "the relationship between the various different species of the natural environment [...]". Other explanations suggest that some of the respondents understood ecosystem services to be equivalent with the ecosystem approach, for example: "taking a holistic view [...], taking into account the needs of both the environment and its stakeholders" or "protecting a particular environment [...] by balancing the needs of the ecosystem in question and the local economy".

There was no significant difference in levels of pre-existing awareness, in terms of having heard of the ecosystem services approach, between the UK and French sample, between respondents with different levels of education or respondents of different age (Pearson Chi-Square $p > .05$). A significant difference was found for gender (Pearson Chi-Square $p = .016$), with 34.62% of female respondents having heard of the approach before compared to 19.20% of male respondents. Even though the concepts of ecosystem services and ESAV were explained in Scenario 3, the scenarios did not significantly affect participants' self-reported pre-existing awareness of the ecosystem services approach (Pearson Chi-Square $p > .05$).

4.4.6 Marine users' views on monetary valuation

In question 8, respondents were given a brief explanation of monetary ESV and five answer options representing different views on the approach. Overall, almost two thirds of the 277 respondents reported positive opinions on monetary valuation: 37.55% said it was a 'good idea' and 23.83% said it was 'useful with limitations'. Thirty-eight respondents did not like the idea of monetary valuation but saw it as a 'necessary evil' (13.72%). Few participants thought that monetary valuation was 'not useful' (5.78%) or 'dangerous' (10.11%). The remaining 9.03% ticked the 'other views' option. Opinions were found to be significantly different between participants in the UK and France (Pearson Chi-Square $p = .035$). As Figure 4.3 shows, two thirds of UK respondents thought that monetary valuation was a good idea or useful, compared to about half of the French respondents. Conversely, more participants were critical of the approach in France than in the UK.

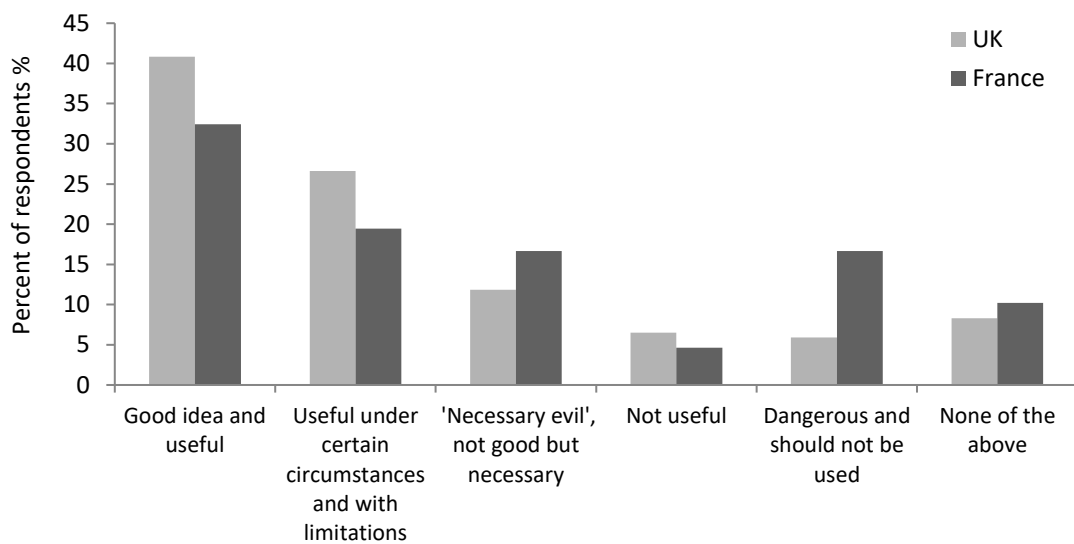


Figure 4.3: Distribution of respondents' views on monetary valuation in the UK ($N = 169$) and France ($N = 108$) (predetermined response categories)

While there was a significant difference in the level of approval and criticism between participants in France and the UK, the arguments for or against monetary ESV that respondents gave were very similar across both subsamples. Table 4.12 provides a summary of the key points that were raised in the respondents' explanations of their views on monetary valuation (for a more detailed breakdown into UK and French views and for participants' responses please refer to Appendix 5).

Views on monetary valuation were not significantly different between commercial and recreational users, male and female respondents, or between the three scenario groups (Pearson Chi-Square $p > .05$). A significant pattern was found between responses to question 8 and to statement 4.1, which gave a monetary value as argument for management (Pearson Chi-Square $p = .000$). The majority of participants who found the monetary argument personally relevant or very relevant also thought that monetary valuation was a good idea or useful (71.92% of $N = 146$), with another 15.07% seeing it as a 'necessary evil'. Similarly, 73.84% of those who thought monetary

ESV was good, useful or necessary ($N = 172$) also found the monetary argument personally relevant or very relevant.

Table 4.12: Summary of the arguments for and against monetary ESV raised in participants' explanations of their views on monetary valuation ($N = 277$, some respondents gave a positive and a negative argument)

Marine users' arguments for and against monetary ESV		Resp. count
Good idea, useful or necessary	Monetary valuation helps/is necessary to raise awareness and understanding of the importance and relevance of marine habitats/species	62
	<ul style="list-style-type: none"> • Monetary values quantify abstract values • Monetary values have relevance and meaning for people's lives • People understand and relate to monetary values regardless of their knowledge about or concern for marine habitats/species • Monetary values show the interdependence between environment and economy, the consequences of human interactions with the marine environment and the relevance of conservation 	
	Monetary valuation provides a measure for comparison and integration of economic and environmental factors in balanced decision making	29
	<ul style="list-style-type: none"> • Monetary valuation quantifies the importance of marine habitats/species in terms of economic value • Monetary valuation provides a measure of the economic costs and benefits of marine conservation and degradation • Economic value gives more weight to arguments in decision making • Monetary valuation provides information for evaluation, comparison and prioritisation of management options 	
	Monetary valuation facilitates communication with and provides arguments for economically oriented stakeholders	21
	<ul style="list-style-type: none"> • Economic arguments (are necessary to) raise attention and concern • Decisions are driven by monetary considerations • Many politicians, policy makers, commercial stakeholders and members of the public understand value only in terms of money 	
	Monetary valuation is necessary because everything is valued in economic terms/driven by monetary considerations	5
	Monetary valuation enables/is necessary for stronger marine conservation	3
	Economic arguments are necessary to secure funding	1
Economic considerations should be part of all decisions concerning the environment	1	

Table 4.12 continued

Limitations, not useful or dangerous	Monetary valuation is difficult, limited by assumptions and estimates, prone to subjectivity, bias, manipulation and misuse	21
	Monetary valuation cannot capture all important factors or values related to a marine habitat/species (for example intrinsic/intangible values)	13
	Danger that monetary valuation may be used as evidence to support interests opposed to conservation or to pay off environmental degradation <i>*France: concern about compensation payments</i>	9
	Nature conservation should not be tied to economic valuation	9
	<ul style="list-style-type: none"> • The marine environment is priceless and should not be valued in money • The marine environment should be protected for its intrinsic value • Respect for the environment should not be tied to monetary values or human benefits • Monetary valuation does not take into account the wellbeing of nature • Conservation is essential to secure sustainable resources 	
	Need for environmental protection is not determined by economic value: some ecologically important species/habitats cannot be valued or have limited value in monetary terms	7
	Ecological arguments are more important, monetary arguments should only be used in support of ecological arguments	5
	Monetary valuation is prone to be misused for political purposes <i>*UK: concern that monetary valuation is used to introduce and justify access fees or restrictions on access rights</i>	5
	Danger that economic value becomes a prerequisite for conservation and conservation decisions will be based on monetary trade-offs	5
	<ul style="list-style-type: none"> • Danger that ecological importance and other non-monetary values may be overlooked 	
	Monetary valuation encourages exploitation/environmentally damaging activities, at the expense of ecological, intrinsic and intangible values	3
	Decision making based only on monetary/quantitative information is prone to manipulation and poor decisions	1
	Monetary valuation is just another way to communicate political choices	1
The value of biodiversity is arbitrary; the economic cost of conservation is real	1	
Invalid explanation	63	
No explanation	35	

*Respondents in France/the UK had particular views on this point.

4.5 Discussion: using the ecosystem services approach to communicate marine management decisions

4.5.1 The effects of ESAV information on attitudes towards marine management

Going back to the beginning of the chapter, the premise for the marine user survey was that securing marine users' acceptance and support of management decisions is important for achieving effective marine management. Engaging marine users as stakeholders in management and decision making processes can foster good relationships and generate management support. However, not every affected or interested marine user will have the opportunity of getting involved in participatory management processes. It is therefore important to find ways of effectively communicating marine management decisions that will lead to acceptance and support among the wider marine user community.

In this context, the main objective of the survey presented here was to test whether the use of ESAV information to explain management decisions has an effect on marine users' attitudes towards management. The key underlying argument was that ESAV can support a better understanding of the management context and provide relevant and convincing justification for management decisions. Based on this, ESAV information was expected to increase acceptance and support of management measures among marine users who were not involved in the decision making process.

The survey results suggest that the ESAV information did have an effect, albeit small, on participants' attitudes towards the proposed management options. However, contrary to what was expected, the ESAV information did not lead to higher levels of

agreement with the management measures. Instead, participants who had received ESAV information tended to agree less strongly and disagree more often with the proposed fishing, anchoring and boating bans, compared to those who had not received ESAV information. Overall, the survey results do not confirm the hypothesis that the use of ESAV in communicating management decisions would increase marine users' acceptance and support of management measures. There are several possible explanations for this finding.

ESAV might lead to more reflective opinions

First, the interviews in Chapter 3 showed that the ecosystem services approach does have the potential to increase understanding of human-ecosystem interactions and management contexts. Taking this into consideration, it is possible that ESAV information leads people to form more reflective opinions. The greater variance in responses, including more critical and neutral responses, in scenario groups 2 and 3, compared to scenario group 1, could be an indication of this (see Figure 4.2).

It could be argued that more complete information and a more comprehensive understanding of the management context would be expected to lead to strong, clearly defined positions for or against specific management options. Whereas people with less complete information could be expected to be less certain, feel less strongly and be more sceptical. However, studies on the effects of information campaigns suggest that this is not necessarily the case. For example, Bidwell (2016) writes that information campaigns which lead to a more detailed understanding of renewable energy projects could result in more conditional public support. Another study on the effect of food assurance schemes found that the product information provided by

these schemes can increase consumer scepticism instead of reducing it (Eden et al. 2008). Research into people's attitudes towards genetically modified food also shows that the provision of information does not always have the expected effect and that other factors play an important role in determining how people respond to information. For example, Scholderer and Frewer (2003) found that providing consumer information about the benefits of genetically modified food made people less likely to choose these products. Another study found that positive, encouraging messages about genetically modified food had a polarising effect, leading people with negative attitudes to be even more opposed and people with positive attitudes to be even more in favour (Frewer et al. 1998). According to various authors, a person's existing views and attitudes have a significant effect on how they will interpret and react to new information (Durant and Legge 2005, Lusk et al. 2004, Poortinga and Pidgeon 2004, Scholderer and Frewer 2003).

Thus, it could be the case that ESAV information leads marine users to reflect more carefully on management options, though the effect on their attitudes might not be increased acceptance and support as was suggested by the VALMER interview findings or ecosystem services literature (Albert et al. 2014, Beery et al. 2016, Berghöfer et al. 2016, Böck et al. 2015, Klein et al. 2015, Lamarque et al. 2011, Luck et al. 2012, Orenstein and Groner 2014).

ESAV might increase uncertainty

Another possible explanation is that, instead of encouraging reflection, ESAV information increases uncertainty as to which management options are most appropriate. Again, the greater variance and neutral responses in scenario groups 2

and 3 and the fact that the difference was largest between Scenario 1 (least technical and detailed) and Scenario 3 (most technical and detailed) could be an indication of this. ESAV shows the links and interactions between different human activities and ecosystem elements. On one hand, this highlights the need for and wider benefits of management. On the other hand, it adds an additional layer of complexity to the management context as people are suddenly expected to take into consideration factors beyond their own interests and areas of expertise. A similar point was raised by the German landscape planners in Albert et al.'s (2014) study who thought that ESAV would add an additional layer of complexity to planning; this would make planning decisions less transparent and harder to communicate and could lead to lower public acceptance of planning proposals.

A review of the literature on the theory of information overload confirms that more information does not always necessarily lead to better decisions (Chen et al. 2009, Jackson and Farzaneh 2012). In the VALMER case studies, where the stakeholders were in direct dialogue and exchange with each other as well as site managers and scientists, people found it useful to gain a new perspective on their site and activities. However, it is possible that in the survey context, with no opportunities for exchange or explanations, the insight gained through ESAV caused uncertainty rather than better understanding.

ESAV might spark interest and overcome social desirability effects

It might also be that the ESAV information made the survey more interesting for the participants, thus encouraging them to reflect more carefully on their responses. One indication that this might be the case are people's responses to statement 2.1. It is

notable that Scenario 1 (no ESAV) contained no reference to the fact that the seagrass bed was a fish nursery or in any other way important for the local fishery, and thus no information to justify a fishing ban. Despite this, participants in scenario group 1 agreed more strongly and disagreed less with the proposed fishing ban than those who had received information about the importance of the seagrass as a fish nursery in Scenarios 2 and 3. This suggests that respondents in scenario group 1 might have reacted to the statements, including 2.1, based on what they thought would be the desired or expected responses rather than based on the information in the scenario. Following this line of thought, the fact that respondents who did receive information about the fish nursery function of the seagrass were less supportive of the fishing ban could mean that they paid closer attention to the scenario and/or questions. One reason for this might be that Scenarios 2 and 3 were more interesting for the participants than Scenario 1.

An indication that 'interestingness' might have played a role in participants' levels of attention to the survey was that the observed effect of the scenario versions on responses was limited to the four statements that contained the word 'ban' – introducing restrictions on fishing, anchoring and boating for commercial and recreational vessels. It can be argued that these four management options were the most likely to cause controversy and differing reactions. The remaining options were either clearly not justified by the scenario (closure of the seagrass to diving, no new management needed), not particularly controversial (closure of the seagrass to bottom trawling), or did not propose any restrictions (provision of moorings).

Other factors unrelated to ESAV might have caused the effect

A fourth possibility is that the effect shown by the results was not caused by the ESAV information but by other factors or differences between the scenario groups. Apart from the ESAV content, the main difference between the scenario versions was that Scenarios 2 and 3 were slightly longer than Scenario 1. However, there is nothing to suggest that this might have caused the difference in responses between the scenario groups. For example, the number of completed surveys and rate of drop outs from the survey were similar for all three versions of the scenario. The results could simply reflect the attitudes and opinions that respondents held regardless of the information they received, in which case the effect would be due to coincidence in the distribution of the respondents across the three scenario groups. Yet, again, there is no evidence to suggest this. The demographic composition of the scenario groups did not differ significantly.

One demographic variable that played an important role in the survey and was found to have had significant influence on respondents' attitudes towards management was country of residence. On average, respondents in France tended to agree or disagree more strongly with the proposed management options than respondents in the UK. Recalling the observed difference in attitudes towards the fishing, anchoring and boating bans, agreement or disagreement was stronger in scenario group 1 than in scenario groups 2 and 3. Coincidentally, while in scenario group 1 about half of the respondents were from France and the other half from the UK, in scenario groups 2 and 3 about two thirds of participants were from the UK and only one third from France.

There is little statistical evidence to support the argument that the observed variance in responses between scenario groups might have been caused by factors relating to the participants' country of residence rather than differences in the scenario. The difference between scenario groups in the proportion of UK and French respondents was not statistically significant. French and UK respondents were not found to have reacted differently to the ESAV information. Further, the difference between scenario groups remained statistically significant even when controlling for the influence of country of residence. Nonetheless, the fact that 1) French respondents expressed stronger views on the proposed restrictions than UK respondents, and 2) that scenario group 1 included a greater proportion of French respondents compared to scenario groups 2 and 3, could provide a plausible explanation for the observed difference in responses between the scenario groups. Experience from the VALMER project and other cross-Channel projects shows that the marine governance setup and the relationship between managers and stakeholders are considerably different in France and the UK (Bailey et al 2012, Celtic Seas Partnership, Dodds and Friedrich 2015, Glegg et al. 2015, Petit and Carpenter 2014). In the UK, where marine management and planning are delegated down to regional and local scales, stakeholder participation plays an increasingly important role. In France, the marine governance structure is more centralised and hierarchical. Marine management follows a top down approach, with clearly defined roles and authorities, and stakeholders are not usually involved in management decisions. Given the different management and engagement cultures in the two countries, it is perhaps not surprising that marine users in France and the UK displayed different attitudes towards management in the survey.

Thus, rather than being an effect of the ESAV information, the reason for the difference in responses between scenario groups might be that UK and French participants reacted differently to the proposed management options. This explanation is supported by the fact that the observed effect was limited to the participants' attitudes towards the management measures. Their opinions on the importance of managing detrimental impacts on the seagrass did not differ significantly between scenario groups, neither in terms of levels of agreement or disagreement, nor regarding what kind of arguments were seen as more or less important.

In a nutshell

To sum it up, participants in the three scenario groups did react differently to the management options proposed in the survey. This effect might have been caused by the ESAV information, which potentially encouraged reflection, increased uncertainty or made the survey more interesting. Or it might have been the result of different attitudes towards management among marine users in France and the UK. Regardless of the different possible explanations, the survey results do not confirm the hypothesis that using ESAV to communicate marine management decisions would increase acceptance and support among marine users.

4.5.2 Relevance of ESAV based arguments for marine management

While the results remain inconclusive with regard to the potential influence of ESAV on marine users' attitudes towards marine management, they do provide an insight into what kind of arguments are relevant to marine users for justifying management

measures. This gives an indication of what kind of ESAV would potentially be more useful for explaining and justifying marine management decisions. In the survey, participants were given a list of ten ESAV based statements which provided justification for the management measures proposed in the scenario. The statements included economic, ecological, scientific, legal and cultural arguments. While all ten arguments were relevant or very relevant to at least half of the respondents, a closer inspection of the results shows that some arguments were more relevant than others.

Top of the list: fisheries and ecology

At the top of the list were fisheries (economic), biodiversity (ecological) and ecosystem (ecological/scientific) arguments. Nearly all respondents found these arguments relevant or very relevant. These were followed by arguments around national law and dive tourism. The fisheries and tourism arguments showed a clear and direct link between the seagrass habitat and the local fishery and dive tourism industry. In comparison, the statements about job security and general economic value, which were less relevant to respondents, were also less specific on how these factors relate to the seagrass.

The two ecological statements explained that further seagrass degradation would have negative consequences for the local biodiversity and marine ecosystem. They did not specify in how far this would affect marine users or how the local community would benefit from protecting the seagrass. Despite this, the ecological arguments were more relevant to the survey participants than most of the economic arguments which drew a direct link to human wellbeing. This could be seen as surprising given that, particularly in the current political and economic climate, economic arguments are

often believed to weigh more than ecological arguments (de Groot et al. 2010, Martín-López et al. 2014). However, other studies have also found that this is not necessarily the case. For example, Metz and Weigel (2010) found economic rationales and messages for conservation to be far less persuasive and encouraging than expected. In their survey on American voters' opinions about the ecosystem services approach, around half of the respondents thought that nature should be protected for its own sake and not for the benefits it provides to people (Metz and Weigel 2010). Bolderdijk et al. (2012) compared the effects of economic and environmental messages on people's motivation to adopt pro environmental behaviours. They found that messages about protecting the natural environment were more appealing and more likely to motivate behaviour change than messages that addressed people's economic self-interest (for example offering opportunities to save money) (Bolderdijk et al. 2012). According to Bolderdijk et al. (2012), the reason for this is that "people rather see themselves as 'green' than 'greedy'" (Bolderdijk et al. 2012, p. 2), they want to be seen as environmentally responsible and not as being in morally questionable pursuit of personal monetary gains. A similar motivation could also explain why the marine users found the ecological arguments more relevant than the economic arguments, despite the fact that the ecological arguments were vague and unspecific.

Bottom of the list: money, culture and EU legislation

The statement that provided a specific monetary value for the economic worth of the seagrass bed caused the highest level of uncertainty among the survey participants. Almost half of the participants were not sure whether the monetary argument was relevant to them or not. This uncertainty was particularly strong in France. Marine

users' views on monetary valuation of marine habitats and species and the ecosystem services they provide will be further discussed in the next section of this chapter.

At the bottom of the relevance ranking were arguments about cultural identity and EU legislation. That the EU legislation argument was least relevant to the marine users is not surprising given the widespread EU scepticism in the UK and France. Conversely, cultural ecosystem services, such as opportunities for recreation, aesthetic beauty, spirituality and cultural identity, have been recognised to play an important role in the wellbeing of individuals and communities (Fletcher et al. 2014, Sagie et al. 2013, Zoderer et al. 2016a). There is a growing body of research into the identification and mapping, assessment and valuation of cultural ecosystem services, for example to inform land use policy (Winkler and Nicholas 2016, Zoderer et al. 2016a), urban planning (Langemeyer et al. 2015, La Rosa et al. 2016), environmental policy (Tratalos et al. 2016) or marine management and conservation (Jobstvogt et al. 2014, Fletcher et al. 2014). Yet, despite the apparent importance of cultural ecosystem services, the results of the present survey suggest that marine users perceive cultural arguments to be less relevant for justifying restrictions on marine activities compared to economic or ecological arguments.

This could have to do with the fact that the cultural argument in the survey referred to cultural identity. Studies have found that people value some cultural ecosystem services (cultural heritage and identity, spirituality) less highly than others (recreation, aesthetic beauty) (Zoderer et al. 2016a, van Berkel and Verburg 2014). However, in another study, Zolderer et al. (2016b) also found a hierarchy of perceived importance of ecosystem services in which cultural ecosystem services in general were perceived to be less important than regulating and provisioning services. Considering that

regulating and provisioning ecosystem services can be related to economic and ecological arguments¹⁷, the present survey findings are in line with Zolderer et al.'s (2016b) hierarchy of perceived importance. Thus, while scientific evidence suggests that it might be important to include cultural ecosystem services in management considerations, these might not be perceived by marine users as the most relevant arguments for management decisions that impose restrictions on commercial and recreational marine activities.

The level of relevance of the different ESAV based arguments also reflects the respondents' opinions on why it is important to protect the seagrass in the scenario, which they had expressed earlier in the survey (question 3). Ecological and fisheries reasons for conservation were seen as more important compared to cultural reasons. Finally, there were no differences in the relevance ranking of ESAV based arguments between commercial and recreational users or between respondents in France and the UK.

Relevant ESAV

These results suggest that ESAV provides most relevant information to marine users 1) if it shows clear and specific links between a species or habitat and a human activity, use or economic sector, or 2) if it illustrates the importance of that species or habitat for maintaining local biodiversity or the health and integrity of the local marine ecosystem. While monetary values and cultural identity are important to some marine users, they are less relevant for justifying management decisions than ecosystem health and integrity, specific economic links or national laws.

¹⁷For example, fish stocks (provisioning service) support the fishing industry, and ecosystem health and integrity are essential for regulating services such as climate regulation or storm protection.

4.5.3 Marine users' views on monetary valuation

Good idea or necessary

While many of the survey participants were not sure whether the monetary value argument for justifying management was relevant to them personally, the majority did think that monetary valuation of marine habitats and species based on the benefits they provide to humans was a good idea, useful or necessary. The results suggest that marine users in France and the UK see monetary valuation as a useful or necessary approach for raising public interest and concern for the marine environment. According to the survey participants, monetary valuation translates the abstract importance of the marine environment into tangible, meaningful values that people can relate to regardless of their knowledge of, or concern for, marine habitats and species. It explains the role that marine ecosystems play for local economies, people's lives and community wellbeing. These views reflect expectations raised by German landscape planners in Albert et al.'s (2014) study who thought that "everybody could relate to monetary terms" (Albert et al. 2014, p. 1308). In the present survey, some respondents saw monetary values as the only way to make people take an interest in the marine environment, as the following quote illustrates:

"The economy is so integral to everything that we do, that giving a habitat a monetary value is the only way to make most people care about it. People are more likely to care about the destruction of an ecosystem, if its destruction directly impacts their livelihood and standard of living."

At the same time, as discussed above, the survey findings also suggest that marine users do not feel or do not like to admit that this economic rationale applies to them personally. Considering these two sides of marine users' attitudes towards monetary

valuation, the survey results remain inconclusive as to whether monetary values would encourage support for marine management or whether they would be ineffective or, in the worst case, counterproductive.

While monetary arguments might not be relevant to them personally, the survey results show that marine users do consider monetary ESV to be useful for supporting balanced decision making in marine management. The survey respondents saw monetary ESV as a measure for comparing and integrating economic and environmental considerations in decision making; and they did think that it would provide relevant arguments for policy makers, managers and economically minded stakeholders. This discrepancy between personal opinions and views on the usefulness of monetary valuation was also found by Beery et al. (2016) who interviewed Swedish civil servants about their perceptions of the ecosystem services approach in the context of municipal governance. One of their study participants said that although “in their personal opinion monetary valuation might not seem reasonable”, it is a necessary part of working in the civil service (Beery et al. 2016, p. 127).

Moral limitations

The limitations that the survey respondents talked about indicate that marine users feel that monetary valuation might be morally incompatible with environmental considerations. These limitations included concerns that monetary valuation cannot capture all important values related to marine habitats and species. Others argued that environmental conservation should be guided by intrinsic values and ecological importance and not be tied to economic value. These views reflect the moral limitations of monetary ESV that are discussed in the ecosystem services literature (Jax

et al. 2013, Luck et al. 2012). The marine users' concerns about the morality of monetary valuation are in line with Bolderdijk et al.'s (2012) argument that people feel a moral responsibility towards the environment whereas the pursuit of monetary interests is seen as morally questionable. They also reflect previous findings by Clark et al. (2000) who reported that their study participants felt morally outraged at the idea that "a monetary sum was being used as a measure of what [they] saw as their ethical and moral values for nature" (Clark et al. 2000, p. 55).

Comparing the survey results with the findings from the interviews in Chapter 3, the views expressed by marine users and marine management stakeholders on the opportunities and limitations of monetary ESV were very similar. However, while overall the survey respondents were more positive about monetary valuation than the interviewed management stakeholders, they were also uncertain as to how relevant they personally find monetary arguments. Thus, the survey results do not confirm the expectations of the interviewed marine managers that monetary ESV would be useful for explaining and justifying marine management measures and regulations to their marine users.

Cultural difference

What the survey did find is evidence for a difference in attitudes towards monetary valuation between marine users in France and the UK. The interview findings had pointed towards a possible cultural difference between the two countries with regard to monetary ESV. The survey results confirm that marine users in France are more sceptical and cautious about monetary valuation of the natural environment and the benefits it provides than in the UK.

4.5.4 Understanding the ecosystem services approach and terminology

Limited familiarity with the ecosystem services approach

Another finding from the interviews in Chapter 3 that was confirmed by the survey results is that commercial and recreational marine users who are not involved in management tend to be unfamiliar with the concepts of ecosystem services and ESAV. As expected, most of the survey participants had not heard of the ecosystem services approach before. Of those who reported that they had, only few showed a good or partial understanding of the approach in their explanations. While these findings are geographically limited to the south coast of the UK and the north coast of France, it can be assumed that they apply to marine users in other regions as well. In fact, studies from different parts of the world also found low levels of knowledge about the ecosystem services concept among stakeholders in environmental management contexts (Böck et al. 2015, Manns 2014, Sagie et al. 2013) and among members of the public (Stapleton et al. 2014).

Some of the explanations given by the survey participants indicate that people might be confusing the ecosystem services approach with other concepts related to the environment, such as sustainable management, biodiversity conservation, ecosystem connectivity or the ecosystem approach. This highlights that over the last decades the public and environmental management stakeholders have been introduced to a plethora of scientific concepts and approaches that are based on similar principles, address similar issues, are often interconnected and sometimes even share the same terminology (for example 'ecosystem approach' and 'ecosystem services approach'). This needs to be considered when using scientific concepts for stakeholder

engagement and communication with the public as confusion over terminology and definitions could limit the effectiveness of engagement and communication strategies.

It also opens up the question how ecosystem services should be defined and explained in communication with marine users. There has been much debate among scientists and academics about definitions and classifications of ecosystem services (for example Costanza 2008, de Groot et al. 2002, Fisher and Turner 2008, Fisher et al. 2009, MEA 2005, TEEB 2010, Wallace 2007). Some argue that ecosystem services classification is context and purpose dependent (Fisher et al. 2009) and that multiple classification systems are necessary (Costanza 2008). Others say that it is imperative for the practical implementation of the approach to have one shared definition and classification system (de Groot et al. 2010, Nahlik et al. 2012). However, Lamarque et al. (2011) point out that while clear definitions and classifications might be necessary to inform management and planning processes, “a precise and complex framework is inappropriate as a communication tool” (Lamarque et al. 2011, p. 447). Instead, what is important in communicating with the public is to have a broad and simple definition that conveys the main message of human reliance and dependence on nature (Lamarque et al. 2011). The results of the marine user survey seem to confirm this view: what is important to marine users is not how ecosystem services are defined but the idea behind the concept. Incidentally, Lamarque et al. (2011) also reported that participants in their study confused ecosystem services with broader concepts they were already familiar with.

Understanding the ecosystem services terminology

This leaves the question whether the ecosystem services terminology should be used in communication with marine users. In their survey of American voters, Metz and Weigel (2010) found that people generally understand the concept that human wellbeing and ecosystems are interconnected; however, the ecosystem services terminology might not be appropriate for communicating with the general public (Metz and Weigel 2010). According to Lamarque et al. (2011), “understanding of the term “ecosystem services” was imprecise” among their study participants (Lamarque et al. 2011, p. 446). Similar points were also raised in the interviews in Chapter 3, where the term ‘ecosystem services’ was referred to as ‘jargon’. Contrary to these findings, the survey results show no evidence that ecosystem services terminology makes the approach difficult to understand for marine users. There was no indication in the comments or response patterns that respondents who received the technical version had more difficulty understanding and reacting to the scenario than respondents who received the non-technical version.

Recalling the different scenario versions, the technical version (Scenario 3) included the terms ‘ecosystem services’ and ‘ecosystem service assessment’; in the non-technical version (Scenario 2) these terms were not used and ESAV was described as ‘integrated ecological and socioeconomic assessment’. One of the key issues with the ecosystem services terminology in Metz and Weigel’s (2010) study was that people disapproved of the idea that nature exists and should be protected because it provides ‘services’ to people. Instead, the surveyed voters preferred phrases like “nature’s value” or “nature’s benefits”, which were also found to be “intuitive and self-explanatory” (Metz and Weigel 2010, p. 9). Moreover, Metz and Weigel (2010) point out that people

do not talk about 'ecosystems' when they describe their relationship and interactions with nature. A study conducted for the UK Government's Department for Environment, Food and Rural Affairs (Defra) in 2007 came to similar conclusions for the UK public: respondents did not understand the term 'ecosystem services' because they were unfamiliar with the term 'ecosystem', while 'nature's services' was found to be more self-explanatory (Defra 2007b). In the present survey, Scenario 3 included a clear and concise explanation of the terms 'ecosystem services' and 'ecosystem service assessment' in which ecosystem services were described as 'the benefits that humans get from the natural environment'. Four examples of marine ecosystem services were also given. This could explain why, contrary to previous findings, the participating marine users had no difficulty understanding and reacting to Scenario 3 despite the technical ecosystem services terminology.

Thus, the survey results suggest that it is possible to use the ecosystem services terminology in communication with marine users, provided the concepts are explained in simple terms and with the help of examples. These findings would support Beery et al. (2016) who argue that the ecosystem services concept needs to be used explicitly if it is to be applied as a pedagogical communication tool, but at the same time stress the need to use local examples that are directly relevant to the local context and people's lives.

4.5.5 Bringing together the evidence: the ecosystem services approach as a communication tool for marine management

In summary, the survey results reveal a number of significant findings about the usefulness of the ecosystem services approach for communicating marine management decisions to marine users.

The results confirm that ESAV can provide relevant arguments for the introduction of marine management measures, rules and regulations to marine users. While different arguments are relevant to different people, it appears that ecological and economic arguments that link a species or habitat to specific human activities or to biodiversity and ecosystem integrity are more relevant for justifying marine management measures than arguments about cultural identity or monetary gains and losses.

Regarding views on monetary valuation, on one side marine users see it as useful or necessary, among other purposes for communicating with stakeholders and the public. On the other side, they have moral concerns and objections to the approach and are uncertain as to how relevant monetary values are to them personally. These results do not confirm the expectations raised by management stakeholders in Chapter 3 that monetary ESV would help communicate the need for and benefits of management and conservation to their marine users. Overall, the survey remains inconclusive as to whether monetary ESV would encourage or discourage acceptance and support of marine management decisions. One conclusion that the survey does allow is that monetary valuation would be less likely to generate support in France than in the UK. The results seem to confirm that there is a cultural difference in attitudes towards monetary valuation between these two countries.

In terms of understanding of the ecosystem services approach, the survey shows that it cannot be assumed that marine users will be familiar with the concepts of ecosystem services and ESAV or that their understanding matches expert definitions of these concepts. However, as discussed above, what is important is that people understand the main idea of human reliance and dependency on nature, rather than the theoretical concept. As to terminology, the survey results indicate that the terms 'ecosystem services' and 'ecosystem service assessment' or 'ecosystem service valuation' can be used in communicating with marine users as long as they are explained in simple terms, using local examples. However, experiences from other studies show that the terms 'ecosystem' and 'services' could be problematic – the first because it might not be understood and the latter because of its potential moral implications – and that a term like 'nature's benefits' might be more appropriate for communicating with the public.

Most importantly however, the survey does not provide any evidence for the assumption that using ESAV information to explain marine management decisions would increase acceptance and support among marine users. The main argument for this hypothesis was that ESAV was found to increase understanding of human-ecosystem interactions and management contexts in the VALMER interviews in Chapter 3. While this might also have been the case in the survey, it did not have the expected effect on marine users' attitudes towards marine management. On the contrary, the survey results suggest that ESAV information might lead people to be more critical, sceptical or uncertain about different marine management options. Having said this, there is the possibility that the observed effect was unrelated to the ESAV information in the different scenario versions. If this was the case, the survey

results would suggest that ESAV information might not make a difference either way for how marine users react to marine management decisions.

4.5.6 Methodological observations and next steps

The scenario approach – did it work?

The relatively good survey response rate suggests that the survey did catch the marine users' interest. Given the similar numbers of respondents across the three scenario groups, it can be assumed that this interest was not caused by the ecosystem services information alone. While the scenario might have contributed to making the survey interesting, it should also be noted that most people dropped out of the survey after seeing or reading the scenario. It might be that people were discouraged by the length of the scenario, or that they did not find the topic interesting. Also, several comments at the end of the survey showed that the scenario reflected real issues at some of the sites in the survey area. This appeared to be a concern for some of the participants who seemed to fear that the survey might have an ulterior motive that might go against their personal interests. Conversely, other participants left positive comments about the fact that the scenario picked up on relevant issues at their sites. Thus, the survey results partly confirm the positive effects of realistic and relevant scenarios (Hughes and Huby 2004, Poulou 2001, Renold 2002, Rahman 1996). However, they also point out the danger that if scenarios reflect reality too closely, this might raise suspicion and antagonise some participants. This highlights the importance of stressing the fictional nature of scenarios in surveys such as the marine user survey presented here.

At the same time, the fictional nature of scenarios has also been identified as the main limitation of the approach (Evans et al. 2015, Hughes 1998, Hughes and Huby 2004, Poulou 2001) and people's reactions to a scenario have to be considered under the caveat that they may not accurately reflect social reality (Barter and Renold 2000, Schoenberg and Ravdal 2000). One indication that this might be true for the marine user survey is that the participants were very willing to agree with restrictive management measures. It is safe to assume that in a real life situation there would have been more conflict and disagreement.

One final but important point is that, even though the information in the scenario was the only aspect that differed between the three survey versions, it was not possible to determine with certainty that the difference in responses between scenario groups was caused by the different information in the three scenario versions. This was not a limitation of the scenario method in itself but of the quantitative questionnaire approach, which did not enable further exploration of what motivated participants to respond in a certain way. While it would have been possible to include questions to this end, it was considered that this would have made the survey too long, with the risk of discouraging people from taking part and thus decreasing the statistical power of the results.

To sum it up, the scenario based survey approach worked well in terms of encouraging people to take part and producing three sets of statistically comparable data. On the downside, it was not possible to establish a clear link between the ESAV information provided in the scenario and the response effect. While it might not always be possible to ask participants about the reasoning behind their responses in a questionnaire

based survey, some kind of testing or probing question might be required to establish this link.

Other methodological observations

One limitation of the survey design that became apparent during the analysis was that participants were not asked for their nationality. It was merely possible to determine their current country of residence based on whether participants had responded to the English or French version of the survey. While it can be assumed that most respondents in the UK were British and most respondents in France were French, it was not possible to clearly determine the participants' cultural identity. This caveat has to be considered in the interpretation of any results relating to differences between the UK and French samples.

Further, only a small number of commercial marine users completed the survey, compared to the number of responses from recreational users. Considering that many commercial users would probably have received the survey invitation during working hours, it is possible that they might not have had the time to engage with the survey. Whereas recreational users, who were more likely to have received the survey invitation in their private email accounts, might have been more at leisure to complete the survey. Nevertheless, overall, the number of commercial responses was sufficiently large to allow a statistical comparison with recreational responses.

One group of commercial users who did not respond to the survey at all were fishermen, despite multiple specifically targeted survey invitation attempts. During the survey design phase the thesis author consulted with colleagues who had experience in working with the fishing community whether fishermen could be reached with an

online survey. While some suggested that fishermen are more willing to take part in research studies when approached in person, others confirmed that fishermen also respond to online surveys. When it became apparent that this was not the case for the survey presented here, it was considered to approach some fishermen in person and ask them to fill in the survey on an iPad or paper version. However, this option was not feasible due to resource limitations and practical issues concerning the online setup of the survey. Consequently, the views of the fishing community are not included in this study. While this does not affect the validity and relevance of the findings, it is a limitation of the study in so far as one of the most important commercial marine user groups is not represented. Thus, whether the ecosystem services approach would be useful for communicating marine management decisions to fishermen remains an open question to be investigated in future research projects.

Next steps

The survey findings do not confirm the expectations raised in the VALMER interviews and ecosystem services literature that using the ecosystem services approach to communicate marine management decisions would increase acceptance and support among marine users. Yet, ESAV does seem to provide arguments for justifying marine management measures that are relevant to marine users. This opens up the question why the ecosystem services approach was so successful in supporting stakeholder engagement in the VALMER case study workshops but did not have the expected positive engagement effect in the marine user survey. It could be that ESAV works as an engagement tool in participatory stakeholder processes but not as a non-participatory communication tool for the wider marine user community. If so, what

could be the reason and what would this mean for the usefulness of the ecosystem services approach for marine stakeholder engagement? To address these questions, Chapter 5 brings together the findings from the VALMER interviews and the marine user survey and discusses them in the context of the pro environmental behaviour research. From the synthesis of the interview and survey findings, a conceptual model of the marine engagement potential of the ecosystem services approach is then developed.

Synthesis and conclusion

5 Pedagogic value and engagement potential of the ecosystem services approach: a discussion

5.1 Introduction

Chapters 2 to 4 have explored the role of stakeholder engagement and the ecosystem services approach in marine governance (Chapter 2), the opportunities and challenges of using ecosystem service assessment and/or valuation (ESAV) to support stakeholder participation in marine management (Chapter 3) and the potential of the ecosystem services approach as a way to communicate management decisions to marine users (Chapter 4). Stakeholder engagement and the ecosystem services approach play an increasingly important role in marine policies and management processes (for example Böhnke-Heinrichs et al. 2013, Curtin and Prellezo 2010, EU 2014b, Gopnik et al. 2012, Kushner et al. 2012, Laurans et al. 2012b, Rees et al. 2013, Sayce et al. 2013, UK 2009). The interviews with stakeholders from the VALMER case studies show that one way in which the ecosystem services approach can contribute to marine management is by supporting better informed and more constructive marine stakeholder engagement in participatory processes. In contrast, the findings from the marine user survey suggest that, in a top down, one way written communication context such as a brochure informing users about new management measures, employing ESAV information to explain and justify marine management decisions does not necessarily increase agreement and support for these decisions among marine users.

The marine user survey finding contradicts expectations regarding the pedagogic value of the ecosystem services approach raised by VALMER stakeholders as well as policy

and management practitioners and ecosystem services experts in other studies (Albert et al. 2014, Beery et al. 2016, Berghöfer et al. 2016, Böck et al. 2015, Klein et al. 2015, Lamarque et al. 2011, Luck et al. 2012, Orenstein and Groner 2014). Chapter 5 makes a critical appraisal of these expectations and addresses the question why the ESAV information in the marine user survey did not have the expected effect on participants' attitudes towards marine management. For this purpose, the findings from the VALMER interviews and the marine user survey are evaluated in the context of existing environmental behaviour research. The discussion then turns back to the questions that were raised at the end of Chapter 2: why, how and under what conditions does the ecosystem services approach help improve marine stakeholder engagement? Addressing these questions, a conceptual model of the marine engagement potential of the ecosystem services approach is developed. Chapter 5 concludes with a discussion of the potential benefits for ecosystem based marine management that could be gained from the integration of ESAV and participatory engagement. First, however, the next section takes a step back and presents an introduction to the environmental behaviour literature and the role that understanding and attitudes play in different theoretical models and empirical studies.

5.2 Background: determinants of environmental behaviour

The study of human behaviour has always been a key focus of the social sciences, be it psychology, sociology, economics or human geography (Barr 2004, Guagnano et al. 1995, Kollmuss and Agyeman 2002, Hogg and Vaughan 2011, Miliute-Plepiene et al. 2016). With growing recognition of, and concern about, environmental problems since the 1970s, understanding what determines and influences people's environmental attitudes and behaviours has become of increasing interest and urgency. As Klöckner (2013) points out, "the contribution of individual behaviour [to causing and solving environmental problems] should not be underestimated" (Klöckner 2013, p. 1028). The result is a large and growing body of literature that explores environmental attitudes and behaviour from all angles. This includes studies that develop, discuss and test theoretical behaviour models and studies that address specific issues such as energy saving, recycling, travel behaviour, sustainable consumer choices or attitudes towards new energy technologies and climate change. Others have reviewed and discussed the different approaches to studying environmental behaviour in more depth (for example Jackson 2005, Klöckner and Blöbaum 2010, Kollmuss and Agyeman 2002). This section offers a brief introduction to the most relevant theoretical frameworks and empirical findings in the context of this thesis, focusing on the role of knowledge and attitudes in determining environmental behaviour.

5.2.1 Relationships between knowledge and attitudes in behaviour models

Four types of models and frameworks of what determines environmental behaviour were identified in the reviewed literature:

- 1) Psychological models that focus on internal, subjective factors (including attitudes and intentions, values, beliefs, social norms, feelings of responsibility and moral obligation, emotional processes),
- 2) Combined psychological and sociological or economic models that integrate internal factors and external, contextual factors (for example social, political or economic context, resources and infrastructure, cultural factors),
- 3) Combined psychological-sociological/economic models that explicitly take into consideration habits (stable, repeated behaviour patterns),
- 4) Frameworks of practical guidance for behaviour change interventions.

The identified models and frameworks are summarised and briefly described in Table 5.1. Several studies have found, or refer to evidence that each of these behaviour models is useful for explaining certain types of behaviour (for example Davison et al. 2014, Klöckner and Blöbaum 2010, Klöckner 2013, Steg and Vleck 2009). At the same time, these studies point out that each model has weaknesses which limit its usefulness and wider application to other types of environmental behaviour (Blake 1999, Klöckner and Blöbaum 2010, Klöckner 2013). For example, psychological models based on rational choice, such as the theory of reasoned action, have been successfully used to explain individual travel choice behaviour; whereas models based on personal and social norms, such as the norm activation model, have been found useful to explain conservation support or agreement with pro environmental policies (Davison et al. 2014, Klöckner and Blöbaum 2010, Steg and Vleck 2009). In contrast, Klöckner and Blöbaum (2010) argue that neither of these models can successfully predict repetitive or habitual behaviour; and Steg and Vleck (2009) criticise the lack of emphasis on contextual factors in both rational choice and normative models.

Table 5.1: A summary and brief description of the main behaviour models and frameworks identified in the reviewed literature

Authors	Description of behaviour models, theories and frameworks
Psychological models	
Burgess et al. 1998	'Deficit' model (also 'knowledge deficit' or 'information deficit') Environmental knowledge leads to environmental attitudes and behaviour
Ajzen and Fishbein 1977	Theory of reasoned action People make reasoned behavioural decisions based on an evaluation of personal consequences and social expectations Beliefs → attitude (towards behaviour) and social norm → behaviour intention → behaviour
Ajzen 1991	Theory of planned behaviour Extends the Theory of Reasoned Action by adding the evaluation of perceived control over the behaviour Beliefs → attitude, social norm and perceived control → intention → behaviour
Schwartz 1977 (in Davison et al. 2014, Han 2014)	Norm activation model (altruism theory) Altruistic behaviour results from a feeling of moral obligation to act (personal norm) which is activated by personal values and beliefs, social norms, awareness of issue and consequences and feeling of responsibility
Stern et al. 1999	Value-belief-norm theory of social movement support Extends the norm activation model by integrating the New Ecological Paradigm (NEP: a global worldview that human actions have adverse effects on the environment, Dunlap and van Liere 1978) Personal values → NEP → awareness of consequences → feeling of responsibility → personal norm → behaviour (activism, citizenship, policy support, personal behaviour)
Grob 1995	Structural model of environmental attitudes and behaviour Environmental behaviour is determined by four components of environmental attitudes: 1) personal philosophical values, 2) emotions, 3) perceived control, and 4) environmental awareness (factual knowledge and problem recognition)
Bamberg and Möser 2007	Integrative psycho-social model of environmental behaviour Environmental behaviour is determined by self-interest (attitude and perceived control) and pro social motives (personal norm)
Han 2014	Extended norm activation model: normative, rational and emotional processes Environmental behaviour is determined by self-interest (attitude), pro social motives (awareness of consequences, feeling of responsibility, personal norm) and anticipated feelings of guilt and pride

Table 5.1 continued

Combined psychological and sociological/economic models

Fietkau and Kessel 1981 (in Kollmuss and Agyeman 2002)	Model of ecological behaviour Environmental behaviour is determined by 1) attitudes and values, 2) possibility to act, 3) behaviour incentives, and 4) perceived consequences of behaviour; attitudes and values are modified by environmental knowledge
Hines et al. 1986/87	Model of responsible environmental behaviour Environmental behaviour is determined by personality factors (attitudes, perceived control, feeling of responsibility), knowledge factors (issue, behaviour, skills) and situational factors
Guagnano et al. 1995	Causal scheme of behaviour Environmental behaviour takes place if the combined effect of internal processes (attitudes) and external conditions is favourable; external conditions and attitudes influence each other and each acts as boundary for the behavioural influence of the other Attitude + external condition > 0 → behaviour; attitude + external condition < 0 → no behaviour
Blake 1999	Value-action gap framework Three sets of obstacles exist between environmental concern and action: 1) individuality (personal attitudes), 2) responsibility (social influence), and 3) practicality (resources, facilities, encouragement)
Kaiser et al. 1999a, 1999b	Model of general ecological behaviour General ecological behaviour is determined by general behaviour intention if external constraints are considered; factual environmental knowledge, environmental values and moral obligation are significant preconditions of intention
Kollmuss and Agyeman 2002	Model of pro-environmental behaviour Environmental behaviour is determined by internal factors (personality, values, environmental consciousness, etc.) and external factors (social, political, cultural factors, economic situation, infrastructure, etc.); influences exist within and between internal and external factors; multiple potential barriers prevent pro-environmental influences and behaviour
Barr 2004, 2007	Framework of environmental behaviour (human geography approach) Environmental behaviour is determined by situational factors, behaviour intention and psychological factors; behaviour intention is influenced by environmental values as well as situational and psychological factors; each set of factors presents potential barriers or enablers

Table 5.1 continued

Combined psychological and sociological/economic models with emphasis on habits

Fransson and Gärling 1999	Process model of behaviour Environmental behaviour is 1) directly determined by habit, intention and situational constraints, and 2) indirectly determined by values, norms and attitudes (which influence habit and intention)
Steg and Vleck 2009	General framework for encouraging environmental behaviour Environmental behaviour is determined by 1) motivational (psychological) factors (reasoned choices, moral norms, values, beliefs, emotions), 2) contextual factors, and 3) habitual behaviour
Klößner and Blöbaum 2010	Comprehensive action determination model Environmental behaviour is 1) directly determined by habit, intention and situational constraints, and 2) indirectly by norms and values (integrates theory of planned behaviour, norm activation model, value-belief-norm theory and the concept of habit)

Frameworks of practical guidance for behaviour change interventions

Michie et al. 2011	Behaviour Change Wheel A comprehensive framework to guide the design and development of behaviour interventions; the framework includes sources of behaviour, intervention functions, and policy categories; sources of behaviour are 1) capability (psychological, physical), 2) opportunity (social, physical), and 3) motivation (reflective, automatic)
Young and Middlemiss 2012	Wheel of change framework Multidisciplinary framework of practical guidance for behaviour change interventions; the framework identifies four areas for intervention: 1) enabling individuals, 2) enabling communities, 3) changing the context, 4) quality factors of interventions

5.2.2 The role of knowledge

Knowledge plays an important role in all identified behaviour studies. About half of the models and frameworks described in Table 5.1 explicitly include factual knowledge (of the environment, specific issues, policy or behaviour) as one indirect determinant of behaviour. Many of these models describe environmental knowledge and awareness as a determinant of attitudes (Bamberg and Möser 2007, Fietkau and Kessel 1981, Kaiser et al. 1999a, 1999b) or behaviour intention (Hines et al. 1986/87). In Grob's (1995) structural model, factual knowledge and problem recognition form environmental awareness. Similarly, Kollmuss and Agyeman (2002) understand knowledge as part of environmental consciousness, which is one internal influence factor. In contrast, Barr (2004, 2007) sees knowledge as a situational variable and thus as part of the external enablers and barriers of environmental behaviour, along with a person's experience and sociodemographic context. In the other models and frameworks, the influence of knowledge is implied by the inclusion of beliefs and attitudes (Ajzen and Fishbein 1977, Ajzen 1991, Fransson and Gärling 1999, Guagnano et al. 1995, Steg and Vleck 2009) or awareness of environmental issues and consequences of behaviour (Han 2014, Klöckner and Blöbaum 2010, Stern et al. 1999).

'Knowledge deficit' and knowledge-behaviour gap

It makes sense to assume that knowledge plays a role in determining environmental behaviour because, as Kollmuss and Agyeman (2002) point out, at least some basic knowledge is needed to recognise environmental problems, evaluate consequences and make decisions on how to act or which product to buy (Michie et al. 2011). In fact, "knowledge can be assumed to be a precondition for any attitude" (Kaiser and Fuhrer

2003, p. 605). Lack of knowledge can be one potential barrier to pro environmental behaviour (Fransson and Gärling 1999, Kollmuss and Agyeman 2002). This is the basic premise of the 'knowledge deficit' approach which assumes that environmental problems are the result of a lack of public knowledge and understanding, and that the provision of expert information will fill this gap and lead to desired changes in public attitudes and behaviour (Burgess et al. 1998). However, the actual relationship between environmental knowledge and behaviour has been found to be weak. Even where knowledge leads to environmental concern and pro environmental attitudes, this often fails to translate into pro environmental behaviour (Barr 2004, Diekmann and Preisendörfer 1992). Blake (1999) calls this the value-action gap, while Kollmuss and Agyeman (2002) talk about the gap between knowledge and action or the attitude-behaviour gap. This gap has been found, for example, in the context of renewable energy projects (Bidwell 2016, Owens and Driffill 2008), air travel (Davison et al. 2014), energy saving (Valkila and Saari 2013), recycling (Barr 2004, 2007) and public concern about climate change (Stoknes 2014).

The various behaviour models in Table 5.1 explain this knowledge/attitude-behaviour gap through the influence of other internal and external influences and barriers. Kollmuss and Agyeman (2002) argue that some of these barriers are in themselves cognitive limitations: first, knowledge and understanding of environmental problems may not necessarily lead to emotional involvement which is important for shaping a person's beliefs, values and attitudes; second, there are limitations to people's ability to understand complex environmental systems; and third, people tend to resist information that contradicts their existing beliefs and values.

Necessary but not sufficient

Nonetheless, despite barriers and competing influences, “knowledge remains an important [...] predictor of ecological behavior” (Kaiser and Fuhrer 2003, p. 609). Many authors describe knowledge as an important and necessary precondition but weaker than other influencing factors and not sufficient to change behaviour (Bamberg and Möser 2007, Bidwell 2016, Frick et al. 2004, Grob 1995, Kaiser and Fuhrer 2003, Owens and Driffill 2008, Simis et al. 2016). While knowledge might not be enough to determine a person’s behaviour, it has been found to contribute to increased acceptance and support of environmental policies, political and structural change and new technologies such as renewable energy or shale gas fracking (Bang et al. 2000, Diekmann and Preisendörfer 1992, Hobman and Ashworth 2013, Kollmuss and Agyeman 2002, Nilsson and Küller 2000, Simis et al. 2016, Stedman et al. 2016, Steg and Vleg 1999, Whitmarsh et al. 2015). As Bidwell (2016) concludes in his study, “the role of information in shaping and changing attitudes toward wind energy should not be categorically dismissed” (Bidwell 2016, p. 761). Conversely, as discussed in Chapter 4, several studies present cases in which information campaigns aimed at increasing knowledge and support were ineffective or counterproductive, causing negative reactions and reinforcing opposition (Durant and Legge 2005, Eden et al. 2008, Poortinga and Pidgeon 2004, Scholderer and Frewer 2003). Thus, while information and knowledge can have a positive influence on support and acceptance of policy and technology, these studies show that the relationship between available information, knowledge and public attitudes is not always straightforward either.

Simcock et al. (2014) argue that “information provision does not necessarily lead to increased knowledge” (Simcock et al. 2014, p. 456.). For example, in their study on

public opinions on shale gas developments in the United States, Stedman et al. (2012) found that extensive media coverage did not increase people's knowledge. According to Simcock et al. (2014), to generate useful knowledge and understanding, information needs to be processed through interactions with others and social learning. This point is also picked up by other authors who argue that in order to be influential and useful, more interactive, participatory, inclusive forms of communication are needed (Bidwell 2016, Blake 1999, Burgess et al. 1998, Kollmuss and Agyeman 2002, Owens 2000, Owens and Driffill 2008).

Ecosystem services information and knowledge

In this thesis, following the distinction made by Simcock et al. (2014), the 'information' that is being provided to the study participants is information about ecosystem services and ESAV; whereas 'knowledge' refers to the study participants' understanding of marine sites, human-ecosystem interactions, stakeholder interactions and marine management contexts.

5.2.3 Different concepts of attitude

Attitudes are an important part of many psychological behaviour models (Blake 1999, Clark et al. 2003, Kaiser et al. 1999a). They form a person's enduring cognitive, emotional and behavioural response to another person, an object, an activity or issue (Hogg and Vaughan 2011). As Kaiser et al. (1999a) point out, three different attitude concepts are frequently used in environmental behaviour research: 1) attitudes towards environmental behaviour, 2) attitudes towards the environment (often referred to as environmental concern), and 3) global ecological worldviews. The

attitudes towards marine management that were explored by the marine user survey in Chapter 4 refer to acceptance and support of management decisions or measures. As such they do not fit into Kaiser et al.'s (1999a) three attitude categories. Instead, attitudes towards management can be interpreted as a form of behaviour. Stern et al. (1999), for example, describe policy acceptance and support as a possible behaviour in support of environmental movements. Others interpret public support for policy, structural strategy or new technologies as 'low cost' behaviour, meaning behaviour that requires little time and effort from a person (Kollmuss and Agyeman 2002, Steg and Vleck 2009). Alongside this, a long list of studies explore efforts to change public attitudes towards environmental policies or new technologies in order to increase acceptance or support, for example of travel restrictions, renewable energy projects, shale gas fracking or genetically modified food (for example Bang et al. 2000, Holman and Ashworth 2013, Nilsson and Küller 2000, Poortinga and Pidgeon 2004, Scholderer and Frewer 2003, Simis et al. 2016, Stedman et al. 2016, Steg et al. 2005, Whitmarsh 2015).

Thus, in a simplified view of behaviour models, the attitudes towards marine management in this thesis take the place of the behaviour while the ESAV information and understanding are the influencing factors under investigation (Figure 5.1).

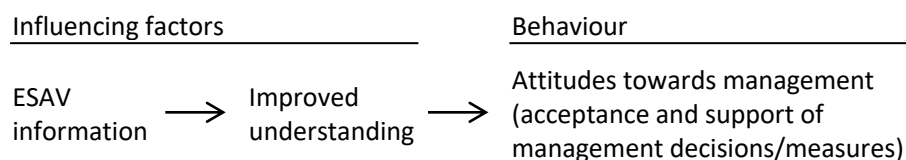


Figure 5.1: A simplified representation of the hypothesised relationships between ESAV information and attitudes towards management under investigation in this thesis

5.3 The pedagogic value of the ecosystem services approach

5.3.1 Great expectations: awareness, education and attitude change

The concept of ecosystem services was initially developed as “a way to communicate societal dependence on ecological life support systems” (Gómez-Baggethun et al. 2010, p. 1209). In the 1970s and 1980s, ecologists and economists began to frame the relationship between nature and human wellbeing in terms of ‘ecosystem services’ in an effort to draw attention to growing concerns about environmental degradation and biodiversity loss and to raise public support for conservation (Gómez-Baggethun et al. 2010, Norgaard 2010). Since then, the ecosystem services approach has moved on into the different spheres of environmental governance. It has become part of international agreements and national policies and has developed into a tool to guide legal, management and planning decisions. However, interest in the pedagogic potential of the ecosystem services approach remains strong.

Various authors discuss the ecosystem services concept and ESAV as ways of raising awareness and educating people about the benefits provided by nature and the dependence of human wellbeing on functioning ecosystems; and as ways of communicating the importance and societal benefits of conservation to policy makers, the public and other stakeholders (Albert et al. 2014, Beery et al. 2016, Berghöfer et al. 2016, Böck et al. 2015, Klein et al. 2013, Lamarque et al. 2011, Luck et al. 2012, Orenstein and Groner 2014). For example, Lamarque et al. (2011) explain that the ecosystem services concept is “widely used to draw attention to the importance of the benefits that people receive from biodiversity and ecosystems” (Lamarque et al. 2011, p. 442). Luck et al. (2012) describe ecosystem services as “a framework for promoting

the societal benefits of ecosystem conservation” (Luck et al. 2012, p. 1020). According to Berghöfer et al. (2016), ESAVs “have great potential to influence public perceptions by conveying the importance of functioning ecosystems to all economic sectors and social groups” (Berghöfer et al. 2016, p. 1). Similarly, Klein et al. (2013) see “communicating the benefits of ecosystem conservation to diverse stakeholder groups” (Klein et al. 2013, p. 174) as one of the strengths of the ecosystem services concept.

It was already mentioned in Chapter 4 that there are expectations among researchers and practitioners that by enhancing people’s understanding of the relationship between humans and nature, the ecosystem services approach can help explain management and planning decisions and increase public acceptance and support of management measures and conservation efforts (Albert et al. 2014, Beery et al. 2016, Böck et al. 2015, Orenstein and Groner 2014). For example, Orenstein and Groner (2014) talk about ecosystem services as “a vehicle with which to communicate the importance of nature conservation to policy makers and the general public, thereby generating more public support for conservation policy and research” (Orenstein and Groner 2014, p. 185). Similarly, Albert et al. (2014) argue that if the ecosystem services concept can demonstrate the benefits of conservation and sustainable resource use for human wellbeing, it could enhance public acceptance of landscape planning proposals. Beery et al. (2016) report that Swedish civil servants and politicians see the ecosystem services concept as a potential pedagogical tool that could help explain management plans and decisions to the public by illustrating human-nature relationships and the benefits provided by nature. As discussed in the previous two chapters, similar expectations were also raised by French and UK marine policy and management practitioners that took part in the VALMER case studies. However, it

appears that despite these expectations, previous to the marine user survey, the pedagogic potential of the ecosystem services approach had not yet been tested in any of the existing studies. No evidence was found proving or disproving the usefulness and effectiveness of the ecosystem services concept and ESAV for raising awareness, enhancing understanding, explaining management or planning decisions or increasing acceptance and support of management measures. This lack of evidence, together with the expectations raised by the interviewed VALMER stakeholders, was the main motivation for conducting the study presented in Chapter 4.

Going back one step further to the beginning of this thesis, the pedagogic value of the ecosystem services approach and its potential influence on people's attitudes towards marine management was one of the central premises for the marine user survey as well as for the VALMER interview study. The ecosystem services approach explicitly shows how humans interact with marine ecosystems and how economic, societal, cultural and spiritual wellbeing depend on and benefit from marine spaces, organisms and ecosystem processes. An ESAV reveals these links and interactions for a specific site and gives them a measure of importance or value. It integrates socioeconomic considerations into a comprehensive assessment of the marine ecosystem and shows what role different stakeholders and user groups play, in terms of positive and negative interactions with the ecosystem and with each other. Thus, ESAV presents the bigger picture of a site as well as the detailed links and interactions within, from an integrated socioeconomic and ecosystem perspective. Part of the rationale for this thesis was that the ecosystem services approach and site specific ESAVs would enable marine stakeholders and wider marine user groups to better understand the management context of a site as well as specific management needs and alternatives.

It was hypothesised that this improved understanding could potentially facilitate constructive stakeholder engagement in marine management processes and increase acceptance and support for management decisions among the wider user community.

5.3.2 Testing expectations: evidence from two studies

The studies in Chapters 3 and 4 assessed the application of the ecosystem services approach in two different marine engagement contexts: 1) direct stakeholder participation in marine management processes, and 2) communication of marine management decisions to the wider marine user community.

VALMER interviews: better understanding and engagement

In the first study, the VALMER interviews (Chapter 3), the participating stakeholders did contribute to, and work with, ESAV in a series of interactive meetings and workshops as part of the project case studies. The interviews confirmed that gaining a better understanding was a key aspect of the stakeholders' experience of engaging with the ecosystem services approach. The site specific ESAVs gave the stakeholders a comprehensive and integrated overview of the marine ecosystems and human activities at their sites and of the links and interactions in these socioeconomic-ecological systems. This enabled them to gain a better understanding of their own role in the system (in terms of interactions, benefits and impacts) as well as other stakeholders' perspectives. It also contributed to the development of a better and shared understanding of site specific issues and management contexts.

As mentioned in section 5.3.1, some of the interviewed managers and policy makers thought that the ecosystem services approach would also be useful for explaining

marine management decisions to the wider marine user community in a way that would increase acceptance of management measures and regulations. They explained that closing a site or prohibiting an activity for the protection of biodiversity or ecologically important features, or without giving any explanation at all, often feels to people like protection for the sake of protection. Whereas, in their opinion, ESAV provides understandable justification for regulations and restrictions, clearly explaining the context of an issue, the consequences of inaction and the benefits of appropriate management. Beery et al. (2016) raise a similar point when discussing the views of their study participants on the anthropocentric framing of the ecosystem services approach:

“The benefit of [ecosystem services] of connecting ecosystems to societal value is considered an advantage over previous terminology such as the concept of biodiversity that only allowed practitioners to argue for conservation from the moral standpoints and intrinsic value of species.” (Beery et al. 2016, p. 126).

This has also been picked up by other authors. For example, Lamarque et al. (2011) say that the ecosystem services concept “has provided a new, anthropocentric, justification for conserving species and ecosystems” (Lamarque et al. 2011, p. 442). Berghöfer et al. (2016) call it “convincing [...] evidence” (Berghöfer et al. 2016, p. 1).

In short, the VALMER interview study confirmed that the ecosystem services approach can improve understanding of human-marine ecosystem relationships and marine management contexts. As will be discussed later in this chapter, this played an important role in supporting constructive engagement in participatory processes. The interviews further confirmed that ESAV provides potentially relevant arguments for justifying management decisions.

Marine user survey: increased agreement with management?

The next step was to test whether using the ecosystem services approach in a one way, one off written communication to explain and justify marine management decisions would increase acceptance and support of these decisions among marine users. The marine user survey (Chapter 4) was designed to represent this situation in a fictitious scenario: a new management plan is presented to affected marine users in a written communication in which ESAV information is used to explain the context of the new management measures; the management plan introduces restrictions for commercial and recreational activities to protect an important seagrass bed.

The survey results revealed that the respondents did find the ESAV based arguments provided in the survey relevant for justifying management. However, the ESAV information in the scenario did not have the expected effect on their attitudes towards the proposed management measures. Although the ESAV versions of the scenario contained information that explained the importance of the seagrass, the role it plays in supporting the local economy and community wellbeing, and the detrimental consequences of losing the seagrass, respondents were not more ready to agree with the proposed restrictions than those who had received the scenario version without this information. On the contrary, those who had received ESAV information were more reluctant to agree with the proposed anchoring and fishing bans than those who had not received ESAV information. The possible reasons for this have been addressed in Chapter 4. The key finding from the marine user survey that will be taken forward here is that, despite providing relevant arguments for management, the ecosystem services approach might not have the expected effect of fostering positive attitudes towards marine management when used to communicate management decisions.

5.3.3 Gaps and barriers to the pedagogic potential of the ecosystem services approach

To recapitulate, the expectation in the ecosystem services literature and among management practitioners is that the ecosystem services approach offers a pedagogic tool for increasing people’s understanding of human-ecosystem relationships, justifying management decisions and thus fostering greater acceptance and support of management and conservation. The VALMER interviews have provided evidence that the ecosystem services approach can support better understanding of human-ecosystem relationships and management contexts. The findings from both studies confirm that ESAV offers relevant justification for management. However, the marine user survey failed to prove that the provision of ESAV information leads to more positive attitudes towards management measures. Figure 5.2 summarises this understanding-attitude gap.

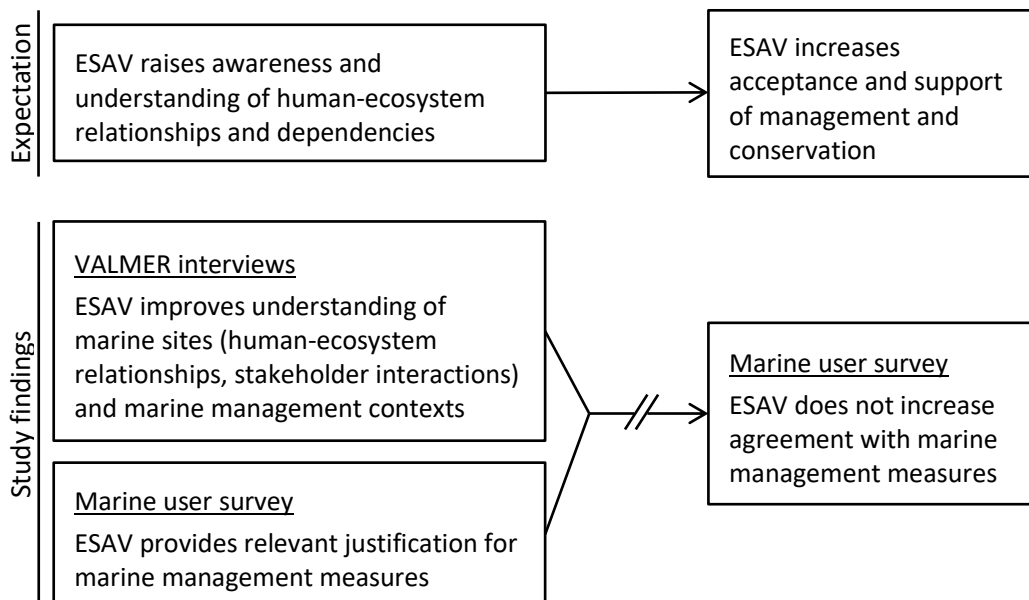


Figure 5.2: Comparison of expectations in the literature and study findings on the influence of ESAV information on attitudes towards management, revealing an understanding-attitude gap

An understanding-attitude gap

As Figure 5.2 illustrates, the findings from the two studies in this thesis suggest that there appears to be a gap between ESAV based understanding and attitudes towards management when using ESAV information to communicate management decisions. It implies that while ESAV information might be effective in improving understanding, this might not be sufficient to improve attitudes towards management. This is similar to the gap between environmental awareness, attitudes or concern and pro environmental behaviour described by Kollmuss and Agyeman (2002) and others (for example Barr 2004, Blake 1999, Diekmann and Preisendörfer 1992, Fransson and Gärling 1999). In most of the empirical studies, this gap is thematised in the context of specific individual or household behaviours such as energy saving, recycling or travel choices (Barr 2004, Davison et al. 2014, Owens and Driffill 2008, Valkila and Saari 2013, Young and Middlemiss 2012).

However, some studies also discuss the gap in more comparable contexts of public attitudes. For example, Bidwell (2016) talks about a gap between generally positive public attitudes towards renewable energy and opposition to specific renewable energy projects. While people seem to understand renewable energy as a solution to energy and climate change challenges, this understanding does not appear to translate into support for specific projects (Bidwell 2016). Bidwell (2016) identifies six possible reasons for this 'social gap' between general support and specific opposition, including 'not in my backyard' attitudes, different general and specific attitude objects and weak general attitudes. So, what is causing the gap between understanding based on ESAV information and attitudes towards management that was found in the marine user survey?

Ecosystem services: a 'knowledge deficit' approach?

The expectation that the provision of ESAV information would lead to increased acceptance and support of management is based on a 'knowledge deficit' understanding of behaviour (Burgess et al. 1998, Kollmuss and Agyeman 2002). The 'knowledge deficit' model continues to be very popular among policymakers and scientists (Barr 2004, Blake 1999, Fernández 2016, Kollmuss and Agyeman 2002, Lucas et al. 2008, Owens and Driffill 2008, Simis et al. 2016, Stoknes 2014). It is frequently used to explain public attitudes to science and technology (Bidwell 2016, Stedman et al. 2016) or public perceptions of risk (Hansen et al. 2003), and forms the basis of government and NGO campaigns targeted at raising awareness, gathering support or changing behaviours (Burgess et al. 1998, Eden et al. 2008, Durant and Legge 2005, Owens 2000, Poortinga and Pidgeon 2004, Scholderer and Frewer 2003, Simcock et al. 2014). It is therefore not surprising that environmental managers, planners and policy makers have 'knowledge deficit' based expectations with regard to the ecosystem services approach. In fact, according to Cook and Spray (2012), the ecosystem services concept itself is a 'knowledge deficit' approach. This interpretation reflects the original purpose of the ecosystem services approach which was to raise awareness and support for conservation (Gómez-Baggethun et al. 2010).

As discussed above, an extensive body of theoretical and empirical research on environmental and social behaviour has shown that the relationship between knowledge and public attitudes and behaviour is not as straightforward as the 'knowledge deficit' model assumes. Most behaviour researchers agree that while knowledge is an essential prerequisite, it is not sufficient to change behaviour (for example Bamberg and Möser 2007, Frick et al. 2004, Kaiser and Fuhrer 2003, Simis et

al. 2016). Thus, it could be concluded that the gap between ESAV based understanding and attitudes towards management that was found in the marine user survey is the consequence of a misplaced belief in the 'knowledge deficit' model.

The expectations regarding the effect of ESAV information on attitudes towards management are not entirely unjustified, as many studies do suggest a positive relationship between levels of awareness and understanding and public acceptance and support of environmental policies and technologies (for example Bang et al. 2000, Bidwell 2016, Hobman and Ashworth 2013, Nilsson and Küller 2000, Simis et al. 2016, Stedman et al. 2016, Whitmarsh et al. 2015). However, while the expectations with regard to the influence of ESAV information on attitudes towards management might be justified to some extent, the findings from the marine user survey show that the 'knowledge deficit' model does not apply in this context. On the contrary, the fact that survey participants who had received ESAV information were, on average, less willing to agree with the proposed management measures compared to those who had not received ESAV information, confirms the point raised earlier that the effect of information on management attitudes is not always as expected.

Barriers to understanding and influence

Putting the survey findings in the context of the behaviour models described in section 5.2, the uncovered understanding-attitude gap suggests that there might be other, more influential factors that are moderating or blocking the influence of the ESAV information and improved understanding on attitudes towards management. Lack of trust in government and management authorities, for example, could be one of these barriers or moderating influences. Trust has been found to be an important element in

generating support for environmental policies (Durant and Legge 2005, Ricci et al. 2010, Simcock et al. 2014). At the same time, public trust in local and national governments and authorities has been reported to be low and declining, in the UK as well as across Europe more generally (Blake 1999, Gaskell et al. 2003, Owens 2000, Ricci et al. 2010). Moreover, as some of the interviewed VALMER stakeholders said, marine users tend to be suspicious of and opposed to new restrictions, especially when they feel that these are put in place for the wrong reasons. However, as agreement with the proposed management measures in the survey was generally high across all three scenario groups, this dismisses the possibility that trust acted as a barrier to the influence of ESAV information.

A more likely barrier hindering the ecosystem services concept and ESAV information from having the expected effect on people's attitudes towards management might be that the approach is more difficult to communicate and more difficult for people to grasp than assumed. To scientists and academics, ecosystem services and ESAV might seem straightforward concepts. However, an important finding from the VALMER interviews is that marine stakeholders find the ecosystem services approach and ESAV very conceptual, academic, abstract and difficult to understand. Similarly, Lamarque et al. (2011) report that "[the ecosystem services] concept is difficult to grasp" (Lamarque et al. 2011, p. 448). As discussed earlier, there are cognitive limitations to understanding complex information that prevent knowledge and information from influencing attitudes and behaviours (Kollmuss and Agyeman 2002). Moreover, several of the VALMER stakeholders referred to ecosystem services as a new way of thinking. Resistance against new or unfamiliar information is another knowledge related barrier to emotional involvement and environmental behaviour discussed by Kollmuss and

Agyeman (2002). Cork and Proctor (2005) raise a similar argument, referring to theories from educational psychology according to which people only accept ideas and information that are compatible with their existing understanding and worldviews. As Cork and Proctor (2005) point out, “scientists often fail to recognise that their concepts are foreign to [people] with different backgrounds” (Cork and Proctor 2005, p. 21). In fact, both studies in this thesis as well as several other studies found that pre-existing knowledge and understanding of the ecosystem services approach were limited among non-experts (Böck et al. 2015, Sagie et al. 2013, Manns 2014).

Simcock et al. (2014) present comprehensibility and relevance as important factors for the usefulness of information. As the results of the marine user survey clearly showed, respondents thought the ESAV based arguments presented in the survey were relevant. Moreover, there was no evidence in the survey results that respondents found the ESAV versions of the scenario more difficult to understand than the non-ESAV version. At first glance, this would appear to dismiss Kollmuss and Agyeman’s (2002) cognitive limitations as barrier to the influence of ESAV information on attitudes towards management. However, looking back to Figures 5.1 and 5.2, the assumption that ESAV improves understanding plays an important role in expectations regarding the ecosystem services approach as a management communication tool. Recalling Simcock et al.’s (2014) argument that the provision of information does not necessarily increase understanding, it is possible that the ESAV information in the marine user survey did not improve respondents’ understanding of the marine management context in the scenario. In fact, the effect of ESAV information on respondents’ understanding was not tested in the survey but rather implied based on findings from the VALMER interviews (which was a limitation of the marine user survey).

In conclusion

What this suggests is that the marine user survey respondents might not have perceived the ESAV information in the scenario as difficult to understand. However, the inherent complexity and novelty of the ecosystem services approach might have prevented the ESAV information from improving their understanding of the management context and from fostering more positive attitudes towards the proposed marine management measures. If this is the case, the gap that was uncovered by the marine user survey does not lie between ESAV based understanding and attitudes towards management but, more likely, between ESAV information and understanding. What this means is that using the ecosystem services approach to communicate marine management decisions might not lead to increased acceptance and support among marine users because ESAV information might be failing to lead to improved understanding of the management context. In conclusion, it seems that the inherent complexity and novelty of the ecosystem services approach might limit the influence of ESAV information when used in a one way written public communication context. This is an important finding given the widely held expectations that ESAV information would be useful for communicating management decisions and securing public support.

5.4 The marine engagement potential of the ecosystem services approach

5.4.1 Participatory engagement: the key to unlocking the potential

As section 5.3 concluded, it seems likely that in the marine user survey, which applied the ecosystem services approach in a non-participatory top down communication setting, ESAV information did not improve respondents' understanding of the marine management context. Conversely, better understanding of ecological and socioeconomic marine systems and management contexts played an important part in the VALMER stakeholders' experience of engaging with ESAV in a participatory process. The VALMER interview findings show that by developing a more comprehensive site understanding the ecosystem services approach encouraged constructive dialogue and exchange among the participating stakeholders. At the same time, the interaction between stakeholders and active involvement in ESAV played a key role in fostering a better site understanding. This is illustrated in Figure 5.3. The ecosystem services approach and site based ESAVs gave the stakeholders a comprehensive and integrated view of the marine ecosystems, human activities and multiple interactions at their sites. This was part of the reason why the stakeholders perceived ESAV to be neutral and objective, rather than representing ecological, economic or other political interests. The combination of improved site understanding and perceived neutrality of the ecosystem services approach encouraged stakeholders to share their own knowledge and views and openly engage in dialogue and discussions. This, in turn, fostered a better understanding of other stakeholders' perspectives and of the broader management contexts of the sites. In this context of constructive dialogue and

exchange, ESAV also enabled the stakeholders to consider things from new perspectives and think outside their usual boxes.

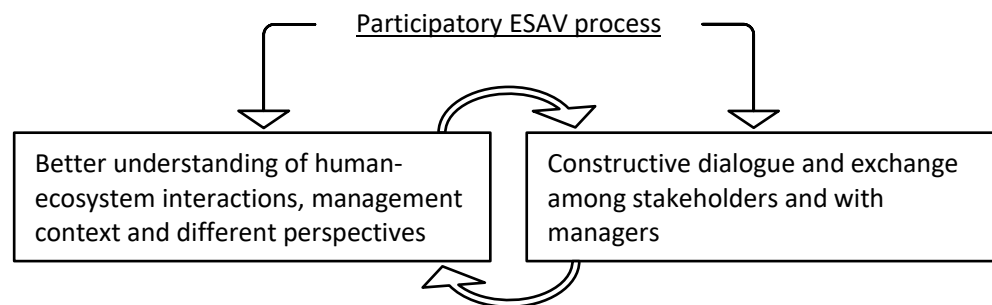


Figure 5.3: Simplified representation of the relationship between understanding and stakeholder interactions in the participatory ESAV processes of the VALMER case studies

Thus, as Figure 5.3 shows, the pedagogic success of the ecosystem services approach in the VALMER case studies was closely linked to the interactions between stakeholders and to their participation in the ESAV process. According to Simcock et al. (2014), the transformation of information into knowledge and understanding requires a process of social interaction and learning. In fact, many authors see more interactive, participatory forms of communication and stakeholder engagement as a way of overcoming the limitations of the ‘knowledge deficit’ approach and of influencing attitudes and behaviour through the provision of information (for example Bidwell 2016, Blake 1999, Burgess et al. 1998, Fransson and Gärling 1999, Hines et al. 1986/87, Kollmuss and Agyeman 2002, Owens 2000).

The findings from the VALMER interviews appear to confirm this theory with regard to the ecosystem services approach and ESAV information. The findings suggest that the key to unlocking the pedagogic potential of the ecosystem services approach is a

participatory engagement process which enables constructive exchange among stakeholders and active involvement in the ESAV. The VALMER interviews do not answer the question whether participatory ESAV based engagement would increase marine users' acceptance and support of management measures. However, they do show that participatory ESAV based engagement can improve relationships among different stakeholders as well as between stakeholders and managers, thus increasing the likelihood that management decisions are well informed, accepted, effectively implemented and complied with.

5.4.2 A conceptual model of the marine engagement potential of the ecosystem services approach

Going back to the beginning of the thesis, Chapter 2 described the central role that stakeholder engagement plays in the implementation of ecosystem based marine management, as well as the potential of the ecosystem services approach to overcome some of the challenges of marine stakeholder engagement. Gaining a better understanding of why, how and under what conditions ESAV can facilitate constructive engagement processes is important if the ecosystem services approach is to be used effectively to support and improve stakeholder engagement in ecosystem based marine management. Therefore, this thesis set out to answer two questions: what is it about the concept of ecosystem services or ESAV that facilitates engagement; and what are the enabling factors, obstacles and limitations for effectively using the ecosystem services approach to support and improve marine stakeholder engagement? The answers to these questions that emerge from the empirical evidence of the VALMER interviews and the marine user survey, and from the theoretical discussion

about pedagogic value in this chapter, can be synthesised into a conceptual model of the marine engagement potential of the ecosystem services approach. The following sections describe the different aspects of this conceptual model, which is illustrated in Figure 5.4 (on page 317).

Why and how can the ecosystem services approach support marine stakeholder engagement?

The answer to the question, what it is about the ecosystem services approach that facilitates marine stakeholder engagement, is summarised in Figure 5.3: ESAV fosters better understanding and constructive dialogue. The evidence from the VALMER interviews shows that ESAV provides a comprehensive and integrated view on a marine site and its human-ecosystem interactions, in a setting that is perceived to be neutral and objective and not focused on specific interests. This enables people to gain a broader understanding of the ecosystems, the different human activities and interests, and the connectivity and interactions within a marine site, beyond their own personal or professional perspectives. It also encourages people to contribute and exchange their own knowledge and views, engage in open dialogue and discussion, and consider things from new perspectives. A more comprehensive site understanding and constructive dialogue foster better mutual understanding among stakeholders and enable them to develop a shared and improved understanding of the marine management context.

Shared and improved understanding of human-ecosystem interactions, management context and different stakeholder perspectives within a marine site, and constructive dialogue among stakeholders and with managers, are at the core of the marine

engagement potential of the ecosystem services approach (Figure 5.4). By fostering better understanding and constructive dialogue, ESAV based engagement processes can improve the relationships among stakeholders, as well as with managers, and support collaborative management. This would explain the positive effects on marine stakeholder dialogue and engagement that were found in the marine governance case studies presented in Chapter 2, in which ESV studies were used in participatory marine policy and management processes (Kushner et al. 2012, van Beukering et al. 2008). Good stakeholder relationships and collaboration with managers can facilitate implementation, and thus increase the effectiveness, of marine management. Furthermore, by encouraging and enabling people to openly share their knowledge, consider things from new perspectives and think outside their usual boxes, ESAV based engagement processes also hold the potential to lead to better informed, more integrated and innovative marine management solutions.

What are the enabling factors, obstacles and limitations for the marine engagement potential of the ecosystem services approach?

What Figure 5.3 (on page 309), and the discussion that led to it, also show is that the key to unlocking the pedagogic potential of the ecosystem services approach, to improve the understanding of socioecological systems and management contexts, is participatory engagement. The findings from the marine user survey have dismissed 'knowledge deficit' expectations that ESAV information would be useful for communicating marine management decisions to marine users in a way that would increase acceptance and support of management. The discussion of the findings in the context of environmental behaviour research has shown that the inherent complexity

and novelty of the ecosystem services approach limit its effectiveness in top down, one way communication.

Instead, effective use of the ecosystem services approach as a marine engagement tool requires the integration of ESAV in an interactive, participatory process. There are two reasons behind this. First, the experience from the VALMER case studies has shown that the interaction with other stakeholders plays a key role in developing a better and shared site understanding through ESAV. One way to explain this interplay between ESAV and stakeholder interaction is that through dialogue with others, and exchange of knowledge, experiences and views, the ESAV information becomes more comprehensive but also more tangible and relevant. The information that the stakeholders contribute completes the bigger picture that is painted by the ESAV, and brings it to life for the stakeholders. The second reason for the importance of having a participatory process is that active involvement of the stakeholders in conducting the ESAV, and applying it to the management context at their marine site, helps overcome the obstacles that result from the novelty and complexity of the ecosystem services approach.

In fact, the evidence from the VALMER interviews confirms that the **technical and theoretical complexity** of the ecosystem services approach, as well as **limited familiarity** with the ecosystem services concept, ESAV methods and terminology, are the main challenges for the effective use of ESAV in participatory engagement processes. As a consequence, introducing stakeholders to the ecosystem services approach and enabling them to work with ESAV requires sufficiently long and/or multiple workshops, and commitment to participate in the entire process. This can present a potential obstacle for ESAV based engagement particularly in marine

management contexts, where marine stakeholders might be spread over large geographical distances, or their availability might depend on unpredictable weather conditions.

The factors that were found to have facilitated successful ESAV based engagement in the VALMER case studies are mainly related to making the ecosystem services approach and ESAV accessible and relevant to non-expert stakeholders from different backgrounds. As illustrated by the VALMER experience, the factors that enable the ecosystem services approach to foster better understanding and constructive dialogue in participatory settings, and thus to support and improve marine stakeholder engagement, are:

- A **mix of different stakeholders**, including those that do not usually meet or that have conflictual relationships (for example commercial stakeholders, public authorities, NGOs, recreational user groups and other interest groups, scientists and experts, and members of the public),
- A **neutral process** supported by scientists or external experts,
- **Active involvement** of the stakeholders in **ESAV discussions and activities**, including opportunities:
 - to validate existing data,
 - to contribute all kinds of knowledge, information and views,
 - and to provide feedback on the ESAV process and results;While **avoiding** exposure of the stakeholders to too much detail about the **technical aspects of ESAV** (for example ecological and socioeconomic modelling),
- Application of ESAV in **exercises with practical management relevance**, for example integration of ESAV in scenario building to explore different management alternatives,

- **Clear and understandable information** about the ecosystem services approach and ESAV that
 - is tailored to the background of the participating stakeholders,
 - is based on real or realistic local examples,
 - and avoids technical jargon or scientific vocabulary (unless this is clearly explained in non-expert terms),
- And **time** for explanations, questions and answers, discussions and activities.

In the context of active involvement and tailored information, two further points should be considered. First, as in every stakeholder engagement context, it is important to take participant contributions seriously and to be transparent about how different information is used. Therefore, the information that stakeholders provide should be integrated into the ESAV, and the comments on ESAV process and results, should be taken into consideration as far as possible; and where not possible, this should be explained. Second, with regard to tailoring the information to the participants, consideration should be given to the fact that pre-existing knowledge about the ecosystem services approach is limited among marine stakeholders and can differ significantly from expert understanding of ecosystem services and ESAV.

The conceptual model of the marine engagement potential of the ecosystem services approach is summarised in Figure 5.4. This model provides a normative framework to guide the effective use of the ecosystem services approach as a marine engagement tool. The application of ESAV in a participatory process that meets the enabling factors listed in the model helps overcome the obstacles posed by the novelty and complexity of the ecosystem services approach, and it supports improved marine stakeholder engagement by fostering better understanding and constructive dialogue. The model

also points out how the use of ESAV as a participatory engagement tool can contribute to more effective and integrated, ecosystem based marine management.

Finally, while the focus of this thesis is on stakeholder engagement in marine management, the enabling factors identified in the conceptual model could also be applicable to participatory ESAV processes in other environmental governance contexts. Thus, it is possible that the effective use of the ecosystem services approach as a participatory engagement tool, as described in the conceptual model, could improve not just marine engagement, but stakeholder engagement in environmental governance more widely. Although further research would be needed to confirm this, similar benefits for stakeholder engagement, and contributions to management, as were found for the marine context, could also be expected from participatory ESAV based engagement processes in other environmental contexts.

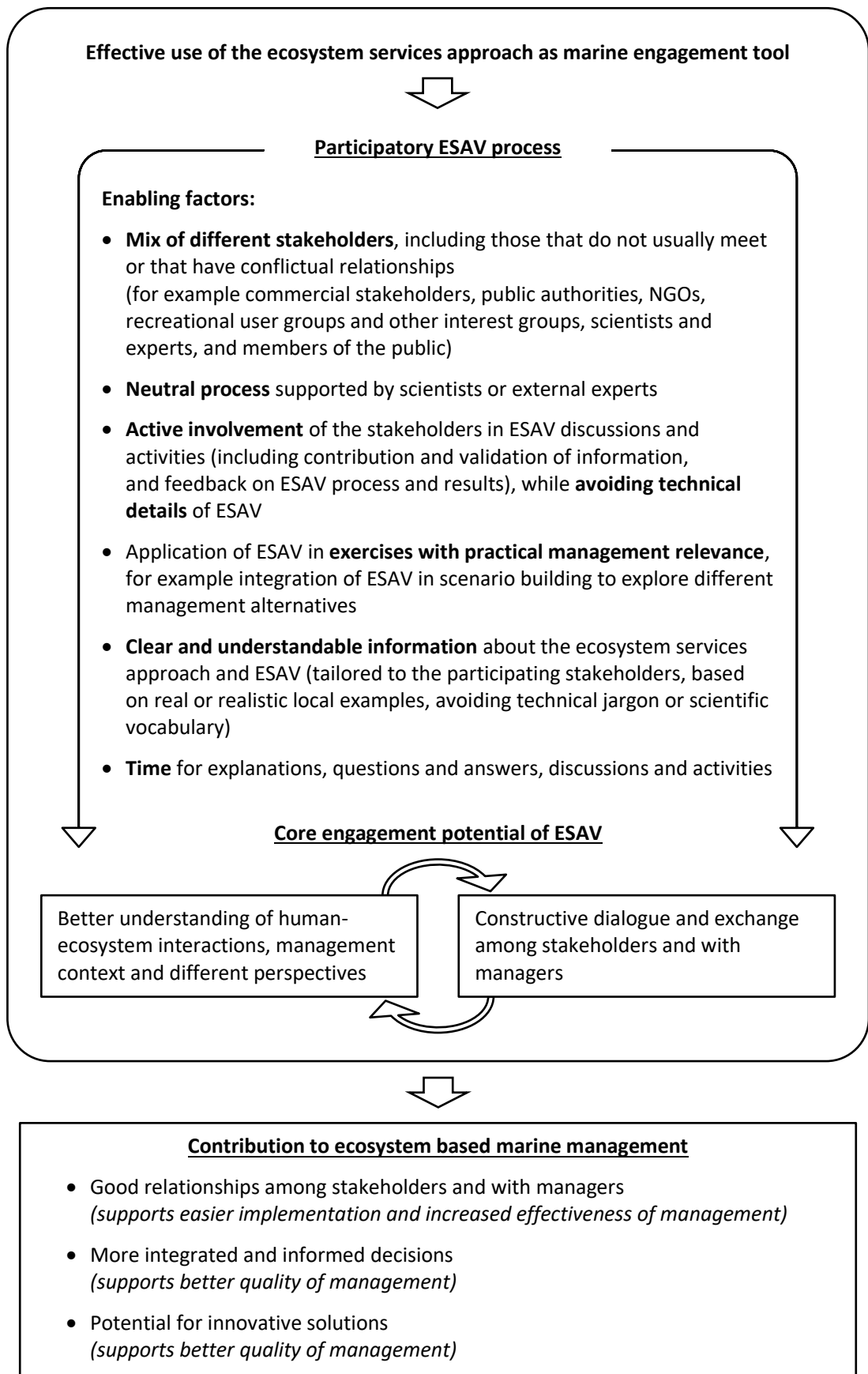


Figure 5.4: A conceptual model of the marine stakeholder engagement potential of the ecosystem services approach

5.5 Ecosystem services approach and participatory engagement: potential benefits for ecosystem based marine management

5.5.1 Participatory ESAV: a relationship with mutual benefits

Looking back to Chapter 2, the review of the stakeholder engagement and ecosystem services literature suggested that there are several interactions between participatory engagement and ESAV. Sociocultural ecosystem service valuations, and some types of economic valuation, are often based on participatory methods (for example Fletcher et al. 2014, Jobstvogt et al. 2014a, 2014b, Klain et al. 2014, Scholte et al. 2015, Yoskowitz et al. 2016). Moreover, many authors see stakeholder participation as an important way of improving the quality, legitimacy and usefulness of ESAV for environmental governance (for example Jax et al. 2013, Sagie et al. 2013, Spangenberg et al. 2015, Verburg et al. 2016). Menzel and Teng (2009) call ecosystem services a “stakeholder-driven concept” (Menzel and Teng 2009, p. 907). The other way around, ESAV is considered to have the potential to support constructive stakeholder dialogue and effective participatory engagement (for example Granek et al. 2010, Iniesta-Arandia et al. 2014, Jax et al. 2013, Spangenberg et al. 2015).

The empirical evidence and conceptual discussions presented in this thesis confirm that the ecosystem services approach has the potential to support and improve marine stakeholder engagement when ESAV is integrated in interactive participatory engagement processes. In particular, the experience from the VALMER case studies, which was captured by the VALMER stakeholder interviews, shows how participatory ESAV processes can facilitate constructive stakeholder engagement in marine management.

In the VALMER case studies, stakeholder participation in itself was an important element of the ESAV processes at the six sites. The local marine stakeholder groups that took part in the case studies helped focus the ESAVs on site relevant issues; they validated the available data for the ESAVs and contributed additional information and local knowledge; they participated in assessment and valuation exercises, for example ecosystem service mapping and scoring in North Devon; and finally, they tested the application of the ESAV outputs in management decision making through scenario building exercises (see Chapter 3.2, also Dodds and Friedrich 2015).

Thus, the evidence from the VALMER interviews and observations from the VALMER case studies appear to confirm the conclusion, suggested by the literature review, that the relationship between the ecosystem services approach and participatory engagement might be mutually beneficial: participatory ESAV supports constructive stakeholder engagement, and stakeholder participation in ESAV improves the quality and usefulness of ESAV for management.

5.5.2 Twofold benefits for ecosystem based marine management

This mutually beneficial relationship between stakeholder engagement and the ecosystem services approach could mean that participatory ESAV processes have the potential to support ecosystem based marine management in two ways. One way is through improved marine stakeholder engagement, as discussed in section 5.4 and Chapter 3. The effective use of ESAV as a participatory engagement tool can improve relationships among marine stakeholders, support collaborative management and lead to better informed, integrated and innovative management solutions. The second way refers to the increasing interest in ESAV as a tool for marine governance, as evidenced

by the growing number of marine ESAV studies aimed to inform and support marine management, planning and conservation (for example Böhnke-Heinrichs et al. 2013, Börger et al. 2014, Fletcher et al. 2012b, Rees et al. 2014, Tallis et al. 2012), as well as the work of the VALMER project (Dodds and Friedrich 2015, Dodds et al. 2015, Mongruel et al. 2015, VALMER 2015).

The evaluation of the marine governance influence of ESAV in the VALMER case studies, conducted by Dodds et al. (2015), revealed that ecosystem service assessment and valuation can support the planning, implementation and monitoring of marine management (see also Dodds and Friedrich 2015). One of the main contributions of ESAV, in particular to marine planning and monitoring of marine management, that was identified in this evaluation, is the provision of an improved marine evidence base that integrates ecological data as well as economic, social and cultural values from different scientific and non-scientific knowledge sources (Dodds and Friedrich 2015, Dodds et al. 2015). The evaluation of the marine governance influence of ESAV was in part based on the VALMER stakeholder interviews presented in Chapter 3; in effect, a similar conclusion to Dodds et al. (2015) was also reached in the interview analysis that was conducted as part of this thesis (see section 3.4.6 and Table 3.14). The VALMER stakeholders thought that ESAV can provide evidence for marine management and planning decisions and a tool for more integrated marine management. The interviews also revealed that the VALMER stakeholders' main concerns about the use of ESAV in marine management were related to the quality and availability of marine data and the robustness of ESAV methods and outputs (Table 3.14).

In fact, as was explained in Chapter 2, scientific uncertainty and lack of data are two of the main methodological issues that limit the usefulness of ESAV (Daily et al. 2000,

Granek et al. 2010, Liu et al. 2010). This is particularly the case for the marine environment where scientific knowledge is still very limited (Fleming and Jones 2012, Jones 2002). Moreover, the multiple economic and sociocultural values related to marine ecosystems are difficult to identify and measure and can easily be overlooked (Chan et al. 2012a, 2012b, Lopes and Videira 2013, Martín-López et al. 2014, Sagie et al. 2013, Spangenberg et al. 2015). Thus, the second possible contribution of participatory ESAV to ecosystem based marine management lies in the potential of participatory engagement to improve the quality of ESAV processes and outputs. As an inclusive approach that encourages stakeholders from different sectors and backgrounds to share their expertise, local knowledge, interests and views, and that enables the integration of these different types of information and values in one comprehensive assessment, participatory ESAV can provide a more comprehensive and robust marine evidence base and decision support for integrated marine management.

In conclusion, the literature review in Chapter 2 highlighted the important role that participatory engagement, and increasingly the ecosystem services approach, play in implementing ecosystem based marine management. It also pointed out the challenges that these two approaches face, in particular in the marine context, and that can limit their effectiveness and usefulness. The research presented in this thesis suggests that the mutual benefits of integrating the ecosystem services approach and participatory engagement could increase the effectiveness of both approaches. Participatory ESAV processes could have the potential to support ecosystem based marine management through better marine stakeholder engagement, as well as through an improved marine evidence base for more informed decision making and

integrated marine strategies and policies. This twofold potential of participatory ESAV for ecosystem based marine management is illustrated in Figure 5.5.

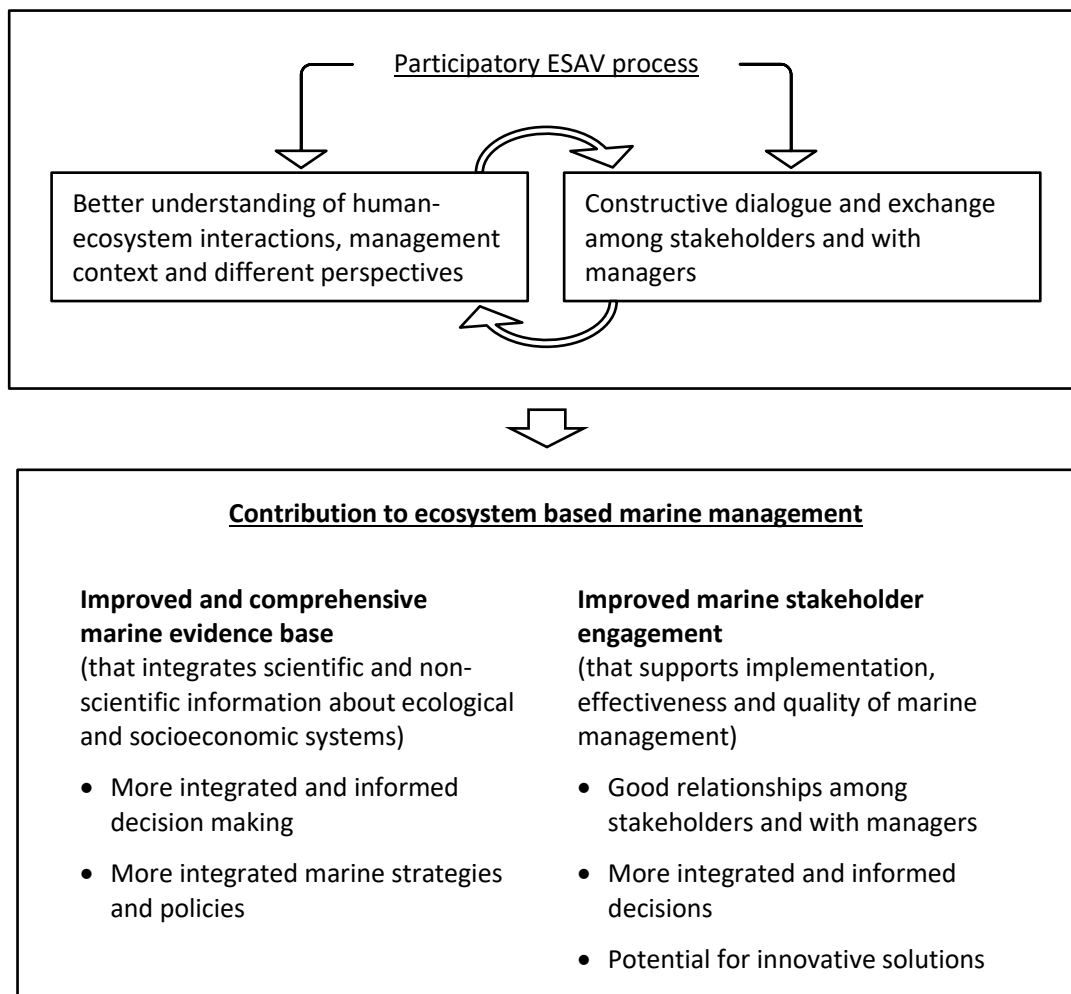


Figure 5.5: An illustration of the possible benefits for ecosystem based marine management from the integration of participatory stakeholder engagement and the ecosystem services approach in a participatory ESAV process

The next and final chapter summarises the key findings from across the thesis and discusses how these address the research aim that was set out in Chapter 1. The chapter concludes the thesis with an outlook on further research into the relationship between marine stakeholder engagement and the ecosystem services approach, and their contribution to ecosystem based marine management.

6 Conclusion

The oceans and seas support human wellbeing through a wide range of functions and resources. They regulate the planet's climate, protect coastal communities from storm damage and flooding, provide food and raw materials, and they are a rich source of cultural identity, artistic inspiration and spiritual fulfilment, to name a few examples. With growing demand for marine resources, human pressures on the marine environment are rapidly increasing. The resulting decline in marine ecosystem health and biodiversity is limiting the ability of the oceans and seas to provide these essential and beneficial ecosystem services for human wellbeing. To stop the ongoing marine degradation and allow marine ecosystems to recover, an ecosystem based approach to marine management is needed that considers all connections and interactions between ecological and socioeconomic systems in one comprehensive strategy. Two key principles for implementing ecosystem based management are stakeholder engagement and the ecosystem services approach.

This is the context in which this thesis explored the relationship between marine stakeholder engagement and ecosystem service assessment and/or valuation (ESAV), with the aim *to critically evaluate the potential of using the ecosystem services approach to support and improve stakeholder engagement in marine management*. The following sections of this final chapter summarise the key findings from across the thesis and discuss how these address the aim and associated objectives that were set out in Chapter 1. The chapter concludes the thesis with an outlook on further research into the interactions between ecosystem services approach and marine stakeholder engagement, and their contribution to ecosystem based marine management.

6.1 Identifying the relationship between stakeholder engagement and the ecosystem services approach

6.1.1 Theoretical context of stakeholder engagement and application in marine management

Stakeholder engagement has been an integral part of environmental governance since the introduction of the first environmental policies, laws and regulations in the late 1960s and early 1970s (Beierle and Cayford 2002, Haklay 2003). It is closely tied to the social and environmental movements, democratic theory, the sustainability agenda and the intrinsic nature of environmental problems which have shaped environmental governance over the last five decades. All of these factors recognise the central role of people's activities, interests and values in effective environmental governance, and demand the involvement of affected or interested stakeholders in decision making (Fiorino 1996, Richardson and Razzaque 2006, van den Hove 2000). Engagement typologies and mechanisms range from top down communication of information, or consultation about proposals, to active participation in decision making and sharing of authority (Beierle and Cayford 2002, Rowe and Frewer 2000). The appropriate level of engagement, and choice of mechanisms, often depends on the context and objectives of the engagement (Bishop and Davis 2002). There are normative and pragmatic rationales for involving stakeholders in environmental governance: participatory engagement is considered a human right and integral part of democratic governance (Fiorino 1990), as well as holding the potential to improve the quality of governance processes, decisions and outcomes (Dietz and Stern 2008, Wesselink et al. 2011).

There are a number of challenges for stakeholder engagement. The main one relates to the time and resource intensive nature of engagement processes (Fraser et al. 2006, Ran 2012). Other difficulties concern questions about who, when and how to engage (Dietz and Stern 2008). For participatory processes to be successful, a number of 'good engagement' criteria must be met, including early and continuous engagement, representativeness and inclusiveness, clear objectives and real influence on decisions, active dialogue and discussion, integration of different knowledge and values, adequate resources and capacity building, and an atmosphere of trust and respect (Dalton 2005, Fiorino 1990, Reed 2008, Rowe and Frewer 2000). If these 'good engagement' criteria are met, involvement of the public and local stakeholders in management processes can support more legitimate, better informed and socially acceptable decisions, reduce conflict between stakeholders and opposition to management, and facilitate the implementation of management measures (Dietz and Stern 2008, Richardson and Razaque 2006, Stirling 2006).

Over the last decades, stakeholder involvement has been recognised as an essential prerequisite for the successful design and implementation of marine protected areas (Dalton 2005, Fernandes et al. 2005, Gall and Rodwell 2016, Sayce et al. 2016). Stakeholder engagement is also considered to play an important role in marine spatial planning (Douvere and Ehler 2009, Gilliland and Laffoley 2008, Pomeroy and Douvere 2008). Further, a number of EU directives, national policies and legislation have started calling for public and stakeholder participation in marine management and planning (for example EU 2008, 2014b, UK 2009). However, in a marine context, effective engagement is often challenging. As a result of traditionally sectoral marine management and the complexity of marine ecosystems and issues, it can be difficult to

identify all relevant stakeholders, and relationships between different stakeholders are often conflictual (Douvere and Ehler, 2009, Maguire et al. 2012, Sutherland and Nichols 2006). Strong stereotypical views can further inhibit cooperation between different groups (Gleason et al. 2010, Mason et al. 2015). On top of this, people often have little knowledge about the marine environment and human interactions with marine ecosystems (Jefferson et al. 2014, Jones 2002, Steel et al. 2005). Finally, from a practical perspective, the geographical extent of marine and coastal environments makes it difficult to gather all relevant stakeholders around one table (Ritchie and Ellis 2010). Given the urgent need for more effective ecosystem based marine management, it is important to find ways of supporting and improving marine stakeholder engagement.

6.1.2 Theoretical context of the ecosystem services approach and application in marine management

The concept of ecosystem services draws an explicit link between ecosystems and human wellbeing. It illustrates how the economic prosperity, social cohesion, health and cultural fulfilment of societies depend on a healthy, functioning natural environment (MEA 2005). The approach emerged in the 1970s as a pedagogic concept used by ecologists to highlight the societal importance of biodiversity and raise support for conservation (Gómez-Baggethun et al. 2010). In the 1990s, research on monetary valuation of ecosystem services drew increasing attention to the approach in scientific and policy communities (Costanza et al. 1997, Daily 1997). The introduction of market based ecosystem service trading mechanisms, adoption of ecosystem services conservation as an implementing principle for the ecosystem approach under

the UN Convention on Biological Diversity, and the release of the UN Millennium Ecosystem Assessment report in 2005 firmly established the ecosystem services approach on the international policy agenda by the mid-2000s (Atkins et al. 2011, Gómez-Baggethun et al. 2010). Since then, it has evolved into a multidisciplinary approach with many different purposes. These purposes range from communicating the implications of ecological change for human wellbeing, integrating ecological, economic and social considerations in policy strategies, and fostering interdisciplinary dialogue, to supporting policy design, management and planning decisions, and legal processes (Granek et al. 2010, Jax et al. 2013, Laurans et al. 2013a, Luck et al. 2012). The multidisciplinary nature of the approach, and its various contexts of application, are also reflected in the diversity of ecosystem service definitions, classification frameworks, ecological, economic and sociocultural value concepts, qualitative and quantitative assessment methods described in Chapter 2.2.

The ecosystem services approach is seen by many as an important tool to foster biodiversity conservation, implement ecosystem based resource management and advance the sustainable development agenda (CBD 2000, Costanza et al. 2014, Daily et al. 2009). In fact, the approach is being applied in various environmental governance contexts around the world, for example in payment for ecosystem services schemes in Latin America (Grima et al. 2016), in strategic impact assessments of development projects (Slootweg and van Beukering 2008), and in coastal zone management (Marre et al. 2015). A review of the influence of monetary ESV in marine governance found that monetary valuation studies have been used to support the management and financing of MPAs (Kushner et al. 2012, Slootweg and van Beukering 2008), to justify government decisions preventing or banning damaging resource extractions (Kushner

et al. 2012, White et al. 1997), and to inform marine and coastal impact assessments, management strategies, MPA policies and user fee schemes, compensation payments and fine systems for environmental damage (Kushner et al. 2012, Schuijt 2003, Rees et al. 2010). However, despite widespread interest in ecosystem service assessment and valuation, the overall uptake and influence in environmental and marine policy and management remains low (Guerry et al. 2015, Kushner et al. 2012, Liu et al. 2010). This is due, at least in part, to a number of methodological difficulties and limitations, conceptual issues and ethical debates surrounding the ecosystem services concept and ESAV. Many of these issues are related to the complexity of ecological and socioeconomic systems, lack of scientific data and certainty, and the value plurality of human-ecosystem relationships (Chan et al. 2012b, Daily et al. 2000, de Groot et al. 2010, Granek et al. 2010, Martín-López et al. 2014, Norgaard 2010). Despite these challenges, the ecosystem services approach is widely considered as necessary tool for advancing sustainable development, and a number of solutions are proposed to address ethical critiques and methodological issues (Costanza et al. 2014, Farber et al. 2006, Kallis et al. 2013, Luck et al. 2012, Schröter et al. 2014). Stakeholder involvement in ESAV plays an important part in this, as a way of increasing the transparency and legitimacy of assessments and valuations, enabling the integration of local and scientific knowledge, and ensuing consideration of the multiple ecological, economic and sociocultural values and interests attached to ecosystem services (Jax et al. 2013, Spangenberg et al. 2015).

6.1.3 Interactions between engagement and ecosystem services approach

The review and analysis of the ecosystem services literature in Chapter 2.2 highlighted that stakeholder participation is a central element of many sociocultural, and some economic, assessment and valuation methods (for example Fletcher et al. 2014, Gee et al. 2017, Jobstvogt et al. 2014a, Yoskowitz et al. 2016). It further revealed that the involvement of stakeholders plays an important role in improving the quality and legitimacy of ESAV studies, as well as their usefulness and influence in marine and environmental governance (for example Jax et al. 2013, Lopes and Videira 2013, Sagie et al. 2013, Spangenberg et al. 2015). Finally, the reviewed literature confirmed that the ecosystem services approach is considered to have the potential to support better stakeholder engagement, which was the premise for the research presented in this thesis. Ecosystem services originated as a pedagogic concept to communicate the societal importance of biodiversity and the consequences of ecological change for human wellbeing (Gómez-Baggethun et al. 2010). Since then, the concept has developed into an approach that is considered to have the potential to facilitate the identification and engagement of relevant stakeholders and foster dialogue between groups with different views and interests (Berghöfer et al. 2016, Cork and Proctor 2005, Granek et al. 2010, Slootweg and van Beukering 2008). Evidence from marine governance case studies appears to confirm that using ESAV in marine policy and management can have positive effects on local stakeholder engagement, facilitating dialogue and collaborative management (Kushner et al. 2012, van Beukering et al. 2008). In order to make effective use of the potential of the ecosystem services approach to support and improve marine stakeholder engagement, it is important to

understand what it is about ESAV that facilitates dialogue and engagement, and what the enabling factors, obstacles and limitations are for using it as an engagement tool.

6.2 Evaluating the marine engagement potential of the ecosystem services approach

6.2.1 Opportunities and challenges of using the ecosystem services approach in participatory marine stakeholder engagement

The VALMER project provided a good opportunity for exploring the use of the ecosystem services approach in participatory marine management processes. The six case studies of the project applied ecosystem service assessment and valuation to different marine governance contexts across the western English Channel region, supported at each site by a local marine stakeholder group. The VALMER stakeholders' experience of working with ESAV was evaluated against a set of 'good engagement' criteria to identify the contribution of the ecosystem services approach to effective engagement in the VALMER case studies. This revealed the opportunities and challenges of using the ecosystem services approach in participatory marine engagement. As illustrated in Figure 3.3 (Chapter 3.5), the use of ESAV in participatory processes:

- 1) offers a platform for bringing together different stakeholders that is perceived as neutral and objective,
- 2) provides opportunities for all participants to contribute their views and knowledge, and allows the integration of different knowledge and interests in decision making,

- 3) helps stakeholders gain a better understanding of a site, its human-ecosystem interactions and management context, and fosters mutual understanding among stakeholders,
- 4) gives people a new perspective and encourages them to think outside the box.

The main challenge that became apparent from the VALMER experience is making the ecosystem services approach and ESAV accessible to non-expert, non-academic, non-scientific audiences. The VALMER stakeholders found the ecosystem services approach to be very complex and conceptual, an impression which is supported by the description of the approach in Chapter 2.2. In particular, the VALMER stakeholders often had difficulties understanding ESAV and following the technical aspects of the assessment and valuation processes. The VALMER interviews also confirm findings from other studies that marine and environmental governance stakeholders tend to have limited, inaccurate or no knowledge about the ecosystem services concept, ESAV methods and terminology (Albert et al. 2014, Beery et al. 2016, Böck et al. 2015, Lamarque et al. 2015, Marre et al. 2015). Moreover, both in these studies and in the VALMER interviews, pre-existing knowledge was found to vary between different stakeholder groups, depending on whether they were professionally involved in marine or environmental management or not.

The VALMER interview findings suggest that previous knowledge of the ecosystem services approach does facilitate understanding of ESAV; whereas, if the stakeholders are not able to follow the assessment and valuation processes, this can lead to frustration and disengagement. Therefore, it is important to take into consideration the backgrounds of stakeholders and their likely levels of ecosystem services knowledge when designing participatory engagement based on ESAV. To make ESAV

accessible, the information should be tailored to the participating stakeholders, avoiding technical jargon and instead using familiar concepts and vocabulary, as well as real or realistic examples. Further, the focus of the ESAV should be on small scale, locally relevant topics, and the ESAV outputs should have a clear practical application for marine management. Finally, another point that became apparent from the VALMER experience is that introducing stakeholders to the ecosystem services approach and enabling them to work with ESAV requires time, ideally multiple workshops, and commitment from the stakeholders to participate in the entire process. This also needs to be considered when planning ESAV based engagement processes.

Coming back to the opportunities, if the engagement process is designed in a way that makes the ecosystem services approach accessible to the stakeholders, the evidence from the VALMER interviews shows that the use of ESAV can have considerable benefits for participatory marine management. The ecosystem services approach provides a neutral, objective and inclusive engagement setting that facilitates constructive dialogue, exchange and mutual learning, and fosters improved and shared understanding of a marine site, its human-ecosystem interactions and management context, as well as better mutual understanding among stakeholders. Through this, ESAV based engagement supports improved relationships between stakeholders and with managers, facilitates more informed and integrated decision making, and holds the potential for more innovative and creative solutions.

6.2.2 The potential of the ecosystem services approach as a tool to communicate marine management decisions to marine users

The VALMER interviews also revealed that marine managers share expectations of managers and planners in other environmental governance contexts that the ecosystem services approach would be useful for communicating policy, management and planning decisions to affected stakeholders, wider user communities or the public. It is thought that ESAV information would help explain and justify management and conservation measures in a way that would increase acceptance and encourage compliance among stakeholders who might not have the opportunity to participate in the decision making process. The potential of the ecosystem services approach as a tool to communicate marine management decisions to marine users was tested with a scenario based online survey of French and UK marine user groups in the whole English Channel region.

The survey results show that marine users do consider ESAV based arguments relevant for justifying marine management measures. In particular, the findings suggest that ESAV information is most relevant to marine users if it draws clear and specific links between a species or habitat and a human activity or economic sector, or if it illustrates the importance of that species or habitat for maintaining local biodiversity or a healthy local marine environment. Interestingly, ecosystem health and integrity were considered to be more relevant for justifying management decisions than monetary values. This might be surprising at a time where decisions, from everyday choices to strategic policy directions, seem to be dominated by economic considerations. Nonetheless, it does confirm other research findings that people prefer to see themselves, and be seen by others, as being concerned with the environment

rather than guided by monetary gain (Bolderdijk et al. 2012, Metz and Weigel 2010). Thus, even if people's behavioural choices might be based on economic arguments, ESAV information might be more useful for explaining and justifying marine management decisions if it focuses on ecological or non-monetary economic arguments, rather than on monetary values.

However, the marine user survey does not provide evidence to confirm the expectation that using ESAV information to explain marine management decisions would increase acceptance and support among marine users. On the contrary, the survey results suggest that ESAV might lead people to be more critical, sceptical or uncertain about different marine management options; or else, that ESAV might not make a difference either way for how marine users react to marine management decisions.

The expectations about the pedagogic potential of the ecosystem services approach are based on a 'knowledge deficit' model of human behaviour. The idea behind this is that by improving people's understanding of the relationship between the natural environment and human interests, ESAV information helps explain the need for, and benefits of, management measures and conservation efforts; this is expected to increase public acceptance and support. In fact, the VALMER interviews found that, in the project case studies, the ESAVs did improve the stakeholders' understanding of the human-ecosystem interactions at their sites; and this played an important role for the positive engagement experience in the case studies. However, the marine user survey revealed a gap between ESAV information, which was considered relevant to justify marine management measures, and actual agreement with these management measures among the participants. An evaluation of the survey results in the context of

environmental behaviour research suggested that the inherent complexity and novelty of the ecosystem services approach was creating a barrier, preventing the ESAV information from improving people's understanding of the management context and fostering more positive attitudes towards marine management. The evaluation concluded that the complexity of the ecosystem services approach and limited familiarity with the approach among non-expert stakeholders and members of the public are likely limiting the effectiveness and influence of ESAV information when used in a non-participatory, top down, written public communication context. Instead, it appears that the key to unlocking the pedagogic potential of improving people's understanding of socioecological systems and management contexts through ESAV is participatory engagement.

6.2.3 The engagement potential of the ecosystem services approach and enabling conditions

The evidence from the VALMER interviews and the marine user survey revealed that in order to effectively use the ecosystem services approach as a marine engagement tool, ESAV needs to be integrated into an interactive, participatory process. As described in the conceptual model in Chapter 5.4 (Figure 5.4), this participatory ESAV process should:

- 1) include a mix of different stakeholders from all relevant sectors,
- 2) be neutral and supported by scientists or external experts,
- 3) actively involve the stakeholders in ESAV discussions and activities, while avoiding to involve them in the technical details of the approach,
- 4) apply ESAV in exercises with practical management relevance,

- 5) provide clear and understandable information that is tailored to the participating stakeholders,
- 6) and allow adequate time for explanations, questions and answers, discussions and activities.

If these enabling conditions are met, participatory ESAV helps the stakeholders gain a more comprehensive understanding of the marine ecosystem, different human interests and human-ecosystem interactions within their marine site. It also encourages the stakeholders to contribute their own knowledge and views, engage in open dialogue and discussion, and consider things from new perspectives. A better marine site understanding and constructive dialogue improve the mutual understanding among stakeholders and enable them to develop a shared understanding of the marine management context.

Effective participatory ESAV based engagement can improve relationships among marine stakeholders, facilitate collaborative management and lead to better informed, integrated and innovative management solutions. Moreover, the evidence from the VALMER case studies and from the wider ecosystem services literature suggests that stakeholder participation in the assessments and valuations also improves the quality and usefulness of ESAV for management. This is an important finding considering the growing interest in ESAV outputs as evidence base for marine management. Thus, in conclusion, integrating ESAV in participatory marine engagement has the potential to enhance the quality, support implementation and increase the effectiveness of ecosystem based marine management in two ways: 1) by improving marine stakeholder engagement, and 2) by providing a more comprehensive evidence base for marine policies, strategies and decision making.

6.3 It is not all about the money

One topic that has come up throughout the thesis is monetary valuation. This is not surprising given that the concept of ecosystem services has its roots in the economic framing of ecosystem functions. While the discussion in Chapter 2.2 showed that the ecosystem services approach encompasses a much broader set of values and disciplines, monetary ESV remains a central focus of interest in the approach. In fact, monetary valuation is often what comes to people's minds when they hear about ecosystem services. Therefore, finding out what marine stakeholders think about monetary valuation is important if the ecosystem services approach is to be effectively used as a marine engagement tool.

What the VALMER interviews and the marine user survey found is that marine stakeholders have mixed views on monetary valuation, ranging from 'good and useful' to 'dangerous and should not be used'. The majority of the VALMER stakeholders, and in particular those directly involved in marine management, described monetary valuation as a 'necessary evil', an approach that they do not personally agree with but consider to be required by the current socioeconomic context of marine governance. The marine users who participated in the survey expressed more positive views, seeing monetary valuation as a good and useful idea, or as necessary to promote environmental interests. At the same time, the marine users were uncertain as to how relevant they personally considered monetary arguments for marine management. Overall, it appears that while there is interest in monetary ESV and its potential usefulness for marine management and conservation, from a personal perspective, marine stakeholders are less convinced about the relevance and appropriateness of

putting a monetary value on the marine environment. Marine management stakeholders, commercial representatives as well as recreational marine users are concerned about the methodological issues of monetary ESV, but even more so about the moral limitations of the approach. These moral concerns of marine stakeholders reflect the conceptual issues of complexity and value plurality, and the ethical debates about anthropocentric perspectives, commodification of nature and moral limitations surrounding the ecosystem services approach that were described in Chapter 2.2. What the interview and survey findings also show is that there are cultural differences in attitudes towards monetary valuation between marine stakeholders in France and the UK.

This suggests that the usefulness of monetary ESV for marine engagement might depend, at least in part, on the personal views and attitudes, as well as the professional and cultural background of the participating stakeholders. While this does not answer the question whether monetary ESV should or should not be used in marine engagement, it highlights that this is something that needs to be considered carefully when designing an ESAV based marine engagement process. What can be concluded from the VALMER interviews and the marine user survey is that marine stakeholders' interest in ecosystem services does not focus solely on monetary valuation.

6.4 In conclusion: the marine engagement potential of the ecosystem services approach and outlook on further research

The aim of this thesis was to critically evaluate the marine engagement potential of the ecosystem services approach. The evidence that was gathered in this research study supports three key findings. First, it appears that the inherent complexity and novelty of the ecosystem services approach might limit the usefulness of ESAV information for explaining marine management decisions to marine users in top down written communication. Second, the integration of ESAV into interactive and inclusive participatory processes can facilitate good, constructive marine stakeholder engagement and potentially contribute to improving the evidence base, decision quality and effective implementation of ecosystem based marine management. Third, the main marine engagement potential of the ecosystem services approach lies in the fact that participatory ESAV fosters better understanding of human-ecosystem interactions, marine management contexts and other people's perspectives, as well as constructive dialogue among marine stakeholders with different interests. The conceptual model that was developed in this thesis provides a normative framework for the effective use of ESAV as an engagement tool in participatory marine management, describing the enabling conditions that are necessary to unlock the marine engagement potential of the ecosystem services approach.

Future research

Looking ahead, to further increase the usefulness of the ecosystem services engagement model for marine management, future research could extend the normative framework with more practical guidance on how to design and conduct an effective ESAV based participatory engagement process. Taking into consideration that both ESAV and participatory engagement involve a wide range of methods and the most effective choice is often context dependent, one option would be to compile an 'ESAV engagement tool box' of different approaches and methods that have been found successful, which could be added to as and when new approaches are tested. The development of an extendable tool box might also encourage testing the applicability and effectiveness of the ecosystem services engagement model in other environmental governance contexts. As suggested in Chapter 5, the enabling factors identified in the model are widely transferable, and it would be interesting to explore whether the effective use of the ecosystem services approach as a participatory engagement tool would hold similar benefits for stakeholder engagement and ecosystem based management in other environmental contexts as were found for the marine context.

While this thesis presents evidence for the positive effects of participatory ESAV on marine stakeholder engagement, further evidence is needed to confirm the potential wider benefits for ecosystem based marine management. Thus, future research should also investigate the effects of ESAV based engagement on marine management. The feasibility of such an evaluation depends on the actual application of ESAV in participatory marine management, as well as on the documentation of these participatory management processes and their outcomes. One possibility might be to

go back to the VALMER case study sites and examine whether, two or more years after the end of the project, traces of the participatory ESAV processes can be found in local marine governance.

Finally, one question that remained unanswered in this thesis is the cause of the unexpected effect of the ESAV information in the marine user survey. Why were survey respondents who received ESAV information more reluctant to agree with the proposed management measures than those who had no ESAV information? As discussed in Chapter 4, it is possible that this effect was unrelated to the ESAV information, which would suggest that such information might not make a difference either way for how marine users react to marine management decisions. However, it could also be an indication that ESAV information might lead people to be more critical, sceptical or uncertain. If this was the case, it could mean that ESAV information might have the potential to increase people's capacity for critical thinking and informed decision making, thus building social capital; or it could mean that people find ESAV information confusing, making it potentially counterproductive for justifying specific resource management or conservation measures. As this might have implications for the use of ESAV as engagement and communication tool, it would be worth further investigation to understand what caused the effect in the marine user survey.

In conclusion

This thesis started with the dire state of the world's oceans and seas, the rapid decline in marine ecosystem health and biodiversity, caused by increasing human pressures, and the threat this poses to human wellbeing. It concludes on a note of ocean optimism: the research presented in this thesis has found evidence that integrating the

ecosystem services approach and participatory stakeholder engagement has the potential to foster comprehensive understanding of marine systems, constructive dialogue and good relationships among marine stakeholders. This is a positive, hopeful finding for the advancement of effective ecosystem based marine management, which has to be a collaborative effort of all those who have a stake in the state of the oceans and seas.



Illustration: An ecosystem services approach to marine stakeholder engagement, by Karin Lübs

Note: The illustration on this page was created to illustrate presentations and posters that present the research described in this thesis, by Karin Lübs, artist and mother of the author.

References

- Abelson, J., Forest, P.-G., Eyles, J., Smith, P., Martin, E. and Gauvin, F.-P. 2003. Deliberations about deliberative methods: issues in the design and evaluation of public participation processes. *Social Science and Medicine* 57: 239-251.
- Abson, D.J., von Wehrden, H., Baumgärtner, S., Fischer, J., Hanspach, J., Härdtle, J., Heinrichs, H., Klein, A.M., Lang, D.J., Martens, P. and Walmsley, D. 2014. Ecosystem services as a boundary object for sustainability. *Ecological Economics* 103: 29-37.
- Adams, M., Wheeler, D. and Woolston, G. 2011. A participatory approach to sustainable energy strategy development in a carbon-intensive jurisdiction: the case of Nova Scotia. *Energy Policy* 39: 2550-2559.
- Airoldi, L., Balata, D. and Beck, M.W. 2008. The Gray Zone: relationships between habitat loss and marine diversity and their applications in conservation. *Journal of Experimental Marine Biology and Ecology* 366: 8-15.
- Ajzen, I. 1991. The theory of planned behaviour. *Organizational Behavior and Human Decision Processes* 50: 179-211.
- Ajzen, I. and Fishbein, M. 1977. Attitude-behavior relations: a theoretical analysis and review of empirical research. *Psychological Bulletin* 84(5): 888-918.
- Albert, C., Hauck, J., Buhr, N. and von Haaren, C. 2014. What ecosystem services information do users want? Investigating interests and requirements among landscape and regional planners in Germany. *Landscape Ecology* 29: 1301-1313.
- Alexander, C.S. and Becker, H.J. 1978. The use of vignettes in survey research. *Public Opinion Quarterly* 42(1): 93-104.
- Ananda, J. 2007. Implementing participatory decision making in forest planning. *Environmental Management* 39: 534-544.
- Andrews, R.N.L. 2006. *Managing the environment, managing ourselves. A history of American environmental policy*. 2nd edition. New Haven, USA, and London, UK: Yale University Press.
- Appelstrand, M. 2002. Participation and societal values: the challenge for lawmakers and policy practitioners. *Forest Policy and Economics* 4: 281-290.
- Ardron, J.A., Rayfuse, R., Gjerde, K. and Warner, R. 2014. The sustainable use and conservation of biodiversity in ABNJ: What can be achieved using existing international agreements? *Marine Policy* 49: 98-108.
- Areizaga, J., Sanò, M., Medina, R. and Juanes, J. 2012. Improving public engagement in ICZM: a practical approach. *Journal of Environmental Management* 109: 123-135.
- Armsworth, P.R., Chan, K.M.A., Daily, G.C., Ehrlich, P.R., Kremen, C., Ricketts, T.H. and Sanjayan, M.A. 2007. Ecosystem-service science and the way forward for conservation. *Conservation Biology* 21(6): 1383-1384.
- Arnstein, S.R. 1969. A ladder of citizen participation. *AIP Journal* 35: 216-224.

- Asah, S.T., Guerry, A.D., Blahna, D.J. and Lawler, J.J. 2014. Perception, acquisition and use of ecosystem services: human behavior, and ecosystem management and policy implications. *Ecosystem Services* 10: 180-186.
- Atkins, J.P., Burdon, D., Elliott, M. and Gregory, A.J. 2011. Management of the marine environment: integrating ecosystem services and societal benefits with the DPSIR framework in a systems approach. *Marine Pollution Bulletin* 62: 215-226.
- Austen, M., Hattam, C. and Börger, T. 2015. Ecosystem services and benefits from marine ecosystems. In: Crowe, T.P. and Frid, C.L.J. (Eds.). *Marine Ecosystems. Human impacts on biodiversity, functioning and services*. Cambridge, UK: Cambridge University Press, pp. 21-41.
- Bailey, H., Senior, B., Simmons, D., Rusin, J., Picken, G. and Thompson, P.M. 2010. Assessing underwater noise levels during pile-driving at an offshore windfarm and its potential effects on marine mammals. *Marine Pollution Bulletin* 60: 888-897.
- Bailey, I., de Groot, J., Whitehead, I., Vantoch-Wood, A. and Connor, P. 2012. *Comparison of National Policy Frameworks for Marine Renewable Energy within the United Kingdom and France*. Task 4.1.2 of WP4 from the MERIFIC Project. A report prepared as part of the MERIFIC Project.
- Balmford, A., Rodrigues, A.S.L., Walpole, M., ten Brink, P., Kettunen, M., Braat, L. and de Groot, R. 2008. *The Economics of Ecosystems and Biodiversity: scoping the science*. Cambridge, UK: European Commission.
- Bamberg, S. and Möser, G. 2007. Twenty years after Hines, Hungerford, and Tomera: a new meta-analysis of psycho-social determinants of pro-environmental behaviour. *Journal of Environmental Psychology* 27: 14-25.
- Bang, H.-K., Ellinger, A.E., Hadjimarcou, J. and Traichal, P.A. 2000. Consumer concern, knowledge, belief, and attitude toward renewable energy: an application of the reasoned action theory. *Psychology and Marketing* 17(6): 449-468.
- Barbour, R.S. 2014. *Introducing qualitative research. A student's guide*. 2nd edition. Los Angeles: Sage Publications.
- Barnes-Mauthe, M., Oleson, K.L.L., Brander, L.M., Zafindrasilivonona, B., Oliver, T.A. and van Beukering, P. 2015. Social capital as an ecosystem service: evidence from a locally managed marine area. *Ecosystem Services* 16: 283-293.
- Barr, S. 2004. Are we all environmentalists now? Rhetoric and reality in environmental action. *Geoforum* 35: 231-249.
- Barr, S. 2007. Factors influencing environmental attitudes and behaviors. A U.K. case study of household waste management. *Environment and Behavior* 39(4): 435-473.
- Barriball, K.L. and While, A. 1994. Collecting data using a semi-structured interview: a discussion paper. *Journal of Advanced Nursing* 19: 328-335.
- Barter, C. and Renold, E. 2000. 'I wanna tell you a story': Exploring the application of vignettes in qualitative research with children and young people. *International Journal of Social Research Methodology* 3(4): 307-323.

- Bastian, O., Grunewald, K. and Syrbe, R.-U. 2015. Classifications of ES. In: Grunewald, K. and Bastian, O. (Eds.). *Ecosystem services – concept, methods and case studies*. Berlin and Heidelberg, Germany: Springer Verlag, pp. 45-53.
- Beaumont, N., Austen, M.C., Atkins, J.P., Burdon, D., Degraer, S., Dentinho, T.P., Deros, S., Holm, P., Horton, T., van Ierland, E., Marboe, A.H., Starkey, D.J., Townsend, M. and Zarzycki, T. 2007. Identification, definition and quantification of goods and services provided by marine biodiversity: implications for the ecosystem approach. *Marine Pollution Bulletin* 54: 253-265.
- Beck, U. 1992. *Risk society: towards a new modernity*. London, UK: Sage.
- Beery, T., Stålhammar, S., Jönsson, K.I., Wamsler, C., Bramryd, T., Brink, E., Ekelund, N., Johansson, M., Palo, T. and Schubert, P. 2016. Perceptions of the ecosystem services concept: Opportunities and challenges in the Swedish municipal context. *Ecosystem Services* 17: 123-130.
- Beierle, T.C. 1998. *Public participation in environmental decisions: an evaluation framework using social goals*. Resources for the Future, discussion paper 99-06.
- Beierle, T.C. and Cayford, J. 2002. *Democracy in practice. Public participation in environmental decisions*. Washington, DC, USA: Resources for the Future.
- Bell, J. 2010. *Doing Your Research Project. A guide for first-time researchers in education, health and social science*. 5th edition. Maidenhead, UK: Open University Press.
- Benson, D., Fritsch, O., Cook, H. and Schmid, M. 2014. Evaluating participation in WFD river basin management in England and Wales: processes, communities, outputs and outcomes. *Land Use Policy* 38: 213-222.
- Berg, B.L. and Lune, H. 2012. *Qualitative research methods for the social sciences*. 8th edition. Boston, USA: Pearson.
- Berghöfer, A., Brown, C., Bruner, A., Emerton, L., Esen, E., Geneletti, D., Kosmus, M., Kumar, R., Lehmann, M., Leon Morales, F., Nkonya, E., Pistorius, T., Rode, J., Slootweg, R., Tröger, U., Wittmer, H., Wunder, S. and van Zyl, H. 2016. *Increasing the policy impact of ecosystem service assessments and valuations – Insights from practice*. Helmholtz-Zentrum für Umweltforschung (UFZ) GmbH, Leipzig, and Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, Eschborn, Germany.
- Bertelli, C.M. and Unsworth, R.K.F. 2014. Protecting the hand that feeds us: Seagrass (*Zostera marina*) serves as commercial juvenile fish habitat. *Marine Pollution Bulletin* 83(2): 425-429.
- Bidwell, D. 2016. The effects of information on public attitudes toward renewable energy. *Environment and Behavior* 48(6): 743-768.
- Bishop, P. and Davis, G. 2002. Mapping public participation in policy choices. *Australian Journal of Public Administration* 61(1): 14-29.
- Blake, J. 1999. Overcoming the 'value-action gap' in environmental policy: tensions between national policy and local experience. *Local Environment* 4(3): 257-278.
- Bloomfield, D., Collins, K., Fry, C. and Munton, R. 2001. Deliberation and inclusion: vehicles for increasing trust in UK public governance? *Environment and Planning C: Government and Policy* 19: 501-513.

- Böck, K., Muhar, S., Muhar, A. and Polt, R. 2015. The ecosystem services concept: Gaps between science and practice in river landscape management. *GAIA* 24(1): 32-40.
- Böhnke-Heinrichs, A., Baulcomb, C., Koss, R., Hussain, S.S. and de Groot, R.S. 2013. Typology and indicators of ecosystem services for marine spatial planning and management. *Journal of Environmental Management* 130: 135-145.
- Bolderdijk, J.W., Steg, L., Geller, E.S., Lehman, P.K. and Postmes, T. 2013. Comparing the effectiveness of monetary versus moral motives in environmental campaigning. *Nature Climate Change* 3: 413-416.
- Bond, A., Palerm, J. and Haigh, P. 2004. Public participation in EIA of nuclear power plant decommissioning projects: a case study analysis. *Environmental Impact Assessment Review* 24: 617-641.
- Börger, T., Beaumont, N.J., Pendleton, L., Boyle, K.J., Cooper, P., Fletcher, S., Haab, T., Hanemann, M., Hooper, T.L., Hussain, S.S., Portela, R., Stithou, M., Stockill, J., Taylor, T. and Austen, M.C. 2014. Incorporating ecosystem services in marine planning: the role of valuation. *Marine Policy* 46: 161-170.
- Borthwick, A.G.L. 2016. Marine renewable energy seascape. *Engineering* 2: 69-78.
- Boyd, J. and Banzhaf, S. 2007. What are ecosystem services? The need for standardized environmental accounting units. *Ecological Economics* 63: 616-626.
- Braat, L.C. and de Groot, R. 2012. The ecosystem services agenda: bridging the worlds of natural science and economics, conservation and development, and public and private policy. *Ecosystem Services* 1: 4-15.
- Braun, V. and Clarke, V. 2006. Using thematic analysis in psychology. *Qualitative Research in Psychology* 3(2): 77-101.
- Bryman, A. 2012. *Social research methods*. 4th edition. Oxford: Oxford University Press.
- Buchy, M. and Hoverman, S. 2000. Understanding public participation in forest planning: a review. *Forest Policy and Economics* 1: 15-25.
- Buckingham, S. 2008. The rise of environmental politics and the environmental movement. In: Buckingham, S. and Turner, M. (Eds.). *Understanding environmental issues*. Los Angeles, London, New Delhi, Singapore and Washington, DC: Sage, pp. 33-55.
- Burgess, J., Harrison, C.M. and Filius, P. 1998. Environmental communication and the cultural politics of environmental citizenship. *Environment and Planning A* 30: 1445-1460.
- Burton, D. 2000. Data collection issues in survey research. In: Burton, D. (Ed.). *Research training for social scientists. A handbook for postgraduate researchers*. London, UK: Sage Publications, pp. 320-334.
- Butchart, S.H.M., Walpole, M., Collen, B., van Strien, A., Scharlemann, J.P.W., Almond, R.E.A., Baillie, J.E.M., Bomhard, B., Brown, C., Bruno, J., Carpenter, K.E., Carr, G.M., Chanson, J., Chenery, A.M., Csirke, J., Davidson, N.C., Dentener, F., Foster, M., Galli, A., Galloway, J.N., Genovesi, P., Gregory, R.D., Hockings, M., Kapos, V., Lamarque, J.-F., Leverington, F., Loh, J., McGeoch, M.A., McRae, L., Minasyan, A., Hernández Morcillo, M., Oldfield, T.E.E., Pauly, D., Quader, S., Revenga, C., Sauer, J.R., Skolnik, B., Spear, D., Stanwell-Smith, D., Stuart, S.N.,

- Symes, A., Tierney, M., Tyrrell, T.D., Vié, J.-C. and Watson, R. 2010. Global biodiversity: indicators of recent declines. *Science* (328): 1164-1168.
- Calado, H., Bentz, J., Ng, K., Zivian, A., Schaefer, N., Pringle, C., Johnson, D. and Phillips, M. 2012. NGO involvement in marine spatial planning: a way forward? *Marine Policy* 36: 382-388.
- Cárcamo, P.F., Garay-Flühmann, R., Squeo, F.A. and Gaymer C.F. 2014. Using stakeholders' perspective of ecosystem services and biodiversity features to plan a marine protected area. *Environmental Science and Policy* 40: 116-131.
- Carson, R. 1962. *Silent Spring*. London, UK: Penguin.
- Carter, N. 2007. *The politics of the environment. Ideas, activism, policy*. 2nd edition. Cambridge, UK: Cambridge University Press.
- CBD 1995. *Report of the first meeting of the Subsidiary Body on Scientific, Technical and Technological Advice*. Second ordinary meeting of the Conference of the Parties to the Convention on Biological Diversity, 6-17 November 1995, Jakarta, Indonesia. UNEP/CBD/COP/2/19.
- CBD 2000. Decisions adopted by the Conference of the Parties to the Convention on Biological Diversity at its fifth meeting, Nairobi, 15-26 May 2000. UNEP/CBD/COP/5/23.
- Celtic Seas Partnership. *Encouraging effective marine management and decision-making across borders – Lessons and recommendations from the Celtic Seas*. Draft for consultation. Celtic Seas Partnership.
- Cesar, H., van Beukering, P., Pintz, S. and Dierking, J. 2002. *Economic valuation of the coral reefs of Hawaii*. Report for the National Oceanic and Atmospheric Administration, Coastal Ocean Program.
- Chan, K.M.A., Guerry, A.D., Balvanera, P., Klain, S., Satterfield, T., Basurto, X., Bostrom, A., Chuenpagdee, R., Gould, R., Halpern, B.S., Hannahs, N., Levine, J., Norton, B., Ruckelshaus, M., Russell, R., Tam, J. and Woodside, U. 2012a. Where are *cultural* and *social* in ecosystem services? A framework for constructive engagement. *BioScience* 62(8): 744-756.
- Chan, K.M.A., Satterfield, T. and Goldstein, J. 2012b. Rethinking ecosystem services to better address and navigate cultural values. *Ecological Economics* 74: 8-18.
- Charles, A. and Wilson, L. 2009. Human dimensions of Marine Protected Areas. *ICES Journal of Marine Science* 66: 6-15.
- Chee, Y.E. 2004. An ecological perspective on the value of ecosystem services. *Biological Conservation* 120: 549-565.
- Chen, Y.-C., Shang, R.-A. and Kao, C.-Y. 2009. The effects of information overload on consumers' subjective state towards buying decision in the internet shopping environment. *Electronic Commerce Research and Applications* 8: 48-58.
- Chess, C. 2000. Evaluating environmental public participation: methodological questions. *Journal of Environmental Planning and Management* 43(6): 769-784.
- Chess, C. and Purcell, K. 1999. Public participation and the environment: do we know what works? *Environmental Science and Technology* 33(16): 2685-2692.

- Chess, C., Dietz, T. and Shannon, M. 1998. Who should deliberate when? *Human Ecology Review* 5(1): 45-48.
- Clark, J., Burgess, J. and Harrison, C.M. 2000. "I struggled with this money business": respondents' perspectives on contingent valuation. *Ecological Economics* 33: 45-62.
- Clark, C.F., Kotchen, M.J. and Moore, M.R. 2003. Internal and external influences on pro-environmental behavior: participation in a green electricity program. *Journal of Environmental Psychology* 23: 237-246.
- Collier, Z.A., Bates, M.E., Wood, M.D. and Linkov, I. 2014. Stakeholder engagement in dredged material management decisions. *Science of the Total Environment* 496: 248-256.
- Conley, A. and Moote, M.A. 2003. Evaluating collaborative natural resource management. *Society and Natural Resources* 16: 371-386.
- Conrad, E., Cassar, L.F., Christie, M. and Fazey, I. 2011. Hearing but not listening? A participatory assessment of public participation in planning. *Environment and Planning C: Government and Policy* 29: 761-782.
- Cook, B.R. and Spray, C.J. 2012. Ecosystem services and integrated water resource management: different paths to the same end? *Journal of Environmental Management* 109: 93-100.
- Cork, S.J. and Proctor, W. 2005. Implementing a process for integration research: ecosystem services project, Australia. *Journal of Research Practice* 1(2): 1-25.
- Costanza, R. 2008. Ecosystem services: Multiple classification systems are needed. *Biological Conservation* 141: 350-352.
- Costanza, R., d'Arge, R., de Groot, R., Farber, S., Grasso, M., Hannon, B., Limburg, K., Naeem, S., O'Neill, R.V., Paruelo, J., Raskin, R.G., Sutton, P. and van den Belt, M. 1997. The value of the world's ecosystem services and natural capital. *Nature* 387: 253-260.
- Costanza, R., d'Arge, R., de Groot, R., Farber, S., Grasso, M., Hannon, B., Limburg, K., Naeem, S., O'Neill, R.V., Paruelo, J., Raskin, R.G., Sutton, P. and van den Belt, M. 1998. The value of ecosystem services: putting the issues in perspective. *Ecological Economics* 25: 67-72.
- Costanza, R., de Groot, R., Sutton, P., van der Ploeg, S., Anderson, S.J., Kubiszewski, I., Farber, S. and Turner, R.K. 2014. Changes in the global value of ecosystem services. *Global Environmental Change* 26: 152-158.
- Cowling, R.M., Egoh, B., Knight, A.T., O'Farrell, P.J., Reyers, B., Rouget, M., Roux, D.J., Welz, A. and Wilhelm-Rechman, A. 2008. An operational model for mainstreaming ecosystem services for implementation. *Proceedings of the National Academy of Sciences* 105(28): 9483-9488.
- Creswell, J.W. 2014. *Research design. Qualitative, quantitative, and mixed methods approaches*. 4th edition, international student edition. Los Angeles, USA: Sage Publications.
- Crossman, N.D., Burkhard, B., Nedkov, S., Willemsen, L., Petz, K., Palomo, I., Drakou, E.G., Martín-López, B., McPhearson, T., Boyanova, K., Alkemade, R., Egoh, B., Dunbar, M.B. and Maes, J. 2013. A blueprint for mapping and modelling ecosystem services. *Ecosystem Services* 4: 4-14.

- Crowe, T., Raffaelli, D. and Frid, C. 2015a. Conclusions. In: Crowe, T.P. and Frid, C.L.J. (Eds.). *Marine Ecosystems. Human impacts on biodiversity, functioning and services*. Cambridge, UK: Cambridge University Press, pp. 377-394.
- Crowe, T., Austen, M. and Frid, C. 2015b. Introduction. In: Crowe, T.P. and Frid, C.L.J. (Eds.). *Marine Ecosystems. Human impacts on biodiversity, functioning and services*. Cambridge, UK: Cambridge University Press, pp. 3-20.
- Cullen-Unsworth, L.C., Mtwana Nordlund, L., Paddock, J., Baker, S., McKenzie, L.J. and Unsworth, R.K.F. 2014. Seagrass meadows globally as a coupled social-ecological system: Implications for human wellbeing. *Marine Pollution Bulletin* 83: 387-397.
- Curtin, R. and Prellezo, R. 2010. Understanding marine ecosystem based management: a literature review. *Marine Policy* 34: 821-830.
- Daily, G.C. 1997. *Nature's services: societal dependence on natural ecosystems*. Washington, DC, USA: Island Press.
- Daily, G.C. and Matson, P.A. 2008. Ecosystem services: from theory to implementation. *Proceedings of the National Academy of Sciences* 105(28): 9455-9456.
- Daily, G.C., Söderqvist, T., Aniyar, S., Arrow, K., Dasgupta, P., Ehrlich, P.R., Folke, C., Jansson, A.M., Jansson, B.-O., Kautsky, N., Levin, S., Lubchenco, J., Mäler, K.-G., Simpson, D., Starrett, D., Tilman, D. and Walker, B. 2000. The value of nature and the nature of value. *Science* 289: 395-396.
- Daily, G.C., Polasky, S., Goldstein, J., Kareiva, P.M., Mooney, H.A., Pejchar, L., Ricketts, T.H., Salzman, J. and Shallenberger, R. 2009. Ecosystem services in decision making: time to deliver. *Frontiers in Ecology and the Environment* 7(1): 21-28.
- Dalton, T.M. 2005. Beyond biogeography: a framework for involving the public in planning of U.S. Marine Protected Areas. *Conservation Biology* 19(5): 1392-1401.
- Daly, H.E. and Farley, J. 2011. *Ecological economics. Principles and applications*. 2nd edition. Washington, DC, USA: Island Press.
- Daniel, T.C., Muhar, A., Arnberger, A., Aznar, O., Boyd, J.W., Chan, K.M.A., Costanza, R., Elmqvist, T., Flint, C.G., Gobster, P.H., Grêt-Regamey, A., Lave, R., Muhar, S., Penker, M., Ribe, R.G., Schauppenlehner, T., Sikor, T., Soloviy, I., Spierenburg, M., Taczanowska, K., Tam, J. and von der Dunk, A. 2012. Contributions of cultural services to the ecosystem services agenda. *Proceedings of the National Academy of Sciences* 109(23): 8812-8819.
- Danley, B. and Widmark, C. 2016. Evaluating conceptual definitions of ecosystem services and their implications. *Ecological Economics* 126: 132-138.
- Davison, L., Littleford, C. and Ryley, T. 2014. Air travel attitudes and behaviours: The development of environment-based segments. *Journal of Air Transport Management* 36: 13-22.
- Defra 2007a. *Securing a healthy natural environment: an action plan for embedding an ecosystems approach*. Department for Environment, Food and Rural Affairs, UK.
- Defra 2007b. *Public understanding of the concepts and language around ecosystem services and the natural environment*. Department for Environment, Food and Rural Affairs, final project report, Defra project code NR0115.

- de Groot, R.S., Wilson, M.A. and Boumans, R.M.J. 2002. A typology for the classification, description and valuation of ecosystem functions, goods and services. *Ecological Economics* 41: 393-408.
- de Groot, R.S., Alkemade, R., Braat, L., Hein, L. and Willemen, L. 2010. Challenges in integrating the concept of ecosystem services and values in landscape planning, management and decision making. *Ecological Complexity* 7: 260-272.
- De Marchi, B. and Ravetz, J.R. 2001. *Participatory approaches to environmental policy*. Concerted Action on Environmental Valuation in Europe, policy research brief number 10. Cambridge Research for the Environment.
- Derraik, J.G.B. 2002. The pollution of the marine environment by plastic debris: a review. *Marine Pollution Bulletin* 44: 842-852.
- De Santo, E.M. 2016. Assessing public “participation” in environmental decision-making: lessons learned from the UK Marine Conservation Zone (MCZ) site selection process. *Marine Policy* 64: 91-101.
- Descombe, M. 2014. *The good research guide. For small-scale social research projects*. 5th edition. Maidenhead, UK: Open University Press.
- De Stefano, L. 2010. Facing the water framework directive challenges: a baseline of stakeholder participation in the European Union. *Journal of Environmental Management* 91: 1332-1340.
- Diekmann, A. and Preisendörfer, P. 1992. Persönliches Umweltverhalten. Diskrepanzen zwischen Anspruch und Wirklichkeit. *Kölner Zeitschrift für Soziologie und Sozialpsychologie* 44(2): 226-251.
- Dietz, T. and Stern, P.C. (Eds.) 2008. *Public participation in environmental assessment and decision making*. Panel on Public Participation in Environmental Assessment and Decision Making, Committee on the Human Dimensions of Global Change. Division of Behavioral and Social Sciences and Education, National Research Council. Washington, DC, USA: The National Academies Press.
- Dodds, W. and Friedrich, L.A. (Eds.) 2015. *The potential role of ecosystem service assessment in marine governance in the western Channel*. VALMER Work Package 4 evidence base report. VALMER project. Available at www.valmer.eu.
- Dodds, W., Philippe, M., Friedrich, L., Fletcher, S., Glegg, G. and Bailly, D. 2015. *Advice note for using ecosystem service assessment to support marine governance*. VALMER project. Available at www.valmer.eu.
- Dogan, E., Bolderdijk, J. W., and Steg, L. 2014. Making small numbers count: environmental and financial feedback in promoting eco-driving behaviours. *Journal of Consumer Policy* 37(3): 413-422.
- Douvere, F. 2008. The importance of marine spatial planning in advancing ecosystem-based sea use management. *Marine Policy* 32: 762-771.
- Douvere, F. and Ehler, C. 2008. Introduction. *Marine Policy* 32: 759-761.

- Douvere, F. and Ehler, C.N. 2009. New perspectives on sea use management: initial findings from European experience with marine spatial planning. *Journal of Environmental Management* 90: 77-88.
- Douvere, F., Maes, F., Vanhulle, A. and Schrijvers, J. 2007. The role of marine spatial planning in sea use management: the Belgian case. *Marine Policy* 31: 182-191.
- Duarte, C.M. 2002. The future of seagrass meadows. *Environmental Conservation* 29(2): 192-206.
- Dulvy, N.K., Sadovy, Y. and Reynolds, J.D. 2003. Extinction vulnerability in marine populations. *Fish and Fisheries* 4: 25-64.
- Dunlap, R.E. and van Liere, K.D. 1978. The New Environmental Paradigm: A proposed measuring instrument and preliminary results. *Journal of Environmental Education* 9: 10-19.
- Durant, R.F. and Legge, J.S. 2005. Public opinion, risk perceptions, and genetically modified food regulatory policy. Reassessing the calculus of dissent among European citizens. *European Union Politics* 6(1): 181-200.
- Eden, S. 1996. Public participation in environmental policy: considering scientific, counter-scientific and non-scientific contributions. *Public Understanding of Science* 5: 183-204.
- Eden, S., Bear, C. and Walker, G. 2008. Understanding and (dis)trusting food assurance schemes: consumer confidence and the 'knowledge fix'. *Journal of Rural Studies* 24: 1-14.
- Edwards, S.D., Jones, P.J.S. and Nowell, D.E. 1997. Participation in coastal zone management initiatives: a review and analysis of examples from the UK. *Ocean and Coastal Management* 36(1-3): 143-165.
- Ehler, C. and Douvere, F. 2009. *Marine spatial planning: a step-by-step approach toward ecosystem-based management*. Intergovernmental Oceanographic Commission and Man and the Biosphere Programme. IOC Manual and Guides No. 53, ICAM Dossier No. 6. Paris, France: UNESCO.
- Ehrlich, P.R. and Mooney, H.A. 1983. Extinction, substitution, and ecosystem services. *BioScience* 33(4): 248-254.
- Englender, D., Kirschey, J., Stöfen, A. and Zink, A. 2014. Cooperation and compliance control in areas beyond national jurisdiction. *Marine Policy* 49: 186-194.
- Eriksen, M., Maximenko, N., Thiel, M., Cummins, A., Lattin, G., Wilson, S., Hafner, J., Zellers, A. and Rifman, S. 2013. Plastic pollution in the South Pacific subtropical gyre. *Marine Pollution Bulletin* 68: 71-76.
- EU 2000. Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy. *Official Journal of the European Communities*.
- EU 2001. Directive 2001/42/EC of the European Parliament and of the Council of 27 June 2001 on the assessment of the effects of certain plans and programmes on the environment. *Official Journal of the European Communities*.

- EU 2003a. Directive 2003/4/EC of the European Parliament and of the Council of 28 January 2003 on public access to environmental information and repealing Council Directive 90/31/EEC. *Official Journal of the European Union*.
- EU 2003b. Directive 2003/35/EC of the European Parliament and of the Council of 26 May 2003 providing for public participation in respect of the drawing up of certain plans and programmes relating to the environment and amending with regard to public participation and access to justice Council Directives 85/337/EEC and 96/61/EC. *Official Journal of the European Union*.
- EU 2006. Regulation (EC) No 1367/2006 of the European Parliament and of the Council of 6 September 2006 on the application of the provisions of the Aarhus Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters to Community institutions and bodies. *Official Journal of the European Union*.
- EU 2008. Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive). *Official Journal of the European Union*.
- EU 2011. Our life insurance, our natural capital: an EU biodiversity strategy to 2020. *European Commission COM(2011) 244 final*.
- EU 2012a. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. Blue Growth opportunities for marine and maritime sustainable growth. *European Commission COM(2012) 494 final*.
- EU 2012b. Directive 2012/18/EU of the European Parliament and of the Council of 4 July 2012 on the control of major-accident hazards involving dangerous substances, amending and subsequently repealing Council Directive 96/82/EC. *Official Journal of the European Union*.
- EU 2014a. Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment. *Official Journal of the European Union*.
- EU 2014b. Directive 2014/89/EU of the European Parliament and of the Council of 23 July 2014 establishing a framework for maritime spatial planning. *Official Journal of the European Union*.
- Evans, S.C., Robers, M.C., Keeley, J.W., Blossom, J.B., Amaro, C.M., Garcia, A.M., Stough, C.O., Canter, K.S., Robles, R. and Reed, G.M. 2015. Vignette methodologies for studying clinicians' decision-making: Validity, utility, and application in ICD-11 field studies. *International Journal of Clinical and Health Psychology* 15: 160-170.
- FAO 2016. *The state of world fisheries and aquaculture 2016. Contributing to food security and nutrition for all*. United Nations Food and Agriculture Organization, Rome.
- Farber, S.C., Costanza, R. and Wilson, M.A. 2002. Economic and ecological concepts for valuing ecosystem services. *Ecological Economics* 41: 375-392.
- Farber, S., Costanza, R., Childers, D.L., Erickson, J., Gross, K., Grove, M., Hopkinson, C.S., Kahn, J., Pincetl, S., Troy, A., Warren, P. and Wilson, M. 2006. Linking ecology and economics for ecosystem management. *BioScience* 56(2): 121-133.

- Fenig, S., Levav, I., Kohn, R. and Yei, N. 1993. Telephone vs face-to-face interviewing in a community psychiatric survey. *American Journal of Public Health* 83(6): 896-898.
- Fernandes, L., Day, J., Lewis, A., Slegers, S., Kerrigan, B., Breen, D., Cameron, C., Jago, B., Hall, J., Lowe, D., Innes, J., Tanzer, J., Chadwick, V., Thompson, L., Gorman, K., Simmons, M., Barnett, B., Sampson, K., De'Ath, G., Mapstone, B., Marsh, H., Possingham, H., Ball, I., Ward, T., Dobbs, K., Aumend, J., Slater, D. and Stapleton, K. 2005. Establishing representative no-take areas in the Great Barrier Reef: large-scale implementation of theory on marine protected areas. *Conservation Biology* 19(6): 1733-1744.
- Fernández, R.J. 2016. How to be a more effective environmental scientist in management and policy contexts. *Environmental Science and Policy* 64: 171-176.
- Fietkau, H.-J. and Kessel, H. 1981. *Umweltlernen: Veränderungsmöglichkeiten des Umweltbewußtseins. Modell-Erfahrungen*. Königsstein, Germany: Hain.
- Finch, J. 1987. The vignette technique in survey research. Research note. *Sociology* 21(1): 105-114.
- Fiorino, D.J. 1990. Citizen participation and environmental risk: a survey of institutional mechanisms. *Science, Technology and Human Values* 15(2): 226-243.
- Fiorino, D.J. 1996. Environmental policy and the participation gap. In: Lafferty, W.M. and Meadowcroft, J. (Eds.). *Democracy and the environment. Problems and prospects*. Cheltenham, UK and Lyme, USA: Edward Elgar, pp. 194-212.
- Firestone, J. and Jarvis, C. 2007. Response and responsibility: regulating noise pollution in the marine environment. *Journal of International Wildlife Law and Policy* 10: 109-152.
- Fisher, R.J. 1993. Social desirability bias and the validity of indirect questioning. *Journal of Consumer Research* 20: 303-315.
- Fisher, B. and Turner, R.K. 2008. Ecosystem services: Classification for valuation. *Biological Conservation* 141: 1167-1169.
- Fisher, B., Turner, R.K. and Morling, P. 2009. Defining and classifying ecosystem services for decision making. *Ecological Economics* 68: 643-653.
- Flannery, W. and Ó Cinnéide, M. 2012. Stakeholder participation in marine spatial planning: lessons from the Channel Islands National Marine Sanctuary. *Society and Natural Resources: an International Journal* 25(8): 727-742.
- Fleming, D.M. and Jones, P.J.S. 2012. Challenges to achieving greater and fairer stakeholder involvement in marine spatial planning as illustrated by the Lyme Bay scallop dredging closure. *Marine Policy* 36(2): 370-377.
- Fletcher, S. and Potts, J. 2007. Ocean citizenship: an emergent geographical concept. *Coastal Management* 35(4): 511-524.
- Fletcher, S., Saunders, J., Herbert, R., Roberts, C. and Dawson, K. 2012a. *Description of the ecosystem services provided by broad-scale habitats and features of conservation importance that are likely to be protected by Marine Protected Areas in the Marine Conservation Zone Project area*. Natural England Commissioned Reports, Number 088.

- Fletcher, S., Rees, S., Gall, S., Jackson, E., Friedrich, L. and Rodwell, L. 2012b. *Securing the benefits of the Marine Conservation Zone Network*. A report to The Wildlife Trusts by the Centre for Marine and Coastal Policy Research, Plymouth University.
- Fletcher, R., Baulcomb, C., Hall, C. and Hussain, S. 2014. Revealing marine cultural ecosystem services in the Black Sea. *Marine Policy* 50: 151-161.
- Fransson, N. and Gärling, T. 1999. Environmental concern: conceptual definitions, measurement methods, and research findings. *Journal of Environmental Psychology* 19: 369-382.
- Fraser, E.D.G., Dougill, A.J., Mabee, W.E., Reed, M. and McAlpine, P. 2006. Bottom up and top down: analysis of participatory processes for sustainability indicator identification as a pathway to community empowerment and sustainable environmental management. *Journal of Environmental Management* 78: 114-127.
- Frewer, L.J., Howard, C. and Shepherd, R. 1998. The influence of initial attitudes on responses to communication about genetic engineering in food production. *Agriculture and Human Values* 15: 15-30.
- Frick, J., Kaiser, F.G. and Wilson, M. 2004. Environmental knowledge and conservation behavior: exploring prevalence and structure in a representative sample. *Personality and Individual Differences* 37: 1597-1613.
- Friedrich, L., Fletcher, S., Rees, S., Gall, S. and Rodwell, L. 2013. *Securing the benefits of the Marine Conservation Zone Network: Evidence for a declining ecological baseline*. Centre for Marine and Coastal Policy Research, Plymouth University.
- Friedrich, L.A., Dodds, W., Philippe, M., Glegg, G., Fletcher, S. and Bailly, D. 2015. *Improving stakeholder engagement in marine management through ecosystem service assessment. A guide for practitioners based on experience from the VALMER project*. VALMER project. Available at www.valmer.eu.
- Gall, S.C. and Thompson, R.C. 2015. The impact of debris on marine life. *Marine Pollution Bulletin* 92: 170-179.
- Gall, S.C. and Rodwell, L.D. 2016. Evaluating the social acceptability of Marine Protected Areas. *Marine Policy* 65: 30-38.
- Gaskell, G., Allum, N. and Stares, S. 2003. *Europeans and biotechnology in 2002*. Eurobarometer 58.0. A report to the EC Directorate General for Research from the project 'Life Sciences in European Society'.
- Gee, K. and Burkhard, B. 2010. Cultural ecosystem services in the context of offshore wind farming: a case study from the west coast of Schleswig-Holstein. *Ecological Complexity* 7: 349-358.
- Gee, K., Kannen, A., Adlam, R., Brooks, C., Chapman, M., Cormier, R., Fischer, C., Fletcher, S., Gubbins, M., Shucksmith, R. and Shellock, R. 2017. Identifying culturally significant areas for marine spatial planning. *Ocean and Coastal Management* 136: 139-147.
- Gill, P., Stewart, K., E. Treasure, E. and Chadwick, B. 2008. Methods of data collection in qualitative research: interviews and focus groups. *British Dental Journal* 204: 291-295.

- Gilliland, P.M. and Laffoley, D. 2008. Key elements and steps in the process of developing ecosystem-based marine spatial planning. *Marine Policy* 32: 787-796.
- Glaser, B. and Strauss, A. 1967. *The discovery of Grounded Theory: strategies for qualitative research*. Chicago, USA: Aldine.
- Gleason, M., McCreary, S., Miller-Henson, M., Ugoretz, J., Fox, E., Merrifield, M., McClintock, W., Serpa, P. and Hoffman, K. 2010. Science-based and stakeholder-driven marine protected area network planning: A successful case study from north central California. *Ocean and Coastal Management* 53: 52-68.
- Glegg, G., Jefferson, R. and Fletcher, S. 2015. Marine governance in the English Channel (La Manche): Linking science and management. *Marine Pollution Bulletin* 95: 707-718.
- Goldman, R.L., Tallis, H., Karelva, P. and Daily, G.C. 2008. Field evidence that ecosystem service projects support biodiversity and diversify options. *Proceedings of the National Academy of Sciences* 105(27): 9445-9448.
- Gómez-Baggethun, E. and Pérez, M.R. 2011. Economic valuation and the commodification of ecosystem services. *Progress in Physical Geography*: 1-16.
- Gómez-Baggethun, E., de Groot, R., Lomas, P.L. and Montes, C. 2010. The history of ecosystem services in economic theory and practice: from early notions to markets and payment schemes. *Ecological Economics* 69: 1209-1218.
- Gopnik, M., Fieseler, C., Cantral, L., McClellan, K., Pendleton, L. and Crowder, L. 2012. Coming to the table: early stakeholder engagement in marine spatial planning. *Marine Policy* 36: 1139-1149.
- Granek, E.F., Polasky, S., Kappel, C.V., Reed, D.J., Stoms, D.M., Koch, E.W., Kennedy, C.J., Cramer, L.A., Hacker, S.D., Barbier, E.B., Aswani, S., Ruckelshaus, M., Perillo, G.M.E., Silliman, B.R., Muthiga, N., Bael, D. and Wolanski, E. 2010. Ecosystem services as a common language for coastal ecosystem-based management. *Conservation Biology* 24(1): 207-216.
- Grêt-Regamey, A., Celio, E., Klein, T.M. and Wissen Hayek, U. 2013. Understanding ecosystem services trade-offs with interactive procedural modeling for sustainable urban planning. *Landscape and Urban Planning* 109: 107-116.
- Grêt-Regamey, A., Weibel, B., Kienast, F., Rabe, S.-E. and Zulian, G. 2015. A tiered approach for mapping ecosystem services. *Ecosystem Services* 13: 16-27.
- Grima, N., Singh, S.J., Smetschka, B. and Ringhofer, L. 2016. Payment for Ecosystem Services (PES) in Latin America: analysing the performance of 40 case studies. *Ecosystem Services* 17: 24-32.
- Grob, A. 1995. A structural model of environmental attitudes and behaviour. *Journal of Environmental Psychology* 15: 209-220.
- Grunewald, K. and Bastian, O. 2015. Ecosystem Services (ES): more than just a vogue term? In: Grunewald, K. and Bastian, O. (Eds.). *Ecosystem services – concept, methods and case studies*. Berlin and Heidelberg, Germany: Springer Verlag, pp. 1-11.
- Grunewald, K., Bastian, O. and Syrbe, R.-U. 2015. Space and time aspects of ES. In: Grunewald, K. and Bastian, O. (Eds.). *Ecosystem services – concept, methods and case studies*. Berlin and Heidelberg, Germany: Springer Verlag, pp. 53-65.

- Guagnano, G.A., Stern, P.C. and Dietz, T. 1995. Influences on attitude-behavior relationships: a natural experiment with curbside recycling. *Environment and Behavior* 27: 699-718.
- Guénette, S. and Alder, J. 2007. Lessons from marine protected areas and integrated ocean management initiatives in Canada. *Coastal Management* 35: 51-78.
- Guerry, A.D., Polasky, S., Lubchenco, J., Chaplin-Kramer, R., Daily, G.C., Griffin, R., Ruckelshaus, M., Bateman, I.J., Duraiappah, A., Elmqvist, T., Feldman, M.W., Folke, C., Hoekstra, J., Kareiva, P.M., Keeler, B.L., Li S., McKenzie, E., Ouyang, Z., Reyers, B., Ricketts, T.H., Rockström, J., Tallis, H. and Vira, B. 2015. Natural capital and ecosystem services informing decisions: from promise to practice. *Proceedings of the National Academy of Sciences* 112(24): 7348-7355.
- Haggett, C. 2011. Understanding public responses to offshore wind power. *Energy Policy* 39: 503-510.
- Haklay, M.E. 2003. Public access to environmental information: past, present and future. *Computers, Environment and Urban Systems* 27: 163-180.
- Halpern, B.S., Walbridge, S., Selkoe, K.A., Kappel, C.V., Micheli, F., D'Agrosa, C., Bruno, J.F., Casey, K.S., Ebert, C., Fox, H.E., Fujita, R., Heinemann, D., Lenihan, H.S., Madin, E.M.P., Perry, M.T., Selig, E.R., Spalding, M., Steneck, R. and Watson, R. 2008. A global map of human impact on marine ecosystems. *Science* 319: 948-952.
- Halvorsen, K.E. 2001. Assessing public participation techniques for comfort, convenience, satisfaction, and deliberation. *Environmental Management* 28(2): 179-186.
- Halvorsen, K.E. 2003. Assessing the effects of public participation. *Public Administration Review* 63(5): 535-543.
- Han, H. 2014. The norm activation model and theory-broadening: individuals' decision-making on environmentally-responsible convention attendance. *Journal of Environmental Psychology* 40: 462-471.
- Hansen, J., Holm, L., Frewer, L., Robinson, P. and Sandøe, P. 2003. Beyond the knowledge deficit: recent research into lay and expert attitudes to food risks. *Appetite* 41: 111-121.
- Hansen, R., Frantzeskaki, N., McPhearson, T., Rall, E., Kabisch, N., Kaczorowska, A., Kain, J.-H., Artmann, M. and Pauleit, S. 2015. The uptake of the ecosystem services concept in planning discourses of European and American cities. *Ecosystem Services* 12: 228-246.
- Harding, J. 2013. *Qualitative data analysis from start to finish*. Los Angeles: Sage Publications.
- Hartley, N. and Wood, C. 2005. Public participation in environmental impact assessment – implementing the Aarhus Convention. *Environmental Impact Assessment Review* 25: 319-340.
- Hatcher, A., Jaffry, S., Thébaud, O. and Bennett, E. 2000. Normative and social influences affecting compliance with fishery regulations. *Land Economics* 76(3): 448-461.
- Hattam, C., Atkins, J.P., Beaumont, N.J., Börger, T., Böhnke-Heinrichs, A., Burdon, D., de Groot, R., Hoefnagel, E., Nunes, P.A.L.D., Piwowarczyk, J., Sastre, S. and Austen, M.C. 2015. Marine ecosystem services: linking indicators to their classification. *Ecological Indicators* 49: 61-75.

- Hauck, J., Görg, C., Varjopuro, R., Ratamáki, O., Maes, J., Wittmer, H. and Jax, K. 2013. "Maps have an air of authority": potential benefits and challenges of ecosystem service maps at different levels of decision making. *Ecosystem Services* 4: 25-32.
- Häyhä, T. and Franzese, P.P. 2014. Ecosystem services assessment: a review under an ecological-economic and systems perspective. *Ecological Modelling* 289: 124-132.
- Haynes-Young, R.H. and Potschin, M.B. 2009. *Methodologies for defining and assessing ecosystem services*. Final report, JNCC, Project Code C08-0170-0062.
- Hein, L., van Koppen, K., de Groot, R.S. and van Ierland, E.C. 2006. Spatial scales, stakeholders and the valuation of ecosystem services. *Ecological Economics* 57: 209-228.
- Hines, J.M., Hungerford, H.R. and Tomera, A.N. 1986/87. Analysis and synthesis of research on responsible environmental behaviour: a meta-analysis. *Journal of Environmental Education* 18: 1-8.
- Hoagland, P., Beaulieu, S., Tivey, M.A., Eggert, R.G., German, C., Glowka, L. and Lin, J. 2010. Deep-sea mining of seafloor massive sulfides. *Marine Policy* 34(3): 728-732.
- Hobman, E.V. and Ashworth, P. 2013. Public support for energy sources and related technologies: the impact of simple information provision. *Energy Policy* 63: 862-869.
- Hogg, M.A. and Vaughan, G. M. 2011. *Social psychology*. 6th edition. Harlow, UK: Pearson Education Limited.
- Holbrook, A.L., Green, M.C. and Krosnick, J.A. 2003. Telephone versus face-to-face interviewing of national probability samples with long questionnaires. Comparisons of respondent satisficing and social desirability response bias. *Public Opinion Quarterly* 67: 79-125.
- Howell, R.A. 2013. It's *not* (just) "the environment, stupid!" Values, motivations, and routes to engagement of people adopting lower-carbon lifestyles. *Global Environmental Change* 23: 281-290.
- Hsieh, H.-F. and Shannon, S.E. 2005. Three approaches to Qualitative Content Analysis. *Qualitative Health Research* 15(9): 1277-1288.
- Hughes, R. 1998. Considering the vignette technique and its application to a study of drug injecting and HIV risk and safer behaviour. *Sociology of Health & Illness* 20(3): 381-400.
- Hughes, R. and Huby, M. 2004. The construction and interpretation of vignettes in social research. *Social Work & Social Sciences Review* 11(1): 36-51.
- IAP2 2014. *IAP2 spectrum of public participation*. International Association for Public Participation.
- Iniesta-Arandia, I., García-Llorente, M., Aguilera, P., Montes, C. and Martín-López, B. 2014. Socio-cultural valuation of ecosystem services: uncovering the links between values, drivers of change, and human well-being. *Ecological Economics* 108: 36-48.
- Innes, J.E. and Booher, D.E. 2004. Reframing public participation: strategies for the 21st century. *Planning Theory and Practice* 5(4): 419-436.

- IPCC 2014. *Climate change 2014: synthesis report*. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland.
- Irvin, R.A. and Stansbury, J. 2004. Citizen participation in decision-making: is it worth the effort? *Public Administration Review* 64(1): 55-65.
- Irwin, A. 2006. The politics of talk: coming to terms with the 'new' scientific governance. *Social Studies of Science* 36(2): 299-320.
- Jackson, T. 2005. *Motivating sustainable consumption. A review of evidence on consumer behaviour and behavioural change*. A report to the Sustainable Development Research Network. University of Surrey.
- Jackson, T.W. and Farzaneh, P. 2012. Theory-based model of factors affecting information overload. *International Journal of Information Management* 32: 523-532.
- Jackson, E.L., Rowden, A.A., Attrill, M.J., Bossey, S.J. and Jones, M.B. 2001. The importance of seagrass beds as a habitat for fishery species. *Oceanography and Marine Biology: An Annual Review* 39: 269-303.
- Jax, K., Barton, D.N., Chan, K.M.A., de Groot, R., Doyle, U., Eser, U., Görg, C., Gómez-Baggethun, E., Griewald, Y., Haber, W., Haines-Young, R., Heink, U., Jahn, T., Joosten, H., Kerschbaumer, L., Korn, H., Luck, G.W., Matzdorf, B., Muraca, B., Neßhöver, C., Norton, B., Ott, K., Potschin, M., Rauschmayer, F., von Haaren, C. and Wichmann, S. 2013. Ecosystem services and ethics. *Ecological Economics* 93: 260-268.
- Jefferson, R.L., Baily, I., Laffoley, D., Richards, J.P. and Attrill, M.J. 2014. Public perceptions of the UK marine environment. *Marine Policy* 43: 327-337.
- Jobstvogt, N., Hanley, N., Hynes, S., Kenter, J. and Witte, U. 2014a. Twenty thousand sterling under the sea: estimating the value of protecting deep-sea biodiversity. *Ecological Economics* 97: 10-19.
- Jobstvogt, N., Watson, V. and Kenter, J.O. 2014b. Looking below the surface: The cultural ecosystem service values of UK marine protected areas (MPAs). *Ecosystem Services* 10: 97-110.
- Jones, P.J.S. 2002. Marine protected area strategies: issues, divergences and the search for middle ground. *Reviews in Fish Biology and Fisheries* 11: 197-216.
- Kaiser, F.G. and Fuhrer, U. 2003. Ecological behavior's dependency on different forms of knowledge. *Applied Psychology: An International Review* 52(4): 598-613.
- Kaiser, F.G., Wölfing, S. and Fuhrer, U. 1999a. Environmental attitude and ecological behaviour. *Journal of Environmental Psychology* 19: 1-19.
- Kaiser, F.G., Ranney, M., Harting, T. and Bowler, P.A. 1999b. Ecological behavior, environmental attitude, and feelings of responsibility for the environment. *European Psychologist* 4(2): 59-74.
- Kallis, G., Gómez-Baggethun, E. and Zografos, C. 2013. To value or not to value? That is not the question. *Ecological Economics* 94: 97-105.

- Kapetsky, J.McD., Aguilar-Manjarrez, J. and Jenness, J. 2013. *A global assessment of offshore mariculture potential from a spatial perspective*. FAO Fisheries and Aquaculture Technical Paper 549. United Nations Food and Agriculture Organisation, Rome.
- Katsanevakis, S., Stelzenmüller, V., South, A., Sørensen, T.K., Jones, P.J.S., Kerr, S., Badalamenti, F., Anagnostou, C., Breen, P. Chust, G., D'Anna, G., Duijn, M., Filatova, T., Fiorentino, F., Hulsman, H., Johnson, K., Karageorgis, A.P., Kröncke, I., Mirto, S., Pipitone, C., Portelli, S., Qiu, W., Reiss, H., Sakellariou, D., Salomidi, M., van Hoof, L., Vassilopoulour, V., Vega Fernández, T., Vöge, S., Weber, A., Zenetos, A. and ter Hofstede, R. 2011. Ecosystem-based marine spatial management: review of concepts, policies, tools, and critical issues. *Ocean and Coastal Management* 54: 807-820.
- Klain, S.C. and Chan, K.M.A. 2012. Navigating coastal values: participatory mapping of ecosystem services for spatial planning. *Ecological Economics* 82: 104-113.
- Klain, S.C., Satterfiled, T.A. and Chan, K.M.A. 2014. What matters and why? Ecosystem services and their bundled qualities. *Ecological Economics* 107: 310-320.
- Klein, T.M., Celio, E. and Grêt-Regamey, A. 2015. Ecosystem services visualization and communication: A demand analysis approach for designing information and conceptualizing decision support systems. *Ecosystem Services* 13: 173-183.
- Klöckner, C.A. 2013. A comprehensive model of the psychology of environmental behaviour – A meta-analysis. *Global Environmental Change* 23: 1028-1038.
- Klöckner, C.A. and Blöbaum, A. 2010. A comprehensive action determination model: toward a broader understanding of ecological behaviour using the example of travel mode choice. *Journal of Environmental Psychology* 30: 574-586.
- Kollmuss, A. and Agyeman, J. 2002. Mind the gap: why do people act environmentally and what are the barriers to pro-environmental behavior? *Environmental Education Research* 8(3): 239-260.
- Korfmacher, K.S. 2001. The Politics of Participation in Watershed Modelling. *Environmental Management* 27(2): 161-176.
- Koschke, L., Fürst, C., Frank, C. and Makeschin, F. 2012. A multi-criteria approach for an integrated land-cover-based assessment of ecosystem services provision to support landscape planning. *Ecological Indicators* 21: 54-66.
- Kosoy, N. and Corbera, E. 2010. Payments for ecosystem services as commodity fetishism. *Ecological Economics* 69: 1228-1236.
- Kull, C.A., de Sartre, X.A. and Castro-Larrañaga, M. 2015. The political ecology of ecosystem services. *Geoforum* 61: 122-134.
- Kumar, M. and Kumar, P. 2008. Valuation of the ecosystem services: a psycho-cultural perspective. *Ecological Economics* 64: 808-819.
- Kushner, B., Waite, R., Jungwiwattanaporn, M. and Burke, L. 2012. *Influence of coastal economic valuations in the Caribbean: enabling conditions and lessons learned*. Working Paper. Washington, DC: World Resources Institute.

- La Manna, G., Donno, Y., Sarà, G. and Ceccherelli, G. 2015. The detrimental consequences for seagrass of ineffective marine park management related to boat anchoring. *Marine Pollution Bulletin* 90: 160-166.
- Lamarque, P., Quétier, F. and Lavorel, S. 2011. The diversity of the ecosystem services concept and its implications for their assessment and management. *Comptes Rendus Biologies* 334: 441-449.
- Langemeyer, J., Baró, F., Roebeling, P. and Gómez-Baggethun, E. 2015. Contrasting values of cultural ecosystem services in urban areas: The case of park Montjuïc in Barcelona. *Ecosystem Services* 12: 178-186.
- La Rosa, D., Spyra, M. and Inostroza, L. 2016. Indicators of cultural ecosystem services for urban planning: A review. *Ecological Indicators* 61: 74-89.
- Laurans, Y., Rankovic, A., Billé, R., Pirard, R. and Mermet, L. 2013a. Use of ecosystem services economic valuation for decision making: questioning a literature blindspot. *Journal of Environmental Management* 119: 208-219.
- Laurans, Y., Pascal, N., Binet, T., Brander, L., Clua, E., David, G., Rojat, D. and Seidl, A. 2013b. Economic valuation of ecosystem services from coral reefs in the South Pacific: Taking stock of recent experience. *Journal of Environmental Management* 116: 135-144.
- Leslie, H.M. and McLeod, K.L. 2007. Confronting the challenges of implementing marine ecosystem-based management. *Frontiers in Ecology and the Environment* 5(10): 540-548.
- Lester, S.E., Costello, C., Halpern, B.S., Gaines, S.D., White, C. and Barth, J.A. 2013. Evaluating tradeoffs among ecosystem services to inform marine spatial planning. *Marine Policy* 38: 80-89.
- Liu, S., Costanza, R., Farber, S. and Troy, A. 2010. Valuing ecosystem services. Theory, practice, and the need for a transdisciplinary synthesis. *Annals of the New York Academy of Sciences* 1185: 54-78.
- Lopes, R. and Videira, N. 2013. Valuing marine and coastal ecosystem services: an integrated participatory framework. *Ocean and Coastal Management* 84: 153-162.
- Lucas, K., Brooks, M., Darnton, A. and Elster Jones, J. 2008. Promoting pro-environmental behaviour: existing evidence and policy implications. *Environmental Science and Policy* 11: 456-466.
- Luck, G.W., Chan, K.M.A., Eser, U., Gómez-Baggethun, E., Matzdorf, B., Norton, B. and Potschin, M.B. 2012. Ethical considerations in on-ground applications of the ecosystem services concept. *BioScience* 62: 1020-1029.
- Luisetti, T., Turner, R.K., Bateman, I.J., Morse-Jones, S., Adams, C. and Fonseca, L. 2011. Coastal and marine ecosystem services valuation for policy and management: managed realignment case studies in England. *Ocean and Coastal Management* 54: 212-224.
- Lundquist, C.J. and Granek, E.F. 2005. Strategies for successful marine conservation: integrating socioeconomic, political, and scientific factors. *Conservation Biology* 19(6): 1771-1778.

- Lusk, J.L., House, L.O., Valli, C., Jaeger, S.R., Moore, M., Morrow, J.L. and Traill, W.B. 2004. Effect of information about benefits of biotechnology on consumer acceptance of genetically modified food: evidence from experimental auctions in the United States, England and France. *European Review of Agricultural Economics* 31(2): 179-204.
- Maes, J., Egoh, B., Willemsen, L., Liqueste, C., Vihervaara, P., Schägner, J.P., Grizzetti, B., Drakou, E.G., La Notte, A., Zulian, G., Bouraoui, F., Paracchini, M.L., Braat, L. and Bidoglio, G. 2012. Mapping ecosystem services for policy support and decision making in the European Union. *Ecosystem Services* 1: 31-39.
- Maguire, B., Potts, J. and Fletcher, S. 2011. Who, when, and how? Marine planning stakeholder involvement preferences – a case study of the Solent, United Kingdom. *Marine Pollution Bulletin* 62: 2288-2292.
- Maguire, B., Potts, J. and Fletcher, S. 2012. The role of stakeholders in the marine planning process – stakeholder analysis within the Solent, United Kingdom. *Marine Policy* 36: 246-257.
- Mah, D.N. and Hills, P. 2014. Participatory governance for energy policy-making: a case study of the UK nuclear consultation in 2007. *Energy Policy* 74: 340-351.
- Manns, F. 2014. *Aral Sea Wetland Restoration Strategy, Uzbekistan*. ValuES case study. http://www.aboutvalues.net/case_studies/ [accessed 30.05.2016].
- Mannsfeld, K. and Grunewald, K. 2015. ES in retrospect. In: Grunewald, K. and Bastian, O. (Eds.). *Ecosystem services – concept, methods and case studies*. Berlin and Heidelberg, Germany: Springer Verlag, pp. 19-25.
- Marre, J.-B., Thebaud, O., Pascoe, S., Jennings, S., Boncoeur, J. and Coglán, L. 2015. The use of ecosystem services valuation in Australian coastal zone management. *Marine Policy* 56: 117-124.
- Martín-López, B., Gómez-Baggethun, E. and García-Llorente, M. 2014. Trade-offs across value-domains in ecosystem services assessment. *Ecological Indicators* 37: 220-228.
- Martinez-Alier, J., Munda, G. and O'Neill, J. 1998. Weak comparability of values as a foundation for ecological economics. *Ecological Economics* 26: 277-286.
- Martinez-Harms, M.J., Bryan, B.A., Balvanera, P., Law, E.A., Rhodes, J.R., Possingham, H.P. and Wilson, K.A. 2015. Making decisions for managing ecosystem services. *Biological Conservation* 184: 229-238.
- Mascia, M.B. 2003. The human dimension of coral reef marine protected areas: recent social science research and its policy implications. *Conservation Biology* 17(2): 630-632.
- Mason, C.M., Lim-Camacho, L., Scheepers, K. and Parr, J.M. 2015. Testing the water: understanding stakeholder readiness for strategic coastal and marine management. *Ocean and Coastal Management* 104: 45-56.
- Mauerhofer, V. 2016. Public participation in environmental matters: compendium, challenges and chances globally. *Land Use Policy* 52: 481-491.
- Mauerhofer, V. and Larssen, C. 2016. Judicial perspectives from the European Union for public participation in environmental matters in East Asia. *Land Use Policy* 52: 552-561.

- McCauley, D.J. 2006. Selling out on nature. *Nature* 443: 27-28.
- McCool, S.F. and Guthrie, K. 2001. Mapping the dimensions of successful public participation in messy natural resources management situations. *Society and Natural Resources: an International Journal* 14(4): 309-323.
- McCormick, J. 1995. *The global environmental movement*. 2nd edition. Chichester, UK: John Wiley and Sons Ltd.
- McDonald, S.L. and Rigling-Gallagher, D. 2015. Participant perceptions of consensus-based, marine mammal take reduction planning. *Marine Policy* 61: 216-226.
- McKinley, E. and Fletcher, S. 2010. Individual responsibility for the oceans? An evaluation of marine citizenship by UK marine practitioners. *Ocean and Coastal Management* 53: 379-384.
- MEA 2003. *Ecosystems and human wellbeing: a framework for assessment. Chapter 2: ecosystems and their services*. Millennium Ecosystem Assessment. Island Press, Washington, DC.
- MEA 2005. *Ecosystems and human well-being: synthesis*. Millennium Ecosystem Assessment. Island Press, Washington, DC.
- Meadows, D.H., Meadows, D.L., Randers, J. and Behrens, W.W. 1972. *The limits to growth: a report for the Club of Rome's project on the predicament of mankind*. New York, USA: Universe Books.
- Meinard, Y., Dereniowska, M. and Gharbi, J.-S. 2016. The ethical stakes in monetary valuation methods for conservation purposes. *Biological Conservation* 199: 67-74.
- Melaku Canu, D. and Solidoro, C. 2014. Socio-economic analysis and stakeholder involvement: mussel-farming in the Gulf of Trieste. *Marine Policy* 43: 55-62.
- Menzel, S. and Teng, J. 2009. Ecosystem services as a stakeholder-driven concept for conservation science. *Conservation Biology* 24(3): 907-909.
- Merrie, A., Dunn, D.C., Metian, M., Boustany, A.M., Takei, Y., Elferink, A.O., Ota, Y., Christensen, V., Halpin, P.N. and Österblom, H. 2014. An ocean of surprises – trends in human use, unexpected dynamics and governance challenges in areas beyond national jurisdiction. *Global Environmental Change* 27: 19-31.
- Metz, D. and Weigel, L. 2010. *Key findings from recent national opinion research on "ecosystem services"*. The Nature Conservancy, Washington, DC.
- Michie, S., van Stralen, M.M. and West, R. 2011. The behaviour change wheel: a new method for characterising and designing behaviour change interventions. *Implementation Science* 6(42).
- Mikalsen, K. and Jentoft, S. 2008. Participatory practices in fisheries across Europe: making stakeholders more responsible. *Marine Policy* 32: 169-177.
- Milcu, A.I., Hanspack, J., Abson, D. and Fischer, J. 2013. Cultural ecosystem services: a literature review and prospects for future research. *Ecology and Society* 18(3): 44.

- Miles, M.B. and Huberman, A.M. 1994. *Qualitative data analysis. An expanded sourcebook*. 2nd edition. Thousand Oaks, CA, USA: Sage Publications.
- Miliute-Plepiene, J., Hage, O., Plepys, A. and Reipas, A. 2016. what motivates households recycling behaviour in recycling schemes of different maturity? Lessons from Lithuania and Sweden. *Resources, Conservation and Recycling* 113: 40-52.
- MMO 2013. *East inshore and east offshore marine plan areas statement of public participation*. Revised August 2013. Marine Management Organisation, UK.
- MMO 2015. *South inshore and south offshore marine plan areas. Statement of public participation*. First revision February 2015. Marine Management Organisation, UK.
- Mongruel, R., Beaumont, N., Hooper, T., Levrel, H., Somerfield, P., Thiébaud, E., Langmead, O. and Charles, M. 2015. *A framework for the operational assessment of marine ecosystem services*. VALMER Work Package 1 guidelines document. VALMER project. Available at www.valmer.eu.
- Moote, M.A., McClaran, M.P. and Chickering, D.K. 1997. Theory in practice: applying participatory democracy theory to public land planning. *Environmental Management* 21(6): 877-889.
- Myers, M.D. and Newman, M. 2007. The qualitative interview in IS research: Examining the craft. *Information and Organization* 17: 2-26.
- Myers, R.A. and Worm, B. 2003. Rapid worldwide depletion of predatory fish communities. *Nature* 423: 280-283.
- Natale, F., Carvalho, N., Harrop, M., Guillen, J. and Frangoudes, K. 2013. Identifying fisheries dependent communities in EU coastal areas. *Marine Policy* 42: 245-252.
- Nahlik, A.M., Kentula, M.E., Fennessy, M.S. and Landers, D.H. 2012. Where is the consensus? A proposed foundation for moving ecosystem service concepts into practice. *Ecological Economics* 77: 27-35.
- Newig, J., Pahl-Wostl, C. and Sigel, K. 2005. The role of public participation in managing uncertainty in the implementation of the Water Framework Directive. *European Environment* 15: 333-343.
- Nilsson, M. and Küller, R. 2000. Travel behaviour and environmental concern. *Transportation Research Part D* 5: 211-234.
- NOAA 2007. *Introduction to stakeholder participation*. NOAA Coastal Services Center, National Oceanic and Atmospheric Administration.
- NOAA 2015. *Marine aquaculture strategic plan FY 2016-2020*. National Oceanic and Atmospheric Administration, National Marine Fisheries Service.
- Norgaard, R.B. 2010. Ecosystem services: from eye-opening metaphor to complexity blinder. *Ecological Economics* 69: 1219-1227.
- Nutters, H.M. and Pinto da Silva 2012. Fishery stakeholder engagement and marine spatial planning: lessons from the Rhode Island Ocean SAMP and the Massachusetts Ocean Management Plan. *Ocean and Coastal Management* 67: 9-18.

- O'Faircheallaigh, C. 2010. Public participation and environmental impact assessment: purposes, implications, and lessons for public policy making. *Environmental Impact Assessment Review* 30: 19-27.
- O'Hagan, A.M., and Ballinger, R. 2009. Coastal governance in North West Europe: an assessment of approaches to the European stocktake. *Marine Policy* 33: 912-922.
- Opdam, P., Coninx, I., Dewulf, A., Steingröver, E., Vos, C. and van der Wal, M. 2015. Framing ecosystem services: affecting behaviour of actors in collaborative landscape planning? *Land Use Policy* 46: 223-231.
- Oppenheim, A.N. 1992. *Questionnaire Design, Interviewing, and Attitude Measurement*. London, UK: Bloomsbury Publishing.
- Orenstein, D.E. and Groner, E. 2014. In the eye of the stakeholder: Changes in perceptions of ecosystem services across an international border. *Ecosystem Services* 8: 185-196.
- O'Riordan, T. and Ward, R. 1997. Building trust in shoreline management: creating participatory consultation in shoreline management plans. *Land Use Policy* 14(4): 257-276.
- Owens, S. 2000. 'Engaging the public': information and deliberation in environmental policy. *Environment and Planning A* 32: 1141-1148.
- Owens, S. and Driffill, L. 2008. How to change attitudes and behaviours in the context of energy. *Energy Policy* 36: 4412-4418.
- Palerm, J.R. 1999. Public participation in environmental decision making: examining the Aarhus Convention. *Journal of Environmental Assessment Policy and Management* 1(2): 229-244.
- Pauly, D., Christensen, V., Dalsgaard, J. Froese, R., and Torres Jr., F. 1998. Fishing down marine food webs. *Science* 279(5352): 860-863.
- Pearce, D.W. 1993. *Economic values and the natural world*. London, UK: Earthscan.
- Pendleton, L., Mongrue, R., Beaumont, N., Hooper, T. and Charles, M. 2015. A Triage approach to improve the relevance of marine ecosystem services assessments. *Marine Ecology Progress Series* 530: 183-193.
- Petersen, S., Krätschell, A. and Hannington, M.D. 2016. *The current state of global activities related to deep-sea mineral exploration and mining*. EAGE/DGG workshop on deep mineral exploration, 18 March 2016, Münster, Germany.
- Peterson, K. and Diss-Torrance, A. 2014. Motivations for rule compliance in support of forest health: Replication and extension. *Journal of Environmental Management* 139: 135-145.
- Peterson, M.J., Hall, D.M., Feldpausch-Parker, A.M. and Peterson, T.R. 2010. Obscuring ecosystem function with application of the ecosystem services concept. *Conservation Biology* 24(1): 113-119.
- Petit, L. and Carpenter, A. 2014. *Towards better governance of the Channel ecosystem*. Report from the Promoting Effective Governance of the Channel Ecosystem Project.

- Pham, C.K., Ramirez-Llodra, E., Alt, C.H.S., Amaro, T., Bergmann, M., Canals, M., Company, J.B., Davies, J., Duineveld, G., Galgani, F., Howell, K.L., Huvenne, V.A.I., Isidro, E., Jones, D.O.B., Lastras, G., Morato, T., Gomes-Pereira, J.N., Purser, A., Stewart, H., Tojeira, I., Tubau, X., Van Rooij, D. and Tyler P.A. 2014. Marine litter distribution and density in European Seas, from the shelves to deep basins. *PloS ONE* 9(4): e95839.
- Pimentel, D. and Wilson, C. 1997. Economic and environmental benefits of biodiversity. *Bioscience* 47 (11): 747-758.
- Plieninger, T., Dijks, S., Oteros-Rozas, E. and Bieling, C. 2013. Assessing, mapping, and quantifying cultural ecosystem services at community level. *Land Use Policy* 33: 118-129.
- Pomeroy, R. and Douvère, F. 2008. The engagement of stakeholders in the marine spatial planning process. *Marine Policy* 32: 816-822.
- Poortinga, W. and Pidgeon, N.F. 2004. Trust, the asymmetry principle, and the role of prior beliefs. *Risk Analysis* 24(6): 1475-1486.
- Portman, M.E. 2007. Zoning design for cross-border marine protected areas: the Red Sea Marine Peace Park case study. *Ocean and Coastal Management* 50: 499-522.
- Portman, M. 2009. Involving the public in the impact assessment of offshore renewable energy facilities. *Marine Policy* 33: 332-338.
- Potschin, M.B. and Haines-Young, R.H. 2011. Ecosystem services: exploring a geographical perspective. *Progress in Physical Geography* 35(5): 575-594.
- Potts, T., Burdon, D., Jackson, E., Atkins, J., Saunders, J., Hastings, E. and Langmead, O. 2013. Do marine protected areas deliver flows of ecosystem services to support human welfare? *Marine Policy* 44: 139-148.
- Poulou, M. 2001. The role of vignettes in the research of emotional and behavioural difficulties. *Emotional and Behavioural Difficulties* 6(1): 50-62.
- Pröpfer, M. and Hapts, F. 2014. The culturality of ecosystem services. Emphasizing process and transformation. *Ecological Economics* 108: 28-35.
- Punch, K.F. 2005. *Introduction to social research. Quantitative and qualitative approaches*. 2nd edition. Los Angeles, USA: Sage Publications.
- Raheem, N., Colt, S., Fleishman, E., Talberth, J., Swedeen, P., Boyle, K.J., Rudd, M., Lopez, R.D., Crocker, D., Bohan, D., O'Higgins, T., Willer, C. and Boumans, R.M. 2012. Application of non-market valuation to California's coastal policy decisions. *Marine Policy* 36: 1166-1171.
- Rahman, N. 1996. Caregivers' sensitivity to conflict: The use of vignette methodology. *Journal of Elder Abuse and Neglect* 8: 35-47.
- Ran, B. 2012. Evaluating public participation in environmental policy-making. *Journal of US-China Public Administration* 9(4): 407-423.
- Rea, A.W., Davis, C., Evans, D.A., Heninger, B.T. and Van Houtven, G. 2012. Using ecosystem services to inform decisions on U.S. air quality standards. *Environmental Science and Technology* 46: 6481-6488.

- Reed, M.S. 2008. Stakeholder participation for environmental management. A literature review. *Biological Conservation* 141: 2417-2431.
- Reed, M., Courtney, P., Urquhart, J. and Ross, N. 2013. Beyond fish as commodities: understanding the socio-cultural role of inshore fisheries in England. *Marine Policy* 37: 62-68.
- Rees, S.E., Attrill, M.J., Austen, M.C., Mangi, S.C., Richards, J.P. and Rodwell, L.D. 2010. Is there a win-win scenario for marine nature conservation? A case study of Lyme Bay, England. *Ocean and Coastal Management* 53: 135-145.
- Rees, S.E., Fletcher, S., Gall, S.C., Friedrich, L.A., Jackson, E.L. and Rodwell, L.D. 2014. Securing the benefits: linking ecology with marine planning policy to examine the potential of a network of Marine Protected Areas to support human wellbeing. *Marine Policy* 44: 335-341.
- Renn, O. 2006. Participatory processes for designing environmental policies. *Land Use Policy* 23: 34-43.
- Renold, E. 2002. Using vignettes in qualitative research. *Building Research Capacity* 3: 3-5.
- Ricci, M., Bellaby, P. and Flynn, R. 2010. Engaging the public on paths to sustainable energy: who has to trust whom? *Energy Policy* 38: 2633-2640.
- Richardson, B.J. and Razzaque, J. 2006. Public Participation in Environmental Decision Making. *Environmental Law for Sustainability*: 165-194.
- Ritchie, H. and Ellis, G. 2010. A system that works for the sea? Exploring stakeholder engagement in marine spatial planning. *Journal of Environmental Planning and Management* 53(6): 701-723.
- Rivero, S. and Villasante, S. 2016. What are the research priorities for marine ecosystem services? *Marine Policy* 66: 104-113.
- Rodríguez-Rodríguez, D., Abdul Malak, D., Soukissian, T. and Sánchez-Espinosa, A. 2016. Achieving Blue Growth through maritime spatial planning: offshore wind energy optimization and biodiversity conservation in Spain. *Marine Policy* 73: 8-14.
- Rose, C., Dade, P. and Scott, J. 2008. *Qualitative and quantitative research into public engagement with the undersea landscape in England*. Natural England Research Reports, NERR019.
- Rothschild, B.J., Ault, J.S., Gouletquer, P. and Héral, M. 1994. Decline of the Chesapeake Bay oyster population: a century of habitat destruction and overfishing. *Marine Ecology Progress Series* 111: 29-39.
- Rowe, G. and Frewer, L.J. 2000. Public participation methods: a framework for evaluation. *Science, Technology and Human Values* 25(1): 3-29.
- Rowe, G. and Frewer, L.J. 2004. Evaluating public-participation exercises: a research agenda. *Science, Technology, and Human Values* 29(4): 512-557.
- Rowe, G. and Frewer, L.J. 2005. A typology of public engagement mechanisms. *Science, Technology, and Human Values* 30(2): 251-290.

- Rowe, G., Horlick-Jones, T., Walls, J., Poortinga, W. and Pidgeon, N.F. 2008. Analysis of a normative framework for evaluating public engagement exercises: reliability, validity and limitations. *Public Understanding of Science* 17(4): 419-441.
- Ruckelshaus, M., McKenzie, E., Tallis, H., Guerry, A., Daily, G., Kareiva, P., Polasky, S., Ricketts, T., Bhagabati, N., Wood, S.A. and Bernhardt, J. 2015. Notes from the field: lessons learned from using ecosystem service approaches to inform real-world decisions. *Ecological Economics* 115: 11-21.
- Ryan, G.W. and Bernard, H.R. 2000. Data management and analysis methods. In: Denzin, N.K. and Lincoln, Y.S. (Eds.). *Handbook of qualitative research*. 2nd edition. Thousand Oaks, CA, USA: Sage Publications, pp. 769-802.
- Rydin, Y. and Pennington, M. 2000. Public participation and local environmental planning: the collective action problem and the potential of social capital. *Local Environment* 5(2): 153-169.
- Saarikoski, H., Tikkanen, J. and Leskinen, L.A. 2010. Public participation in practice – assessing public participation in the preparation of regional forest programs in Northern Finland. *Forest Policy and Economics* 12: 349-356.
- Saarikoski, H., Jax, K., Harrison, P.A., Primmer, E., Barton, D.N., Mononen, L., Vihervaara, P. and Furman, E. 2015. Exploring operational ecosystem service definitions: the case of boreal forests. *Ecosystem Services* 14: 144-157.
- Sagie, H., Morris, A., Rofè, Y., Orenstein, D.E. and Groner, E. 2013. Cross-cultural perceptions of ecosystem services: a social inquiry on both sides of the Israeli-Jordanian border of the Southern Arava Valley Desert. *Journal of Arid Environments* 97: 38-48.
- Samhuri, J.F., Haupt, A.J., Levin, P.S., Link, J.S. and Shuford, R. 2014. Lessons learned from developing integrated ecosystem assessments to inform marine ecosystem-based management in the USA. *ICES Journal of Marine Science* 71(5): 1205-1215.
- Sarantakos, S. 2013. *Social research*. 4th edition. Palgrave Macmillan.
- Sattler, C. and Matzdorf, B. 2013. PES in a nutshell: from definitions and origins to PES in practice – approaches, design process and innovative aspects. *Ecosystem Services* 6: 2-11.
- Sayce, K., Shuman, C., Connor, D., Reisewitz, A., Pope, E., Miller-Henson, M., Poncelet, E., Monié, D. and Owens, B. 2013. Beyond traditional stakeholder engagement: public participation roles in California's statewide marine protected area planning process. *Ocean and Coastal Management* 24: 57-66.
- Schoenberg, N.E. and Ravdal, H. 2000. Using vignettes in awareness and attitudinal research. *International Journal of Social Research Methodology* 3(1): 63-74.
- Scholderer, J. and Frewer, L.J. 2003. The biotechnology communication paradox: experimental evidence and the need for a new strategy. *Journal of Consumer Policy* 26: 125-157.
- Scholte, S.S.K., van Teeffelen, A.J.A. and Verburg, P.H. 2015. Integrating socio-cultural perspectives into ecosystem service valuation: a review of concepts and methods. *Ecological Economics* 114: 67-78.

- Schröter, M., van der Zanden, E.H., van Oudenhoven, A.P.E., Remme, R.P., Serna-Chavez, H.M., de Groot, R.S. and Opdam, P. 2014. Ecosystem services as a contested concept: a synthesis of critique and counter-arguments. *Conservation Letters* 7(6): 514-523.
- Schuijt, K.D. 2003. *Valuation of water – the process of economic valuation of ecosystems in water management*. PhD dissertation, Erasmus University Rotterdam.
- Schwartz, S.H. 1977. Normative influences on altruism. *Advances in Experimental Social Psychology* 10: 221-279.
- Schwartz, D., Bruine de Bruin, W., Fischhoff, B., and Lave, L. 2015. Advertising energy saving programs: the potential environmental cost of emphasizing monetary savings. *Journal of Experimental Psychology: Applied* 21(2): 158-166.
- Schwepe-Kraft, B. and Grunewald, K. 2015. Approaches to the economic valuation of natural assets. In: Grunewald, K. and Bastian, O. (Eds.). *Ecosystem services – concept, methods and case studies*. Berlin and Heidelberg, Germany: Springer Verlag, pp. 85-104.
- Simcock, N., MacGregor, S., Catney, P., Dobson, A., Ormerod, M., Robinson, Z., Ross, S., Royston, S. and Hall, S.M. 2014. Factors influencing perceptions of domestic energy information: content, source and process. *Energy Policy* 65: 455-464.
- Simis, M.J., Madden, H., Cacciatore, M.A. and Yeo, S.K. 2016. The lure of rationality: why does the deficit model persist in science communication? *Public Understanding of Science* 25(4): 400-414.
- Simmonds, M.P., Dolman, S.J., Jasny, M., Parsons, E.C.M., Weilgart, L., Wright, A.J. and Leaper, R. 2014. Marine noise pollution – increasing recognition but need for more practical action. *Journal of Ocean Technology* 9(1): 71-90.
- Slabbekoorn, H., Bouton, N., van Opzeeland, I., Coers, A., ten Cate, C. and Popper, A.N. 2010. A noisy spring: the impact of globally rising underwater sound levels on fish. *Trends in Ecology and Evolution* 25(7): 419-427.
- Slootweg, R. and van Beukering, P. 2008. *Valuation of Ecosystem Services and Strategic Environmental Assessment. Lessons from influential cases*. Netherlands Commission for Environmental Assessment.
- Solow, R.M. 1974. The economics of resources or the resources of economics. *American Economic Review* 64(2): 1-14.
- Soma, K. and Haggett, C. 2015. Enhancing social acceptance in marine governance in Europe. *Ocean and Coastal Management* 117: 61-69.
- Soneryd, L. and Weldon, S. 2003. Noise and newts: public engagement in the UK and Sweden. *Environmental Impact Assessment Review* 23: 17-37.
- Sowman, M. 2006. Subsistence and small-scale fisheries in South Africa: a ten-year review. *Marine Policy* 30: 60-73.
- Spangenberg, J.H., Görg, C. and Settele, J. 2015. Stakeholder involvement in ESS research and governance: between conceptual ambition and practical experiences – risks, challenges and tested tools. *Ecosystem Services* 16: 201-211.

- Spence, A. Levgue, C., Bedwell, B. and O'Malley, C. 2014. Engaging with energy reduction: Does a climate change frame have the potential for achieving broader sustainable behaviour? *Journal of Environmental Psychology* 38: 17-28.
- Stagl, S. 2006. Multicriteria evaluation and public participation: the case of UK energy policy. *Land Use Policy* 23: 53-62.
- Stapleton, L.M., Hanna, P., Ravenscroft, N. and Church, A. 2014. A flexible ecosystem services proto-typology based on public opinion. *Ecological Economics* 106: 83-90.
- Stedman, R.C., Jacquet, J.B., Filteau, M.R., Willits, F.K., Braiser, K.J. and McLaughlin, D.K. 2012. Marcellus shale gas development and new boomtown research: views of New York and Pennsylvania residents. *Environmental Practice* 14(4): 382-393.
- Stedman, R.C., Evensen, D., O'Hara, S. and Humphrey, M. 2016. Comparing the relationship between knowledge and support for hydraulic fracturing between residents of the United States and the United Kingdom. *Energy Research and Social Science* 20: 142-148.
- Steel, B.S., Smith, C., Opsommer, L., Curiel, S. Warner-Steel, R. 2005. Public ocean literacy in the United States. *Ocean and Coastal Management* 48: 97-114.
- Steg, L. and Vleck, C. 2009. Encouraging pro-environmental behaviour: an integrative review and research agenda. *Journal of Environmental Psychology* 29: 309-317.
- Steg, L., Dreijerink, L. and Abrahamse, W. 2005. Factors influencing the acceptability of energy policies: a test of VBN theory. *Journal of Environmental Psychology* 25: 415-425.
- Steinhorst, J., Klöckner, C.A. and Matthies, E. 2015. Saving electricity – For the money or the environment? Risks of limiting pro-environmental spillover when using monetary framing. *Journal of Environmental Psychology* 43: 125-135.
- Stern, N. 2006. *Stern Review of the Economics of Climate Change*. Cambridge, UK: Cambridge University Press.
- Stern, P.C., Dietz, T., Abel, T., Guagnanon, G.A. and Kalof, L. 1999. A value-belief-norm theory of support for social movements: the case of environmentalism. *Research in Human Ecology* 6(2): 81-97.
- Stirling, A. 2006. Analysis, participation and power: justification and closure in participatory multi-criteria analysis. *Land Use Policy* 23: 95-107.
- Stoknes, P.E. 2014. Rethinking climate communications and the “psychological climate paradox”. *Energy Research and Social Science* 1: 161-170.
- Stroh, M. 2000. Qualitative interviewing. In: Burton, D. (ed.): *Research training for social scientists. A handbook for postgraduate researchers*. London, UK: Sage Publications, pp. 196-214.
- Sturges, J.E. and Hanrahan, K.J. 2014. Comparing telephone and face-to-face qualitative interviewing: a research note. *Qualitative Research* 4(1): 107-118.
- Suman, D., Shivlani, M. and Milon, J.W. 1999. Perceptions and attitudes regarding marine reserves: a comparison of stakeholder groups in the Florida Keys National Marine Sanctuary. *Ocean and Coastal Management* 42: 1019-1040.

- Surís-Regueiro, J.C. and Santiago, J.L. 2014. Characterization of fisheries dependence in Galicia (Spain). *Marine Policy* 47: 99-109.
- Sutherland, M. and Nichols, S. 2006. Issues in the governance of marine spaces. In: International Federation of Surveyors. *Administering Marine Spaces: International issues*. Copenhagen, Denmark: FIG publication. https://www.fig.net/pub/figpub/pub36/chapters/chapter_1.pdf [accessed 26.01.2017]
- Syakur, A., Wibowo, J.T., Firmansyah, F., Azam, I. and Linkie, M. 2012. Ensuring local stakeholder support for marine conservation: establishing a locally-managed marine area network in Aceh. *Fauna and Flora International, Oryx*, 46(4): 516-524.
- Tallis, H., Karelva, P., Marvier, M. and Chang, A. 2008. An ecosystem services framework to support both practical conservation and economic development. *Proceedings of the National Academy of Sciences* 105(28): 9457-9464.
- Tallis, H., Levin, P.S., Ruckelshaus, M., Lester, S.E., McLeod, K.L., Fluharty, D.L. and Halpern, B.S. 2010. The many faces of ecosystem-based management: making the process work today in real places. *Marine Policy* 34: 340-348.
- Tallis, H., Lester, S.E., Ruckelshaus, M., Plummer, M., McLeod, K., Guerry, A., Andelman, S., Caldwell, M.R., Conte, M., Copps, S., Fox, D., Fujita, R., Gaines, S.D., Gelfenbaum, G., Gold, B., Kareiva, P., Kim, C.-K., Lee, K., Papenfus, M., Redman, S., Silliman, B., Wainger, L. and White, C. 2012. New metrics for managing and sustaining the ocean's bounty. *Marine Policy* 36: 303-306.
- TEEB 2010. *The Economics of Ecosystems and Biodiversity ecological and economic foundations*. Edited by Pushpam Kumar. London and Washington, DC, USA: Earthscan.
- Tratalos, J.A., Haines-Young, R., Potschin, M., Fish, R. and Church, A. 2016. Cultural ecosystem services in the UK: Lessons on designing indicators to inform management and policy. *Ecological Indicators* 61: 63-73.
- Turner, R.K. and Daily, G.C. 2008. The ecosystem services framework and natural capital conservation. *Environment and Resource Economics* 39: 25-35.
- Turner, R.K., Paavola, J., Cooper, P., Farber, S., Jessamy, V. and Georgiou, S. 2003. Valuing nature: lessons learned and future research directions. *Ecological Economics* 46: 493-510.
- UK 2004. *The Environmental Information Regulations 2004*. Statutory Instruments 2004 No. 3391, Freedom of Information, Environmental Protection.
- UK 2009. *Marine and Coastal Access Act 2009*. United Kingdom Government.
- UK 2010. *The Marine Strategy Regulations 2010*. Statutory Instruments 2010 No. 1627, Environmental Protection, Marine Management.
- UK NEA 2011. *The UK National Ecosystem Assessment: Synthesis of the Key Findings*. UNEP-WCMC, Cambridge, UK.
- UN 2016. *The first global integrated assessment. World Ocean Assessment I*. United Nations.
- UN Atlas of the Oceans 2016. *Facts: coasts and coral reefs*. <http://www.oceansatlas.org/subtopic/en/c/304/> [accessed 06/02/17]

- UNCED 1992a. *Rio Declaration on Environment and Development*. United Nations Conference on Environment and Development.
- UNCED 1992b. *Agenda 21*. United Nations Conference on Environment and Development.
- UNECE 1998. *Convention on access to information, public participation in decision-making and access to justice in environmental matters, Aarhus Convention*. United Nations Economic Commission for Europe.
- UNEP 2006. *Marine and coastal ecosystems and human wellbeing: A synthesis report based on the findings of the Millennium Ecosystem Assessment*. United Nations Environment Programme.
- UNEP 2011. *Taking steps toward marine and coastal ecosystem-based management. An introductory guide*. United Nations Environmental Programme Regional Seas Reports and Studies No. 189.
- UNFCCC 1998. *Kyoto Protocol to the United Nations Framework Convention on Climate Change*. United Nations.
- Urquhart, J. and Acott, T. 2013. Constructing 'The State': fishers' and non-fishers' identity and place attachment in Hastings, south-east England. *Marine Policy* 37: 45-54.
- US Institute for Environmental Conflict Resolution 2011. *Principles for stakeholder involvement in coastal and marine spatial planning*. U.S. Institute for Environmental Conflict Resolution, Morris K. Udall and Steward L. Udall Foundation.
- Valentine, G. 1997. Tell me about...: using interviews as a research methodology. In: Flowerdew, R. and Martin, D (Eds.). *Methods in human geography*. Harlow, UK: Addison Wesley Longman, pp. 110-126.
- Valkila, N. and Saari, A. 2013. Attitude-behaviour gap in energy issues: case study of three different Finnish residential areas. *Energy for Sustainable Development* 17: 24-34.
- VALMER 2015. *Valuing marine ecosystem services in the Western Channel*. Project summary. VALMER project. Available at www.valmer.eu.
- van Berkel, D.B. and Verburg, P.H. 2014. Spatial quantification and valuation of cultural ecosystem services in an agricultural landscape. *Ecological Indicators* 37: 163-174.
- van Beukering, P.J.H., Slootweg, R. and Immerzeel, D. 2008. *Valuation of ecosystem services and strategic environmental assessment. Influential case studies*. Netherlands Commission for Environmental Assessment.
- van Beukering, P.J.H., Papyrakis, E., Bouma, J. and Brouwer, R. 2013. The economics of ecosystem services and poverty. In: van Beukering, P.J.H., Papyrakis, E., Bouma, J. and Brouwer, R. (Eds.). *Nature's Wealth. The economics of ecosystem services and poverty*. Cambridge, UK: Cambridge University Press, pp. 1-30.
- van den Hove, S. 2000. Participatory approaches to environmental policy-making: the European Commission Climate Policy Process as a case study. *Ecological Economics* 33: 457-472.

- Van Riper, C.J. and Kyle, G.T. 2014. Capturing multiple values of ecosystem services shaped by environmental worldviews: a spatial analysis. *Journal of Environmental Management* 145: 374-384.
- Vatn, A. 2000. The Environment as a Commodity. *Environmental Values* 9(4): 493-509.
- Verburg, R., Selnes, T. and Verweij, P. 2016. Governing ecosystem services: national and local lessons from policy appraisal and implementation. *Ecosystem Services* 18: 186-197.
- Videira, N., Antunes, P., Santos, R. and Lobo, G. 2006. Public and stakeholder participation in European water policy: a critical review of project evaluation processes. *European Environment* 16: 19-31.
- Waite, R., Kushner, B., Jungwiwattanaporn, M., Gray, E. and Burke, L. 2015. Use of coastal economic valuation in decision making in the Caribbean: enabling conditions and lessons learned. *Ecosystem Services* 11: 45-55.
- Walker, G., Simmons, P., Irwin, A. and Wynne, B. 1999. Risk communication, public participation and the Seveso II directive. *Journal of Hazardous Materials* 65: 179-190.
- Wallace, K.J. 2007. Classification of ecosystem services: Problems and solutions. *Biological Conservation* 139: 235-246.
- Wallace, K.J. 2008. Ecosystem services: Multiple classifications or confusion? *Biological Conservation* 141: 353-354.
- Wates, J. 2005. The Aarhus Convention: a driving force for environmental democracy. *Journal for European Environmental Planning and Law* 1: 2-11.
- WCED 1987. *Our Common Future*. Report of the World Commission on Environment and Development.
- Webler, T., Kastenholtz, H. and Renn, O. 1995. Public participation in impact assessment: a social learning perspective. *Environmental Impact Assessment Review* 15: 443-463.
- Wedding, L.M., Reiter, S.M., Smith, C.R., Gjerde, K.M., Kittinger, J.N., Friedlander, A.M., Gaines, S.D., Clark, M.R., Thurnherr, A.M., Hardy, S.M. and Crowder, L.B. 2015. Managing mining of the deep seabed. *Science* 349(6244): 144-145.
- Werner, S.R., Spurgeon, J.P.G., Isaksen, G.H., Smith, J.P., Springer, N.K., Gettleson, D.A., N'Guessan, L. and Dupont, J.M. 2014. Rapid prioritization of marine ecosystem services and ecosystem indicators. *Marine Policy* 50: 178-189.
- Wesselink, A., Paavola, J., Fritsch, O. and Renn, O. 2011. Rationales for public participation in environmental policy and governance: practitioners' perspectives. *Environment and Planning A* 43: 2688-2704.
- West, P. 1982. *Reproducing naturally occurring stories: vignettes in survey research*. Working Paper, Medical Research Council Social & Public Health Sciences Unit. First published by the MRC Medical Sociology Unit, Aberdeen.
- White, A.T. and Courtney, C.A. 2002. Experience with marine protected area planning and management in the Philippines. *Coastal Management* 30: 1-26.

- White, A.T., Barker, V. and Tantrigama, G. 1997. Using integrated coastal management and economics to conserve coastal tourism resources in Sri Lanka. *Ambio* 26(6): 335-344.
- Whitmarsh, L., Nash, N., Upham, P., Lloyd, A., Verdon, J.P. and Kendall, J.-M. 2015. UK public perceptions of shale gas hydraulic fracturing: the role of audience, message and contextual factors on risk perceptions and policy support. *Applied Energy* 160: 419-430.
- Winkler, K.J. and Nicholas, K.A. 2016. More than wine: Cultural ecosystem services in vineyard landscapes in England and California. *Ecological Economics* 124: 86-98.
- Winthrop, R.H. 2014. The strange case of cultural services: limits of the ecosystem services paradigm. *Ecological Economics* 108: 208-214.
- Worm, B., Barbier, E.B., Beaumont, N., Duffy, J.E., Folke, C., Halpern, B.S., Jackson, J.B.C., Lotze, H.K., Micheli, F., Palumbi, S.R., Sala, E., Selkoe, K.A., Stachowicz, J.J. and Watson, R. 2006. Impacts of biodiversity loss on ocean ecosystem services. *Science* 314: 787-790.
- Yoskowitz, D.W., Werner, S.R., Carollo, C., Santos, C., Washburn, T. and Isaksen, G.H. 2016. Gulf of Mexico offshore ecosystem services: relative valuation by stakeholders. *Marine Policy* 66: 132-136.
- Young, W. and Middlemiss, L. 2012. A rethink of how policy and social science approach changing individuals' actions on greenhouse gas emissions. *Energy Policy* 41: 742-747.
- Zoderer, B.M., Tasser, E., Erb, K.-H., Lupo Stanghellini, P.S. and Tappeiner, U. 2016a. Identifying and mapping the tourists' perception of cultural ecosystem services: A case study from an Alpine region. *Land Use Policy* 56: 251-261.
- Zoderer, B.M., Lupo Stanghellini, P.S., Tasser, E., Walde, J., Wieser, H. and Tappeiner, U. 2016b. Exploring socio-cultural values of ecosystem service categories in the Central Alps: the influence of socio-demographic factors and landscape type. *Regional Environmental Change* 16(7): 2033-2044.

Appendix 1:

Best practice and effectiveness criteria frameworks

The next pages present a summary of the best practice and effectiveness criteria frameworks for stakeholder engagement identified in the literature review presented in Chapter 2.

Table A1.1: Summary of best practice and evaluation criteria frameworks identified in a review of the marine and environmental engagement literature, including whether the frameworks are based on theory, empirical evidence, context or other information sources (in chronological order of publication; in the framework headings, (o) indicates original wording and (a) indicates author's adaptation)

Authors	Best practice and evaluation criteria frameworks	Based on
Fiorino 1990	<p>Democratic process criteria for evaluating institutional mechanisms as democratic processes (o)</p> <ol style="list-style-type: none"> 1. Allow for the direct participation of amateurs in decisions 2. Enable citizens to share in collective decision making [shared authority] 3. Provide a structure for face to face discussion over some period of time 4. Offer citizens the opportunity to participate on some basis of equality with administrative officials and technical experts 	Democratic and participation theory
Webler et al. 1995	<p>Three criteria for good public decision making processes (o)</p> <ol style="list-style-type: none"> 1. Fairness 2. Competence 3. Social learning 	Theory and empirical evidence
Moote et al. 1997	<p>Evaluative criteria to assess the application of participatory democracy approaches to public participation (o)</p> <ol style="list-style-type: none"> 1. Efficacy (Groups and individuals interested in or affected by public land decisions report that the resultant plan addresses their needs, concerns, and values, and they will not appeal it.) 2. Representation and access (Everyone who might be affected by or have an interest in the plan is involved, particularly nonactivist, nonaligned members of the public. Access is provided through informal forums that give everyone an opportunity to voice their needs and concerns. Agency representatives strive to make people feel comfortable and respected.) 3. Information exchange and learning (All interests are encouraged to discuss their needs, concerns, and values in informal, multidirectional exchanges. Active dialogue improves everyone's understanding of the range of values, interests, and concerns. Collective revision and refinement of goals, objectives, and decision-making criteria is encouraged.) 4. Continuity of participation (The public is involved continuously throughout all stages of planning and decision making.) 5. Decision-making authority (Decision-making authority is explicitly shared among all participants, with agencies holding no exclusive decision making authority.) 	Theory, empirical evidence and context

Beierle 1998	<p>Six “social” goals for participation (o)</p> <ol style="list-style-type: none"> 1. Educating and informing the public 2. Incorporating public values into decision-making 3. Improving the substantive quality of decisions 4. Increasing trust in institutions 5. Reducing conflict 6. Achieving cost-effectiveness (in a later version, the sixth goal is omitted (Beierle and Cayford 2002)) 	Theory
Chess and Purcell 1999	<p>Public participation rules of thumb (o)</p> <ol style="list-style-type: none"> 1. Clarify goals 2. Begin participation early and invest in advance planning 3. Modify traditional participatory forums to meet process or outcome goals 4. Implement a public participation programme with various forms of public participation 5. Collect feedback on public participation efforts 	Empirical evidence
Innes and Booher 1999	<p>Principles for evaluating consensus building processes (o)</p> <p><u>Process criteria</u></p> <ul style="list-style-type: none"> • Includes representatives of all relevant and significantly different interests • Is driven by a purpose and task that are real, practical, and shared by the group • Is self-organizing, allowing participants to decide on ground rules, objectives, tasks, working groups, and discussion topics • Engages participants, keeping them at the table, interested, and learning through in-depth discussion, drama, humour, and informal interaction • Encourages challenges to the status quo and fosters creative thinking • Incorporates high-quality information of many types and assures agreement on its meaning • Seeks consensus only after discussions have fully explored the issues and interests and significant effort has been made to find creative responses to differences <p><u>Outcome criteria</u></p> <ul style="list-style-type: none"> • Produces a high-quality agreement • Ends stalemate • Compares favourably with other planning methods in terms of costs and benefits 	Theory and empirical evidence

Innes and
Booher 1999
continued

- Produces creative ideas
- Results in learning and change in and beyond the group
- Creates social and political capital.
- Produces information that stakeholders understand and accept
- Sets in motion a cascade of changes in attitudes, behaviours and actions, spinoff partnerships, and new practices or institutions
- Results in institutions and practices that are flexible and networked, permitting the community to be more creatively responsive to change and conflict

Palerm 1999

Principles of public participation in environmental decision making (o)

Romanillos-
Palerm 1998

Stakeholders

- All persons and/or groups who consider themselves affected by a decision should have an opportunity to participate in the decision-making process
- It must be provided for cognitively non-competent actors to be given an opportunity to participate, either directly or through actors representing their interests, with the consent of the actors they are to represent
- The definition of directly affected actors must be based not only on physical and health impacts, but also socio-economic impacts which are a direct result of environmental impacts

Notification

- Notification should be made through media reaching the maximum number of people; use of official gazette is necessary but should not be the sole means of notification
- Directly affected actors should be directly notified
- The notification should be provided in translated form at least for affected nationals and directly affected international actors who are not fluent in the dominant language
- The notification should include background information, venue, time and date of any meetings where the decision will be deliberated, as well as information on where relevant information can be obtained or consulted
- The notification should be made with sufficient time to allow actors to prepare their positions

Time and Venue of Meetings

- The time and venue of any meetings should be accessible to the affected public

Meetings

- Opportunities should be given for a two-way communication process to take place between the different actors
- Sufficient meetings should take place to cover the directly affected area

Palerm 1999
continued

- Translation services should be provided at least for the affected nationals and directly affected international actors not fluent in the dominant language
- The process should be mediated by a neutral party
- An egalitarian atmosphere should be promoted
- All actors should have a right to make objective, normative and subjective claims
- All claims are subject to be questioned and challenged
- Elements which promote social learning should be encouraged
- Independent experts should be allowed to be brought in to help solve conflicting claims
- Efforts should be made to translate subjective claims into their objective and normative components
- Minutes of the meetings should be kept, distributed to the participants and made publicly available
- It should be encouraged to reach a consensus or a fair compromise
- Financial help should be made available for financially resourceless actors
- Participants should agree on rules to solve conflicting claims
- Participants should agree on procedures to determine discourse closure when no consensus is possible
- The public should have a say in defining the public participation process

Decision

- The decision must be justified and make explicit how the arguments presented by the different persons or groups were considered
- The decision should be given to all participants and made publicly available
- The decision should be available in translated form at least for the affected nationals and directly affected international actors not fluent in the dominant language

Information

All relevant information should be made readily available free or at a reasonable cost

Buchy and
Hoverman
2000

Analytical framework: principles of good practice and key attributes of effective public consultation (o)

- | | | | |
|---|--|---|---|
| <p>1. Commitment and clarity</p> <ul style="list-style-type: none"> • Disclosure of interests • Agreed objectives and expectations • Transparency of the process | <p>2. Time and group dynamics</p> <ul style="list-style-type: none"> • Time, timing • Continuity and follow up | <p>3. Representativity</p> <ul style="list-style-type: none"> • Representativity • Equity | <p>4. Transfer of skills</p> <ul style="list-style-type: none"> • Resourcing the process • Quality of information |
|---|--|---|---|

Theory and
empirical
evidence

Rowe and Frewer 2000	Framework for evaluation of public participation methods (normative model) (o)	Theory		
	<p><u>Acceptance Criteria:</u></p> <ul style="list-style-type: none"> • Representativeness: the public participants should comprise a broadly representative sample of the population of the affected public • Independence: the participation process should be conducted in an independent, unbiased way • Early involvement: the public should be involved as early as possible in the process as soon as value judgments become salient • Influence: the output of the procedure should have a genuine impact on policy • Transparency: the process should be transparent so that the public can see what is going on and how decisions are being made <p><u>Process Criteria:</u></p> <ul style="list-style-type: none"> • Resource accessibility: public participants should have access to the appropriate resources to enable them to successfully fulfil their brief • Task definition: the nature and scope of the participation task should be clearly defined • Structured decision making: the participation exercise should use/provide appropriate mechanisms for structuring and displaying the decision-making process • Cost effectiveness: the procedure should in some sense be cost-effective 			
Halvorsen 2001	Assessment criteria for public participation techniques (a)	Theory		
	<ul style="list-style-type: none"> • Participant satisfaction • Comfort and convenience • Deliberative quality 			
McCool and Guthrie 2001	Dimensions of successful public participation in messy natural resource situations (o)	Views of scientists, managers and public		
	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <p><u>Product-oriented measures</u></p> <ul style="list-style-type: none"> • Plan written • Plan implementation • Socially and politically acceptable </td> <td style="width: 50%; vertical-align: top;"> <p><u>Process-oriented measures</u></p> <ul style="list-style-type: none"> • Learning (content, process, interpersonal) • Responsibility (managers responsive, sense of ownership) • Relationship building (between managers and publics, among publics, learning to listen) • Interest representation (being heard) </td> </tr> </table>	<p><u>Product-oriented measures</u></p> <ul style="list-style-type: none"> • Plan written • Plan implementation • Socially and politically acceptable 	<p><u>Process-oriented measures</u></p> <ul style="list-style-type: none"> • Learning (content, process, interpersonal) • Responsibility (managers responsive, sense of ownership) • Relationship building (between managers and publics, among publics, learning to listen) • Interest representation (being heard) 	
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Bond et al. 2004	Framework for public participation in environmental impact assessment (EIA): principles of participation (o)					Theory, empirical evidence and context
	<ul style="list-style-type: none"> • Public participation must take place <i>early</i> in the decision-making process, when alternatives are still open, and ideally from the screening and scoping stages • Public participation must be <i>inclusive</i>, integrating a wide range of stakeholders and taking particular account of minorities • Public participation must be a <i>two-way communication</i> affair, where there is a dialogue between the developer and the public oriented to reach (if possible) consensus and where mutual learning takes place • In order for public participation to be effective, it must be accompanied by real opportunities of <i>access of information</i> as well as <i>provision of key information</i> • Effective public participation should <i>empower</i> stakeholders, i.e. give them a real opportunity to influence the decision making process • Public participation should take into account the <i>values</i> of stakeholders and not be limited to the discussion of factual evidence 					
	Key success factors for public participation in EIA of nuclear power plant decommissioning projects					
	<ol style="list-style-type: none"> 1. Acceptance on behalf of authorities and developers that public participation can be a positive experience [...] creates the right environment for successful public participation 2. Integration of public participation activities within one coherent EIA strategy 3. Extensive participation used before final strategies are adopted can lead to publicly acceptable decommissioning strategies 4. Transparency in the decision making process fosters confidence in the public participation process 5. Provision of sufficient information facilitates public participation 					
Dalton 2005	Framework for involving the public in planning of US MPAs (o)					Theory and empirical evidence
	<ol style="list-style-type: none"> 1. Active participant involvement <ul style="list-style-type: none"> • Opportunity for input • Early involvement • Motivated participants • Influence over the final decision 	<ol style="list-style-type: none"> 2. Decisions based on complete information <ul style="list-style-type: none"> • Best available information exchange • Constructive dialogue • Adequate analysis 	<ol style="list-style-type: none"> 3. Fair decision making <ul style="list-style-type: none"> • Transparency • Representative participation 	<ol style="list-style-type: none"> 4. Efficient administration <ul style="list-style-type: none"> • Cost effective • Accessible • Limited influence of sponsoring agency 	<ol style="list-style-type: none"> 5. Positive participant interactions <ul style="list-style-type: none"> • Positive social conditions • Constructive personal behaviour • Social learning 	

Hartley and Wood 2005	Aarhus Convention practice evaluation criteria (o)	<ul style="list-style-type: none"> • Timing: the participation process begins early enough to ensure that all participants can have an input • Accessibility: the public have access to all documentation relevant to the decision-making process • Information provision: the public are informed where material relevant to the decision-making process can be obtained • Interaction: the participation techniques used allow stakeholders to contribute effectively • Competence: the public have the ability to challenge experts and have access to the necessary information to do this effectively • Influence on decision-making: the outcome of participation influences the decision-making process • Compromise: the process used allows a consensus to be achieved • Fairness: the full range of potentially affected individuals is identified • Communication: the material is presented in a non-technical format and is understandable to lay people • Trust: the process facilitates the development of trust amongst all involved 	Aarhus Convention (UNECE 1998)			
IAP2 2007	Core values for the practice of public participation (o)	<ol style="list-style-type: none"> 1. Public participation is based on the belief that those who are affected by a decision have a right to be involved in the decision-making process. 2. Public participation includes the promise that the public's contribution will influence the decision. 3. Public participation promotes sustainable decisions by recognizing and communicating the needs and interests of all participants, including decision makers. 4. Public participation seeks out and facilitates the involvement of those potentially affected by or interested in a decision. 5. Public participation seeks input from participants in designing how they participate. 6. Public participation provides participants with the information they need to participate in a meaningful way. 7. Public participation communicates to participants how their input affected the decision. 	Theory			
Dietz and Stern 2008	Empirically supported principles of practice for environmental public participation (o)	<table border="0"> <tr> <td> <u>Management practices</u> <ul style="list-style-type: none"> • Clarity of purpose • Commitment to use the process to inform decisions • Adequate resources • Appropriate timing • Implementation focus • Commitment to learning </td> <td> <u>Organising practices</u> <ul style="list-style-type: none"> • Inclusiveness of participation • Collaborative problem formulation and process design • Transparency of process • Good-faith communication </td> <td> <u>Integrating science</u> Iteration between analysis and broadly based deliberation with: availability of decision-relevant information, explicit attention to both facts and values, explicitness about analytic assumptions and uncertainties, independent review, reconsideration of past conclusions </td> </tr> </table>	<u>Management practices</u> <ul style="list-style-type: none"> • Clarity of purpose • Commitment to use the process to inform decisions • Adequate resources • Appropriate timing • Implementation focus • Commitment to learning 	<u>Organising practices</u> <ul style="list-style-type: none"> • Inclusiveness of participation • Collaborative problem formulation and process design • Transparency of process • Good-faith communication 	<u>Integrating science</u> Iteration between analysis and broadly based deliberation with: availability of decision-relevant information, explicit attention to both facts and values, explicitness about analytic assumptions and uncertainties, independent review, reconsideration of past conclusions	Empirical evidence
<u>Management practices</u> <ul style="list-style-type: none"> • Clarity of purpose • Commitment to use the process to inform decisions • Adequate resources • Appropriate timing • Implementation focus • Commitment to learning 	<u>Organising practices</u> <ul style="list-style-type: none"> • Inclusiveness of participation • Collaborative problem formulation and process design • Transparency of process • Good-faith communication 	<u>Integrating science</u> Iteration between analysis and broadly based deliberation with: availability of decision-relevant information, explicit attention to both facts and values, explicitness about analytic assumptions and uncertainties, independent review, reconsideration of past conclusions				

Reed 2008	Best practice stakeholder participation (o)	<ol style="list-style-type: none"> 1. Stakeholder participation needs to be underpinned by a philosophy that emphasises empowerment, equity, trust and learning 2. Where relevant, stakeholder participation should be considered as early as possible and throughout the process 3. Relevant stakeholders need to be analysed and represented systematically 4. Clear objectives for the participatory process need to be agreed among stakeholders at the outset 5. Methods should be selected and tailored to the decision-making context, considering the objectives, type of participants and appropriate level of engagement 6. Highly skilled facilitation is essential 7. Local and scientific knowledges should be integrated 8. Participation needs to be institutionalised 	Theory and empirical evidence					
Portman 2009	Framework for analysis of public participation in marine environmental impact assessments (o)	<table border="0"> <tr> <td> 1. Effective communication <ul style="list-style-type: none"> • Process display • Transparency • Understandability • Accessibility </td> <td> 2. Broad-based inclusion <ul style="list-style-type: none"> • Identification • Fairness • Pro-activity </td> <td> 3. Prioritization <ul style="list-style-type: none"> • Decision making effectiveness • Boundary definition • Cumulative considerations </td> <td> 4. Early three-way learning <ul style="list-style-type: none"> • Flexibility • Openness </td> <td> 5. Alternatives analysis <ul style="list-style-type: none"> • Early identification • Unbiased presentation </td> </tr> </table>	1. Effective communication <ul style="list-style-type: none"> • Process display • Transparency • Understandability • Accessibility 	2. Broad-based inclusion <ul style="list-style-type: none"> • Identification • Fairness • Pro-activity 	3. Prioritization <ul style="list-style-type: none"> • Decision making effectiveness • Boundary definition • Cumulative considerations 	4. Early three-way learning <ul style="list-style-type: none"> • Flexibility • Openness 	5. Alternatives analysis <ul style="list-style-type: none"> • Early identification • Unbiased presentation 	Theory and empirical evidence
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De Stefano 2010	Procedure and perception criteria for proactive information, consultation and active involvement (a)	<p><u>Procedure criteria</u></p> <ul style="list-style-type: none"> • Scope of the process (elaboration of laws, plans/strategy and specific water-related projects) • Scope of the participants (include at least representatives of specified stakeholder groups) • Process design (consultation objective and target audience stated at outset, consultation time table, responses from consultations published before decision) • Capacity building (access to background documents, sufficient time for consideration, financial support for active involvement) <p><u>Perception criteria</u></p> <ul style="list-style-type: none"> • Level of empowerment (adequate, complete, timely information and a real chance to influence the process) 	Context (EU Water Framework Directive)					

MacMillan 2010	Criteria for evaluation of citizen engagement in heritage planning (o)				Empirical evidence and context
	<ol style="list-style-type: none"> 1. Representativeness: How representative of the Nova Scotia population are these participants? More specifically, how inclusive was this consultation process of diverse elements of the Nova Scotia population? 2. Influence: Does the participating citizenry perceive itself to have had an influence on the resulting action (in this case, in formulating the task force recommendations)? 3. Early involvement: Did the members of the public have input early in the process? Have they had an opportunity for subsequent reaction to draft documents? 4. Deliberative opportunities: Have members of the public been able to engage in dialogue and debate with each other and with decision-makers about issues and goals in this area? 5. Transparency: Have members of the public been able to access information and to observe the process throughout its stages? 6. Developing citizenship skills: Has this involvement enhanced knowledge about the issues and general citizenship skills? 				
Saarikoski et al. 2010	Evaluation criteria for effective participatory processes (o)				Theory and empirical evidence
	<ol style="list-style-type: none"> 1. Inclusiveness <ul style="list-style-type: none"> • A broad range of interest groups present • No stakeholder and interest group who is willing to participate is deliberately excluded from the process 	<ol style="list-style-type: none"> 2. Interactiveness <ul style="list-style-type: none"> • Formation of deliberative spaces • Joint problem solving 	<ol style="list-style-type: none"> 3. Fairness <ul style="list-style-type: none"> • All views are heard and respected • An unconstrained process • A free access to all information 	<ol style="list-style-type: none"> 4. Impact <ul style="list-style-type: none"> • Potential to influence decision-making • Reconciliation of different interests • Capacity building 	
Conrad et al. 2011	Fundamental requirements for effective public participation (o)				Public and professional perceptions
	<ul style="list-style-type: none"> • Systematic identification of all stakeholders • Representative and fair involvement of different stakeholders in the process • Early involvement of participants • Clear notification and publicization of the public participation process • Provision of appropriate and adequate information • An informed public • Participation 'culture': people interested in participating • Adequate time and space for exchange of information and views • Timing of participation events 				

Conrad et al.
2011 continued

- Providing varied mechanisms for participation
- Good communication skills
- Ongoing public involvement, not on only a one-off basis
- Transparency
- Accountability
- Consistent practices
- Technical competence to conduct the process
- Scientifically rigorous collection and analysis of data
- Genuine institutional support of the process
- Adequate weighting given to public views in decision making
- Follow-up: public informed of how their input was taken into account
- Independent functioning of the process, free of undue influence

US Institute for
Environmental
Conflict
Resolution
2011

Principles for stakeholder involvement in coastal and marine spatial planning (o)

1. Clear goals and avenues for stakeholder and public participation

- The goals, schedule, and reasons for the planning process are communicated publicly and include a clear map of the CMSP decision process and stakeholder input points.
- Public and stakeholder involvement is developed and implemented in consultation with the stakeholder groups.
- Roles for the regional planning body agencies [...], stakeholders and the public [...] are clearly established.
- Stakeholder involvement is institutionalized [...].

2. Inclusiveness and accessibility

- Stakeholder participation and representation includes the full range of interests in national and regional coastal and ocean planning.
- Barriers to participation are identified and addressed before and during convening of the stakeholders.
- Engagement processes accommodate those stakeholders with varying levels of interest and resources through a variety of effective engagement mechanisms.

3. Transparency and openness

- Information about the decision process and supporting information for the plan are publicly available for review and comment.
- Stakeholders have access to the regional planning body through consistent and appropriate communication channels.
- Decision makers are open to learning from stakeholders and take their ideas into consideration.
- Decision makers provide feedback to stakeholders about how their input has been taken into consideration and describe how that input has shaped interim and final products.

Theory and
empirical
evidence

- US Institute for Environmental Conflict Resolution 2011 continued
4. Informed engagement
- Quality, informed discussion and engagement occur throughout all phases of the CMSP process.
 - Stakeholders and planners engage in a process of mutual education to improve overall knowledge about the process and subject matter, and to enhance substantive discussions.
 - Interactive and informed discussions take place among agencies, regional planning bodies, and stakeholders.
 - Technical information is provided in an appropriate format for stakeholder and public use.
 - Stakeholders have access to technical experts and input into scientific and technical aspects of the planning process.
 - Stakeholder knowledge and data is evaluated for possible inclusion into the plan.
5. Timeliness
- Participation occurs at a time that allows stakeholder input to be used in the development of the products of the planning process.
 - Stakeholders have sufficient notice of meetings and advance materials to realistically and effectively participate.
6. Process integrity
- Stakeholders have confidence in the value of the process.
 - The planning body and the stakeholders hold themselves accountable for meaningful participation in the CMSP process.
7. Adaptability and flexibility
- As needs and issues evolve, additional options for stakeholder engagement are developed.
 - Engagement methods take into consideration unique regional and local features.
 - Stakeholder processes are monitored and evaluated on a regular basis.

Flannery and Ó Cinnéide 2012

Criteria to evaluate stakeholder participation in the Channel Islands National Marine Sanctuary advisory council (o)

Process criteria

- Self or co-design of process
- Shared purpose
- Equality
- Interdependency
- Representation and participation (diverse and inclusive, legitimacy, networked)
- Deliberative decision making and constructive dialogue
- Effective process management

Outcome criteria

- High-quality agreement
- Reciprocal relationships and new networks
- Network power
- Increased institutional capacity
- Learning (changes in attitudes and practices)

Collaborative planning theory

Ran 2012	<p>Public participation evaluation model (process and outcome criteria) (a)</p> <ul style="list-style-type: none"> • Equity (fair, accessible, unbiased) • Effectiveness (opportunity for input and influence, environmentally and socially sound outcome) • Efficiency (efficient use of time, money and resources) • Social learning (solidarity, learning, capacity building) 	Germain et al. 2001
Mah and Hills 2014	<p>Normative framework for participation (a)</p> <ol style="list-style-type: none"> 1. Content parameters: <ul style="list-style-type: none"> • Accuracy (provision of precise descriptions) • Comprehensiveness (exchange of information on knowledge, attitudes, values, practices and perceptions) • Objectivity (provision of balanced and unbiased information) 2. Process parameters: <ul style="list-style-type: none"> • Timeliness (early involvement, adequate time for consideration, discussion and challenge of information) • Inclusiveness (all stakeholders) • Transparency (proactive provision of meaningful and accessible information, openness and accountability) • Responsiveness (no predetermined decisions, open, systemic, integrated and adaptive approach) • Empowerment (delegation of authority, resource sharing) • Deliberation (encouragement and facilitation of discussion, debate and reflection of/on information and each other's views) 3. Outcome parameters: <ul style="list-style-type: none"> • Improvement of the substantive quality of decisions (local knowledge, alternative solutions and wide range of interests considered) • Policy legitimacy (based on moral and process legitimacy) • Trust enhancement (trust and confidence in institutions, mutual respect) 	Theory and empirical evidence
McDonald and Rigling-Gallagher 2015	<p>Recommendations for successful negotiations (o)</p> <ol style="list-style-type: none"> 1) Representative participation 2) Shared learning 3) Repeated interactions 4) Facilitated negotiations 5) Consensus-based negotiations 	Theory and empirical evidence

References

- Beierle, T.C. 1998. *Public participation in environmental decisions: an evaluation framework using social goals*. Resources for the Future, discussion paper 99-06.
- Beierle, T.C. and Cayford, J. 2002. *Democracy in practice. Public participation in environmental decisions*. Washington, DC, USA: Resources for the Future.
- Bond, A., Palerm, J. and Haigh, P. 2004. Public participation in EIA of nuclear power plant decommissioning projects: a case study analysis. *Environmental Impact Assessment Review* 24: 617-641.
- Buchy, M. and Hoverman, S. 2000. Understanding public participation in forest planning: a review. *Forest Policy and Economics* 1: 15-25.
- Chess, C. and Purcell, K. 1999. Public participation and the environment: do we know what works? *Environmental Science and Technology* 33(16): 2685-2692.
- Conrad, E., Cassar, L.F., Christie, M. and Fazey, I. 2011. Hearing but not listening? A participatory assessment of public participation in planning. *Environment and Planning C: Government and Policy* 29: 761-782.
- Dalton, T.M. 2005. Beyond biogeography: a framework for involving the public in planning of U.S. Marine Protected Areas. *Conservation Biology* 19(5): 1392-1401.
- De Stefano, L. 2010. Facing the water framework directive challenges: a baseline of stakeholder participation in the European Union. *Journal of Environmental Management* 91: 1332-1340.
- Dietz, T. and Stern, P.C. (Eds.) 2008. *Public participation in environmental assessment and decision making*. Panel on Public Participation in Environmental Assessment and Decision Making, Committee on the Human Dimensions of Global Change. Division of Behavioral and Social Sciences and Education, National Research Council. Washington, DC, USA: The National Academies Press.
- Fiorino, D.J. 1990. Citizen participation and environmental risk: a survey of institutional mechanisms. *Science, Technology and Human Values* 15(2): 226-243.
- Flannery, W. and Ó Cinnéide, M. 2012. Stakeholder participation in marine spatial planning: lessons from the Channel Islands National Marine Sanctuary. *Society and Natural Resources: an International Journal* 25(8): 727-742.
- Germain, R.H., Floyd, D.W. and Stehman, S.V. 2001. Public perceptions of the USDA Forest Service public participation process. *Forest Policy and Economics* 3: 113-124.
- Halvorsen, K.E. 2001. Assessing public participation techniques for comfort, convenience, satisfaction, and deliberation. *Environmental Management* 28(2): 179-186.
- Hartley, N. and Wood, C. 2005. Public participation in environmental impact assessment – implementing the Aarhus Convention. *Environmental Impact Assessment Review* 25: 319-340.
- IAP2 2007. *IAP2 Core Values of Public Participation*. International Association for Public Participation.

- Innes, J.E. and Booher, D.E. 1999. Consensus building and complex adaptive systems. *Journal of the American Planning Association* 65(4): 412-423.
- MacMillan, C.M. 2010. Auditing citizen engagement in heritage planning: the views of citizens. *Canadian Public Administration* 53(1): 87-106.
- Mah, D.N. and Hills, P. 2014. Participatory governance for energy policy-making: a case study of the UK nuclear consultation in 2007. *Energy Policy* 74: 340-351.
- McCool, S.F. and Guthrie, K. 2001. Mapping the dimensions of successful public participation in messy natural resources management situations. *Society and Natural Resources: an International Journal* 14(4): 309-323.
- McDonald, S.L. and Rigling-Gallagher, D. 2015. Participant perceptions of consensus-based, marine mammal take reduction planning. *Marine Policy* 61: 216-226.
- Moote, M.A., McClaran, M.P. and Chickering, D.K. 1997. Theory in practice: applying participatory democracy theory to public land planning. *Environmental Management* 21(6): 877-889.
- Palerm, J.R. 1999. Public participation in environmental decision making: examining the Aarhus Convention. *Journal of Environmental Assessment Policy and Management* 1(2): 229-244.
- Portman, M. 2009. Involving the public in the impact assessment of offshore renewable energy facilities. *Marine Policy* 33: 332-338.
- Ran, B. 2012. Evaluating public participation in environmental policy-making. *Journal of US-China Public Administration* 9(4): 407-423.
- Reed, M.S. 2008. Stakeholder participation for environmental management. A literature review. *Biological Conservation* 141: 2417-2431.
- Romanillos-Palerm, J.R. 1998. *Public participation in environmental impact assessment: an empirical-theoretical evaluative framework*. PhD thesis, Imperial College, University of London.
- Rowe, G. and Frewer, L.J. 2000. Public participation methods: a framework for evaluation. *Science, Technology and Human Values* 25(1): 3-29.
- Saarikoski, H., Tikkanen, J. and Leskinen, L.A. 2010. Public participation in practice – assessing public participation in the preparation of regional forest programs in Northern Finland. *Forest Policy and Economics* 12: 349-356.
- UNECE 1998. *Convention on access to information, public participation in decision-making and access to justice in environmental matters, Aarhus Convention*. United Nations Economic Commission for Europe.
- US Institute for Environmental Conflict Resolution 2011. *Principles for stakeholder involvement in coastal and marine spatial planning*. U.S. Institute for Environmental Conflict Resolution, Morris K. Udall and Steward L. Udall Foundation.
- Webler, T., Kastenholz, H. and Renn, O. 1995. Public participation in impact assessment: a social learning perspective. *Environmental Impact Assessment Review* 15: 443-463.

Appendix 2



Working paper: International review of the application of Ecosystem Service Valuation in marine governance

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Abstract

This working paper presents the key findings of an international review and analysis of existing documentation of the application of Ecosystem Service Valuation (ESV) in marine governance. The review identified 44 case studies across the Caribbean and Central America, South and West Pacific, the United States of America, Europe and Africa for which there was evidence of actual or potential ESV application in marine governance, policy and decision making processes. The analysis revealed interesting insights on the geographic and thematic distribution of marine ESV applications, the ecosystem services that the ESV studies assessed and the valuation methods that were used. Further, it identified intended purposes and actual applications of ESVs as well as the barriers and enabling conditions for successful ESV use and influence. Overall, it appears that the application of ESV in marine policy and decision making contexts is still limited in extent and poorly documented in the literature. The findings indicate that the VALMER project, with its six case studies, has the potential to significantly add to the practical and academic expertise on the application of the Ecosystem Service approach in marine policy making, planning and management, particularly for the European context.

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1 Introduction

Marine ecosystems are increasingly threatened and suffering from degradation, largely as a result of poorly informed decisions about resource use and exploitation that do not consider fully the impacts on the marine environment or the interconnectedness of marine ecosystems. To halt further degradation and enable marine ecosystems to recover, a better informed, ecosystem based approach to the management of marine activities and resources is necessary. The assessment and valuation of ecosystem services, the direct and indirect benefits of ecosystems for human wellbeing, is a key element in facilitating this ecosystem approach (MEA 2005). Ecosystem Service Valuation (ESV), in particular, can potentially be a powerful tool to support ecosystem based management and informed decision making in marine governance (Kushner et al. 2012, Laurans et al. 2013, Slootweg and van Beukering 2008). It can contribute to better informed, holistic, transparent and participatory decision making about marine ecosystem and resource management by:

- Increasing the transparency of human-ecosystem interactions (Rea et al. 2012, Slootweg and van Beukering 2008);
- Integrating ecosystem, economic and social considerations in decision making (Pittock et al. 2012, Slootweg and van Beukering 2008);

- Facilitating the identification of relevant stakeholders and their engagement in decision making (Slootweg and van Beukering 2008);
- Providing better understanding of the distribution of costs and benefits between stakeholders (Cesar and Chong 2004, Slootweg and van Beukering 2008);
- Reflecting the social importance and value of marine ecosystem services (EA 2009, Laurans et al. 2013, Liu et al. 2010);
- Providing a common denominator/language for comparing the costs and benefits of different policy or management alternatives, different ecosystem services, as well as different social, economic and ecological issues (EA 2009, Hoelzinger and Dench 2011, Rea et al. 2012, Pittock et al. 2012);
- Demonstrating the value of ecosystem conservation (UNEP 2006);
- Revealing the values that are implied in any decision and that, if not made explicit, might be overlooked by decision makers (Barde and Pierce 1991, Schuijt 2003).

The literature points out that there is growing interest in the use of ESV as a tool for marine governance (Kushner et al. 2012, Laurans et al. 2013b, Pascal et al. 2012). At the same time, there is limited understanding whether and how ESV is currently being used in the marine context and what kind of influence it is potentially having on marine decision making (Kushner et al. 2012, Pearce and Seccombe-Hett 2000, Slootweg and van Beukering 2008). To address this gap in understanding, an extensive international review and analysis of existing studies that document the application of ESV in marine governance was conducted. The aim was to explore the application of ESV in international marine governance and to assess the conditions of use and influence. The review addressed three key research questions:

- 1) To what extent is ESV being used in marine governance?
- 2) Where, how and for what is ESV being used in marine governance?
- 3) What are the barriers and enablers that are hindering or supporting the use and influence of ESV in marine governance?

2 Methods

The review covered a broad range of literature including peer reviewed papers, grey literature and project documentation (see Appendix I for a list of references). Web of Knowledge, ScienceDirect and Google Scholar were searched using combinations of the following terms: 'ecosystem services', 'assessment', 'valuation', 'marine', 'coastal', 'policy', 'governance', 'decision making' and 'case study'. When a case of ESV application in governance was identified, Google was used to search for further grey literature or project documentation. Selection criteria for the case studies were:

- Marine or coastal ecosystems, including mangrove forests¹
- Evidence of actual or potential application of ESV in or influence on decision making and governance processes

For each case study a template with a set of parameters was compiled to allow systematic collection of information, including:

- Geographic location
- Topic/sector
- Scale of project/policy/plan
- Valuation context
- Valuation method
- Ecosystem services
- Policy use and influence
- Barriers and enabling conditions
- Who commissioned the ESV
- Who conducted the ESV

A thematic analysis approach was used to analyse the data. The information for each parameter was categorised and the case studies were compared to identify patterns, frequent and common themes as well as differences and similarities.

¹ One wetland case study was included as it provided an interesting addition to the spectrum of ESV applications identified by the review.

3 Results and analysis

A total of 44 case studies were identified for which there was evidence of actual or potential ESV use in or influence of marine governance. The following analysis presents key findings of the review regarding the geographic distribution and thematic context of the case studies, the ecosystem services assessed in the ESV studies and the associated valuation methods. The analysis further looks at the design and applications of the ESV studies, as well as the barriers and enablers that hindered or supported the use and influence of ESV in the case studies. These findings provide answers to the three research questions that were introduced above.

3.1 Geographic distribution

Two thirds of the 44 case studies were located in the Caribbean and Central America (12) and the South and West Pacific (14), with focus on coral reefs and mangrove ecosystems. One factor behind the large number of case studies from these two regions is the high dependence of Caribbean and Pacific states on their marine resources which provide subsistence and income from tourism, fisheries and raw materials (Kushner et al. 2012). Nine case studies were located in the United States of America (USA), eight of which had clear evidence of influence on marine policy, laws and regulations. This reflects the USA's standing tradition of using environmental valuation in project and regulatory appraisal (Liu et al. 2010, Navrud and Pruckner 1997).

Table 1: The 44 case studies and their use or influence of ESV, grouped by geographic location.

Case study	ESV use/influence	References
South and West Pacific		
Navakavu Locally Managed Marine Area, Fiji	Used to inform local communities and support local management decisions	Laurans et al. 2013b O'Garra 2012 Pascal et al. 2012
Fiji	Led to a government decision for temporary moratorium on mangrove reclamation	Lal 2003
Kiribati	Supported government efforts to phase out beach mining	Laurans et al. 2013b Pacific News Center 2012
Majury Atoll, Marshall Islands	Used to examine feasibility of aggregate mining alternatives	McKenzie et al. 2006
New Caledonia	Used to influence budget allocations; used to determine compensatory measures in Environmental Impact Assessments; used to inform decision making	Laurans et al. 2013b Pascal et al. 2012
Saipan, Northern Mariana Islands	No record of use/influence but potentially attributable to policy makers' increased understanding of the economic importance of coral reefs	Laurans et al. 2013b Pascal et al. 2012 van Beukering et al. 2006
Tubbataha Reefs National Marine Park, Philippines	Supported establishment of two-tiered fee structure for sustainable financing of Marine Park	Tongson & Dygico 2004
Olango Island, Philippines	Justified investment in ecosystem management and a Marine Protected Area; justified establishment of another Marine Protected Area; justified user fee increase; encouraged eco-tourism development	Kushner et al. 2012 Laurans et al. 2013b White & Cruz-Trinidad 1998 White et al. 2000a White et al. 2000b
Palawan Island, Philippines	Supported Marine Protected Area establishment; led to ban of destructive activity (logging); encouraged eco-tourism development	Cesar 2000 Hodgson & Dixon 2000 Kushner et al. 2012
Puerto Princesa, Palawan Island, Philippines	Led to ban of destructive activity (shrimp aquaculture) and restoration of mangrove ecosystem	Farley et al. 2009 Kushner et al. 2012
Pagbilao mangrove forest, Philippines	Encouraged private sector involvement and investment in mangrove conservation	Gilbert & Janssen 1998 Janssen & Padilla 1996 Janssen & Padilla 1999 Kushner et al. 2012 van Beukering et al. 2008

Solomon Islands	Supported national government in developing a coral management plan; led some coral harvesters to consider coral farming as an alternative	Albert et al. 2012a Albert et al. 2012b
Sri Lanka	Led to ban of destructive activity (coral mining); influenced the development of national strategies to promote conservation	Kushner et al. 2012 White et al. 1997
Vanuatu	Used to highlight how conservation helps local/regional economies and people that depend on marine ecosystems; helped put forward benefits of conservation to local communities; used as a tool for community decision making about trade-offs between short and medium term goals	Laurans et al. 2013b Pascal 2011 Pascal et al. 2012
Caribbean and Central America		
Andros Island, Bahamas	Justified ecosystem protection; informed reef damage estimates; used to raise awareness of economic benefits of conservation among decision makers and the public	Hargreaves-Allen 2010 Kushner et al. 2012
Gladden Spit Marine Reserve, Belize	Used to justify funding for Marine Reserve management; resulted in increased donations for Marine Reserve; helped facilitate a historically strained dialogue with stakeholders (fishers and tour operators)	Hargreaves-Allen 2008 Kushner et al. 2012
Hol Chan Marine Park, Belize	Justified user fee increase; helped facilitate the dialogue with stakeholders	Kushner et al. 2012 Trejo 2005
Belize	Informed a court ruling on fines in a ship grounding case; led to a government decision to enact new national fisheries regulations; supported a successful NGO and public campaign to prevent offshore drilling	Cooper et al. 2008 Kushner et al. 2012
Térraba-Sierpe National Wetland Reserve, Costa Rica	Informed the Wetland Reserve management plan	Earth Economics 2010 Kushner et al. 2012
La Caleta Marine Reserve, Dominican Republic	Justified user fee increase	Kushner et al. 2012 Wielgus et al. 2010
Cancun, Mexico	Justified user fee introduction	Kushner et al. 2012 Rivera-Planter & Muños-Piña 2005
Bonaire National Marine Park, Netherlands Antilles	Justified and supported the design, introduction and increase of a user fee system; improved management and financial sustainability of Marine Park; helped facilitated the dialogue with stakeholders; set an example on user fee systems for other Marine Parks	Slootweg & van Beukering 2008 Thur 2010 van Beukering et al. 2008
Man of War Shoal Marine Park, St. Maarten	Led to government recognition of the economic importance of coral reefs; used by government to support Marine Park establishment; used to sue for damages caused by boat sinking in the Marine Park	Bervoets 2010 Kushner et al. 2012 World Resources Institute 2008
St. Lucia	Used for advocacy	Kushner et al. 2012

Trinidad and Tobago	Used to engage decision makers	Kushner et al. 2012
Jamaica	Used to educate the general public and for advocacy purposes	Kushner et al. 2012
USA		
Exxon Valdez oil spill, Prince William Sound, Alaska USA	Informed a court ruling on fine for environmental damage; led to reframing of national policy, new safety norms, legislation and regulations	Brown 1992 Carson & Hanemann 1992 Carson et al. 1992 Carson et al. 2003 Duffield 1997 Liu et al. 2010 McDowell Group 1990 Slootweg & van Beukering 2008 van Beukering et al. 2008
Florida USA	Helped justify a trust fund to buy up beaches and provide public access	Bell & Leeworthy 1986 Kushner et al. 2012
Florida Keys National Marine Sanctuary, Florida USA	No record of use/influence but provided potential justification for a user financed marine protection programme	Bhat 2003
Florida Keys National Marine Sanctuary, Florida USA	Supported the design of regulatory alternatives for the Marine Sanctuary; led to increased regulatory compliance and lower enforcement costs; supported development of cooperative management processes with stakeholders	Kushner et al. 2012 Leeworthy & Wiley 2000
Florida USA	Supported introduction of new state wide fishing licence scheme	Bell 1982 Kushner et al. 2012
Florida USA	Used to justify revision of beach nourishment plans and government investment	Johns et al. 2001 Kushner et al. 2012
Florida Keys National Marine Sanctuary, Florida USA	Supported the design and introduction of an escalating penalty system for reef damage	Cesar et al. 2002 Cesar & van Beukering 2004 Kushner et al. 2012 Laurans et al. 2013b van Beukering & Cesar 2004 van Beukering & Cesar 2010 van Beukering et al. 2004 van Beukering et al. 2008

Hawaii USA	Supported the design and introduction of an escalating penalty system for reef damage	Cesar et al. 2002 Cesar & van Beukering 2004 Kushner et al. 2012 Laurans et al. 2013b van Beukering & Cesar 2004 van Beukering & Cesar 2010 van Beukering et al. 2004 van Beukering et al. 2008
Big Island and Maui, Hawaii USA	Supported the establishment of a voluntary private sector reef conservation fund by dismissing initial concerns about negative impacts on businesses	Cesar et al. 2002 Kushner et al. 2012 Laurans et al. 2013b van Beukering & Cesar 2004 van Beukering et al. 2004 van Beukering et al. 2008
Europe		
Gwen Finch Wetland Reserve, UK	Provided post project justification of investment in ecosystem restoration and Wetland Reserve establishment	Hoelzinger and Dench 2011
Lyme Bay, UK	Contributed to decision for establishment of protected area	Rees et al. 2010
Blackwater Estuary, UK	No record of use/influence but potential to inform coastal management policy appraisal and managed realignment strategy	Luisetti et al. 2008 Shepherd et al. 2007
Humber Estuary, UK	No record of use/influence but potential to inform coastal management policy appraisal and managed realignment strategy	Andrews et al. 2006 Turner et al. 2007
Rotterdam Port, Netherlands	Informed Cost-Benefit Analysis of port development, though extent of influence unclear as the final decision was a political decision	Schuijt 2003
Dutch Wadden Sea, Netherlands	Contributed to the debate about granting permission for gas drilling, increasing policy makers' awareness of potential economic losses if drilling negatively affected ecosystem services, contributing to decisions to delay and set strict conditions for drilling	Runhaar & van Nieuwaal 2010 Schuijt 2003 Slootweg & van Beukering 2008 Turnhout et al. 2008 van Beukering et al. 2008
Wareham, UK	Experimental study as part of coastal management policy appraisal and managed realignment strategy	Defra 2007 Slootweg & van Beukering 2008 van Beukering et al. 2008
UK	No record of use/influence but potentially used as evidence to support and lobby for the designation of a Marine Protected Area network	Fletcher et al. 2012
Africa		
Mombasa Marine National Park, Kenya	No record of use/influence but potential support of government plans to raise Marine Park entry fees and potential justification of Marine Park funding	Liu et al. 2010

In Europe, on the other hand, the use of ESV in environmental policy making is a much more recent development (Navrud and Pruckner 1997, Pearce and Seccombe-Hett 2000). In the eight European case studies, only three ESV studies appeared to have had limited application or influence in marine governance, albeit limited. These were the Lyme Bay case study in the United Kingdom (UK) as well as the Rotterdam Port and Dutch Wadden Sea case studies in the Netherlands (see Table 1). In the European case studies the ESV focus was on estuaries and coastal subtidal ecosystems.

3.2 Case study thematic context

The exploration of the context of the reviewed case studies revealed nine broad themes (Table 2). The most prominent theme across all geographic regions was marine conservation and resource management, related to Marine Protected Areas (MPA) or ecosystems. Other topics were more geographically focussed. In the Caribbean, financing of MPA management was a key interest. In several Caribbean case studies ESV was used to determine and introduce MPA user fees, with prominent success stories such as the Bonaire Marine Park setting examples for other MPAs across the region. Management and regulation of marine resource exploitation was a frequent topic in the South and West Pacific. Here, ESV was applied, among other things, to inform management and regulatory decisions concerning shrimp aquaculture in mangrove forests, aggregate dredging and coral mining. In Europe, key interests were Environmental Impact Assessments of development projects as well as coastal and flood protection, using ESV to inform coastal risk management policy appraisals and managed realignment strategies. Lastly, all three cases in which ESV was used to determine penalty or compensation payments were from the USA, a country with a strong litigation culture. The majority of the 44 case studies had a small geographic or spatial scale focus, such as MPAs, small islands or specific habitats.

Table 2: Distribution of the 44 case studies across nine broad thematic contexts of ESV application in marine governance, including the types of ecosystems that were assessed under each theme.

Topic	Case studies	Caribbean	South Pacific	USA	Europe	Africa	Ecosystems
Marine conservation and resource management	18	6	5	4	3		Reefs; mangroves; beaches; coastal subtidal ecosystems
MPA/ecosystem management financing	6	4	1			1	Reefs
Marine resource exploitation	6		4	1	1		Reefs; coastal subtidal ecosystems
Marine economic benefits for small island states	5	2	3				Reefs; mangroves
Coastal/flood management	3				3		Coastal subtidal ecosystems; estuaries
Penalty and compensation payment	3			3			Coastal ecosystems; reefs
Public access to beaches	1			1			Beaches
Land reclamation and compensation area	1				1		No info
Terrestrial resource use impacts	1		1				Reefs

3.3 Ecosystem services

The case studies were found to cover a broad range of cultural, provisioning, regulating and supporting services (following the classification of the Millennium Ecosystem Assessment (MEA 2005); Table 3). The most frequently assessed services were tourism and recreation (cultural), fisheries (provisioning) and coastal protection (regulating). In the majority of case studies (29), more than one ecosystem service was assessed; the ESV studies that valued only one ecosystem service focused on tourism and recreation (11) (for the remaining four case studies no information on the assessed ecosystem services was given in the available literature).

Table 3: Ecosystem services assessed in the 44 case studies, following the Millennium Ecosystem Assessment classification, including the number of times that elements of the respective ecosystem service categories were valued in the case studies.

supporting	regulating	provisioning	cultural	biodiversity
nutrient storage primary productivity soil formation habitat	coastal protection water quality carbon sequestration climate regulation denitrification	fisheries construction materials bio prospecting coral trade aquaculture	tourism + recreation research + education aesthetics cultural heritage subsistence bequest	
supporting unspecified		provisioning unspecified	cultural unspecified	
14x valued	27x valued	23x valued	47x valued	8x valued

3.4 Valuation methods

Tourism and recreation were found to be most frequently valued using contingent valuation and market price indicators such as revenues, income, or similar. When looked at separately, recreation was mostly valued with contingent valuation. For tourism, which can be more easily linked to economic activities than recreation, both contingent valuation and market price indicators related to tourism spend were used. Market price indicators were also identified as the main method for fisheries valuations. Coastal protection on the other hand, being an indirect use of ecosystems, was valued with methods such as avoided damages or replacement cost.

Table 4 gives an overview of the valuation methods that were used for ESV in the case studies. For 17 case studies no information about valuation methods was found. In the remaining cases, 15 ESV studies applied multiple valuation methods and 12 used only one method (mostly contingent valuation or benefits transfer) (Table 5).

Table 4: Valuation methods used in the 44 case studies.

Valuation method	Valuation method specific	Case studies
Market price methods	Market price indicators	11
	Avoided damages	4
	Damage assessment	2
	Replacement cost	1
Stated preference	Contingent valuation	13
	Choice experiment	2
	Willingness To Pay surveys	2
Benefits transfer		10
Surveys, interviews		6
Revealed preference	Hedonic pricing	3
	Travel cost	2

Table 5: Overview of single- and multiple method/ecosystem service ESVs in the 27 case studies for which information about valuation methods was found.

		Valuation methods	
		Single	Multiple
Ecosystem services	Single (Tourism/ recreation)	5 4x contingent valuation Willingness To Pay survey	3 Contingent valuation + surveys/interviews + travel cost + market price indicators
	Multiple	7 4x Benefits transfer Contingent valuation Choice experiment Market price indicators	12

3.5 Design and use of ESV

A key focus of the review and analysis was the question for what purpose ESV studies have been designed and used in the marine context. A previous review by Laurans et al. (2013) categorised ESV applications into:

- a) Informative: to support policy and decision making in general
- b) Decisive: to inform a specific decision, legislation, regulation, project
- c) Technical: to design economic instruments, for example fees, taxes

In the 44 case studies of this review, over half of the ESVs could be categorised as 'informative' in design (24) as well as in use (28). These were designed and used for

purposes such as support of policy and management decisions or to provide political justification for the implementation of potentially controversial decisions like the establishment of an MPA (Tables 6-8). About one third of the case study ESVs were designed and used for one single purpose (13), six were designed and used for multiple purposes; five had a single design purpose but multiple applications and in one case the ESV was designed for multiple purposes but used for only one; for the remaining case studies the available information did not allow a comparison between design purpose and application. Interestingly, in approximately 50 per cent of cases the end use of the ESV study differed from the original purpose the study was designed for (Table 6).

Table 6: Classification of the case study ESVs according to their original design purpose and actual application.

ESV designed/used to...		Designed	Used
Informative	Support policy and management	15	10
	Pre decision/project/investment justification (conservation)	3	14
	Post decision/project/investment justification (conservation)	/	1
	Awareness/information	2	4
	Stakeholder dialogue	/	3
	Cooperative management with stakeholders	/	1
	Maintain/leverage support	3	/
	Advocacy, lobbying	1	4
	Assessment	5	1
	General application/validity of ESV	2	1
	Reframing of policy	3	3
	Encourage investment or business	/	3
	Support private sector initiative	/	1
Decisive	Funding decision	1	1
	Court ruling	1	3
	Specific regulation, legislation, policy, project, plan, etc.	5	14
	Decision between alternatives	2	/
Technical	Damage estimate	/	1
	Fees	4	3
	Fines	1	5

The differences were both within and between ESV application categories as well as additions of unplanned uses. For example, in 11 case studies the ESV studies were used to inform a specific decision without having been designed for this decision. Similarly, two originally informative ESV studies were also used to guide technical

decisions about fines and damage estimates. This indicates that the original design and purpose of an ESV study might not necessarily be a deciding factor in determining how an ESV is used and what kind of influence it can have.

The following Tables (7, 8) give a flavour of the different purposes, uses and influences of the 44 ESVs that were identified in the literature. The original design purposes in particular were often very case study specific, with only seven themes being present in more than two case studies. These included providing guidance for MPA user fee systems and political justification of MPAs, as well as more general objectives such as identifying, assessing and informing governments about conservation and financing opportunities or MPA effectiveness (Table 7). In about one third of the case studies (13) the ESVs were designed to inform and support some element of government policy or decision making, ranging from MPA establishment and financing to resource use and coastal management policies.

With regard to the documented actual use and influence of the ESVs in the 44 case studies, five areas of application appeared to be particularly frequent: 1) ten ESVs supported and improved the management and financing of MPAs, 2) ten ESVs led to or supported government decisions to prevent ecosystem damaging resource exploitation, 3) in eight case studies the ESVs were used for information, awareness raising, advocacy and campaigning, 4) seven ESVs supported decisions for ecosystem conservation such as the establishment of MPAs, and 5) six ESVs were used in decisions about ecosystem damage penalties (see Table 8 for further details and areas of application).

Table 7: List of identified purposes that the 44 ESVs were designed for.

Purpose	Case studies
Guide user fee systems for sustainable financing of MPA management	5
Provide decision makers with information and tools to advance the national marine conservation agenda	5
Identify/assess and inform government on opportunities for marine conservation	4
Identify and inform government/local communities of the economic value and importance of marine ecosystems	4
Identify/assess and inform government on opportunities for financing of marine management and conservation	3
Assess MPAs (effectiveness, public investment appraisal)	3
Provide policy makers and managers with justification for marine conservation/MPA establishment	3
Support/inform MPA management plans/ecosystem management	2
Assess marine resource alternatives	2
Inform reorientation/appraisal of government policies/strategies for coastal management (managed realignment)	2
Practical guidance on the use of different valuation approaches for policy and management decision making	2
Maintain government support and funding for MPA	1
Support ecosystem restoration plan	1
Determine damage claims	1
Maintain public support for marine conservation/MPA (in the face of opposition)	1
Support government decision to stop a destructive activity	1
Support government policy evaluation on ecosystem management alternatives	1
Facilitate better consideration of marine ecosystems in land and resource planning and conservation	1
Inform a national government infrastructure project	1
Provide a baseline for the status of marine ecosystem services	1
Communicate the importance of marine ecosystems	1
Gain additional support for marine ecosystem protection priorities	1
Foster local MPA stewardship	1
Contradict an industry EIA and lobby government against a potentially detrimental activity	1
Lobby government for designation of MPA network	1

Table 8: List of documented uses/influences of the 44 ESVs.

Use/influence	Case studies
Supported/improved MPA management and/or financing	10
Facilitated the dialogue and cooperation between MPA managers and stakeholders	
Supported the introduction/increase of MPA user fees	
Led to increased regulatory compliance and lower enforcement costs in MPA	
Improved the MPA management plan	
Led to/supported resource management decision to prevent ecosystem damage	10
Led to/supported decision to phase out/ban destructive resource use	
Informed the assessment of alternative resource sources	
Led to the decision to review existing beach nourishment plans	
Contributed to the permitting delay and strict conditions for a potentially detrimental resource use	
Contributed to the development of a national coral management plan	
Used for information, awareness raising of decision makers and/or the public and for advocacy/campaigning	8
Used for awareness raising about the economic benefits of ecosystem services and conservation	
Used for advocacy	
Informed the political and legal debate in a national planning process	
Informed a civil society campaign against detrimental resource use	
Let to/supported decision for ecosystem conservation	7
Justified/supported decision for ecosystem conservation or MPA establishment	
Supported decision for ecosystem restoration	
Provided post project justification for ecosystem restoration and reserve establishment	
Supported ecosystem damage assessment and setting of fines	6
Supported ecosystem damage assessment	
Informed court decision on fines for ecosystem damage	
Supported introduction of an ecosystem damage penalty system	
Informed/supported the design of policies, regulations, management tools (fees, penalty systems, etc.)	5
Informed/supported the design of MPA user fee system	
Informed/supported the design of regulatory alternatives for MPA	
Informed/supported the design of ecosystem service damage penalty system	
Led to/supported the introduction of new regulations, legislation, policies, etc.	4
Led to new national safety norms, legislations, regulations	
Supported the introduction of a new state license requirement	
Led to development of national coral management plan	
Helped advance the national conservation agenda	3
Supported national ecosystem conservation and sustainable resource policies	
Influenced the development of national strategies to promote conservation	
Led to investment in MPA management	2
Supported/improved local/community based management	2
Led to/supported government investment in projects to enhance public recreational ecosystem services	2
Encouraged private sector involvement and investment in ecosystem management/conservation	2
Informed budget decisions	1
Encouraged eco-tourism development	1
Informed national infrastructure planning process	1
Informed policy appraisal process	1
Indirect influence: precedent for similar applications of ESV	1

3.6 Barriers and enablers

One of the key objectives of this review was to identify conditions that enable or hinder successful application of ESV as a tool in marine governance. For 33 case studies, the available literature documented specific conditions that hindered or supported the use or influence of ESV. These documented barriers and enablers could be categorised into:

- Contextual factors (regarding the general context of the decision making process in which ESV was applied);
- Methodology and procedure (the design, implementation and communication of ESV studies);
- Valuation results (the nature of the results);
- Decision context (the context in which the final decision was made).

The most frequently documented enabling conditions that supported the application and influence of ESV in the 44 case studies were contextual factors. These included the high dependence of small island states' communities and national economies on their marine resources or the presence of a clear policy question to which the ESV study was applied (Table 10). Another key factor that was identified as facilitating successful ESV application in the US and Caribbean experience was the existence of transparent, participative governance and decision making structures. Barde and Pearce (1991) argue that ESV reveals the values that are implied in decisions. In their review of environmental valuation case studies they found this to be an obstacle to use of ESV as policy and decision makers were reluctant to reveal information that could potentially limit their decision authority and inhibit strategic decision making (Barde and Pearce 1991). This is in line with the finding of the present review, indicating that a transparent and participative political system and decision making processes might be important prerequisites for successful application of ESV in marine governance. One important procedural enabler was an effective communication strategy which ensured that the results were addressed to and tailored for the right audience (for example widespread dissemination or targeted to specific decision makers; appropriate writing style and type of document) and directed at concrete opportunities for application (for example user fee systems, compensation payments, legislation or regulations).

Table 10: Documented enabling conditions for ESV application and influence.

Enabling conditions	Case studies
Context	
Transparent, participative governance and decision making structures	11
High dependence on coastal/marine resources	6
Clear policy question to which ESV is applied	5
Local/in country support for valuation	2
Local interest in/request for valuation	2
Visible threats to ecosystem resource and economic health	1
Decision makers' understanding of and interest in valuation	1
Small country size (population, geographic extent), in particular for national-level application	1
Government/organisational/management stability (low turnover of employees and officials)	1
Methodology and procedure	
Effective communication of results (widespread; targeted to audience and application opportunities)	5
Involvement of local stakeholders and experts (increases credibility and ownership)	2
Simple, easy to do valuation methods	2
Cooperation by public and private stakeholders	1
Timing: make use of 'windows of opportunity' (for example important local events)	1
Valuation results/topic	
ESV results identified causal links between ecosystems, ecosystem services and users	3
ESV results identified economic implications of decision, catching decision makers' attention	2
Money was key issue in the debate (for example damage compensation claims)	2
Recognition that absolute values not always necessary, for example in policy appraisals	1
Decision context	
Study outcomes in line with the general political climate/project plans/political and public concerns	3
External conditions supporting the decision that is in line with the ESV results	2

Regarding barriers to ESV application in the case studies, the most frequently documented barriers related to methodological difficulties associated with undertaking ESV studies (Table 11). The limitations of the use of benefits transfer, for example, were discussed in the documentation of the Wareham, UK case study. The lack of an adequate communication strategy for the ESV results and stakeholder targeted outreach hampered the influence of the ESVs in Jamaica, the Dominican Republic and St. Lucia. In five case studies from the South Pacific and Alaska, valuation of fisheries benefits for communities with a subsistence culture was reported to be a major challenge.

Table 11: Documented barriers to ESV application and influence.

Barriers	Case studies
Context	
Little/no dependence on coastal/marine resources	2
Lack of political interest in ESV or in the issue that ESV addresses	2
No government/organisational/management stability (high turnover of employees and officials)	2
Overburdened conservation community/no NGO outreach/no public conservation forum	2
Corruption in government	1
Decision makers' limited understanding of ESV	1
Methodology and procedure	
Capturing ecosystem service and resource values for subsistence, non-market cultures	5
No adequate, targeted, stakeholder specific outreach	3
Methodological difficulties (double counting, limitations of benefits transfer, etc.)	3
Apparent lack of involvement of local experts (would have increased credibility and ownership)	1
Development of new project specific valuation method which limited the time available for outreach	1
Difficulty in linking ecosystem service impact to event/activity	1
Controversy around contingent valuation method	1
Economic rhetoric, difficult to understand for policy makers and stakeholders	1
Valuation results/topic	
Small values, due to methodology, that did not capture decision makers' attention	1
Valuation results varied with different methodologies and assumptions	1
No clear strategy or tangible examples on how to use the results	1
Hypothetical nature of the study, not related to real-life circumstances	1
Valuation criticised by scientists/experts as scientifically unsound	1
Decision context	
Economic valuation unlikely to play decisive role in political decisions in contested policy areas	1
Valuation study not/no longer in line with political climate/debate	1
Complex political and economic context	1

In the context of the VALMER project, which explores ESV application in the governance of six Western Channel marine sites, the European case study experience is of particular relevance. Table 12 gives an overview of the factors that were documented or identified in the literature as potential barriers and enablers to the application and influence of ESV in the eight European case studies.

Table 12: Documented actual and potential enablers and barriers in the European case studies.

Enablers	<p>Effective communication of results</p> <p>ESV results identified economic implications of decision, catching decision makers' attention</p> <p>Study outcomes in line with the general political climate/project plans/political and public concerns</p>
Barriers	<p>Methodological issues</p> <p>Valuation results varied with different methodologies and assumptions</p> <p>Hypothetical nature of the study, not related to real-life circumstances</p> <p>Valuation criticised by scientists/experts as scientifically unsound</p> <p>Economic valuation unlikely to play decisive role in political decisions in contested policy areas</p> <p>Valuation study not/no longer in line with political climate/debate</p> <p>Complex political and economic context</p>

3.7 Documentation of marine ESV application

A significant finding from the review has been that the use and influence of ESV in marine governance is very poorly documented, especially in the peer reviewed literature. Most of the information was derived from grey literature; only twelve peer reviewed papers covered aspects of the 44 case studies. Across the available papers and documents there was little uniformity in the kind of information that was provided about the valuation study and its application. For none of the 44 case studies, a complete set of information on all search parameters of this review was found. For many case studies, important review information was not available, including:

- Valuation methods used;
- How and at what point ESV was used in policy and decision making;
- Barriers and/or enabling conditions of ESV use and influence;
- Who commissioned and who used the ESV studies.

For example, the available literature did not present a complete analysis of the strengths and weaknesses of using ESV in the respective project, policy or decision making contexts for any of the 44 case studies. Instead, most case study documentations only reported on either barriers or enablers, with 11 case studies lacking this information entirely.

4 Summary and conclusions

At the start of this international review of ESV application in marine governance stood three key research questions:

- 1) To what extent is ESV being used in marine governance?
- 2) Where, how and for what is ESV being used?
- 3) What are the barriers and enablers for the use and influence of ESV?

The findings present evidence that ESV is being applied in marine governance and is influencing marine policy and management decisions in a number of different contexts. However, documented ESV use and influence in the marine context remains limited, particularly in Europe. As Laurans et al. (2013) point out, this might be either because use and influence are not being adequately recorded and documented or because ESV is not actually being used to great extent yet. The present review indicates that reality might lie somewhere in between. The majority of ESV applications in marine policy and decision making were found in the Caribbean, South and West Pacific and the USA, where interest in the use of valuation in environmental policy and decision making appears to be higher than in Europe (Kushner et al. 2012, Liu et al. 2010, Navrud and Pruckner 1997, Pearce and Seccombe-Hett 2000). In Europe, documented ESV use in marine governance is still very limited. Here, projects like VALMER can play an important role in increasing both the visibility of ESV and its application in marine governance.

As to the question about 'how and for what' ESV was applied in the 44 case studies, the review draws a very diverse, unfocused picture. The 44 ESVs covered a broad range of ecosystem services, using a range of different valuation methods. The most commonly valued ecosystem services were tourism and recreation, fisheries and coastal protection. The majority of ESVs informed or supported policy and management processes, projects or government decisions at a small geographic or spatial scale, such as MPAs, small island states or specific habitats. Over half of the ESVs was designed and used for informative purposes. However, identified purposes and documented applications of the ESVs were largely very case study specific. Most importantly, in approximately 50 per cent of cases the end use of the ESV study differed from its original purpose, both in the sense of additional and completely different uses.

Lastly, a comprehensive analysis of the strengths and weaknesses of the 44 marine ESV applications was hindered by the limited documentation of enabling conditions and barriers to use and influence in the case studies. The most frequently documented enablers of ESV use and influence were factors related to the context of the policy and decision making processes in which ESV was applied, while the most frequent barriers were methodological difficulties of undertaking ESV studies.

In summary, the review revealed that ESV is being applied as a governance tool in a number of different marine contexts around the world. At the same time, it found that use and influence of ESV in marine governance is still limited in extent, often unfocused and case study specific in nature and overall very poorly documented.

5 Considerations for VALMER

This review has identified a gap in documented ESV applications in European marine governance as well as generally poor documentation of ESV application in the marine context. There is therefore a significant opportunity for the VALMER project to add to both the European experience of marine ESV application and to the academic literature on the Ecosystem Service approach in practice.

Potential insights from the VALMER case studies that could significantly add to the understanding of ESV in marine practice include:

- Strengths and weaknesses of particular valuation methods, including methodological issues associated with less studied and valued services such as cultural;
- Use of ecosystem service assessments and valuations to explore stakeholder views and preferences on various management options and trade-offs;
- Use of ecosystem service assessments and valuations to improve stakeholder engagement in marine governance processes;
- When and how ESV is applied to policy, management or decision making processes.

Further, in light of the review's finding that methodological difficulties with undertaking ESV were frequently reported as a barrier for ESV application, VALMER Work Package 1's Guide, as a key VALMER output, will be particularly valuable in contributing to and potentially improving ESV application in marine governance.

References

- Albert, J.A., Trinidad, A., Boso, D. and Schwarz, A.J. 2012a. *Coral reef economic valuation and incentives for coral farming in Solomon Islands*. Policy Brief. CGIAR Research Program on Aquatic Agricultural Systems. Pengang, Malaysia. AAS-2012-14.
- Albert, J.A., Trinidad, A., Cabral, R. and Boso, D. 2012b. *Economic value of coral reefs in Solomon Islands: case-study findings from coral trade and non-coral trade communities*. WorldFish Center, Solomon Islands.
- Andrews, J.E., Burgess, D., Cave, R.R., Coombes, E.G., Jickells, T.D., Parkes, D.J. and Turner, R.K. 2006. Biogeochemical value of managed realignment, Humber estuary, UK. *Science of the Total Environment* 371: 19-30.
- Barde, J.-P. and Pearce, D.W. 1991. *Valuing the environment: six case studies*. London: Earthscan.
- Bhat, M.G. 2003. Application of non-market valuation to the Florida Keys marine reserve management. *Journal of Environmental Management* 67(4): 315-325.
- Bell, F.W. 1982. *The economic impact and valuation of saltwater recreational fisheries in Florida*. Technical report, Florida Sea Grant College, Project No. R/FR-16.
- Bell, F.W. and Leeworthy, V. 1986. *An economic analysis of the importance of saltwater beaches in Florida*. Florida Sea Grant Report 82. Gainesville: University of Florida.
- Bervoets, T. 2010. *Working paper on the economic valuation of country St. Maarten's coral reef resources*. St. Maarten, Netherland Antilles: Nature Foundation St. Maarten.
- Brown, G.Jr. 1992. *Replacement costs of birds and mammals*. Distributed by the State of Alaska Attorney General's Office.
- Carson, R.T. and Hanemann, W.M. 1992. *A preliminary economic analysis of recreational fishing losses related to the Exxon Valdez oil spill*. A report to the Attorney General of the State of Alaska.
- Carson, R.T., Mitchell, R.C., Hanemann, W.M., Kopp, R.J., Presser, S. and Ruud, P.A. 1992. *A contingent valuation study of lost passive use values resulting from the Exxon Valdez oil spill*. A report to the Attorney General of the State of Alaska.
- Carson, R.T., Wilks, L. and Imber, D. 1994. Valuing the preservation of Australia's Kakadu Conservation Zone. *Oxford Economic Papers, New Series, Special Issue on Environmental Economics* 46: 727-749
- Carson, R.T., Mitchell, R., Hanemann, M., Kopp, R., Presser, S. and Ruud, P. 2003. Contingent Valuation and Lost Passive Use: Damages from the Exxon Valdez Oil Spill. *Environmental and Resource Economics* 25: 257-286.
- Cesar, H.S.J. (Ed.) 2000. *Collected essays on the economics of coral reefs*. Kalmar, Sweden: CORDIO.
- Cesar, H.C. and Chong, C.K. 2004. *Economic valuation and socioeconomics of coral reefs: methodological issues and three case studies*. WorldFish Center, Economic Valuation and Policy Priorities for Sustainable Management of Coral Reefs, Contribution No. 1721.

- Cesar, H.S.J. and van Beukering, P.J.H. 2004. Economic valuation of the coral reefs of Hawaii. *Pacific Science* 58(2): 231-242.
- Cesar, H., van Beukering, P., Pintz, S. and Dierking, J. 2002. *Economic valuation of the coral reefs of Hawaii*. Report for the National Oceanic and Atmospheric Administration, Coastal Ocean Program.
- Cooper, E., L. Burke and N. Bood. 2008. *Coastal Capital: Economic Contribution of Coral Reefs and Mangroves to Belize*. Washington DC: World Resources Institute.
- Defra 2007. *An introductory guide to valuing ecosystem services*. Department for Environment, Food and Rural Affairs, London.
- Dixon, J.A., Scura, L.F. and van 't Hof, T. 1993a. Meeting ecological and economic goals: marine parks in the Caribbean. *Ambio* 22(2-3): 117-125.
- Dixon, J.A., Scura, L.F. and van 't Hof, T. 1993b. *Ecology and microeconomics as 'Joint Products': The Bonaire Marine Park in the Caribbean*. LATEN Dissemination Note No.6, The World Bank, Latin America Technical Department, Environmental Division.
- Duffield, J. 1997. Nonmarket valuation and the courts: the case of the Exxon Valdez. *Contemporary Economic Policy* XV: 98-110.
- EA 2009. *Ecosystem services case studies*. Environment Agency Better Regulation Science Programme Report.
- Earth Economics 2010. *Nature's value in the Terraba-Sierpe National Wetlands: The Economics of Ecosystem Services*. Tacoma, WA: Earth Economics.
- European Commission 2010. *How economic valuation studies influenced natural gas extraction in the Dutch Wadden Sea - NL*. OURCOAST project. <http://ec.europa.eu/ourcoast/index.cfm?menuID=7&articleID=56> [accessed 17.09.2013]
- Farley, J., Batker, D., de la Torre, I. and Hudspeth, T. 2009. Conserving mangrove ecosystems in the Philippines: transcending disciplinary and institutional borders. *Environmental Management* 45(1): 39-51.
- Fletcher, S., Rees, S., Gall, S., Jackson, E., Friedrich, L. and Rodwell, L. 2012. *Securing the benefits of the Marine Conservation Zone Network*. A report to the Wildlife Trusts. Centre for Marine and Coastal Policy Research, Plymouth University.
- Gilbert, A.J. and Janssen, R. 1998. Use of environmental functions to communicate the values of a mangrove ecosystem under different management regimes. *Ecological Economics* 25: 323-346.
- Hargreaves-Allen, V. 2008. *The economic value of the Gladden Spit and Silk Cayes Marine Reserve in Belize*. Conservation Strategy Fund.
- Hargreaves-Allen, V. 2010. *The economic valuation of natural resources of Andros Island*. Conservation Strategy Fund.
- Hodgson, G. and Dixon, J.A. 2000. El Nido revisited: ecotourism, logging and fisheries. In: Cesar, H.S.J. (Ed.). *Collected essays on the economics of coral reefs*. Kalmar, Sweden: CORDIO.

- Hoelzinger, O. and Dench, D. 2011. *The Economic Evaluation of Gwen Finch Wetland Reserve. Case Study for the Worcestershire Wildlife Trust, Worcester.*
- Janssen, R. and Padilla, J.E. 1996. *Valuation and evaluation of management alternatives for the Pagbilao Mangrove Forest.* CREED Working Paper series No. 9.
- Janssen, R. and Padilla, J.E. 1999. Preservation or conservation? Valuation and evaluation of a mangrove forest in the Philippines. *Environmental and Resource Economics* 14: 297-331.
- Johns, G.M., Leeworthy, V.R., Bell, F.W. and Bonn, M.A. 2001. *Socioeconomic study of reefs in southeast Florida: final report.* Hollywood, Florida: Hazen and Sawyer Environmental Engineers and Scientists.
- Kushner, B., Waite, R., Jungwiwattanaporn, M. and Burke, L. 2012. *Influence of coastal economic valuations in the Caribbean: enabling conditions and lessons learned.* World Resources Institute working paper.
- Lal, P. 2003. Economic valuation of mangroves and decision-making in the Pacific. *Ocean and Coastal Management* 46: 823-844.
- Laurans, Y., Rankovic, A., Billé, R., Pirard, R. and Mermet, L. 2013a. Use of ecosystem service economic valuation for decision making: questioning a literature blindspot. *Journal of Environmental Management* 119: 208-219.
- Laurans, Y., Pascal, N., Binet, T., Brander, L., Clua, E., David, G., Rojat, D., Seidl, A. 2013b. Economic valuation of ecosystem services from coral reefs in the South Pacific: Taking stock of recent experience. *Journal of Environmental Management* 116: 135-144.
- Leeworthy, V. 1991. *Recreational use value for John Pennekamp Coral Reef State Park and Key Largo National Marine Sanctuary.* Rockville, MD: National Oceanic and Atmospheric Administration.
- Leeworthy, V.R. and Wiley, P.C. 2000. *Proposed Tortugas 2000 Ecological Reserve: final socioeconomic impact analysis of alternatives.* Silver Springs, MD: NOAA.
- Liu, S., Costanza, R., Farber, S. and Troy, A. 2010. Theory, practice, and the need for a transdisciplinary synthesis. *Annals of the New York Academy of Sciences, Ecological Economics Reviews* 1185: 54-78.
- Luisetti, T., Turner, K. and Bateman, I. 2008. *An ecosystem services approach to assess managed realignment coastal policy in England.* CSERGE Working Paper ECM 08-04.
- McDowell Group 1990. *An assessment of the impact of the Exxon Valdez oil spill on the Alaska tourism industry.* McDowell Group.
- McKenzie, E., Woodruff, A. and McClennen, C. 2006. *Economic assessment of the true costs of aggregate mining in Majuro Atoll, Republic of the Marshall Islands.* SOPAC Technical Report 383.
- MEA 2005. *Ecosystems and human well-being: current state and trends: findings of the Condition and Trends Working Group.* Edited by Hassan, R., Scholes, R. and Ash, N., The Millennium Ecosystem Assessment series, v. 1.

- Mills, M.J. 1992. *Alaska sport fishing in the aftermath of the Exxon Valdez oil spill*. Special Publication No. 92-5, Alaska Department of Fish and Game, Division of Sport Fish, Anchorage, Alaska.
- Navrud, S. and Pruckner, G.J. 1997. Environmental valuation – to use or not to use? A comparative study of the United States and Europe. *Environmental and Resource Economics* 10: 1–26.
- O’Garra, T. 2012. Economic valuation of a traditional fishing ground on the coral coast in Fiji. *Ocean and Coastal Management* 56: 44-55.
- Pacific News Center 2012. *SPC: Kiribati to end beach mining for aggregates*. Guam News Release 19th September 2012. http://www.pacificnewscenter.com/index.php?option=com_content&view=article&id=27367:spc-kiribati-to-end-beach-mining-for-aggregates&catid=45:guam-news&Itemid=156 [accessed 17.09.2013]
- Pascal, N. 2010. *Ecosystèmes coralliens de Nouvelle-Calédonie, valeur économique des services écosystémiques Partie I : valeur financière*. IFRECOR Nouvelle-Calédonie, Nouméa.
- Pascal, N. 2011. *Cost-benefit analysis of community-based marine protected areas: 5 case studies in Vanuatu, South Pacific*. Research report, CRISP-CRIOBE, Moorea, French Polynesia.
- Pascal, N., Brander, L., Clua, E., David, G., Laurans, Y. and Seidl, A. 2012. *What impacts to expect from economic valuation of coral reefs?* Proceedings of the 12th International Coral Reef Symposium, Cairns, Australia.
- Pearce, D.W. and Seccombe-Hett T. 2000. Economic Valuation and Environmental *Decision-Making in Europe Environmental Science and Technology* 34(8): 1419-1425.
- Pittock, J., Cork, S. and Maynard, S. 2012. The state of the application of ecosystems services in Australia. *Ecosystem Services* 1: 111-120.
- Ransom, K.P. and Mangi, S.C. 2010. Valuing recreational benefits of coral reefs: the case of Mombasa Marine National Park and Reserve, Kenya. *Environmental Management* 45: 145-154.
- Rea, A.W., Davis, C., Evans, D.A., Heninger, B.T. and van Houtven, G. 2012. Using Ecosystem Services To Inform Decisions on U.S. Air Quality Standards. *Environmental Science and Technology* 4: 6481-6488.
- Rees, S.E., Attrill, M.J., Austen, M.C., Mangi, S.C., Richards, J.P. and Rodwell, L. 2010. Is there a win-win scenario for marine nature conservation? A case study of Lyme Bay, England. *Ocean and Coastal Management* 53: 135-145.
- Rivera-Planter, M. and Muñoz-Piña, C. 2005. Fees for reefs: economic instruments to protect Mexico’s marine natural areas. *Tourism* 8(2-3): 195-213.
- Rönnbäck, P. and Primavera, J.H. 2000. Illuminating the need for ecological knowledge in economic valuation of mangroves under different management regimes – a critique. *Ecological Economics* 35(2): 135-141.
- Runhaar, H. and van Nieuwaal, K. 2010. Understanding the use of science in decision-making on cockle fisheries and gas mining in the Dutch Wadden Sea: Putting the science-policy interface in a wider perspective. *Environmental Science and Policy* 13(3): 239-248.

- Schuijt, K. 2003. *Valuation of Water - The process of economic valuation of ecosystems in water management*. PhD dissertation, Erasmus University Rotterdam.
- Shepherd, D., Burgess, D., Jickells, T.D., Andrews, J., Cave, R., Turner, R.K., Albridge, J., Parker, E.R. and Young, E. 2007. Modelling the effects and economics of managed realignment on the cycling and storage of nutrients, carbon and sediments in the Backwater estuary, UK. *Estuarine, Coastal and Shelf Science* 73(3-4): 355-367.
- Slootweg, R. and van Beukering, P. 2008. *Valuation of Ecosystem Services and Strategic Environmental Assessment. Lessons from influential cases*. Netherlands Commission for Environmental Assessment.
- Thur, S.M. 2010. User fees as sustainable financing mechanisms for marine protected areas: an application to the Bonaire National Marine Park. *Marine Policy* 34(1): 63-69.
- Tongson, E. and Dygico, M. 2004. User fee system for marine ecotourism: the Tubbataha Reef experience. *Coastal Management* 32(1): 17-23.
- Trejo, J.E. 2005. *Valuing marine protected areas in Belize: a case study using Contingent Valuation Methodology to determine tourists' Willingness To Pay*. Athens, Ohio: Ohio University.
- Turner, R.K., Burgess, D., Hadley, D., Coombes, E. and Jackson, N. 2007. A cost-benefit appraisal of coastal managed realignment policy. *Global Environmental Change* 17(3-4): 397-407.
- Turnhout, E., Hisschemöller, M. and Eijsackers, H. 2008. Science in the Wadden Sea policy: from accommodation to advocacy. *Environmental Science and Policy* 11(3): 227-239.
- UNEP 2006. *Marine and coastal ecosystems and human wellbeing: A synthesis report based on the findings of the Millennium Ecosystem Assessment*. United Nations Environment Programme.
- Uyarra, M.C., Gil, J.A. and Côté, I.M. 2010. Charging for nature: marine park fees and management from a user perspective. *Ambio* 39: 515-523.
- van Beukering, P.J.H. and Cesar, H.S.J. 2004. *Economic analysis of Marine Managed Areas in the main Hawaiian Islands*. Report for the National Oceanic and Atmospheric Administration, Coastal Ocean Program, Washington, DC.
- van Beukering, P.J.H., Cesar, H.S.J., Dierking, J. and Atkinson, S. 2004. *Recreational survey in selected Marine Managed Areas in the main Hawaiian Islands*. Report for the Division of Aquatic Resources and the Department of Business, Economic Development and Tourism, Honolulu.
- van Beukering, P., Haider, W., Wolfs, E., Liu, Y., van der Leeuw, K., Longland, M., Sablan, J., Beardmore, B., di Prima, S., Massey, E. et al. 2006. *The economic value of the coral reefs of Saipan, Commonwealth of the Northern Mariana Islands*.
- van Beukering, P.H., Slootweg, S. and Immerzeel, D. 2008. *Valuation of ecosystem services and strategic environmental assessment. Influential case studies*. Netherlands Commission for Environmental Assessment.
- van Beukering, P.J.H. and Cesar, H.S.J. 2010. *Recreational value of coral reefs, Hawaii*. TEEBcase.

- White, A.T., Barker, V. and Tantrigama, G. 1997. Using integrated coastal management and economics to conserve coastal tourism resources in Sri Lanka. *Ambio* 26(6): 335-344.
- White, A.T. and Cruz-Trinidad, A. 1998. *The values of Philippine coastal resources: why protection and management are critical*. Cebu City, Philippines: Coastal Resources Management Project.
- White, A.T., Vogt, H.P. and Arin, T. 2000. Philippine coral reefs under threat: the economic losses caused by reef destruction. *Marine Pollution Bulletin* 40(7): 598-605.
- White, A.T., Ross, M. and Flores, M. 2009. Benefits and costs of coral reef and wetland management, Olango Island, Philippines. In: Cesar, H.S.J. (Ed.). *Collected essays on the economics of coral reefs*. Kalmar, Sweden: CORDIO.
- Wielgus, J., Cooper, E., Torres, R. and Burke, L. 2010. *Coastal capital: Dominican Republic. Case Studies on the economic value of coastal ecosystems in the Dominican Republic*. Washington, DC: World Resources Institute.
- World Resources Institute 2008. *Tourism and recreation valuation tool*. Washington, DC: World Resources Institute.
- World Resources Institute 2008. *Fisheries valuation tool*. Washington, DC: World Resources Institute.

Appendix 3:

VALMER stakeholder interview protocols

The following pages contain the question protocols for the VALMER stakeholder interviews presented in Chapter 3, in the main English version (as used in North Devon and Plymouth to Fowey) and the main French version (as used in Golfe Normand Breton and Golfe du Morbihan). The question protocols were adapted slightly for the interviews in Poole Harbour and the Iroise Sea, where some of the questions were not relevant in the respective case study contexts.



Stakeholder ID

**Ecosystem services assessment and valuation:
Stakeholder interview at all VALMER sites in the UK and France**

SITE:	1.	2.	3.	4.	5.	6.
	<i>Poole Harbour</i>	<i>North Devon</i>	<i>Plymouth-Fowey</i>	<i>Golfe Normand-Breton</i>	<i>Mer d'Iroise</i>	<i>Golfe du Morbihan</i>
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Grey cursive sections are guides for the interviewer, i.e. what the question is trying to find out, prompts, etc. Please feel free to adapt the exact wording of the questions to the interview situation as you see fit or necessary.

Please read out: Thank you very much for taking the time to participate in this interview today. I am part of the VALMER team at Plymouth University. We are exploring how ecosystem service valuation can be applied in marine planning and management and whether it can support stakeholder engagement in marine governance. This research will feed into key VALMER deliverables that are aimed at providing advice and guidance for marine managers on the use of ecosystem service valuation in marine governance.

In this interview I would like to talk to you about your views on the use of ecosystem service valuation in marine governance to help us examine the value of this approach in real and practical terms.

The interview should take about 45 minutes and all information you provide will remain confidential and anonymous.

If you agree, I would like to record this interview to help me with note taking. Yes
No

Are you happy to go ahead with the interview?

1.0 To start, can you please tell me what VALMER events, meetings or workshops you participated in throughout the VALMER xxx case study?

Interviewer to tick

Poole Harbour	North Devon	Plymouth-Fowey
<ul style="list-style-type: none"> ○ PHSG meeting May 2013 ○ PHSG meeting Nov 2013 ○ Open meeting Jan 2014 ○ Other... 	<ul style="list-style-type: none"> ○ Coastwise meeting Oct 2012 – Triage ○ NDBR Marine Working Group meeting Jan 2013 – Triage ○ Stakeholder workshop 1 Dec 2013 ○ Stakeholder workshop 2 Jan 2014 ○ Stakeholder workshop 3 Mar 2014 ○ Stakeholder workshop 4 Sept 2014 ○ Evening meeting fishermen ○ Evening meeting divers 	<ul style="list-style-type: none"> ○ Task & Finish workshop 1 May 2013 ○ Task & Finish workshop 2 March 2014 ○ Task & Finish workshop 3 June 2014 ○ Task & Finish workshop 4 ○ Task & Finish workshop 5 ○ Other...

2.0 What motivated you to participate in the case study and the VALMER project?

We want to find out if they participated because it was about ecosystem services and ESA&V, to see whether this potentially motivates engagement.

Responses to be attributed to one of the following categories by interviewer. Categories to be used as **prompts** if the interviewee talks about something different or does not know what to say:

- *Your job required you to learn more about the ecosystem services approach*
- *Your organisation was interested in learning more about the ecosystem services approach*
- *Using ESA&V could directly benefit your work*
- *The topic VALMER is looking at in the xxx case study site is important for you or your organisation*
- *Other...*

3.0 When you first started participating in the VALMER project, what did you know and think about Ecosystem Service Assessment?

Before VALMER perspective. We want to find out what they knew and thought about ESA before VALMER and where they had their knowledge from.

Prompts:

- Where did you have the knowledge from?
- Did you find it interesting, valid, where you sceptical, critical, etc.?

3.1 And what were your thoughts specifically on Ecosystem Service Valuation?

Before VALMER perspective. We want to find out if they distinguished between assessment and valuation, what they understood by 'valuation' and what they thought about monetary and non-monetary approaches before VALMER.

Prompts:

- What did you understand by 'valuation' (monetary, importance, value in general, etc.?)?
- What did you think about the usefulness of monetary valuation and/or non-monetary valuation?

3.2 *If there is a change in their B/A survey:* Your before-after response to statement 1 "I have a good understanding of ESA&V" indicates that your understanding of ESA&V has changed from x to y. Could you tell me in how far your understanding has changed?

After VALMER perspective. We want to find out if their understanding of and/or views on ESA&V have changed through VALMER.

Prompts:

- What are your views on ESA&V now?
- What do you think has led to this change?

If there is no change in their B/A survey: Your before-after response to statement 1 "I have a good understanding of ESA&V" indicates that your understanding of ESA&V has not changed. Do you agree with this, or would you say that your understanding of and/or views on ESA&V have changed? In how far?

After VALMER perspective. We want to find out if their understanding of and/or views on ESA&V have changed through VALMER.

4.0 Do you feel that engaging in the topic of ESA&V throughout the VALMER case study process has added anything to your understanding of your site and the associated ecosystem services?

We want to find out what they learned through ESA&V and VALMER, to test their understanding of ESA&V and to see if it added anything to their broader understanding of the site.

Prompts for ‘working with ESA&V’ depending on case study:

involvement in choosing services to be assessed/valued, mapping of ecosystem services, hearing about and discussing ecosystem services and ESA&V, scenario building

Following your VALMER experience, can you please tell me if you agree or disagree with the following statements? On a scale of 1 strongly disagree, 2 disagree, 3 neutral, 4 agree to 5 strongly agree, or 0 don’t know

		0	1	2	3	4	5
		Don't know	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
4.1	I have gained a better understanding of the local marine habitats and species (case study specific, see table below).						
4.2	I have gained a better understanding of how the local marine ecosystem supports social and economic wellbeing in the area.						
4.3	I have gained a better understanding of how different activities and management options affect the local ecosystem’s ability to provide ecosystem services.						
4.4	I have gained a better understanding of the need for management to secure healthy, resilient and functioning local marine ecosystems , to ensure the provision of ecosystem services.						

Statements 4.1, 4.2 and 4.4 to be adapted to the case study					
<i>Poole Harbour</i>	<i>North Devon</i>	<i>Plymouth-Fowey</i>	<i>Normand-Breton</i>	<i>Iroise</i>	<i>Morbihan</i>
<i>The local marine ecosystem in the Harbour</i>	<i>Local subtidal habitats</i>	<i>The local marine environment</i>	<i>The local marine environment</i>	<i>Local kelp forests</i>	<i>Local sea grass beds</i>

5.0 Taking a closer look at the VALMER meetings and workshops that you attended, how did you find the information that was provided about ecosystem services, ESA&V and assessment/valuation results?

Prompt:

- Was it interesting, constructive, too complicated, boring, etc.?

5.1 What did you think of the formats of the presentations and the activities in the workshops (maps, identification of activities, choice and development of scenarios, group discussions, etc.)?

5.2 What did you think of scenario building as an approach to work with ESA&V?

Prompt:

- Was it interesting, constructive, too complicated, boring, etc.?

5.3 Did you feel that the use of ESA&V in the meetings/workshops supported discussions among stakeholders/participants about the case study site?

Prompt:

- Did it lead to interesting discussions?

We want to find out what they thought about the ESA&V related information and about formats of information and activities to explore how well the information/activities were received, how engaging they were.

Do you agree or disagree with the following statements?

	0	1	2	3	4	5
	Don't know	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
5.4	ESA&V did support the development of a common understanding of the management question that was addressed in the case study (see table below for prompt).					
5.5	ESA&V did foster better understanding among stakeholders with different interests and perspectives.					
5.6	The ESA&V information was too technical, not easy to understand.					
5.7	ESA&V did help support the discussion and appraisal of different management options in the scenario building process.					
5.8	Using ESA&V in decision making can lead to greater acceptance and buy-in of the decisions among stakeholders.					

Prompts for statement 5.3 if interviewee is not clear on what is meant by 'management question'					
<i>Poole Harbour</i>	<i>North Devon</i>	<i>Plymouth-Fowey</i>	<i>Golfe Normand-Breton</i>	<i>Mer d'Iroise</i>	<i>Golfe du Morbihan</i>
<i>The value of recreational activities supported by the Harbour marine ecosystem</i>	<i>The value of subtidal sedimentary habitats in supporting commercial fisheries, carbon sequestration and waste remediation</i>	<i>The ecosystem services provided by intertidal and subtidal habitats at the site</i>	<i>The ecosystem services that tidal and subtidal benthic habitats provide at the site</i>	<i>The ecosystem services provided by kelp habitats at the site, particularly kelp harvesting and fishing</i>	<i>The ecosystem services provided by seagrass habitats at the site</i>

5.9 Why do you think that ESA&V can/cannot increase acceptance and buy-in of decisions among stakeholders?

6.0 The main purpose of the VALMER project is to explore the potential of ESA&V for supporting marine governance. Having seen the case study results, how do you think ESA&V might support management at your site?

Prompts:

- *What kind of management questions could ESA&V inform?*
- *What type of activities or sectors could use this information?*
- *Shoreline management planning, marine planning, MPA management*

6.1 More generally, what do you think might be the advantages or benefits of integrating ESA&V into management and decision making processes?

Prompts:

Extend the evidence base, explore spatial trade-offs, understand socio-economic implications of decision making options, prioritisation of management effort

6.2 Conversely, what do you think might be the potential weaknesses or difficulties (of integrating ESA&V into management and decision making processes)?

Prompts:

Uncertainty about and credibility of the evidence base, complexity of ESA&V concept

In summary, can you please tell me if you agree or disagree with the following statements?

		0	1	2	3	4	5
		Don't know	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
6.4	Using ESA&V in marine and coastal management can support better informed decisions.						
6.5	Using ESA&V can support marine conservation.						
6.6	Using ESA&V can support marine planning.						
6.7	ESA&V can support decision making, choices between alternatives, trade-off decisions, prioritisation of management effort (category: <i>decisive use</i>).						
6.8	ESA&V can be used to determine user fees, e.g. for natural park entrance (category: <i>technical use</i>).						
6.9	ESA&V can be used in damage assessment to determine compensation payments or fines (category: <i>technical use</i>).						
6.1	ESA&V can raise awareness among decision makers and the public regarding the condition and value of the environment, as well as the role and relevance of ecosystem services (category: <i>informative use</i>).						

7.0 Finally, VALMER is putting together a glossary to facilitate the use of ESA&V by different practitioners and stakeholders involved in marine governance. For this glossary, we are trying to identify a common understanding across the VALMER case studies of the terms ecosystem services and ecosystem service valuation. It would be really helpful if you could tell me what these terms mean to you. How would you explain, first, ecosystem services and, second, ecosystem service valuation to a colleague?

7.0a Ecosystem services:

7.0b Ecosystem service valuation:

8.0 Thank you very much for your time! Do you have any further comments?

Interviewer's name: Wendy Dodds Laura Friedrich Manuelle Philippe Steve Fletcher

Date:.....

French version



Numéro
d'identification de
l'interviewé

Les services écosystémiques marins et leurs évaluations Enquête auprès des acteurs participant au projet VALMER

Site d'étude	1. Poole Harbour	2. North Devon	3. Plymouth- Fowey	4. Golfe Normand- Breton	5. Mer d' Iroise	6. Golfe du Morbihan
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Les sections en gris sont présentées pour aider la personne qui fait passer l'entretien (clarifiant les questions, suggérant des réponses, etc.)

Merci de participer à l'entretien suivant qui vise à recueillir des informations sur votre expérience en relation avec les services écosystémiques dans le projet VALMER.

Cette recherche vise à fournir des conseils et orientations pour les gestionnaires de la mer sur l'utilisation de l'évaluation des services écosystémiques dans la gouvernance maritime.

L'entretien dure environ 45 minutes. Toute l'information que vous nous donnez dans cette enquête restera confidentielle, les données seront analysées et restituées anonymement.

Si vous êtes d'accord, je souhaiterais enregistrer cette interview pour m'aider avec la prise de notes. Oui Non

Etes-vous d'accord pour réaliser cet interview?

Votre participation dans le cas d'étude

1.0 Pour commencer, pouvez-vous préciser à quels événements, réunions ou ateliers vous avez participé dans le cadre de l'étude de cas menée par le projet VALMER ?

Golfe du Morbihan	Golfe Normand-Breton	Mer d'Iroise
<ul style="list-style-type: none">○ Entretien○ Atelier 'culture commune' Sept 2013○ Atelier 'écologues et gestionnaires' Feb 2014○ Atelier 'pêche récréative' Jan 2014○ Atelier 'plaisance et mouillages' Feb 2014○ Atelier 'activités récréatives' Mar 2014○ Atelier 'pêche professionnelle' Mai 2014○ Atelier 'conchyliculture' Jun 2014○ Atelier 'qualité de l'eau' Jun 2014○ Atelier 'scenarios et options de gestion' Sept 2014○ Enquête grand public Mar 2014○ Journée de zostères Dec 2014○ Autre...	<ul style="list-style-type: none">○ Atelier 'culture commune' Nov 2013○ Atelier scenarios 1 Feb 2014○ Atelier scenarios 2 Apr 2014○ Atelier scenarios 3 Nov 2014○ Événement final Jan 2015○ Autre...	

Votre motivation à participer à VALMER

2.0 Qu'est-ce que vous a incité à participer au projet VALMER ?

Attribuer les réponses à une des catégories suivantes. Suggérer les catégories suivantes comme réponse si l'interviewé parle de quelque chose complètement différent ou ne sait pas quoi dire :

- Vos missions professionnelles nécessitaient d'acquérir des connaissances nouvelles sur les services écosystémiques
- Votre organisation était intéressée à en apprendre davantage sur l'approche par les services écosystémiques
- utiliser l'approche des services écosystémiques pourrait être directement utile à votre mission professionnelle
- le thème de l'étude du projet VALMER est important pour vous ou votre organisation
- autre...

Votre perception de l'évaluation des services écosystémiques

3.0 Quand vous avez commencé à participer au projet VALMER, qu'est-ce que vous saviez et pensiez des services écosystémiques ?

Suggestions :

- *Est-ce que vous le trouviez intéressant ou est-ce que vous étiez sceptique, critique, etc. ?*

3.1 Quel était votre avis sur l'évaluation des services écosystémiques avant VALMER ?

Suggestions :

- *Qu'est-ce que vous pensiez que « évaluation » signifiait (évaluation monétaire, importance, valeur en général, etc.) ?*
- *Qu'est-ce que vous pensiez de l'utilité de l'évaluation monétaire et/ou non-monétaire des services ?*

3.2 S'il y a un **changement** dans l'enquête A/A : Votre réponse sur « J'ai une bonne compréhension de ce qu'est l'évaluation des services écosystémiques » a changé de x à y. Pourquoi ?

Suggestions :

- *Quelle est votre opinion sur l'évaluation des services écosystémiques maintenant ?*
- *Qu'est-ce qui selon vous a apporté ce changement ?*

S'il n'y a **pas de changement** dans l'enquête A/A : Votre réponse sur « J'ai une bonne compréhension de ce qu'est l'évaluation des services écosystémiques » n'a pas changé. Etes-vous toujours d'accord avec cette affirmation ou est-ce que vous diriez que votre compréhension sur l'évaluation des services écosystémiques a changé ? Pouvez-vous expliquer pourquoi ?

Les apports de l'évaluation des services écosystémiques sur la connaissance de votre site d'étude

4.0 Pensez-vous que travailler sur les services écosystémiques a amélioré votre compréhension du site d'étude et des services associés?
 Oui Non

Suggestions pour expliquer 'travailler sur l'évaluation des services écosystémiques': choix collectif des services écosystémiques à évaluer, élaboration de scénarios d'évolution de services, cartographie des services écosystémiques, échanges autour des services écosystémiques et de leurs évaluations, etc.

Suite à votre expérience de Valmer, pouvez-vous dire si vous êtes d'accord ou en désaccord avec les énoncés suivants ?

		0	1	2	3	4	5
		Ne sais pas	Pas du tout d'accord	Pas d'accord	Neutre	D'accord	Tout à fait d'accord
4.1	J'ai acquis une meilleure compréhension des habitats marins et/ou des espèces locales (spécifique à l'étude de cas, voir tableau ci-dessous).						
4.2	J'ai acquis une meilleure compréhension de la façon dont l'écosystème marin local contribue au bien-être social et économique.						
4.3	J'ai acquis une meilleure compréhension de la façon dont les différentes activités et/ou les options de gestion influencent la capacité de l'écosystème local à fournir des services écosystémiques.						
4.4	J'ai acquis une meilleure compréhension de la nécessité d'une gestion pour garantir des écosystèmes marins locaux sains, résistants et fonctionnels, afin d'assurer le support des services écosystémiques.						

Information spécifique aux études de cas					
Poole Harbour	North Devon	Plymouth-Fowey	Golfe Normand-Breton	Mer d'Iroise	Golfe du Morbihan
L'écosystème marin local dans le port naturel	Habitats sous-marins locaux	Le milieu marin local	Les habitats benthiques intertidaux et infralittoraux	Les habitats de laminaires	Les herbiers de zostères

Travailler sur les services écosystémiques dans les ateliers de travail collectif VALMER

5.0 Qu'avez-vous pensé de l'information sur les services écosystémiques, l'évaluation des services et les résultats de cette évaluation dont vous avez eu connaissance dans les ateliers de travail ?

Suggestion :

- *Est-ce que c'était intéressant, constructif, trop compliqué, ennuyeux, etc. ?*

5.1 Qu'avez-vous pensé du format des présentations et des techniques d'animation (cartes, identification des éléments clés en sous-groupe, choix et développement des scénarios, groupes de discussion...)?

5.2 Qu'avez-vous pensé de l'approche par « scénario » pour aborder le sujet sur les services écosystémiques ?

Suggestion :

- *Est-ce que c'était intéressant, constructif, trop compliqué, ennuyeux, etc. ?*

5.3 Est-ce que le fait de discuter des services écosystémiques et de leur évaluation a aidé à animer la discussion sur le sujet de votre site ?

Suggestion :

- *At-il mené à des discussions intéressantes ?*

Êtes-vous d'accord ou en désaccord avec les affirmations suivantes?

		0	1	2	3	4	5
		Ne sais pas	Pas du tout d'accord	Pas d'accord	Neutre	D'accord	Tout à fait d'accord
5.4	L'approche par les services écosystémiques a aidé à la compréhension commune sur des enjeux de gestion sur votre site d'étude (<i>voir tableau ci-dessous pour enjeux de gestion spécifique au site d'étude</i>).						
5.5	Cette approche a favorisé une meilleure compréhension entre les acteurs locaux ayant des intérêts et points de vue divers.						
5.6	L'information sur les services et leur évaluation était trop technique, pas facile à comprendre.						
5.7	Cette approche a permis d'aider la discussion et l'évaluation des différentes options de gestion dans le processus de construction de scénario.						
5.8	L'utilisation de l'approche par les services écosystémiques dans la prise de décisions peut permettre aux acteurs locaux d'accepter et de s'approprier les décisions plus facilement.						

Information sur les enjeux de gestion spécifiques aux sites d'étude					
<i>Poole Harbour</i>	<i>North Devon</i>	<i>Plymouth-Fowey</i>	<i>Golfe Normand-Breton</i>	<i>Mer d'Iroise</i>	<i>Golfe du Morbihan</i>
<i>La valeur des activités de loisir soutenues par l'écosystème marin dans le port naturel</i>	<i>La valeur des services écosystémiques que les habitats sédimentaires infralittoraux fournissent, en particulier, la pêche commerciale, la séquestration du carbone et l'épuration de l'eau</i>	<i>Les services écosystémiques que les habitats benthiques intertidaux and infralittoraux dans le Golfe fournissent</i>	<i>Les services écosystémiques que les habitats benthiques intertidaux et infralittoraux fournissent dans le Golfe</i>	<i>Les services écosystémiques que les habitats de laminaires fournissent dans le Parc, notamment la production d'algues et la pêche</i>	<i>Les services écosystémiques que les habitats d'herbiers de zostères fournissent dans le Golfe</i>

5.9 Pourquoi pensez-vous que l'approche par les services écosystémiques permet/ne permet pas aux acteurs d'accepter et de s'appropriier les décisions plus facilement ?

La plus-value de l'approche des services écosystémiques pour la gestion et la gouvernance maritime

6.0 Le but principal du projet VALMER est de voir si l'évaluation des services écosystémiques pour aider la gestion. Après avoir vu les résultats de votre site d'étude, comment pensez-vous que cette approche pourrait soutenir la gestion de votre site?

Suggestions :

- *Quels types d'enjeux de gestion pourraient être aidés par cette approche ?*
- *Quels types d'activités ou quels secteurs pourraient utiliser cette information?*

6.1 Plus généralement, quels sont les avantages ou les bénéfices de l'intégration de l'évaluation des services écosystémiques dans la gestion et les processus de prise de décisions?

Suggestions :

Élargir la connaissance, explorer des options de prise de décision, comprendre les implications socio-économiques, prioriser des efforts de gestion

6.2 Selon vous, quels sont les faiblesses ou difficultés potentielles de l'intégration de l'évaluation des services écosystémiques dans la gestion et les processus de prise de décisions?

Suggestions :

S'approprier des concepts difficiles, obtenir des connaissances fiable

Suite à votre expérience de Valmer, pouvez-vous dire si vous êtes d'accord ou en désaccord avec les énoncés suivants ?

	0	1	2	3	4	5
	Ne sais pas	Pas du tout d'accord	Pas d'accord	Neutre	D'accord	Tout à fait d'accord
6.4						
6.5						
6.6						
6.7						
6.8						
6.9						
6.1						

Vision Commune

7.0 Enfin, VALMER met sur pied un glossaire afin de faciliter l'utilisation de l'évaluation des services écosystémiques par différents acteurs impliqués dans la gestion et gouvernance maritime. Pour ce glossaire, nous essayons d'identifier une vision commune sur les termes services écosystémiques et évaluation des services écosystémiques. Que signifient ces termes pour vous ? Comment expliqueriez-vous les services écosystémiques et l'évaluation des services écosystémiques à un collègue?

7.0a Services écosystémiques:

7.0b Évaluation des services écosystémiques:

8.0 Merci beaucoup pour votre temps! Avez-vous d'autres commentaires?

Nom de l'interviewer:	<input type="radio"/> Laura Friedrich	<input type="radio"/> Manuelle Philippe
	<input type="radio"/> Mari Le Coz	<input type="radio"/> Lucas Herry
	<input type="radio"/>	
Date:.....		

Appendix 4:

The marine user survey

The following pages contain copies of the English and French version of the marine user survey presented in Chapter 4. The survey was conducted online using the Qualtrics online survey services. Figures A2.1 to A2.3 give an idea of what the survey looked like in the online version that was accessed by the survey participants.



Question:

In the scenario presented on the previous page, would you agree or disagree that the following management measures are justified?

Please select one option for each measure. You can go back to read the scenario again at any time.

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Don't know
Closure of the seagrass bed to bottom trawling	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
An anchoring ban on the seagrass for private sailing boats	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ban of all boat traffic in the area of the seagrass	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
Closure of the seagrass bed to diving	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
A seasonal fishing ban on and around the seagrass bed to protect juvenile fish	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Figure A2.1: Snapshot of question 2 in the online version of the survey

Please answer this question.

Have you heard about the 'ecosystem services approach' before taking this survey?

Yes

No

Previous Next

Figure A2.2: Snapshot of question 5 in the online version of the survey

Please read the following brief text and then answer the question that follows.

Monetary valuation of the natural environment is the idea of determining how much the environment contributes to human wellbeing in terms of economic value. For example, in our scenario we could say that the seagrass bed is worth £750,000 per year to the local economy because it supports important economic activities. Monetary valuation could potentially be used to inform management and planning decisions.

Question:

What do you think about the idea of putting a monetary value on marine habitats and species based on the benefits they provide to humans?

Please select one option by clicking on it and explain your answer in a few words.

Good idea and useful because...

Useful under certain circumstances and with limitations because...

Figure A2.3: Snapshot of question 8 in the online version of the survey

English version of the marine user survey

Dear survey participant,

Thank you for taking the time to participate in my survey and sharing your views with me.

This survey is part of my PhD project in which I am exploring the potential of different approaches to improve the engagement of stakeholders in marine management decisions.

Some of the questions are based on a scenario which has been designed specifically for the purposes of this PhD research. Please be reassured that this scenario is entirely fictional; any similarity to real situations is purely coincidental and unintentional.

The survey will take approximately 10 minutes. It is entirely anonymous; your information will remain anonymous and only aggregated results will be analysed and presented. Because of this, once you have pressed 'Submit' you will not be able to withdraw your data from the survey. If you close this window before completing the survey, your session will not be saved.

If you have any questions about this survey or my research, please do not hesitate to contact me, Laura Friedrich, by email at laura.friedrich@plymouth.ac.uk.

There are no right or wrong answers in this survey. I would appreciate your honest opinion very much.

Please click on this box and then use the 'Next' button at the bottom of the page to start the survey.

- I confirm that I have read the survey conditions, I am 18 years or older and I agree for my responses to be used in this research.

Please note: This survey has been approved by the Ethics Committee of the Faculty of Science and Environment, Plymouth University. If you have any questions about the ethical dimension of this research, please contact: Paula Simson, Secretary to Faculty Ethics Committee, Faculty of Science and Environment Email: paula.simson@plymouth.ac.uk.

[Question 1]¹ For what purpose do you primarily use the marine environment? *Please select one option by clicking on it.*

- Commercial fishing mobile gear
- Commercial fishing static gear
- Owning or working for a dive shop or charter boat
- Owning or working for an angling shop or charter boat
- Owning or working for a surf shop or school
- Owning or working for a water sports centre
- Other commercial purpose, please specify _____
- Owning or working for a sailing school
- Diving (recreational)
- Sailing (recreational)
- Angling (recreational)
- Surfing (recreational)
- Kayaking, paddle boarding, or similar (recreational)
- Other recreational purpose, please specify _____

Imagine yourself in the following scenario...

Please read the scenario carefully and then answer the questions on the following pages. You can go back to this page to refer to the scenario at any point when you are answering the questions. The scenario is entirely fictional; any correlations with real situations are purely coincidental and unintentional.

[Participants were given one of the following three scenarios; they were not informed that there were three different versions of the scenario]

[Scenario 1] Imagine that there is a large seagrass bed in the marine site that you use for work or recreation. According to scientists, the seagrass plays an important role in the local marine ecology.

A new marine management plan is introduced to the area. You receive a brochure explaining the new management measures. The brochure says that the new plan is based on an ecological survey of the site and was informed by consultations with local stakeholders.

The findings of the ecological survey and stakeholder consultation are presented in the brochure:

¹ In the online survey version for participants the questions were not numbered.

- The main marine activities in the area are a commercial plaice fishery and recreational diving, with regular trips being provided by local dive shops. The site is also popular for sailing. These activities are important for the local economy and identity of the local community.
- In the area of the seagrass bed, the main activities are diving and sailing. Some parts of the seagrass bed are occasionally trawled for plaice; however, the main area for the local plaice fishery is outside the seagrass.
- The seagrass is not in healthy condition because of the impacts of bottom trawling and anchoring from dive boats and private sailing boats.

[Scenario 2] Imagine that there is a large seagrass bed in the marine site that you use for work or recreation. According to scientists, the seagrass plays an important role in the local marine ecology.

A new marine management plan is introduced to the area. You receive a brochure explaining the new management measures. The brochure says that the new plan is based on an integrated ecological and socio-economic assessment of the site and its marine activities, which was informed by consultations with local stakeholders.

The findings of the assessment are presented in the brochure:

- The main marine activities in the area are a commercial plaice fishery and recreational diving, with regular trips being provided by local dive shops. The site is also popular for sailing. These activities are important for the local economy and identity of the local community.
- The seagrass bed plays an important role in supporting local marine activities. It is the main nursery habitat for the plaice stock which supports the local fishery. The seagrass bed also is an important dive site for local dive shops, attracting many divers to the area. Some parts of the seagrass bed are occasionally trawled for plaice; however, the main area for the local plaice fishery is outside the seagrass.
- The seagrass is not in healthy condition because of the impacts of bottom trawling and anchoring from dive boats and private sailing boats. Further degradation of the seagrass bed would lead to a reduction of the local plaice stock and the site would lose its attractiveness for divers. This could have negative consequences for the local fishery and dive shops.

[Scenario 3] Imagine that there is a large seagrass bed in the marine site that you use for work or recreation. According to scientists, the seagrass plays an important role in the local marine ecology.

A new marine management plan is introduced to the area. You receive a brochure explaining the new management measures. The brochure says that the new plan is based on an ecosystem service assessment of the site, which was informed by consultations with local stakeholders.

A brief introduction to the ecosystem services approach is given:

Ecosystem services are the benefits that humans get from the natural environment. Examples of marine ecosystem services are: nutrition from fish and seafood, coastal protection from storm waves, renewable energy and opportunities for recreational activities.

Ecosystem service assessment is an integrated ecological and socio-economic assessment of a site, looking at the ecosystem services that are provided and the interactions between human activities and the natural environment at the site.

The findings of the assessment are presented in the brochure:

- The main marine activities in the area are a commercial plaice fishery and recreational diving, with regular trips being provided by local dive shops. The site is also popular for sailing. These activities are important for the local economy and identity of the local community.
- The seagrass bed plays an important role in supporting local marine activities. It is the main nursery habitat for the plaice stock which supports the local fishery. The seagrass bed also is an important dive site for local dive shops, attracting many divers to the area. Some parts of the seagrass bed are occasionally trawled for plaice; however, the main area for the local plaice fishery is outside the seagrass.
- The seagrass is not in healthy condition because of the impacts of bottom trawling and anchoring from dive boats and private sailing boats. Further degradation of the seagrass bed would lead to a reduction of the local plaice stock and the site would lose its attractiveness for divers. This could have negative consequences for the local fishery and dive shops.

[Question 2] In the scenario presented on the previous page, would you agree or disagree that the following management measures are justified? *Please select one option for each measure. You can go back to read the scenario again at any time*

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Don't know
A seasonal fishing ban on and around the seagrass bed to protect juvenile fish	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Closure of the seagrass bed to bottom trawling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
An anchoring ban on the seagrass for commercially operated dive boats	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
An anchoring ban on the seagrass for private sailing boats	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Closure of the seagrass bed to diving	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Provision of moorings in the seagrass area	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
No new management measures for the seagrass bed are necessary	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ban of all boat traffic in the area of the seagrass	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

If you have any additional comments on this question, please put them here.

Question 3: In the scenario presented earlier, would you agree or disagree with the following statements? *Please select one option for each statement. You can go back to read the scenario again at any time.*

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Don't know
If the seagrass bed is not protected, the local community could lose part of its identity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Measures to protect the seagrass bed are necessary	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The local plaice fishery does not depend on the seagrass bed being healthy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The restriction of economic activities is justified because the seagrass is considered as ecologically important	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Further damage to the seagrass bed would threaten local jobs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The seagrass needs to be maintained in a healthy state because it plays an important role in the local marine ecosystem	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Loss of the seagrass would not have any impact on the wellbeing of the local community	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The seagrass is a hindrance for marine activities in the area	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It is irrelevant for the local economy whether the seagrass is healthy or not	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

If you have any additional comments on this question, please put them here.

The following brief text is a continuation of the scenario you read earlier. Please read this text and answer the question that follows.

The brochure about the new management plan tells you that [Scenario 1] based on the ecological survey and stakeholder consultation/ [Scenario 2] based on the stakeholder informed, ecological and socio-economic assessment/ [Scenario 3] based on the stakeholder informed ecosystem service assessment, the local management team decided to introduce restrictions and regulations for anchoring and bottom trawling. In the brochure, the team explains why the new management measures were needed and provides the following arguments.

[Question 4] How relevant to you are the arguments they present for justifying the new management measures? Please select one option for each argument.

	Very relevant	Relevant	Neutral	Not very relevant	Not at all relevant	Don't know
In healthy condition, the seagrass contributes around £750,000 per year to the local economy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Protecting the seagrass bed from further degradation will help secure local jobs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The seagrass bed plays an important role for the identity of the local community	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Loss of the seagrass would significantly reduce the marine biodiversity in the area	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
As a nursery habitat for plaice, the seagrass has an important function for the local fishery	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The economic value of a healthy seagrass bed is higher than the costs caused by the new management measures	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In healthy condition, the seagrass bed attracts dive tourists to the area	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Scientists say further degradation of the seagrass bed would change the marine ecosystem in the area considerably	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
National legislation requires protection of the seagrass because it is designated as a habitat of conservation importance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Failure to protect the seagrass will result in a fine from the EU because it is listed as a threatened habitat under EU legislation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

If you have any additional comments on this question, please put them here.

[Question 5] Have you heard about the 'ecosystem services approach' before taking this survey?

- Yes
- No

[If No is selected, the survey skips to 'Please read the following brief text...']

[Question 6] Where did you hear about ecosystem services? *Please select one option by clicking on it.*

- Work
- Newspapers
- TV or radio
- Other _____
- University
- Internet
- Friends or family

[Question 7] What was your understanding of what is meant by the 'ecosystem services approach'?

Please read the following brief text and then answer the question that follows.

Monetary valuation of the natural environment is the idea of determining how much the environment contributes to human wellbeing in terms of economic value. For example, in our scenario we could say that the seagrass bed is worth £750,000 per year to the local economy because it supports important economic activities. Monetary valuation could potentially be used to inform management and planning decisions.

[Question 8] What do you think about the idea of putting a monetary value on marine habitats and species based on the benefits they provide to humans? *Please select one option by clicking on it and explain your answer in a few words.*

- Good idea and useful because _____
- Useful under certain circumstances and with limitations because _____
- 'Necessary evil', not good but necessary because _____
- Not useful because _____
- Dangerous and should not be used because _____
- None of the above, I think _____

Finally, please tell me a little about yourself.

How do you identify your gender?

- Female
- Male
- Other _____

What is your age? _____

What is your highest level of qualification?

- No formal education
- Primary level education
- Secondary level education
- Bachelor's degree
- Master's degree
- Doctoral degree
- Professional degree
- Other _____

How far away from the sea do you live?

- Within 5 miles from shore
- 5 to 10 miles from shore
- 11 to 20 miles from shore
- Further than 20 miles from shore

Do you have any further comments that you would like to add?

Thank you very much for taking the time to participate in my survey! If you have any further questions about this survey or my research, please contact me by email at laura.friedrich@plymouth.ac.uk.

French version of the marine user survey

Cher(e) participant(e) à l'enquête,

Merci d'avoir pris le temps de participer à cette enquête et de me faire part de vos points de vue.

Cette enquête s'inscrit dans mon sujet de thèse de doctorat, pour lequel j'explore le potentiel présenté par différentes approches afin d'améliorer la participation des acteurs locaux à la gestion du milieu marin.

Certaines des questions sont basées sur un scénario qui a été conçu spécifiquement pour les besoins de mes recherches de doctorat. Soyez assuré(e) que ce scénario est entièrement fictif. Toute ressemblance avec des situations réelles est purement fortuite et involontaire.

L'enquête dure environ 10 minutes et est entièrement anonyme. Vos réponses resteront anonymes et seule la somme globale des résultats sera analysée et présentée. Pour cette raison, vous ne serez pas en mesure de retirer vos données de l'enquête une fois que vous aurez appuyé sur le bouton 'Soumettre'. Si vous fermez cette fenêtre avant d'avoir terminé de répondre à l'enquête, vos données ne seront pas sauvegardées.

Si vous avez des questions sur cette enquête ou mes recherches, n'hésitez pas à me contacter, Laura Friedrich, par courriel à l'adresse suivante: laura.friedrich@plymouth.ac.uk.

Il n'y a pas de bonnes ou de mauvaises réponses à cette enquête. Je vous serais très reconnaissante de fournir votre honnête opinion.

Veillez sélectionner la case ci-dessous, puis cliquez sur «Suivant» en bas de la page pour commencer l'enquête.

- Je confirme avoir lu les conditions de l'enquête et avoir 18 ans ou plus. Je donne mon accord pour que mes réponses soient utilisés pour cette recherche.

N.B.: Cette enquête a été approuvée par le comité d'éthique de la Faculté des Sciences et de l'Environnement de l'Université de Plymouth. Si vous avez des questions au sujet de la dimension éthique de cette recherche, merci de contacter Paula Simson, Secrétaire du Comité d'éthique de la Faculté, Faculté des Sciences et de l'Environnement. Email: paula.simson@plymouth.ac.uk

[Question 1] A quelle fin utilisez-vous principalement l'environnement marin? *Merci de choisir une seule option (cliquez sur l'option de votre choix).*

- Pêche commerciale – engins mobiles
- Pêche commerciale – engins statiques
- Owning or working for a dive shop or charter boat
- Propriétaire ou employé(e) d'un magasin ou d'une compagnie de location de bateaux pour la pêche de loisir
- Propriétaire ou employé(e) d'un magasin ou d'une école de surf
- Propriétaire ou employé(e) d'un centre nautique
- Other commercial purpose, please specify _____
- Propriétaire ou employé(e) d'une école de voile
- Plongée sous-marine (loisir)
- Voile (loisir)
- Pêche à la ligne (loisir)
- Surf (loisir)
- Kayak, paddle, ou similaire (loisir)
- Autre activité de loisir, veuillez préciser _____

Imaginez le scénario suivant ...

Veillez lire attentivement le scénario avant de répondre aux questions sur les pages suivantes. Vous pourrez accéder à cette page à tout moment pour relire le scénario lorsque vous répondrez aux questions. Le scénario est entièrement fictif; toute ressemblance avec des situations réelles est purement fortuite et involontaire.

[Participants were given one of the following three scenarios; they were not informed that there were three different versions of the scenario]

[Scénario 1] Imaginez qu'il y a un grand herbier dans le site marin que vous utilisez pour le travail ou les loisirs. D'après les scientifiques, l'herbier joue un rôle important dans l'écologie marine locale.

Un nouveau plan de gestion du milieu marin est introduit dans la région. Vous recevez une brochure expliquant les nouvelles mesures de gestion. La brochure mentionne que le nouveau plan se base sur une étude écologique du site et a été alimenté par un processus de consultation des acteurs locaux.

Les résultats de l'étude écologique et du processus de consultation sont présentés dans la brochure:

- Les principales activités maritimes dans la région sont la pêche commerciale de la plie et la plongée de loisir, avec des sorties en mer régulières proposées par les magasins de plongée locaux. Le site est également populaire pour la voile. Ces

activités sont importantes pour l'économie locale et l'identité de la communauté locale.

- Là où se trouve l'herbier, les principales activités sont la plongée et la voile. Certaines parties de l'herbier font parfois l'objet de chalutage pour la pêche de la plie. Mais la zone principale de pêche locale de la plie se situe en dehors de l'herbier.
- L'herbier n'est pas en bon état en raison des impacts du chalutage du fond marin et de l'ancrage des bateaux de plongée et des voiliers privés.

[Scenario 2] Imaginez qu'il y a un grand herbier dans le site marin que vous utilisez pour le travail ou les loisirs. D'après les scientifiques, l'herbier joue un rôle important dans l'écologie marine locale.

Un nouveau plan de gestion du milieu marin est introduit dans la région. Vous recevez une brochure expliquant les nouvelles mesures de gestion. La brochure mentionne que le nouveau plan se base sur une évaluation écologique et socio-économique intégrée du site et de ses activités maritimes, évaluation qui a été alimentée par un processus de consultation des acteurs locaux.

Les résultats de l'évaluation sont présentés dans la brochure:

- Les principales activités maritimes dans la région sont la pêche commerciale de la plie et la plongée de loisir, avec des sorties en mer régulières proposées par les magasins de plongée locaux. Le site est également populaire pour la voile. Ces activités sont importantes pour l'économie locale et l'identité de la communauté locale.
- L'herbier joue un rôle important dans le soutien des activités marines locales. Il est le principal habitat de reproduction du stock de plie, qui soutient la pêche locale. L'herbier est également un site de plongée important pour les magasins de plongée locaux, et attire de nombreux plongeurs dans la région. Certaines parties de l'herbier font parfois l'objet de chalutage pour la pêche de la plie. Mais la zone principale de pêche locale de la plie se situe en dehors de l'herbier.
- L'herbier n'est pas en bon état en raison des impacts du chalutage du fond marin et de l'ancrage des bateaux de plongée et des voiliers privés. Davantage de dégradation de l'herbier pourrait entraîner une réduction du stock local de plie, et le site pourrait perdre de l'attraction qu'il présente pour les plongeurs. Cela pourrait avoir des conséquences négatives pour la pêche locale et les magasins de plongée.

[Scénario 3] Imaginez qu'il y a un grand herbier dans le site marin que vous utilisez pour le travail ou les loisirs. D'après les scientifiques, l'herbier joue un rôle important dans l'écologie marine locale.

Un nouveau plan de gestion du milieu marin est introduit dans la région. Vous recevez une brochure expliquant les nouvelles mesures de gestion. La brochure mentionne que le nouveau plan se base sur une évaluation des services écosystémiques du site, évaluation qui a été alimentée par un processus de consultation des acteurs locaux.

Une courte introduction à l'approche par les services écosystémiques est fournie:

Les services écosystémiques sont les avantages que les humains obtiennent de l'environnement naturel. Les exemples suivants sont des services écosystémiques marins : la nutrition grâce aux poissons et fruits de mer, la protection que fournissent les côtes contre les tempêtes, les énergies renouvelables et les opportunités que présente l'espace marin pour les activités récréatives.

L'évaluation des services écosystémiques est une évaluation écologique et socio-économique intégrée d'un site, qui prend en compte les services écosystémiques qui sont fournis et les interactions entre les activités humaines et l'environnement naturel sur le site.

Les résultats de l'évaluation sont présentés dans la brochure:

- Les principales activités maritimes dans la région sont la pêche commerciale de la plie et la plongée de loisir, avec des sorties en mer régulières proposées par les magasins de plongée locaux. Le site est également populaire pour la voile. Ces activités sont importantes pour l'économie locale et l'identité de la communauté locale.
- L'herbier joue un rôle important dans le soutien des activités marines locales. Il est le principal habitat de reproduction du stock de plie, qui soutient la pêche locale. L'herbier est également un site de plongée important pour les magasins de plongée locaux, et attire de nombreux plongeurs dans la région. Certaines parties de l'herbier font parfois l'objet de chalutage pour la pêche de la plie. Mais la zone principale de pêche locale de la plie se situe en dehors de l'herbier.
- L'herbier n'est pas en bon état en raison des impacts du chalutage du fond marin et de l'ancrage des bateaux de plongée et des voiliers privés. Davantage de dégradation de l'herbier pourrait entraîner une réduction du stock local de plie, et le site pourrait perdre de l'attraction qu'il présente pour les plongeurs. Cela pourrait avoir des conséquences négatives pour la pêche locale et les magasins de plongée.

[Question 2] Dans le scénario présenté à la page précédente, les mesures de gestion suivantes vous paraissent-elles justifiées? *Veillez sélectionner une option pour chaque mesure. Vous pouvez revenir en arrière pour relire le scénario à tout moment.*

	Tout à fait d'accord	D'accord	Neutre	Pas d'accord	Pas du tout d'accord	Ne sais pas
Une interdiction saisonnière de pêcher sur et autour de l'herbier afin de protéger les poissons juvéniles	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fermeture de l'herbier au chalutage de fond	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Une interdiction d'ancrage sur l'herbier pour les bateaux commerciaux de plongée	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Une interdiction d'ancrage sur l'herbier pour les voiliers privés	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fermeture de l'herbier à la plongée	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fourniture d'amarrages dans la zone de l'herbier	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Aucune nouvelle mesure de gestion de l'herbier n'est nécessaire	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Interdiction de circuler dans la zone de l'herbier pour tous les bateaux	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Si vous avez des commentaires supplémentaires pour cette question, merci de les indiquer ci-dessous.

[Question 3] Dans le scénario présenté précédemment, êtes-vous d'accord avec les affirmations suivantes? *Veillez sélectionner une option pour chaque affirmation. Vous pouvez revenir en arrière pour relire le scénario à tout moment.*

	Tout à fait d'accord	D'accord	Neutre	Pas d'accord	Pas du tout d'accord	Ne sais pas
Si l'herbier n'est pas protégé, la communauté locale perdra de son identité	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Des mesures pour protéger l'herbier sont nécessaires	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
La pêche locale de la plie ne dépend pas d'un herbier en bon état	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
La restriction des activités économiques est justifiée car l'herbier est considéré comme important d'un point de vue écologique	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Davantage de dégâts causés à l'herbier pourraient menacer l'emploi local	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
L'herbier doit être maintenu dans un bon état car il joue un rôle important dans l'écosystème marin local	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
La disparition de l'herbier n'aurait pas d'impact sur le bien-être de la communauté locale	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
L'herbier est un obstacle pour les activités maritimes dans la région	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cela n'a pas d'importance pour l'économie locale que l'herbier soit en bon ou en mauvais état	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Si vous avez des commentaires supplémentaires pour cette question, merci de les indiquer ci-dessous.

Le court texte ci-dessous fait suite au scénario que vous avez lu précédemment. Veuillez lire ce texte, puis répondez à la question.

La brochure présentant le nouveau plan de gestion précise que [Scenarion 1] sur la base de l'étude écologique et du processus de consultation des acteurs locaux/ [Scenarion 2] sur la base de l'évaluation écologique et socio-économique alimentée par le processus de consultation des acteurs locaux / [Scenarion 3] sur la base de l'évaluation des services écosystémiques alimentée par le processus de consultation des acteurs locaux, l'équipe de gestion locale a décidé d'introduire des restrictions et réglementations pour l'ancrage et le chalutage de fond. Dans la brochure, l'équipe explique en quoi les nouvelles mesures de gestion étaient nécessaires et avance les arguments suivants.

[Question 4] Les arguments présentés pour justifier les nouvelles mesures de gestion sont-ils pour vous pertinents? *Veillez sélectionner une option pour chaque argument. Vous pouvez revenir en arrière pour relire le scénario à tout moment.*

	Très pertinent	Pertinent	Neutre	Pas vraiment pertinent	Pas du tout pertinent	Ne sais pas
S'il est en bon état, l'herbier rapporte environ 1 million d'euros par an à l'économie locale	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Protéger l'herbier contre davantage de dégradation permettra de sauvegarder l'emploi local	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
L'herbier joue un rôle important pour l'identité de la communauté locale	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
La disparition de l'herbier réduirait de manière significative la biodiversité marine dans la région	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
En tant qu'habitat de reproduction pour la plie, l'herbier a une fonction importante pour la pêche locale	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
La valeur économique d'un herbier en bon état est supérieure aux coûts engendrés par les nouvelles mesures de gestion	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
S'il est dans un bon état, l'herbier attire les touristes pratiquant la plongée dans la région	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Les scientifiques estiment que davantage de dégradation de l'herbier changerait considérablement l'écosystème marin de la région	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
La législation nationale requiert la protection de l'herbier car il est désigné comme un habitat important à préserver	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
L'incapacité à protéger l'herbier se traduira par une amende de l'UE, car l'herbier est répertorié comme un habitat menacé en vertu de la législation de l'UE	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Si vous avez des commentaires supplémentaires pour cette question, merci de les indiquer ci-dessous.

[Question 5] Avant de participer à cette enquête, aviez-vous déjà entendu parler de «l'approche par les services écosystémiques»?

- Oui
- Non

[If No is selected, the survey skips to 'Please read the following brief text...']

[Question 6] Où avez-vous entendu parler des services écosystémiques? *Veillez choisir une option (cliquez sur l'option de votre choix).*

- Au travail
- Dans les journaux
- A la télévision ou à la radio
- Other _____
- A l'université
- Sur Internet
- Via des amis ou des membres de ma famille

[Question 7] Quelle était votre compréhension de ce qu'on entend par «l'approche par les services écosystémiques»?

Veillez lire le court texte ci-dessous, puis répondez à la question qui suit.

Le concept d'évaluation monétaire de l'environnement naturel cherche à déterminer combien l'environnement contribue au bien-être humain en termes d'argent. Par exemple, dans notre scénario, nous pourrions dire que l'herbier vaut 1 million d'euros par an à l'économie locale, car il soutient des activités économiques importantes. L'évaluation monétaire pourrait potentiellement être utilisée pour éclairer les décisions de gestion et de planification.

[Question 8] Que pensez-vous de l'idée d'attribuer une valeur monétaire aux habitats marins et aux espèces marines sur la base des avantages qu'ils procurent aux humains? Veuillez cliquer sur l'option de votre choix et expliquer votre réponse en quelques mots.

- Bonne idée et utile, car _____
- Utile dans certaines circonstances et avec des limites, car _____
- «Mal nécessaire», mauvaise idée mais inévitable, car _____
- Pas utile, car _____
- Dangereuse, et à éviter, car _____
- Aucune des réponses ci-dessus, je pense _____

Enfin, parlez-moi un peu de vous.

A quel genre vous identifiez-vous?

- Féminin
- Masculin
- Autre _____

Quel âge avez-vous? _____

Quel est votre plus haut niveau de qualification?

- Pas d'éducation formelle
- Ecole primaire
- Ecole secondaire
- Licence
- Master
- Doctorat
- Diplôme professionnel
- Autre _____

A quelle distance de la mer vivez-vous?

- A moins de 10 kilomètres de la côte
- Entre 10 et 20 kilomètres de la côte
- Entre 20 et 30 kilomètres de la côte
- A plus de 30 kilomètres de la côte

Avez-vous d'autres commentaires dont vous souhaiteriez me faire part?

Merci beaucoup d'avoir pris le temps de participer à cette enquête! Si vous avez d'autres questions sur cette enquête ou mes recherches, merci de me contacter par e-mail à l'adresse suivante : laura.friedrich@plymouth.ac.uk.

Appendix 5:

Additional marine user survey results

List of Tables on the following pages:

Table A5.1: Breakdown of marine user survey demographics by scenario group

Table A5.2: Mean responses for questions 2, 3 and 4 (overall and by scenario group, country of residence, primary user category, gender)

Table A5.3: Responses for questions 2 and 3 on a five point strongly agree (1) to strongly disagree (5) scale and additional don't know (in number of respondents), subdivided by scenario groups (Scenario 1 (S1) N = 91, Scenario 2 (S2) N = 92, Scenario 3 (S3) N = 94)

Table A5.4: Overview of respondents' views on monetary valuation of ecosystem services in the UK and French samples (based on open responses to question 8)

Table A5.5: Respondents' explanations of their views on monetary valuation (open ended part of question 8); responses have not been edited – UK sample

Table A5.6: Respondents' explanations of their views on monetary valuation (open ended part of question 8); responses have not been edited – French sample (French original and English translation by L Friedrich)

Table A5.1: Breakdown of marine user survey demographics by scenario group

		Scenario 1 Count	S1 %	Scenario 2 Count	S2 %	Scenario 3 Count	S3 %	Total Count	Total %
Sample size		91	100	92	100	94	100	277	100
Country of residence	UK	49	53.85	58	63.04	62	65.96	169	61.01
	France	42	46.15	34	36.96	32	34.04	108	38.99
Primary marine use	Commercial	20	21.98	17	18.48	20	21.28	57	20.58
	Recreational	71	78.02	75	81.52	74	78.72	220	79.42
Gender*	Female	19	28.88	21	22.83	12	12.90	52	18.77
	Male	72	79.12	71	77.17	81	87.10	224	80.87
Distance of residence from shore	< 5 miles/< 10 km	67	73.63	60	65.22	67	71.28	194	70.04
	5-10 miles/10-20 km	9	9.89	5	5.43	4	4.26	18	6.50
	11-20 miles/20-30 km	4	4.40	5	5.43	5	5.32	14	5.05
	> 20 miles/> 30 km	11	12.09	22	23.91	18	19.15	51	18.41
Highest level of qualification	No formal education	0	0	1	1.09	0	0	1	0.36
	Primary level	0	0	0	0	2	2.13	2	0.72
	Secondary level	15	16.48	11	11.96	18	19.15	44	15.88
	Bachelor's degree	21	23.08	30	32.61	25	26.60	76	27.44
	Master's degree	18	19.78	22	23.91	21	22.34	61	22.02
	Doctoral degree	9	9.89	6	6.52	2	2.13	17	6.14
	Professional degree	15	16.48	14	15.22	11	11.70	40	14.44
	Other	13	14.29	8	8.70	15	15.96	36	13.00

*One missing value for gender in scenario group 3

Table A5.2: Mean responses for questions 2, 3 and 4 (overall and by scenario group, country of residence, primary user category, gender)

Question	Mean overall	Mean by scenario group			Mean by country of residence		Mean by primary use category		Mean by gender	
		Scenario 1	Scenario 2	Scenario 3	UK	France	Commercial	Recreational	Male	Female
Q2										
2.1	1.78 (N = 274)	1.48 (N = 90)	1.88 (N = 92)	1.99 (N = 92)	1.93 (N = 166)	1.56 (N = 108)	2.02 (N = 56)	1.72 (N = 218)	1.84 (N = 221)	1.58 (N = 52)
2.2	1.29 (N = 275)	1.31 (N = 90)	1.24 (N = 91)	1.31 (N = 94)	1.34 (N = 168)	1.21 (N = 107)	1.48 (N = 56)	1.24 (N = 219)	1.29 (N = 223)	1.27 (N = 51)
2.3	1.83 (N = 277)	1.54 (N = 91)	1.90 (N = 92)	2.03 (N = 94)	1.93 (N = 169)	1.66 (N = 108)	1.84 (N = 57)	1.82 (N = 220)	1.85 (N = 224)	1.73 (N = 52)
2.4	1.74 (N = 276)	1.51 (N = 91)	1.78 (N = 91)	1.94 (N = 94)	1.93 (N = 169)	1.45 (N = 107)	1.72 (N = 57)	1.75 (N = 219)	1.80 (N = 224)	1.51 (N = 51)
2.5	3.54 (N = 272)	3.46 (N = 89)	3.52 (N = 91)	3.63 (N = 92)	3.46 (N = 167)	3.67 (N = 105)	3.72 (N = 57)	3.49 (N = 215)	3.55 (N = 220)	3.47 (N = 51)
2.6	2.24 (N = 267)	2.34 (N = 87)	2.29 (N = 91)	2.10 (N = 89)	2.57 (N = 163)	1.73 (N = 104)	2.04 (N = 56)	2.30 (N = 211)	2.24 (N = 218)	2.27 (N = 48)
2.7	4.02 (N = 267)	4.15 (N = 87)	4.07 (N = 87)	3.86 (N = 93)	3.83 (N = 167)	4.35 (N = 100)	4.13 (N = 54)	4.00 (N = 213)	4.00 (N = 214)	4.12 (N = 52)
2.8	3.67 (N = 270)	3.42 (N = 91)	3.60 (N = 88)	4.00 (N = 91)	3.81 (N = 166)	3.46 (N = 104)	3.88 (N = 57)	3.62 (N = 213)	3.71 (N = 219)	3.54 (N = 50)
Q3										
3.1	2.41 (N = 269)	2.41 (N = 87)	2.26 (N = 90)	2.55 (N = 92)	2.47 (N = 165)	2.32 (N = 104)	2.53 (N = 57)	2.38 (N = 212)	2.43 (N = 217)	2.27 (N = 51)
3.2	1.55 (N = 275)	1.48 (N = 90)	1.49 (N = 92)	1.69 (N = 93)	1.68 (N = 168)	1.36 (N = 107)	1.63 (N = 57)	1.53 (N = 218)	1.61 (N = 222)	1.33 (N = 52)
3.3	3.90 (N = 245)	3.83 (N = 76)	3.98 (N = 83)	3.90 (N = 86)	3.84 (N = 153)	4.00 (N = 92)	3.78 (N = 50)	3.93 (N = 195)	3.80 (N = 198)	4.30 (N = 46)
3.4	1.98 (N = 275)	1.80 (N = 90)	1.96 (N = 92)	2.17 (N = 93)	2.06 (N = 167)	1.85 (N = 108)	2.16 (N = 57)	1.93 (N = 218)	2.01 (N = 222)	1.87 (N = 52)
3.5	2.30 (N = 262)	2.35 (N = 83)	2.13 (N = 89)	2.41 (N = 90)	2.43 (N = 159)	2.09 (N = 103)	2.31 (N = 55)	2.29 (N = 207)	2.36 (N = 211)	2.04 (N = 50)
3.6	1.42 (N = 276)	1.36 (N = 90)	1.43 (N = 92)	1.46 (N = 94)	1.55 (N = 168)	1.21 (N = 108)	1.49 (N = 57)	1.40 (N = 219)	1.46 (N = 223)	1.23 (N = 52)
3.7	3.95 (N = 264)	3.99 (N = 85)	4.08 (N = 87)	3.78 (N = 92)	3.88 (N = 161)	4.05 (N = 103)	3.96 (N = 56)	3.94 (N = 208)	3.89 (N = 212)	4.16 (N = 51)
3.8	4.18 (N = 272)	4.16 (N = 91)	4.20 (N = 90)	4.16 (N = 91)	4.14 (N = 165)	4.23 (N = 107)	4.23 (N = 57)	4.16 (N = 215)	4.13 (N = 220)	4.37 (N = 51)
3.9	4.17 (N = 270)	4.18 (N = 87)	4.29 (N = 91)	4.05 (N = 92)	4.15 (N = 163)	4.21 (N = 107)	4.12 (N = 57)	4.19 (N = 213)	4.12 (N = 218)	4.37 (N = 51)

Table A5.2 continued

Q4										
4.1	2.15 (N = 222)	2.07 (N = 76)	2.14 (N = 71)	2.24 (N = 75)	2.06 (N = 144)	2.32 (N = 78)	2.17 (N = 46)	2.14 (N = 176)	2.28 (N = 180)	1.61 (N = 41)
4.2	2.16 (N = 266)	2.14 (N = 86)	2.02 (N = 90)	2.31 (N = 90)	2.22 (N = 164)	2.06 (N = 102)	2.23 (N = 56)	2.14 (N = 210)	2.23 (N = 214)	1.86 (N = 51)
4.3	2.45 (N = 274)	2.46 (N = 90)	2.31 (N = 91)	2.57 (N = 93)	2.41 (N = 168)	2.50 (N = 106)	2.40 (N = 57)	2.46 (N = 217)	2.50 (N = 221)	2.19 (N = 52)
4.4	1.66 (N = 276)	1.57 (N = 91)	1.67 (N = 91)	1.72 (N = 94)	1.75 (N = 168)	1.51 (N = 108)	1.75 (N = 57)	1.63 (N = 219)	1.71 (N = 224)	1.43 (N = 51)
4.5	1.62 (N = 270)	1.46 (N = 89)	1.62 (N = 89)	1.77 (N = 92)	1.62 (N = 164)	1.52 (N = 106)	1.68 (N = 56)	1.60 (N = 214)	1.68 (N = 220)	1.37 (N = 49)
4.6	2.19 (N = 250)	1.96 (N = 83)	2.24 (N = 82)	2.35 (N = 85)	2.27 (N = 156)	2.05 (N = 94)	2.29 (N = 52)	2.16 (N = 198)	2.29 (N = 204)	1.76 (N = 45)
4.7	2.02 (N = 275)	2.08 (N = 90)	1.90 (N = 91)	2.09 (N = 94)	2.07 (N = 169)	1.95 (N = 106)	2.04 (N = 57)	2.02 (N = 218)	2.12 (N = 223)	1.63 (N = 51)
4.8	1.71 (N = 274)	1.58 (N = 88)	1.79 (N = 92)	1.76 (N = 94)	1.77 (N = 167)	1.62 (N = 107)	1.80 (N = 56)	1.69 (N = 218)	1.75 (N = 221)	1.58 (N = 52)
4.9	1.92 (N = 273)	1.81 (N = 89)	1.92 (N = 90)	2.02 (N = 94)	1.92 (N = 167)	1.92 (N = 106)	1.93 (N = 56)	1.92 (N = 217)	1.92 (N = 221)	1.92 (N = 51)
4.10	2.51 (N = 250)	2.40 (N = 83)	2.43 (N = 81)	2.43 (N = 86)	2.42 (N = 153)	2.65 (N = 97)	2.53 (N = 53)	2.50 (N = 197)	2.55 (N = 200)	2.33 (N = 49)

Table A5.3: Responses for questions 2 and 3 on a five point strongly agree (1) to strongly disagree (5) scale and additional don't know (in number of respondents), subdivided by scenario groups (Scenario 1 (S1) *N* = 91, Scenario 2 (S2) *N* = 92, Scenario 3 (S3) *N* = 94)

Quest.	Strongly agree (1)			Agree (2)			Neutral (3)			Disagree (4)			Strongly disagree (5)			Don't know		
	S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3
Q2																		
2.1	59	41	36	25	33	35	2	10	12	2	4	4	2	4	4	1	0	2
2.2	66	73	71	22	14	18	1	4	4	0	0	1	1	0	0	1	1	0
2.3	55	47	44	29	25	24	3	7	10	2	8	11	2	5	5	0	0	0
2.4	59	46	48	25	31	24	3	5	7	3	6	10	2	3	5	0	1	0
2.5	10	12	6	13	6	7	10	15	23	38	39	25	18	19	21	2	1	2
2.6	33	37	38	26	24	25	6	8	11	9	11	9	13	11	6	4	1	5
2.7	1	3	8	8	9	6	8	6	10	30	30	36	40	39	33	4	5	1
2.8	9	6	4	11	8	2	20	16	13	35	43	43	16	15	29	0	4	3
Q3																		
3.1	18	27	18	33	33	34	22	14	18	10	12	15	4	4	7	4	2	2
3.2	53	55	44	33	33	39	3	1	7	0	2	1	1	1	2	1	0	1
3.3	2	1	3	8	10	11	14	9	13	29	33	24	23	30	35	15	9	8
3.4	40	34	24	36	41	44	9	7	12	2	7	11	3	3	2	1	0	1
3.5	19	29	16	30	32	38	23	17	25	8	9	5	3	2	6	8	3	4
3.6	65	59	58	22	29	31	1	2	4	0	1	0	2	1	1	1	0	0
3.7	5	3	4	5	5	12	8	7	14	35	39	32	32	33	30	6	5	2
3.8	2	4	3	3	3	6	14	6	7	31	35	32	41	42	43	0	2	3
3.9	1	1	2	4	3	9	11	6	10	33	40	32	38	41	39	4	1	2

Table A5.4: Overview of respondents' views on monetary valuation of ecosystem services in the UK and French samples (based on open responses to question 8)

UK sample (n=169)	Number of Resp.	French sample (n=108)	Number of Resp.
Views on monetary valuation of ecosystem services		Views on monetary valuation of ecosystem services	
Good idea and useful because...	69	Good idea and useful because...	35
People understand/relate to monetary values – monetary values help people, policy makers, authorities understand the importance and relevance of a marine habitat/species	29	Monetary valuation helps raise awareness and increase understanding of the importance and relevance of marine habitats/species (for a community or local economy)	13
<ul style="list-style-type: none"> • Monetary values: are quantifiable; have direct relevance to people's lives; provide a universal language; capture people's attention • Monetary values help understand: the importance/relevance of a marine habitat/species for people's lives, local communities and economies; the interdependence between environment and economy; the consequences of human interactions with the marine environment; the economic benefits of conservation; the magnitude of problems related to the marine environment • People understand monetary values even if they have limited knowledge about or concern for the marine environment 		<ul style="list-style-type: none"> • Monetary values: are understandable for people with no knowledge of marine habitats/species; quantify an abstract value; are meaningful to people; show that marine resources are not inexhaustible; provide a common value reference regardless of people's level of awareness or concern for environmental protection 	
Monetary valuation provides a measure for comparison and integration of economic and environmental factors in balanced decision making	14	Monetary valuation provides clear and meaningful arguments	5
<ul style="list-style-type: none"> • Monetary valuation provides: a quantifiable measure of importance/ economic value of marine habitats/species; a measure of benefits and costs of marine conservation or degradation 		<ul style="list-style-type: none"> • To inform management decisions; to set priorities and put the cost of conservation into perspective; to balance the argument of immediate economic gain; economic arguments weigh more than other arguments; monetary valuation allows to assess the economic impact of habitat degradation 	

Table A5.4 continued

<p>Monetary valuation provides arguments for economically oriented stakeholders (policy, commercial) and people</p> <ul style="list-style-type: none"> Economic arguments drive decisions and raise people’s attention and concern 	5	<p>Monetary valuation facilitates communication with and provides arguments for politicians, decision makers and economically oriented stakeholders (with low concern for environmental protection)</p> <ul style="list-style-type: none"> Most politicians and decision makers understand value only in monetary terms; monetary value is understood by all economically oriented stakeholders 	4
<p>Economic considerations should be part of all decisions concerning the environment</p>	1	<p>Monetary valuation is unavoidable because everything is valued in economic terms</p>	3
<p>No/invalid explanation</p>	20	<p>Monetary valuation enables/is necessary for stronger marine conservation</p>	2
<p>Useful under certain circumstances and with limitations because...</p>	45	<p>Useful under certain circumstances and with limitations because...</p>	21
<p>Useful:</p> <p>Monetary valuation provides a measure of the costs and benefits related to marine conservation</p> <ul style="list-style-type: none"> Useful for comparison or evaluation of management options; shows the economic effects of decisions 	7	<p>Useful:</p> <p>Monetary valuation quantifies the importance of a marine habitat/species</p> <ul style="list-style-type: none"> Monetary valuation: raises awareness; provides a common reference point; highlights issues 	4
<p>Monetary valuation can raise attention, concern and understanding of the value of marine habitats/species and the relevance of marine conservation</p>	6	<p>Monetary valuation can provide decisive/relevant arguments</p>	2
<p>Useful (no further explanation)</p>	16	<p>Useful (no further explanation)</p>	5

Table A5.4 continued

Limitations:		Limitations:	
Methodological limitations of monetary valuation	11	Monetary valuation of intangible values is very difficult/impossible	4
<ul style="list-style-type: none"> • Monetary valuation: is difficult to do; provides only estimates; is liable to manipulation; is subjective 			
Monetary valuation cannot capture all important factors/values related to a marine habitat/species (for example intrinsic values)	6	Monetary arguments alone are not enough and should only be used in support of ecological arguments	3
Some ecologically important species/habitats that need protection cannot be valued or have limited value in monetary terms	6	Monetary valuation is very difficult and prone to limitations, subjectivity and bias	3
Danger that monetary valuation may be used as evidence to support interests opposed to conservation	2	Danger that monetary valuation may be used to pay off environmental degradation	1
<ul style="list-style-type: none"> • For example if the economic value of the damaging activity is larger than the monetary value attributed to the marine habitat/species 			
Limitations (no further explanation)	4	Limitations (no further explanation)	0
No/invalid explanation	16	No/invalid explanation	10
Necessary evil, not good but necessary because...	20	Necessary evil, not good but necessary because...	18
Monetary (quantifiable) value is the most important motivation for some people, monetary valuation is necessary to provide understandable arguments and raise concern for marine conservation <u>But</u> monetary valuation cannot capture all relevant values; makes it difficult to argue for the conservation of ecologically important habitats/species with low economic value; holds the danger of providing evidence in support of interests opposed to conservation	8	Monetary arguments are necessary to raise awareness about the importance of marine species/habitats and conservation and to encourage behaviour change <u>But</u> monetary valuation cannot capture all relevant factors/values; does not take into account the wellbeing of nature; is dangerous, subjective and prone to misuse for lobbyism	10

Table A5.4 continued

Policy makers, authorities and other decision makers are driven by monetary considerations <u>But</u> monetary valuation cannot capture all values related to a marine species/habitat/ecosystem	4	Monetary valuation provides an indicator for decision making <u>But</u> decision making based on monetary/quantitative indicators alone is prone to manipulation and poor decisions	1
Monetary valuation is the only way to achieve marine conservation	1	Monetary valuation is necessary in a world governed by money	2
Economic arguments are necessary to secure funding	1		
No/invalid explanation	6	No/invalid explanation	5
Not useful because...	11	Not useful because...	5
Methodological limitations of monetary valuation (assumptions, estimates, subjectivity)	2	Monetary valuation is just another way to communicate political choices	1
Monetary valuation can be misused to support interests opposed to marine conservation	1	Monetary valuation is prone to be misused for political purposes	1
Monetary valuation creates a precedent for monetary value as a prerequisite for species/habitat/ecosystem conservation	1		
Danger that other non-monetary values may be overlooked	1		
No/invalid explanation	6	No/invalid explanation	3
Dangerous and should not be used because...	10	Dangerous and should not be used because...	18
Monetary valuation is used to introduce and justify restrictions on access rights or access fees	4	Monetary valuation does not capture the full importance of the natural environment but can be misused to justify or determine compensation payments for environmental damage	4

Table A5.4 continued

Monetary valuation shifts the focus of conservation decisions from marine habitat/species protection to monetary trade-offs	2	Nature conservation is incompatible with economic valuation <ul style="list-style-type: none"> The conservation need of an ecosystem is not determined by its economic value; nature conservation is tied to core moral values; ecosystem conservation is essential to secure sustainable resources 	4
The environment should not be valued in monetary terms	1	The monetary value of a marine species/habitat is difficult to quantify	1
Monetary valuation enables environmentally damaging commercial activities	1	Monetary valuation encourages exploitation for profit at the expense of ecological, intrinsic and intangible values	1
		The value of biodiversity is arbitrary whereas the cost of conservation to the local economy is real	1
No/invalid explanation	2	No/invalid explanation	7
None of the above, I think...	14	None of the above, I think...	11
Concern about relevance, accuracy, potential bias and misuse of valuation outputs	3	Consideration and respect for the natural environment should not be tied to monetary values or benefits for humans	2
Monetary valuation creates new opportunities for exploitation	1	Collective awareness and education is more important/useful	2
The marine environment should be protected for its intrinsic value	1	The marine environment is priceless	1
Ecological arguments are more important than monetary arguments	1	It is better to rely on ecological arguments	1
Would need more information about the approach to form an opinion	1	Don't know	1
No/invalid explanation	7	No/invalid explanation	4

Table A5.5: Respondents' explanations of their views on monetary valuation (open ended part of question 8); responses have not been edited – UK sample (N = 157)

Respondents' views on monetary valuation in the UK

Good idea and useful because...

We understand measurement by monetary value

The thing that drives the world that we have created for ourselves is money. The economy is so integral to everything that we do, that giving a habitat a monetary value is the only way to make most people care about it. People are more likely to care about the destruction of an ecosystem, if its destruction directly impacts their livelihood and standard of living.

People put a value they can understand on money

Economic effects should come into all environmental debates.

Helps people see the importance of it.

some people can only think about money

Local people and in particular councils etc understand the importance to everyone not just invisible environmentalists.

It helps those work in monetary terms to understand its value. It's not necessarily important for all to see the environment in those terms but is for policy makers/government and to help clarify the "purpose" as an added element of why protection is needed.

If a monetary value can be proved, it's a good idea.

Allows quantification relative to traditional economic measures of success.

Beneficial to the local community and worth saving

It takes account of all stakeholders and not imply short term gain by commercial fishermen which is often minimal when subsidies removed. A means of comparison. What is first sale value of plaice landed to fishermen

Provides a counter balance to the argument about loss of income if a fishing ban is in place

bring's people into the area to spend money if there are a good dive sites with lots of stuff to see.

Table A5.5 continued

We can continue to harvest from The sea only if we manage it correctly .

Essential in order to be able to protect it.

People tend to relate to money, rather than be concerned about seagrass that they probably know little about. Including the implications of its demise.

...it impacts on human activity, and a monetary value allows local economies to estimate losses and costs if areas are closed.

Many public and elected members of public bodies fail to recognise both the environmental and economic benefit of habitat management.

This is understood by people.

A healthy ecosystem. Benefits everyone, humans and marine life.

it is generally an 'unseen' but important part of the world to most people except divers. So only a small minority actually see the degradation that is happening if certain activities are not controlled. Putting a monetary value gives people an idea of how much use that environment is to their lives.

Useful because humans tend to relate to monetary issues more than emotional ones

Money talks- it gives a quantifiable measure of worth which people can understand and should have direct relevance to people's lives

important marine habitats can play a vital role to the local economy and therefore providing a monetary value allows people to understand the importance of a habitat/species outside the ecological role.

monetary value is a universal language. It will also help to capture the attention of those with uninformed views and provided it is supplemented with a breakdown of suggested figures (i.e. how the £750k is amounted), this will allow it to be understood at multiple levels, not just those who carry out further research themselves.

It helps explain the benefit in terms that the public can understand

every body will be aware of the consequences of damaging the habitat.If it can be put into monetary terms therefore giving a yard stick for it to be measured against

You know how much you are losing if its destroyed

it helps shape the arguments and put the different factors into a common currency

it gives a value that can be understood by people not involved in activities.

the world deals in £'s etc and can focus the mind on the value they give. Look at how much money recreational angling brings to the local economy which would be lost or significantly reduced without a healthy and protected marine environment.

Table A5.5 continued

It highlights the relevance & value of a marine zone to the wider public, who may not ordinarily see the 'benefit' or 'connection' for a town & a patch of grass under the sea.

You have to use this in making a balanced decision

Most people can understand money so this would have some meaning to them.

it provides a benchmark against which costs can be assessed. In this scenario if it cost £50k it is great value - if it costs £5m it isn't!

We have a duty of care to protect our natural environment to the mutual benefit of all living creatures & mankind.

it helps people understand the link between our environment and our economy - interdependence. I work with 'Social return on Investment in the social care economy; this helps put another perspective and value on human activity.

We all need a clean sea.

As humans we are just another species in the whole Gaia system of interplay between inanimate and animate parts which has evolved. It is therefore necessary to preserve the whole system.

We in Lyme Bay have seen an increase in fish since the area was closed to trawling and scallop dredging, if an area needs a rest then it should be closed down.

By placing a monetary value the wider community will have some basic understanding of the impact of the marine environment.

it gives a value that can be readily understood. Against this, commercial fishermen could use this as a lever to get some monetary recompense for money they have lost by not exploiting the area in question.

Everything come down to money and what benefit you get from it and it's an easy way to weigh things up

It gives people an idea of the magnitude of the problem

It makes people realise monetary consequences of their action or inaction. Everyone understands the pound while many people don't understand seagrass and many locals probably don't ever get to see it. And they see money every day.

it puts in simple terms what most people recognise and the true value to the economy of a particular area for far to long it has only been the commercial fishing sector that has been considered when it is now known that other activities such as diving angling surfing actually contribute far more to the economy even the taxes from the businesses and goods totally contribute more than just the sector that has been in existence for many years

it high lights the cost of marine jobs

Table A5.5 continued

by placing an economic value on ecosystems, governments, businesses and economists are more likely to take notice and protect them.

It ensures that the value of an eco system is spelt out in terms that most will understand. I do not know how much the die back of the mussel beds in 2015 of the Shambles has cost the Weymouth fishery but it would have been useful for all concerned to understand the cost, and perhaps reacted more effectively.

It shows the benefits against the losses incurred if the habitat is not protected

Many people will respond to financial factors even if they are not worried about environmental issues.

people understand monetary loss.

people will always relate to money.

people trash things they dont value, and people value things differently

Putting a value on the benefits makes a situation clearer to the public.

Many stakeholders in our communities are driven by economic decision making and by those familiar with business economics. Cold facts on such issues removes the emotional oppositions and makes rational decision making more likely.

makes it tangible to the layman. Everyone understands the value of money, making it relate to them.

It provides a measure of importance rather than relying on emotional debate. A cost figure does not tell the whole story. It is only one key indicator in the decision.

Everything else has a value, so it's appropriate here too.

Money drives decisions whether we like it or not

Everyone understands and can relate to monetary values and costs. Not everyone can appreciate what seagrass is, looks like, where it is, let alone the wider implications

Useful under certain circumstances and with limitations because...

useful if done but very difficult to do accurately in the face of future uncertainties (e.g. global warming and weather/climate changes).

As it clarifies the benefits in a manner that will be clearer to some individuals and give the initiatives substance and measurable benefits

the the largest stakeholder in terms of monitary benefit to the local economy could be the cause of the destruction of this marine habitat in the longterm i.e trawling for plaice.

Table A5.5 continued

Useful because money is something everyone can understand. Limited because there may be habitats and species that need protection simply to preserve the amazing and beautiful creatures of the sea that we may never actually see but which play an important part in the whole ecosystem, but which have no easily demonstrated monetary value.

on the one hand allows to objectively assess the value of the protected ecosystem and therefore implement economically relevant measures, but on the other I don't think it's only the monetary value of marine habitats that matters, there are other important factors that cannot be reduced to just their economic value

it gives people of different ecological values a common reference point in evaluating options. Limited by the difficulty in actually assessing natural resources in economic terms.

Assumptions can be subjective and conclusions can often appear contrived to meet the end result desired

The marine Eco system is a fundamentally important part of our planet

If it protects habitats that are of benefit to humans but it depends what other affects it has on the area

its difficult to show proof of that value.

quantifying the value of an environmental feature can help non-technical decision makers to better understand the economic effects of political decisions.

of the "panda effect". Ugly or non contributing ecosystems are then left to the ravages of progress.

Good idea to protect the seagrass beds whether it should have a monetary value put on it I am not sure it is certainly important for protecting young fish

It's not always possible to put a monetary value on

We have too many "boffins" making too many regulations, I just want guidance to sail my little boat in peace, without hurting the environment

it may help people to get the bigger picture

there are times when the survival of natural habitats or resources have value that can not be monetised

the process of determining the monetary value seems very subjective to me.

Monitoring activities in the area. Placing mooring boys for dive boats in the area, this intern brings revenue to local population

because whilst some may have limited value economically we need to preserve it anyway

It is not a precise value more an estimate, and cannot account for natural events such as storm damage. However it can put into context the value of a marine resource

Table A5.5 continued

and more people may be able to relate to a monetary value than the concept of biodiversity.

Good because in a society where it is quite hard to make people care about conservation issues, attaching a monetary value can attract their attention to what they are worth. Bad because it doesn't take into account the intrinsic value of the marine environment, i.e. it's only valuing how we see the ocean and what it means to us, not what it means to biodiversity as a whole.

Only useful if the link is clear and the stated benefits to humans have a clear community value (i.e. rather than just protecting vested interests). Otherwise a monetary value may degrade or detract from perceived ecologic value which some may consider priceless.

There is more to life than monetary value, but would create part of an argument for and against.

It depends who values and for what purpose.

this would be my preferred compromise.

As the survey will show any value placed will be based on subjective opinion, it has the potential to be overstated; in the scenario it is likely that activity will continue due to the infrastructure of the local dive scene being well established, it may be a case of not what they dive for but that they can dive.

gives it credence however statistics can lie.

Could be useful, but if undervalued at the assessment stage could be used as evidence to support the opposition to the conservation efforts.

not to be more important than the ecology.

they can only ever be an estimate and can be manipulated to favour certain stakeholders.

We do need to manage all natural environments and habitats to maintain ecological diversity and balance. However, management costs do need to be taken into consideration.

Little bit at a time.

commercials carry too much political weight.

it could be possible to have a misleading monetary value. The value of the ecosystem is priceless.

The diversity of marine life is required to support other marine life and without it the sea becomes an empty void.

Useful because it can provide some measurement of cost of conservation, but unlikely to ever provide sufficient information on the intrinsic value of a place.

I think valuing an ecosystem service will provide different people with different outcomes. Can be hard to relate a value with a natural service. Some people may find

Table A5.5 continued

attributing a value to it a highly useful reference. Others may find it arbitrary and therefore of little value.

It assists policymakers, but nature has an intrinsic value which can not be determined.

It might be the only way members of the public can connect with the arguments. there are clearly limitations because the impacts are not just monetary, and the conversion itself is subjective.

The actual values are too low to be of any real significance

it will give some idea of the value of the value of the ecosystem in terms of value to local jobs and local leisure activities but not sure how you arrive at the final values

enables a comparison to be made with other locations

Having worked in this area, I would need evidence that the scientists know what they are doing.

'Necessary evil', not good but necessary because...

General public only understands "cost of things" not "value of things".

it 's an understandable reason for conservation. people think money However it can only be an imprecise value.

Some people will only engage if they think it will lose money for the area

Everything comes down to money ... in the end. Unfortunately!

Saying something has a specific value, then largely negating that value by preventing any use of it seems odd. Protection is necessary and could mostly be achieved by education of leisure users. Prohibition may be necessary for those with a commercial interest in an area, not because they will collectively abuse it but in the search for a competitive edge, the unscrupulous might.

the "bottom line" appears to be THE most important thing to so many people!!

it can be used to write off certain ecosystems as an acceptable loss... The concept that all ecosystems are linked is also lost... so I find the concept a little too simplistic.

In an argument to protect an environment if it is of high monetary value more people and businesses are likely to understand and care. However , it will be difficult to argue for important areas of low monetary value if this is the primary measure of value.

It can provide an argument in terms acceptable and justifiable to some. The risk is to reduce everything to financial terms when complex environmental and social systems are more valuable than it is possible to assess and may be 'priceless '.

Table A5.5 continued

It is the only way to get habitats protected. If it has no monetary value, it will probably end up being destroyed. If it has, it may be preserved.

I believe that unfortunately a large proportion of influential people to these decisions are financially driven

Again how are you going to police it. Time is valuable, employing people to police it, will out way it's importance. Most pleasure boat users won't give thought to the damaged sea bed.

most people are motivated by money alone

in the current economic climate (and that of the passed 8 years) people feel more certain about things if a number can be put on something, however, putting a number on the health of our ecosystems could lead to more destruction of them (ie if the number is not deemed high enough)

Unless there's economics invoked no one is interested in funding

Unfortunately money is the only consideration that most governments and authorities have but there are some services that are priceless, for example you can't put a monetary value on the emotional response people have to knowing that a seahorse exists

It might be the only way to convince and enforce decisions

the power that be have to justify any spending. The problem is they do not tend to listen to the users. They frequently use these figures to justify what they want to do, regardless of local opinion.

,MONEY COUNTS,

Not useful because...

People can use financial arguments of allowing commercial fishing, berthing of boats etc to show better returns than keeping marine environments. Arguments should be based on importance of environment and Eco system.

who can ever judge the value

its about the environment not profit

it may appear that the monetary value is the only value.

It's a subjective measurement which without proper foundation is meaningless. I believe it serves only to alienate the public from buying in to the scheme.

monetary value to humans is not as greater need as health and diversity of marine life

There is much more than just a monetary value. Makes a precedence where things only get protected if a monetary value can be shown.

Table A5.5 continued

too many assumptions and estimates

The eco system Balance Sheet is not monetary.

The local commercial netter's don't give a monkey's because all they want to do is net anything that swims, regardless of where it is.

how will the monetary value be calculated?

Dangerous and should not be used because...

The data will not be used objectively and will just be used to support restriction policies that will have been predetermined; these restrictions will be infringements on access rights that have always existed.

it can emphasise commercial over exploitation of the resource .There is no emphasis on the monetary investment needed to generate the £750.000 IF ANY

Monetary value is often calculated incorrectly. E.g. "It costs £x to send a policeman to your home" The policeman is paid whether he visits you or not, but this is often included in the cost.

We should not put a value on the environment

as soon as you start putting a financial figure on marine areas, the protection takes a back seat.

If the idea of conservation becomes less important than the monetary value of the eco-system being considered then comparisons become a matter for accountants rather than conservationists. Thus decisions will be made on a business footing where monetary data rules.

Opens the door to environmentally damaging commercial activities.

open to bogus calculation and ignores principles of free access in favour of spuriously accurate investment appraisals

We dont want all the red tape that goes with it

Personal experience is that academics seek to get people to put a monetary value on their access to MPAs but there is a background fear that access charges will be introduced because government thinks people would actually be prepared to pay what they say is their perceived value.

None of the above, I think...

you can't start putting values on certain areas, the seagrass bed have had to put up with sailing boats anchoring since time began, it depends on weather temp of water etc etc

Table A5.5 continued

Scientists are making a comfortable living coming up with stats which are either ignored by policy makers or used in a way which defeats the purpose of the evidence. Take RA v Commercial fishing as an example - RA is worth 10 times that of the commercial sector, but commercials seem to have far too much political influence, so policy makers are allowing fish stocks to decline without any thought for the future.

Should be protected for its own sake.

Not sure how relevant and accurate the so called costing would be, and who would benefit from these costings?

I would need more info

Ecology is more important than monies

The question is to open ended

The MMO have no idea of monetary values, they don't listed to consultation from stakeholders and have no idea of how their legislation effects local business. The recent designation of MCZ's is an example of where stakeholders were asked for their views which were not even responded to and completely ignored, they are a shambles of a department.

Nothing else is working. People netting in restricted areas. Boats throwing back small fish instead of increasing their mesh sizes. Netting within casting distance of land. Anglers being greedy and ignoring landing sizes still regular with a few.. Don't know much about seagrass, surely though it's all there for a reason to balance eco system and measures to sustain need to be taken seriously across board. A policy which is near on impossible. Would like to say educating would work but some simply don't care or are too dumb to understand

It depends who is responsible for calculating the value to ensure an unbiased and accurate figure is communicated

If you put a financial value on the habitat it will create more opportunities for people wanting to exploit it.

Table A5.6: Respondents' explanations of their views on monetary valuation (open ended part of question 8); responses have not been edited – French sample (French original and English translation by L Friedrich) (N = 85)

Respondents' views on monetary valuation in France	
French original	English translation
Bonne idée et utile, car...	Good idea and useful because...
<p>donnera une idée claire pour ceux qui n'ont aucune connaissance dans ce domaine et peut être un valeur représenté sensibilisera un peu plus</p> <p>cela permet d'éclairer bon nombre de personnes sur l'impact réel d'un environnement naturel riche, pour la communauté.</p> <p>C'est la manière la plus concrète pour donner conscience a des acteurs en vivant... de mon point de vue bien sur...</p> <p>Je connais cette notion à l'étranger (Philippines) mais pas pour la France. Valoriser les habitats marins -ici, herbiers, lieu de reproduction, nursery, protection, alimentation des plies mais aussi d'autres poissons, coquillages et crevettes, crabes-- peut faire prendre conscience de son importance. Utile mais faut-il légiférer ? Utile pour limiter l'impact de la pêche (disparition de la ressource), du tourisme (destruction des herbiers par les gens, les bateaux, les ancrages sauvages). Utile aux décideurs locaux -élus, administration, professionnels pêche et tourisme- pour prendre conscience, apprendre, coordonner actions et informer (flyers, presse, expo).</p> <p>Cela peut effectivement permettre aux gens de prendre conscience de l'importance des herbiers dans la vie économique locale.</p> <p>cela peut permettre de convaincre les incrédules et ceux qui basent tout sur l'argent.</p> <p>Ca permet de quantifier une situation qui n'est pas appréhensible autrement que par des considérations philosophique.</p>	<p>will give a clear idea for those who have no knowledge in this area and can be a represented value, will raise a bit more awareness</p> <p>it allows to show to many people the real impact of a rich natural environment , for the community</p> <p>the most concrete way of raising awareness of stakeholders</p> <p>I know this concept abroad (Philippines) but not for France. Valuing -here marine habitats, meadows, breeding, nursery, protection, plaice food but also other fish, shellfish and shrimp, crabs-- can raise awareness of its importance. Useful but should we legislate? Useful to limit the impact of fishing (disappearance of resources), tourism (destruction of seagrass beds by people, boats, wild anchors). Helpful to local decision makers - élus, administration, tourism - and fishing professionals to be aware, learn, share and coordinate information (flyers, press, exhibition).</p> <p>this can actually help people realise the importance of seagrass beds in the local economy</p> <p>it can help convince the sceptics and those that base everything on money</p> <p>It quantifies a situation that is not apprehensible other than by philosophical considerations.</p>

Table A5.6 continued

tout est basé sur la gestion et l'économie dorénavant. Tout doit pouvoir être quantifié.

il s'agit d'un mode de raisonnement explicite et significatif pour des décisions de gestion pertinentes pour le grand public.

Bonne idée, mais bravo si vous pouvez estimer un chiffre.

Il n'y a que comme ça que les politiques comprennent....

Donne des arguments important et permet de fixer des priorités. Permet de relativiser le coût des mesures de protections

incontournable

les ressources marines ne sont pas inépuisables, valoriser leur impact permet d'en prendre conscience. REPONSE RELATIVE A LA CASE SUIVANTE : nous sommes confrontés à un projet industriel de culture marine de 225ha, mal construit et hasardeux. Mais la tendance politique conduit aujourd'hui à accepter n'importe quoi au nom de l'économie.

les populations comprennent mieux lorsque la valeur est chiffrée et cela leur permet de mieux prendre conscience de la valeur globale de l'écosystème et ainsi de mieux se l'approprier

malheureusement la plupart des décideurs ne connaissent que la richesse monétaire comme valeur. Leur seul repère est l'argent. La morale et l'éthique n'étant pas quantifiable et ne leur rapportant rien personnellement ils ont besoin de tout transformer en Euros.

la valeur monétaire fait partie d'un vocabulaire qui est compris par tous les acteurs économiques et peut donc permettre de communiquer plus facilement avec des entités pour qui la protection de l'environnement n'est pas prioritaire

C'est le seul moyen de les préserver

everything is based on the management and the economy now. Everything must be quantified.

it is a clear and meaningful argument for management decisions of relevance to the general public

good idea but difficult to estimate a value

the only way to make politicians understand

Provides meaningful arguments and helps set priorities. Puts into perspective the cost of protective measures

unavoidable

marine resources are not inexhaustible, valuing their impact helps raise awareness of this [...]

people understand better when values have a number/figure, this allows them to become aware of the overall value of an ecosystem and to better take ownership

unfortunately, most decision makers understand value only in terms of monetary wealth. Their only point of reference is money. As moral and ethics are not quantifiable and don't yield anything for them personally, they need to turn everything into euros

the monetary value is part of a vocabulary that is understood by all economic stakeholders, and can therefore allow to communicate more easily with stakeholders for which environmental protection is not a priority

It is the only way to protect them/to achieve conservation (the habitats/ecosystems)

Table A5.6 continued

L'économie est un argument de poids face à tout autre argument.
(Malheureusement)

la valeur monétaire est une échelle de valeur commune à tous quelque soit notre sensibilité à la protection de l'environnement.

C'est démontrer qu'il existe des intérêts financiers autres que ceux auxquels on fait référence habituellement.

tout est évalué en terme économique dans le cadre de la mondialisation

bonne idée car les gens ont une représentation plus parlante et sont très sensibles lorsque les choses sont représentées en valeur marchande

Prise de conscience de la valeur de territoires sous marins mais la prise de conscience de la valeur peut attirer les convoitises voire les pillages

je pense que cela serait utile pour chiffrer les pertes

la valeur monétaire frappe toujours les esprits et donne une référence à chacun

cela met en balance l'argument du gain économique immédiat trop avancé comme incompatible avec les mesures de protections environnementales.

cela permet d'évaluer l'impact économique d'une dégradation de ce milieu. Cela peut peut-être convaincre les moins sensibles à l'environnement.

ça permettra de pouvoir préserver d'avantage l'environnement marin.

resources, protection des especes

je n'en ai aucune idée

proche de la notion de valeur économique qui me paraîtrait mieux appropriée mais je ne suis pas économiste.

The economy is a strong argument in the face of any other argument.
(Unfortunately)

monetary value is a common value scale for all regardless of our level of concern/awareness/sensitisation for environmental protection.

This is to demonstrate that there are financial interests other than those to which one usually refers.

everything is valued in economic terms in the context of globalization

good idea because people have a more meaningful representation and are very sensitive when things are represented in market value

Awareness of the value of underwater habitats but awareness of the value can provoke envy or looting

I think it would be useful to quantify the losses

the monetary value always strikes the minds and gives a reference to each

it weighs/puts in balance the argument of immediate economic gain too advanced as incompatible with environmental protection measures.

it allows to assess the economic impact of the degradation of a habitat. This can potentially convince those with less awareness/concern for the environment

it will enable more/harder protection of the marine environment

resources, species protection

I don't know

close to the concept of economic value that would seem to me more appropriate but I am not an economist.

Table A5.6 continued

Utile dans certaines circonstances et avec des limites, car...

Cela peut être une idée pour quantifier l'importance du site, mais ce ne doit pas être l'argument principal. La valeur monétaire n'est qu'une image du problème.

il est extrêmement difficile de chiffrer les services rendus par les habitats. On ne connaît que très peu l'habitat marin et nous n'avons qu'une vague idée désormais de ce qu'est un habitat sain et fonctionnel. Comment attribuer une valeur à une chose dont on ne sait pas pas à quoi elle doit ressembler dans son fonctionnement normal ? Comment savoir si on ne sous estime pas cette valeur ? Il s'agit néanmoins d'un argumentaire valable car assimilable directement par la majorité des humains.

on rentre dans un système de marchandisation de tous ce qui nous entoure et une justification basée uniquement sur l'économique. Comment empêcher quelqu'un de procurer plus d'argent a la communauté que ce que coute sa dégradation.

Il est très difficile de valoriser du bien être, des usages, des coutumes.

je pense que l'évaluation peut être décisive, mais très complexe, délicate et pourrait sans doute être taxable d'insuffisances voire de partialité

tout ne peut être quantifié en terme d'argent : a prendre en compte ; histoire , identité locale ,culture , tourisme ; economie .

l'apport de l'environnement ne peut se réduire à de l'argent même s'il est vrai est un point commun à tous les acteurs

Argument qui peut être pertinent pour convaincre certains personnes ou organisme mais la biodiversité n'a pas de prix ! La logique économique ne devrait être qu'un prétexte pour défendre la logique...écologique.

Ce qui a une valeur monayable aujourd'hui pourrait ne pas avoir le meme poids plus tard tandis que la qualité de l'environnement est une constante pour l'avenir

Useful under certain circumstances and with limitations because...

It may be a good idea to quantify the importance of the site, but it should not be the main argument. The monetary value is only one aspect of the problem.

it is extremely difficult to quantify the services rendered by habitats. We know only very few marine habitat and we have only a vague idea now of what a healthy and functional habitat. How to assign a value to something we do not know what it should look like in normal operation? How to know if one is not underestimating the value? Nevertheless, it is a valid argument because it is understood by most people.

we get into a system in which everything around us is merchandised and argumentation based solely on economics. How to prevent someone from providing more money to the community than the cost of environmental degradation?

it is very difficult to value wellbeing, customs and habits

i think valuation can be key/decisive, but very complex, difficult/sensitive and could be prone to/accused of shortcomings and subjectivity/bias

not everything can be quantified in terms of money, things to consider include local identity, culture, tourism, economy

the contribution of the environment cannot be reduced to money even if it is true that it is a common point to all stakeholders

Argument that may be relevant to convince some people or organisations but biodiversity is priceless! The economic reasoning should only be a pretext for defending/supporting the ecological reasoning

What has a monetary value today might not have the same weight later on, whereas the quality of the environment is a constant for the future

Table A5.6 continued

<p>la valeur monétaire permet de situer un habitat sur une échelle, ce qui facilite la prise de conscience et met en évidence certains enjeux. Toutefois la valeur monétaire d'un site naturel marin est loin d'être un critère d'analyse suffisant</p> <p>l'argent ne fait pas le bonheur et la beauté d'un spot de plongée préservé est inestimable.</p> <p>si ce sont des autorités extérieures qui imposent des règles, à la place des citoyens et contre leur grè, la vie devient difficile</p> <p>impact sur le PIB la nature a t'elle une valeur marchande ? bien commun de l'humanité</p> <p>le contrôle est impossible.</p> <p>En cas de dégradation par la pêche par exemple</p> <p>Attentions aux chiffres annoncés qui sont non quantifiables par le grand publics en opposition aux coûts de protections qui eux sont quantifiables..</p>	<p>the monetary value allows to locate a habitat on a scale, which facilitates awareness and highlights certain issues. However, the monetary value of a marine site is far from being a sufficient analysis criterion</p> <p>Money does not buy happiness and the beauty of a preserved/protected diving spot is priceless.</p> <p>if external authorities impose rules, instead of citizens and against their wishes/will, life becomes difficult</p> <p>impact on GDP. Does nature have a market value? Common good of humanity</p> <p>control is impossible</p> <p>For example, in case of degradation through fishing</p> <p>Attention to the announced figures that are not quantifiable by the general public as opposed to the costs of protection that are quantifiable ..</p>
<p>«Mal nécessaire», mauvaise idée mais inévitable, car...</p>	<p>'Necessary evil', not good but necessary because...</p>
<p>Malheureusement il faut faire appel au porte monnaie pour réveiller les consciences sur la valeur des espèces marines et habitats marins.</p> <p>Tout est soucis d'argent, si seulement cela pouvait ouvrir les yeux à un grand nombre de personnes</p> <p>les gens ne réagissent malheureusement qu'à l'argent</p> <p>si tout ne peut pas se monayer c'est le discours et l'argument qui reste le plus sensibilisateur</p> <p>Sinon trop peu de gens s'imaginent l'importance de la préservation de l'environnement.</p>	<p>unfortunately it is necessary to appeal to the purse to raise awareness about the value of marine species and habitats</p> <p>Everything is money worries, if only it could open the eyes of many people</p> <p>unfortunately, people only react to money</p> <p>if not everything can be monetised, it remains the argument that raises most awareness</p> <p>without, too few people think of the importance of environmental conservation</p>

Table A5.6 continued

il est besoin de chiffrer pour se rendre compte des impacts négatifs

Il fournit un indicateur parmi d'autres, mais rien de plus. Se focaliser sur cet unique indicateur ou seulement sur des indicateurs quantitatifs est source d'erreurs et de mauvaises décisions voire de manipulation des décideurs. Les exemples sont légions...

c'est malheureusement le seul moyen de motiver les acteurs à modifier leur comportement car ils y trouvent un intérêt financier approche à mon sens purement centrée sur le bien être humain et loin des préoccupation du bien être de la nature et de la biodiversité

Certaines personnes ont besoin de voir un profit pour pouvoir réfléchir à la préservation d'un écosystème.

Malheureusement l'argument économique est la raison qui poussera les pêcheurs et les acteurs locaux à conserver l'herbier marin. Si ce n'est que pour l'écologie, je crains que les mesures de gestion ne soit pas adoptées car non rentables...

quoi que l'on dise, in fine c'est l'argent qui guide tout. Je suis pour des sanctuaires, mais on ne peut empêcher de hommes de vivre

la plupart des personnes ne comprennent que l'aspect monétaire et ne se sentent concernés que si cela se traduit par un perte d'argent (ou un gain...), pourtant la systématisation de cette évaluation monétaire me parait dangereuse, dans le sens où normalement la nature ou la vie ne se monnaient pas, d'autant plus que toute évaluation ne pourrait rester que subjective, faire le jeu de lobby, etc...

Démarche déstabilisante de chiffrer le prix d'un milieu naturel. Dans un monde déjà trop régi par l'argent et l'impact néfaste de l'homme, cette démarche s'inscrit dans cette suite logique non enviable. Mais c'est peut-être juste une habitude à prendre de voir s'afficher la valeur monétaire de la nature.

putting a number/figure on things is necessary to become aware of the negative impacts

It provides one measure among many, but nothing more. Focusing on this single measure or only on quantitative measures is prone to errors and poor decisions or manipulating decision makers. The examples are legion ...

unfortunately it is the only way to motivate people to change their behaviour because they find a financial interest. In my opinion it is an approach that is based purely on human wellbeing and far away from concern for the wellbeing of nature and biodiversity

certain people have to see a profit/benefit to be able to think about the conservation of an ecosystem

Unfortunately, the economic argument is the reason that will push the fishermen and local stakeholders to protect the seagrass. If it is only for the ecology, I fear that the management measures will not be adopted because unprofitable ...

whatever is said, ultimately it's the money that guides everything. I am for sanctuaries, but we can not prevent people from living

most people understand only the monetary aspect and only feel concerned if this results in a loss of money (or gain ...), yet the systematization of this monetary assessment seems to me dangerous, in the sense that normally nature or life are not sold/traded/made money of, particularly since any assessment would remain subjective, play the lobby game, etc ...

destabilizing approach to quantify the price of a natural environment. In a world already too much governed by money and the negative impact of man, this approach is the undesirable logical consequence. But this may be just a habit of showing up the monetary value of nature.

Table A5.6 continued

Pas utile, car...	Not useful because...
<p>Monétariser des impacts environnements n'est qu'une autre façon de communiquer des choix politiques</p> <p>L'idée de traduire en € serait vite détournée à des fins politiques. Une interdiction à TOUS d'endommager l'herbier(ou tout autre site) sous peine d'amendes non négociables serait , à mon avis plus sensée. La mise en place de corps morts avec anneaux éviterait le "labourage" mais continuer les plongées éducatives</p> <p>difficile à quantifier suivant les activités exercées.</p>	<p>Monetising environmental impacts is just another way to communicate political choices</p> <p>The idea of translating everything to € would soon be abused for political purposes. A ban for ALL to damage the seagrass (or any site) under penalty of non-negotiable fines would, in my opinion, be more sensible. The establishment of dead bodies with rings would avoid the "ploughing" but continue educational dives</p> <p>difficult to quantify depending on the activities which are practiced</p>
Dangereuse, et à éviter, car...	Dangerous and should not be used because...
<p>ne prend pas compte les criteres liés à la richesse patrimoniale. exemple chantier autoroute A28, il a bien fallu imaginer un solution pour protéger le coléoptère doré dont tout le monde se fout. autre exemple, la fabrication de l'usine Hurel Hispano, où il a fallu déplacer un peu le cours de la rivière pour ne pas mettre en péril l'écrevisse à patte blanche dont la majeure partie des gens ignorent l'existence. Dans ces 2 cas la biodiversité ne rapporte rien. Et bien au contraire, les mesures de préservation coutent de l'argent, et mettent en péril des projets ma fois très intéressant pour l'économie locale. La biodiversité a très souvent le prix que l'on veut bien lui donner, comme une collection de timbre ou la culture.</p> <p>Car certains grands groupes industriels commencent à utiliser cette notion pour compenser leurs dégats écologiques qui sont parfois irréversibles. Comment chiffrer des ressources naturelles qui seront essentiellement pour des générations futures ? Tout n'est pas quantifiable en terme économique et heureusement.</p>	<p>Biodiversity only has the value that we attribute to it whereas conservation costs money and threatens projects of importance to the local economy</p> <p>because some large industrial groups are beginning to use this concept to compensate for the ecological damage that they cause that is sometimes irreversible. How to put a figure on natural resources that will be essential for future generations? Not everything is quantifiable in economic terms and this is lucky.</p>

Table A5.6 continued

c'est propager une appréciation très réductrice de l'importance du patrimoine naturel qui relève tout autant du beau, du sensible, de l'agrément du cadre de vie, de l'irremplaçable etc . C'est aussi laisser croire qu'on peut dégrader du moment qu'on compense financièrement.

si demain, quelqu'un arrive à faire dire aux chiffres qu'un fond sableux "vaut plus" qu'un herbier car favorise le bâtiment en souffrance par exemple, on peut dire adieu à notre herbier. Il me semble que "l'écologie" doit se méfier au plus haut point de l'argent et des lobbies attendants.

On ne peut pas connaître tout les avantages sur le long terme, tout n'est pas paramétrable et il y a risque de ne pas considérer des variables sous-jacentes importantes capables d'avoir un impact important par la suite.

la mise en place d'un rapport entre la valeur écosystémique et la valeur monétaire crée de facto une hiérarchie dans la valeur économique des sites à protéger allant au contraire de l'idée d'une protection de l'écosystème planétaire global (faune flore climat). Ce n'est pas parcequ'un écosystème ne rapporte rien économiquement parlant qu'il ne faut pas le protéger.

la protection de la nature par l'économie va à l'encontre de ce qu'est la nature. L'environnement oriente les économies locales, préserver la nature est lié aux valeurs fondamentales et morales qui lient les hommes

Comme je l'ai dit plus haut, on ne peut pas tout lier à l'économie. L'équilibre du milieu naturel doit être complètement indépendant de toute pression économique, démographique, stratégique, etc. L'écosystème doit être en amont, les activités humaines en aval. Ainsi l'homme y trouvera un bénéfice qui sera limité mais suffisant et durable.

l'écologie n'a rien à voir avec des considérations économiques.

it communicates/spreads a very simplistic assessment of the importance of the natural heritage which does not take into account beauty, irreplaceable, ????. It also makes people believe that the environment can be degraded if financial compensation is paid.

if tomorrow someone manages to make monetary values say that a sandy bottom is 'worth more' than a seagrass bed because it supports the struggling construction sector, we can say good bye to our seagrass bed. It appears that 'ecology' should beware money and related lobbies to the utmost

We cannot know all the benefits in the long run, all is not adjustable and there is the risk that important underlying variables might not be considered that can have a significant impact in the future.

the establishment of a relationship between the ecosystem value and monetary value creates a de facto hierarchy in the economic value of protected sites which goes against the idea of protecting the overall global ecosystem (climate flora fauna). It is not because an ecosystem does not contribute anything economically that it does not need to be protected

protection of nature through the economy is contrary to what nature is. The environment directs local economies, preserving nature is linked to the core values and morals that unite men

As I said above, we cannot link everything to the economy. The balance of the natural environment must be completely independent of any economic pressure, demographic, strategic, etc. The ecosystem must come first, human activities second. So that man will find a benefit that is limited but sufficient and sustainable.

Ecology has nothing to do with economic considerations

Table A5.6 continued

<p>Dangereux, et à éviter à mon sens car tout ce qui a de la valeur ou qui a de la valeur potentiel attire les prédateurs pour se faire de l'argent au détriment de la valeur intrinsèque des choses ou de la valeur humaine ou de la nature (exemples : exploitation minière en Nouvelle Calédonie ou Australie au détriment de la barrière de corail qui est en réelle danger, plusieurs centaines ou milliers d'années de nature détruite pour le profit et l'argent!)</p> <p>Difficile à quantifier</p> <p>L'éducation par la notion d'argent me paraît plus du registre d'un conditionnement réduisant la dimension humaine et au-delà universel de l'enjeu.</p> <p>Dans le même esprit, quantifier les bancs de sables, les bûches, les épaves, les estuaires.....tout ce qui est sujets à valoriser les zones de flores, les zones de faune mais également les zones industrielles (parc éoliens ou générateur marémotrices par exemple). Une gestion équitable, réfléchi et commune évitera des conflits d'intérêts.</p>	<p>Dangerous, and to be avoided in my opinion because anything that has value or potential value attracts predators that seek to make money at the expense of the intrinsic value of things or the human value or the value of nature (eg mining in New Caledonia or Australia at the expense of the reef which is in real danger, hundreds or thousands of years likely destroyed for profit and money!)</p> <p>difficult to quantify</p> <p>Education through the concept of money seems to me more a conditioning that reduces the human and universal dimension of the issue</p> <p>Similarly, quantify sandbanks, tarpaulins, wrecks, estuaries all that is subject to add value to/highlight the value of the areas of flora, wildlife areas but also industrial areas (wind park or tidal for example). An equitable, rational/cautious and common management will avoid conflicts of interest.</p>
<p>Aucune des réponses ci-dessus, je pense...</p> <p>cela n'a pas de prix</p> <p>Rien n'est qu'urgent de nos jours... Marre de ces rapports à l'argent. Et si nous respections tous notre mère nature sans être obligé de penser à l'argent? C'était la pensée et coup de gueule du jour, d'un plongeur passionné.</p> <p>Pour moi, n'envisager l' environnement naturel que sous une approche uniquement liée au " bonheur" de l' Homme" et au profit qu'il peut en tirer est inacceptable. Je trouve dommage d' en arriver là. Si c' est la seule solution pour limiter les dégâts, alors oui.</p>	<p>None of the above, I think...</p> <p>it doesn't have a price/it is priceless</p> <p>It is all about money these days... Tired of relating everything to money. What if we all respected mother nature without being forced to think about money? Thought and rant of a passionate diver</p> <p>for me, to consider the natural environment purely/solely through an approach related to the 'happiness of man' and to the profit/benefit that he can draw from it is unacceptable. It is a shame if it comes to this. If this is the only way to limit the damage, then yes.</p>

Table A5.6 continued

ce n'est pas nécessairement le financier qui doit dicter les "bonnes pratiques " mais une prise de conscience collective en formant les plus jeunes à l'écologie. Exemple à Lorient je suis intervenu pour accompagner une classe de primaire à faire une sortie de pêche à pied. beaucoup d'enfants découvraient les algues!!

JE NE PENSE PAS QUE CELA APPORTE UN PLUS IL ME SEMBLE PLUS INTERESSANT D'EDUQUER LES GENS

que je ne sais pas

qu'il faut mieux jouer sur l'aspect ecologique

Etude trop complexe

good practice does not necessarily have to be all about the money. Instead, good practice should be about raising collective awareness by training young people in ecology.

I don't think this adds anything more. It seems more interesting to me to educate people

I don't know

it is better to play/rely on the ecological aspects

too complex study