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Valuation of Ecosystem Services in Ecosystem-Based Marine Spatial Planning in the Baltic Sea Region

- why, when and how?

Ida Reuterswärd

Supervisor

Thomas Lindhqvist

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Published in 2015 by IIIEE, Lund University, P.O. Box 196, S-221 00 LUND, Sweden,
Tel: +46 – 46 222 02 00, Fax: +46 – 46 222 02 10, e-mail: iiiee@iiiee.lu.se.

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Acknowledgements

Watching the vast horizon of the Mediterranean Sea, temporarily living in Marbella, and with a boyfriend taking good care of our daughter, I finally had the time and energy to gather my thoughts and start up the writing of my Master's thesis. Seven years had passed since my fellows in Batch 11 graduated from IIIEE. I had already left to enter the world of environmental policy-making at the Swedish Ministry of the Environment. These past years I have worked with international environmental co-operation in the Baltic Sea Region, and I have had the possibility to follow, and to some extent impact, historic landmarks in marine management – the adoption of the HELCOM Baltic Sea Action Plan, the EU Marine Strategy Framework Directive, and the Directive Establishing a Framework for Maritime Spatial Planning, as well as, observing the understanding of the value of ecosystem services climbing the political agenda. These last years I have become increasingly motivated to reassume my role as a student, freeing my mind from the limits set by the political agenda, and instead taking a researcher's perspective. Seeing a major policy challenge growing at the horizon, and being convinced that research would be important for future policy-making on this issue, I identified Valuation of Ecosystem Services in Ecosystem-Based Marine Spatial Planning in the Baltic Sea Region as an area for my research. A main driver for my interest in the subject chosen was the endeavour to get people more engaged in decision-making, convinced that this will eventually lead to a contribution to reaching good environmental status of the Baltic Sea. With an earlier background in working with the implementation of the UN Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters (the Aarhus Convention), I have come to understand that letting people into decision-making and increasing the understanding of the importance of a healthy environment for our wellbeing can be a forceful driver for change. Based on the analysis of this thesis, I would like to argue that valuation of ecosystem services can be an important tool in marine spatial planning to improve participatory and effective decision-making and move towards improved environmental status of the Baltic marine environment.

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Ida Reuterswärd
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Abstract

The ecosystems of the Baltic Sea are under severe pressure, threating the long-term prosperity of the region and human wellbeing. New marine management approaches need to be tested and developed. Valuation of ecosystem services in the process of ecosystem-based marine spatial planning in the Baltic Sea region could be useful in improving communication between stakeholders, as well as, the evaluation of progress towards achieving good environmental status. This thesis investigates why, when and how valuation of ecosystem services could be integrated into the marine spatial planning process in the Baltic Sea Region. The rationales for this are many, including recent regional policy developments supporting ecosystem-based management that contributes to the achievement of good environmental status, and substantial work initiated making ecosystem services visible through mapping and assessment, as well as, the testing of methods of ecosystem valuation. This thesis suggests that ecosystem-based marine spatial planning and valuation of ecosystem services could be seen as mutually supportive; the marine spatial planning decision-making process would benefit from valuation and valuation of ecosystem services would benefit from having a policy framework to impact decision-making. Following a template for marine spatial planning, this thesis suggests that valuation of ecosystem services could be relevant to consider at all stages of the planning process, and that the process could benefit from a pragmatic approach, including exploring qualitative, quantitative, as well as, monetary valuation. This thesis argues that a broad and multi-disciplinary stakeholder learning process is necessary to integrate valuation of ecosystem services in marine spatial planning, strengthening the understanding of the link between resource systems and governance systems, and indeed, the link between the economy and the environment.

Keywords: marine spatial planning, valuation of ecosystem services, Baltic Sea Region, ecosystem-based decision-making

Executive Summary

Global, as well as, regional marine governance has failed. Oceans cover almost three quarters of the planet surface, but are far more vast than their surface area when the underlying water column and the sea floor are included. The ocean is the world's single largest ecosystem and provides us with a wide range of services and resources that directly support human health, societies and economies. For centuries the three-dimensional marine realm has been seen as almost free for human exploration and exploitation. Today ocean health is in severe decline; habitat destruction, biodiversity loss and climate change are pushing the ocean system to the point of collapse (Global Ocean Commission, 2014). The Baltic Sea is one of the most polluted seas in the world; its ecosystems are under severe pressure, with none of its sub-basins in good environmental status. Projections of human activities and their impacts indicate that human activities, affecting ecosystems, are on the rise in the twenty years to come (Helcom, 2010; WWF, 2010).

The use of the sea has neither been properly planned, nor have its ecosystems been properly valued. As a response, marine, or maritime, spatial planning (MSP) and methods for valuation of ecosystem services are two policy approaches that are now gaining political recognition, globally as well as regionally, as tools for improving marine management.

Marine spatial planning is a public process of analysing and allocating the spatial and temporal distribution of human activities in marine areas to achieve ecological, economic and social objectives that are usually specified through a political process (UNESCO, 2009). As such marine spatial planning is an attempt to move away from a sector-wise marine management towards a more integrated management. Today, it is frequently asserted that marine spatial planning should be ecosystem-based (Jay, 2010). In the Baltic Sea Region marine spatial planning is gaining support on many policy levels. A new EU Directive Establishing a Framework for Maritime Spatial Planning (FMSP) has recently been adopted (Directive 2014/89/EU of the European Parliament and the Council of 23 July 2014 Establishing a framework for maritime spatial planning), and the Helsinki Commission (HELCOM), together with VASAB (Visions And Strategies Around the Baltic Sea) are intergovernmental organisations that have joined hands to contribute to the development of marine spatial planning (HELCOM, 2014). In most Baltic countries national initiatives are implemented to move towards marine spatial planning (PartiSEApate country fishes, 2014).

Valuation of ecosystem services is concerned with expressing the flow of value from the natural environment, through services that benefit and promote the wellbeing of people. This is accomplished through mapping and assessing ecosystem services, and used to estimate ecosystem values in qualitative, quantitative or monetary terms in order to influence decision-making processes (MA, 2005, TEEB, 2010). As such, valuation of ecosystem services is an attempt to awaken the public deeply embedded in the global economy and distant from natural processes (Norgaard, 2010) and to explicitly acknowledge values that for too long have been neglected in decision-making (Constanza et al., 1997). The EU has recently embarked on a major exercise of mapping and assessment of ecosystem services (MAES), and in the Baltic Sea Region valuation of ecosystem services is engaging pan-Baltic discussions, as well as research (for example Ahtainen et al. (2014) and SWaM (2013b)). Valuation of ecosystem services is also taking place on a national level, focussing for example on the willingness-to-pay (WTP) studies of improved environmental status (GES-REG, 2013; Ressurreicao et al., 2012).

The overall aim of this thesis is to contribute to achieving better marine management practices in the Baltic Sea region. To this end this thesis aims to combine the two policy approaches of

marine spatial planning and valuation of ecosystem services so as to enhance the understanding of why, when and how they could be integrated.

In order to achieve the research aim, the following research questions were formulated:

Why? With neither broad consensus on the need and use of valuation of ecosystem services in marine spatial planning, nor any practical examples of its application, there is a need to address the why question. This thesis tries to answer what is there in the current policy developments in the Baltic Sea region that is guiding the development of ecosystem-based marine spatial planning, if ecosystem-based marine spatial planning and valuation of ecosystem services could be seen as mutually supportive and why the timing is right for taking steps to develop the valuation of ecosystem services in marine spatial planning.

When? The Baltic Sea countries have agreed on a template for ecosystem-based marine spatial planning, including suggestions for different steps of the procedure. Following the steps of the planning in this template procedure, this thesis will try to answer the question of when in the marine spatial planning process valuation of ecosystem services could be relevant and what methods of valuation could be interesting to use. Importantly, this thesis will apply a broad understanding of the concept of valuation methods, may they be qualitative, quantitative or monetary valuation.

How? To be able to conclude on how valuation of ecosystem services could be integrated into broad-scale marine spatial planning in decision-making in the Baltic Sea Region, this thesis will take departure in the social-ecological framework theory, acknowledging how the complex cross-scale interaction of natural resource systems and governance systems challenges the developments in the region. Through interviews it will try to address the role of stakeholders to develop valuation of ecosystem services in ecosystem-based marine spatial planning. It will analyse how valuation of ecosystem services in ecosystem-based marine spatial planning could be relevant in further social-ecological system analysis.

The overall structure of the research is threefold:

Firstly, this thesis explores the nature and value of marine spatial planning; giving special focus to what ecosystem-based management is, as well as current developments in the Baltic Sea Region. This thesis brings emphasises that ecosystem-based management has the primary goal of securing the long-term delivery of multiple ecosystem services that support human wellbeing (UNEP, 2011). This may challenge the current conception of sustainable development by placing the ecological dimension as the foundation for any social and economic development. The Baltic Sea Region has a long tradition of marine governance co-operation, and today eight out of nine riparian states are EU member states. Within this regional governance framework, policy is being developed by different actors both collaboratively and in parallel. The HELCOM Baltic Sea Action Plan (BSAP) and the binding EU Marine Strategy Framework (MSFD) aim at achieving good environmental status by 2020/2021. The new EU Directive Establishing a Framework for Maritime Spatial Planning and the softer HELCOM/Vasab work aim at developing ecosystem-based marine spatial planning by 2020/2021. In each policy framework ecosystem-based marine spatial planning should aim at achieving good environmental status, and contributing to the sustainable use of marine goods and services (MSP Directive); EC, 2013a; Helcom, 2014). This thesis, however, shows that on a national level and on a project level the understanding of ecosystem-based marine spatial planning is still scattered.

Secondly, this thesis turns to analysing the nature of value and the value of nature, giving special attention to the importance of not only mapping and assessing ecosystem services but to bring their values into decision-making (Daily et al., 2009) in particular to current developments in the Baltic Sea Region. For the Baltic Sea Region a classification system of ecosystem services suggests that ecosystem services can be regulating, provisioning, cultural and supporting services, including both intermediate and final services (Ahtainen et al., 2014). The mapping and assessment of services is a challenging task that has started, but still a lot remains to be done (Ahtainen et al., 2014; EC, 2011; EC, 2013b). Bringing mapping and assessment into decision-making, The Economics of Ecosystem and Biodiversity (TEEB) suggests three steps: recognising, demonstrating and capturing values, and that valuation could be qualitative, quantitative as well as monetary (TEEB 2010; TEEB 2009). This thesis deals with a variety of valuation methods, such as indicators, multi-criteria analysis, various monetary valuation methods, as well as how trade-offs between ecosystem services have been dealt with previously. Bringing attention to valuation in the Baltic Sea Region, this thesis shows that there are examples that take into consideration valuation in the work of the Marine Strategy Framework Directive (Tuhkanen et al., 2014; SWaM, 2012; SWaM, 2013). The public, on the regional, national, as well as the local levels, have expressed how much they value healthy ecosystems in several monetary valuation studies (SWaM, 2013; GES-REG, 2013; Ressurreicao et al., 2012). The business case of a healthy environment is shown in several studies (WWF, 2013; Zennström et al., 2015), and there are examples of how the value of species and habitats is given attention in studies using monetary valuation methods (Kulmala et al., 2012; Kaminska, 2013). However, this thesis underlines that these examples of valuation are made separately, not directly integrated into a broader decision-making process, like marine spatial planning.

Thirdly, the concept of ecosystem-based marine spatial planning and valuation of ecosystem services are brought together with analysis and conclusions of why, how and when this could be done in the Baltic Sea Regional context.

On the question of why, this thesis argues that regional policy has now translated the global principles for ecosystem-based management into a regional context. Recently, and for the first time ever, both EU law and regional policy in international organisations, were formulating that the achievement of good environmental status and the safeguarding of ecosystem services and ecosystem boundaries should be guiding future marine spatial planning. Based on these developments, the work towards achievement of good environmental status and the development of marine spatial planning need to go hand in hand in the coming years. Thereafter, this thesis takes the next step and argues that ecosystem-based marine spatial planning and valuation of ecosystem services actually could be seen as mutually supportive. Ecosystem-based marine spatial planning would need and benefit from mapping and assessing ecosystem services, but also to present values qualitatively, quantitatively and monetarily. At the same time the work on valuation of ecosystem services needs a policy framework to be able to recognise, demonstrate, as well as, capture values successfully in decision-making. Communication between stakeholders and evaluation of progress in the adaptive management process, which marine spatial planning offers, is argued to be key reasons that should create acceptance for taking steps towards valuation of ecosystem services in marine spatial planning. Moreover, this thesis suggests that the timing for such developments is now; the regional policy framework is in place, marine spatial planning having the same time frame as the policy framework for achieving good environmental status in the marine environment, and the global work on developing methods for mapping, assessment and valuation of ecosystem services, calls for regional examples to lead the way.

On the question of when, this thesis concludes, following a template for ecosystem-based marine spatial planning agreed upon on a pan-Baltic level, that valuation of ecosystem services has a role to play at every step of the process, and that, using a pragmatic approach to valuation of ecosystem services, a variety of valuation methods could be considered, may they be qualitative, quantitative or monetary. It is argued that the public entity leading the process would need to involve stakeholders at an early stage to decide how valuation of ecosystem services could serve its purpose of making ecosystem values visible to humans, have importance for improving the decision-making process itself, as well as for facilitating the communication between stakeholders involved and complete an evaluation of the progress towards achieving good environmental status.

On the how question, this thesis concludes, based on interviews with representatives from different stakeholders groups (research, international organisations, national authority and NGO), that there is a great need for a broad participatory learning process to be able to move towards bringing on board the values of ecosystems into the decision-making governance systems like marine spatial planning. Established top-down governance structures need to be combined with bottom-up stakeholder initiatives testing practices and sharing experiences. This thesis suggests that valuation of ecosystem services in ecosystem-based marine spatial planning could be taken into consideration in further social-ecological system analysis. This could contribute to furthering the understanding of how to make ecosystem services valued in marine spatial planning, but also contribute to strengthening the understanding of the link between resource systems and governance systems, and indeed, the link between the economy and the environment.

Finally, this thesis identifies a number of issues where further research and co-operation is needed. Firstly, it points to the question of how to translate the Marine Strategy Framework Directive (MSFD) descriptors and indicators and the economic and social analysis into the language of mapping and assessment of ecosystem services, taking the work of Mapping and Assessment of Ecosystem Services (MAES) and The Economics of Ecosystems and Biodiversity (TEEB) into consideration. Secondly, it addresses how to translate this work into the spatial dimension of marine spatial planning, taking into consideration how planning will influence the programme of measures of the MSFD as well as how valuation of ecosystem services could contribute to the evaluation of progress, taking action towards achieving good environmental status. Also, understanding how concrete planning options will affect the provision of ecosystem services and their boundaries will be a delicate task for further research and co-operation. Another area where further regional research and co-operation would be wished for is how different methods of valuation of ecosystem services, may they be qualitative, quantitative or monetary, could provide useful information to the marine spatial planning process. With administrative and ecosystem boundaries on different levels in the Baltic Sea Region, the region's stakeholders need to embark on a broad and adaptive learning process. A multi-disciplinary approach will also be important, combining for example natural sciences, social sciences, economics, as well as computer visualisation used in marine spatial planning.

In conclusion, this thesis has been built on the fact that the Baltic Sea ecosystems are under severe pressure, threating long-term prosperity of the region and human wellbeing. New marine management approaches need to be tested and the Baltic Sea Region could become a global example of moving towards valuation of ecosystem services in ecosystem-based marine spatial planning. Valuation of ecosystem services in ecosystem-based marine spatial planning could prove useful in order to improve communication between stakeholders, as well as, facilitate evaluation of progress towards achieving good environmental status.

Table of Contents

List of Figures

Abbreviations

BSAP	Baltic Sea Action Plan
CBA	Cost Benefit Assessment
CBD	Convention on Biological Diversity
CPR	Common Pool Resources
CVM	Contingent Valuation Method
DPSIR	Drivers Pressures States Impacts Responses
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
ESA	Economic and Social Assessment
FMSP	Directive Establishing a Framework for Maritime Spatial Planning
GES	Good Environmental Status
HELCOM	Helsinki Commission
IPBES	Intergovernmental Platform on Biodiversity and Ecosystem Services
MA	Millennium Ecosystem Assessment
MAES	Mapping and Assessment of Ecosystem Services
MSFD	Marine Strategy Framework Directive
MSP	Marine Spatial Planning
RPC	Replacement Cost Method
SEA	Strategic Environmental Assessment
SES	Social Ecological Systems
TEEB	The Economics of Ecosystems and Biodiversity
ESA	Economic and Social Analysis
VASAB	Visions and Strategies Around the Baltic Sea
WFD	Water Framework Directive
WTP	Willingness to Pay
UNESCO	United Nations Educational Scientific and Cultural Organisation
UN	United Nations
UNCLOS	United Nations Convention on the Law of the Sea

1 Introducing the subject

1.1 Background

"It is too dangerous! And it is too complicated! What if we make valuation of ecosystem services in the marine spatial planning process and end up in an infected discussion where people argue that exploitation of nature will give higher benefits to humans than conservation?" This reaction to the idea of using valuation of ecosystem services in marine spatial planning was heard at a Regional workshop on the *Valuation of Marine and Coastal Ecosystem Services in the Baltic Sea* held in Stockholm on 7-8 November 2013. Convinced that fear would not be a good enough reason to stop us from trying to improve decision-making to save the Baltic Sea, this reaction inspired me to move forward with my endeavour to explore why, when and how valuation of ecosystem services could be used in ecosystem-based marine spatial planning in the Baltic Sea Region.

With a global population set to increase from seven towards nine billion people in the next decades, the need to secure a healthy and productive global ocean is pressing. In this situation it is becoming increasingly clear that we are not managing the oceans as effectively as we could; depleting fish stocks and pollution are major global challenges. A healthier ocean that is better managed could not only provide more food and more employment, it would improve prospects for nature, for the ecosystem services that we need, and for responsible businesses (Global Ocean Commission, 2014). The Baltic Sea, being one of the most polluted seas in the world, threatened by eutrophication, hazardous substances and overfishing, and surrounded by nine countries and about 85 million people, is in urgent need of improved marine management practices. Progress in strengthening the understanding of the importance of a healthy sea is necessary for prosperous regional development.

The alarming status of global oceans and seas, the Baltic Sea being one example, should trigger research to combine different practical approaches to achieve improved marine management contributing to healthier and more productive oceans and seas. Today ecosystem-based marine spatial planning is spreading as a policy tool for improved marine management, and so are methods of valuation of ecosystem services, but there is still very little insight from research and policy-making on how to combine these too approaches. This thesis argues that valuation of ecosystem services in ecosystem-based marine spatial planning should not be avoided, but explored further. Integrating ecosystem valuation into marine spatial planning has a unique momentum right now, and choosing this path can contribute to improved marine management in the Baltic Sea Region for years to come.

1.2 Purpose

The purpose of this thesis is to contribute to better knowledge on current policy developments in the Baltic Sea Region on ecosystem-based marine spatial planning and valuation of ecosystem services respectively, and to increase the understanding of why, when and how these two policy tools could be interlinked to achieve better marine management practices.

Earlier research has analysed the growing interest amongst policy-makers for marine spatial planning, as well as attempted to bring the benefits and challenges of marine spatial planning into light (e.g. Douvere (2008) and Crowder et al. (2008)). Moreover, scanning research on marine spatial planning, ecosystem-based management seems to be a concept of general acceptance; however, there lacks a consensus on what it would mean in practice for the planning process. Some research highlights the need for ecosystem services to be at the

centre of the ecosystem-based marine spatial planning process for communicative and evaluation purposes (e.g. Garnek et al. (2009) and Böhnke-Henrichs et al. (2013)), but little attention seems yet to have been given to analysis of how current policy developments in the EU, with the Marine Strategy Framework Directive (MSFD) being implemented next to a new Directive Establishing a Framework for Maritime Spatial Planning (FMSP), could impact future policy developments.

When it comes to valuation of ecosystem services, the backbone of information is the literature provided by the TEEB,[1] giving insights on its importance and outlining advice for policy-makers on how to approach the issue (e.g. TEEB (2010a) and TEEB (2010b)). There is also a growing amount of research using a variety of valuation methods making the value of different ecosystem services visible, also so in the Baltic Sea Region. However, valuation studies do not yet seem to be integrated into a larger decision-making process and research has so far been reluctant in proposing how it could be done. Instead, stand-alone examples highlighting the importance of the value of selected ecosystem services can be found (e.g. Ahtainen et al. (2014), Kaminska (2013), Kulmala et al. (2012) and WWF (2014)).

As stated above the notion of combining these approaches and implementing them in practice is only starting to develop. On the global level UNEP is now about to launch a large-scale project, *Catalyzing policy reforms that integrate the value of marine ecosystems, their services and the vital natural capital they represent – a TEEB for our oceans and coasts*, with the aim to develop methods to value marine ecosystem services and explore ways of incorporating such methods into decision-making. In this project marine spatial planning will likely be one prioritised decision-making process (GEF, 2014). At the Baltic regional level, countries are being triggered by recent policy developments, ready to embark on a journey of full-scale ecosystem-based marine spatial planning and have expressed the importance of taking valuation of ecosystem services into account (HELCOM, 2014), but not yet addressing how to do it in practice.

Against this backdrop, I would like to contribute in this thesis by trying to answer the following three questions:

The why question

With neither broad consensus on the need and use of valuation of ecosystem services in marine spatial planning, nor any practical examples of its application, there is a need to specifically address the why question. Based on an analysis of literature and policy-making on the nature of ecosystem-based marine spatial planning and valuation of ecosystem services respectively, I will try to answer the following sub-questions: 1) what in the current policy developments in the Baltic Sea Region is guiding ecosystem-based management, 2) could ecosystem-based marine spatial planning and valuation of ecosystem services be seen as mutually supportive and 3) why would it be important that valuation of ecosystem services is developed now in marine spatial planning?

The when question

With no general blueprint for the steps of a marine spatial planning process, as this is very much decided on a national level, the Baltic Sea Region nevertheless serves us with unique

[1] The Economics of Ecosystems and Biodiversity (TEEB) is a global initiative with the aim to draw attention to the economic benefits of biodiversity, as well as the growing cost of biodiversity loss and ecosystems degradation (www.teebweb.org).

conditions for analysing when valuation of ecosystem services could be useful in marine spatial planning processes. The Baltic Sea countries have agreed on a template for ecosystem-based marine spatial planning, including suggestions for different steps of the procedure. Following the steps of the planning in this template procedure, I will try to answer these sub-questions: 1) when in the marine spatial planning process could valuation of ecosystem services be relevant and 2) what methods of valuation could be interesting to use? Importantly, this thesis will apply a broad understanding of the concept of valuation methods, may they be qualitative, quantitative or monetary valuation.[2]

The how question

To be able to conclude on how valuation of ecosystem services could be integrated in broad-scale marine spatial planning in decision-making in the Baltic Sea Region, I will take departure in the social-ecological framework theory, acknowledging how the complex cross-scale interaction of nature resource systems and governance systems challenge the developments in the region and try to address 1) the role of stakeholders and 2) valuation of ecosystem services in ecosystem-based marine spatial planning as an important component in social-ecological system analysis. Interviews with stakeholder representatives will be used as a reality test on the status of ecosystem-based marine spatial planning and valuation of ecosystem services in the region today, and how it could develop in the future.

1.3 Scope

The pressing need for improved management to achieve good environmental status of the Baltic Sea marine environment is the starting point for this thesis. It focuses on policy development and research originating and supporting the development of the environmental sector agenda. Choosing this approach, marine spatial planning cannot be seen as a "neutral" instrument balancing all interests equally, may it be energy, transport, economic development and nature. Instead it takes its departure in ecosystem-based management, with the understanding that the protection of ecosystem services and their boundaries will set the framework for human activities (see Section 2.2.2).

This thesis will focus on the Baltic Sea Region. Indeed, marine spatial planning and ecosystem valuation is under development on both a global scale, in different marine regions, as well as on a more local level, with a focus on coastal management. The same goes for valuation of ecosystem services, with global UN reports setting standards and advancing common understanding, as well as regional, national and local examples of valuation. However, to limit the scope of the analysis to the Baltic Sea Region is suitable both from an ecological point of view (the Baltic Sea as one entity) and from a governance system perspective (the Helsinki Commission for the Marine Environment, HELCOM, including all riparian states and the European Union covering eight out of nine states). The Baltic Sea context also allows for examples to be taken from different countries without becoming either too site-specific, or too general. Additionally, as presented earlier, the Baltic Sea Region provides a template process for ecosystem-based marine spatial planning, with guidelines on ecosystem-based management, which gives a unique possibility to make some general conclusions with a generic value, responding to the research questions. Nevertheless, to understand the current developments in the Baltic Sea Region, some global outlooks on marine spatial planning and valuation of ecosystem services will also be given. This will

[2] Monetary valuation is a sub-category of quantitative valuation, but will be mentioned as a separate category to stress its importance in the discussions around valuation of ecosystem services.

demonstrate to the reader that the Baltic Sea Region is advancing, but not alone in what is a global movement on taking on board ecosystem service valuation in decision-making.

The focus of this thesis is marine spatial planning, not including integrated coastal zone management, but focusing on the planning of the territorial sea and the exclusive economic zone. Definitely, valuation of ecosystem services and spatial planning is of outmost importance in the coastal waters where the level of economic activities is high. Nevertheless, taking a Baltic Sea regional approach, this thesis follows the definition of the EU Directive Establishing a Framework for Maritime Spatial Planning (Directive 2014/89/EU of the European Parliament and the Council of 23 July 2014 establishing a framework for maritime spatial planning), as well as the features of the work of HELCOM, mainly focusing the analysis of marine spatial planning to the marine space outside the coastal waters, reaching out to include the exclusive economic zone.

Marine spatial planning is the term that is used in this thesis, although maritime spatial planning is used equally often, for example in the EU context. To my understanding, there is no clear difference between using marine or maritime spatial planning, though marine spatial planning may give a more clear focus to the marine environment, whilst maritime spatial planning implies a broader cross-sectorial approach, giving some more attention to the economic activities in the marine realm.

This thesis pays special attention to the achievement of goals and objectives in the marine spatial planning process. It follows the general understanding that goals are set for the longer term and are not easily measurable, while objectives are set to a mid or shorter term and should be measurable. With this understanding, this thesis is arguing that achieving good environmental status is a long-term goal for the marine spatial planning that has gained recognition in EU policy and HELCOM. Along this understanding, this thesis also argues that the ecological objectives are prerequisites for social and economic objectives, and the ecological objectives could be measured using the descriptors, indicators and an economic and social analysis of the Marine Strategy Framework Directive, including ecosystem service mapping, assessment and valuation. Ecosystem-based management then mainly becomes a management tool to achieve a goal, navigating between objectives (see Figure 11 in Section 4.1).

According to the TEEB valuation framework, valuation of ecosystem services can be qualitative, quantitative or monetary. All valuation methods aim at understanding the benefits of nature for humans, and the welfare gain that ecosystems provide. This thesis will take a broad approach to valuation, not limiting itself to monetary valuation. Different valuation methods will be analysed from a stakeholder perspective, focusing on methods of special interest for marine spatial planning processes. Hence, this thesis will not aim at covering all valuation methods, nor applying a dogmatic approach in ranking them in any way. Instead, a pragmatic approach is taken, focusing on possible ways that valuation could be used to improve decision-making.

Marine spatial planning is a policy tool guiding a public process in analysing and allocating the spatial and temporal distribution of human activities in marine areas to achieve objectives set by a political process. Importantly, this means that it is up to the national or EU legislation to deem how marine spatial planning regulations will interact with already existing regulations on, for example, transport, fisheries and biological conservation. A marine spatial planning regulation will often not override already existing regulations, but attempt to co-ordinate regulations, guided by set political objectives. Having said that, this thesis will not go

into a discussion on how a marine spatial planning framework may, or may not, override legislation for other sectors. It will instead take a generic approach, pointing out specific aspects and highlighting core elements of the planning that could impact the overall public governance of a marine area.

Acknowledging stakeholder participation as the core element of a marine spatial planning process, this thesis will take a stakeholder perspective. This will be done not only when exemplifying different valuation approaches (Section 3.3), but also using interviews as a barometer of how marine spatial planning could take on board valuation of ecosystem services in the years to come, and the role of different stakeholders in this regard (Section 4.3).

The scope, and also likely the subject of this thesis, does not allow for a direct and short answer as to the why, when and how questions, but rather to analyse what could be considered in dealing with these issues. Consequently, the attempt is to "draw a bigger picture" and "look into the future" of what might be of interest to consider. Any attempt to be more dogmatic would be not only impossible, but would be misleading to the reader on subject of what is practically feasibly.

1.4 Method

The writing of this thesis has been a rewarding learning process. The main method used has been to make an analysis of current policy and law documents on marine spatial planning and valuation of ecosystem services, as well as how relevant research has dealt with these approaches.

Firstly, mainly to address the "why" question it was necessary to explore what literature said about the concepts of marine spatial planning and valuation of ecosystem services respectively. To reply to the "why" question a thorough literature study was carried out. Information was gathered mainly from published academic research and complemented by published reports, many from international institutions such as UNESCO, UN and EU, devoted to current policy developments on marine spatial planning and valuation of ecosystem services.

Secondly, in order to approach the "when" question it was necessary to give special focus to the Baltic Sea Region. To scan for current developments in marine spatial planning and region-specific cases of valuation, academic research and reports were gathered and analysed. To reply to the "when" question an important element of research was to analyse the recent legal and other policy instruments under implementation which have steered the regional policy development. These include EU directives, national regulations, as well as documents and guidelines decided upon in international organisations such as HELCOM. Working as a policy-maker at the Swedish Ministry of Environment, I have had unique access to these sources of information and on-going discussions of current and future policy developments within the area of research.

Finally, as a framework for the analysis of "how", the ideas from social-ecological systems research was used, especially the reflections on challenges concerning the management of large-scale resources that depend on international co-operation and for which institutional diversity may be as important as biological diversity for our long-term survival. To better deal with the information gained from literature to address the "how" question, interviews were carried out to capture the reflections of four important representatives familiar with valuation of ecosystem services in marine spatial planning in the Baltic Sea Region; one NGO (WWF),

one international organisation (HELCOM), one national authority (Swedish Agency for Marine and Water Management) and a research institute (Swedish Institute for the Marine Environment). The motivation for holding these interviews, although few and arguably not generally representative for all sector interests, was to acknowledge the importance of the participation of different stakeholders moving forward in management of the commons, the Baltic Sea being such a resource. They were also used as a reality test on the status and forecast of valuation of ecosystem services in ecosystem-bases marine spatial planning.

1.5 Disposition

Chapter 2 will explore the nature of marine spatial planning and the planning of nature. It will analyse the origins and specifics of ecosystem-based marine spatial planning as response to the urgent need to move away from a sector-by-sector ocean management approach to one that balances the increasing intensity of human activities with the ability of the oceans to provide ecosystem services. The state of ecosystem-based marine spatial planning in the Baltic Sea Region will be given special attention.

Thereafter Chapter 3 will analyse the nature of value and the value of nature. The chapter will highlight that whilst humanity has benefited enormously from the rapid economic and technological developments of the last century much of this progress has been achieved to the detriment of natural systems and the sustainability of resources and ecosystem functions. The chapter will present how methods of valuation of ecosystem services have been developed to combat, if one may say so, what Folke (2014) labels as the ecological analphabetism, our inability to see the connection between nature and the development of our societies and our economies. The state of valuation of marine ecosystem services in the Baltic Sea Region will be given special attention.

In Chapter 4 the concepts of ecosystem-based marine spatial planning and valuation of ecosystem services will be brought together with an analysis on why, how and when this could be done in the Baltic Sea regional context. The conclusion of the chapter will capture not only the benefits of making this happen, but also propose a concrete way forward on how to do it.

In Chapter 5 I will conclude this thesis, answering to the research questions on valuation becoming an integrated part of ecosystem-based marine spatial planning in the Baltic Sea Region, as well as identifying areas in need of further research in this regard.

2 Ecosystem-based Marine Spatial Planning

Plans are nothing. Planning is everything.
Dwight D. Eisenhower, general and president (1890-1969)

Three quarters of our planet are covered by oceans and seas. Indeed, it is a blue planet we inhabit. For centuries the vast marine space – over and under the surface – has been an area beyond traditional jurisdictions, and with enormous richness to harvest: an area of exploration and exploitation. In our minds it might still be so, but things are starting to change.

This chapter will begin the journey by giving a short and general introduction to the origins and specifics, as well as the challenges and opportunities, or let us shortly call it "the nature" of marine spatial planning. Why is it happening now, and what is it? (Section 2.1) With this on board, we will go into the deep with the notion of ecosystem-based management (Section 2.2). We will do this because ecosystem-based management is like the sea itself – it looks great on a sunny day, but you have to get under the surface to know how it is really doing, and what it is about. The chapter will thereafter turn to the Baltic Sea (Section 2.3), a region where ecosystem-based marine spatial planning is growing on the horizon. This chapter will finally be concluded in Section 2.4.

2.1 The nature of planning and the planning of nature

The human mind has the unique gift of planning. We can make intended actions to achieve an objective: to move from here in a direction to get to our goal. But we also have the rare gift of spatial imagination. To illustrate what we see around us, for example nature, and illustrate how we want it changed. We can make maps.

2.1.1 Expanding spatial planning – from land to sea

In modern society public policy comes as a response to expressed societal needs. This is also the case for spatial planning – terrestrial spatial planning, as well as, marine spatial planning. Spatial planning refers to the methods used by the public sector to influence the distribution of people and activities in spaces of various scales (CEMAT, 2007). The beginning of terrestrial spatial planning was triggered as a response to the industrial revolution and urbanisation at the end of the 19th century. Industrialisation brought about not only social and economic problems, but also increasing environmental challenges. Coal became the principal raw material. Society was changing fast, and to be able to allocate and plan for the distribution of people, infrastructure and activities, spatial planning was implemented. Hence, terrestrial spatial planning not only allowed for more planned development, it also helped to avoid escalating health problems, like the pollution of water and air. Gradually a project-by-project and permit-by-permit spatial planning became a comprehensive planning process (Douvere, 2008).

Spatial planning as a tool for marine management is much more recent, it is actually only a few decades old. Indeed, our oceans and seas, by their very nature, resist the conditions of planning: the ownership is uncertain and the boundaries as well. But although the marine space often is perceived as a commons, open to free passage and exploitation, it does not mean that activities in our seas until now have been totally unregulated. As Douvere (2008) puts it "ocean space has been regulated or allocated in a number of different ways, but most importantly, this has been done predominantly within individual economic sectors" – fishing, mining, transport. Planning for use has been undertaken by different actors and only

covering one or a few activities at the time. It has not been integrated planning, made by the public and covering all activities in a given area. This is where marine spatial planning comes into the picture, with the aim of bringing it all together (see Figure 1 below). Many see it as an idea whose time has now come (Ehler et al., 2007, as referred in Gilliland et al., 2008).

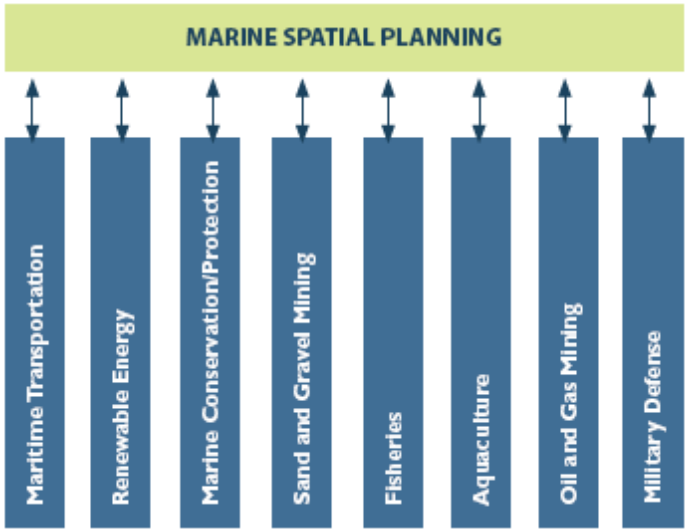


Figure 1 Marine Spatial Planning as Integrated Sector Management

Source: UNESCO (2009)

So why did marine spatial planning start its circumnavigation as a policy tool? One of the first attempts to turn from piecemeal governance to integrated marine management was made forty years ago, in 1975, with the Great Barrier Reef Marine Park in Australia (see Section 2.3.1 on how this has inspired the Baltic Sea Region). Marine spatial planning was at this time foremost a policy response to the need for nature conservation (Douvere, 2008). Nature was threatened by tourism and fishing exploitation and a new management approach was utterly needed that allowed for human activities while simultaneously providing a high level of protection for specific areas (Douvere et al., 2008). Since then, and with an intensified attention, marine spatial planning has spread as a management tool, but not only for conservation purposes. The idea of marine spatial planning is now turning into concrete policy-making all around the world.

One could identify three reasons why marine spatial planning is increasingly taken on board by policy-makers and academia. Firstly, the legal framework for the governance of the sea, UNCLOS, has become more strongly established. This means that states can exercise increased sovereignty and put in place strategies for overseeing activities in coastal waters, territorial waters, as well as, in the exclusive economic zone (Churchill et al., 1999, as referred to in Jay, 2010).[3] Secondly, a wave of increased and intensified sea use is spreading all over the world. The fishing, mining, and wind-energy sectors are increasingly competing for space. To be able to facilitate exploitation of natural resources, these industrial actors themselves are demanding a more organised response from society: more planning (Jay, 2010). With the

[3] For information on state rights in marine waters, see United Nations Convention for the Law of the Sea (UNCLOS), at www.un.org.

sea providing such huge economic values, the wish for optimising activities in a spatial area is strong. Marine spatial planning could be seen as a means to prevent losses and increase economic output from different sectors (White et al., 2012; see also Section 3.2.2 on trade-offs between ecosystem services). Thirdly, and not the least important, in less than two human generations, population sizes of vertebrate species have dropped by half (WWF, 2014). While the oceans are home to an estimated 50-80% of all life on earth (UNESCO, 2014), marine ecosystems are experiencing continuous loss of populations and species. As an example, the U.N. estimates that 53% of global fish stocks are "fully exploited", and 32% are either overexploited, depleted, or recovering from depletion, and need to be urgently rebuilt (FAO, 2011). This imposes a dual challenge. As Worm et al. (2006) highlight, it both impairs the ability of marine ecosystems to feed a growing human population but also sabotages their stability and recovery potential in a rapidly changing marine environment. In conclusion, the reasons for developing marine spatial planning may have different advocates, but they are all calling for more public involvement to meet the governance deficit of our oceans and seas. As expressed by Kidd et al. (2012): "The sense that marine spatial planning has been prompted by the recognition that the externalities of unregulated development are hampering future prosperity, underpinned by social concerns for specific communities, can be seen to parallel the motivations for establishing terrestrial planning systems in many parts of the world a century ago."

Today, we see marine spatial planning initiatives in almost all continents (see examples in UNESCO (2009)). They are initiated by countries, as well as by regions. When spatial planning is expanding from land to sea, it aims to integrate different sectors, leaving piecemeal governance behind. But by doing so, it is challenged to deal with navigating between multiple objectives. The advocates for planning, may they be legal, industrial or environmental, are pushing the agenda. With the Obama administration, the USA has proposed a framework for large-scale regional marine spatial planning throughout the US exclusive economic zone, interestingly for several different reasons namely; "to meet economic, environmental, security and social objectives" (Gopnik et al., 2012). The EU and several countries in the Baltic Region have recently initiated or landed legislation on marine spatial planning, which is done with a multitude of objectives (EC, 2014). As we will see later, the objectives for planning can be many, different, and sometimes even contradictory (see Section 2.3). As pointed out in the *Marine Spatial Planning – Step-by-step guide toward Ecosystem-based Management* (UNESCO, 2009), marine spatial planning is likely to be most successful in achieving expected or desired outcomes/results when conducted an "objective-based approach". Such an approach gives a hierarchy of goals, objectives and indicators to evaluate the performance of management measures in achieving those goals and objectives. A crucial issue is therefore, how does the concept of ecosystem-based management influence the objective setting of the planning process? To understand what is happening in the Baltic Sea Region we will go through the basic elements of marine spatial planning, and then focus on the planning aspiring to be ecosystem-based.

2.1.2 What is marine spatial planning?

The established definition used by UNESCO marine spatial planning is "a (1) public process of (2) analysing and allocating the spatial and temporal distribution of human activities in marine areas (3) to achieve ecological, economic, and social objectives that are usually specified through a political process." (UNESCO, 2009). One could say that these elements are the foundation of the nature of planning.

1) Marine spatial planning is a public process

Both these words; *public* and *process* are important to note. It is a crucial first step in marine spatial planning to identify who is responsible for running the process (UNESCO, 2009). The word *public* implies that it is not a private process, run by the private sector. Instead it is a process run by government or another public office elected with the mandate to govern the marine space. Being a public process, it would also ideally imply that different views of society are represented. It may be the views of the business sector, the people, or the non-governmental organisations, or even future generations. But in the planning process the level of stakeholder participation of these sectors can vary greatly, as illustrated in Figure 2. Speaking about the public, we also need to remember that planning can be conducted on different public levels; local, regional, national, and international. In sum, these key elements – who is the public, and who is represented – are indeed relevant for the multi-level and multi-stakeholder Baltic Sea Region (see Section 2.3).

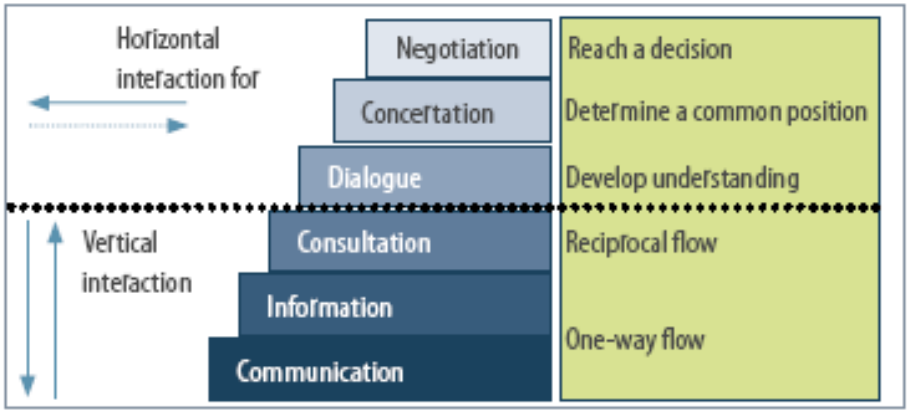


Figure 2 Different types of stakeholder participation

Source: UNESCO (2009)

Secondly, marine spatial planning is a *process*, not a product. The plan itself may be a final product, but the process does not stop with the plan, because the marine spatial planning has the nature of adaptive management. The elements of the process can of course vary, but the crucial elements are illustrated in Figure 3 below (see also elements of Baltic Sea marine spatial planning process in Section 4.2). Importantly, the process is forward-looking and moving, not stagnating. Once the process has completed its cycle, it starts over again. This means that the planning is a process of learning for all the stakeholders concerned. It also means that evaluation needs to have a central role, one has to look at the result, compare with the achievement of objectives, check indicators, and start the process again (see for example in UNESCO (2009), Douvere et al. (2010), Carneiro (2012) and Morf et al. (2013)). In the cyclic planning process, we not only have to deal with a complex ecosystem that continuously changes, we also have human activities, which vary in intensity, and stakeholders, who differ in values and interests. It is clear that for this adaptive management process we need to incorporate a lot of different information (see also Section 2.1.3). The establishment of adaptive management as a learning and evaluation process, which also has to deal with the changing ecosystem and governance system, is what is now very much a primary challenge for the Baltic Sea Region (see Sections 2.3 and 4.1 and 4.3).

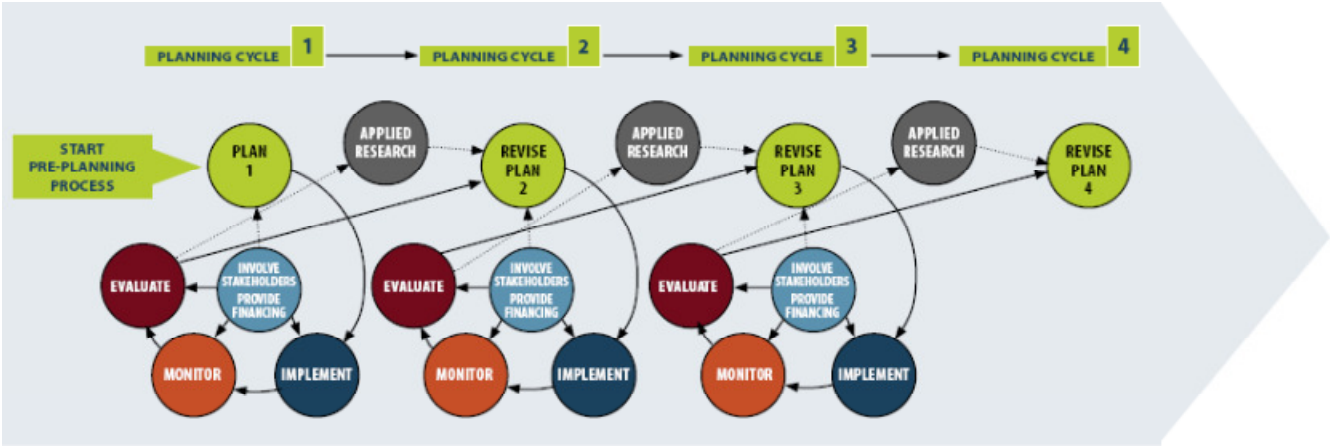


Figure 3 Continuing Marine Spatial Planning Process

Source: UNESCO (2009)

2) Marine spatial planning has the nature of analysing and allocating the spatial and temporal distribution of human activities in marine areas

Let us start by giving attention to the nature of marine spatial planning as a tool for *analysing* human activities in (a) space and (b) time. (a) In an early stage of planning one needs to define the boundaries for the area, the space in answer to the question: for which area are we planning? This is truly challenging when it comes to the marine environment, because often the planning area will not coincide with the boundaries of a single ecosystem. Equally, human activities such as transport, which has to be thoroughly identified and mapped, often extend far beyond the planning area. In addition, as we all know, pollution does not know any boundaries. The conclusion is that although the planning is place or area-based, the interconnection with the surrounding area should not be forgotten in any analysis. (b) For which time frame are we making the analysis? Defining the time frame, with a base year with "current conditions", and a target year of "future conditions", is utterly important. Often, as underlined in the UNESCO guide (UNESCO, 2009), the time frames have to conform to other relevant time frames of national planning periods. Let us keep the issue of space and time in mind for later, when we look at decision-making levels and when marine spatial planning time frames need to coincide with current administrative regulations and targets (see Sections 2.3.3 and 4.2).

Now we turn to *allocating*, the core part of the decision-making, taking a step away from the piecemeal governance where every sector cares for its own interests, and instead bringing them all together. Importantly, marine spatial planning is about allocating human activities, not nature itself. Ecology as such cannot be allocated, although altered. A nesting site is in one location, but a line of wind power plants can also be placed there. Nevertheless, marine spatial planning needs to map the spatial and temporal distribution of species, habitats, as well as, human activities. In the allocation, some areas could of course be identified as ecologically important, and some as economically important. The issue of allocation, and boundaries for it, is especially relevant when we later address ecosystem-based management. We will get back to this when giving attention to ecosystem-based management and the ecosystem setting boundaries for the allocation (see Section 2.2, 4.1). For both the analysis and the allocation, the access to a variety of information is of key importance. This will be dealt with in Section 2.1.3.

3) Marine spatial planning aims at achieving ecological, economic, and social objectives that are usually specified through a political process

Now we get back to the aim of marine spatial planning, integrating various sectors and concerns, but without losing direction. As mentioned above the objectives for the planning process may vary, it may be about social issues, the economy, or the environment. Nevertheless, without specifying the desired outcome, "you might wind up with very different results, biased toward one (or more) particular sectors or concern, and very far from the integrated results you originally intended to achieve" (UNESCO, 2009). Indeed, planning is to have clear principles, as well as objectives and goals of the process. So, if "the public" is the captain on the ship, we do not only need coordinates for the route, but a clear destination. In marine spatial planning, it is the "political process" that sets the objectives, may it be policy-making on the European, regional, national or local level. Indeed, it is a delicate balancing act between different, sometimes conflicting policy objectives. As will be highlighted in the analysis; if the political process chooses an ecosystem-based management approach, one would need to ask: how will it impact objectives, and the choice of direction for the process? (see Sections 2.2.2, 2.3 and 4.1).

With the elements of marine spatial planning in place, let us stay for a while with the art of making maps. Marine spatial planning is much more than gathering information and producing maps, but yet it cannot be done without it. What is mapped is also setting the scene for decision-making. The question that could be asked is: what information is included, and how?

2.1.3 Information – putting different layers together

Imagine that you fly over the southern part of Sweden, beautiful Skåne. The patchwork of fields is spreading out in different colours, roads, villages and cities. You see a changing landscape. It seems organised. Then you leave land, and head over the Baltic Sea. Now the surface is blue, it seems homogeneous from horizon to horizon. But the one surface is misleading us. Marine spatial planning is three dimensional decision-making, including the sea floor, the water column and the surface. Let us look at the different layers of information, and ask how they are put together.

A first important step in marine spatial planning, especially when ecosystem-based planning is employed, is to go under the surface, to the sea floor and water column, and map the biophysical conditions, such as communities of marine organisms and habitats, but also the geology (Crowder et al., 2008). Indeed, this is to a large extent a science-driven fact-finding mission, but all in the interest of the public authority governing the process, as the responsible party for the planning process. In its ambition to establish marine spatial planning the Swedish Government Inquiry *Kunskap på djupet* (Knowledge in depth) (SOU 2011:56) underlines something that is a challenge globally: biological knowledge of the sea today is limited to certain areas, while vast areas are missing data. However, when planning has the objective of balancing further exploitation or conservation, much more knowledge is very much needed. The Convention for Biodiversity provides with a framework for valuation of nature, including criteria to identify the most ecologically and biologically important marine areas (CBD, 2008). Additionally, private actors often have an interest and knowledge in mapping the sea bottom and water column. Hence, mapping biophysical conditions can be made by many, and the information may not always be publicly and easily accessible.

The next layer of information to map, as suggested by Crowder et al. (2008), is the human uses of the area and political and legal arrangements that relate to these places, where socio-economic overlays could identify the spatial distribution of, for example, recreational boating and oil and gas development, while jurisdictional overlays would delineate areas covered by protected areas etc. Indeed, the mapping of human activities and jurisdictional boundaries are often tangible information; number of ships, level of fishery etc. Plan Bothnia, a marine spatial plan for the Bothnian Sea, is a good example of how a pilot plan is built with these layers of information, also indicating future development of human activities (see Section 2.3).

Yet another layer of information could be to add what Martin et al. (2008) call "the missing layer": the social landscape. Today there is a rapid development of using geo-technologies, which "is becoming the forum where marine spatial data is aggregated, planning options are visualised, impact analyses are performed, and regulatory zones are established and mapped". The authors argue that local information from fishermen on how they use the sea needs to be included in the mapping. Without this input, decision-making will be less participatory, and risk missing out on important information. This brings us into the crucial issue of linking the status of environment with the human use of it. When applying an ecosystem-based management, it has been argued that more traditional methods of biodiversity valuations mentioned above really need to be complemented with assessments of ecosystem services and how they are affected by exploitation. Focus needs to be kept on the whole ecosystem, including its ability for biodiversity to provide goods and services to humans. The importance of a broad application of socio-economic analysis thereby becomes a crucial issue for decision-making. Socio-economic analysis is about being able to value if a measure taken can contribute to social-economical effectiveness. Effectiveness is very much about what individuals and society deem as effective, hence analysis must also include how individuals and society look at the value of ecosystems and their services provided (SOU 2011:56). This would mean, for example, that it is not only the classification of valuable species or statistical data on recreational boating that could be mapped, or indeed the protected area that tourists often enjoy, but also the estimated value of ecosystem services of recreation itself by tourists and other users (see Section 2.3 for examples and Chapter 4 on importance of layers of information). This leads us to the necessity to have a close look at the concept of ecosystem-based management, a management approach where ecosystem services and values for humans are important elements.

2.2 Ecosystem-based Management

Let us start by being clear: marine spatial planning does not have to be ecosystem-based. Similarly, ecosystem-based management at sea does not necessarily need marine spatial planning. One can manage the sea based on a variety of principles and objectives and one can utilise marine spatial planning without going back to the basics of ecosystem-based management. Nevertheless, as will be shown, the concept of ecosystem-based marine spatial planning seems to have taken science and policy by storm. Today, it is frequently asserted that marine spatial planning should be ecosystem-based (Jay, 2010). The arguments for marine spatial planning and ecosystem-based management going hand in hand vary. From one side marine spatial planning is seen to give the framework that ecosystem-based management has been searching for, providing spatial and temporal aspects of management (Douvere, 2008). From another perspective, ecosystem-based management is seen as an important management principle for achieving an effective marine spatial planning (UNESCO, 2009). But indeed, although the concept of ecosystem-based management is often used, it is not often examined how it really impacts decision-making. This chapter will argue that three principles of ecosystem-based management are especially important to speak

clearly about if planning is to be labelled ecosystem-based: the conservation of ecosystem services, management within the boundaries of ecosystems and, thirdly, the valuation of ecosystem services.

2.2.1 A management approach and its principles

According to UNEP guide on *Taking Steps toward Marine and Coastal Ecosystem-Based Management*, ecosystem-based management "is a strategy for the integrated management of land, water and living resources that provides sustainable delivery of ecosystem services in an equitable way" (UNEP, 2012). By this definition we understand that ecosystem-based management is an integrated approach that goes beyond examining single issues in isolation, very much like marine spatial planning as such, but has the ambition of a holistic and cross-sectorial perspective to management (see Figure 1). We also understand that it is a strategy focusing on ecosystems, humans being a part of them, and their benefits and services, for the long-term wellbeing of humans.

Ecosystem-based management has its origin and international legal support in the UN Convention on Biological Diversity (CBD). The Convention was originally adopted at the Rio de Janeiro Summit in 1992 as an international policy response to a steady stream of alarm signals: human kind is changing ecosystems, including marine ecosystems, more rapidly and extensively than in any comparable period in human history (see for example in MA, 2005). Science had shown that diversity in ecosystems is necessary for safeguarding the dynamics and stability of life-supporting services that nature provides humankind – air, water, climate etc. As a result the CBD not only speaks about the "inherit value" of biological diversity for nature itself, but also its value for humans (SOU 2013:68). The fundamental acknowledgement that nature has a value for humans is something we will keep coming back to in the forthcoming analysis.

To improve management of ecosystems a new management approach was developed within the framework of CBD, the ecosystem approach, or differently called ecosystem-based management. If you go back to its origin, it is based on twelve guiding principles; the Malawi Principles (see Appendix 1). As can be noted, the principles cover a range of issues for improved management; decentralised decision-making, adaptive management, and participation. It also has a strong focus on advancing knowledge-based decision-making. Leaving the more procedural issues aside, it gives a strong focus on this: safeguarding ecosystem services and highlighting their values to humans.

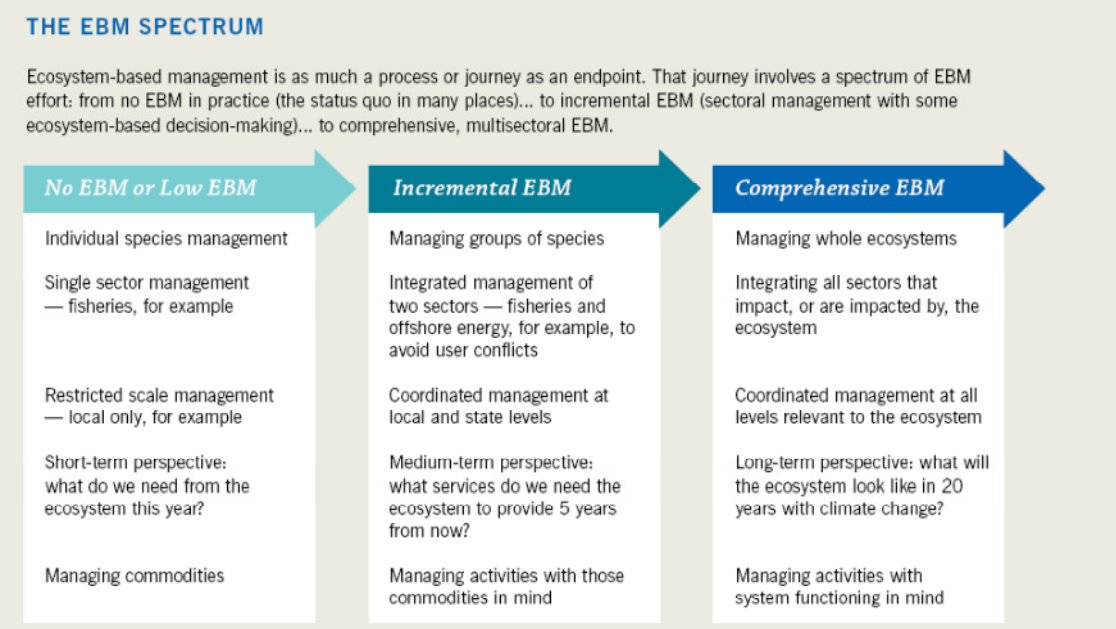


Figure 4 The Ecosystem-based Management Spectrum

Source: UNEP (2011)

How should management deal with all these twelve principles in decision-making? It seems to be the case that there is no universal template for how it should be done. Indeed, ecosystem-based management can mean many different things (see Figure 4). Instead, it is said that the principles should be seen as "one package", but depending on the context of implementation, different parts of the elements in this management approach can be highlighted (UNEP, 2011). So management has to deal with a key issue: which of these principles are especially important to speak clearly about when we are to implement this management approach in ecosystem-based marine spatial planning? Let us go from principle to practice.

2.2.2 From principle to practice

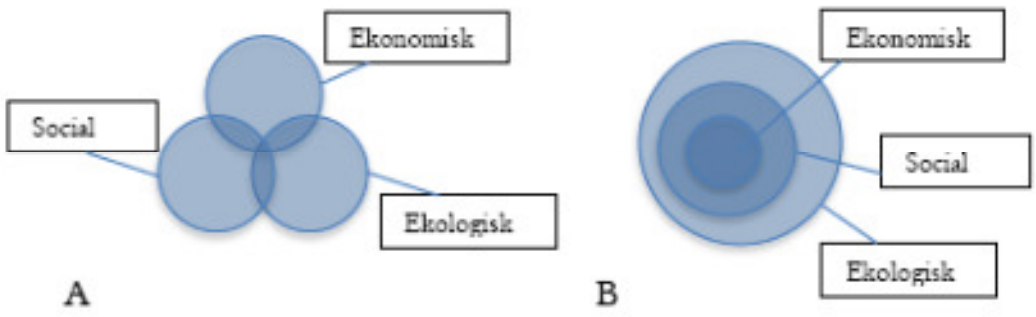
As stated above in Section 2.1.2, it is for the political process to set the objectives for marine spatial planning. Many times objectives can be multiple. If decision-makers chose to have an ecosystem-based management approach, decision-making needs to deal with how this influences the setting of objectives, and ultimately also how conflicting objectives will be dealt with.

According to UNEP (2011): "fundamentally, the primary goal of any ecosystem-based project is to secure the long-term delivery of multiple ecosystem services that support human wellbeing by sustaining critical ecosystem structures, functions, and processes." Putting ecosystem-based management into the context of marine spatial planning that is very much focussing on the interaction between humans and ecosystems, ecosystem-based management challenges to be an issue of how human activities are in accordance with the dynamics of the ecosystem. The Governmental Inquiry on marine spatial planning consequently concludes that "a sustainable management must therefore take its departure from a natural ecosystem dynamics. The ecosystem structure and function must be kept" (SOU 2011:56). Keeping the conservation of ecosystem structure and functioning, in order to maintain ecosystem services, is also said to be the priority target according to Malawi Principle 5. According to

CBD Advanced Users Guide (2014) of the principles, a key issue implementing this principle is to "Develop and promote management strategies and practices that enable and ensure conservation of ecosystem services and take account of, or minimise, risks/threats to ecosystem function and structure." Importantly, as underlined by Curtin et al. (2010) the focus is on the ecosystem as a whole and not just single activity or species of fish. Further Principle 6 says that ecosystems must be managed within the limits of their functioning, and according to the Advanced Users Guide (2014) this means to "Develop and promote appropriate management strategies and practices that sustain resources and maintain ecosystems within the limits of their functioning".

With these key principles in mind it is of importance to highlight an important issue that Foley et al. (2010) point out: although ecosystem health and functioning is implicit in most marine spatial planning processes, it is not guaranteed to serve as a foundation for the process. It is either not seen as the primary goal or social and economic goals are being prioritised to the detriment of ecological goals and objectives. Foley does not aim at resolving what he sees as the debate over the relative roles of social, economic, and ecological objectives in developing marine spatial planning, but argues that "ecological principles should be at the foundation of any ecosystem-based process."

What Foley underlines, but at the same time in a way also partly avoids, is what we could call the clashes of the conceptions of development. With the Brundtland Report in the 1980s, the concept of sustainable development has established itself as a main principle of management. As well known, sustainable development aims at balancing three dimensions: the social, ecological and economical dimensions. These three parts are interrelated, but to a large extent seen as equally important. Ending up in a delicate act of balance between these dimensions, operationalising this principle in practice has shown not to be easy. However, it seems that a new conception is entering the scene, placing the ecological dimension as the fundament for any social and economic development (SOU 2013:68; see also Figure 5 below).



A, som ofta är det sätt på hur Bruntlandkommissionens tre aspekter på hållbarhet illustreras, visar de ekonomiska, sociala och ekologiska dimensionerna som jämnbördiga.
B sätter istället den ekologiska dimensionen som fundamentet på vilket de andra dimensionerna vilar.

Figure 5 Shifting development paradigm. Text translated: A, The three dimensions of sustainability, social, economic and ecologic are illustrated as equally important. B. The ecologcial dimension is instead seen as a fundament for the social and economic dimensions.

Source: SOU 2013:68

The two different conceptions of the world very much originate from different perceptions of the relationship between humans and nature. Research today shows that sustainable development needs to take into account the risk of irreversible environmental degradation, hindering economic growth. An important area of research today is to estimate the planetary boundaries (for example climate change, freshwater use, ocean acidification) identifying a safe operating space for humanity within which humanity can continue to thrive for generations to come (Rockström et al., 2009). Ecosystems set the boundaries for social and economic development. As argued in SOU 2013:68, to bridge this difference in perspectives, methods to explain the relationship between economy and environment are needed.

Why are the clashes of conceptions of development important for ecosystem-based marine spatial planning? One could argue that ecosystem-based management according to the above mentioned Malawi principles pushes policy-making in the direction of a new development paradigm taking the ecological dimension as a fundament for social and economic development, and that this will need to have several implications for practical decision-making. Firstly, one could argue, speaking clearly about these two principles – the functioning of ecosystem goods and services and limits of ecosystem functioning – will need to influence any task of setting objectives for the marine spatial planning process. With this perception, economic or social objectives should not be compromising the maintenance of ecosystem services. Indeed, this could have very practical implications in the decision-making process – for example when choosing between alternative management options (see Section 4.1).

But, though easily said, it will undoubtedly be difficult to do. Going along with these two principles, to safeguard ecosystem services and keep within their limits, will need work to be done in developing methods for assessment of marine ecosystem services. Assessment of ecosystem services is not at least important as to be able to judge if progress is made to reach environmental objectives. Böhnke-Henrichs et al. (2013) argue that the lack of well-structured, systematic classification and assessment of marine ecosystem services is a reason why the ecosystem service concept rarely is applied in marine spatial planning. According to the same line of argumentation, the Government Inquiry preparing for national legislation on marine spatial planning emphasises the need to focus on ecosystem services in marine spatial planning, arguing that "an advantage of formulating the goals from ecosystem services, is that they, at least theoretically, can be measured in economic terms and compared, which could facilitate comparisons" (SOU 2011:56). Garnek et al. (2009) underline that using the language of ecosystem services creates a "common language" and this could actually be facilitating comparisons of management. Taking the discussion one step further, the authors state that making ecosystem service assessments may include qualitative and quantitative analysis, and even monetary valuations, and that "the goal of these assessments is to link management actions directly to changes in ecosystem conditions and to gain an understanding of how those changes may affect the benefits that various individuals and groups derive from ecosystems." (See further Sections 3.1 and 3.2). The Malawi Principle 4 picks up on the same idea, saying that recognising potential gains from management, there is usually a need to understand and manage the ecosystem in an economic context.

To summarise, it could be noted that whilst the ecosystem-based management is acknowledged to have a role in marine spatial planning, it is up to practice to show how it will be done. Many aspects of the Malawi management principles of ecosystem-based management could be relevant for the marine spatial planning process, not forgetting participation and adaptation, but as has been argued, the very fundament of ecosystem-based management is not to be forgotten, namely the functioning and limits of ecosystem services.

If acknowledged in practice, this will further management into the mapping and assessment of ecosystem services, and once having done so take the next step addressing of valuation of ecosystem services. That is, the step to valuation of ecosystem services is not far away. This brings us to have a closer look at valuation in Chapter 3, but let us now focus on The Baltic. The Baltic Sea Region is developing ecosystem-based marine spatial planning; how and why is marine spatial planning climbing the policy agenda? And what does ecosystem-based management mean for this region?

2.3 The Baltic Sea – developing ecosystem-based marine spatial planning

Every marine region has its specific environmental challenges and its unique governance framework. It is often said that the Baltic Sea is one of the most polluted seas in the world, surrounded by some of the richest countries. All of the surrounding countries, with the exception of the Russian Federation, are part of the European Union. This chapter will start (Section 2.3.1) by giving an up-date on current status and future trends on the environment and human use of the Baltic Sea. Importantly, both the present situation and a long-term forward-looking perspective will be given. Thereafter, Section 2.3.2 provides an introduction to the governance framework of the region. With these two components, giving a necessary background to current and projected future policy developments, Section 2.3.3 will examine how ecosystem-based marine spatial planning is developing in the region.

2.3.1 Current status and future trends

The current environmental status of the Baltic Sea is the legacy of decades of pressure from anthropogenic sources of nitrogen, phosphorus, organic matter and hazardous substances originating from mainly land-based sources, but also from activities at sea (HELCOM, 2010). Also, intense commercial fishing has had a strong and widespread impact on the marine ecosystems. Although some recovery is being seen in some fish stocks, for example cod, the overall picture is that many Baltic fish stocks are threatened. Moreover, the fish being caught, for example salmon, often show high levels of contaminants, such as dioxins, which is why it is recommended to not eat fish frequently (Havet, 2013/2014). Every year statistics show that oil spills are scattered all over the Baltic Sea area, which are having a severe impact on biodiversity (Havsmiljöinstitutet, 2013). Many species are threatened. Reports show, for example, that the population of sea birds is declining, and the reason may be a mix of severe pressures, together worsening the situation by the year (Havsmiljöinstitutet, 2012). In summary, the major environmental challenges of the Baltic Sea are four: eutrophication, hazardous substances, threatened biodiversity and the impact of maritime activities. Looking at the HELCOM maps on status for ecosystem health (see Figure 6), one cannot reasonably say that the Baltic Sea is doing well. Eutrophication causes dead sea bottoms, which are spreading towards the coastline. Further, the Baltic Sea is unique with its brackish water; it is neither marine nor freshwater. As a result the Baltic Sea sustains both marine and freshwater species, and it is very sensitive to changes. With climate change, it is projected that changes in precipitation will take place, putting new and increased pressures on the Baltic ecosystem (HELCOM, 2010).

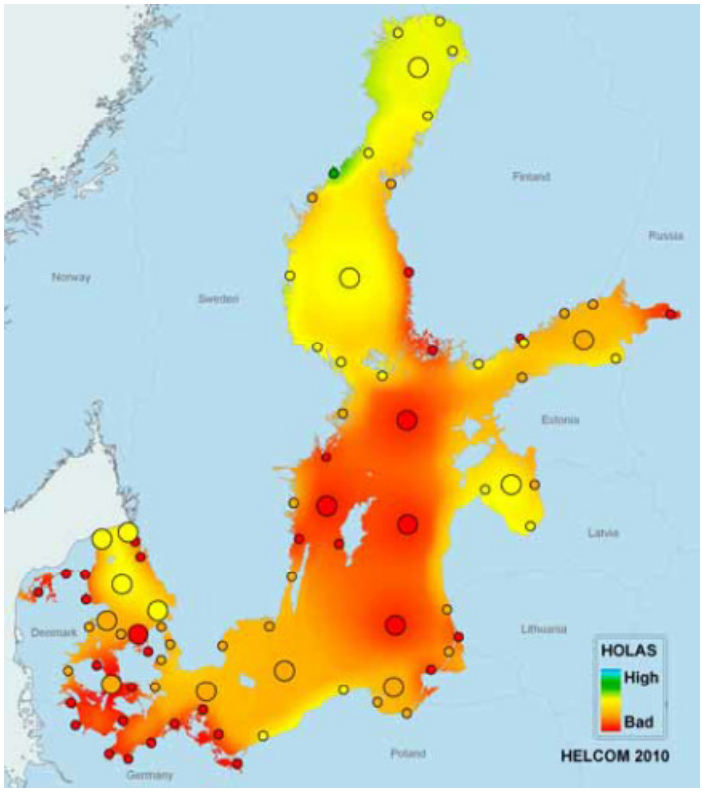


Figure 6 Level of ecosystem health according to HOLAS (Helcom Initial Holistic Assessment). High is blue and green, bad is yellow and red. As can bee seen almost the whole Baltic sea is yellow and red.

Source: HELCOM (2010)

It should also be noted that there are positive trends in the environmental status of the Baltic Sea. Today, we can see decreasing trends of inputs of nitrogen and phosphorous, especially improving the environmental situation in the coastal environment. Wastewater treatment plants have been built all around the Baltic Sea and improved agricultural practices in some parts of the region show that the decreasing trends could continue. Also, exempt from a signs of a recovering cod stock, there are also indications of an increasing seal population (HELCOM, 2010; Havsmiljöinstitutet, 2014; HELCOM, 2009). When it comes to hazardous substances, several heavy metals and other hazardous substances have almost been stopped from being released into the marine environment. This will hopefully have positive impact in the future, with decreasing levels of substances in the food webs of the ecosystem. But at the same time, when some problems are being effectively dealt with, new ones arise. Recent research shows that new hazardous substances are spreading in the ecosystem and their sources are even more difficult to trace (Havet 2013/2014). To summarise, when analysing current status and future trends of the Baltic Sea ecosystems, one needs to have dual vision, understanding the legacy of the past and its impact, but also acknowledging that there are some positive trends, and these could be strengthened. Indeed, the policy decisions for the future will impact the direction of development.

The outlook *Future trends in the Baltic Sea* (WWF, 2010) makes an important projection of human activities and their impacts on the environment in the twenty years to come. The conclusion, in short, is that the Baltic Sea is becoming more crowded. In addition, the human use of the Baltic Sea is projected to intensify. Although uncertainties in the forecasts exist, the trends are clear: many sectors, ranging from wind energy, shipping, oil and gas extraction, to tourism and aquaculture, are on the rise. For example, over the next 20 years, shipping is

expected to double in terms of the number of ships. At the same time, the size of the ships is predicted to increase substantially. The wind energy sector is also expecting enormous growth, increasing today's capacity of about 400 MW sixty times to 25,000 MW. WWF illustrates the trends by a map including the range of activities projected, indeed a picture that challenges decision-making to think (Figure 7). With this report, very much influenced by the marine spatial planning of the Great Barrier Reef in Australia (see Section 2.1.1), WWF argues that "So far there has been no attempts to put together a holistic and strategic plan for all sectors and human uses of the Baltic Sea. The lack of integrated planning and management in many cases results in counteracting decisions that hinder sustainable development in the region."

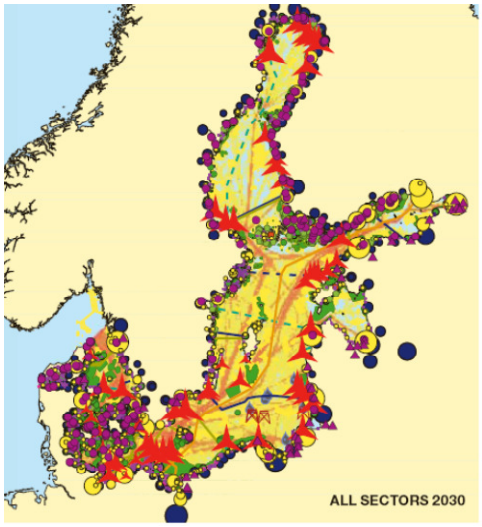


Figure 7 A Crowded Sea: Future trends for all sectors in 2030

Source: WWF (2010)

The current status and the future trends of the Baltic Sea Region are challenging in many respects. Let us now turn to the governance framework of the region.

2.3.2 The governance framework of the Baltic Sea Region

As put forward by Bloye Olsen et al. (2010), for any marine spatial planning to succeed, it is crucial to include a governance baseline in the analysis. The governance baseline can help to identify the crucial hindering and success factors for the implementation of Marine Spatial Planning (MSP). According to Olsen et al., the baseline could have two parts, part one focuses on the past and current performance of the governance system as it has responded – or failed to respond – to changes in the condition of the ecosystems in a specific locale. Part two of the baseline outlines a strategic approach to a design of a new programme and records the goals, objectives and strategies of MSP implementation. Understanding the general governance framework of the Baltic Sea Region today can help to identify the crucial hindering and success factors for the future implementation of MSP, and could also be seen as valuable using a social-ecological framework (see Section 4.3).

One thing more than anything else has an impact on the current and future governance in the Baltic Sea Region: eight out of nine costal countries are EU member states. This means that eight countries are bound together by EU policies, ranging from mandatory directives to softer EU strategies, and these range over a large policy area – economy, environment, transport, energy and trade. As a result the policy framework having an impact on the marine

environment in the Baltic Sea Region very much boils down to this: firstly, managing EU (both between the Baltic EU members and between them and the rest of the EU including other marine regions), and secondly, managing EU and the Russian Federation. It is important to remember that seen in a historical perspective this situation is very new, it was only in 2005 that Estonia, Latvia, Lithuania and Poland became EU members. Hence, the EU dominance of the Baltic Sea is only starting off, trying to find its feet.

In 1972 the Baltic Sea Region was pioneering as the first region to establish a marine convention, HELCOM, the Helsinki Commission for the Marine Environment. This was in the mist of the Cold War era, but the pollution of the sea urged countries to come together, although they only managed to deal with some issues separately. At this time the work in HELCOM was very much focused on science, analysing the environmental status of the sea rather than dealing with the different root causes of pollution. At that time land-based industrial pollution was in focus and the solutions were very much end-of-pipe oriented directed by a command-and-control approach, not going to the source, but trying to deal with the outputs. During the decades that followed management changed focus, gradually it tried to tackle more and more diffuse sources of pollution. With the adoption of the Baltic Sea Action Plan (BSAP) in 2007 the governance finally reached a coherent and action-oriented approach. With science as the base and an ecosystem-based management approach, the BSAP for the first time actually set a goal: good environmental status by 2021 and the actions listed in the plan all aimed at reaching that goal. As summarised by Valman (2014), the indicators derived are used to define the state of the ecosystem in order to set targets that represent a "good" ecosystem state. The novelty of the BSAP lied in its comprehensiveness as a management plan, how targets were set and calculated and its adaptable structure. With the BSAP it became more clear than ever; to reach this goal the involvement of all sectors was needed. Technical solutions were necessary, but without cross-sectorial co-operation the goal would not be achieved. Yet, HELCOM was still only an intergovernmental environmental organisation mainly governed by Ministries of Environment and without a compliance mechanism. Moreover, what was agreed upon in HELCOM needed to be matched with a much more mandatory EU policy framework – not only governing fishery, agriculture and transport policy, but also, from 2008 steered by a Marine Strategy Framework Directive (MSFD). The Directive, like the BSAP, was adopted setting the goal to achieve good environmental status (by 2020), and likewise introduced ecosystem-based management as a marine management principle (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); see more on MSFD in Section 3.3.1).

At this time, yet another EU policy instrument that would change the Baltic governance entered the scene; the macro-regional EU Strategy for the Baltic Sea Region (the Strategy). The aim of the Strategy was to enhance cross-sectorial and multi-level governance through concrete project co-operation. The EU had grown, with 27 member states, and the voices for macro-regional co-operation aimed at implementing EU policy regionally and coordinating relevant actors in regions was pushed up on the EU agenda. The Strategy had three goals: to have a healthy sea, to increase prosperity, and to connect the region. Notably, a strong focus was given to the marine environment, but the Strategy ranges over other issues as well (EC, 2013a). From 2014 it is projected that huge sums of EU financial support will be channelled towards the priorities under the Strategy- The Strategy is also seen as the regional strategy of the overall EU Maritime Policy. The Maritime Policy was launched in 2007 with the aim of providing a more coherent approach to maritime issues, with increased coordination between

different EU policy areas. In the next section we will get back to the features of the maritime policy, since marine spatial planning is one of its key areas.

As can be seen, the governance framework of the region has undergone great change. HELCOM BSAP and EU MSFD have together changed the direction of management focussing on achieving good environmental status. The need for cross-sectorial co-operation has been accentuated. At the latest ministerial meeting of HELCOM, in October 2013, the future of marine governance in the Baltic Sea Region was on the agenda (HELCOM Copenhagen Ministerial Declaration, 2013). There was a call for modernisation of HELCOM, not only so it would be able to assist in implementing the EU Marine Strategy Framework Directive, without losing its role as including Russia in decision-making, but also being clear that strengthened cross-sectorial co-operation was needed, confirming the role of HELCOM in developing marine spatial planning being an example. The next chapter will show what is now happening in this regard.

2.3.3 Marine spatial planning

In the Baltic Sea Region marine spatial planning is high on the political agenda and still climbing. To understand the development, it is important to note what is happening on different policy levels: the pan-EU level, the sub-regional Baltic level, the national level including local level, but also on the project level, uniting different countries and stakeholders. In doing this the key features of planning highlighted in Section 2.1.2 need to be remembered: who is the public and which political process is setting the objectives? Who participates in the process and how are the analysis and allocation made? As will be shown, the notion of ecosystem-based management has recognition in the region, but it is still quite unclear what it will mean in practice.

For decision-making at all these levels, one feature of the Baltic Sea needs to be kept in mind: the Baltic Sea itself is divided into sub-basins that should be seen as ecological units. None of them are today in good environmental status (HELCOM, 2010). What might be the critical environmental challenge in one basin is not as important in another. Yet, connectivity between basins is of course there, the overall environmental status in each basin is relevant for the others. This specifically means that any action programme tasked to improve the marine environment needs to work on different levels, locally, sub-regionally and on the Baltic Sea level itself. Moreover, relevant for marine spatial planning in the Baltic Sea Region, we need to keep in mind the jurisdictional boundaries to planning. Marine spatial planning is usually covering the waters outside the coastal waters, including the territorial sea and the exclusive economic zone (see scope Section 1.3) and this area is within national competence to plan. This means that the ecological boundaries of the sea and jurisdictional boundaries for planning are not easily matched. With these different boundaries in mind, let us look at the development of marine spatial planning on four policy levels.

1) The pan-EU level

The EU with its 28 countries has access to several sea basins, but the Baltic Sea is unique since eight out of nine coastal countries are EU members. It makes the Baltic Sea almost an EU internal sea. Since 2007 the EU has had a maritime policy with a strong focus on strengthening the maritime economy, giving focus to development of activities at sea such as wind energy, aquaculture and transport. With the Europe 2020 strategy, an overall EU strategy that has the aim of getting European economy back on track, the economic focus of the maritime policy has become even stronger; the maritime economy can help boost the European economic recovery (Declaration of the European Ministers responsible for the

Integrated Maritime Policy and the European Commission, on a Marine and Maritime Agenda for growth and jobs, the "Limassol Declaration", 2012). The Commission therefore has launched a Blue Growth initiative tasked with promoting for sustainable marine and maritime growth. As expressed in guiding documents, Blue Growth aims to "unlock the potential of the blue economy" (EC, 2012). In the Blue Growth initiative the job potential in different maritime sectors is listed, however it lacks a clear link to the state of ecosystem services (compare with Section 3.3.3). To boost the maritime sectors such as aquaculture, tourism and transport a number of initiatives are taken. Also, the Blue Growth initiative has a strong call for the establishment of marine spatial planning. Consequently, one year later, the Commission in 2013 presented a proposal for a Directive on Maritime Spatial Planning which landed in a Directive Establishing a Framework for Maritime Spatial Planning in July 2014 (MSP Directive).

Acknowledging that the EU maritime policy has had a strong focus on boosting economic development, it is of special importance to look closely at how the MSP Directive address the objective of planning in general, and in particular the status of ecosystem-based management. In the preamble of the Directive it is stated that it is the high and rapidly increasing demand for maritime space for different purposes that requires an integrated planning and management approach. In Article 5.1 the Directive states that "When establishing and implementing maritime spatial planning, Member States shall consider economic, social and environmental aspects to support sustainable development and growth in the maritime sector, applying an ecosystem-based approach, and to promote the coexistence of relevant activities and uses." Having manifested the ecosystem-based approach in a Directive article, the Directive elaborates in the Preamble on what applying this approach means:

> *In order to promote the sustainable growth of maritime economies, the sustainable development of marine areas and the sustainable use of marine resources, maritime spatial planning should apply an ecosystem-based approach as referred to in Article 1(3) of Directive 2008/56/EC with the aim of ensuring that the collective pressure of all activities is kept within levels compatible with the achievement of good environmental status and that the capacity of marine ecosystems to respond to human-induced changes is not compromised, while contributing to the sustainable use of marine goods and services by present and future generations. In addition, an ecosystem-based approach should be applied in a way that is adapted to the specific ecosystems and other specificities of the different marine regions and that takes into consideration the ongoing work in the Regional Sea Conventions, building on existing knowledge and experience.* (text underlined by the author)

Three issues are especially important to note. Firstly, the ability of ecosystems to respond to changes and deliver goods and services are brought in to define the application of ecosystem-based management. Secondly, EU policy makes a clear link to the achievement of good environmental status: the aim of spatial planning is to ensure that human activities are kept within levels not compromising the achievement of good environmental status. To give focus to the status of ecosystems is very much what has been argued in Section 2.2.2, namely that whereas ecosystem-based management according to the twelve Malawi Principles includes a variety of managerial aspects, it is Principles 5 and 6, on the delivery of ecosystem services and the limits of the ecosystem functioning, that need to be given special attention. This means that marine spatial planning needs to go hand in hand with the work on the Marine Strategy Framework Directive, something that we will come back to in Sections 3.3.1, 4.1, and 4.2. The Directive Establishing a Framework for Maritime Spatial Planning is now under transposition to national law in the member states and it remains to be seen how

member states will take on board ecosystem-based management as an objective for marine spatial planning.

Thirdly, from the quotation above, it is also shown that the work of the Regional Seas Conventions, for example HELCOM, is relevant in applying the ecosystem-based management in practice. Let us now go to the Baltic level.

2) The pan-Baltic level

In the Baltic Sea Action Plan adopted by HELCOM in 2007, one of the strategic actions to improve the Baltic Sea environment was to develop broad-scale marine spatial planning principles in the Baltic Sea Region (HELCOM, 2014). But HELCOM was not the only governmental organisation interested. VASAB, the intergovernmental organisation tasked with the mandate of spatial planning in the Baltic Sea Region also wanted to expand its activities in the development of marine spatial planning in the Baltic Sea Region. To combine the knowledge of marine environment with the knowledge of planners, a joint and co-chaired working group on marine spatial planning was established. In 2010 a set of broad-scale marine spatial planning principles was agreed upon. The principles bring forward the ecosystem-based approach as the overarching principle for sustainable management, which aims at achieving a Baltic Sea ecosystem in good status – a healthy, productive and resilient condition so that it can provide the services humans want and need. Importantly, the broad-scale management principles, already in its Principle 2, manifests that marine spatial planning must seek to protect and enhance the marine environment and thus should contribute to achieving good environmental status according to the EU Marine Strategy Framework Directive and HELCOM Baltic Sea Action Plan. It is clear that since the adoption of the Baltic Sea Action Plan not only have policy initiatives for marine spatial planning developed as such in the Baltic Region, but also HELCOM has been successful in pushing the agenda to get the ecosystem approach as a fundamental principle for marine spatial management. The next step for the HELCOM-Vasab expert group on marine spatial planning was to develop guidance on what ecosystem-based approach would mean for the marine spatial planning process, hence approaching its operationalisation. The document (HELCOM, 2014) outlines the different stages of the planning process and what needs to be reflected upon so as to be ecosystem-based. We will get back to these stages in Section 4.2, when analysing when valuation of ecosystem services can be done in ecosystem-based marine spatial planning.

What could be seen is hence that the sub-regional level has worked actively on getting acknowledgement and operationalisation to ecosystem-based management in marine spatial planning for many years, which surely also has had an impact on the member states drafting the Directive Establishing a Framework for Maritime Spatial Planning. From the policy perspective of the EU Strategy for the Baltic Sea Region mentioned above, HELCOM-Vasab have also been tasked to draw up and develop the application of transboundary and ecosystem-based maritime spatial plans by 2020 (EU, 2013a). But, whereas the pan-EU level legislation and policy set the objectives, framework and timeline for the development of marine spatial planning, and the pan-Baltic level has made an effort to complement the work, it is still the national level that withholds the real planning mandate, and planning authorities lead the procedures that are laid down in law.

3) The national level, including a local perspective

Taking a national perspective, keeping the local perspective in sight, the picture of developing marine spatial planning in the Baltic Sea Region becomes even more scattered. Going through sources, it seems that the topic is on the agenda for all countries, but where some await the EU legislation (e.g. Denmark), others have gone ahead and have started drafting legislation (e.g. Estonia, Latvia and Sweden). It is also the case that some countries already had legislation in place, although its scope may vary (e.g. Germany) and some countries have gone for local pilot studies where marine spatial planning is being tested (e.g. Poland). For the Russian Federation marine spatial planning is on the long-term agenda (PartiSEApate country fishes, 2014). Also, several countries are starting up bi- or tri-lateral co-operation projects, such as Sweden and Finland (see Plan Bothnia below) in the Bothnian Bay and Russia-Finland and Estonia in the Gulf of Finland. With this picture it is difficult, if not impossible, to evaluate how the ecosystem-based management is applied generally on a national level. It is important to note that the spatial planning mandate seldom lies with an agency tasked with environmental issues, but many countries strive to bring relevant authorities together in coordinating the use of the sea. One can conclude that most Baltic Sea countries are starting to set sail for national marine spatial planning, some have programmed the coordinates for the journey, there is a general understanding of the journey's destination being good environmental status, but few have left the harbour.

4) The project level

When the "top-down" development of marine spatial planning is only starting off at the pan-EU, pan-Baltic and the national level as well, the "bottom-up" development through concrete projects has been a way of testing new ideas and could, for example, lead the way for the practical application of planning objectives. Today several co-operation projects are testing marine spatial planning in the Baltic Sea Region. In these projects responsible public authorities may be participating, but they can also be organised by other entities representing their countries. Let us mention two projects that are likely to have a future policy influence.

Balt Sea Plan

This project aims at setting a long-term vision for marine spatial planning in the Baltic Sea Region, choosing 2030 as the target year. The project engages stakeholders from all Baltic countries, some authorities, but mostly academic institutions. The project also includes a number of pilot studies for marine spatial planning in different parts of the Baltic Sea. Now we will look closer at how the project deals with the ecosystem-based management. Searching in the basic documents setting the framework of the project, as well as, the long-term vision, it becomes clear that the ecosystem-based management is not an overarching principle for this project. In fact, nowhere is it mentioned that decision-making should be ecosystem-based. Instead the project has a strong focus on the three dimensions of sustainability stating that "maritime spatial planning seeks to secure economic prosperity, social well-being and a healthy and resilient Baltic ecosystem at the same time." Emphasising this view is also the statement that "The ecosystem approach is used as a basis for dealing with the environmental aspects (sic!) of spatial planning within and outside protected areas." However, one statement tries to reassure the commitment for the environmental targets set by regional governments saying: "A number of specific and timed targets have been drawn up by the EU and HELCOM which set out the desired state to be achieved either for the ecosystem as a whole or more specifically for certain species and habitats. MSP must play its part to make sure these targets are achieved." (BaltSeaPlan Vision 2030, 2011) Remembering the discussion in Section 2.2.2 on the different conceptions of developmebnt, it seems that

the Balt Sea Plan project is keeping to the sustainability paradigm, not seeing the ecological dimension as the foundation for social and economic development.

Plan Bothnia

This project aims at setting up a pilot plan for the Bothnian Sea, and is a bi-lateral co-operation project between Sweden and Finland, involving a large number of stakeholders. The project report puts different layers of information together, such as the environment, shipping, wind energy etc. The principles for planning used for the project follows, notably, the HELCOM-Vasab broad-scale maritime spatial planning principles from 2010. This means that the ecosystem-based management is on board. As the project does not go further into the issue of allocation of activities, only outlines interests as a basis for future decision-making, it never comes to the stage of applying the ecosystem approach in practice. The report acknowledges this with a frank statement "In a democratic society, all relevant sectors and viewpoints should be included in a process of spatial planning. Planning has thus a social dimension, playing a part in safeguarding the public good and civic wellbeing. Planning also has an economic dimension, aiming to boost growth and prosperity. There is also an environmental dimension of planning, even if this has often been in the shadow of other interests in practical application. At sea the environmental dimension is strengthened by ecosystem approach, which is often mentioned as a key characteristic of MSP. Using this approach, the ecosystem of the planning area provides both the basis and limitations for planning. What practical implications this has on planning, without sacrificing its cross-sectorial nature, remains to be answered." (HELCOM, 2013b).

2.4 Conclusion of the chapter

The circumnavigation of marine spatial planning has just started, and it has reached the Baltic Sea, defining its route by the day. Marine spatial planning comes as a societal response to the need for more integrated management of sectoral interests and use of the sea, may it be for legal, economic or environmental reasons. This chapter has shown that in the Baltic Sea Region "the public" steering the developments actually navigate on many different policy levels simultaneously; the pan-EU level, the pan-Baltic level, the national level and the project level. It has also been shown that while ecosystem-based management often is a stated objective, it remains unclear what is its status in relation to other objectives. Hence it is unclear not only how it will be dealt with in concrete situations of decision-making, but also what the very destination of the process of planning will actually be. Giving the current and future trends of the Baltic Sea Region, with a poor environmental condition and an increasing competition for space at sea, combined with a diagnosis of a governance framework that is struggling to bring sectors and actors together, the chapter has argued that three principles of ecosystem-based management are especially important for the future of marine spatial planning: the conservation of ecosystem structure and functioning, keeping ecosystems within the limits of their functioning, but also, the potential gains with valuation of ecosystem services. The chapter has shown that the need for communicating and explaining the relationship between economy and environment is urgent , may it be in layers of information in maps, but also as communication, in the adaptive planning process. This brings us to the next chapter; taking a closer look at valuation of ecosystem services.

3 Valuation of marine ecosystem services

"We measure what we value and we value what we measure."
(unknown)

Two thirds of the planet's natural capital comes according to some estimates from the ecosystem services that humans benefit from the biomass of our oceans and seas (UNEP/Grid-Arendal, 2012). Indeed, it is not difficult for everyone to make a quick estimate that for example the food production from our seas must create huge value for us, but then it becomes more difficult. What other values sum up this enormous natural capital, how is it measured, and really, why should it be?

This chapter will start by supplying the basis for understanding the value of nature, focusing on the ecosystem services for marine ecosystems (Section 3.1.1). What goods and services are we talking about, and why? Thereafter we will do the accounting of the nature of value (Section 3.2). Values can be qualitative, quantitative and monetary and a large variety of valuation methods can be used. The chapter will thereafter turn to the Baltic Sea and go to the balance sheet, examining how valuation of ecosystem services is done today (Section 3.3), before concluding in Section 3.4. A multi-stakeholder perspective will be taken, giving the perspective of the regulator, the public, the businesses, the species and the scenarios. This overview will show that valuation indeed can be made in many different ways, differently put; one could say that the value of nature can come in many different currencies. In Section 3.5 a global outlook will be given.

3.1 The nature of value and the value of nature

The idea of expressing ecosystem functions in terms of goods and services, hence using a market metaphor to communicate nature as a fixed stock of capital that can sustain a limited flow of ecosystem services, started off not surprisingly in the decade of a booming market economy, the 1980s. Norgaard (2010) summarises it as an attempt by conservation biologists joining with environmental economists to build support for conservation. The hope was to awaken a public deeply embedded in a global economy and distant from natural processes. The aim was to make visible the value of ecosystems to policy-makers, and not only the values of the goods as such, such as the fish harvested from the sea, but also the supporting services, like nutrient recycling, without which goods would not be (SOU 2013:68). Put differently, a healthy fish cannot live in the sea if it does not have a well-working "factory", a sea in good environmental status. In other words, what the notion of goods and services wanted to communicate was very much how the natural processes provide with both goods and services that generate wellbeing for humans, which can, as soon will be described, be translated to a value, for example an economic value.

Today, three decades later, the idea of ecosystem services has received remarkable recognition, although it may be to a larger extent in science and policy-making, and there is still a long way to go to awaken the general public. An important step in gaining broad recognition was made in 2005 with the UN report Millennium Ecosystem Assessment (MA). The MA's vision was a world in which people and institutions appreciate natural systems as vital assets, recognise the central roles these assets play in supporting human wellbeing, and routinely incorporate their material and intangible values into decision-making (MA, 2005). But indeed, a vision is one thing, having an impact on decision-making another (Daily et al., 2009). This needs to be illustrated as in Figure 8 below.

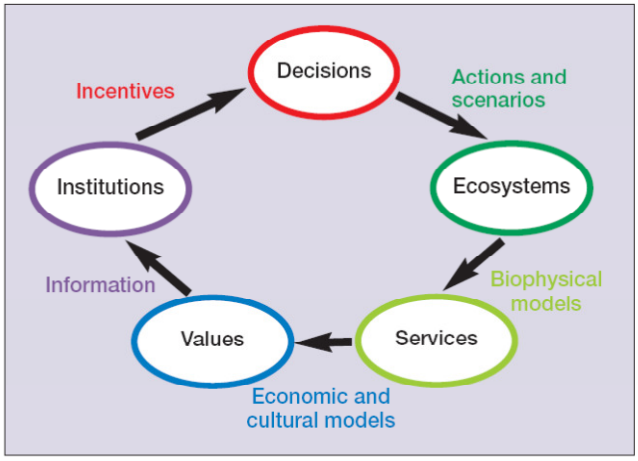


Figure 8 Integrating ecosystem services and their values into decision-making

Source: Daily et al. (2009)

To understand this circular connectivity is critical for any analysis of valuation of ecosystem services. Starting with the ecosystems, the biophysical models need to be identified, and thereafter the ecosystem services, the benefits for humans, need to be identified, mapped and assessed. When this has been done one can estimate and demonstrate the value of the services with appropriate methods, taking into account economic and cultural models. Having done so, the information can be captured by institutions and brought on board into decision-making, which is influencing the future of ecosystem management. The following sections will in principal follow the logic of this circular process, starting with the identification and assessment of ecosystems (Section 3.1.1), and then going into the issue of value for humans (Section 3.2). Later, in Section 3.3 and in Chapter 4 the impact on institutions and decisions will be given attention.

3.1.1 Ecosystem services

The identification of ecosystems and their services may at a first glance look easy, but will quickly turn into a rather complicated exercise. Let us start with the basics of the identification of ecosystem services put into different categories, and then unfold the complexity. In the MA ecosystem services were defined as "services provided by the natural environment that benefit people" (MA, 2005). As can be seen in Figure 8 above, it is not the intrinsic value itself that is in focus, but the aim is to describe the very flow of value from nature to human societies. While there is no single agreed upon method of categorising all ecosystem services, the framework presented by Millennium Ecosystem Assessment is widely accepted and seen as a useful starting point (Defra, 2007). However, since the MA, the classification of ecosystem services has been developed to be applicable to different contexts. For the marine environment context of the Baltic Sea, the following (See Figure 9 below) classification for the valuation of ecosystem services has been presented (Ahtainen et al., 2014). This approach reveals that ecosystem services are contributing both directly and indirectly to human wellbeing, providing four different types of services (regulating, provisioning, cultural and supporting) in two categories; intermediate and final services.

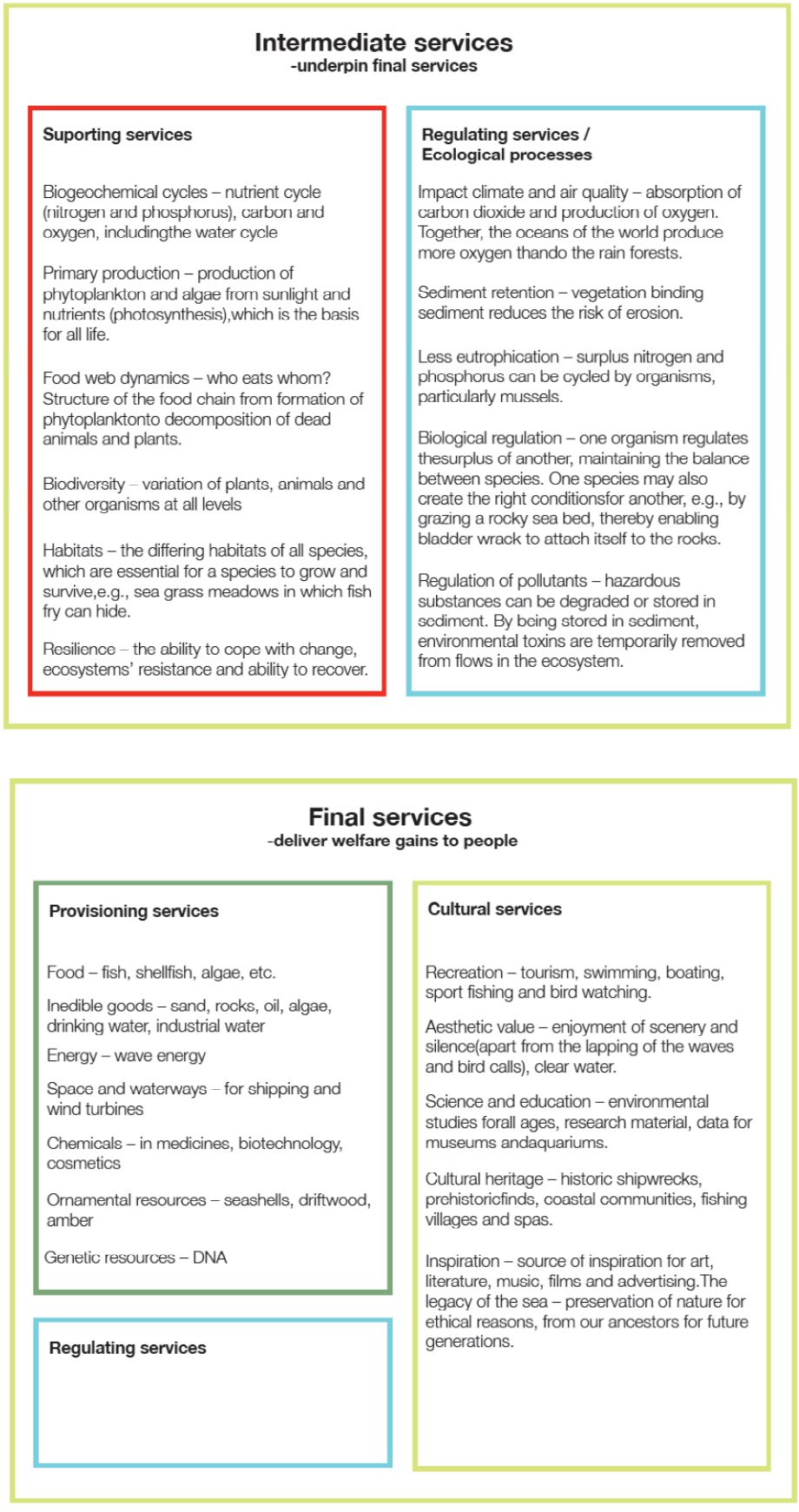


Figure 9 Classification of Ecosystem Services (adapted from Ahtainen et al., 2014 and EPA, 2009)

Importantly, to avoid so-called double counting, the distinction between intermediate and final services is crucial when we later come to valuation of ecosystem services. An example could be nutrient cycling and recreation. Nutrient cycling, providing us with clear water, is an intermediate service, but it is also part of a final service, namely recreation. Therefore, to avoid double counting we can only count for final services, in this case the recreational benefits, and not the intermediate values (Ahtainen et al., 2014).

Today, both science and policy have embarked on the huge task of identification of ecosystems and their services, and this task is very much about an exercise of assessment and mapping. An Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES) has been launched to guide the flow of scientific information related to biodiversity and ecosystem services to governments and practitioners. Many international organisations, governmental and non-governmental, are now developing ecosystem service assessment tools, designed for governments as well as the private sector (SOU 2013:68).

To support and emphasise ecosystem service recognition, a Strategic Plan has been adopted within the Convention on Biological Diversity with a set of targets, called the Aichi biodiversity targets. In short, target 2 says that by 2020, at the latest, biodiversity values should have been integrated into national and local development, as well as, into planning processes and being incorporated into, as appropriate, national accounting and reporting systems. The EU has, in its EU Biodiversity Strategy to 2020, taken on the task of improving the knowledge of ecosystems and their services. The EU countries have started the mapping and assessment of the state of ecosystems and their services in their national territories and will also assess the economic value of such services and promote the integration of these values into accounting and reporting systems at EU and national level by 2020 (EC, 2011). This is important information. With the initiative MAES (Mapping and Assessment of Ecosystem Services) a huge exercise has been launched. Firstly, this mapping and assessment exercise is trying to create crosswalks between already performed mapping of marine habitat typologies relating to MSFD as well as the Habitat Directive, including sea maps, which secondly needs to be brought further into the broader context of ecosystem services classification. Together these will aim to move towards an EU ecosystem assessment at different spatial scales that ultimately will provide answers to the key policy questions. Having this assessment, the next step will be the task of valuation for ecosystem services looking for baseline and contrasting scenarios and their integration into environmental and economic accounting (EC, 2013b).

With the assessing and mapping of ecosystem services growing by the day, the challenges are many: filling data gaps, and achieving consistency in mapping approaches, to mention some. Some important questions need to be asked: Where do we stand today when it comes to identifying marine ecosystems and their services in the Baltic Sea Region? Guerry et al. (2012) bring to our attention that research on modelling, mapping and valuing ecosystem services as such has predominantly focused on terrestrial systems. Marine systems present new challenges: they are more dynamic and they are three dimensional (sea surface, water column, and sea floor). The classification of ecosystem services is a challenge concerning the Baltic Sea. The existing classification schemes for ecosystem services do not necessarily take into account the special characteristics of the Baltic Sea, and therefore it is important to adapt these to the conditions of the area (Ahtainen et al., 2014). Another important question to be asked is: Where will this identification and assessment exercise lead us? Will it ever be complete? And how will it be used in decision-making? Remembering Figure 8 above, the mapping and assessment should be done to be forwarded into decision-making. Primmer et al. (2012) argue that the ambition of measuring all or a very broad range of ecosystem

services is unrealistic. It also tends to lead us to traditional knowledge production segregated to specific habitats, ecosystems, geographical areas and sectors. Instead, if we want a more integrated model for ecosystem governance, we need to build on existing governance arrangements, but aim at communicating across ecosystem and sector boundaries.

Following this line of argumentation it could be asked: How can information from mapping and assessment be translated into the decision-making aspect of the marine spatial planning process? As underlined by Maes et al. (2012), mainstreaming ecosystem services into policy and decision-making is dependent on the availability of spatially explicit information on the state and trends of ecosystems and their services. For marine ecosystems additional research is needed to include the resilience of ecosystems to environmental change in spatially explicit assessments. As highlighted in Section 2.2.2, it has been said that the lack of a well-structured, systematic classification and assessment of marine ecosystem services has hindered the ecosystem service concept being applied in marine planning and management. To bridge this gap, Böhnke-Henrichs et al. (2013) not only propose a typology, but also select appropriate indicators for all relevant ecosystem services. The authors argue that a further prerequisite to marine ecosystem services being effectively utilised in ecosystem-based management and marine spatial planning decision-making is quantification and valuation of marine ecosystem services via a set of indicators that relates to human benefits, which is also important to facilitate economic valuation of ecosystem services. The authors highlight the ongoing work on the implementation of the MSFD, and that the development of an ecosystem services typology could facilitate the implementation of the Directive. The authors conclude that "identifying and testing suitable ecosystem indicators, as well as their consistent application in valuation studies, requires attention in future marine ecosystem service research" (see further on indicators in Sections 3.2 and 3.3). Linking the implementation of the MSFD with what is going on regarding ecosystem services and marine spatial planning is something that we will come back to in Sections 3.3.1 and 4.

To conclude, policy and academia have now taken on the huge task of identification, assessment and mapping of ecosystem services. Moreover, we can see that there is a growing interest to bring this mapping and assessment one step further, into quantification and valuation of ecosystem services. This brings us into the next section, on valuation of nature – benefits for humans.

3.2 Valuation of nature – benefits for humans

"Understanding value is critical to inform trade-offs in decision-making on land conversion and ecosystem management. When the true value of ecosystem services are included, traditional trade-offs may be revealed as unacceptable. The cost of acting to sustain biodiversity and ecosystem services can be significantly lower than the cost of inaction." These are the words of the study of *The Economics of Ecosystem and Biodiversity (TEEB) for National and International Policy Makers* (TEEB, 2010). A number of TEEB reports has followed up on the MA work with the clear aim of solidifying and making more applicable the valuation of ecosystem services in decision-making. Before we look into how it is done, let us have a look at the nature of value.

3.2.1 Why value and what is value and valuation?

An important starting point in the argument for valuation is to highlight the very root causes of the systematic neglect of ecosystems and biodiversity in economic and development policy: their characterisation as a public and often global good. This means that since benefits take many forms and are widespread, it is difficult to 'capture' value and ensure that

beneficiaries pay for them. Moreover, the existing markets and market prices only capture some ecosystem services (e.g. ecotourism, water supply) that can easily be translated into monetary terms. Instead, in most cases individuals and businesses can commonly use what biodiversity provides without having to pay for it, also those providing the service often do not get due recompense; and finally, costs of conservation and restoration are paid immediately, often at local level, yet many benefits occur in the future (TEEB, 2010). By this argumentation one could say that TEEB is a follow-up on the long academic tradition of analysing the challenges that follow the so called "tragedy of the commons", namely that the users of a commons are caught in an inevitable process that leads to the destruction of the very resource on which they depend (see also Section 4.3). One could also argue that embarking on the case of valuation builds on the recognition that all decisions made by society about ecosystems actually imply valuations, explicit or not. To quote Constanza et al. (1997) on the issue of valuations of ecosystems: "We can decide to make them explicit or not; we can do them with an explicit acknowledgement of the huge uncertainties involved or not; but as long as we are forced to make choices, we are going through the process of valuation". Constanza tries to meet the criticism that valuation is either impossible or unwise, and that one cannot place a value on "intangibles" such as human life, environmental aesthetics, or long-term ecological benefits. Others who criticise the focus on ecosystem services argue that the growing interest to use the metaphor of nature as a stock that provides a flow of services is simply insufficient to the huge environmental task ahead of us, that this will blind us, we cannot analyse global problems within a partial equilibrium economic framework (Norgaard, 2010; see also Section 3.2.3 on trade-offs between ecosystem services). The very focus on translating nature into figures can also be criticised, arguing that this increasing focus on figures only will give the power to the ones producing figures, that it moves the discussions from the basic issue of distribution of rights, and even that figures are not the solution, but themselves are the real problem. Or as Sörlin (2013) puts it; "For the one that lack money, the price on the environment is useless."

Indeed, the aim of valuation of ecosystems can be discussed at length, as well as what it is to valuate. As wisely pointed out in SOU 2013:68, human societies are continuously discussing values. To find democratic solutions on societal conflicts, it is important to understand that values can have objective (more scientifically based) or subjective (emotional, cultural) foundations. Both are important and can interact. Hence, "to value" can have two meanings, 1) to purely assess a value or 2) to see something as valuable. In the same line, the notion of valuation can be understood either as the action of giving a value (positively or negatively) to something or the result of making such an act. Legal and economic instruments in a society are built on a number of valuations that have developed in a historical context. If the instruments are seen as legitimate, they normally strengthen the values that they are aimed at. The Governmental Inquiry SOU 2013:68 concludes that we lack an operative understanding on how human values develop through learning about socio-economic systems, and how this learning can be taken on board in decision-making processes. TEEB (2010) formulates this with other words: "Valuation can act as a powerful form of feedback, a tool for self-reflection, which helps us rethink our relation to the natural environment and alerts us to the consequences of our choices and behaviour on distant places and people." Following this argumentation, it could be said that by assessing the value of something, in fact the value can also change. In short, we tend to value what we measure and we measure what we value. This needs to be kept in mind for the later analysis (see below and in Section 4.1).

3.2.2 The three steps: recognising, demonstrating and capturing value

The TEEB team has developed a three step approach for valuation of ecosystem services: recognising, demonstrating and capturing value, which can be understood together with the circular framework proposed by Daily et al. (2009) in Figure 8 above. The first step, recognising ecosystem services, includes mapping and assessment of ecosystem services. This can in some cases be sufficient to ensure conservation and sustainable use, and impact decision-making. As highlighted by TEEB (2010) this can include an analysis of how these ecosystem services are impacted by a policy-decision. The second step is to estimate and demonstrate the value of ecosystem services, using a variety of valuation methods (see Section 3.2.3). It is argued that demonstrating the value, e.g. the monetary value, can be important not only to calculate the costs and benefits of a management option, but also for achieving more efficient use of natural resources. The third step is to capture the value. This is the final tier of the economic approach, which involves the introduction of mechanisms that incorporate the values of ecosystems into decision-making, for example through incentives or price signals. Policy decisions can include payments for ecosystem services, and introduce new markets for sustainably produced goods and ecosystem services. Remembering these three steps is relevant when later analysing the marine spatial planning process, and the options of addressing valuation of ecosystem services, see Section 4.1. Now we will focus more on the demonstration of values, and on the different levels of valuation, including different methods used in valuation of ecosystem services.

3.2.3 The three levels: qualitative, quantitative and monetary valuation

The TEEB guide to policy-makers (2009) suggests a pragmatic approach to valuation of ecosystem services in decision-making: "always identify impacts qualitatively, then quantify what you can, then monetise (where possible)". Imagine a pyramid where qualitative valuation is the base, with quantitative and monetary valuation as upper levels. In this logic, all three types of analysis are useful, but they provide different levels of information to a decision-maker. As one goes up the pyramid, there are fewer ecosystem services that can be assessed without increasing time and resources to do the exercise. It is therefore suggested that the type of analysis largely depends on the type of benefit being measured, the time and resources available and the significance of the decision. These three levels of valuation could be seen as three different strategies to valuation and how it could be integrated in decision-making (TEEB, 2009). But importantly, when a decision is to be made, a combination of three approaches to valuation could also be used. In cases where there is great uncertainty about how the value can be estimated, it could even be motivated to stay with a qualitative and quantitative analysis (SOU 2013:68). In the *Introductory guide to valuing ecosystem services* the pathway is to establish an environmental baseline, identify and provide qualitative assessment of the potential impacts of policy options, quantify the impacts of policy options on specific ecosystem services, assess the effects on human welfare, and then into the economic value of changes in ecosystem services (Defra, 2007).

Bringing valuation into decision-making one thing is especially important to note: it is the *change* in human wellbeing resulting from a management option that needs to be valuated (Defra 2007; TEEB, 2010). Let us give an example: Qualitatively describing the changes in recreational use of a certain nature area after implementing a policy to improve its state. Quantitative valuation estimates the changes in ecosystem benefits in numbers, e.g., determining the increase of the yearly number of visitors to the area. Monetary valuation entails expressing the values in monetary terms, e.g., the willingness to pay per visit (Ahtainen et al., 2014). Valuing the change in human, or societal, wellbeing, follows the theory of

economics, focussing on marginal values. The market price is only a "signal", but the value is, for example, using the monetary valuation, the total marginal willingness to pay (SOU 2013:68).

For these three levels of values different valuation methods could be used to inform decision-making. Before going into valuation methods, let us address the challenging question, when could monetary valuation be useful? This key question needs to be asked before embarking on any economic valuation. As argued by SOU 2013:68 monetary valuation is preferably done in traditional cost-benefit calculations where ecosystem services need to be expressed in the same units (money). Monetary valuation is less reliable or even directly improper in situations that include a variety of ecosystem services or different ethical situations. This is especially valid for supporting or regulating ecosystem services that are necessary for the long-term capacity of ecosystems, e.g. water regulation. In this case, there are too many uncertainties to be able to use a monetary value.

The following valuation methods are relevant as a background to Section 3.2 and Chapter 4.

Indicators for qualitative and quantitative valuation of ecosystem services

Compared to traditional biodiversity indicators on status and trends in species diversity and richness (see Section 2.1.3), long recognised as important, ecosystem services indicators are a relatively new tool. Ecosystem service indicators aim at describing the flow of benefits provided by biodiversity to humans and their wellbeing. For example, when the ecosystem service is identified to be a regulating service such as waste treatment and water purification (capture of nutrients and prevention of eutrophication) the indicator could be removal of nutrients (tonnes or percentage) or water quality (nutrients, phosphorus). Indicators can be used to better measurement and communication of the impacts that change an ecosystem's capacity to provide services supporting human well-being and development. TEEB states that it is essential to continue efforts to develop reliable indicators of the provision of the main types of eco-system services, including regulating, supporting and cultural services (TEEB, 2010). As mentioned earlier, Böhnke-Henrichs et al. (2013) try to address the development of indicators, also to link valuation to the ongoing work on the implementation of the MSFD, but also identify the need for further research in this regard. Later, in Section 3.3, we will come back to how MSFD is approaching a way of linking Directive indicators of the state of the environment with indicators for ecosystem services and we will bring it further into the analysis in Chapter 4.

Multi-criteria analysis as a tool for qualitative, quantitative and monetary valuation

The multi-criteria analysis has gained recognition in the last decades, and aims at valuating different consequences, using qualitative, quantitative and monetary methods. The multi-criteria analysis tries to be more comprehensive, building on the experiences gained from the more traditional cost-benefit analysis (CBA) or other forms of socio-economic analysis, as well as, the legally mandatory environmental impact assessment (EIA). It defines the problem, looks at different options and criteria, describes the alternatives through a process of valuation, highlights the interests of different stakeholders and compares different alternatives to find a compromise (SOU 2013:68). It is here important to note that the more traditional forms of cost-benefit analysis, as well as, EIA and Strategic Environmental Assessments (SEA) (see Section 4.2), traditionally do not link to the concept of ecosystem services. In SOU 2013:68 the multi-criteria analysis is presented as having potential in strengthening ecosystem service valuation. The Swedish Agency for Marine and Water Management has taken one step further and presented a report were multi-criteria analysis

includes an ecosystem service analysis and is tested for a marine spatial planning process, which we will have a look at in Section 3.3.

Monetary valuation: a variety of methods

The monetary, also called economic, valuation, is the core of the TEEB business since it focuses on the monetary consequences of the loss of biodiversity (TEEB, 2010b). This section will highlight the basics of economic valuation and some methods used. The information is selected so as to provide the necessary background information to Section 3.2 on valuation of ecosystem services in the Baltic Sea Region, and the further analysis in Chapter 4. Let us start with the two issues that TEEB concentrates on: (1) aggregation of value, also called Total Economic Value (TEV) and different valuation methods, and (2) valuation in economic trade-off issues between ecosystem services.

(1) Aggregation of Monetary Value and Valuation Methods

Aggregating values involves bringing together all the information on the monetary values of ecosystem services into a single matrix to attain an aggregated monetary value of all delivered ecosystem services (TEEB, 2010b). The TEV framework can be a useful tool for exploring what types of values for each ecosystem service we are trying to elicit. This helps in determining the valuation methods required to capture these values (Defra, 2007). In Figure 10 below the TEV framework is presented, showing a variety of values. As indicated in the figure different ecosystem services can be shown by different values. In the text following examples of different valuation methods are mentioned, relevant for later analysis in this thesis.[4] .

[4] More information on different valuation methods can be found in TEEB, 2010b

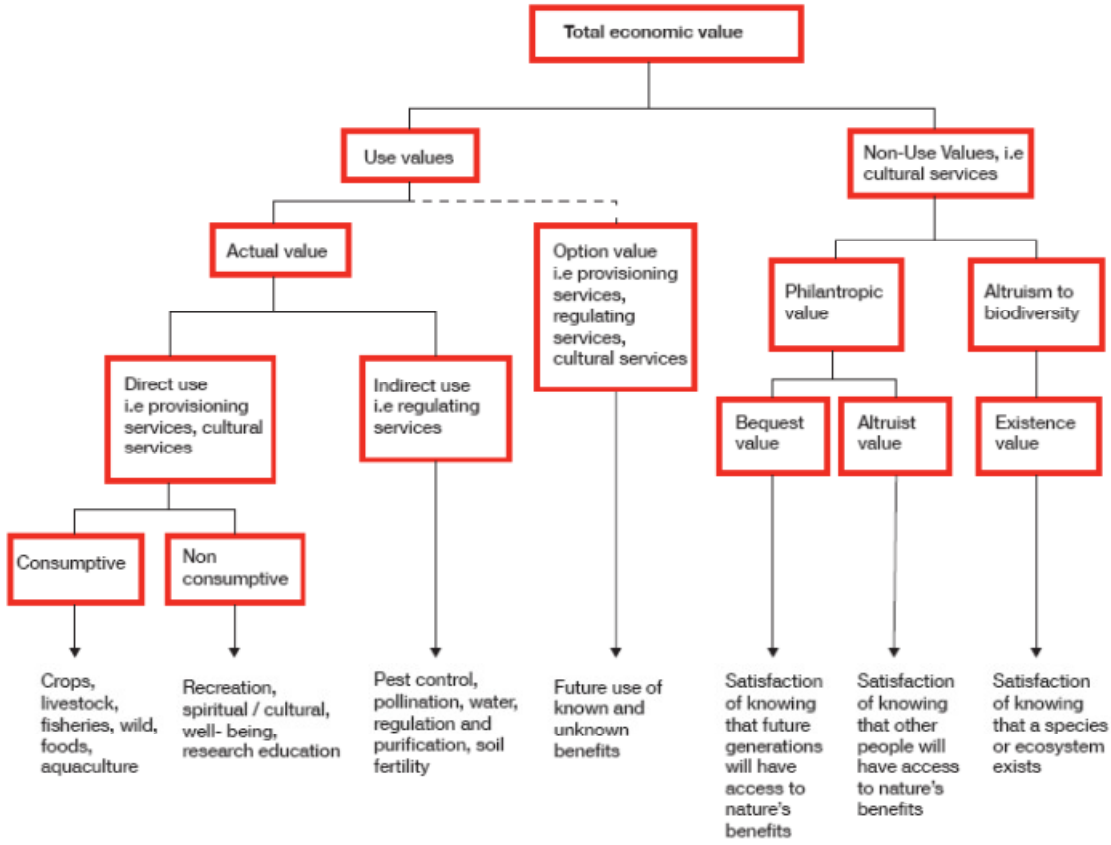


Figure 10 Total Economic Value Framework and Ecosystem Services

Source: Adapted from TEEB (2010b)

Let us start with "use values" which include direct and indirect use of ecosystems and options for future use. Firstly, the direct use value arises from the direct use of an ecosystem good or service and can include consumptive use (e.g. timber production) and non-consumptive use (e.g. wildlife viewing). To measure, a market price method can be used to see what the goods are worth on the market. Another method used is the Replacement Cost Method (RPC), where the cost for replacing the ecosystem services with another management option is tested. One example could be replacing the biological/chemical water purification in the sea with a waste water treatment plant. Secondly, we also have indirect use value which refers to benefits derived not from direct consumption but from effects on other goods and services which people value. A method frequently used in this regard is the so called Contingent Valuation Method (CVM), the willingness-to-pay (WTP) study, where the respondent has to put a price tag on, for example, an improvement in the marine environment. The third value presented is the option value, the value of having the option of using (both directly and indirectly) the ecosystem good or service in the future. Option value is also called the insurance value. Today's valuation of ecosystem services often focuses on current preferences, with preferences from people living now, and the knowledge that we have now. However, looking into the future, the insurance value could be very high, and difficult to replace and to make a valuation many assumptions are needed. An example of such a value could be an area at sea that might be of no value to anyone, but then it is

discovered that the area is absolutely necessary for cod to sprawl As suggested in SOU 2013:68 this value could be given attention through a long-term learning process where different stakeholders participate to gradually understand the capacity of ecosystem resilience and ability to generate ecosystem services. "Non-use values" exist because people derive pleasure from simply knowing that nature and its elements (e.g. a rare species) exist, or because they wish to bequest it to future generations (TEEB, 2010b). A contingent valuation method such as willingness-to-pay could be used as a method. These values could also be given attention as part of a more long-term learning process.

The methods described aim at estimating values for one ecosystem good or service. Let us now turn to the challenge of trade-off between different ecosystem services. Decisions often provide a situation where different ecosystem services will be affected differently, or even in conflicting ways.

2) Trade-offs between ecosystem services

Economic theory has a long history of evaluating trade-offs in returns from different assets to identify optimal investment strategies. Applying this on ecosystem services, a trade-off occurs when the extraction of one ecosystem service has a negative impact on the provision of other services. Indeed, in a concrete situation of decision-making, while some ecosystem services are strengthened, some can be eroded. For example, through irrigation the producing services can increase, the yield will likely increase, but at the same time an increasing yield can inflict on regulating and cultural services since it can impact the overall soil quality and crop diversity. Altogether this can mean that the long-term capacity of the ecosystem will be endangered. Current research is trying to make visible which ecosystem services are generated, how they are connected, or "bundled" as it is called, and which conflicts of interest and synergies this could mean for the overall production of ecosystem services (SOU 2013:68).

Put into a situation of valuation, a trade-off analysis can be made using different valuation methods; multi-criteria analysis, cost benefit-analysis and cost-effectiveness analysis (TEEB, 2010b). Let us turn to two illustrative examples of trade-off analysis, one in theory and one in practice, building on the tradition of economic theory, but combining this with marine ecosystem management in marine spatial planning. In the article *Evaluating trade-offs among ecosystem services to inform marine spatial planning*, Lester et al. (2013) argue that while there has been progress applying trade-off analysis of ecosystem services in land use planning, there is a lack of parallel frameworks in the marine realm. The study therefore proposes a framework to "reveal inferior management options, demonstrate the benefits of comprehensive planning for multiple, interacting services over managing single services, and identify "compatible" services that provide win-win management options." It may sound simple, but a delicate exercise is proposed.

Two examples are given: The first case addresses fishery yield and biomass preservation making a graph with two axes: system-wide biomass conservation (i.e. retaining the fish in the sea) on a horizontal axis, and the system-wide profit (i.e. harvesting fish) on the vertical axis. After plotting all (or a large subset of) possible management options, one can forecast the "efficiency frontier", comprised of Pareto-optimal options,[5] whereby one service cannot

[5] Pareto efficiency or Pareto optimality, is a state of allocation of resources in which it is impossible to make any one individual better off without making at least one individual worse off.

be further increased without a cost in terms of the other service(s). The authors argue that "the results, if hold more generally, have the potential to help minimise disputes between conservation and fisheries interests and highlight marine reserves as a key component of marine spatial plans".

The second example is about wave energy, fishery yield and real estate value, the first ecosystem service (waves) having an impact on the others if taken as wave energy. The question is: Where is the optimal spatial placement of wave energy facilities to minimise conflicts among multiple ocean uses, reducing impact on crab fishing and having an impact on real estate value (coastal viewshed)? The analysis is a cost-benefit analysis with all three services modelled in the same unit (dollar/km/year), and the value is summed to determine the optimal placement of the facility, where the total value is maximised. The outcome is: 4.95 km offshore. The authors acknowledge that implementing the monetary ecosystem trade-off framework in practice is not without challenges, such as to identify and quantify all the services and issues that should guide decision-making. But it is seen as a starting point, since "Managers and scientists need simple and transparent means for determining the trade-offs, or lack thereof, among key services and communicating these interactions to policy makers and stakeholders." (Lester et al., 2013).

In fact this approach has also been tested in reality. In the article *Ecosystem service trade-off analysis* we are introduced to a trade-off analysis between different ecosystem services performed in Massachusetts. The study aims at identifying and quantifying the value from choosing optimal wind farm designs that minimise the loss for fishery and the whale-watching sector (White et al., 2012). The task is to seek wind-energy areas with high wind but low fisheries and whale-watching values. Importantly, it is argued that using this method in marine spatial planning could prevent more than USD 1 million in losses to the incumbent fishery and whale-watching sectors and could generate more than USD 10 billion in extra value to the energy sector. The authors are trying to build a case for those not believing in marine spatial planning as a useful management tool. How is value presented in this case? The authors borrow from economics, and visualise trade-offs by plotting sector values against each other in relation to potential management strategies. In this valuation exercise, fishing sector values are plotted by calculating annual payoff to fisheries based on revenues from yields and market price, and costs in relation to fishing effort and fish stock density. Like the case mentioned above, what the authors are trying to find and map spatially is the efficiency frontier that, although familiar to economists, has seldom been used for marine management. With this method the authors argue that "Making trade-offs explicit improves transparency in decision-making, helps avoid unnecessary conflicts attributable to perceived but weak trade-offs, and focuses debate on finding the most efficient solutions to mitigate real trade-offs and maximise sector values. Our analysis demonstrates the utility, feasibility, and value of MSP and provides timely support for the management transitions needed for society to address the challenges of an increasingly crowded ocean environment."

To conclude this section we could say that valuation of ecosystem services is a challenging task, but a variety of approaches and methods are evolving to inform decision-making. As has been shown there is clearly a spatial dimension of both assessment and valuation of ecosystem services evolving, that could be providing with layers of information to marine spatial planning (see Section 2.1.3). Before turning to the Baltic Sea Region, to see what is measured and valued in that region, we will put the context of valuation into the context of ecosystem-based management. As discussed in Section 2.2, ecosystem-based management has its origin in a number of principles, ecosystem services being at the centre of its

application, but also pushing strongly for the principle of public participation in decision-making.

3.2.4 Ecosystem service assessments – bringing valuation of ecosystem services into ecosystem-based management

To be useful for decision-making the TEEB framework the latest years has developed manuals for concrete decision-making processes on national and local level. In what is called ecosystem service assessments a step-wise approach has been outlined on how to implement ecosystem-based management, including valuation as a component (SOU 2013:68). The steps can be summarised as follows: (1) Define important problems that need to be solved, together with stakeholders. (2) Identify for these problems the most relevant ecosystem services and the users of these. (3) Define the need for information and chose suitable methods for the analysis (mapping and assessment). (4) Assess the situation/threats and the value of ecosystem services (valuation: monetary or non-monetary) (5) Identify different policy alternatives, assess their impact, including issues of distribution (6) Evaluate, adjust and report.

To note, the step-wise approach is reminiscent of the circular model presented in Figure 8 above, and is following up on the TEEB three-step approach to valuation of ecosystem services of identification, demonstration and capturing of values presented in Section 3.2.3. In the framework of ecosystem service assessment the focus is on making stakeholders participate in the process, especially by having a say on which ecosystems that need to be mapped, assessed and then valued. This approach is an element that we will come back to in Chapter 4. Now we will turn to the Baltic Sea, to understand more of what is measured and what is valued in this region.

3.3 The Baltic Sea – ecosystem services and valuation approaches

The aim of this section is to highlight some studies with valuation of ecosystem services that already have been made in the Baltic Sea Region. As shown in the previous section valuation can be done in a variety of ways, with different aims, which become very clear also in this chapter. Acknowledging a stakeholder approach as the core element of a marine spatial planning process, this chapter will highlight different valuation methods from different interests, e.g. from a regulator perspective, a public perspective, a local level perspective, a business perspective, and finally, a species and habitat perspective. The valuation studies chosen are meant to be illustrative, but importantly these valuations have not been done as part of an integrated marine spatial planning process. They are stand-alone studies made with different aims and at different scales.[6] Until today, as far as could be found, valuation of ecosystem services has not yet been tested in a marine spatial planning process in the Baltic Sea Region. However, on a global scale there are some cases of valuation of ecosystem services in marine spatial planning which will be paid some brief attention to point to a growing interest for this issue globally (see 3.3.5). In all, Section 3.3 serves as a "smörgåsbord" to show various examples of valuation that is actually already taking place, and as a preparation for Chapter 4, where the ingredients of marine spatial planning and valuation will be brought together.

[6] For a list of valuation studies of ecosystem services in the Baltic Sea area, see Appendix 2 in Ahtiainen et al. (2014).

3.3.1 The Regulator

In Section 2.2 it was shown that the governance system of the Baltic Sea Region is largely influenced by the EU, and one of the main EU legal instruments influencing the governance of the marine environment is the Marine Strategy Framework Directive (MSFD). Today, the Directive is in a critical stage of implementation, and taking a closer look it becomes clear that the Directive opens up the possibility of connecting future policy decisions to valuation studies of ecosystem services.

But let us start with the basics of the MSFD. The aim of the Directive is to achieve Good Environmental Status (GES) in marine waters by 2020 (Marine Strategy Framework Directive). What is good environmental status? To know the current state of environment and what good environmental status should be, the backbone of the Directive is a set of qualitative descriptors on the different features of the state of environment, for example "human induced eutrophication is minimised" and "biological diversity is maintained". For each descriptor the member states have to develop environmental targets and associated indicators for the marine waters. These targets and indicators aim at guiding progress towards achieving good environmental status, explaining the descriptors more in detail, and guiding programmes of measures to be developed. For the descriptor "human induced eutrophication is minimised", the environmental targets in Sweden have been decided to be "concentrations of nutrients do not result in negative direct or indirect effects on biological diversity and ecosystems" and the indicator related is the "level of concentration of phosphorus and nitrogen in marine waters" (HVMFS, 2012).

Importantly, as noted by Böhnke-Henrichs et al. (2013) the MSFD demands a dual decision-making approach based both on ecological analysis, through the descriptors, environmental targets and indicators, but also an economic and social analysis (ESA). In doing their ESA the member states have been given fairly free hands to choose methods, both in making an economic and social analysis of the use of marine waters, and to make an analysis of the cost of degradation. Among methods, an ecosystem service approach and marine accounts approach have been suggested. In a study of four Baltic countries, Sweden, Estonia, Latvia and Finland it was noted that while Sweden and Latvia chose an ecosystem service approach, linking the descriptors to ecosystem services provided, Estonia and Finland picked the marine accounts approach, which focus on market-based economic data, gathering data from different sectors and activities, such as shipping and fishing. The authors concluded that the development of an ecosystem services approach to ESA would support the MSFD objective of developing an ecosystem-based approach to governance of marine waters. Also, using such an approach, there is a need to harmonise the classification of ecosystem goods and services (Tuhkanen et al., 2014).

The MSFD is applying a DPSIR framework linking Drivers-Pressures-State-Impacts-and-Response, a framework that establishes a link between an initial assessment, including the ecological analysis and an economic and social analysis with a programme of measures and a monitoring programme. Taking a closer look at the case of Sweden, actually Sweden has made an effort not only to link the GES descriptors and indicators to ecosystem services, but also to show which ecosystem services are relevant to the main human activities such as commercial fisheries and tourism. Thereafter, Sweden has taken one step further, and brought forward a number of studies on economic valuation of ecosystem services, trying to get an answer to the question: what do we know about the cost of degradation? With a sample of valuation studies, for example on the effects from eutrophication on provisioning services such as food, is highlighted (SWaM, 2012). Notably, there are not valuation studies to be used for all ecosystem services, why this is only a first step to link descriptors and

indicators with ecosystem services and their economic values. The DPSIR framework can also be linked to qualitative and quantitative valuation; it has been suggested by TEEB (2010b) and addressed by research (Atkins et al., 2011). Ecosystem service indicators were given attention to in Section 3.2.3 as a valuation method.

What does this mean in short? Today, with the first implementation cycle of the MSFD, the regulator has made it possible to link information on the state of the environment (descriptors and indicators) with an ecosystem service approach, where also the benefits, and potential losses, to humans are given attention (see layers of information, Section 2.1.3). Although few countries seem to have embarked on the endeavour of translating descriptors and indicators into the framework of ecosystem services, examples now show that it can be done, and that valuation of ecosystem services can be included in this work.

Another valuation method tested in a case study by Swedish authorities worth mentioning is the development of multi-criteria analysis. This method, earlier mentioned in Section 3.2.3, is gaining recognition as a way to combine a cost-benefit analysis with a more traditional environmental impact assessment. In its report *Impact assessments in the development of marine spatial plans* (SWaM, 2013), a method to apply multi-criteria analysis in order to achieve a sustainability assessment as a part of the marine spatial planning process is tested in theory. Taking departure in the three dimensions of sustainability, the study proposes to valuate social, economic and ecological capital and to test them with alternative management options. An analysis of the capital is forwarded into a matrix where "weak" and "strong" sustainability is analysed. "Weak" sustainability is where the total sum of social, economic and ecological capital (per capita) is not decreasing over time, and "strong" sustainability is where no capital (per capita) is reduced over time. To achieve MSFD GES it is suggested that "strong" sustainability requires that the management option does not compromise with achieving GES. An EIA is suggested to be performed analysing the potential impact on MSFD GES, as well as the impact of policy decisions on ecosystem services. The interesting part with this study is that it tries to combine current regulatory instruments such as MSFD and EIA, taking an ecosystem service perspective, and using a multi-criteria analysis as a way of strengthening the participatory element of the marine spatial planning process. Nevertheless, the study does not take a closer look at how this valuation approach could be integrated in the different stages of the MSP process, and stays at concluding that there is a need to identify which monetary ecosystem valuation studies could be most relevant, but that further attention will be needed to address this issue to move from theory to practice.

3.3.2 The public – regional, national, local level

There are some important valuation studies made in the Baltic Sea Region taking the perspective of the public. Three examples are shown here, one made on a regional level, as well as a national level, and one example is from a local level. Eutrophication and biological diversity are in focus. As shown by Kettunen et al. (2012), preference-based valuation methods are currently the most commonly used to assess the economic value of ecosystem services. These two examples are stated preference methods based on carefully constructed surveys that ask people's willingness to pay for a well-defined change in an ecosystem service.

In 2013 the research network Baltic Stern presented the report *The Baltic Sea – Our Common Treasure, Economics of Saving the Sea* (SWaM, 2013). Through a comprehensive survey the report shows that the people in the nine countries bordering the Baltic Sea are willing to pay approximately EUR 3800 million for a less eutrophicated Baltic Sea, fulfilling the political targets set in the Baltic Sea Action Plan (see Section 2.2.2). The surveys also shows the countries in which people have the highest willingness to pay for this, ranking Sweden and

Finland at the top, and Latvia and Russia at the bottom. To push the decision-making process at the HELCOM ministerial meeting the same year, the results were presented with an estimation of the costs of reaching the targets set in the Baltic Sea Action Plan, which not surprisingly presented the conclusion that the benefits exceeds the costs by EUR 1000-1500 million annually.

Taking a closer look at the national level, a study on *Valuing the Estonian benefits and costs of improved environmental quality of the Baltic Sea: a discrete choice experiment approach* supports the need for fulfilling the policy targets set by the MSFD by 2020. The Willingness To Pay (WTP) study focused on how people valuate the importance of combating different environmental problems such as large scale oil and chemical pollution of marine waters and degradation of water quality for recreational use in two different scenarios. Overall the study shows that people are willing to pay EUR 55 annually for the moderate improvement scenario and 16% more, or EUR 64 annually, for the significant improvement scenario which fulfils the GES levels of environmental status according to MSFD. The authors conclude that the WTP represents welfare and the benefit to society, and that failure to meet the MSFD policy targets can be seen as a potential loss of benefits to society (GES-REG, 2013).

Going down to the local scale, namely the Gulf of Gdansk in Poland, an interesting contingent valuation survey has been made exploring the marginal WTP and motivations to prevent three levels of species loss (10%, 25% and 50%) as compared to current levels for fish and all marine species. Results, based on interviews, showed that motivations underlying WTP for marine species conservation encompassed primarily bequest values and direct use values. Residents were more willing to pay than visitors, and the amount of payment increased with the level of species loss. An important conclusion of the study was that the lack of awareness among respondents about the consequences of biodiversity changes and welfare trade-offs showed the need to communicate the link between biodiversity changes and human wellbeing and to embrace a fuller dialogue between policymakers and the public (Ressurreicao et al., 2012). The study has also presented ecological valuation maps, where the spatial distribution of the biological values of the area was outlined, put together with the socio-economic valuation with the above mentioned WTP studies (Zarzycki et al., 2013), a combination of different layers of information which could have important relevance for marine spatial planning (see Section 2.1.3).

Summarising, important studies with different spatial scales have been conducted in the Baltic Sea Region to show the value that the public assigns achieving the goal of good environmental status. These studies are conducted separately from a public marine spatial planning process, although such methodologies easily could be used to inform decision-making processes, something we will come back to in Chapter 4.

3.3.3 The Business

Showing the business case for safeguarding the environment and ecosystem services is another important angle taken in valuation of ecosystem services that is gaining recognition. The WWF report *Turning adversity into opportunity, a business plan for the Baltic Sea* (WWF, 2013), shows that for three industries – tourism, agriculture and fishing – the difference between potential scenarios for 2030 could amount to 550 000 jobs and EUR 32 billion in annual value added. A positive scenario is called "clear waters", a scenario where the marine environment's good status is upheld is one in which generates jobs and additional income. For example for the fishing sector, highly depending on ecosystem services delivered by the marine environment, this positive scenario where fish stocks can prosper is expected to add an economic potential of EUR 175 million per year and 16 000 jobs by 2030. One could say

that valuation in this case is made with direct market values (see Section 3.2.3). For the projections made, data from ICES, FAO and Eurostat is used. The results of the study can surely be debated, they are projections of potential future scenarios, but the main message is delivered; there is a strong business case for an investment in the Baltic Sea. The European Commission has picked up this message and makes a reference to the study in its report *A sustainable Blue Growth for the Baltic Sea Region* (EC, 2014). This is an important sign that the EU maritime policy are taking steps acknowledging the importance of ecosystem services for the development of many maritime sectors, and that their value should be accounted for (compare with Sections 2.3.2 and 2.3.3). Another recent study presents similar results, but higher estimates: a healthy Baltic Sea will save or create about 900 000 jobs by 2030 (Zennström et al., 2015).

3.3.4 The species and habitats

Estimating the economic value of important species and habitats can illustrate how valuation can include not only provisioning and cultural ecosystem services, but also the importance of regulating and supporting ecosystem services (see Section 3.2.3). Two studies are illustrative. The first study is on the keystone migratory species Baltic Salmon, a species which has an important role in reducing sedimentation, regulating food webs and maintaining the general ecological balance of ecosystems. Additionally, the salmon provide recreational opportunities associated with marine areas. The second study is on the role of bottom sediments, in regulating nitrogen and phosphorous compounds.

In the past salmon played a central role in the economy and culture of the Baltic region, however, the salmon population has collapsed because of logging, the construction of dams for hydropower production, pollution and overfishing. In the study *Ecosystem services provided by Baltic salmon – a regional perspective to the socio-economic benefits associated with a keystone migratory species* (Kulmala et al., 2012), it is suggested that today the cultural services of salmon for anglers is greater than the economic value of commercial salmon landings with a net present value ranging from EUR 6 million to EUR 25 million (i.e. EUR 0.9–3.6 million per year) in Denmark, Finland, Poland and Sweden for 2009–2015. The study aims at highlighting the non-market values embedded in recreational angling compared to the market values of commercial salmon landings. It also takes a qualitative approach in valuation, highlighting the values of the species for regulating and supporting ecosystem services, concluding that at present estimates for economic value exist only for a fraction of the total benefits that ecosystem services likely provide.

Why and how to estimate the value of the eutrophication mitigation service provided by bottom sediments? In an ongoing research project the task is to estimate the economic valuation of balancing the effects of eutrophication processes – regulating ecosystem services of the Gulf of Gdansk – using a combination of two non-market goods valuation methods, i.e. the Replacement Cost Method (RPC) and the Contingent Valuation Method (CVM). With an ever-increasing intensity of the marine resources exploitation, the study argues that a more in-depth description of all the benefits, which we obtain from ecosystems, are required, and that bottom sediments are habitats not to be forgotten. The research hypothesis assumes that the value of balancing the effects of eutrophication services of the bottom sediments, estimated on the basis of replacement cost of ecosystem services, is higher than the value expressed by social preferences. The study starts by identification and quantification of the services regulating the effects of eutrophication and to indicate a substitute for the provided ecosystem services. Then, the replacement cost calculation is made by estimating the cost of removing nutrients by a wastewater treatment plant. The next step is to compare this replacement cost with a Willingness To Pay (WTP) study (Kaminska, 2013). The

documentation is not yet finalised, but shows that research is eager to provide knowledge to support informed decisions, not forgetting the values of ecosystem services that exist, but traditionally have not been given enough attention.

3.3.5 A global outlook on valuation of ecosystem services in marine spatial planning

While a variety of valuation studies have been made in the Baltic Sea Region, but not yet integrated into a public marine spatial planning process, it could be relevant to highlight two cases outside the Baltic Region with the aim of connecting ecosystem service valuation with marine spatial planning.

The first example is the Integrated *Valuation of Ecosystem Services and Tradeoffs* (InVEST) software, a Natural Capital Project product. The programme has been used in coastal and marine spatial planning in several cases globally. It follows general planning steps, similar to the steps in Section 4.2 below, and for each step it identifies how InVEST can help; assessing how marine use may affect ecosystem services, assessing the current ecosystem status, to developing scenarios, to identifying ecosystem providers and beneficiaries to informing design of monitoring plans. The software aims at quantifying ecosystem services in biophysical terms (e.g. number of fish), but also estimates economic values in monetary currency, using a range of techniques such as avoided damage or treatment cost and market valuation. The project suggests that economic models and economic value estimates should be treated as first estimates only, for gaining support for marine spatial plans (InVEST, 2014). The second case goes deep into the mapping of cultural dimensions of marine ecosystem services and highlights the challenges of integrating these into the marine spatial planning process. The workshop states that not only does cultural service need to be defined by stakeholders since it cannot be found through a pre-set criteria, also the specific places which are culturally significant need to be determined, and a base line for cultural features or practices of importance is suggested as a basis for planning. Moreover, along the planning process, a risk assessment is needed to identify vulnerable ecosystem services based on existing and future pressures in the planning area. Also, the cultural ecosystem services needs to be mapped, for example mapping recreational use, such as scuba diving and fishing (ICES, 2013). In the study, the valuation approaches suggested seems to be more quantitative and qualitative than economic.

3.4 Conclusion of the chapter

Valuation of ecosystem services has become the darling of many policy-makers and academia. It is seen by many as the answer to combat the ecological analphabetism, the alienation between man and nature, which has grown evident in the industrial society. However, as shown by Section 3.1, valuation of ecosystem services is a delicate task. Firstly the ecosystem services need to be identified and assessed, and this is not always easy. Secondly, having done the mapping of services, valuation can come into the picture. The chapter presents the important developments in this regard within the work of TEEB, emphasising that valuation can be qualitative, quantitative and monetary, and that a variety of methods can be used. Looking at the multitude of valuation approaches, including what is progressing in the Baltic Sea Region (Section 3.2), it seems that two questions are crucial: what will the valuation of ecosystem services be used for? How can it be brought into decision-making? As shown in the chapter, valuation is not yet established in marine spatial planning processes, although many examples show that it is not far from happening. In Chapter 4 we will explore further how it could be done.

4 Valuation of ecosystem services in ecosystem-based marine spatial planning

This chapter will discuss the research questions as formulated in Chapter 1. Firstly, the chapter analyses why valuation of ecosystem services could be an integral part of marine spatial planning in the Baltic Sea Region (Section 4.1). Based on recent and current policy developments it will be argued – and illustrated – that communication and evaluation are key motives and that valuation of ecosystem services and ecosystem-based marine spatial planning could be seen as mutually supportive. It will also be argued – and illustrated – that it should happen now. Thereafter, I will outline when valuation could be given attention in the marine spatial planning process, a process of several stages (Section 4.2). The analysis will go through the stages and highlight that valuation could be brought into the process at a number of occasions and in a number of ways, using a pragmatic approach. The analysis will also discuss the appropriate valuation methods that could be considered at the different stages. Finally, I will address, in more general terms, the question of how: How will the Baltic governance regime come closer to bringing on board valuation in the marine spatial planning processes? (Section 4.3) In this section I will put the analysis into the context of the social-ecological system framework, which highlights the need for cross-scale interaction of natural resource systems and governance systems, as well as the importance and challenges of participation in decision-making processes. Acknowledging the importance of stakeholders as a crucial part of the marine spatial planning process, four interviews have been carried out to identify different stakeholder perspectives and conduct a reality test on how valuation of ecosystem services could be integrated into marine spatial planning. In the final section, Section 4.4, the chapter will be concluded, bringing the pieces together for the final conclusions in Chapter 5.

4.1 Why?

Mutual need and good timing – this is the short answer to the short question of why. Let me explain this further, reflecting on what has been presented in the previous chapters, and using three illustrations.

4.1.1 Setting sails – goals and objectives

As a starting point we need to remember the overall rationale for marine spatial planning as highlighted in Section 2.1.1: leave piecemeal governance behind and navigate towards better governance where sectors and stakeholder interests are brought together on a journey towards better marine management. In this thesis it has been shown that it is the "public" authority who is the responsible captain on the ship of marine spatial planning, tasked not only to get everyone on board, but to set the coordinates – the objectives – for the journey and communicate the destination – the goal. Most Baltic Sea countries are now starting to set sail for national marine spatial planning, and should be having a look at the new Directive Establishing a Framework for Maritime Spatial Planning as an instruction, but also seeking guidance from the HELCOM/Vasab expert group, while listening to the capital harbour – the national legislator – on how to programme the journey. As shown in this thesis, it could be argued that the Baltic Sea Region has chosen to embark on a so called ecosystem-based marine spatial planning journey. The concept of ecosystem-based planning is now, but not without controversy, being established as a provision in international agreements and guiding documents, as well as in EU law, ready to be transposed into national legislation. But, what does this mean for the journey towards marine spatial planning to be made?

Analysing current policy developments it can be argued that the Baltic Sea Region has translated ecosystem-based management as contributing to the achievement of good environmental status according to the Marine Strategy Framework Directive (MSFD) and Baltic Sea Action Plan (BSAP). Hence it seems that ecosystem-based management has acceptance as a management tool to achieve a goal, a destination of the process. However, if it is recognised that the achievement of good environmental status is setting the destination and influencing the coordinates for marine management, how will this influence the decision-making processes of the region, and steer the decisions taken within the marine spatial planning processes?

As has been highlighted, a marine spatial planning process will benefit from a clear hierarchy of goals, objectives and indicators, as well as a clear message on the desired outcome. Acknowledging that good environmental status sets a goal for the horizon, the countries clearly need to address how they will deal with different sector objectives. A point of departure for addressing the setting of coordinates for the journey is the challenging question of how to deal with the three dimensions of sustainable development – environmental, social, and economic – which have for two decades marked our understanding of what development should be. As has been analysed in this thesis, management has for a long period tried to balance between these three dimensions, often each having separate advocates arguing their cause. However, with an ecosystem-based management, one could argue, the paradigm is slowly changing, and instead of an act of balance, the environmental objective is now gradually recognised as the very fundament to social and economic development. From an ecosystem-based management perspective the overarching objective is then to take decisions allowing for ecosystems to deliver goods and services that humans want and need. This is what the HELCOM/Vasab guidelines indicate, and what is reflected in the Directive Establishing a Framework for Maritime Spatial Planning, as well as derived from Malawi Principles 5 and 6. To put it differently: the capacity of ecosystems to deliver to society will need to become the baseline for social and economic activities. Interestingly, it is not only the traditional environmental sector that is advocating this shift in the concept of the development paradigm. As has been shown, this is gaining support also in the more business-oriented policy in the Baltic Sea Region: the maritime policy on blue growth has come to a stage where a healthy environment actually is seen as a prerequisite for the development of the maritime economy and job creation. Also at the global policy arena, a healthy marine environment is increasingly seen as necessary for food security and economic development, with several international summits arranged on this topic.[7]

This development could be illustrated as in Figure 11 below. The goal of good environmental status is set, and the planning has to cruise between many different objectives. Sometimes objectives are not conflicting, but sometimes they will be. If so, the ecological objective of sustaining ecosystem goods and services and keeping activities within ecosystem boundaries needs to be thoroughly analysed, and also the prevailing social and economic objectives in a decision-making situation. For instance, a protected area could be a specific case where conflicting objectives meet, conservation vs. exploitation, which would need to trigger an analysis of how decisions will impact ecosystem services and the achievement of good environmental status.

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[7] For example The Economist/National Geographic World Ocean Summit, 24-26 February 2014, The Word Bank Global Oceans Action Summit for Food Security and Blue Growth, 23-24 April 2014 and Our Ocean Conference, U.S Department of State, 16-17 June 2014.

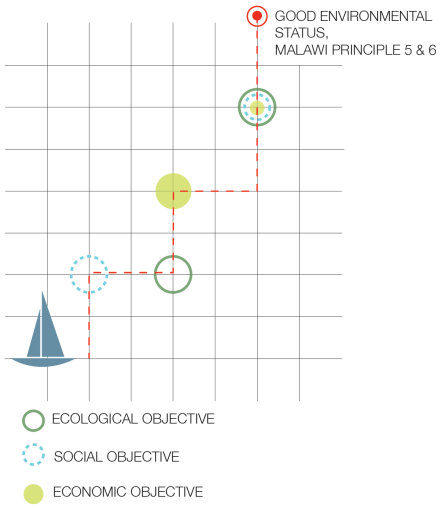

Figure 11 Safeguarding Ecosystem Services in Achieving Good Environmental Status

4.1.2 Marine spatial planning needs valuation

Replying to the question of why marine spatial planning and valuation should go hand in hand, does also call for a broader analysis. Let us use another image, Figure 12 below, illustrating the mutual need between ecosystem-based marine spatial planning and valuation of ecosystem services, in this regard.

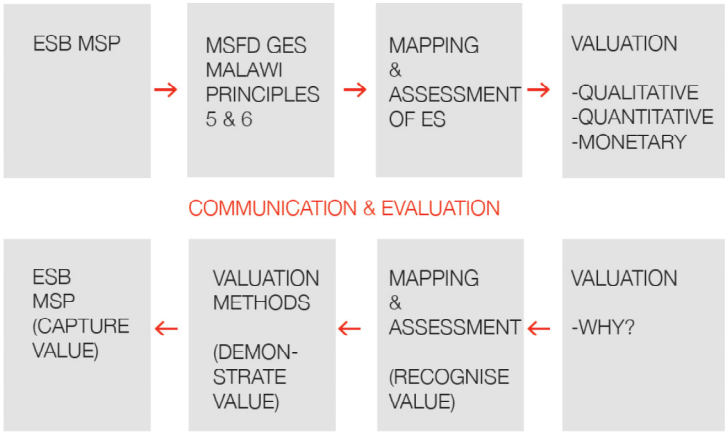

Figure 12 Mutual need between Ecosystem-based Marine Spatial Planning and Valuation of Ecosystem Services

Starting with the analysis on why ecosystem-based marine spatial planning needs valuation, we need to remember the overall task of planning: to put different layers of information together (Section 2.1.3). Within a process where there is an understanding that the achievement of good environmental status is the goal, and the functioning of the ecosystem services is directing the process, it could be argued that mearly information on the biophysical state, namely the description of the environmental status, and mapping the human uses of the area, such as fishing and transport is necessary information, but not enough. Instead, with an ecosystem-based management perspective, the link between the two, the goods and services delivered by nature to humans, the state of the ecosystem services, would need to be given special attention.

As has been shown, the MSFD today could serve as a framework for translating the status of ecosystem services. Hence, it could be argued that the MSFD framework could be used to communicate with stakeholders on the state of ecosystem services in the planning area, as well as the value of these services, giving the MSFD information a spatial dimension. The MSFD framework would then be used to translate the new development paradigm where the safeguarding of ecosystem services and boundaries in the planning area need to be better understood. Using the MSFD framework translating descriptors and indicators to ecosystem services would demand a more thorough mapping and assessment exercise to be carried out. The MSFD framework would also preferably be matched with ongoing policy initiatives on mapping and assessment of ecosystem services, such as the European Mapping and Assessment of Ecosystem Service (MAES). But, to be able to bring the mapping and assessment further into policy decisions, also contributing to the implementation of the MSFD programme of measures, the exercise would need to be linked to valuation of ecosystem services, may it be qualitative, quantitative or monetary. As shown in this thesis, the MSFD social and economic analysis could include valuation of ecosystem services. This information could also be relevant for the actual development of marine spatial plans, evaluating changes in ecosystem services as well as different output of policy initiatives in the planning area (see more in Section 4.2).

In a report on *Ecosystem Services in Nordic Freshwater Management* (Magnussen et al., 2014) attention is given to how ecosystem services can be used in the implementation of the EU Water Framework Directive (WFD). The Directive is older than MSFD and experiences in its implementation can be useful guidance for MSFD. The report argues, based on a number of examples, that ecosystem services can now illustrate not only the total benefits of different implementation strategies, and to assist the analysis of the programme of measures and the cost-effectiveness of measures, but also illustrate how the benefits from ecosystem services are changed (enhanced) when reaching good ecological status. Good ecological status is the equivalent to what is labelled as good environmental status in the MSFD. The report also argues that through developing an ecosystem service framework a useful tool for systematic identification of benefits and to investigate the connection between ecological changes and welfare gains could be made. However, the report underlines "this framework is clearly no "quick fix". Much work is still needed on all aspects of identifying, quantifying, mapping and not at least valuing ecosystem services (by monetary and non-monetary approaches), both with respect to the ecological underpinnings and the economic methodology."

4.1.3 Valuation needs marine spatial planning

Let us now take the other perspective, remembering Figure 12 above, why valuation needs marine spatial planning. The overall rationale for valuation of ecosystem services is to combat the systematic neglect of ecosystems and biodiversity in economic and development policy. Indeed, all policy decisions made by society about ecosystems imply valuations, but, as has been said by Constanza et al. (1997), we can decide to make them explicitly or not. Valuation of ecosystem services can contribute in making values visible. But valuation as such does not say much, it has to be given a political context, the question "Why value?" needs to be asked, and answered. As shown in this thesis the process of valuation starts with mapping and assessment of ecosystem services, and recognising their existence is an important first step to make their benefit for human wellbeing visible. However, mapping and assessment exercises are time-consuming, and, without knowing how they will be used as input to further research or decision-making, their impact is limited. Today, the EU is performing a major mapping exercise, MAES. To avoid a situation where society gets lost in a major mapping and assessment exercise, with a limited policy impact as a result, it could be argued that mapping and assessments preferably should develop as an integral part of policy

processes, such as marine spatial planning. In this way it is also more likely that the ecosystems are not only recognised, the first step in the TEEB approach, but also brought further to step two and three, where values get demonstrated and captured. Taking the point of departure from valuation, the first argument why valuation should be brought into the marine spatial planning process is to have an effective approach to mapping and to bring assessment into decision-making, as shown in Figure 8.

But there is second argument. Having studied, for example in Section 3.2, the cases in the Baltic Sea Region, a number of valuation studies are already presented that contribute to different decision-making processes, may it be recreational fishing of salmon, or as an input to a HELCOM ministerial meeting. This is good. However, to give impact in a more long-term process, it could be argued that a next logical step is to make use of valuation as an integral part of a decision-making process where the process participants identify the need for knowing more about the value of ecosystems, and research or other forms of studies contribute with this information. Thereafter this information could be brought into the drafting process of the marine spatial plan, and act as an effective tool for communication between stakeholders and decision-makers and society as a whole. When representatives from different sectors – energy, transport, fishery, and environment – come together they need to understand the goal of the planning process, and to share a common understanding of how to reach it. They need to understand the boundaries and the framework set for spatial activities. With this argumentation, communication between stakeholders becomes a key motive for why valuation of ecosystem services is needed in marine spatial planning.

Another key motive would be evaluation. Marine spatial planning is about adaptive management, a cyclic process, where stakeholders participate, and complex and changing information needs to be provided. The plan is not a final goal, but a framework for activities and a starting point for the next planning phase. As has been stated in this thesis: what is measured will be valued, and if the objective is to keep ecosystem services functioning and keep within the framework of achieving good environmental status then the progress towards this end needs to be evaluated. Valuation of ecosystem services could have a role in showing the output of plans, giving a baseline of the state of ecosystem services and how they have been affected with the plan being implemented. Communication and evaluation will be given further attention in Section 4.2.

4.1.2 It should happen now

The timing is perfect. As shown in Figure 13 below there are four reasons. Firstly, the regulatory framework for marine spatial planning in the Baltic Sea Region is now to be consolidated. On the EU level with an EU Directive, on the pan-Baltic level with the work within the HELCOM/Vasab group on marine spatial planning, on a national level in a growing number of countries, as well as, on a project level, experience can be shared. The time frames are set, by 2021 coherent marine spatial plans needs to be presented by the EU countries. Since the objective of ecosystem-based management has been broadly recognised, it now needs to be shown what it means in practice. It is time to go to work. The coming years will be the time when marine spatial planning procedures are to find their form in a pan-Baltic context, and stakeholders are to engage in the process. Many stakeholders have a general interest in pan-Baltic issues, not only national planning procedures. Although every country has a large amount of sovereignty when it comes to the design of the marine spatial planning process, there also needs to be co-operation with others to deal with planning procedures. Exchange of information and knowledge will be of great importance, also on valuation of ecosystem services. Secondly, the time frame form the EU Directive Establishing a Framework for Maritime Spatial Planning co-insides with the time frame of

MSFD, which motivates increased co-ordination of processes in the year to come (see more on matching time frames in Section 4.2). Thirdly, on the global, EU, as well as national level, a major exercise of mapping of ecosystem services is ongoing, both within the Mapping and Assessment of Ecosystem Services (MAES) and on a global level linked to the work within the Convention on Biodiversity (CBD). Fourthly, taking a global outlook, the issue of the pressing need for improved marine management is climbing the political agenda. As highlighted in this thesis, a TEEB for the Ocean is to be prepared, developing valuation of ecosystem services in the Baltic Sea region would have a possibility to be a showcase on broad-scale ecosystem-based marine spatial planning where valuation of ecosystem services are tested to be integrated in the decision-making process.

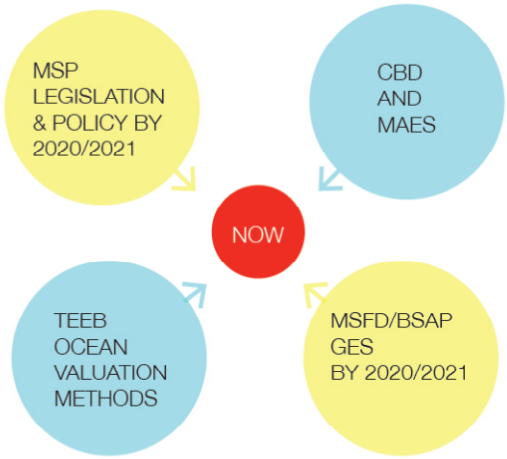

Figure 13 Why Valuation of Ecosystem Services in Marine Spatial Planning Now?

4.2 When?

The process of planning can take different forms, but we will now follow the general steps as presented by HELCOM/Vasab in their guidelines *Document on ecosystem-based approach and MSP* (HELCOM, 2014). HELCOM/Vasab has agreed on a common understanding of what an ecosystem-based approach could be for marine spatial planning. A template for the steps of the planning process have been outlined, including what the steps would need to include for the planning process to be defined as ecosystem-based. In preparation of the guidelines, lengthy discussions have been held between the members of the working group, showing that going from principle to practice of ecosystem-based management is not easy. Following the discussions of the group one of the challenging tasks was too settle on how social, economic and ecological objectives interrelate, hence how the concept of sustainable development would impact the process, and how economic and social aspects of development would be taken on board. The discussions show on the challenging shift in the concept of development that has been given attention in this thesis (see Section 2.2.2.), namely the shift from seeing economic, social and ecological dimensions as equally important, to seeing the ecological dimension as a fundament to the other dimensions Importantly, the document is not binding, but will only be guiding the further work in the group, as well as nationally. Although the focus of the paper is on implementing ecosystem-based management, and to give attention to ecosystem-services, it is worth noting that the issue of valuation of these services is not clearly expressed as an integral part of the whole process, but only shortly mentioned in the template. The following analysis aims at contributing in this regard, not giving clear answers on how valuation can be made at each of the stages, but to provide further input to the template presented, having the ambition to

make valuation an integrated part of the process. A pragmatic approach to valuation studies is taken, mixing more general suggestions to make values visible, with suggestions for further valuation studies.

4.2.1 The first step: Starting the process

The first step in the planning process, as presented in the HELCOM/Vasab guidance document is about starting the preparatory process, taking necessary political decisions and allocating resources so that the competent planning authority can begin its work. To make the ecosystem-based approach part of the planning procedure, it is suggested that all relevant environmental authorities be identified, and an analysis of how a Strategic Environmental Assessment (SEA) is implemented with the ecosystem approach be made. This first step is also about defining the planning area, and starting points, as well as, goals on a general level. In this regard the ecological conditions in the planning area need to be mapped, such as marine protected areas (MPAs), and the functions of the ecosystem goods and services as well as their links to ongoing and future maritime activities. This is also the stage where strategic goals and ecological objectives need to be recognised, as well as economic and social objectives. The content of the plan and preliminary planning options can be mapped and, in doing this, ecosystem services and preliminary planning options linked to ecological status in important areas can be developed. But more needs to be done at this early stage. The issues relevant for an impact assessment should be identified, as well as, the existing knowledge base and the gaps in knowledge, to establish an impact assessment procedure. To strengthen the ecosystem-based management, it is also suggested that the scoping of the environmental assessment needs to include knowledge, as well as, knowledge gaps on the marine ecosystem, natural values and their relations to human activities. It also needs to identify potential threats, and most probable future changes in the ecosystems and human activities. The identification, description and assessment of significant environmental effects of the maritime spatial plan, according to the Directive on Strategic Environmental Assessment (SEA Directive) need to be carried out. Finally, and not to be forgotten, the starting of the process includes participation and interaction, and procedures to carry this out should be established, so as to enhance an ecosystem-based approach in the planning procedure.

Valuation of ecosystem services at this stage:

Recognising valuation of ecosystem services in the planning process together with stakeholders: At this initial stage the most important thing would be to not only decide to what extent valuation of ecosystem services is important in the planning process, but already now reflect and even decide on how to deal with valuation of ecosystem services in the different stages of the marine spatial planning process. Remembering what was said in Section 3.2.1 all decisions made by society about ecosystems actually imply valuations, explicitly or not. In the preparation of the plan, using the TEEB approach (Section 3.2.2), this stage ideally would not only recognise ecosystem services but also bring attention to their potential value. Mapping and assessment of ecosystem services will be needed at this stage, and potentially also a scanning for which of these services would benefit from being qualitatively, quantitatively or monetarily valued. The TEEB framework, as well as the Swedish Inquiry on *Making values of ecosystem services visible*, propose so called ecosystem service assessments (see Section 3.2.3) where the authorities governing the process, together with stakeholders, taking a participatory approach to deciding which ecosystems that need to be mapped, assessed and then valued. This would mean that the process starts with not only recognising that values of ecosystem services will be made explicit, but also with inviting stakeholders to identify problems that need to be solved, crucial ecosystem services relating to these problems, and

how assessment of ecosystem services and their values could be made visible throughout the process.

Deciding how to link valuation of ecosystem services to legal requirements: According to the EU Directive Establishing a Framework for Maritime Spatial Planning a strategic environmental assessment (SEA) needs to be made where plans are likely to have significant effects on the environment, referring to Recital 23 of the Directive on SEA. The task of the SEA is to, on a strategic level, address the environmental effects associated with policies, plans and programmes. Today, the integration of ecosystem services in the SEA context is a practice still in its infancy. Partidario et al. (2013) suggest that an ecosystem services framework needs to be developed and tested as a fundamental component of the SEA procedure, and that qualitative, as well as, quantitative assessments of ecosystem services may be used. Partidario et al. argue that often the valuation of ecosystems in its own terms (e.g. the cultural value of a given feature, or traditional activity in a landscape) may be more important to stakeholders than a market value (e.g. how many tourists are willing to pay to visit), and concludes that where stakeholders learn about the benefits associated to ecosystems and find a reason for their conservation and enhancement, the motivation of stakeholders "will stimulate the use of SEA as a strategic instrument to help management and negotiation through appropriate governance, where there is a value chain to stakeholders pinpointed by the valuation of ecosystem services." Taking a participatory ecosystem-based approach outlining the marine spatial planning process it could hence be argued that countries establishing the SEA process for their plans could consider – by themselves and together with others in the marine spatial planning expert group and at the initial phase of the process – how to include ecosystem services into the SEA framework.. Reflecting on values – qualitative, quantitative or monetary – of ecosystem services could provide with important information in the analysis of potential effects of different plan alternatives.

The second regulatory issue to address at this early stage of planning is how the work on the Marine Strategy Framework Directive (MSFD) and Baltic Sea Action Plan (BSAP) will be brought into the marine spatial planning process, and especially its links to ecosystem services and valuation. The HELCOM/Vasab guidelines speak clearly about the necessity of mapping the ecological conditions of the planning area, including the function of ecosystem goods and services and their ongoing and future links to maritime activities. As has been shown, the MSFD and BSAP are now important elements of the governance framework of the Baltic Sea Region and the achievement of good environmental status should be guiding the marine spatial planning process according to the new Directive Establishing a Framework for Maritime Spatial Planning. Moreover, the MSFD provides an initial assessment containing not only ecological information, but also social and economic information all of which countries are free to fit into an ecosystem service approach. Although countries have addressed ecosystem services differently in the first implementation cycle of MSFD, it is clear that all EU Baltic Sea countries today, based on the initial assessments, possess unique information on the environmental status and socio-economic aspects of their marine waters. This could mean that important MSFD related information would be available for the mapping and assessment of ecosystem services in the planning area. In a recent report on ecosystem-based management in marine spatial planning the Swedish Agency for Marine and Water Management highlights the importance of including the information from the initial assessment in the marine spatial planning process so as to implement the ecosystem-based marine spatial planning (SWaM, 2014).

But, in line with earlier argumentation, it could be suggested that MSFD is not only relevant for the mapping and assessment of ecosystem services in an ecosystem-based MSP process,

but also valuation of ecosystem services. As we have seen, if an ecosystem service analysis is made within the MSFD framework, the development of ecosystem service indicators could be used, as a valuation method of the state of ecosystem services. This was given attention in Sections 3.2.3 and 3.3.1. As highlighted, Sweden has chosen to start translating the MSFD descriptors and indicators into ecosystem services, but also to show how ecosystem services are relevant to the main human activities such as commercial fisheries and tourism. Furthermore, Sweden opens up the possibility to bring economic valuation into the picture, to illustrate the cost of degradation. With these examples in mind it could be argued that qualitative, quantitative and monetary valuation methods in the future could be used not only in evaluation of progress within the work on the MSFD, but also contributing to translating ecological and socio-economic information, including information on ecosystem services, into a spatial dimension asking the question; where in the planning area do we have high ecological values that provide with important ecosystem goods and services to us? How will this information impact the programme of measures and the content of the marine spatial plans? Are crucial ecosystem services being improved or degraded?

With this in mind, it could be relevant for the member states – as well as the HELCOM/Vasab expert group – to discuss further how countries will use the information provided in the MSFD in the spatial dimension of MSP, both to address mapping and assessment of ecosystem services, but also to use valuation to evaluate the progress of and find suitable actions within the programme of measures. It might be that countries will not be ready for this endeavour until the next MSFD and MSP planning cycles, but to discuss the issue might be useful to map out what is possible at this stage, and what could be relevant to keep in mind for the planning process and for future MSFD and MSP cycles. Although the first step of the planning process might give the most attention to the information provided by MSFD and how to translate this information into a spatial dimension, as we will see, the MSFD would need to be an integrated part in the whole process, not at least in the next step, setting the goals.

4.2.2 The second step: Setting the goals

When setting the goals, the HELCOM/Vasab guidelines state that the existing legislation, as well as, sector strategies, programmes and plans need to be taken into account. Sectorial goals need to be identified, and short and long-term goals need to be decided. The ecosystem approach can be implemented by giving special attention to the identification of environmental objectives, as to ensure that the implementation of the marine spatial plan will be compatible with the achievement of good environmental status. Areas in need for protection with regard to the capability and capacity of their ecosystems to recover need to be identified, and taken into consideration in the setting of short and long-term goals. At this stage the content of the plan, what the plan will cover, with preliminary planning options and future scenarios, need to be included. Ecosystem-based goals need to be taken on board in all preliminary options. When this is done the identification of issues, investigations and an impact assessment is needed. The ecosystem approach is withheld through identifying and defining existing problems in marine ecosystems, but also to ensure the identification and valuation of services. Here, the guidelines actually mention the role of valuation of ecosystem services. Finally, also this stage has a strong need for participation and interactions. The need to communicate and promote goals concerning the marine ecosystems, including their values, should be clarified to stakeholders.

Valuation of ecosystem services at this stage:

Implementing Malawi Principles 5 and 6 on objectives of ecosystem-based management: What might be the most important element of this stage is to make clear what the goals and objectives should be, and clarify this with stakeholders. As has been argued in Section 2.2.2 the main Malawi principles of ecosystem-based management relevant for marine spatial planning would be to maintain the ecosystem structure and function, as well as, to safeguard and keep management of ecosystems within the functional limits of the ecosystem, namely Principles 5 and 6. Moreover, as has been highlighted several times, the new Directive Establishing a Framework for Maritime Spatial Planning translates ecosystem-based management very much to what is said in these principles by making the link to the achievement of good environmental status, and the capacity of ecosystems to respond to human induced changes. With this in mind it could be argued that it is up to the public, governing the marine spatial planning process, to speak clearly on how they view the concept of development, either as a delicate act of balance between social, ecological and economic objectives, or communicating that the ecosystem-based management will mean that ecology is seen as a prerequisite for social and economic development, see Sections 2.2.2 and 4.1. Surely, what this will mean in practice for allocation of activities in marine spatial areas cannot be easily said , but speaking clearly about the hierarchy of objectives and the baseline framework for decision-making would clarify the rules of the game for the whole process. Willingness to speak clearly about this issue, will also allow for following-up on the discussion on how MSFD will be integrated into the MSP process. Or more explicitly said: how will the MSP process contribute to the achievement of GES? It could be that when identifying planning options at this stage, it will already be evident that for example the interests of establishing a marine protected area will lead to a potential conflict with transportation links, identifying problems that need to be analysed if ecological objectives are to be met. At this stage it seems like member countries – as well as the HELCOM/Vasab expert group – might need to discuss how to deal with different sector objectives, without their conflicting with the overall goal and ecological objectives given by applying ecosystem-based management (see Section 4.1).

Clarify the values to stakeholders – choosing valuation methods: The guidelines speak clearly about clarifying to stakeholders not only how to deal with goals and objectives concerning the marine ecosystems, but to include the values. An ecosystem service assessment proposed by TEEB and SOU 2013:68 formulates this as a stage for assessment of threats to and the value of ecosystem services, using monetary or non-monetary valuation techniques. According to the TEEB three-step approach it could also be called the stage where values need to be demonstrated, may they be qualitative, quantitative or monetary. What needs to be done at this stage is hence to build upon the mapping and assessment of ecosystem services carried out, conclude discussions on which ecosystem services would need to be given special attention and if methods could be used to make their values more explicit. The three levels of valuation, qualitative, quantitative and monetary are relevant, as well as a number of valuation methods. As shown in Section 3.2.3 not only qualitative and quantitative values could be relevant, such as deciding on indicators or multi-criteria analysis, but also to reflect on the use of monetary valuation, bringing Malawi Principle 6 into action. For example, depending on the level of ambition, a Total Economic Value framework could be used to analyse which monetary values are relevant and if valuation methods can be used to make these visible. This could of course end up in a heavy analytical process, but the most important thing is to try to illustrate the range of different values at stake and include a discussion of if and how these values could be made visible, and if it would be relevant for the decisions to be taken. Use values, non-use values and option values can be discussed with stakeholders, to illustrate the complexity of the benefit transfer that ecosystem services

provide to humans. An important aspect of performing a more large-scale inventory of ecosystem services and methods to value them is to address possible double counting of ecosystem services, as highlighted in Section 3.1.1. Indeed, it is most important to show the multitude of values, not to aim to cover all values in a comprehensive way. Notably, the MSP process rarely can overrule fishery policy, energy policy or transport policy merely by producing a plan (see scope in Section 1.3), but it can make conflicts visible, and take a long-term perspective and thus have an impact on future development of sector policies. Intelligently chosen, valuation studies could facilitate a cross-sector discussion on different values at stake in the marine area, without having the ambition to weigh different values against each other.

As shown in Section 3.3, the Baltic Sea Region has a number of examples of highlighting values through different methods. Remembering the studies exemplified from the region, some issues that might be relevant for the public authority to decide upon if relevant to use could be the importance of showing the values of different development scenarios, the value of different habitats or the value of achieving good environmental status according to the public concerned etc. One might argue that the public authority responsible can lose credibility in taking on board valuation of ecosystem services before taking the decisions, namely that this would be to take a biased role trying to convince stakeholders that ecosystem services need to be safeguarded. At the same time, it could be argued, this is not a problem, if already spoken clearly about the overarching goal of the planning process, namely achieving good environmental status (see Section 4.1), and that difficult decisions need to be taken. In this case, the use of valuation and a variety of methods could instead be a forceful instrument for learning and communication with stakeholders, and between sector interests on the challenges of the planning area. Some concrete examples of questions asked and valuated could be: Do we need to better understand the value of a marine protected area, certain habitats or species? What is the value for business of increasing fish stocks and enhancing recreational use, hence deciding on not planning for large-scale exploitation of seabeds or wind parks? What do we know about species values to humans today, and how these values may change over time?

4.2.3 The third step: Preparation of the plan

The third phase is a writing phase. This is when the competent authority has to take on board the discussions and revise the goals of the plan with regard to the assessed impacts on marine ecosystems and the sustainable use of the ecosystem services. It is now the contents of the plan that need to be presented, the functioning of the carrying capacity of the marine ecosystems will need to be taken into account. This is also the stage for evaluation and further impact assessment. If more precise investigations and assessments of marine ecosystems are needed, it is now that they should be carried out. As always the participation and interaction is a crucial part of this step, to give input, and reflect on the process at large.

Valuation of ecosystem services at this stage

Carry out valuation studies: If the need for valuation – quantitative, qualitative or monetary – of some ecosystem services has been identified in the earlier stages of the process, and the appropriate valuation methods have been chosen, this is the stage where those studies have to be performed. An important issue to deal with is who will carry out the valuation; will it be an integrated part of the planning process, or rather in the form of input from studies made by research or consultants? Surely, with a broad interest in cross-sectorial research on valuation of ecosystem services there might be interesting possibilities for inter-governmental organisations such as HELCOM to identify general decisions that would benefit from having

valuation studies made. Importantly, carrying out valuation studies, the issue of making the study site-specific or generic needs to be discussed, is it a special protected area we are interested in giving attention, or rather a general study in the willingness to pay for a policy measure that could have general spatial implications, for example changed fishery policy. An important method for valuation that was highlighted in Section 3.2.3 is the trade-off analysis, namely using different valuation methods. A trade-off analysis between different ecosystem services could serve as an illustrative example of making visible which ecosystem services are generated; how they are connected, or "bundled" as it is called; and which conflicts of interest and synergies this could mean for the overall production of ecosystem services. Additionally, as shown, there are multiple concrete examples of trade-off analysis in the marine spatial planning process, highlighting different sector needs such as wind parks, tourism and fishery, and having the ambition to illustrate efficient management options. Moreover, as shown in Section 3.3.5, there are several global examples of how the InVEST software is used to calculate impact on ecosystem management. If, for example, cultural ecosystem services have been identified as especially relevant in the planning area, an international example in the same section shows interesting approaches to mapping, assessment and valuation.

Set the structure for evaluation of results: As highlighted by the HELCOM/Vasab guidelines this is the stage for setting the framework for evaluation and impact assessments. If further investigation on the environmental status is needed, this is when it needs to be carried out. At this step, preparing for the plan, it is advisable to pay extra attention to how ecosystem services in the planning area will be evaluated, hence if ecosystem indicators could be used in the process, and later on, preparing for the next planning phase. Indeed, as explained earlier, the MSFD framework could be useful in setting indicators as to benchmark progress on ecosystem services, and hence be able to visualise signs of improvements or degradation in the marine environment. But, today the setting of ecosystem service indicators is not yet broadly established within the MSFD framework. Preparing for marine spatial planning, the responsible public authority would need to exchange experiences with other member countries, or even propose in-house or external research to assist in the work of evaluation, see further Section 4.3.

4.2.4 The fourth step: The proposal

Time for the proposal: The proposal should be selected as a result of the evaluation process of the planning options, the potential impacts of all proposals on ecosystem goods and services should be taken into account. As for the impact assessment, this is when the content proposals could be negotiated with sector interests, if necessary. The ecosystem approach is applied in a series of check-points, including looking for solutions to avoid, mitigating or compensating negative impacts on the marine ecosystems, and setting up a system for monitoring the interactions between human activities and marine ecosystems, in order to ensure an adaptive management approach.

Valuation of ecosystem-services at this stage

Presenting alternative planning options: As the guidelines indicate, this is a delicate phase of the planning process where the responsible planning authority needs to present a proposal and, if necessary, negotiate this proposal with sector interests. Ideally, if there has been a general agreement with stakeholders at the early stages of the planning process on how to make ecosystem services visible, and what valuation methods that would benefit from being used, then this is when the public authority has to present the results to the stakeholders. It could be that this is the stage were different planning options are presented, including the impact

on different ecosystem services. As shown in Sections 2.2.2 and 3.2.3, it is the change in ecosystem services for human wellbeing resulting from a management option that needs to be valuated, and hence could be illustratively shown to stakeholders; qualitatively, for example describing recreational use; quantitatively, changes in ecosystem benefits in numbers; or monetary, willingness to pay. As highlighted previously by Garnek et al. (2009), this creates a "common language" to "link management actions directly to changes in ecosystem conditions and to gain an understanding of how those changes may affect the benefit that various individuals and groups derive from ecosystems." Valuation studies would here ideally enhance communication and thereby facilitate the needed decision-making.

Capturing values: Along the planning process, values of special concern might have come to the attention of authorities and stakeholders. It could for example be that the valuation approaches taken in the planning process highlight the need for giving, further attention to recreational values in other policy decisions, taking place outside the planning process of MPAs. As shown in Section 3.2.2, the TEEB calls this phase to capture values, bringing the value of ecosystem services into decision-making, for example through incentives or prince signals. To identify the need for policy actions along the work of drafting the marine spatial plan could be an interesting link between the planning proposal to the programmes of measures of the MSFD, or even BSAP.

4.2.5 The fifth step: Approval

When the plan is presented for approval it will also be presented to the general public. The inner circle of concerned stakeholders is likely to be expanded. This is also when the politicians need to present the plan, and communicate its content to the public. Further opinions and statements could need to be integrated into the proposal. In accordance with the SEA Directive a statement on how environmental considerations have been integrated into the plan and the reasons for choosing the plan in the light of other reasonable alternatives needs to be presented.

Valuation of ecosystem-services at this stage

Communication to the broader public: The overall priority at this stage concerning valuation of ecosystem services would be to communicate to a broader public what the plan suggests and why. Indeed, it might be necessary, so as to gain political support and final approval of the plan, that the general public be informed why and what the plan will mean for the future development of the planning area. If the planning process has included a participatory process where valuation of ecosystem services has helped the sectors to move in the same direction, it might be easier to motivate and communicate to the general public the design of the plan. If the plan is presented together with valuation studies pointing to the high values that people give to a good environmental status, it would likewise likely help the adoption of the plan. As a comparison, as presented in Section 3.3.2., the Baltic Stern study was made to give support to ministers in taking active decisions at the HELCOM ministerial meeting in 2013.

4.2.6 The sixth step: Monitoring

At the end of this cycle of the process, it is time to evaluate the time period of the plan and to bring knowledge to the next cycle. The impacts on the marine ecosystems according to a monitoring programme are needed, so as to be able to support adaptive management. The appropriate balance between conservation and use of biodiversity will need to be evaluated.

Valuation of ecosystem-services at this stage

Adaptive management – urgent need for evaluation: Marine spatial planning has a key feature as a cyclic and adaptive management process (see Section 2.1.2). This means that management must evaluate change in ecosystem services, as well as human activities, and adjust management accordingly. Also, the adaptive management is crucial as a learning process for stakeholders. At the end of a cycle and as a preparation for the next cycle, it would be needed to evaluate changes in ecosystems and human activities. Additionally, it could be useful to make an evaluation of whether the very use of valuation methods in the marine spatial planning process has been fruitful or not: Has it helped stakeholders and decision-makers? Has it created new problems of any kind? Ideally researchers that follow the planning process could contribute by analysing the pros and cons of valuation, see below Section 4.3. An exchange of experiences in the Baltic Sea Region would be of great interest.

As highlighted by Bloye Olsen et al. (2010), it is crucial, in order for any marine spatial planning to succeed, to include a governance baseline in the analysis. The governance baseline can help to identify the crucial hindering and success factors for the implementation of MSP. Ideally a baseline on crucial hindering and success factors for the implementation of MSP would already have been made at an early stage of the planning and ideally, this baseline analysis would be followed up, outlining a strategic approach to a design of a new programme, and recording the goals, objectives and strategies of MSP implementation as a preparation of a revised plan. It would be interesting if such a baseline analysis would give attention to valuation of ecosystem services, namely it is being dealt with, and how it potentially can impact hindereing as well as success factors.

4.2.7 The seventh step: Revision of the plan

A new cycle has begun. Plans should be reviewed on a regular basis in order to implement adaptive management. To enhance ecosystem-based management, the revision of the plan would need to avoid negative impacts on ecosystems, their structure, processes, functions and interactions, but also their productivity and health.

Valuation of ecosystem services at this stage

Going into the next planning cycle, matching the time frame of different policy frameworks: With at least some experiences of valuation of ecosystem services in the first planning cycle, and ideally shared experiences with other countries, as well as monitoring on how the plan has been implemented, the second planning cycle is more fit to further explore how valuation could be integrated into the different stages of marine spatial planning. Revising the plan, it should be an overall target to see to that the value of ecosystem services are allowed to increase, so that the ecosystems can produce the goods and services that we want and need. As shown in Section 2.1.2 on the crucial elements of marine spatial planning, it is advisable that time frames of marine spatial planning conform to time frames of other relevant national planning periods. One such important matching of time frames would be the planning cycle of MSFD and MSP. The next planning cycle of MSFD will start from 2015 for six years, finishing in 2020. The EU countries will have until 2021 to establish maritime spatial plans.

4.3 How?

After addressing why and when valuation could be relevant in ecosystem-based marine spatial planning, let us now turn to the question of how. This analysis will take place in the framework of social-ecological systems theory, which focuses on social-ecological systems (SES), where the dialogue on human/nature relations and the interaction of social and

natural sciences is in focus. Social and ecological systems are seen as complex and adaptive and delineated by spatial or functional boundaries surrounding particular ecosystems and their problem context. The SES research also focus on how systems cope with change, namely the capacity-building to deal with complexity, uncertainty and surprise through adaptive learning (Glaser et al., 2008).

Indeed, all humanly used resources are embedded in complex, social-ecological systems. As Ostrom (2009) suggests, these systems contain subsystems including both natural resource systems and governance systems, highlighting the importance of the interactions between nature and society. Revisiting the theory of Garrett Hardin's *The tragedy of the Commons* from 1968, Ostrom et al. (1999) question Hardin's metaphor that the users of a commons are caught in an inevitable process that leads to destruction of the very resource on which they depend. Instead, Ostrom argues that although the tragedy of the commons might be real, it is not inevitable. Instead, for successful governance of so called Common-Pool Resources (CPR), components of crucial importance are that users have access to accurate knowledge of external boundaries and have reliable indicators of resource conditions, or as Ostrom puts it "when the flow of resources is relatively predictable, it is also easier to assess how diverse management regimes will affect long term benefits and costs". Having said that, Ostrom underlines that while empirical studies show that the tragedy of the commons can be overcome in local and regional CPR management, the world is now facing global challenges. Indeed, a successful management of social-ecological systems is far more challenging for the management of large-scale resources that depend on international co-operation (Ostrom et al., 1999). Likely, with a larger number of participants, larger ecosystems and more complex governance systems, it will also be more difficult to assess not only the managerial boundaries, but also the benefits and costs of different management options. Law, being a fundamental element of society and having the potential power to affect the biosphere and its functioning, has an important role to play in a globalised and interconnected world of seven billion people and as Ebbesson et al. (2014) point out, increasing cross-scale interaction in social-ecological systems are likely to require new legal and institutional interactions at different levels. The new cross-scale linkages and cascading dynamics in social-ecological contexts also challenge how to frame the group of actors who may access information, participate in decision-making and request review of decisions. Interestingly, as the social-ecological contexts expand the broadening of the group of persons who have the right to access environmental information and to participate in decision-making can also be expanded in many countries, inviting new actors and forms for the decision-making process (Ebbesson et al., 2014).

As has been shown in Sections 2.1.2 and 2.3.3, ecosystem-based marine spatial planning in the Baltic Sea Region poses a number of complex social-ecological challenges, including cross-scale interactions of nature resource systems and governance systems. Marine spatial planning will not only have the task to improve integrated management, but allows for a broadening of the management process bringing more stakeholders on board in decision-making processes. With this development, it is clear that stakeholders engaged also will request, as well as need, to understand more about the benefits and costs of different management options. Indeed, the states and the stakeholders taking part in the marine spatial planning process of the Baltic Sea Region – may it be on regional, national or local level – will the coming years face the challenging task of common-pool-resource management.

Taking departure in the question of this thesis – how valuation can be developed within ecosystem-based marine spatial planning in the Baltic Sea Region – the voices of some engaged stakeholders will now be presented. Their thoughts reflect the major challenges

highlighted by the social-ecological systems theory, namely the understanding of the interlinked challenges of management of resources and the development of governance systems. The questions asked are three; where the region stands today on ecosystem-based marine spatial planning, valuation of ecosystem services and their role as stakeholders in the decision-making processes taking form. The four stakeholders chosen represent one NGO, one research institute, one is representative from the pan-Baltic governance level and one is representative from the national agency level.

Where do we stand on ecosystem-based marine spatial planning in the Baltic Sea Region today?

Mr Hermanni Backer, Professional Secretary at the HELCOM Secretariat who has participated in the PlanBothnia project (see Section 2.3) and the HELCOM-Vasab working group on ecosystem-based marine spatial planning (see Section 2.2), states that in principle ecosystem-based management should not as such be controversial to implement in the region; there is today a broad understanding for keeping economic activity within ecological boundaries. Nevertheless, when considering when it is to be implemented in practice, it becomes more complicated. Then it becomes an issue of who has the right of taking decisions over whom. Spatial planning traditionally gives the planners the democratic mandate to make decisions, but with marine spatial planning a broader decision-making process, including industry, will be on the table. It will be a challenge to allow for a participatory process while keeping a clear direction and framework staying within ecosystem boundaries in decision-making.

Ms Andrea Morf, a researcher at the Swedish Institute for the Marine Environment with long experience of marine spatial planning in the Baltic Sea region, underlines the importance for creating a shared vision of what ecosystem-based marine spatial planning would mean in practice. If there is no such shared vision amongst stakeholders in the beginning of the planning process, it will affect not only the process itself, but also create difficulties for drafting of the final plan. To this end, it is crucial to understand the ecological boundaries. However, the methods for this are not yet sufficiently developed, and although the MSFD definition of good environmental status is crucial for guiding the decision-making process, it does not give clear answers when applied to a spatial dimension. Ecosystem-based marine spatial planning will therefore need not only a clear procedural framework, but also clear guidelines on how to deal with substantial issues such as the achievement of good environmental status. Today there is a great variation among countries in the Baltic Sea region on which objectives initiate and steer the marine spatial planning process. Many countries rely on the development of economic activities as a major driver for the process, whilst others have a broader understanding of the ecosystem-based management perspective and an interest in a broader participatory approach in the decision-making process. One major challenge will be to engage stakeholders, giving them a "carrot" that makes them willing to participate, but not creating unrealistic expectations, since such a plan cannot accommodate everyone's wishes.

Mr Jan Schmidtbauer Crona, a senior analyst on marine spatial planning and maritime affairs at the Swedish Agency for Marine and Water Management, acknowledges that on a principal level the Baltic Sea Region has reached quite far to get broad acceptance of ecosystem-based marine spatial planning, however, it is still to be shown how it will be implemented in practice in various countries. From a pan-Baltic perspective it will be crucial to gradually get a shared vision and understanding of, for example, how to translate good environmental status into the planning process, as well as to fit different sub-regional plans together.

Mr Mattias Rust, an expert in oil, maritime affairs and marine spatial planning at WWF, confirms that although the term "ecosystem-based marine spatial planning" is today well acknowledged, it has a long way to go to being applied in real decision-making. While the EU Marine Spatial Planning Directive is making the link between ecosystem-based management and the achievement of good environmental status, there are still many conflicting political objectives that will influence the practical planning process.

Where do we stand today on valuation of ecosystem services?

Mr Hermanni Backer confirms that the issue of valuation of ecosystem services is taken on board in the template HELCOM-Vasab process for ecosystem-based management, however, it is still to be seen how it will be taken on board in the planning process. Valuation of ecosystem services would ideally be something to be included in the beginning of the planning process, including some kind of mapping of ecosystem services linked to socio-economic considerations, as a benchmarking material that is possible to come back to afterwards, to evaluate how well it has been taken on board in the plans.

Ms Andrea Morf states that there is much going on regarding the development of methods for valuation of ecosystem services, but still there is a great need for further research and development. Valuation of cultural services is especially interesting. Valuation has a special role to play in the beginning of the planning process, as well as in the evaluation of the planning process, but might also be of interest when different management options are presented. Monetary valuation needs to be made with caution, reminding participants how and why it is made. Still, the final decisions made based on them have to be seen as political; the claims of full rationality and objectivity in planning are unrealistic and outdated. Ms Morf underlines that transparency and fairness of decision-making processes and transparency of the knowledge processes behind are at least as important.

Mr Jan Schmidtbauer Crona asks the rhetorical question what valuation will contribute to the planning process? Ecosystem services are getting increasingly acknowledged, but for example working on the implementation of the MSFD, countries are approaching the concept of ecosystem services very differently, which poses a challenge when taking the step to address valuation of ecosystem services in the Baltic Sea Region. In the planning process the difference between different management options is important to highlight, namely how will different management options affect, for example ecosystem services? Valuation of ecosystem services could be a means to show the output of different planning options. At the same time valuation of ecosystem services risks to be seen as a manipulative way of steering the process in an already decided direction, before decisions are taken. The responsible planning agency has an important role to play in integrating valuation of ecosystem services into the planning process where it is most useful and credible.

Mr Mattias Rust argues that valuation of ecosystem services mainly has a role to play to improve long-term decision-making, communicating to stakeholders why different management options are taken. The risks with monetary valuation should not be neglected, not forgetting the need for applying the precautionary principle. It is for the Government to set the objectives of the planning process and see to that relevant information for decision-making is available to make the right decisions. If valuation of ecosystem services is seen as valuable for reaching the objectives, then it should be included in the decision-making material, but it cannot be negotiable with actors, it can only be a means of communicating the benefits with achieving environmental objectives.

How can you as a stakeholder contribute in making valuation of ecosystem services an integrated part of the marine spatial planning process?

Mr Hermanni Backer emphasises the need for further research, combined with further intergovernmental co-operation in the Baltic Sea Region. The institutional structures are there to intensify international co-operation.

Ms Andrea Morf emphasises the need for research, not only following the planning process, but also to see research as part of the evaluation of the process, both once plans are presented and of the actual outcomes of planning. Research needs to be integrated into the process, but also has to have an independent position, keeping a critical eye on process and outcomes. Methods of valuation of ecosystem services are in great need of development, as are an exchange of experiences across the globe.

Mr Jan Schmidtbauer Crona argues that, embarking on the first cycle of the marine spatial planning process, it is difficult to see how valuation will be an integrated part of the process. However it will be easier once the process has commenced and going into the next cycle. Agencies, steering the planning process, need to identify how to address ecosystem services as a part of SEA, so that it becomes an integrated part of the formal process carried out.

Mr Mattias Rust stress that an NGO like WWF can provide reports showing the value of ecosystem services that are productive and functioning, like the study carried out by WWF (see Section 3.3.3), however it is up to the responsible agency and to international co-operation to deem where valuation is relevant so as to make stakeholders supportive to the decisions taken, decisions that ideally contribute to achieving good environmental status of the marine environment.

The interviews clearly indicate that at a time when the Baltic Sea region is embarking on a broad-scale marine spatial planning process the broader Baltic stakeholder understanding of the concepts of "ecosystem-based decision-making", "good environmental status", as well as "values of ecosystem services", is in great need of a participatory learning process. The representatives interviewed confirmed that both the understanding of ecosystems and the governance systems, the two dimensions of social-ecological frameworks, need to be improved.

Following the argumentation made in the article *Making the ecosystem approach operational – Can regime shifts in ecological- and governance system facilitate the transition?* co-evolution between science, policy and practice is crucial. The existing governance institutions are designed to deal with individual sectors, and not with applying an ecosystem-based management. To make the transition to an operational implementation of ecosystem-based management, bottom-up pilot initiatives should be matched with re-organisation of top-down governance structures. Learning processes are crucial in this regard (Österblom et al., 2010). Having a look at the management of the Great Barrier Reef in Australia, the interplay between individual actors, organisations and institutions at multiple levels has been determined to be central in a transition to ecosystem-based management. Change is triggered by stewardship and interaction among key actors is crucial (Olsson et al., 2008).

Indeed, addressing how valuation can become a part of ecosystem-based marine spatial planning in the Baltic Sea Region these insights are very valid. From the interviews it seems like top-down governance structures need to be established as well as combined with bottom-up stakeholder initiatives testing practices and sharing experiences. The

representatives interviewed have all witnessed the importance of embarking on a pan-Baltic learning process, but also that science, policy and practice together, as well as respectively, need to do their homework in testing a way forward. To develop predictive models of social-ecological systems to deduce universal solutions, panaceas, to problems of overuse or destruction of resources does not seem to be the answer. In Ostrom's *A diagnostic approach for going beyond panaceas* it is argued that many variables are needed to be analysed in a nested, multitier framework, showing on the complexity in replying to "how" to make things happen (Ostrom, 2007). Improving the understanding of the link between the resource systems and the governance system is critical. Valuation of ecosystem services in ecosystem-based marine spatial planning could be valuable to take into consideration in further social-ecological system analysis. This could contribute to further understanding of how to make ecosystem services valued in marine spatial planning, but also contribute to strengthen the understanding of the link between resource systems and governance systems, and indeed, the link between the economy and the environment.

4.4 Conclusion

In this chapter the questions of why, when and how have been analysed based on what has been presented in earlier chapters. On the question of why, the chapter has highlighted communication and evaluation as two key words, and illustrated that marine spatial planning and valuation of ecosystem services could be seen as mutually supportive as well as dependent. The chapter has also analysed the different steps of the planning process – going from setting objectives, through preparing a plan and monitoring a plan – to analyse how valuation could be considered at the different stages. Finally, the chapter has devoted attention to the interplay between social-ecological systems facing the Baltic Sea Region bringing in the views of four stakeholder categories highlighting the challenges of navigating towards valuation of ecosystem services in ecosystem-based marine spatial planning in the Baltic Sea Region.

5 Conclusion

In this chapter I will conclude this thesis by addressing the three questions of why, when and how valuation of ecosystem services could be relevant in ecosystem-based marine spatial planning, linking to the initial purpose as presented in Section 1.4 and to the analysis in Chapter 4. Here I will also devote special attention to suggestions for further research and suggestions for co-operation.

Our global oceans and seas are in an alarming poor state, including the Baltic Sea. With continuing marine degradation, our oceans and seas will not be able to provide us humans with the ecosystem services on which we – and our economies – depend. Enormous values are at stake. Global food security is threatened. Nature and recreational values endangered. With the failure of current ocean management practices, and the unlikeliness for a panacea for a quick-fix for a successful ocean management regime, this thesis argues that we should not be afraid, but open to exploring and debating new management approaches. An improved understanding of the link between our economy and the environment is critical. This thesis suggests that valuation of ecosystem services in ecosystem-based marine spatial planning could and should be tested to get better marine management and to contribute to taking steps towards good environmental status of the Baltic Sea. In this thesis ecosystem based marine spatial planning and valuation of ecosystem services have been brought together, asking – and trying to reply to – the question of why, when and how these concepts could be combined in order to improve the management of the Baltic Sea.

The why question

With neither broad consensus on the need and use of valuation of ecosystem services in marine spatial planning, nor any practical examples of its application, there is a need to address the why question. This thesis presented how both marine spatial planning and valuation of ecosystem services have climbed the political policy agenda in the Baltic Sea Region. Based on an analysis of literature and policy-making on the current situation of ecosystem-based marine spatial planning and valuation of ecosystem services respectively, this thesis suggested that current policy developments in the Baltic Sea Region now have clear motivation for valuation of ecosystem services to develop within the framework of ecosystem-based marine spatial planning. This thesis showed that regional policy has translated the global principles for ecosystem-based management in a regional context. Recently, and for the first time ever, both EU law and regional policy in international organisations, are formulating that the achievement of good environmental status and the safeguarding ecosystem services and ecosystem boundaries should be guiding future marine spatial planning. Based on these developments, this thesis argues that the work towards achievement of good environmental status and the development of marine spatial planning need to go hand in hand in the coming years.

With the legal and policy support for such a direction in policy development, this thesis takes the next step and argues that ecosystem-based marine spatial planning and valuation of ecosystem services actually could be seen as mutually supportive. Based on an analysis of the nature of marine spatial planning and the nature of valuation of ecosystem services, it becomes clear that ecosystem-based marine spatial planning would need and benefit from mapping and assessing ecosystem services, but also to present their values. At the same time the work on valuation of ecosystem services need a policy framework to be able to recognise, demonstrate, as well as, capture values successfully in decision-making. Communication between stakeholders and evaluation of progress in the adaptive management process that

marine spatial planning offers are argued to be key reasons that should motivate acceptance for taking steps towards valuation of ecosystem services in marine spatial planning.

Moreover, this thesis suggests that the timing for such developments is now. The regional policy framework is in place, marine spatial planning having the same time frame as the policy framework for achieving good environmental status in the marine environment, as well as the global work on developing methods for mapping, assessment and valuation of ecosystem services, call for regional examples to lead the way.

The when question

With no general blueprint for the steps of a marine spatial planning process, as this is very much decided on a national level, the Baltic Sea Region nevertheless can serve as a unique example for analysing when valuation of ecosystem services could be useful in marine spatial planning processes. This thesis presents, following a template for ecosystem-based marine spatial planning agreed upon on a pan-Baltic level, an analysis when in the marine spatial planning process valuation of ecosystem services could be relevant and what methods of valuation that could be interesting to make use of. This thesis concludes that valuation of ecosystem services has a role to play at every step of the process, and that, using a pragmatic approach to valuation of ecosystem services, a variety of valuation methods could be considered, may they be qualitative, quantitative or monetary. It is argued that the public entity leading the process would need to involve stakeholders at an early stage to decide how valuation of ecosystem services could serve its purpose of making ecosystem values visible to humans, have importance for improving the decision-making process itself, as well as for facilitating the communication between stakeholders involved and evaluation of the progress towards achieving good environmental status.

The how question

With arguments on why and when valuation of ecosystem services could develop within the framework of marine spatial planning, there is a need to try to be more practical and address the how question: what is needed to make it happen? This thesis concludes, based on interviews with representatives from different stakeholders groups (research, international organisations, national authority and NGO), that there is a great need for a broad participatory learning process to be able to move towards bringing on board the values of ecosystems into the decision-making governance systems like marine spatial planning. Established top-down governance structures need to be combined with bottom-up stakeholder initiatives, testing practices and sharing experiences. This thesis suggests that valuation of ecosystem services in ecosystem-based marine spatial planning could be valuable to take into consideration in further social-ecological system analysis. This could contribute to further understanding of how to make ecosystem services valued in marine spatial planning, but also contribute to strengthening the understanding of the link between resource and governance systems, and indeed, the link between the economy and the environment.

Future research and co-operation

This thesis has suggested that the implementation of the Marine Strategy Framework Directive (MSFD) and the development of ecosystem-based marine spatial planning should go hand in hand the years to come. To make this happen there is a pressing need for research and international co-operation. Firstly, it points to the question of how to translate the Marine Strategy Framework Directive (MSFD) descriptors and indicators and the economic and social analysis into the language of mapping and assessment of ecosystem services,

taking the work of Mapping and Assessment of Ecosystem Services (MAES) and The Economics of Ecosystems and Biodiversity (TEEB) into consideration. Secondly, on how to translate this work into the spatial dimension of marine spatial planning, taking into consideration how planning will influence the programme of measures of the MSFD as well as how valuation of ecosystem services could contribute to the evaluation of progress, taking action towards achieving good environmental status. Also, understanding how concrete planning options will affect the provision of ecosystem services and their boundaries will be a delicate task for further research and co-operation.

Another area where further regional research and co-operation could be wished for is how different methods of valuation of ecosystem services, may they be qualitative, quantitative or monetary, could provide useful information to the marine spatial planning process. Indeed it would also be useful to see how socio-economic information, including studies on valuation of ecosystem services, potentially could be integrated with other information. HELCOM is now developing a free map service combining up to 500 map layers in total, with maps ranging from biodiversity landscape features to information of maritime traffic. To include information on ecosystem services and their values would be interesting to explore.

With a mis-match between administrative and ecosystem boundaries since ecosystems do not follow country boarders, the region's stakeholders need to embark on a broad and adaptive learning process. A multi-disciplinary approach will also be important, combining for example natural sciences, social sciences, economics, as well as computer visualisation used in marine spatial planning. Making use of valuation of ecosystem services as a tool to move forward towards improved marine management, further analysis on how valuation can be taken on board in the marine spatial planning processes will be necessary. But it is not only the coordinates for the journey ahead that needs proper analysis, but also reflecting and learning experiences from what is left behind, in the wake of transitioning towards ecosystem-based marine management in the Baltic Sea Region.

In conclusion, this thesis has shown that the Baltic Sea Region could be a global example of moving towards valuation of ecosystem services in ecosystem-based marine spatial planning. Not only is the long tradition of international co-operation, and a EU regulatory framework in place, steering the work towards achieving good environmental status as well as developing ecosystem-based marine spatial planning by 2021, but also substantial work has been initiated for making ecosystem services visible through mapping and assessment of ecosystem services, as well as, cases testing methods of ecosystem valuation. The governments, tasked with the role of establishing marine spatial planning, and the EU Commission and HELCOM/Vasab, impacting maritime and marine policy development, would need to lead the way, however, inviting for a broader participatory stakeholder learning process. A growing support amongst the broader business community that blue growth needs to be supported by healthy ecosystems to be prosperous could trigger this development. Ambitious NGOs pushing for change, and well established Baltic research networks would be necessary. The ecosystems of the Baltic Sea are under severe pressure, threating long-term prosperity of the region and human wellbeing. New marine management approaches need to be tested, and valuation of ecosystem services in ecosystem-based marine spatial planning could be useful in improving communication between stakeholders, as well as, in the evaluation of progress towards achieving good environmental status.

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Mr Hermanni Backer, Professional Secretary at the HELCOM Secretariat, December 2014

Ms Andrea Morf, Reseracher, Swedish Institute for the Marine Environment, December 2014

Mr Mattias Rust, Expert in oil, maritime affairs and marine spatial planning, WWF, December 2014

Mr Jan Schmidtbauer Crona, Analyst on marine spatial planning and maritime affairs Swedish Agency for Marine and Water Management, December 2014

Appendix 1: The 12 Malawi Principles

Source: Convention on Biological Diversity (2014)

Principle 1: The objectives of management of land, water and living resources are a matter of societal choices.

Principle 2: Management should be decentralized to the lowest appropriate level.

Principle 3: Ecosystem managers should consider the effects (actual or potential) of their activities on adjacent and other ecosystems.

Principle 4: Recognizing potential gains from management, there is usually a need to understand and manage the ecosystem in an economic context. Any such ecosystem-management programme should:

Principle 5: Conservation of ecosystem structure and functioning, in order to maintain ecosystem services, should be a priority target of the ecosystem approach.

Principle 6: Ecosystem must be managed within the limits of their functioning.

Principle 7: The ecosystem approach should be undertaken at the appropriate spatial and temporal scales.

Principle 8: Recognizing the varying temporal scales and lag-effects that characterize ecosystem processes, objectives for ecosystem management should be set for the long term.

Principle 9: Management must recognize the change is inevitable.

Principle 10: The ecosystem approach should seek the appropriate balance between, and integration of, conservation and use of biological diversity.

Principle 11: The ecosystem approach should consider all forms of relevant information, including scientific and indigenous and local knowledge, innovations and practices.

Principle 12: The ecosystem approach should involve all relevant sectors of society and scientific disciplines.