Document title	Synthesis Report on the Ecosystem Approach to Maritime Spatial Planning
Code	5-2
Category	INF
Agenda Item	5 – Ecosystem-based approach in MSP
Submission date	14.10.2019
Submitted by	Sweden
Reference	

Background

The Pan Baltic Scope (2018-2019) project's activity 1.2.1 is focused on the Ecosystem Based Approach in Maritime Spatial Planning. One of the deliverables is recommendations to the HELCOM/VASAB MSP Working group on how to revise the current H/V EBA guidelines. As a background analysis for those recommendations, a synthesis report has been developed by David Langlet and Aron Westholm (Department of Law, University of Gothenburg).

The report provides a synthesis of major views, findings and recommendations from the scientific literature and selected reports and guidance documents relevant to the implementation of the ecosystem approach in maritime spatial planning. The synthesised literature and other documents have not been limited to but have a particular focus on the Baltic Sea. Based on the synthesis, the report aims to analyse the consistency between the identified perspectives and recommendations and the manner in which the ecosystem approach is characterised and operationalised in the HELCOM-VASAB Guideline for the implementation of ecosystem-based approach in MSP in the Baltic Sea area. Based on that analysis, the report also suggests possible improvements to the HELCOM-VASAB Guideline. The recommendations will be taken forward in a specific document which will be discussed at the H/V MSP working group meeting in spring 2020.

Action requested

The Meeting is invited to take note the content of the Synthesis Report on the Ecosystem Approach to Maritime Spatial Planning, a deliverable from the Pan Baltic Scope project, and get inspiration for the discussion on development of the HELCOM-VASAB EBA guidelines that will follow in 2020.

Pan Baltic Scope

Co-funded by the European Maritime and Fisheries Fund of the European Union

Synthesis Report on the Ecosystem Approach to Maritime Spatial Planning

Synthesis Report on the Ecosystem Approach to Maritime Spatial Planning

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The authors acknowledge the valuable assistance with editing and systematization of sources provided by Henrik Jansson.
2019

This synthesis report was developed within the framework of the Pan Baltic Scope project.

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Content

Ecosystem-Based Toolbox

Ecosystem-Based Approach in Sub-basin SEA

Executive Summary

The present synthesis report engages with the concepts of ecosystem approach and maritime spatial planning and the relationship between them with a particular focus on the Baltic Sea context. The report is based on a review of scientific literature, selected reports and pertinent guidance documents. The HELCOM-VASAB Guideline for the implementation of ecosystem-based approach in maritime spatial planning is assessed in the light of these sources. The Guideline is found to be fairly well aligned with the Malawi Principles for the Ecosystem Approach endorsed by the parties to the Convention on Biological Diversity. But since both documents and in particular the Guideline are short on substance, limited guidance for the actual application of an ecosystem approach is achieved. An assessment of the Guideline in relation to the scientific literature on the ecosystem approach reveals significant room for improvement. This includes potential amendments aimed at dealing with uncertainty and precaution in a more systematic fashion, ensuring that public participation processes enable genuine two-way communication and avoid capture by particularly resourceful or articulated interests, as well as increasing transparency concerning trade-offs among users and interest.

Introduction

The present report provides a synthesis of major views, findings and recommendations from the scientific literature and selected reports and guidance documents relevant to the implementation of the ecosystem approach in maritime spatial planning. The synthesised literature and other documents are not limited to but has a particular focus on the Baltic Sea. Based on the synthesis, the report aims to analyse the consistency between the identified perspectives and recommendations and the manner in which the ecosystem approach is characterised and operationalised in the HELCOM-VASAB Guideline for the implementation of ecosystem-based approach in Maritime Spatial Planning (MSP) in the Baltic Sea area. Based on that analysis, the report also suggests possible improvements to the HELCOM-VASAB Guideline.

Structure of the report

The report comprises three parts in addition to this introduction. The first part sets out the findings of the synthesis of scientific literature and relevant reports and guidance documents. It starts with an account of how the ecosystem approach and MSP are described in the literature and then structures the synthesised material in relation to six themes which largely correspond to the 'key elements of the ecosystem-based approach' set out in the HELCOM-VASAB Guideline: These are:

- Access to and use of best available knowledge and practice;
- Development and implementation of development alternatives and mitigation measures;
- Analysis and management of anthropogenic effects and interactions between human activities and the ecosystems, incl. cumulative effects;
- Principles and processes for participation and communication;
- Degree of subsidiarity and coherence in planning;
- Flexibility and adaptability of the planning.

The second part presents two policy instruments of relevance for ecosystem-based management in the Baltic Sea region: the Malawi principles and the HELCOM-VASAB Guideline. In the final part, the Guideline is assessed in relation to the Malawi principles and the synthesised literature resulting in some conclusions and recommendations regarding potential improvement of the Guideline.

How the work was carried out

The synthesis is based on material identified through searches in relevant databases and on Google scholar, using terms such as 'ecosystem approach', 'planning', 'Malawi principles', 'maritime spatial planning', 'marine spatial planning' 'HELCOM', 'VASAB' in different combinations. The relevance of the search terms has been checked by testing them against known relevant literature on MSP, primarily in the journal Marine Policy which is a major outlet for research on MSP. The material retrieved has been analysed for its relevance to the aim of the report. The intention has not been to include all potentially relevant literature but to capture a sufficiently large and representative sample. Frequently occurring or otherwise apparently relevant publications referred to in the retrieved material have also been retrieved and added to the material when found relevant. The main criterion for including sources in the synthesis has been their relevance in relation to the application of the ecosystem approach in MSP, in particular but not exclusively in a Baltic Sea context.

The synthesis aims to present majority views from the literature, but also to account for contradictory or supplementary perspectives. The main findings and recommendations from the synthesis have then been compared to the content of the HELCOM-VASAB Guideline in order to identify potential contradictions or gaps. The low level of substantive detail of the Guideline[1] has necessitated a main focus on identifying potentially useful additions to the guideline, rather than analysing substantive differences between the Guideline and the synthesised literature.

1. The Guideline e.g. holds that 'results shall be communicated' but does not specify in what way that should be done or how to deal with challenges associated with reaching different groups, building trust and legitimacy for the information etc. which are issues typically discussed in the literature.

1. The Ecosystem Approach and Maritime Spatial Planning – an Introduction

1.1. The Ecosystem Approach

While the scientific ideas on which the ecosystem approach is premised can be traced at least to the first half of the 20th century (Grumbine 1994, 28) the approach has a shorter history as an established principle for environmental management. An early iteration of the approach in international law is found in the 1980 Convention on the Conservation of Antarctic Marine Living Resources, which requires conservation or harvesting activities to be carried out with regard to the maintenance of the ecological relationship between harvested and other species as well as to the marine ecosystem as a whole (Langlet and Rayfuse 2018b, 2). The approach gained general recognition as a policy concept in 1995 when the parties to the Convention on Biological Diversity (CBD) agreed that it 'should be the primary framework of action to be taken under the Convention' (CBD, Decision II/8). In 2000 the same parties adopted a definition according to which the ecosystem approach 'is a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way.' It further 'requires adaptive management to deal with the complex and dynamic nature of ecosystems and the absence of complete knowledge or understanding of their functioning' (CBD, COP Decision V/6).

This definition was followed up with the elaboration and subsequent endorsement by the CBD parties of the 12 so-called 'Malawi Principles for the Ecosystem Approach' (CBD, COP Decision V/6). In short, these principles hold that management objectives are a matter of societal choice (Principle 1) and that the ecosystem approach should seek the appropriate balance between conservation and use of biodiversity (Principle 10). Furthermore, ecosystems must be managed within the limits of their functioning (Principle 6) with conservation of ecosystem structure and functioning being a key feature of the approach (Principle 5). The approach should be undertaken at the appropriate scale (Principle 7) with management decentralized to the lowest appropriate level (Principle 2). Ecosystems should be understood in an economic context, aligning incentives to promote sustainable use and internalize costs and benefits (Principle 4) and managers should consider the effects of their activities on adjacent and other ecosystems (Principle 3). While change is inevitable (Principle 9), objectives for ecosystem management should be set for the long term (Principle 8). Application of the ecosystem approach should involve consideration of all forms of relevant information (Principle 11) and involve all relevant sectors of society and scientific disciplines (Principle 12).

The ecosystem approach was endorsed by the parties to the Helsinki Convention through a joint statement with OSPAR in 2003 (OSPAR/HELCOM statement 2003[2]). The statement defines the ecosystem approach as 'the comprehensive integrated

2. Annex 5 'Towards an Ecosystem Approach to the Management of Human Activities'

management of human activities based on the best available scientific knowledge about the ecosystem and its dynamics, in order to identify and take action on influences which are critical to the health of marine ecosystems, thereby achieving sustainable use of ecosystem goods and services and maintenance of ecosystem integrity'.

In addition to politically endorsed statements and definitions there is a wealth of scientific literature that grapples with how the approach should be defined and what it means in practice to apply an ecosystem approach in different kinds of natural resource management (e.g. Grumbine 1994; Slocombe 1998; Tallis et al. 2010; Long et al. 2015).

Further complicating the picture is that there are a number of concepts with similar or overlapping meaning such as 'ecosystem-based management', 'ecosystem approach to management', and 'ecosystem based marine management'. These all come with different definitions in different contexts. However, an analysis (Arkema et al. 2006, 528) of definitions of 'ecosystem management' (EM), 'ecosystem-based management' (EBM) and 'ecosystem-based fisheries management' (EBFM) provided in the scientific literature found no statistically relevant differences in how they related to notions such as the inclusion of humans in ecosystems, complexity, ecosystem goods and services, or the precautionary approach. None of these terms thus seem to have a distinct or established content that differentiates it from the concept of 'ecosystem approach'. This is corroborated by a review of references to the ecosystem approach between 1957 and 2012 which identified three primary uses of the term, one being 'as an alternative to ecosystem management or ecosystem-based management'. The other primary uses were 'in reference to an integrated and equitable approach to resource management as per the CBD; and as a term signifying a focus on understanding and valuing ecosystem services.' (Waylen et al. 2014, 1215)

In the following 'ecosystem approach' and 'ecosystem-based management' are used interchangeably, since they are the ones most generally used in scientific and policy texts while other concepts will be used only when called for by a need to be consistent with original sources.

Murawski (2007, 682) has concluded that the many definitions of concepts such as ecosystem approach to management and ecosystem-based management 'invariably share a number of common characteristics involving broadening stakeholder involvement, evaluation of multiple simultaneous drivers or ''pressures'' on ecosystems, and specifying that EAM/EBM is geographically based vs. being primarily species or single-issue driven.' The same influential paper by Murawski (2007, 682) on ecosystem approaches to marine resource management finds that an ecosystem approach to management has some defining characteristics (in comparison to more narrow management approaches), namely that it is: '(1) geographically specified, (2) adaptive in its development over time as new information becomes available or as circumstances change, (3) takes into account ecosystem knowledge and uncertainties, (4) recognizes that multiple simultaneous factors may influence the outcomes of management (particularly those external to the ecosystem), and (5) strives to balance diverse societal objectives that result from resource decision making and allocation. Additionally, because of its complexity and emphasis on stakeholder involvement, the process of implementing EAM needs to be (6) incremental and (7) collaborative'. The lack of a clear definition of ecosystem-based management enjoying general support may be why many authors leave the issue of definition aside

and focus on the core challenges, and steps that ecosystem-based management, including MSP, needs to consider (WWF 2017, 15).

Going beyond the issue of definitions, the real challenge and what managers commonly struggle with is the approach's practical implementation (Österblom et al. 2010, 1290). In practice, the diverse contexts in which an ecosystem approach is required or pursued, make a universal definition of concrete management measures that would constitute the operationalization of the ecosystem approach unrealistic and probably unhelpful. General guidelines like the Malawi Principles for the ecosystem approach are useful by providing an overarching frame of reference that can be supplemented by practical experience of the problems encountered and the lessons learned in implementing the approach in specific contexts and situations (Langlet and Rayfuse 2018a, 447).

As a particular problem has been identified that the concept of ecosystem approach lacks concrete guidance that allows balancing conservation and sustainable use of natural resources (Douvere 2008, 765) and that it contains concepts and principles that are too broad and complex (Ansong 2017, 66). In this it resembles the related concept of sustainable development which is often defined as entailing either 'soft' or 'hard' sustainability depending on whether it is understood to allow for a general weighing up of the ecological, social and economic dimensions or if it is premised on the ecosystem setting limits which all social and economic activities must respect (Gilek et al. 2018, 161). While the vague nature of notions associated with the ecosystem approach, such as 'ecosystem health' and 'ecosystem integrity' have been criticised for their lack of substance, this vagueness has also been identified as an important factor behind the broad acceptance of the ecosystem approach (Engler 2015, 295). The relative vagueness makes it necessary to identify and deal with potential value conflicts as well as inconsistent perceptions and expectations in the practical application of the approach.

In fact, many definitions of the ecosystem approach contain provisions indicating that management is to be 'within the limits of' or respecting the functions of the ecosystem, thus signalling that ecosystems impose restrictions on the volume and nature of human activities affecting them, although the detailed nature of those limits may be contested.

In an EU context is it noteworthy that the Marine Strategy Framework Directive (Directive 2008/56/EC) requires application of 'an ecosystem-based approach to the management of human activities, ensuring that the collective pressure of such activities is kept within levels compatible with the achievement of good environmental status', the latter being an environmental condition defined primarily through ecological criteria. The definition of the ecosystem approach endorsed by the parties to the Helsinki and OSPAR Conventions in a similar way sees the approach as a way to 'achieving sustainable use of ecosystem goods and services and maintenance of ecosystem integrity' (OSPAR/HELCOM statement 2003).

A related issue debated in the scientific literature is whether the ecosystem approach can be introduced gradually into existing management structures, or whether it inevitably implies a dramatic shift that requires completely new structures and processes. While Slocombe (1998, 487) finds that most ecosystem management goals cannot be achieved by incremental change but require 'fundamental qualitative changes in planning, management, and understanding' others give a more nuanced picture (Murawski 2007, 688) and the dominant view has been found

to be one embracing implementation of the ecosystem approach to management in an incremental and evolutionary manner (Engler 2015, 302). There is also wide agreement that the ecosystem approach can be implemented despite shortages of data or insufficient knowledge and that gradual learning and improvement are inherent to the approach (Murawski 2007, 684; Engler 2015, 302; UNEP 2011, 14).

1.2. Maritime spatial planning

Ecosystem-based marine spatial management has been described as 'an emerging paradigm of ocean management' (Katsanevakis et al. 2011, 808). Maritime spatial planning (MSP), perhaps the most elaborate form of spatial marine management, is widely seen as a tool enabling effective implementation of ecosystem-based marine management (Douvere 2008, 763; Maes 2008, 798; Domínguez-Tejo et al. 2016, 116).

Although spatial management of human uses of the sea is well established (shipping lanes, fisheries closure areas; marine protected areas etc.), it has traditionally been done on a case-by-case or sector-by-sector basis thereby making it hard to effectively coordinate various activities and largely ignoring cumulative impacts on ecosystems and their components (Katsanevakis et al. 2011, 808). Since the early 2000s, MSP has gained international traction and its focus has gradually shifted from managing marine protected areas (MPAs) to dealing with competing claims for ocean space in a much broader or more comprehensive manner. An important step in this development was the first international workshop on MSP as an instrument for ecosystem-based marine management convened in 2006 by the UNESCO Intergovernmental Oceanographic Commission (IOC). It resulted in the influential report 'Visions for a Sea Change' comprising examples of existing MSP processes as well as discussing preconditions and challenges for ecosystem-based MSP (Ehler and Douvere 2007).

There is no international legal framework explicitly regulating or prescribing MSP. Even though large parts of the United Nations Convention on the Law of the Sea (UNCLOS) and the system of jurisdictional zones that it establishes may be seen as a basic form of spatial planning for marine areas, these rules are primarily focused on allocating competences and only in very general terms provide for integrative management or the coordination of plans and activities needed for transboundary MSP.[3] However, MSP is being implemented around the world and is even compulsory for coastal EU member states according to the EU's MSP Directive (Directive 2014/98/EU).

In the Baltic Sea region, MSP-related projects have been pursued since the 1990s, particularly within the framework of the intergovernmental forum VASAB (Vision and Strategies Around the Baltic Sea). Also, HELCOM has been working with MSP for some time, and collaborated with VASAB in the elaboration of a regional framework for MSP in the Baltic. This work has inter alia resulted in the Baltic Sea Broad-scale Maritime Spatial Planning Principles. Among these principles are that MSP should have a long-term perspective and that MSP should be developed in a joint pan-Baltic dialogue with coordination and consultation between the Baltic Sea states. Whenever possible, maritime spatial plans should also be developed and amended with the Baltic Sea Region per-

3. On the role of the LOSC for marine spatial planning, see D Hassan and N Soininen 'United Nations Convention on the Law of the Sea as a Framework for Marine Spatial Planning' in D Hassan, T Kuokkanen and N Soininen (eds), Transboundary Marine Spatial Planning and International Law (Routledge, London, 2015) 60–84.

spective in mind (HELCOM/VASAB 2010, Principles 3 and 8).

According to an oft quoted definition originating from UNESCO, MSP 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 usually have been specified through a political process.' (Ehler and Douvere 2009, 18). The EU's MSP directive, which aims to promote the sustainable growth of maritime economies, the sustainable development of marine areas and the sustainable use of marine resources, contains a very general definition of MSP according to which it is 'a process by which the relevant Member State's authorities analyse and organise human activities in marine areas to achieve ecological, economic and social objectives'(Directive 2014/89/EU, art 3 (2)).

An important feature of MSP is its ability to capture and handle cumulative or aggregate effects on the marine environment and thereby, in principle, reduce the risk of unsustainable impacts (Collie et al. 2013, 2). The application of the ecosystem approach as part of MSP should also help safeguard ecological processes and ecosystem resilience, thereby securing the continued delivery of ecosystem services and the associated social and economic benefits (Gilliland and Laffoley 2008, 789). It must be noted that there is an important difference between comprehensive cross-sectoral ecosystem-based management and applying ecosystem-based policies to an individual sector (e.g. ecosystem-based fisheries management) (UNEP 2011, 11). Obviously, it is only the former that has the potential to manage the totality of important aggregate effects that human activities have on the ecosystem.

There is no 'one-size-fits-all' version of MSP (Collie et al. 2013, 2) and although it may be described as a rational process governed by principles operationalized through certain steps, MSP is essentially a social and political process that takes many forms and is characterized by the specific locality and context (Kidd and Shaw 2014, 1536). Against this background, some have rejected the idea of identifying 'best practices' for MSP and propose looking for 'good practices' (WWF 2017, 49) in recognition of the fact that what is best is unlikely to be the same everywhere.

It has been noted that it is hard to evaluate the relative effectiveness of different MSP frameworks and processes since they tend to pursue varying and complex objectives. Having attempted to evaluate different MSP processes based on 12 case studies around Europe, Jones et al (2016, 257) found that the diversity of objectives made a detailed structured analysis of the relative effectiveness of different MSP processes unfeasible. The same study also concluded that rather than being focused on achieving optimum trade-offs between a diversity of ecological, economic and social objectives MSP processes tended to be driven by a particular priority objective. Effectiveness therefore tended to be primarily based on the fulfilment of that objective. However, such a bias is hardly consistent with the aim of MSP according to common definitions.

2. Perspectives on the application of the ecosystem approach

This section synthesises and reflects on key perspectives relating to the application of the ecosystem approach found in the scientific literature and in certain policy documents. The section is structured in accordance with the 'key elements for applying the ecosystem-based approach in MSP' as set out in the HELCOM-VASAB Guideline with a few modifications reflecting the fact that some 'key elements' are seldom addressed as distinct topics in the literature but rather form part of more composite topics. Dealing with these key elements under a joint heading here avoids having to split interesting perspectives into more fragmented parts and also reduces the need for repetition.

2.1. Access to and use of best available knowledge and practice

It is widely acknowledged that successful development and implementation of ecosystem-based marine spatial management requires the use of best available science (Katsanevakis et al. 2011, 809) and access to the best available relevant information (Gilliland and Laffoley 2008, 789). All MSP processes depend on large amounts of data. Effectively applying an ecosystem approach to ensure that the planned activities can be carried out within the limits of the ecosystem makes such processes even more knowledge-intensive since it necessitates continuous monitoring of relevant ecosystems (Österblom et al. 2010, 1291). Inevitably, relevant data is often lacking or uncertain. Uncertainty also tends to be aggravated when dealing with complex ecosystem dynamics and interactions between natural and social systems as is typically required in ecosystem-based management. This means that scientific inputs into such management and policy processes are often associated with considerable uncertainty (Linke et al. 2014, 506).

The handling of uncertainty in marine environmental management tends to be highly intuitive, dependent on experts' judgment and producing results that might vary depending on e.g. training and background (Udovyk and Gilek 2013, 20). To deal with the intuitive nature of experts' judgment, the use of methods such as NUSAP (Numeral Unit Spread Assessment Pedigree) has been recommended in order to elaborate and clarify the knowledge base (Udovyk and Gilek 2013, 21). When managers have to rely on expert opinion, monitoring is needed to ensure that more accurate data can be generated and used to assess and improve management measures (Foley et al. 2010, 962). Encouragingly, Baltic Sea case studies show that the challenges associated with scientific uncertainty feature high on relevant political and scientific agendas (Linke et al. 2014, 506). However, while uncertainty is being recognised as an important factor in marine governance requiring specific strategies, uncertainties tend in practice to be less visible in management processes (Udovyk and Gilek 2013, 20). A lack of shared understanding of how uncertainties should be handled in science and policy processes is seen to impede communication between scientists and policymakers as well as among scientists themselves (ibid.).

Although generation of more data is often important, in ecosystem-based management uncertainty is typically not a problem that can be 'solved' through more studies and additional measurements since it follows from the unpredictability and complexity of the socio-ecological system itself.

Uncertainty about how complex ecosystems will respond to different external forces will always remain (Murawski 2007, 684). Ecosystem-based management also requires that knowledge be perceived as provisional and views management as a learning process where systems for incorporating the results of previous actions must be in place (Boström et al. 2016, 152).

Cases of scientific uncertainty in Baltic Sea environmental management studied by Udovyk and Gilek show little mention of uncertainties related to ecosystem unpredictability and the complexity of socio-ecological systems. This may lead to these challenges being underestimated and to underinvestment in attempts at comprehensively evaluating complex environmental risks and identifying appropriate management measure (Udovyk and Gilek 2013, 20). It has also been noted more generally that while there is typically insufficient information to completely understand any ecosystem, science is often not the limiting factor for ecosystem management. The main limitation tends to be lacking political will to make controversial decisions in uncertain circumstances (Murawski 2007, 684).

The challenges facing generation and use of knowledge in marine management are not confined to lacking or insufficient data but equally relates to issues such as what kind of knowledge is relevant and how it should be communicated and put to use in management processes. An often-recurring point made in the literature is the need for widening the perspective beyond a strict natural science or technical approach, which misses the multiple social dimensions that need consideration in ecosystem-based management. Although of fundamental importance, knowledge about ecosystem states and processes will not deliver such management without sufficient understanding of e.g. perspectives and preferences held by relevant groups or imbedded in social structures. The political challenges and societal implications inherent in many policy- and management processes need to be acknowledged and analysed (Boström et al. 2016, 563; Linke et al. 2014, 517).

Knowledge and data are traditionally generated through monitoring and research. However, although often seen primarily as an instrument for increasing the legitimacy and improving the efficacy of implementation of planning and other governance processes, stakeholder participation also has an important role as a means to gather knowledge and improve efficacy of policy implementation (Boström et al. 2016, 155). Disseminating monitoring and data gathering among a variety of actors can contribute to enhancing the quality of scientific processes by stimulating discussions on methods and methodologies, leading to scientific improvements (Boström et al. 2016, 162).

Core strategies and methods recommended for dealing with uncertainty, without looking for unrealistic quick fixes, include broadened forms of participation and decisions based on precaution (Udovyk and Gilek 2013, 20). If not managed properly, actual or perceived confusion about scientific uncertainty can be used by stakeholders to interpret scientific assessments in line with their own interests and to discredit the positions of other groups (Linke et al. 2014, 513). A guide from UNEP urges managers to '[e]mbrace uncertainty by making it apparent, but do not let

it distract attention from the things that are known' (UNEP 2011, 14). Broadening of stakeholder engagement can formalise existing but dispersed knowledge as well as legitimise the management process (Boström et al. 2016, 152). Among other things it helps bringing practical experiences of working with and within concrete ecosystems into the management process, a kind of knowledge that is vital when attempting to interpret and respond to complex ecosystem feedback (Boström et al. 2016, 152).

Clear communication of uncertainties between and among scientists and decision-makers is also needed for effective science–policy interactions and ultimately for improved credibility of environmental governance (Udovyk and Gilek 2013, 21). However, communication and cooperation between actors and stakeholders in ecosystem-based management processes can be quite challenging. Scientists and policymakers do typically not share a common working methodology or objectives. While science strives for objectivity, policy making is shaped by among other things societal expectations or economic interests (Zervaki 2018, 235). This can be particularly emphasized in ecosystem-based management since both environmental and social dimensions need to be recognized at many levels in the management process (Linke et al. 2014, 519). Recognising and deliberating about the differences can help handle the fact that, typically, 'managers want concrete numbers while scientists like to give more nuanced, qualitative expressions' and ease the tensions that may otherwise arise regarding how to deal with uncertainty and how and where to define the roles of science and policy respectively (Linke et al. 2014, 513).

Although there is wide recognition of the importance of applying a precautionary approach as a means to manage insufficient knowledge, case studies of MSP-processes revealed little actual information on how that had been done in practice and how it had impacted on decisions (Domínguez-Tejo et al. 2016, 126). The precautionary principle can also be defined and applied very differently in MSP processes (WWF 2017, 50), presumably with different outcomes. This is also reflected in shifting definitions of precaution in policy instruments. As a way of illustration, the 'Checklist Toolbox' for The Ecosystem Approach in Maritime Spatial Planning developed within the Baltic SCOPE project holds that 'activities that, according to current scientific knowledge, may lead to significant or irreversible impacts on the marine ecosystem and whose impacts may not be in total or in parts sufficiently predictable at present require a specific careful survey and weighing of the risks' (Schmidtbauer Crona 2017, 9), while a UNEP Guide to Marine and Coastal Ecosystem-Based Management finds that 'under the precautionary approach, the proponent of a new or expanded activity must show the activity is safe before it is fully allowed, shifting the burden of proof from the public sector to the private sector' (UNEP 2011, 16). One take on precaution is thus based on existing knowledge giving rise to expectations of potential significant or irreversible impacts, whereas the other is premised on a reversal of the burden of proof regarding an activity's environmental acceptability.

Another important dimension of knowledge needs for MSP is that data or knowledge regarding activities and conditions in the marine environment is not sufficient since there is a strong link between what happens at sea and in coastal communities and economies (Gazzola et al. 2015, 1162). There is a need to integrate coastal and sometimes further landwards activities in data collection and analysis for marine planning purposes.

The quality and credibility of marine environmental policies could also in many cases benefit from putting increased weight on socio-economic appraisals (Udovyk and Gilek 2013, 21) to supplement the currently dominant focus on natural science data. However, assessing the 'social dimension' in planning is often complicated by relevant and qualitative social data being less available than ecosystem data (Link et al. 2017, 1950) and where it is available it may lack a spatial dimension that would make it easily applicable in MSP-processes. Planners may therefore need to look for and try to integrate non-spatial information. Otherwise, important social dimensions such as cultural values may not be fully considered in management plans and policy decisions (Stithou 2017, 15). Problems associated with the lack of social data can be further compounded by planners' and other marine resource managers' limited familiarity with social science methods (Stithou 2017, 15).

2.2. Development and implementation of development alternatives and mitigation measures

It is widely held that MSP should be seen as an instrument for ecosystem-based management that enables management of human activities and their cumulative effects so as to promote sustainable development. But as already noted, there is limited agreement on what ecosystem-based management means more concretely when it comes to balancing environmental, economic and social objectives in specific cases (Gilek et al. 2018, 168). Diverging views in this regard have e.g. been revealed in the development of the HELCOM-VASAB Guideline for the implementation of ecosystem-based approach in Maritime Spatial Planning (Gilek et al. 2018, 173). Although there are many ways in which this balancing can be done, two 'model' views reflect what is often called 'weak' and 'strong' sustainability respectively. While the former allows for a more unrestricted balancing as long as the ecological, social and economic dimensions of sustainability are all considered the latter is premised on the continued functioning of (core) ecosystem features as a prerequisite for the other dimensions and thus as constituting a limit that may not be transgressed. In economic terminology this translates to whether natural capital (e.g. productive marine ecosystems) is wholly substitutable by manmade capital (e.g. infrastructure and technology) (Neumayer 2013, 1). Many influential definitions of the ecosystem approach, both in the literature and policy documents, more or less explicitly embrace the view that ecosystem-based management should result in human activities affecting ecosystems staying within ecological boundaries (Grumbine 1994, 31; OSPAR/HELCOM statement 2003; Directive 2008/56/EC). At the same time, it must be recognized that although scientific methods may be used to understand and monitor ecosystem structures and processes, what is a desirable state of the ecosystem is ultimately a matter of societal choice (Malawi principle 1), not least in the case of the Baltic Sea where the ecosystem and many of its components have been profoundly affected by human activities for a long time.

The challenges of implementing ecosystem-based management are thus, as previously noted, not only scientific but to a large extent political, legal and social. Main issues associated with planning and management that go beyond the collection and interpretation of scientific data include 'building a collective vision and objectives for EBM, designing metrics to evaluate the accomplishment of the objectives and creating ocean governance frameworks as well as bridging the gap between scientific concepts and operational goals.' (Espinosa-Romero et al. 2011, 575 references omitted).

In MSP as in other management processes, the costs and benefits of alternative scenarios need to be evaluated. Economic activities in the marine environment often have 'negative spatial externalities', i.e. unintended consequences beyond the area where the activity is undertaken, which call for intervention or at least cost-benefit assessment. Good management should ensure that activities produce a net gain (Katsanevakis et al. 2011, 815).

Halpern et al. (2012, 201-202) identify increased transparency concerning trade-offs among users and interest associated with alternative planning scenarios and how such trade-offs are assessed as an important improvement to many MSP-processes. Such transparency requires planners to identify ecosystem goods and services and the relative social and economic benefits with which they are associated for different groups. In such an exercise it needs to be evaluated if there are strong trade-offs between particular uses and services and also if perceived trade-offs are in fact real or if it is even possible to create win-win situations through appropriate management. Trade-offs may also look very different in the short, medium and long-term (Halpern et al. 2012, 201-202). A challenge for making transparent trade-off assessments is the need for assessing very different ecosystem services, such as aesthetic or cultural values, energy generation and national security considerations. The use of trade-off analyses would benefit from better guidance on how to best work with diverse 'currencies' (Halpern et al. 2012, 201).

A recurring point in the literature is the need for management processes to operate in accordance with clear goals and objectives (Slocombe 1998, 483) which should be achievable on appropriate time scales in ways that are seen as legitimate by the relevant stakeholders (Murawski 2007, 683). Before specific targets and measures can be elaborated high-level goals also need to be translated into clear, measurable, short-term goals (Katsanevakis et al. 2011, 809).

Although it may be challenging to find agreement on goals and objectives among diverse actors, once in place they should help reduce value conflicts. However, it has been questioned whether it is at all reasonable to assume that conflicts could be 'planned away' since the trade-offs normally required in planning decisions will create winners as well as losers (Jones et al. 2016, 260). Experiences from many planning processes show that spatial data needs to be linked to clear, specific objectives at an early stage of the planning process. There is otherwise a risk of planners and other interested parties focusing too strongly on the apparently easier and more tangible spatial data handling at the expense of engaging with the more challenging task of agreeing on objectives (Gilliland and Laffoley 2008, 792).

Espinosa-Romero et al. (2011, 576) emphasize the importance of making a clear distinction between fundamental and means objectives with the former reflecting the values of stakeholders while the latter are tools for achieving the fundamental objectives. If they are confused, resources may be spent on achieving means objectives while failing to achieve fundamental ones. Shifts in complex socioecological systems can make previously valid means objectives redundant or even counter-productive.

Integrated ecosystem assessment (IEA) has been described as central to ecosystem-based management. Espinosa-Romero et al. (2011, 575-576) define IEA as consisting of six steps: '(1) identification of objectives, threats to ecosystems and ecosystem management drivers; (2) development of indicators for ecosystem state; (3) establishment of thresholds for each indicator; (4) risk analysis to evaluate how

indicators respond to human and environmental disturbances and the probability that indicators will reach an undesirable state; (5) evaluation of management strategies to predict the effects of indicators; and (6) monitoring management strategy outcomes'. However, the authors caution that applying IEA without appropriate stakeholder involvement and indicators related to stakeholder objectives may lead to important values being overlooked or indicators being developed that lack usefulness for management decisions which need to consider stakeholder values (Espinosa-Romero et al. 2011, 576).

A way to reduce uncertainty regarding the outcomes of management actions in marine ecosystems governance in general and MSP in particular is to include redundancies and buffer areas as a kind of 'insurance policy' for protecting important ecosystem functioning and services (Foley et al. 2010, 962).

Redundancy in MSP allows for inevitable mistakes and enables learning to occur over time without the loss of valuable functions.

Although socio-economic considerations may be inevitable, it is important that ecological considerations and safety margins are essentially respected when designing MSP features that will allow species that disappear from one location to be replaced by recolonization in other places (Crowder and Norse 2008, 777). Particular consideration should be given in MSP to preserving and if necessary restoring key species important for community structure and functioning (i.e. keystone species, foundation species, basal prey and top predators). If they decline below certain functional thresholds significant decline in ecosystem services is likely to follow (Foley et al. 2010, 961).

The coupled socio-ecological systems characterised by non-linear dynamics and cross-scale interactions involved in marine resources management make it challenging to predict the outcome of management actions. Even beginning to effectively manage such systems requires a thorough understanding of the 'aggregate dynamics within and among resources, actors, and institutions across multiple scales' (Link et al. 2017, 1949). Link et al. (2017, 1950) recommend the use of mental or conceptual models to link human dimensions to ecological systems in a common analytical framework. Such models can facilitate participation by diverse stakeholders and also discussion by making socio-ecological systems more comprehensible. However, the same authors question the ability of 'governance' to produce predefined results with any certainty since governance in itself is as 'inherently uncertain and dynamic as the natural system' and also affected by numerous externalities (Link et al. 2017, 1949). Reflexive governance implies that problems often cannot be 'solved' but only handled and that new problems or trade-offs are likely to follow the implementation of management action. The core issue is thus not whether governance structures are able to solve problems but rather if they have the ability to deal with them continuously (Boström et al. 2016, 157).

2.3. Identification of ecosystem services

Identifying and managing ecosystem goods and services are commonly seen as part of ecosystem-based management (Arkema et al. 2006) and can also be a natural corollary to the integration of humans and human activities in the ecosystem. The identification of ecosystem goods and services and the social and economic benefits with which they are associated can be used to increase transparency concerning trade-offs among users and interests associated with alternative planning scenarios (Halpern et al. 2012, 201-202). However, warnings have been raised that placing the

notion of ecosystem goods and services at the core of management regimes risks perpetuating 'resourcism', valuing nature only as a source of resources for human consumption without serious concern for the integrity of the ecological systems themselves (Grumbine 1994). There are also concerns that the growing popularity and attention given to ecosystem services concepts may lead to them replacing comprehensive management approaches. Although ecosystem services may be useful tools for assessment they must not be seen as substitutes for implementing the ecosystem approach (Waylen et al. 2014, 1221). It has also been argued that the ecosystem services approach, although promising as a way to consider interactions between environmental and economic interests, 'is fundamentally problematic' because of the very diverging evaluation and prioritisation of socio-cultural values between different stakeholders and among the general public (Gilek et al. 2018, 187).

At the same time, the realization that the ability of (marine) ecosystems to provide goods and services on which people depend are seriously compromised by human activities can work as a call for sustainable ecosystem-based management based on ecological principles (Crowder and Norse 2008, 773; Foley et al. 2010, 957). The value of ecosystem goods and services associated with marine ecosystems can also make a strong case for including redundancies and buffer areas into MSP-frameworks as an insurance against losing those resources, not least in the light of the uncertainty associated with complex ecological processes (Foley et al. 2010, 962).

In many cases there is a lack of relevant or qualitative data needed for assessing the provision and enjoyment of ecosystem services. Who benefits and how from specific ecosystem services are often not sufficiently known and may be hard to establish due e.g. to inconsistent collection of social, economic, and ecological data and underrepresentation of social scientists in planning processes (Stithou 2017, 18). Case studies also show that economic information tends to prevail over social counterparts within MSP processes. Impact assessments of planning areas often contain rather comprehensive economic context while suffering from significant knowledge gaps in terms of social data (Domínguez-Tejo et al. 2016, 126). There should thus be a particularly strong case for strengthening the collection and use of social data in relation to MSP processes as well as the methods employed. Katsanevakis et al. (2011, 818) recommend seeking alternatives to monetary valuation, such as Environmental Impact Assessment (EIA), Opinion Polling (OP) and Multi-Criteria Analysis (MCA). There is also a need for better guidance on how to implement socioeconomic evaluation into marine spatial management (Katsanevakis et al. 2011, 816).

2.4. Analysis and management of anthropogenic effects and interactions between human activities and the ecosystems, incl. cumulative effects

As noted by Grumbine in 1994, managers can 'no longer discount the effects of humans in ecosystems' (Grumbine 1994, 29). The effects that ecosystems and changes in such systems have on humans and social structures is also becoming increasingly evident, not least in the Baltic region where eutrophication, dioxins, and dramatic shifts in the commercially interesting fish fauna provide good examples. Considering humans as parts of the ecosystem is seen as central to ecosystem-based management (Domínguez-Tejo et al. 2016, 116). At the same time, concerns have been raised that inclusion of humans as part of the ecosystem could justify a prioritization of short-term (often economic) interests

and that it makes strict legal requirements to prevent over-use essential (Bastmeijer 2018, 216).

A recurring theme in the literature on MSP and ecosystem-based marine management more widely is the need to better integrate and consider human dimensions, also beyond those that are easily measurable in economic terms (Domínguez-Tejo et al. 2016, 126). Gilek et al. (2018, 186-187) find that although the ecosystem approach is often described as a comprehensive sustainable development approach its actual implementation in MSP processes tends to be primarily concerned with ecological and economic values and trade-offs between these. They even identify the need for a complementary 'Socio-cultural Approach' (SA) to better address the manner in which 'issues such as participation, procedural justice, social inclusion and knowledge pluralism could be focused and promoted in MSP.' (Gilek et al. 2018, 189). Domínguez-Tejo et al. (2016 p. 126) identify a lack of 'frameworks, tools and data' to standardize human activities and assess cumulative effect over relevant scales as an important MSP challenge and also find that socio-economic benefits are often presented in the form of narratives by concerned businesses and other economic actors.

A key component of ecosystem-based management should be to ensure that the combined pressures of different human activities are kept within safe limits so as not to disrupt important ecosystem functions. But determining what factors in combination constitute a critical pressure, or what cascade effects may follow from apparently limited impacts puts ecosystem knowledge to the test. The relevant literature proposes the use of e.g. 'Integrated Ecosystem Assessment (IEA), pressure analysis (dPSIR), evolutionary impact assessment, integrated ecosystem-based risk assessment and network analysis between human use and food webs' for dealing with cumulative impacts on the marine environment but there is still limited experience of turning these into management practice (Rodriguez 2017, 193).

2.5. Principles and processes for participation and communication

Participation has been described as the 'sine qua non for successful MSP projects' since effective marine spatial planning is dependent on public trust in its ability to balance various interests (Zervaki 2018, 233). Participation is also seen as fundamental to the ecosystem approach as both a knowledge acquisition process and as a means of ensuring the engagement of concerned actors, thereby enhancing the understanding and acceptance of policies and measures. Issues relating to participation are clearly among the most prevalent themes in the MSP and ecosystem approach literature.

Although proper involvement of stakeholders and the wider public may be critical to a successful outcome of MSP processes (Douvere 2008, 766), designing and operating truly inclusive processes are not easy. As noted by Grumbine 25 years ago, '[m]anagement through dialogue and cooperation at local and regional levels will be quite different from management imposed bureaucratically' and it gives raise to questions such as if and how a shared understanding can be formed with very diverse groups in terms of both knowledge and values and what the role of 'experts' should be if all parties have a voice in decision-making (Grumbine 1994, 33).

Assessing stakeholder participation and communication of environmental risk governance concerning the Baltic Sea, Boström et al. (2016, 63) have found 'a striking lack of institutionalised structures for stakeholder participation and communication, particularly at the regional level'

and also noted a significant gap between ideal scenarios and practice with respect to how stakeholder participation and communication is done. This relative lack of pre-existing structures and practices makes it particularly important to give due consideration to the design of stakeholder involvement in MSP processes.

When people are invited to participate, it is imperative that the participation can be genuine. Marine governance problems need to be formulated in such a way that stakeholders can contribute to resolving them and also see that their participation is meaningful and can affect the outcome (Gilek et al. 2018, 165).

Stakeholders must not be disempowered by only being presented with readymade alternatives preferred by the relevant agencies (Grumbine 1994, 34). The legitimacy of MSP plans also requires that background information as well as the rationale behind important planning decisions are communicated in a transparent and clear way (Backer 2015, 147). Experience shows e.g. that fishers can feel excluded from policy processes, such as the development of maritime spatial plans, because the language used by scientists is not accessible to them (Gilek et al. 2018, 182).

If stakeholder participation is enhanced and the number of actors increases there is likely to follow a perception of crowdedness and decision-making being made harder. This can result in actual decision-making shifting back to other forums to maintain control or efficiency. While this tension cannot be eliminated it needs to be recognised and consciously managed through organisational and design measures (Boström et al. 2016, 563). To avoid being bogged down in endless participatory processes it has been deemed essential to apply 'strong leadership and binding timelines' (UNEP 2011, 36).

There may have to be a selection of stakeholders with whom to engage in the MSP process. Criteria developed for assessing potential stakeholders include the relationship (economic, social or cultural) to the resources of the specific area at issue, the continuity of this relationship and the positive or negative impact of changes to the use of the area and its resources. Stakeholders' ability to provide scientific or local knowledge can also be an important factor (Zervaki 2018, 234).

Local users have first-hand knowledge of the ecological as well as the social systems at issue and their involvement may be valuable already in the MSP design phase. However, involvement of stakeholders in the design phase necessitates early provision of scientific guidance in an accessible form and the risk that such guidance will be ignored since it is viewed as a threat to user activities should not be disregarded (Rassweiler et al. 2014, 1). Experience shows that incorporation of local or indigenous knowledge in the management of ecosystems can be quite difficult but also that it may improve conservation outcomes (Gazzola et al. 2015, 1165). Users as well as local communities and scientists should not only provide information but also get information back from the process in a 'continually enriching loop' (UNEP 2011, 40).

Important is also that stakeholder engagement needs to continue throughout the process and even after decisions have been made (Grumbine 1994, 34; Gilliland and Laffoley 2008, 794). At the same time, consideration must be given to keeping the costs for participation in proportion to the activities being undertaken (Gilliland and Laffoley 2008, 795). The design of participatory processes needs to remain flexible with 'multiple options in the participatory repertoire' since what works well in one context may not do so in another (Link et al. 2017, p 1951). It must also be recognized

that constitutional frameworks and administrative systems relevant to MSP participation varies between countries inevitably affecting the design of participation (Zervaki 2018, 232).

A perceived benefit from increased involvement of stakeholders is that it could place more weight on socio-economic appraisals, which currently tend to be somewhat marginalized in many marine management processes (Udovyk and Gilek 2013, 21). However, there is also the risk that economically stronger or more well-organized interests become disproportionally influential or even dominate participatory processes or structures (Wakefield 2018, 302). Concerns have also been raised that organizing participation in planning processes as direct involvement of interest groups and stakeholders at the expense of the general public could actually weaken democratic control over MSP (Backer 2015, 147). Increased influence by strong actors, be they industry or environmental NGOs, can also result in marginalization of communities who have a strong cultural connection to the sea without being represented by those actors (Gazzola and Onyango 2018, 473).

2.6. Degree of subsidiarity and coherence in planning

While the Baltic Sea can be viewed as one ecosystem, it needs for management purposes to be broken down into smaller, more manageable units, making marine management 'a question of delimitations.' (Westholm 2018, 117). To effectively implement an ecosystem approach both ecological and social systems need to be defined in such a way as to render them manageable. Geographic areas and institutional responsibility must be carefully delineated. These choices should be thoroughly considered and based on the best available understanding of both the relevant ecological and social systems (Langlet and Rayfuse 2018a, 447).

Under the ecosystem approach meaningful ecosystem boundaries should constitute the starting point for any marine plans but planning units also need to reflect the reality of socio-political and administrative considerations and find a sensible balance between these (Gilliland and Laffoley 2008, 789). A good illustration of this conflict is the EU's MSP directive the application of which is based on marine regions, i.e. a division of the EU's marine areas based on scientific criteria but which has been 'stripped of this scientific understanding' by excluding coastal waters from its area of application, an exclusion based in politics without scientific rationale (Westholm 2018, 133) 'Nestedness' can be a way to make the MSP reflect the multiscale nature of ecosystems. A hierarchical approach that addresses different issues at different levels and where each level can provide context for the one below also offers the most effective and clear management structure (Gilliland and Laffoley 2008, 789). To enhance cooperation and coordination in ecosystem-based marine management in the Baltic Sea region Hegland et al. (2015, 20) find that the 'nested' nature of Baltic Sea governance must be acknowledged and call for coordination structures that respect the principle of subsidiarity and make use of stakeholder involvement as a mean for coordination across sectors.

According to Foley et al. (2010, 962), spatial delineations of management measures within a planning area should be based on: '(1) explicitly identified ecosystem and socioeconomic goals;(2) an assessment of the ranges, types, and intensities of human uses that are compatible with those goals; and (3) use rules that favor compatible uses.' At the same time Kidd and Shaw (2014, 1537) point to the trend towards 'fuzzy' or 'soft' planning ideals in terrestrial planning, meaning that objectives, action and boundaries are loosely defined and continuously evolving in a dialogue

between actors. They find this approach to planning to resonate with the adaptive management ideas of MSP.

As to level of management it should be acknowledged that there is unlikely to be one 'best' or 'most appropriate' level of MSP or marine management in general (Westholm 2018, 118). Instead that will vary depending on context, the specific issue and the general structure and logic of the governance and the wider socio-economic system in each country or region. In addition to level of management, the nature and main focus of the institution that is given responsibility for a particular management or planning task is also likely to have an impact on the outcome since institutions tend to have their distinct logics and priorities (Westholm 2018, 135; Österblom et al. 2010, 448).

It must be recalled that many important pressures affecting the achievement of MSP objectives are typically external to the MSP area. These include e.g. runoff from agriculture, industry and waste water (Domínguez-Tejo et al. 2016, 126). An overlap of marine and terrestrial planning could encourage integration between these two planning spheres and related institutions (Gilliland and Laffoley 2008, 790). Integrating the planning and management of activities on land and at sea and fully considering so called 'land-sea-interaction' is challenging. While integration of planning regimes across the land-sea boundary is desirable, land-sea interactions are complex and require effective planning and management (Kidd and Shaw 2014, 1538). Among the things that can hamper plan integration are different perspectives and technical knowledge between planning constituencies. In this respect, capacity building for planning professionals to develop 'legal, cultural and geographical knowledge of each other's space' may be needed (Smith et al. 2011, 300).

To achieve intended planning outcomes, it must be considered that implementation of public policy rarely rests in the hands of public authorities alone and that implementation of plans is 'a social process entailing contact, communication, and negotiation, as well as incentives or disincentives to encourage particular types of behaviour and action.' (Kidd and Shaw 2014, 1539) Consideration of how and by whom plans are to be implemented should permeate the planning process and may also have to be reflected in the plans themselves (ibid.).

2.7. Flexibility and adaptability of the planning

It is widely recognised that marine spatial planning is an iterative process and requires recurring adaptation in the light of new knowledge and experiences gained from implementing policy measures (Katsanevakis et al. 2011, 809; Gilek et al. 2018, 166). That knowledge is provisional and management is seen as a learning process is also central to ecosystem-based management (Grumbine 1994, 31).

The complexity and dynamism of social-ecological systems mean that uncertainty is inevitable and that not everything can be correctly predicted or modelled. This makes it particularly important to focus on getting the process right since that will allow for continuous learning and improvement (Collie et al. 2013, 8).

The particular complexity of planning in shared ecosystems such as the Baltic Sea where many actors need to align to shared objectives without losing operative flexibility has prompted Gilek et al. (2018, 166) to describe the main task for MSP managers and policymakers as being to 'manage the capacity of social-ecological systems to cope with and respond to change'.

There is no one right way of doing MSP or implementing ecosystem-based management. MSP regimes reflect the social and political context within which they operate and will inevitably be highly diverse (Kidd and Shaw 2014, 1537). All management systems will also have to be adjusted in relation to changing ecological, technological, social and political contexts (Halpern et al. 2012, 203).

Plans need to be reviewed in response to e.g. new data, changed levels of human activity or changes in the policies directing the planning effort. The plan review period needs to strike a balance between keeping the plans sufficiently up-to-date so as to make them relevant and useful while enabling their effect to be assessed and (hopefully) benefits to realise. The cost of undertaking a thorough review must also be kept at a reasonable level. Gilliland and Laffoley (2008, 791) find the typical period between cyclical reviews to be 5–7 years. However, more important than the actual review period should be to have a system for considering new information and changing circumstances outside of the formal revision process and also to align the duration of the plan with the expected relevance of its objectives (ibid.). Temporal scales have been found to be challenging in spatial planning generally. Case studies on land planning reveal that while spatial scale tends to be sufficiently considered, planning timeframes were too short to handle issues related to ecosystem restoration, processes that often take decades to complete thus requiring a long-term approach (Phillips and João 2017, 470).

To make the best possible use of the resources invested in planning any policy interventions, it is recommended that planning processes are evaluated as they occur so that lessons can be drawn without delay when the processes finish, allowing the data and experiences gained to be incorporated into future processes and measures (Halpern el al. 2012, 201). Evaluating plans and associated measures requires indicators covering relevant ecological, social and economic factors affected by the plan implementation. In combination with thresholds such indicators, provided that they are sufficiently specific, responsive and operate at appropriate timescales, can be used to assess achievement of management objectives and facilitate adaptive management towards such objectives (Katsanevakis et al. 2011, 812).

3. Principles and tools for ecosystem-based marine management in the Baltic Sea region

3.1. Malawi principles

As previously mentioned, the Malawi Principles were elaborated within the framework of the CBD and subsequently endorsed by the parties to the convention in 2004 (CBD, COP Decision VII/11). The principles reflect most of the criteria proposed for ecosystem management in the scientific literature and has become an important reference point in discussions about ecosystem management. Interesting to note is that lawyers and social scientists generally attach much more importance to the Malawi Principles when discussing what the ecosystem approach is and how it should be applied than do natural scientists. The latter tend to be more interested in what ecosystem approach principles and methods have most support in the scientific literature. The actual principles, which are supplemented by short explanations in the original CBD document, are these:

1.	Management objectives are a matter of societal choice.
2.	Management should be decentralized to the lowest appropriate level.
3.	Ecosystem managers should consider the effects of their activities on adjacent and other ecosystems.
4.	Recognizing potential gains from management there is a need to understand the ecosystem in an economic context, considering e.g. mitigating market distortions, aligning incentives to promote sustainable use, and internalizing costs and benefits.
5.	A key feature of the ecosystem approach includes conservation of ecosystem structure and functioning.
6.	Ecosystems must be managed within the limits to their functioning.
7.	The ecosystem approach should be undertaken at the appropriate scale.
8.	Recognizing the varying temporal scales and lag effects which characterize ecosystem processes, objectives for ecosystem management should be set for the long term.
9.	Management must recognize that change is inevitable.
10.	The ecosystem approach should seek the appropriate balance between conservation and use of biodiversity.
11.	The ecosystem approach should consider all forms of relevant information, including scientific and indigenous and local knowledge, innovations and practices.
12.	The ecosystem approach should involve all relevant sectors of society and scientific disciplines.

The relative brevity of the principles makes them accessible and good as inspiration and points of reference, but less useful as guidance for the practical operationalisation of the ecosystem approach.

3.2. The HELCOM-VASAB Guideline for the implementation of the ecosystem-based approach in MSP in the Baltic Sea area

The Guideline was jointly developed by VASAB and HELCOM, formally adopted by VASAB and soon after approved by HELCOM, both decisions being made in June 2016.

The Guideline is presented as 'a first step towards a common understanding on how the ecosystem-based approach can be applied in drawing up a spatial plan for a sea area in accordance with spatial planning legislation in force in the Baltic Sea countries.' (HELCON/VASAB Guideline) It is intended to be tested in practice and subsequently amended as may be needed according to experiences gathered.

A significant part of the document 'Guideline for the implementation of ecosystem-based approach in Maritime Spatial Planning (MSP) in the Baltic Sea area' is in fact a short summary of policy documents and pieces of international and EU law of relevance to environmental management of the Baltic Sea (e.g. the Helsinki Convention, the HELCOM Baltic Sea Action Plan and the EU's Marine Strategy Framework Directive and Maritime Spatial Planning Framework Directive). The main contribution of the Guideline is the identification of nine 'key elements' of the ecosystem-based approach that are seen as an operationalization of the ecosystem-based approach in line with the Malawi Principles. The key elements are:

Best available Knowledge and Practice:	The allocation and development of human uses shall be based on the latest state of knowledge of the ecosystems as such and the practice of safeguarding the components of the marine ecosystem in the best possible way.
Precaution:	A far-sighted, anticipatory and preventive planning shall promote sustainable use in marine areas and shall exclude risks and hazards of human activities on the marine ecosystem. Those activities that according to current scientific knowledge may lead to significant or irreversible impacts on the marine ecosystem and whose impacts may not be in total or in parts sufficiently predictable at present require a specific careful survey and weighting of the risks.
Alternative development:	Reasonable alternatives shall be developed to find solutions to avoid or reduce negative environmental and other impacts as well as impacts on the ecosystem goods and services.
Identification of ecosystem services:	In order to ensure a socio-economic evaluation of effects and potentials, the ecosystem services provided need to be identified.
Mitigation:	The measures are envisaged to prevent, reduce and as fully as possible offset any significant adverse effects on the environment of implementing the plan.
Relational Understanding:	It is necessary to consider various effects on the ecosystem caused by human activities and interactions between human activities and the ecosystem, as well as among various human activities. This includes direct/indirect, cumulative, short/long-term, permanent/temporary and positive/negative effects, as well as interrelations including sea-land interaction.
Participation and Communication:	All relevant authorities and stakeholders as well as a wider public shall be involved in the planning process at an early stage. The results shall be communicated. Integrated Coastal Management (also known as ICM), as an informal and flexible instrument, can support the process of participation and communication.
Subsidiarity and Coherence:	Maritime spatial planning with an ecosystem-based approach as an overarching principle shall be carried out at the most appropriate level and shall seek coherence between the different levels.
Adaptation:	The sustainable use of the ecosystem should apply an iterative process including monitoring, reviewing and evaluation of both the process and the outcome.'

The Guideline document also comprises a short section on available knowledge on ecosystems of the Baltic Sea and a description of the maritime spatial planning process. To this is added a table describing the implementation of the ecosystem-based approach in the maritime spatial planning process by linking general steps in the MSP planning procedure with corresponding elements of the ecosystem-based approach.

To what extent the 'key elements' and the table linking MSP steps to ecosystem approach elements are in line with views and recommendations in the scientific literature and in relevant policy documents regarding how to define and operationalize the ecosystem approach is discussed in a subsequent section.

4. Comparison and Conclusions

4.1. The practical application of ecosystem-based MSP in the Baltic Sea region in relation to ecosystem approach principles

Since this study is confined to existing, published sources, it is not possible to make any comprehensive comparison of national MSP implementation in the Baltic Sea states. That would have required collecting extensive volumes of material from the various national processes and probably also additional research methods. There are, however, some existing studies on which to draw in order to gain general insights into the application of the ecosystem approach in the region. These are partly focused on MSP and partly reflect experience from marine environmental governance more broadly, thus describing the context or preconditions for applying the ecosystem approach in MSP, rather than actually describing the MSP process.

It should initially be noted that the Baltic Sea region has been described as 'an exemplar of best practice in terms of its attempts to plan in an integrated and holistic manner for a maritime macro region' (Kidd and Shaw 2014, 1539) and also as a pioneer in its attempts more generally to implement ecosystem-based marine management through existing and new institutions (Hegland et al. 2015, 21). The different projects carried out in the region to explore the preconditions and challenges for and provide support to the operationalisation of transboundary MSP have also gained much recognition. HELCOM and VASAB have been key forums for promoting this development (Backer 2015, 141).

Despite this, a lack of coordination has been identified between, among others, governing bodies of Regional Sea Conventions and the member states (Hegland et al. 2015, 15). Also, the ecosystem approach has only to a limited extent been found to have translated into changed practises (Boström et al. 2016, 161), with many working with marine environmental governance struggling to turn concepts such as sustainability, uncertainty, and precaution into feasible operations (Boström et al. 2016, 168). The handling and communication of uncertainties is a field where environmental governance in general in the Baltic Sea region has often been shown to be unreflective or inattentive to aspects other than the purely technical (Udovyk and Gilek 2013, 20).

Some relevant insights into the actual performance of national MSP processes can be gained from the General Ecosystem Approach Checklist as filled out by the Baltic Scope partners and set out in the report 'The Ecosystem Approach in Maritime Spatial Planning - A Checklist Toolbox' (Schmitbauer Crona 2017). An analysis of the answers provided in the checklist reveals e.g. the absence of a clear common interpretation of the precautionary principle in MSP and differences in relation to how uncertainty is addressed in the decision-making process (Schmitbauer Crona 2017, 11). A similar variation between the Baltic Sea states was identified with respect to which stakeholders are involved at which stages in the MSP process (Schmitbauer Crona 2017, 13).

The literature dealing with Baltic Sea MSP also indicates the existence of quite significant differences between how MSP is implemented in Baltic countries, e.g. in relation to what is considered as the appropriate level for MSP or its sub-processes and what kind of body is vested with the responsibility to implement MSP (Westholm 2018, 135). The same applies in relation to the view taken on sustainability and knowledge integration (Gilek et al. 2018, 179-181).

If a higher level of consistency is desirable, which seems reasonable considering the extensive practical interconnections of national MSP in such a small and intensively used area as the Baltic Sea, more coordination is needed. A 'soft' way of achieving, or at least promoting this would be through more extensive and substantive guidance.

4.2. The HELCOM-VASAB Guideline and the Malawi Principles

The relative abstractness and shortness of detail of the Malawi Principles make it hard to use them for assessing other documents beyond checking that all elements of the principles are also recognised in the material at hand, i.e. in this case the HELCOM-VASAB Guideline. What should be noted in this regard is that the key elements set out in the Guideline are intended as an operationalization of the ecosystem-based approach in line with the Malawi Principles. In the following it will be analysed to what extent the Guideline covers all Malawi principles, and if so, how the principles are reflected or elaborated.

That the objectives of management of land, water and living resources are a matter of societal choices (Malawi Principle 1) is not explicit in the 'key principles' but is reflected e.g. in the notion of 'Alternative development', which necessitates the evaluation of different options against societal values (including those relating to the ecosystem). That management should be decentralized to the lowest appropriate level (Malawi Principle 2) is merely reiterated in the 'key principles' and besides noting that '[d]ifferent planning levels usually have different tasks. More general plans can guide more detailed planning on a lower level' there is little information or guidance provided on challenges associated with choice of level for different aspects of MSP. As regards Malawi Principle 3, that ecosystem managers should consider the effects (actual or potential) of their activities on adjacent and other ecosystems, this is not clearly found in the Guideline but is related to the need, mentioned in the 'key principles', to consider various effects on the ecosystem including indirect effects and sea-land interaction. This implies that terrestrial ecosystems could be considered. Since it is far from obvious what to consider as one ecosystem in a management context (Langlet 2018, 279), it is also hard to judge when effects on other ecosystems are in fact considered or should be so. That there is usually a need to understand and manage the ecosystem in an economic context (Malawi Principle 4) is recognized in the 'key principle' holding that ecosystem services need to be identified. What methods can or should be used for that purpose is not addressed in the Guideline.

By referring to the 'practice of safeguarding the components of the marine ecosystem in the best possible way' the Guideline links to Malawi Principle 5 on the maintenance of ecosystem services being a priority target. It also follows from the table that natural resources should be used sustainably, respecting the capacity of ecosystems to respond to human-induced changes. This can also be seen to reflect Malawi Principle 6, i.e. that ecosystems must be managed within the limits of their functioning. That the ecosystem approach should be undertaken at appropriate spatial and temporal scales (Malawi Principle 7) finds little expression in the Guideline, except for a mentioning that short and long-term effects and sea-land interactions should be considered. This also has relevance for Malawi Principle 8, concerning varying temporal scales and the fact that objectives for ecosystem management should be set for the long term. However, it is also clear from the table on implementation of the ecosystem-based approach in the MSP process that both short- and long-term goals should be iden-

tified and decided on. Malawi Principle 9, that management must recognize change as inevitable is not explicit in the Guideline but is reflected in the key principle on adaptation, which holds that the sustainable use of the ecosystem should apply an iterative process including monitoring, reviewing and evaluation of both the process and the outcome. That the ecosystem approach should seek the appropriate balance between, and integration of, conservation and use of biological diversity (Malawi Principle 10) is reflected in the 'key principle' calling for reasonable alternatives to be developed to find solutions to avoid or reduce negative environmental and other impacts. What constitutes a reasonable balance is not further elaborated beyond reference to 'good environmental status' of the marine environment as an objective of MSP.

That the ecosystem approach should consider all forms of relevant information, including scientific and indigenous and local knowledge, innovations and practices and involve all relevant sectors of society and scientific disciplines (Malawi Principles 11 and 12) finds expression in the 'key principle' on Best available Knowledge and Practice ('the allocation and development of human uses shall be based on the latest state of knowledge of the ecosystems as such and the practice of safeguarding the components of the marine ecosystem in the best possible way') and that on Participation and Communication ('All relevant authorities and stakeholders as well as a wider public shall be involved in the planning process at an early stage. The results shall be communicated.')

Overall there seems to be no major differences in how the ecosystem approach is understood in the Guideline and in the Malawi Principles, in particular not since the Guideline is intended as 'an operationalization of the ecosystem-based approach in line with the Malawi Principles' and thus reasonably must be interpreted and applied in the light of the Principles. The brevity of the Guideline makes it hard to see that it adds much substance to the Malawi Principles. What it does is to partly add a particular focus, e.g. by being more explicit on alternative development. The Guideline also, through the table, adds some clarity with respect to how the elements are to apply in MSP as a process and also regarding the order of different steps.

4.3. The HELCOM-VASAB Guideline relating to developments in the literature

As mentioned above, the brevity and lack of substantive elaboration of the different steps and concepts mentioned in the Guideline, also noted in Gilek et al. (2018, 172), make it hard to compare it with a body of literature that often aims at testing and contesting concepts and practices at another level of detail or engages with competing objectives and assumptions present in most processes aiming to operationalise the ecosystem approach. Nevertheless, the following section sets out some recommendations on how the Guideline could be made to more clearly reflect important perspectives in the literature surveyed.

Overall, the Guideline deals to a very limited extent with how to manage conflicts or opposing perspectives relating to values and objectives, or how to overcome lacking trust or understanding between MSP actors.

In large parts the Guideline has more the character of a checklist than a help to reflect constructively on practical and value related challenges. Presenting a more fundamental remake of the Guideline in this respect is beyond the scope of this report. What will be done is to point to areas where the Guideline could rather easily be enhanced through additions or revisions consistent with its current character but still potentially making it a better tool for reflective application of the ecosystem approach.

Best available knowledge and practice

With respect to the first 'key element' of the Guideline, i.e. the one dealing with best available knowledge and practice, it is, as has also been pointed out by Gilek et al. (2018, 175), striking that nothing is said about the potential role of local knowledge. It ought to at least be mentioned that local knowledge can be an important source of information about ecosystems and not least about the social system with which the ecosystem is interlinked. In light of the wealth of both scholarship and different reports that underscore the importance of enhancing data and knowledge about 'the human dimension' of ecosystem management, it is problematic that this is not clearly reflected in the Guideline. The existing statement that 'the allocation and development of human uses shall be based on the latest state of knowledge of the ecosystems as such and the practice of safeguarding the components of the marine ecosystem in the best possible way' misses the important point that it is not only knowledge of the practice of safeguarding the components that is needed, but equally much knowledge about the perceptions, values and practices that drive people to act in ways that may or may not be consistent with safeguarding the marine ecosystem. Many would also argue that knowledge is needed about the relative value attributed by different groups to various functions and effects of the ecosystem (ecosystem services) in order to 'ensure a socio-economic evaluation of effects and potentials' as instructed by the Guideline.

Precaution

A recurring concern in the synthesised literature is that of uncertainty and how that is handled within MSP or other environmental management processes aiming to apply an ecosystem approach. Apart from a reference to identification of 'the existing knowledge base and also gaps in knowledge' there is currently little trace of this in the Guideline. It is evident from the literature that uncertainty is inherent to the management of complex socio-ecological systems and not a problem that can be solved. Rather it calls for transparency and careful management so as not to undermine trust in the process, or at least in the scientific basis for it, or obfuscate the interface between science and policy.

A core part of managing uncertainty must be precaution. The 'key element' dealing with precaution briefly mentions that certain activities 'whose impacts may not be in total or in parts sufficiently predictable at present require a specific careful survey and weighting of the risks'. In addition to reflecting a strikingly soft version of precaution, this provides little guidance on how to do this or the expected outcome. The Guideline should aim to contribute to a more deliberate and consistent application of precaution.

Preferably, the inherent nature of uncertainty in the management of socio-ecological (marine) systems should be made clear, as should the attendant need for integrating preauction into management processes in a structured manner. This should be coupled with a clearer definition of preauction, incorporating elements of internationally recognized definitions such as the one found in Principle 15 of the 1992 Rio Declaration on Environment and Development. The need for clear communication of uncertainties between and among scientists and decision-makers should also be emphasised and means for improving this communication could be proposed. The Guideline may also point to other strategies or instruments that can be employed to manage uncertainty, including the role of redundancy in MSP for avoiding the loss of important values due to unforeseen events or consequences.

Alternative development

With respect to alternative development there seems to be much potential for enhancing the role of the social dimension of MSP. What is now stated in this 'key element', namely that '[r]easonable alternatives shall be developed to find solutions to avoid or reduce negative environmental and other impacts as well as impacts on the ecosystem goods and services' gives little cue for engaging with the social and cultural aspects of development alternatives. The importance of doing so should be made explicit and tools that may be used for this purpose should be identified in the Guideline. Inspiration could perhaps be had from the WWF assessment of the integration of the ecosystem approach into UK and Ireland Marine Spatial Plans, which poses in its ecosystem approach checklist the question: 'Does the MSP plan and process allocate development based on environmental criteria, as well as economic and social factors?' (WWF 2017, 70).

Increased transparency concerning trade-offs among users and interest associated with alternative planning scenarios is seen as important to successful and legitimate MSP processes, something that is not currently seen in the Guideline. Analyses of trade-offs can be sensitive and contentious, but transparency can also allow a clearer and more elaborate process aimed at compensating those who actually stand to lose from planning decisions as well as identify perceived losses that may be based on misconceptions or faulty assumptions. The importance of having transparent structures for both assessing and communicating trade-offs in MSP processes should be made explicit in the Guideline.

Identification of ecosystem services

When discussing ecosystem services, it is important to define their role in the weighing up of interests in the MSP process. The main two criticisms identified here, i.e. that ecosystem services value nature only as a source of resources for human consumption, and that there are likely to be important differences in how groups of stakeholders evaluate and prioritize between ecosystem services need to be properly addressed in the Guideline. Ecosystem services can be useful e.g. for increasing transparency concerning trade-offs, but should be clearly framed as one instrument within a comprehensive management structure.

Mitigation

In order to mitigate adverse environmental effects, it is important to understand risks and reduce uncertainties. By including redundancies in MSP processes, ecosystems may enjoy a greater protection. Including redundancies and also a mentioning of considerations of key species for ecosystem structure and functioning would make the key element on mitigation more concrete and useful. In relation to mitigation it needs also to be emphasized that the ecosystem approach, including in the definition endorsed by HELCOM, should result in human activities affecting ecosystems staying within ecological boundaries.

Relational understanding

This 'key element' relatively well reflects the important aspects found in the relevant literature. Most of the challenges in regard to this are found in the implementation phase. Since the management of e.g. land-sea interactions is seen as quite challenging, a valuable addition could be to indicate methods and mechanisms that have been found to facilitate the identification, monitoring and management of various effects and interactions across traditional management and planning areas. Among other things, the need to integrate coastal and sometimes further landwards activities in data collection and analysis for marine planning purposes could be made clear.

Participation and communication

The 'key element' participation and communication is also one where it would be advisable to provide some more guidance in line with the extensive discussion on this topic in the scientific literature and policy documents. The need for designing participatory processes so as to make them accessible to a wide diversity of people, including the general public in coastal communities is a recurring theme. The importance of facilitating real two-way communication as part of such processes, e.g. by consciously dealing with different terminologies and preconceptions regarding whose views are valued is also often stressed. It should be considered how these aspects could be incorporated into the Guideline. The same goes for the need to avoid that particularly resourceful or well-placed interests either dominate or circumvent the participatory process. It could also be pointed out that with increased participation there is a need for clear structures and time frames to avoid that processes stall. Also worth highlighting is the need to align expectations about the nature of the participation and what outcomes can be expected with the realities of how the participatory process is designed and fitted into the overall MSP process.

Subsidiarity and coherence

While the 'lowest appropriate level' of governance is a key element that echoes the Malawi principle no. 2, it would benefit from some further elaboration. At present it does not reflect the nestedness of marine ecosystems. There may not be one appropriate level, and this ought to be reflected in the key elements, since it can otherwise lead to oversimplification that could jeopardize the purpose of ecosystem management. The importance of integrating management between governance levels needs to be further highlighted. This could be done by underscoring that there is a need to have clear institutional instruments that mandate and facilitate cooperation and integration between different levels, both nationally and transnationally.

In terms of coherence, the key elements should promote a common understanding, not only by means of implementation, but also regarding the basic formulation of the ecosystem-based approach. In this context, it is pertinent to recall that the definition of the ecosystem approach endorsed by the parties to the Helsinki Convention is explicit on it aiming at maintenance of ecosystem integrity. A clearer articulation of this in the 'key principles' could contribute to increased coherence in the assessment of alternatives and weighing up of interests.

Adaptation

That change is inevitable in ecosystem management (Malawi principle no. 9) is not fully reflected in the key element on adaptation. Furthermore, new information and changing circumstances are factors that affect adaptation needs but which are not reflected in the present wording of the Guideline. Although information can be included in the 'knowledge element', it can still be of importance to connect it to adaptation as well. The review process can be facilitated by the use of indicators, which could be reflected in the 'key elements' as a methodology.

Concluding remarks

Overall, we find the HELCOM-VASAB Guideline to be fairly well aligned with the Malawi principles for the Ecosystem Approach, although there are some differences in emphasis. At the same time, it must be noted that both documents are short on substance, not least in relation to the handling of opposing perspectives or conflicting values and objectives. Currently, the Guideline provides limited help to those grappling with the application of the ecosystem approach to real-world planning and management situations. Although sometimes theorising beyond what is relevant for practical management, the scientific literature probes many of the complexities and contestations associated with managing socio-ecological systems so as to achieve sustainable use within ecological boundaries.

Against this backdrop and in order to facilitate the increased usefulness of the Guideline, we have made recommendations aimed e.g. at a more reflective and systematic handling of uncertainty, at ensuring genuine participation based on realistic expectations, and at increased transparency concerning trade-offs among users and interests.

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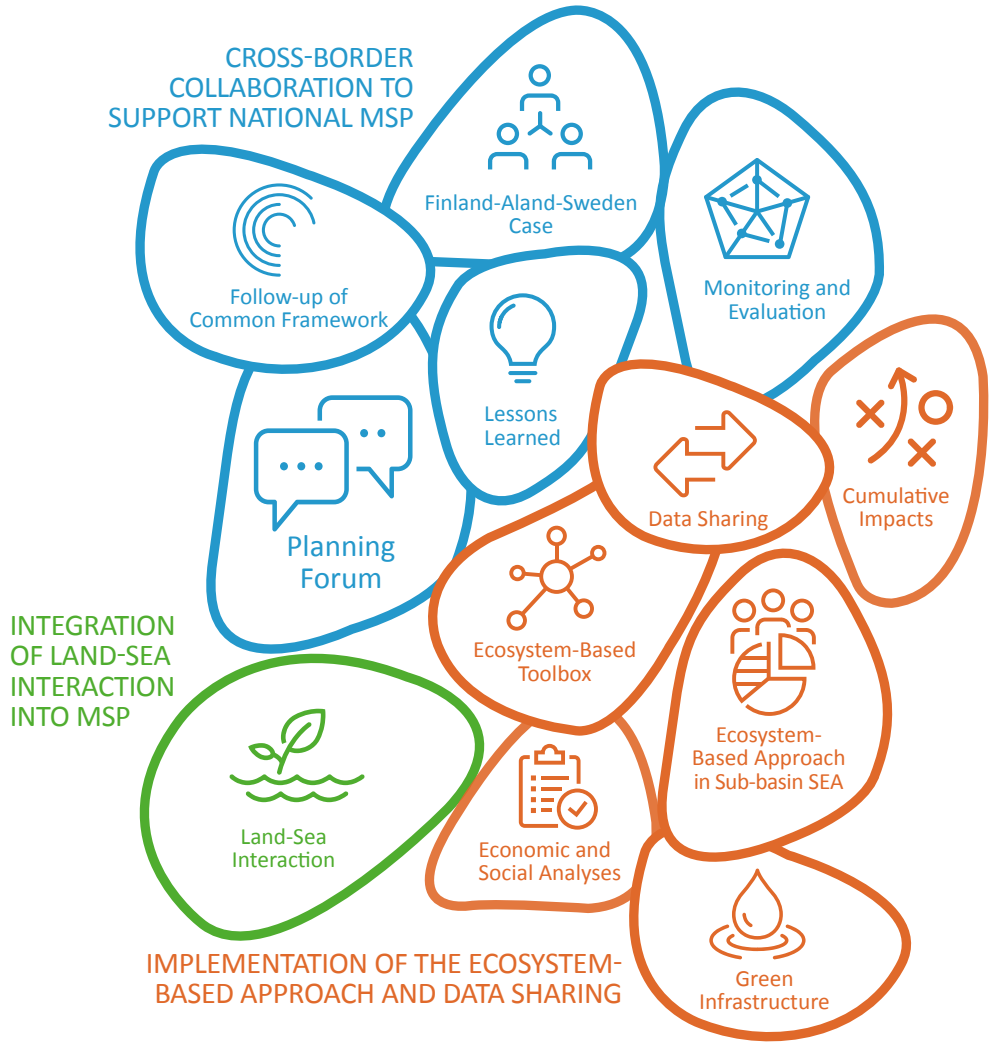

The present synthesis report engages with the concepts of ecosystem approach and maritime spatial planning and the relationship between them with a particular focus on the Baltic Sea context. The report is based on a review of scientific literature, selected reports and pertinent guidance documents. It aims to analyse the consistency between the identified perspectives and recommendations and the manner in which the ecosystem approach is characterised and operationalised in the HELCOM-VASAB Guideline for the implementation of ecosystem-based approach in Maritime Spatial Planning in the Baltic Sea area.

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