Guidelines for implementing an Ecosystem-based Approach in Maritime Spatial Planning

Including a method for
the evaluation, monitoring and
review of EBA in MSP

September 2021

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A practical approach toward an Ecosystem-based Approach in Maritime Spatial Planning

Including a method for
the evaluation, monitoring and
review of EBA in MSP

European Climate, Infrastructure and Environment Executive Agency (CINEA)

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CBA	Cost-benefit analysis
CBD	Convention on Biological Diversity
CEA	Cumulative effects assessment
CIA	Cumulative impact assessment
CINEA	Climate, Infrastructure and Environment Executive Agency
CFP	Common Fisheries Policy
DAPP	Dynamic Adaptive Policy Pathways
EA	Ecosystem Approach
EASME	Executive Agency for Small and Medium-sized Enterprises
EBA	Ecosystem Based Approach
EBFM	Ecosystem-Based Fisheries Management
EBM	Ecosystem-Based Management
EC	European Commission
EEA	European Environmental Agency
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
ES	Ecosystem services
EU	European Union
FAO	Food and Agriculture Organisation
FARNET	Fisheries Areas Network
GES	Good Environmental Status
GI	Green Infrastructure
GIS	Geographical Information System
HELCOM	Helsinki Commission
ICZM	Integrated coastal zone management
LSI	Land sea interactions
MAES	Mapping and assessment of ecosystems and their services
MCA	Multi-criteria analysis
MPA	Marine protected area
MSFD	Marine Strategy Framework Directive
MSP	Maritime Spatial Planning
NGO	Non-Governmental Organisation
PoM	Programme of measures
RBMP	River Basin Management Plan
RDM	Robust Decision Making
ROA	Real options analysis
SEA	Strategic Environmental Assessment
UN	United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organization
VASAB	Vision & Strategies Around the Baltic Sea
WFD	Water Framework Directive

1 INTRODUCTION

The EU's **Maritime Spatial Planning Directive** (2014/89/EU) calls on Member States to apply "an ecosystem-based approach" (EBA) in their planning. At international level, UNESCO has called for the use of EBA in maritime spatial plans[1].

How to integrate EBA into MSP?

This guidance aims to support the work of planners, experts and stakeholders in EU Member States. It presents a practical, stepwise approach for incorporating an ecosystem-based approach (EBA) in maritime spatial plans (MSPs). It is aimed at officials preparing the plans, experts supporting their work, as well as stakeholders involved in the preparation and implementation of maritime spatial plans. Within the overall method presented here, this guidance also includes a practical method to monitor and evaluate EBA in maritime spatial planning.

To prepare this guidance, we carried out an extensive literature review[2], interviewed MSP practitioners across the EU and incorporated lessons learned from five case studies[3] carried out in different regional seas, addressing specific methodological challenges relevant to the integration of EBA in MSP.

What you will find in this practical guidance

- The guidance presents an introduction to ecosystem-based concepts, principles and approaches (section 2).
- The guidance describes how work under the EU regulatory framework – including the Marine Strategy Framework Directive (MSFD) – provides resources for EBA in MSP (section 3).
- It presents a set of key actions to integrate EBA in the main steps of the MSP process (section 4).
- It describes potential tools that can be applied as part of operationalizing EBA in MSP (section 4 and Annex I).
- It provides an approach to monitor, evaluate and review progress in integrating EBA in MSP (section 5).
- Throughout, the guidance provides illustrations from MSP case studies, conducted in Member States (and beyond), as well as references for users to further explore when integrating EBA into MSP.

What you will not find in this practical guidance

While this guidance outlines how to proceed toward integrating EBA into MSP, with potential issues to consider and key analytical tools that could be applied, it is not a technical manual for using these tools.

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[1] This guidance refers to *maritime* spatial planning, the term used in the EU Directive. At UN level and in other contexts, *marine* spatial planning is often used. In this document, these two terms are considered the same.

[2] Strosser, P., et al, Study on Integrating an Eco-system-based Approach into Maritime Spatial Planning: What are the lessons from current practice in applying Ecosystem-Based Approaches in Maritime Spatial Planning? Results from the literature review, August 2021 (prepared for the European Commission – European Climate, Infrastructure and Environment Executive Agency, CINEA), available at: https://op.europa.eu/en/publication-detail/-/publication/be6c1830-2d63-11ec-bd8e-01aa75ed71a1/language-en

[3] ACTeon, Baltic Environmental Forum, Fresh Thoughts, GRID-Arendal and Wageningen Research, Study on integrating an ecosystem-based approach into maritime spatial planning: Project case-study reports, August 2021 (prepared for the European Commission – the European Climate, Infrastructure and Environment Executive Agency, CINEA), available at: https://op.europa.eu/en/publication-detail/-/publication/707ddfe7-353c-11ec-bd8e-01aa75ed71a1/language-en/format-PDF/source-238648827

We moreover recognise that this document cannot be a definitive cookbook providing a fixed set of rules. There is no one-size-fits-all solution for integrating EBA into MSP – which is a context-specific process that can be adapted as environmental, socio-economic or institutional settings change. The MSP process, and any EBA that may be applied, will depend on the governance context in each Member State, on the data and analytical capacity available, and on the resources available at national and regional sea level. One thing we've learned from talking to practitioners and experts is that in each country, both MSP itself as well as activities for EBA in MSP, will start with existing national approaches for implementing EU legislation, carrying out environmental monitoring and bringing together institutions, researchers and stakeholders.

Further work and future developments

We've reviewed existing guidance documents for MSP and EBA. Those documents can also provide insights for your work on EBA and MSP – and they may provide insights on key areas that this guidance doesn't cover in depth. The box below provides a list of a few key existing guidance documents.

Examples of key guidance documents on EBA and MSP

IOC-UNESCO, Marine spatial planning: A Step-by-Step Approach toward Ecosystem-based Management, 2009, and IOC-UNESCO/European Commission, MSPglobal International Guide on Marine/Maritime Spatial Planning, 2021[4]

Pan Baltic Scope, EBA in MSP – a SEA inclusive handbook, 2019[5]

UN Environment/MAP, Conceptual Framework for Marine Spatial Planning in the Mediterranean, 2018[6]

WWF, Guidance paper: Ecosystem based Maritime Spatial Planning in Europe and how to assess it, 2021[7]

The information in the following sections may provide a starting point for your work on EBA, or it might complement the knowledge you already have. Whichever the case, we encourage you to use this practical guidance and to contribute to the ongoing development of EBA and its integration into MSP. Remember that work on the integration of EBA in MSP is constantly evolving in the EU and around the world, in particular as EU Member States implement the MSP Directive as well as other parts of the EU regulatory framework. What is presented in this practical guidance will need to be regularly updated and complemented by these practical experiences in Europe and beyond. Key MSP actors – such as the European Commission, EU Member States, UNESCO-IOC, regional sea commissions and NGOs – may wish to review this and other guidance documents in the medium-term, perhaps in five years or so, drawing on these experiences and in preparation for the revision of maritime spatial plans in Europe.

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[4] Both these documents are available at: https://www.mspglobal2030.org/resources/key-msp-references/
[5] Available at: http://www.panbalticscope.eu/wp-content/uploads/2019/12/EBAinMSP_FINAL-1.pdf
[6] Available at: http://paprac.org/storage/app/media/Meetings/MSP%20Conceptual%20Framework%20EN.pdfhttp://paprac.org/storage/app/media/Meetings/MSP%20Conceptual%20Framework%20EN.pdf
[7] Available at: https://wwfeu.awsassets.panda.org/downloads/wwf_eb_maritime_spatial_planning_guidance_paper_march_2021.pdf
In addition, BirdLife International has published a short position paper on EBA in MSP – see: https://www.birdlife.org/sites/default/files/how_to_apply_the_ecosystem-based_approach_in_marine_spatial_planning.pdf

2 APPLYING EBA IN MSP: WHAT IS IT ABOUT?

This section provides an overview of the ecosystem-based approach and of maritime spatial planning. The section first highlights the importance of EBA for MSP, then presents a way of understanding EBA in terms of three main elements, and it closes by discussing the benefits of integrating EBA in MSP.

The section provides a basis for Section 3, which describes how different parts of the EU regulatory framework can play a key role in integrating EBA into MSP, and for also Section 4, which shows how EBA can be addressed in each step of the MSP cycle. Section 5 then discusses how the integration of EBA in MSP can be monitored, evaluated and reviewed.

2.1 Why is an ecosystem-based approach important for MSP?

Around the world, citizens, stakeholders and governments are becoming more aware of the many values of oceans and seas. Science provides new insights into the wealth of biodiversity in our seas, and citizens around the world are realising that we live on a blue planet. Policy makers and entrepreneurs are looking to develop new, sustainable opportunities in the blue economy from renewable energy to advanced aquaculture. As a result, however, the world's oceans and seas are becoming ever more crowded with economic activities – and this is the case especially in the EU's regional seas. Moreover, in the EU and globally, increasing the areas established for biodiversity protection is also recognised as a growing need. Maritime spatial planning is a policy response that can allocate space for current and future human activities as well as for nature and biodiversity, reconciling and making trade-offs among competing goals. Around the world, countries from Australia to Indonesia to Belize have developed maritime spatial plans – and since 2014 this is a requirement for the EU's maritime Member States.

2.1.1 The EU´s MSP Directive

In Europe, some of our regional seas are as crowded as our land territory, and MSP responds to the pressing need to manage maritime space. Member States such as Belgium and Germany were among the pioneers in establishing plans for their maritime areas. The European Union established a common approach by adopting **Directive 2014/89/EU establishing a framework for maritime spatial planning**[8], the so-called **MSP Directive**. In its provisions, the Directive seeks, among others, to:

- reduce conflicts between sectors and create synergies between activities;
- encourage investment – by creating predictability, transparency and clearer rules in the management and sharing of marine space;
- protect marine ecosystems; and
- increase cross-border cooperation among EU countries.

Member States should establish maritime spatial plans by March 2021 and implement them thereafter. Under the Directive, **EBA**, together with sustainability, is a core part of MSP (see the box below).

[8] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014L0089&from=EN

The MSP Directive calls for an ecosystem-based approach

The Directive's Preamble states that:

(14) In order to promote the sustainable growth of maritime economies, the sustainable development of marine areas and the sustainable use of marine resources, ***maritime spatial planning should apply an ecosystem-based approach*** *as referred to in Article 1(3) of Directive 2008/56/EC*[9] *with the aim of* ***ensuring that the collective pressure of all activities is kept within levels compatible with the achievement of good environmental status*** *and that the capacity of marine ecosystems to respond to human-induced changes is not compromised, while contributing to the sustainable use of marine goods and services by present and future generations…* (emphasis added)

Article 5 on the *Objectives of maritime spatial planning* specifies that:

1. When establishing and implementing maritime spatial planning, Member States shall consider economic, social and environmental aspects to support sustainable development and growth in the maritime sector, ***applying an ecosystem-based approach****, and to promote the coexistence of relevant activities and uses.* (emphasis added)

The ecosystem-based approach is, in the words of the Secretariat for the Convention on Biological Diversity, "a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way"[10]. EBA is thus closely linked both to safeguarding the conservation and protection of ecosystems and to ensuring the sustainability of economic activities. The MSP Directive, in addition to calling for an ecosystem-based approach, highlights the importance of sustainability (see the box below).

Sustainability is a core objective of the MSP Directive

Article 1 of the Directive states that:

This Directive establishes a framework for maritime spatial planning aimed at promoting the ***sustainable growth*** *of maritime economies, the* ***sustainable development*** *of marine areas and the* ***sustainable use*** *of marine resources*. (emphasis added)

2.1.2 A clarification: the process and the plan

MSP is intended to achieve sustainable maritime economies while preserving the proper functioning of the marine ecosystems. The integration of EBA should contribute to this. It is important to recognise that EBA is relevant both for a maritime spatial plan that is put in place and the process of developing that plan. This guidance distinguishes between the MSP process, on the one hand, and the outcome of the process on the other: the outcome is the plan which is adopted and then implemented. When considering the plan itself, a key question is whether is contributes to societal goals – including those for ecosystems and sustainability. When considering the MSP process, a key question is the extent to which EBA has been integrated in each of its stages, including implementation of the plan.

[9] NB. The Marine Strategy Framework Directive
[10] https://www.cbd.int/ecosystem/

2.2 The main elements of an Ecosystem-based Approach

The Malawi Principles, developed in 1998 under the Convention on Biological Diversity (CBD), provided perhaps the first international presentation of the ecosystem-based approach. A range of policy and academic documents have since developed the definitions of EBA and closely related concepts such as ecosystem-based management (EBM). These many definitions, though broadly similar, have varied in their emphasis. As a result, a universal implementation framework is not available. This guidance draws on a recent review of reports and documents on EBA, including the Malawi Principles, to identify 15 main principles for EBA in MSP[11]. (Annex II provides an overview of the Malawi Principles and the basis for the approach presented here.) To facilitate the understanding of EBA and its practical application, these 15 principles have been organised into three broad themes representing the main aspects of EBA specifically relevant for MSP:

(1) capturing the **functioning and dynamics of marine ecosystems**,
(2) accounting for relevant **human activities and socio-economic considerations** including their interconnections with marine ecosystems, and
(3) organising the MSP process with regard to **governance and management**.

The box below indicates how the EBA principles fit under the three themes and the figure on the next page presents an overview of the three themes. The sub-sections that follow provide further description for each theme.

The principles of EBA can be organised into three broad themes*

Capturing the integrity, functioning and dynamics of marine ecosystems

- Consider the **ecological integrity and biodiversity** of marine ecosystems;
- Consider ecosystem **connections** and define **distinct boundaries;**
- Account for the **dynamic nature** of ecosystems;
- Particularly relevant for the environmental aspect of **sustainability**;
- Consider appropriate **spatial and temporal scales**;

Incorporating human activities and their potential ecosystem effects along with their socio-economic considerations

- Make explicit **human activities**, their pressures and **ecosystem services** delivered as part of an entire Socio-Ecological System (SES);
- Take account of the **cumulative impacts** of human activities;
- Give priority to **sustainability** as priority policy objective accounting for ecological as well as socio-economic goals and how society chooses to balance them;
- Consider appropriate **spatial and temporal scales;**

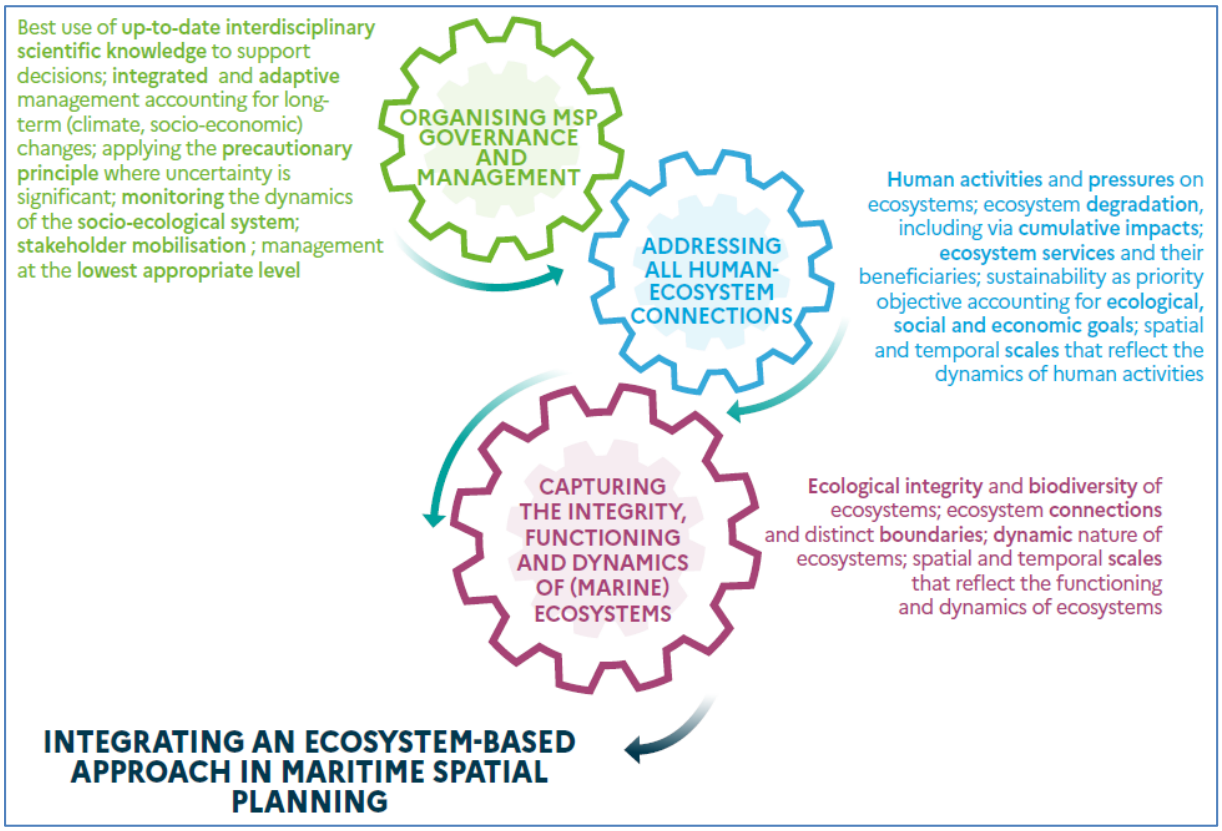
Organising the MSP process with regard to governance and management

- Make best use of up-to-date **scientific knowledge;**
- Mobilise **interdisciplinary** science to address the different components of the SES;
- Acknowledge **uncertainty** in assessments and decisions;
- Support **integrated management** accounting for all sectors and issues;
- Support **adaptive management** of marine ecosystems to address unexpected (climate, socio-economic) changes, including by setting long-term management objectives;
- Apply the **precautionary principle** for issues where uncertainty is significant;
- Develop appropriate **monitoring** for capturing the functioning and dynamics of the SES;
- Mobilise **stakeholders** and support management at the lowest appropriate level.

* Note that some principles fit under more than one theme. Please see Annex II for an overview of the 15 principles.

[11] This is taken from Long R.D., et al, Key principles of marine ecosystem-based management, Marine Policy, Vol. 57, July 2015, available at: https://doi.org/10.1016/j.marpol.2015.01.013

Figure 1: The EPA principles: overview of the three broad themes



2.2.1 Capturing the integrity, functioning and dynamics of marine ecosystems

Ecosystems are at the core of EBA. Key aspects such as ecosystem health, integrity, diversity and functioning need to be addressed. Moreover, the EU has a set of policy goals for ecosystem protection, restoration and management (see Section 3). The degree to which specific ecosystem issues are incorporated in MSP is determined also by the outcome of the stakeholder process and the available knowledge. In each cycle of the MSP process, these need to be balanced but may initiate the further development of the knowledge base where clear gaps are identified. This should then allow the MSP process to become increasingly ecosystem-based as a deeper EBA is applied.

The following indications can guide the application of EBA in the MSP process with regards to capturing the integrity, functioning and dynamics of marine ecosystems:

- **The level of detail.** The MSFD, for example, distinguishes between ecosystem components (e.g. fish or seabirds), major species groups (e.g. cetaceans and seals) or specific species list (e.g. IUCN red list). The representation of the ecosystem can be improved by including more (and different) aspects of the ecosystem in greater detail. But this comes with increasing demands on the monitoring programmes and data availability. If the knowledge base is not suited for this, it will only obfuscate the process and result in huge uncertainties likely to hamper informed decision-making.
- **Ecosystem interactions.** The various ecosystem components are connected through foodwebs and other relationships. Including these allows the consideration of knock-on effects from ecosystem components known to be affected on other ecosystem components that are unlikely to be directly affected. Again, this puts considerable demands on the knowledge basis (e.g. foodweb interactions) and provides an additional layer of complexity.
- **Ecosystem boundaries and spatio-temporal scale.** The chosen ecosystem boundaries need to be large enough to adequately cover the spatial distributions of the main

ecosystem components (and/or the main anthropogenic pressures, see Section 2.2.2), but not so large that the effects of decisions in the MSP process are lost in the complexity and natural dynamics of the ecosystem. The spatial scale should be adequate to represent the distribution of the ecosystem components. In practice, this is mainly determined by habitats or sessile species, as mobile species often operate at large spatial scales. The temporal scale needs to be appropriate to capture the dynamics of the relevant components (i.e. natural but also as the consequence of the planned human activities) and drives the design of the monitoring programmes. The time horizon chosen for the assessments should cover a long-enough period to capture any likely ecosystem impacts.

- **Exogenous drivers.** Climate change is likely to affect the ecosystems and their functioning and may cause the ecosystem dynamics to exceed historic levels of both its abiotic and biotic components. One concrete consequence is the increase of the water temperature contributing to shifts in the species distributions relevant for the spatial planning of conservation areas (such as marine protected areas, MPAs), or patterns of exploitation, such as fisheries.

2.2.2 Incorporating human activities and their socio-economic considerations

MSP is about managing human activities, and the integration of EBA requires an explicit consideration of their potential ecosystem effects and social-economic consequences. This determines which activities should be included but may also require more detail on how they may impact the ecosystem as well as the socio-economic drivers determining their allocation and operations. In addition, MSP should consider the socio-economic benefits that different activities derive from marine ecosystems. Ultimately, applying EBA in MSP requires that the socio-economic drivers and their goals need to be balanced with environmental goals set for the ecosystem.

The integration of EBA in the MSP process for the theme of human activities should consider the following elements:

- **Selection of activities and their information requirements.** Sectoral activities being planned as part of the MSP processes need to be considered. The demand for the products they deliver largely determines the preferred locations and spatial extent of these activities. Integration of EBA may apply to the maritime (i.e. sectoral) spatial planning at the basis of MSP but may also involve a wider selection of sectors and their activities from the perspective of the marine (i.e. ecosystem focus) spatial planning in terms of e.g. cumulative effects, to the activities of very different sectors not taking place within the MSP area but potentially impacting the same ecosystem and its components.
  One example is that the effects of mortality of seabirds from collisions caused by offshore wind farms may add to the effects of reduced chick survival in the coastal zone or even on land (due to contaminants or tourism). A further example illustrates that additional information may be required because specific activities cause additional pressures (e.g. noise or pollution) impacting the environment beyond "only" those required for production: bottom trawl fisheries not only cause mortality of the commercial fish species but also other non-target sensitive fish species, such as sharks and rays, and possibly marine mammals or seabirds. In addition, there is damage to the seafloor from abrasion as well as relatively minor pressures such as noise contaminants or litter which may contribute to the cumulative impacts on certain vulnerable species. Thus, with the decision to include a specific sector comes the decision which pressures to include as these determine the potential environmental impacts.
- **Capturing the benefits that services provided by marine ecosystems deliver.** Marine ecosystems provide a wide range of ecosystem services that benefit different activities, sectors and citizens from the local to the global scale. Understanding the importance of these benefits, how these might be impacted as a result of the spatial

development of sectoral activities and how protection of (parts of) the ecosystem can optimise their delivery are key to integrating EBA in MSP.

- **Balancing socio-economic and environmental goals.** The goal of sustainable levels of exploitation requires the explicit consideration of trade-offs between environmental, social and economic goals. This starts in the designing step when all relevant policy objectives, as well as priorities for a representative set of stakeholders (e.g. sectoral representatives, environmental NGOs, representatives of local communities) are considered. In the subsequent steps, this is translated into requirements for the knowledge base, transdisciplinary or (at least) interdisciplinary science as well as an integrated assessment framework that addresses all societal goals and all dimensions of sustainability.
- **Accounting for exogenous societal drivers.** Macro-economic developments, climate change or changes in cultural attitudes may alter economic sectors' development priorities as well as the value society puts on specific ecosystem services or on the conservation of (aspects of) biodiversity. It is thus necessary to identify these drivers and assess their importance, including in how they can impact the balance between the different societal goals relevant to MSP.

2.2.3 Organising the MSP process with regard to governance and management

Accounting for EBA in MSP has many implications in terms of governance and management. Key elements include the following:

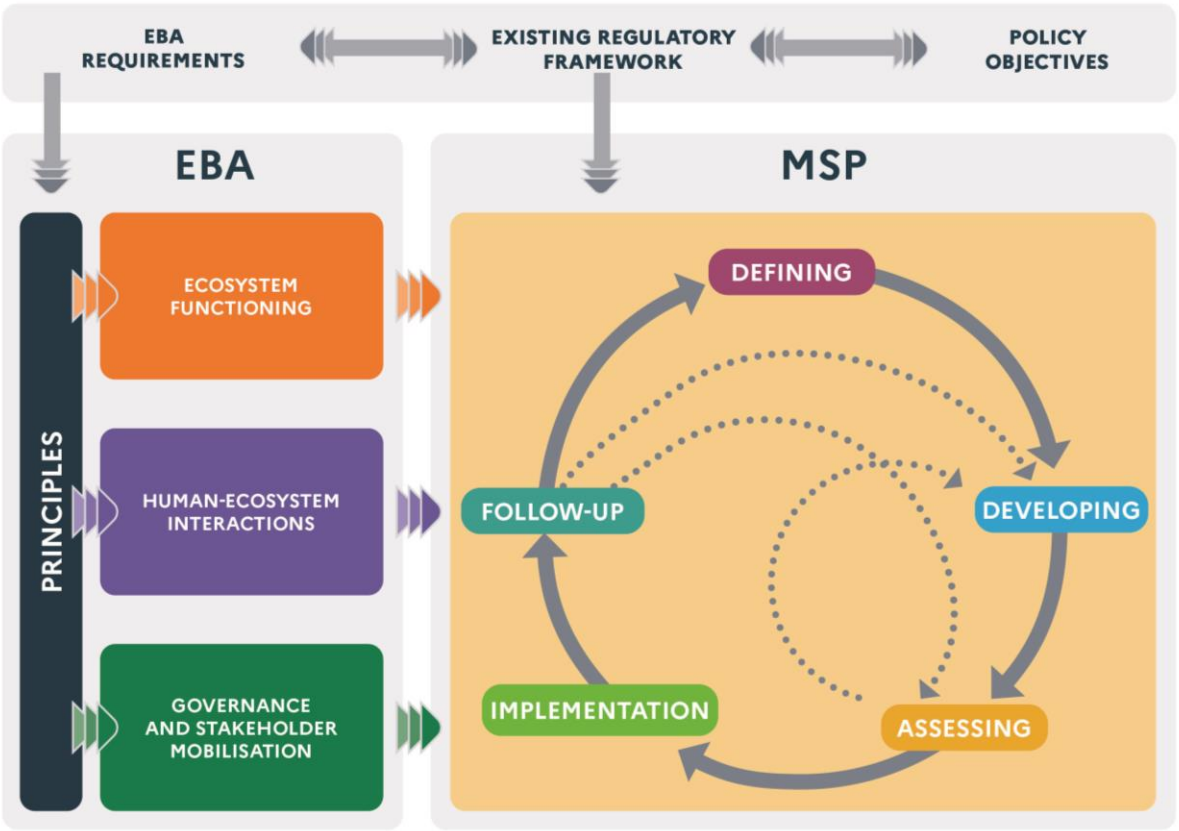
- **Stakeholders** representing different sectors (e.g. benefiting from marine resources) and ecological interests (e.g. environmental NGOs) as well as science and policy are mobilised across the stages of the MSP process. Integrating views from all sectors, bringing stakeholders in the process from the onset and mobilising stakeholders at the lowest appropriate management scale (e.g. at the scale of individual spatial units considered in maritime spatial plans) are principles that are seen as key to effective stakeholder involvement;
- Dedicated mechanisms are put in place at the **science-policy interface** to make best use of up-to-date scientific interdisciplinary knowledge including for (1) characterising uncertainty in technical, ecological and socio-economic assessments carried out to support MSP decisions, and (2) applying the precautionary principle whenever duly justified/necessary;
- Sound environmental **monitoring** (in terms of ecological aspects covered, spatial coverage, number of monitoring locations, frequency of monitoring) will capture changes in marine ecosystems and how these might be affected by MSP decisions. It is important also to monitor other components of the socio-ecological system (e.g. changes in socio-economic activities and of anthropic pressures) so as to anticipate likely changes in anthropic pressures and take timely actions to protect marine ecosystems;
- Adequate attention is given to the main actors and dynamics of the social-ecological system considered, taking account of uncertainty when decisions on the sharing and management of marine space are made: (1) putting in place mechanisms that build on monitoring results and on updated knowledge for **anticipating** future and unexpected (climate and socio-economic/global) changes; (2) **adapting planning and management according to** monitoring results; and (3) applying dedicated methods and tools that give priority to **adaptive management** and **resilient development pathways**.

2.3 How does EBA fit into the MSP cycle?

The IOC-UNESCO 2009 guidance[12] highlights a central characteristic of maritime spatial planning: "MSP does not lead to a one-time plan. It is a continuing, iterative process that learns and adapts over time…". While that publication sets out a ten-step cycle for MSP, this guidance uses a simpler, five-stage cycle developed for a Baltic Sea project and based on the experience of EU Member States in that regional sea[13]. These five stages are:

1. **Defining:** setting the frame for the MSP, organising the MSP process and identifying its priority objectives and principles (societal goals)
2. **Developing**: building the knowledge base including stocktaking and analysing data and other information
3. **Assessing**: Assessing and weighing planning alternatives
4. **Implementing**: Implementing the plan
5. **Follow-up**: Evaluating results and performance

Figure 2: EBA themes can be applied in each step of the Maritime Spatial Planning (MSP) cycle



Of course, as the IOC-UNESCO document emphasises, MSP is an iterative process with results of its monitoring and evaluation (i.e., the *Follow-up* step) being used for adapting of the other steps (i.e., *Defining, Developing, Assessing, Implementing*) in subsequent cycles. For this reason, it is best to consider the integration of an EBA as part of the cyclical character of MSP where EBA can be applied in each step of the cycle as shown in Figure 2

[12] Ehler, Charles, and Fanny Douvere. Marine Spatial Planning: a step-by-step approach toward ecosystem-based management. Intergovernmental Oceanographic Commission and Man and the Biosphere Programme. IOC Manual and Guides No. 53, ICAM Dossier No. 6. Paris: UNESCO. 2009 (English), p. 18.

[13] Altvater, S. et al, EBA in MSP – a SEA inclusive handbook, Pan Baltic Scope, 2019. Available at: http://www.pan-balticscope.eu/results/reports/

above. Its implementation may draw on the EU regulatory framework (elaborated in Section 3 of this document) and involve operational tools (described in Section 4 and Annex I).

These steps present a schematic view of MSP. The actual sequence in each Member State will depend on national governance and planning mechanisms. One crucial aspect at the national level will be the approval of a plan, and a key question in this process will be its legal standing. For many Member States, the plans are binding once approved, but they can also be voluntary documents – as is the case, notably, for Sweden (see the box below). This is of course a Member State choice, and it can influence how EBA is considered. Moreover, the scope of the legal standing will vary across Member States; the key point is that domestic legal systems will influence MSP cycles and also the approach for integrating EBA.

Binding and non-binding plans

In many Member States, such as Belgium and Germany, the maritime spatial plan is or will be a legally binding document. In Sweden, on the other hand, the MSP – though it will be adopted by the national government – is more a strategic document to guide actions. In a workshop for the Baltic case study, it was noted that new EBA approaches could be more easily integrated in non-binding maritime spatial plans such as the one in Sweden, as these are more flexible. On the other hand, binding plans may offer stronger legal guarantees for ecosystem protection, though their modification (and thus adaptive management) will require a formal process. In the end, however, there is not a simple distinction between binding and non-binding plans – some plans lie between the two, providing some binding requirements for government bodies as well as some strategic directions for their work.

2.4 What are the benefits of integrating EBA in MSP?

Key elements of the EU policy and regulatory framework – such as the Marine Strategy Framework Directive (MSFD) and the Integrated Maritime Policy (IMP) – call for an ecosystem-based approach. So do global agreements such as the Convention on Biological Diversity. Consequently, the implementation of EBA in MSP is an EU and international goal in its own right. In that sense, operationalising EBA in MSP will contribute to the achievement of the objectives of this broader policy and legal framework.

The literature review has shown that the development of EBA in MSP is a gradual process and that only very limited information on its benefits has emerged yet, thus preventing any formal analysis[14]. However, the shorter-term benefits and potential added value of applying EBA in MSP that can be inferred include:

- **Decision-making:** The wider perspective that comes with the application of EBA should lead to decisions that provide a better balance across a set of societal goals, in particular ensuring that short-term, often economic, goals do not outweigh the longer term, often environmental or social, goals.

[14] For the study's analysis of the literature review, please see: Strosser, P., et al, Study on Integrating an Ecosystem-based Approach into Maritime Spatial Planning: What are the lessons from current practice in applying Ecosystem-Based Approaches in Maritime Spatial Planning? Results from the literature review, August 2021 (prepared for the European Commission – the European Climate, Infrastructure and Environment Executive Agency, CINEA), available at: https://op.europa.eu/en/publication-detail/-/publication/be6c1830-2d63-11ec-bd8e-01aa75ed71a1/language-en
The case studies also support this conclusion. The five case studies are published in the following document: ACTeon, Baltic Environmental Forum, Fresh Thoughts, GRID-Arendal and Wageningen Research, Study on integrating an ecosystem-based approach into maritime spatial planning: Project case-study reports, August 2021 (prepared for the European Commission – the European Climate, Infrastructure and Environment Executive Agency, CINEA), available at: https://op.europa.eu/en/publication-detail/-/publication/707ddfe7-353c-11ec-bd8e-01aa75ed71a1/language-en/format-PDF/source-238648827

- **Improved knowledge base:** By providing a wider perspective on the social-ecological system, bringing in experts across disciplines, EBA can strengthen understanding of ecosystems and of their interactions with human activities, and the impacts of human pressures and other pressures.
- **Stronger stakeholder engagement, understanding and buy-in**: this in turn will result in greater awareness, stakeholder involvement in implementation, potentially better compliance with rules and reduced conflicts – so these benefits include greater social capital.
- **Better planning and implementation:** As it takes account of a wider range of objectives, applying EBA in MSP should overall improve management resulting in higher societal and environmental benefits.

The expectation is that these inferred short-term benefits should contribute to the achievement of the longer-term societal goals that are in the policy documents.

Sustainability lies at the core of EBA and EBM, as the Secretariat of the Convention on Biological Diversity has indicated (see section 2.1 of this document). As EBA requires the explicit consideration of all dimensions of sustainability, it is likely that the integration of EBA will result in a more balanced outcome in terms of the achievement of the environmental, social and economic goals. Closely tied to sustainability is the increased resilience of the whole social-ecological system that EBA may bring – the resilience, for example, of the blue economy to the consequences of climate change. Sustainability and resilience, however, are long-term and high-level objectives, which are notoriously difficult to assess, thereby limiting the reporting of evidence that integration of EBA in MSP benefits the achievement of such high-level goals. Moreover, sustainability can be interpreted in different ways, as noted in the box below.

EBA, as the previous sections highlight, requires an iterative process of learning and adaptive management. These benefits are linked to the degree to which EBA is integrated in MSP. For example, stronger cross-border co-operation among public bodies and stakeholders can help to coordinate management at spatial scales more relevant to ecosystem processes, thereby delivering resilient marine ecosystems that can support a sustainable blue economy. As the development and implementation of EBA develops (e.g. through the proposed tools, or increasingly ambitious stakeholder processes), clear benefits should emerge. Some of these benefits can be made more tangible through the outcomes of monitoring programmes and their indicators if monitoring is not limited to ecological monitoring and encompass wider components of the socio-ecological system.

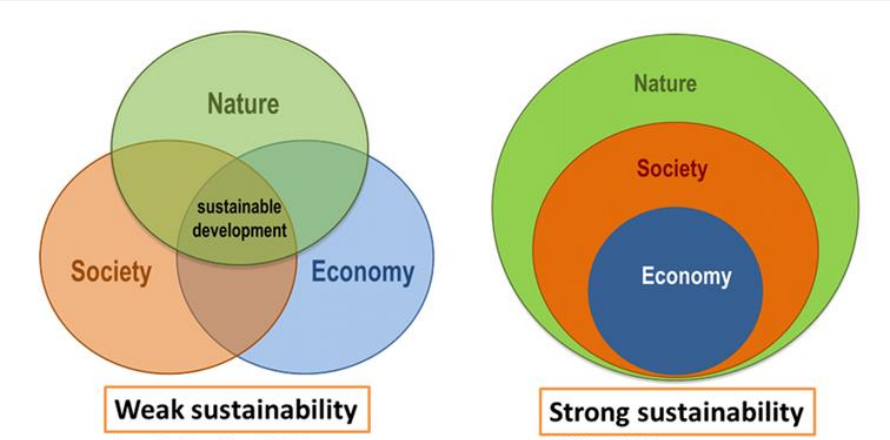
Achieving sustainability: consequences for the prioritisation of societal goals

When having to balance the different societal goals there is a distinction between "weak" and "strong" sustainability, which differ in how the different sustainability dimensions are weighed, as illustrated by the figure below[15].

Weak sustainability, or sustainable development, presents the environmental, social, and economic dimensions with equal weighting and seeks to balance them. In practice this implies that the local circumstances, jurisdiction, policy objectives and stakeholder views may determine this balance. Reconciling trade-offs may occur early in the process, that is in the *defining* step, and later in the process, in the *assessing* step. Moreover, the EU regulatory establishes clear Europe-wide societal goals for water management, biodiversity protection and more to be addressed in MSP (see section 3 below).

[15] The figure is based on the Brundtland Report – World Commission on Environment and Development, Our Common Future, Oxford University Press, 1987 – for weak sustainability and, for strong sustainability, Giddings et al, Environment, economy and society: fitting them together into sustainable development, Sustainable Development, 2002, https://doi.org/10.1002/sd.199

Figure 3: Comparing "weak" and "strong" sustainability.



Strong sustainability, with a focus on systems, presents the three dimensions as nested and confers different sizes and weightings to them. The consequence is that economic goals can only be pursued if the basic societal needs are fulfilled which, in turn, can only be achieved within the limits of a healthy environment. This implies that the environmental goals should take precedence, followed by the social and economic goals. Decision-making should thus always occur within the environmentally safe and socially just space. In practice this implies that environmental thresholds are not exceeded.

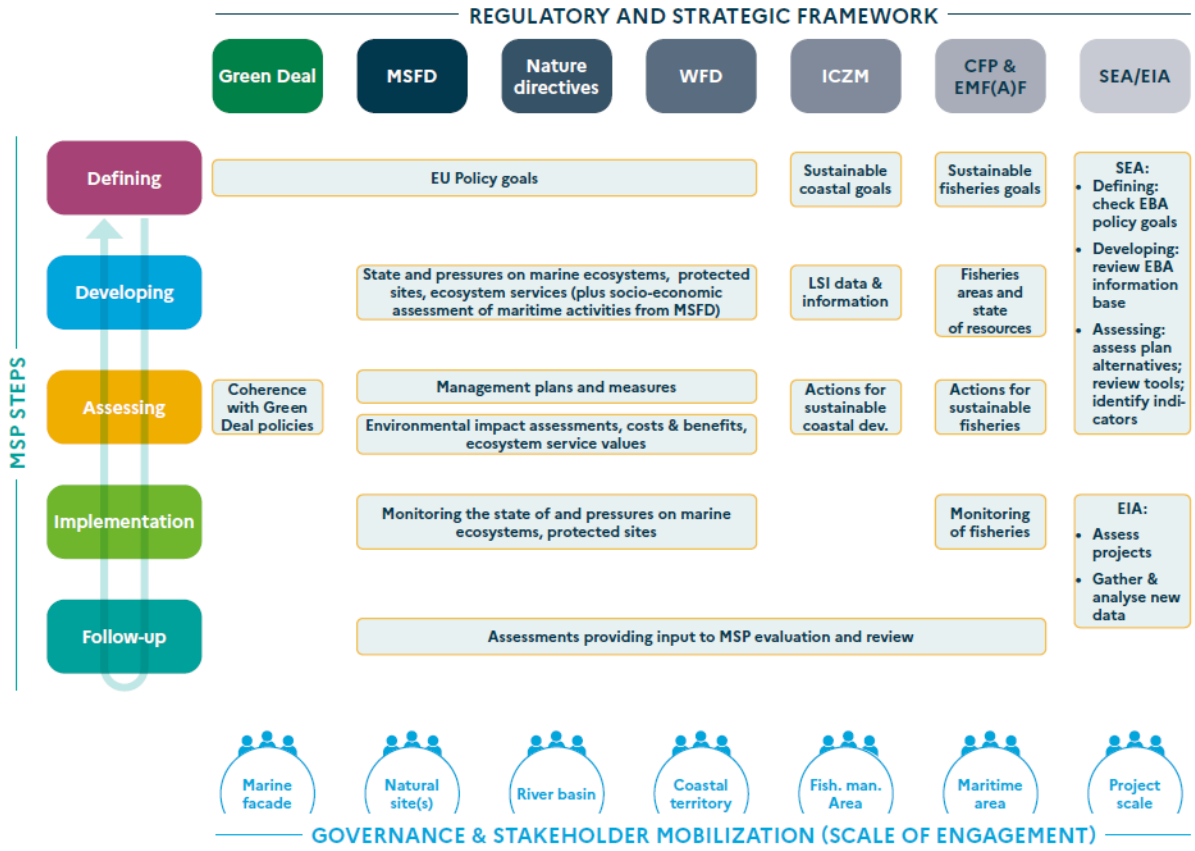
EBA is assumed to be embedded in the model for strong sustainability.

3 HOW CAN THE EU'S REGULATORY FRAMEWORK SUPPORT EBA IN MSP?

The ecosystems-based approach has a strong presence in EU legislation and policy, and the MSP Directive refers to key pieces of this regulatory framework. In particular, the Marine Strategy Framework Directive (MSFD)[16] sets out a central role for an ecosystem-based approach in the protection of the marine environment. The MSP Directive highlights the MSFD and its goal of ensuring good environmental status in European seas. The MSP Directive also cites other EU legislation, including the Birds and Habitats Directives and the Common Fisheries Policy as well as the Directives on Strategic Environmental Assessment (SEA) and Environmental Impact Assessment (EIA), as well as the EU Biodiversity Strategy[17].

This section provides a brief overview on how key pieces of EU legislation and policy can support EBA and indications of key opportunities and challenges. While each legal and policy document is described separately, together they form *an integrated framework*. The figure below provides a schematic overview of how key pieces of this framework contribute to EBA (each is discussed in the following pages). Section 4 then draws on this information to highlight key elements that the EU regulatory framework can bring at each step of the MSP process.

Figure 4: Key elements of the EU regulatory and strategic framework can support EBA across the main MSP steps



[16] Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive)

[17] Other legislation – and in particular the Water Framework Directive – can be included in the next draft of this guide.

While this section focuses on legislation, the EU's overall policy priorities are also important for EBA in MSP, notably the Green Deal (see the box below).

The European Green Deal

The 2019 European Green Deal[18] highlights several key goals and actions that are important for EBA in MSP, including the new EU Biodiversity Strategy to 2030 (described below), measures to reduce adverse impacts of fishing and the importance of a sustainable blue economy. The Green Deal calls for stronger EU climate action and indicates among its follow-up actions the 2020 Strategy for offshore renewable energy: that Strategy and its call for increasing offshore renewable energy in turn can influence maritime spatial plans; the Green Deal also underlines the importance of the health of marine ecosystems.

A set of key strategies and action plans that have followed the Green Deal will also be important for work on MSP. These include the **EU strategy on offshore renewable energy**[19], which calls for an expansion of these energy systems as part of the EU's climate goals, while noting that "sea spaces for offshore energy exploitation should be compatible with biodiversity protection".

The **new approach for a sustainable blue economy**[20] seeks to put the EU's blue economy on a sustainable path. It includes the target in the Biodiversity Strategy for 2030 to protect 30 % of the EU's sea area (see section 3.3 below). It highlights the importance of sustainable fisheries and also calls for the development of low-impact aquaculture. The new approach moreover highlights the importance of MSP in achieving a sustainable blue economy, referring to the ecosystems-based approach. Linked to this document is a set of sustainability criteria that may be relevant for EBA, including in terms of SEA (see section 3.7) and evaluation (section 5).

The international context is also important. At global level, the sustainable development goals (SDGs) address "life below water" in SDG 14, whose targets include reducing marine pollution, sustainably managing and protecting marine and coastal ecosystems, and ending overfishing. The European Commission's "Whole-of-government approach"[21] calls for implementing the SDGs throughout EU policies, including the multiannual financial framework, as well as the engagement of civil society. National sustainable development strategies and plans that implement the SDGs may be relevant for EBA in MSP.

The conventions governing Europe's four regional seas – the Baltic, Black, Mediterranean and North-East Atlantic – also play a key role in EBA and MSP: examples are provided in the following sections.

3.1 The MSFD provides objectives, monitoring and measures for EBA

The MSFD calls on Member States to develop marine strategies that protect and preserve the marine environment and incorporate an EBA (see the box below). This text from the MSFD indicates three key issues for consideration: achieving good environmental status,

[18] See: European Commission, A European Green Deal, web page: https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en

[19] European Commission, An EU Strategy to harness the potential of offshore renewable energy for a climate neutral future, COM(2020) 741 final, November 2020, available at: https://ec.europa.eu/energy/topics/renewable-energy/eu-strategy-offshore-renewable-energy_en

[20] European Commission, on a new approach for a sustainable blue economy in the EU – Transforming the EU's Blue Economy for a Sustainable Future, COM(2021) 240 final, May 2021, available at: https://ec.europa.eu/oceans-and-fisheries/ocean/blue-economy/sustainable-blue-economy_en

[21] https://ec.europa.eu/info/strategy/international-strategies/sustainable-development-goals/eu-holistic-approach-sustainable-development_en

ensuring the resilience of marine ecosystems in the face of human-induced changes, and ensuring that marine goods and services are used sustainably.

> "Marine strategies shall apply **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 and that the capacity of marine ecosystems to respond to human-induced changes is not compromised, while enabling the sustainable use of marine goods and services by present and future generations." – MSFD Art. 1(3) (emphasis added)

3.1.1 What does the MSFD bring for EBA in MSP?

This Directive plays a crucial role, as it provides four core elements for EBA in MSP. These are:

- **Policy objectives:** the MSP Directive explicitly states that maritime spatial planning should apply an ecosystem-based approach as set out by the MSFD and that it should contribute to the MSFD **objective of good environmental status (GES)**. Consequently, GES should be part of maritime spatial plans in the EU, and the 11 MSFD descriptors need to be explicitly addressed when capturing environmental issues.
- **Monitoring** of the marine environment that provides an overview of the status of habitats and species and of pressures from human activities: this monitoring provides a key part of the information basis when assessing the performance of the MSP to achieve societal goals (MSFD data is INSPIRE-compliance – please see section 3.6 below for more details on this and other data portals).
- **Programmes of measures (PoMs)**, which are likely to include measures with a spatial component (e.g., MPAs and no-take zones) to mitigate pressures and impacts on the marine environment, as well as measures with spatial implications: maritime spatial plans will need to be aligned with these measures.
- **Understanding services delivered to society by marine ecosystems**. The MSFD offers the opportunity to make ecosystem services delivered by marine ecosystems explicit, highlighting how the degradation of marine ecosystems impacts negatively on these services – and how improvements in ecosystem services will result from improvements in GES (e.g. via the application of cost-benefit assessments that consider economic values of ecosystem services and support the selection of new measures for achieving GES).

The MSFD has strong links to other pieces of legislation described in this section. For example, it draws on data from the Birds and Habitats Directives and relies on measures set out in national PoMs to ensure a coherent framework for the management of human activities in the marine environment. For several descriptors, the MSFD draws on data collection under the Common Fisheries Policy. This involves not only Descriptor 3 for commercial fish stocks, but also Descriptor 1 biodiversity, Descriptor 4 marine food webs or Descriptor 6 sea floor integrity.

3.1.2 What key opportunities and challenges might be encountered?

As set out above, the MSFD can provide a range of key inputs to work on EBA in MSP. The table on the following page provides an overview of the potential contributions.

Table 1: Implementation of the MSFD can provide support for EBA in MSP

MSFD Implementation cycle	Potential contribution to EBA in MSP
Art 8. Initial Assessment	Provides an **inventory** of the ecosystem components included in the area, including not only habitats and species, but also physical and chemical features (e.g. pollutants, or underwater noise). The Initial Assessment serves to identify those ecosystem components that are in risk of not achieving GES and on which the MSP should pay special attention in the planning process.
Art 9. GES Determination	The GES Determination established under the MSFD **defines the ideal state** of each of the ecosystem components. Some Member States decided to use this for the environmental objectives of the MSP, placing therefore their MSP under the umbrella of the overarching objectives established for the marine environment under the MSFD.
Art 10. Environmental targets	The MSFD environmental targets aim at **reducing anthropic pressures and impacts** on the environment through the establishment of qualitative or quantitative quality objectives for ecosystem features, the development of initiatives aimed at reducing impacts or pressures, including in some cases restrictions for coastal or maritime activities. In a similar way as the GES Determinations, the inclusion of the set of targets in the MSP could strengthen the alignment of the objectives under both policy frameworks. Examples of these targets could include the reduction of the mortality of non-commercial species due to by-catch from fisheries or compensating habitat loss due to dredging or the installation of offshore wind farms.
Art 11. Monitoring Programme	Support the establishment of the framework for the monitoring of the ecosystem components, generating reliable long-term data series that enable an accurate and efficient **adaptative management**. This **ecosystem-focused monitoring** provides support for tailoring management decisions to ecosystem capacity.
Art 13. Programme of Measures	The **management measures** developed in the framework of the MSFD often include technical or geographical restrictions aimed at reducing pressures and impacts on the marine environment. These measures could bring a finer level of detail to MSP processes, adding specific requirements for spatial zoning established for different sectors. Examples of measures could include seasonal and spatial fishing bans or restrictions on marine sand and gravel extraction.

Given the central role of the MSFD for improving the environmental status of marine ecosystems, Member States have opportunities to **integrate its implementation** with that of MSP. Examples of these opportunities include:

- Preparing documents that set out common approaches and actions for the two Directives as in France (see the box below);
- Giving a single government body the lead for both Directives: in Spain, for example, the Ministry for the Ecological Transition and the Demographic Challenge is the competent authority for both the MSFD and the MSP Directive, and a single department coordinates the implementation of both Directives;
- Coordinating the MSP planning cycle with the MSFD cycle to strengthen links between data availability and measures: in Belgium, for example, MSP is reviewed and updated every six years, following the same timeframe as the MSFD;
- Facilitating the use of MSFD knowledge in MSP, supporting the development of common marine/maritime knowledge systems and databases that are fed by knowledge-enhancing efforts carried out under each directive to support their implementation (see section 3.6 for further information).

Aligning MSP and MSFD: an example from France

In France, a common strategic document for both the MSFD and the MSP Directive was adopted in 2019 for Mediterranean waters (the *Document stratégique de façade Méditerranée*)[22]. It builds on a national strategic framework for the seas and coasts, the *Stratégie nationale pour la mer et le littoral*. The Mediterranean strategy then launched a process to develop a common action plan, to be published in 2021, through a process of co-creation with stakeholders.

Among the challenges, **data availability** is likely to be a key issue: even in Member States and regional seas where MSFD monitoring is relatively strong, MSP experts have found that further data was needed to understand ecosystem status and how this may be impacted by human activities. Threshold values have mostly not been identified for the "state" descriptors (i.e. biodiversity, food web functioning or seafloor integrity), as well as some others, due to a lack of knowledge, and instead the Member States use alternatives, such as the identification of sensitive areas, i.e. green infrastructure. In several Member States, data gathering for the MSFD is far from complete and provides ecological and socio-economic information at spatial scales that are not sufficiently disaggregated as compared to the needs of the MSP process. The box below shows an example how data limitations were managed in Latvia's MSP process.

Latvia: managing gaps in MSFD data

The case studies[23] and literature review[24] have shown that many Member States face gaps in the MSFD data that could be used for integrating EBA in MSP. These gaps stem from a range of factors, including incomplete environmental monitoring, data organised at broad spatial scales (as the MSFD marine reporting units are often very large), and also the lack of national definitions for key components of good environmental status.

The work to integrate EBA into Latvia's first maritime spatial plan used several strategies to cope with these problems – most prominently, using the best available knowledge for decisions, assembling data from other sources and using expert knowledge. The preparatory work sought to compile available data sets and based on that to produce, if possible, new information (including maps) relevant for MSP process.

MSFD data were used where possible. For example, level of eutrophication (MSFD descriptor D5) in the Gulf of Riga is too high to allow fish aquaculture in this location (though the final version of the plan did not seek to identify areas for aquaculture).

The team brought together experts from across disciplines – including marine ecology and geology, cultural heritage and the main economic sectors using the sea. These experts employed the best data available, for example drawing on previous marine geology surveys to prepare the country's first unified marine geology map, which then served as the basis for a benthic habitat map (though resolutions in that map varied as benthic habitat surveys provided strong data for some locations, while for others only bathymetry and low-resolution geology data were available).

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[22] See: http://www.dirm.mediterranee.developpement-durable.gouv.fr/le-document-strategique-de-facade-mediterranee-r335.html

[23] ACTeon, Baltic Environmental Forum, Fresh Thoughts, GRID-Arendal and Wageningen Research, Study on integrating an ecosystem-based approach into maritime spatial planning: Project case-study reports, August 2021 (prepared for the European Commission – the European Climate, Infrastructure and Environment Executive Agency, CINEA), available at: https://op.europa.eu/en/publication-detail/-/publication/707ddfe7-353c-11ec-bd8e-01aa75ed71a1/language-en/format-PDF/source-238648827

[24] Strosser, P., et al, Study on Integrating an Eco-system-based Approach into Maritime Spatial Planning: What are the lessons from current practice in applying Ecosystem-Based Approaches in Maritime Spatial Planning? Results from the literature review, August 2021 (prepared for the European Commission – the European Climate, Infrastructure and Environment Executive Agency, CINEA), available at: https://op.europa.eu/en/publication-detail/-/publication/be6c1830-2d63-11ec-bd8e-01aa75ed71a1/language-en

Though some data were incomplete, decisions had to be taken on the basis of what was available, foreseeing that planning solutions might have to be adjusted when better knowledge and data become available. Moreover, tasks for implementation of the strategic objectives of MSP seek to address the main knowledge and data gaps – these tasks were then taken into the MSFD Programme of Measures.

Where information is missing, the MSFD calls on Member States to use the **precautionary principle**[25] in how marine space can be shared and managed – a principle that is also cited in the Preamble to the MSP Directive. Moreover, the MSFD builds also on a cyclical planning process, with ongoing learning and improvement. An ecosystem-based approach recognises that gaps in data and in understanding are inevitable: the key step, when applying EBA, is to develop decision-making in the face of such uncertainties and identify these gaps along with options to address them.

The initial scoping exercise not only serves for the identification of key elements of the ecosystem that may require such precautionary approach and can also identify other components that either are in good state or that are not impacted by any known pressures. In these cases, the MSFD favours a **risk-based approach** on the development of management measures, focusing efforts only on those elements of the marine ecosystem that require specific protection from identified threats. The integration of this approach in MSP could improve the efficiency of the management of the environmental aspects, reducing costs and focusing resources on the key elements for ensuring a well-functioning ecosystem.

Consequently, Member States should seek the best available knowledge when gathering data for an EBA, starting with data gathered via the EU regulatory framework. They should work with sectoral experts and engage data holders – these can include different government agencies as well as research institutes and sectoral organisations. They should apply a precautionary approach when ecosystem features are identified as being in poor condition in the MSFD status assessments, and also when data are not available.

The work for EBA in MSP can also create opportunities for the implementation of the MSFD, for example via new information and analysis of ecosystems. Notably, the assessment of cumulative impacts under MSP can provide valuable insights for MSFD assessments. Moreover, MSP can translate measures under the MSFD into the spatial dimension, potentially strengthening their effectiveness.

3.2 The Water Framework Directive (WFD) can complement the MSFD

The WFD protects and maintains Europe's freshwater, both surface and groundwater, as well as coastal waters out to one nautical mile. It covers both their chemical status and their ecological status. The WFD and MSFD are closely linked, with the MSFD protecting marine waters beyond coastal waters.

3.2.1 What does the WFD bring for EBA in MSP?

The WFD, like the MSFD, brings environmental **goals** to be integrated in MSP, in particular the goal of good chemical and ecological status of coastal waters. In addition, it helps

[25] See the Communication from the Commission on the precautionary principle, COM(2000)1, February 2000; see also, European Commission, Study on the precautionary principle in EU environmental policies: Final report (prepared by Milieu Ltd), 2017, available at: https://op.europa.eu/en/publication-detail/-/publication/18091262-f4f2-11e7-be11-01aa75ed71a1/language-en

capture the many land-based pressures (such as polluting discharges leading to eutrophication) that impact on the state of marine ecosystems, contributing to their degradation.

Implementation of the WFD will also bring the results of **monitoring and assessment programmes**. While some WFD data is incorporated in the MSFD's descriptors, the WFD's monitoring and assessment programmes can provide an analysis of (land-based) anthropogenic pressures and impacts in greater spatial resolution (notably that of coastal water bodies defined under this Directive): this information will provide a valuable input to the assessment of land-sea interactions under the MSP. In addition, the WFD's intercalibration process provides a mechanism to ensure common assessment of coastal waters with similar conditions.

Under the WFD, Member States prepare river basin management plans and **programmes of measures** to improve water status. While the bulk of these measures are likely to address land-based sources of pollution that are outside of the scope of MSP, these measures will be important in the analysis of land-sea interactions that affect coastal and marine waters.

3.2.2 What key opportunities and challenges might be encountered?

Member States face both challenges and opportunities in ensuring coherence in the implementation of the MSP and WFD Directives. The WFD is implemented in six-year planning cycles, similar to the MSFD – and consequently there could be a mismatch in cycles.

The WFD covers coastal waters (out to one nautical mile) and gathers data there that will be potentially useful for EBA in MSP. WFD measures may also affect coastal waters as well as other maritime waters. Consequently, work under the WFD may be valuable in particular for the analysis of land-sea interactions under MSP.

The WFD calls for cooperation on transboundary river basins; while this cooperation focuses on freshwater issues, it can reinforce regional sea cooperation. The WFD also sets out requirements for public and stakeholder engagement, which could be integrated with those for other EU frameworks including the MSP Directive and the MSFD.

3.3 The Birds and Habitats Directives and the Biodiversity Strategy

The EU Birds and Habitats Directives together play a central role in protecting vulnerable species and habitats, including in marine ecosystems. The two Directives (together, the "EU Nature Directives") have created the Natura 2000 network of protected areas, which covers 18 % of the EU's land area and 8 % of the EU's marine territory[26].

The Biodiversity Strategy for 2030, published by the European Commission in 2020, calls for reversing biodiversity loss, restoring ecosystems and increasing the number of and the protection afforded to protected areas: notably, the Strategy calls for **protecting 30 % of the EU's sea area**, ensuring that **at least 10 % of the sea area is strictly protected**, and integrating ecological corridors. There should be no deterioration in conservation trends and status by 2030, which among others reinforces the need to meet MSFD goals for good environmental status. And the Strategy calls for sound science to be the basis for biodiversity protection, including marine protected areas (MPAs) – see the box below.

[26] European Commission (DG Environment): https://ec.europa.eu/environment/nature/natura2000/index_en.htm

The 2030 Strategy builds on the previous **Biodiversity Strategy to 2020**, which highlighted the importance of implementing the MSFD and achieving its goal of good environmental status, as well as completing the Natura 2000 network in the marine environment and ensuring the sustainability of fisheries. The earlier Strategy sets out a vision for 2050 that the EU's biodiversity and its ecosystem services are protected, valued and appropriately restored.

3.3.1 What do the Nature Directives and the Biodiversity Strategy bring for EBA in MSP?

The EU Nature Directives set broad objectives that should be addressed in MSP – notably, the protection of biodiversity and the conservation and restoration of natural habitats and species. Moreover, the Habitats Directive calls for particular attention to the protection of priority species and priority habitats, the latter defined as habitats in danger of disappearance.

Under the Nature EU Nature Directives, Member States have designated **Natura 2000 sites** whose spatial locations need to be incorporated in maritime spatial plans, and the management plans for these sites should set out restrictions and requirements for human activities – and these can be included in the plans. Management plans can also be established for protected species – these too will need to be incorporated in maritime spatial planning. Member States must provide regular reporting on the state of their Natura 2000 network and on the conservation measures they undertake. While some of this is captured by the MSFD, this reporting and the underlying data can provide further inputs for EBA assessments.

The Nature Directives and the Natura 2000 network have raised public awareness of biodiversity and ecosystems and they can provide an asset for public engagement in MSP. Furthermore, new plans, projects and activities that potentially affect Natura 2000 sites should undergo an "appropriate assessment" (Article 6(3) of the Habitats Directive) – such assessments may be needed for potential projects' allocated space under a maritime spatial plan, such as new wind farms. These assessments will also be required for maritime spatial plans themselves, if they potentially affect Natura 2000 sites. In practice, many Member States have coordinated their appropriate assessments for other types of plans and projects with their SEA and EIA procedures: this can be good practice for MSP and the projects developed under maritime spatial plans. (See section 3.7 below for further information on SEA and EIA.)

3.3.2 What key opportunities and challenges might be encountered?

A key challenge is that many Member States have not yet established management plans for their marine Natura 2000 sites or for national MPAs: these sites thus do not have objectives or restrictions to be incorporated in MSP. Here there is an opportunity to **use the MSP process to trigger the development of sites' management plans**, as it was done in Belgium and the Netherlands – and to develop preliminary restrictions for protected areas, as in Poland (see the box below).

Addressing gaps in Natura 2000 site management plans

In **Belgium**, work for the country's first MSP (in 2014) led to stronger restrictions in one Natura 2000 site. In the **Netherlands**, the process to develop the country's first MSP (published in 2016) led to the identification of new Natura 2000 sites and the development of management plans for some existing sites. In **Poland**, although some marine Natura 2000 sites lacked management plans, pilot MSP work included an analysis of protected habitats as well as human pressures in these areas to identify restrictions to be included in the spatial plan. In **Bulgaria** as well, the preparation of the country's MSP has addressed marine Natura 2000 sites, even though many lacked management plans.

The Biodiversity Strategy's objectives to increase the protection of EU seas will be an opportunity for biodiversity protection and may pose a challenge for human activities in crowded sea areas. Member States may wish to address this challenge in their future MSP revisions – but early planning work can be valuable.

The assessment of marine green infrastructure[27] (see the box below) can help to improve the coherence of MPA networks by **identifying ecological hotspots and corridors**, and thereby contributing to the objectives of the Strategy. The European Commission's 2013 Green Infrastructure Strategy highlights the importance of identifying and protecting green infrastructure and its role in supporting ecosystem services. A 2019 guidance document calls for, among others, greater use of EU funding instruments to support green infrastructure[28].

Defining marine green infrastructure

The Commission's 2013 Strategy defines green infrastructure as 'a strategically planned network of natural and semi-natural areas with other environmental features designed and managed to deliver a wide range of ecosystem services' and explains that green infrastructure can be found established in both terrestrial and marine areas. Green infrastructure extends to marine areas, where underwater features including reefs and sea grasses are valuable for ecosystems and their services. (While the term 'blue infrastructure' is sometimes used, 'marine green infrastructure' helps to indicate possible links with green infrastructure in coastal areas and on land.) In rural and urban areas, the concept of green infrastructure is relatively well established; however, its deployment is lagging in the marine realm: key factors include to scarcity of spatial data and dynamic nature of marine ecosystem. One major challenge is the need for a methodology to analyse connectivity between marine ecosystems and to identify appropriate ecological corridors.

A further challenge is that, whilst the assessments carried out under the MSFD often rely on data gathered over the implementation of the Nature Directives, sources[29] have pointed out some **misalignments** between these monitoring and management frameworks that may pose some challenges for the assessment of some of elements of the ecosystem. At the same time, it is evident that these policy frameworks cover in many cases the same species and habitats, in particular regarding Marine Protected Areas and Natura 2000 sites. It is therefore of uttermost importance to coordinate monitoring and assessment efforts at national level, **avoiding duplication** and favouring the re-use of existing data under these policy frameworks, integrating it as well under MSP.

3.4 The CFP supports work for sustainable fish stocks

The EU's Common Fishery Policy (CFP) sets out the rules for sustainably managing European fishing fleets and conserving fish stocks; it aims to ensure EU fishing and aquaculture are environmentally, economically and socially sustainable in the long term. Since 2013, EU legislation for the CFP calls for an "ecosystem-based approach to fisheries management" (EBFM)[30].

[27] Marine green infrastructure is also called blue infrastructure
[28] Available from: https://ec.europa.eu/environment/nature/ecosystems/strategy/index_en.htm
[29] Alignment of the Marine Strategy Framework Directive and the Habitats Directive - Current state and future perspectives – JRC: https://op.europa.eu/en/publication-detail/-/publication/d254ec02-bcd8-11ea-811c-01aa75ed71a1/language-en
[30] Regulation 1380/2013, Article 2.

3.4.1 What does the CFP bring for EBA in MSP?

The work on EBA in MSP should, consequently, incorporate EBFM. Studies are currently underway at EU level to better define EBFM in practical terms, and the results can provide an input to future work on EBA and MSP.

The CFP moreover brings key **mechanisms** for the sustainable management of commercial fisheries, such as multiannual plans[31] for fisheries, fishing opportunities (TACs and quotas[32] for most of commercial fish stocks) and strategic plans on aquaculture. A broad range of environmental, economic and social **data** are collected under the EU data collection framework for the CFP to underpin the scientific advice on fisheries[33] supporting decision-making. While some of these are used under the MSFD, EBA assessments may find more detailed CFP data valuable (see the box below).

Ecosystem-based approaches applied to fisheries management under the CFP

A forthcoming study on EBA applied to fisheries management shows that the CFP now provides key knowledge to enhance the application of EBA in fisheries management which may often require the explicit consideration of a spatial aspect (and thus MSP) such as in case of Marine Protected Areas (MPAs). For example, the knowledge base now includes information of fishing impacts on the structure and functioning of marine ecosystems instead of only the impacts on the commercial stocks (though gaps remain). This data now includes improved characterisations of different types of fisheries and their interactions with the wider ecosystem. The study considers ecosystem effects (e.g. of climate change or foodweb relations) on fisheries resources in the context of inherent ecosystem variability, and includes the influence of social, economic and governance aspects on fishing opportunities. Together, these clearly address several of the EBA principles mentioned in section 2 of this guidance.

Stakeholder forums under the CFP can provide mechanisms for stakeholder engagement in MSP, including across borders. The Advisory Councils[34] bring together stakeholders at regional sea scale and for other cross-border dimensions, providing input for the CFP on fisheries management as well as on data and measures. Other forums include Fisheries Local Action Groups under FARNET (the European Fisheries Areas Network)[35], as well as regional coordination groups for the data collection framework.

The CFP's financing instrument, the **European Maritime and Fisheries Fund,** and its successor, the **European Maritime Fisheries and Aquaculture Fund,** support investments for more sustainable fisheries. It may be useful to consider how measures financed by the Fund **will contribute to the implementation of EBA in MSP,** including through support to environmental and biodiversity conservation and restauration measures as well as to human activities that are sustainable in their use of marine resources.

3.4.2 What key opportunities and challenges might be encountered?

The development and implementation of an EBA in fisheries management comes with additional challenges such as the mitigation of effects on vulnerable and essential fish habitats. MSP can provide an opportunity to strengthen implementation of spatial measures, such as such as MPAs, that can address these challenges.

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[31] See: https://ec.europa.eu/oceans-and-fisheries/fisheries/rules/multiannual-plans_en
[32] See: https://ec.europa.eu/oceans-and-fisheries/fisheries/rules/fishing-quotas_en
[33] See: https://ec.europa.eu/oceans-and-fisheries/fisheries/scientific-input/scientific-advice-and-data-collection_en
[34] See: https://ec.europa.eu/oceans-and-fisheries/fisheries/scientific-input/advisory-councils_en
[35] See: https://ec.europa.eu/oceans-and-fisheries/funding/local-partnerships_en

The development of maritime spatial plans can face space-sharing and spatial exclusion conflicts, for example for the designation of proposed offshore wind farm areas and N2000 Special Areas of Conservation that can take sea space away from fisheries but could also bring benefits in terms of state of the stocks on the long run. The designation of multiple-use areas in crowded seas may provide one opportunity for sustainable use and for freeing marine space for future blue economy developments while meeting conservation requirements. The need for integrating a more multi-use and multi-sectoral approach in MSP is underlined both in the offshore renewable energy strategy[36] and in the new approach for sustainable blue economy[37].

Multiple use areas

Belgium's new maritime spatial plan covers a crowded sea area of just under 3,500 km^2. The plan, published in 2020, foresees the possibility of use of wind farm areas also for aquaculture[38]. In the Netherlands as well, multiple use is one of the five themes of the North Sea 2050 Spatial Agenda (published in 2014), with single use areas designated only where needed – for example, for absolute nature protection or for safety of cables[39].

Multiple use areas may, however, benefit certain fishing metiers. For example, in areas designated for offshore wind farms there may be opportunities for small-scale fisheries using pots and traps (targeting e.g. lobster and crab), while notably fisheries applying mobile gear (e.g. bottom trawl) face greater restrictions. Mariculture of seaweed or shellfish is likely to become the main multi-use activity that falls under CFP in such areas.

Other EU policies and legislation interact closely with the CFP, and it will be valuable to consider these interactions for EBA in MSP. This includes the MSFD (see section 3.1), where ensuring that commercial fisheries are within safe biological limits is a part of good environmental status. The Biodiversity Strategy for 2030 (see section 3.3) calls for full implementation of CFP measures for fisheries resources and mentions a forthcoming action plan on fisheries resources and marine ecosystems. Further EU policies under the Green Deal can also support EBA goals, for example in aquaculture: the Farm to Fork Strategy calls for an increase in organic aquaculture, and recent strategic guidelines call for aquaculture to support ecosystem goals[40].

3.5 Linking MSP and Integrated Coastal Zone Management (ICZM)

A 2002 EU Recommendation[41] sets out key principles for ICZM and calls on EU Member States to develop national strategies. The MSP Directive cites this Recommendation as well as the Protocol on Integrated Coastal Zone Management in the Mediterranean under the

[36] European Commission, An EU Strategy to harness the potential of offshore renewable energy for a climate neutral future, COM(2020) 741 final, November 2020, available at: https://ec.europa.eu/energy/topics/renewable-energy/eu-strategy-offshore-renewable-energy_en

[37] European Commission, on a new approach for a sustainable blue economy in the EU – Transforming the EU's Blue Economy for a Sustainable Future, COM(2021) 240 final, May 2021, available at: https://ec.europa.eu/oceans-and-fisheries/ocean/blue-economy/sustainable-blue-economy_en

[38] https://www.health.belgium.be/en/environment/seas-oceans-and-antarctica/north-sea-and-oceans/marine-spatial-plan

[39] https://www.noordzeeloket.nl/en/policy/noordzee-2050/@166956/north-sea-2050/

[40] European Commission, Strategic guidelines for a more sustainable and competitive EU aquaculture for the period 2021 to 2030, COM(2021) 236 final, Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2021:236:FIN

[41] Recommendation of the European Parliament and of the Council of 30 May 2002 concerning the implementation of Integrated Coastal Zone Management in Europe (2002/413/EC), available at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32002H0413&from=EN

Barcelona Convention[42]. It calls on Member States to "promote coherence between maritime spatial planning and the result plan or plans and other processes, such as integrated coastal management…" (Art. 6(1)(c)).

3.5.1 What does ICZM bring for EBA in MSP?

The Recommendation calls an "ecosystem approach" to ICZM, and its principles are broadly similar to those of an ecosystem-based approach (see section 2.2 above).

Member States have taken different approaches to ICZM and its links with MSP. In Latvia and in some other Baltic countries, ICZM is largely incorporated as part of MSP, and in particular under work to address land-sea interactions as part of maritime spatial planning.

In the Mediterranean, the Protocol cited above calls on Parties to establish ICZM strategies, plans and programmes: a 2019 Framework links ICZM to MSP. The MSP Directive calls on Member States to take into account land-sea interactions in maritime spatial planning (Articles 1, 4, 6 and 7); this Mediterranean Framework underlines that ICZM can be used to help address land-sea interactions (see the box below).

A Common Regional Framework for ICZM in the Mediterranean

This document[43], adopted by the Parties to the Barcelona Convention in 2019, identifies MSP as the main tool for implementing ICZM in the marine part of the coastal zone. It highlights the importance of EBA as a goal also for ICZM, and it calls for the development of guidance and tools to implement ICZM and MSP in a complementary way and for the development of networks and projects at regional sea and national levels.

The Framework highlights the links between ICZM and land-sea interactions under MSP. It refers to three types of land-sea interactions: those related to natural processes (such as coastal erosion and flooding); those related to human land and sea uses and activities (such as pollution from land sources); and the interactions of planning processes and plans.

The UNEP Mediterranean Action Programme under the Barcelona Convention has promoted work that links ICZM and MSP: examples include the Global Environment Facility's Adriatic Project, which supported the integration of the ecosystem approach into MSP, ICZM and MPAs in Albania and Montenegro[44]; and the CAMP Otranto Strait Project for the coordinated implementation of MSP and ICZM in Albania and south-eastern Italy.

3.5.2 What key opportunities and challenges might be encountered?

Linking ICZM and MSP can build a bridge between land and sea – as described in the box above, ICZM can help countries take land-sea interactions into account in their maritime spatial planning. This can create the challenge and opportunity of integrating different perspectives and analytical approaches. There are different approaches for the integration of these two planning areas, such as:

- Addressing coastal management as part of MSP: as noted above, in Latvia MSP and its call to consider land-sea interactions now process the context for ICZM.
- Establishing formal coordination mechanisms between ICZM and MSP
- Using one agency to lead both processes, as in Massachusetts (see the box below)

[42] The protocol is available in English, French and Spanish in a document that can be downloaded from: http://paprac.org/storage/app/media/Dokumenti/Protocol_publikacija_May09.pdf
[43] Decision IG.24/5. Available at: https://wedocs.unep.org/bitstream/handle/20.500.11822/31703/19ig24_22_2405_eng.pdf
[44] See: SPA/RAC, The GEF Adriatic project, web page, Available at: https://www.rac-spa.org/node/1941

ICZM and MSP in Massachusetts: coordination via a common agency

The State of Massachusetts in the US set up a coastal zone management process before its MSP. By law, the two are separate, with ICZM extending from the coastline to 0.3 nautical miles, and then MSP from that line to 3 nautical miles. In practice, there are strong links as a single state agency – the Executive Office of Energy and Environmental Affair and in particular the Office of Coastal Zone Management under this Executive Office – oversees both processes (for further information see the case study on the Massachusetts Ocean Management Plan[45]).

3.6 Drawing on INSPIRE and data portals in MSP

The INSPIRE Directive (2007/2/EC) aims to create a common EU infrastructure for spatial data on the environment. Its implementation can improve and strengthen data management for EBA in MSP. Member State marine and maritime data can be accessed through the INSPIRE Geo-Portal[46].

3.6.1 What does INSPIRE bring for EBA in MSP?

INSPIRE can be an instrument not only for data collection, but also for increasing the transparency of MSP processes. The INSPIRE data model can be used to map maritime activities and support the integration of sea and land planning in an overview of cross-border planning for any EU marine region. The coverage of many maritime activities – including fisheries, aquaculture, oil and gas, underwater infrastructure and maritime transport, as well as nature conservation sites, protected areas and underwater cultural heritage – allows cross-sector interoperability and can significantly support the MSP requirements related to land-sea interactions. INSPIRE can moreover integrate spatially explicit assessment data from other EU Directives such as the MSFD, WFD and the Nature Directives. This information can support the implementation of EBA as well as the coordination of efforts to protect and manage the marine environment.

3.6.2 What key opportunities and challenges might be encountered?

One challenge is that implementation of INSPIRE has been slow in several Member States: as a consequence, some key data sets may not be available. A further issue is that INSPIRE is built around national data sets, which do not always directly support cross-border analysis: a recent North Sea project found that work is needed to harmonise data sets and facilitate data sharing for MSP purposes[47].

These issues are being addressed in part via the growing links and harmonisation among EU-level data portals. For work on EBA and MSP, EMODnet (the European Marine Observation and Data Network) provides a broad range of datasets (see the box below)[48]. INSPIRE and EMODnet data standards are compatible, strengthening potential links. However, it is crucial to note that the potential of these platforms relies on Member States

[45] Published in: ACTeon, Baltic Environmental Forum, Fresh Thoughts, GRID-Arendal and Wageningen Research, Study on integrating an ecosystem-based approach into maritime spatial planning: Project case-study reports, August 2021 (prepared for the European Commission – the European Climate, Infrastructure and Environment Executive Agency, CINEA), available at: https://op.europa.eu/en/publication-detail/-/publication/707ddfe7-353c-11ec-bd8e-01aa75ed71a1/language-en/format-PDF/source-238648827

[46] Available at: https://inspire-geoportal.ec.europa.eu/

[47] SEANSE, Strategic Environmental Assessment on North Sea energy: summary report, 2020, available at: https://northseaportal.eu/downloads/

[48] See also: https://emodnet.ec.europa.eu/en/emodnet-maritime-spatial-planning-msp

taking an active role in populating them with information obtained through the implementation of the different environmental policies.

EMODnet

EMODnet is a network of research organisations supported by the EU's integrated maritime policy. These organisations work together to observe the sea, process the data according to international standards and make that information freely available as interoperable transboundary data layers and data products. EMODnet provides access to European marine data across seven discipline-based themes, i.e. Bathymetry, Geology, Seabed habitats, Chemistry, Biology, Physics and Human activities (including aquaculture, shipping, pipelines, energy installations, oil and gas, renewable energy), which can be accessed through a data portal[49]. EMODnet collaborates with the Copernicus Marine Service, which provides satellite data that can complete the network's *in situ* data[50].

Both INSPIRE and EMODnet standards can help to harmonise spatial data across countries, a key step in improving cross-border cooperation on MSP. This was tested in the MarSP project, supporting MSP in the Azores, Madeira and Canary Islands: the project developed an extended version of the INSPIRE model for MSP[51]. Regional sea commissions can facilitate data sharing and harmonisation: the work of HELCOM is a leading example (see the box below).

Sharing spatial data in the Baltic Sea

HELCOM's map and data service[52] provides a map-based visualisation of environmental data. HELCOM has also developed guidelines for coherent monitoring efforts in Baltic Sea[53]. In addition, its Basemaps portal[54] provides a spatial visualisation of national MSP data from Baltic Sea countries: both "input" data used in preparing plans as well as "output" data, showing the areas designated by the plans.

The MSP EMODnet model was recently developed under EMODnet's Human Activities portal: it extends the MSP INSPIRE model, developed under MarSP and is integrated with elements of HELCOM's Basemaps portal[55]. A Technical Expert Group (TEG) on MSP data under the MSP Experts Group endorsed this model, together with the MarSP and HELCOM models, as potential solutions for Member States to use.

The European Commission's *New approach for a sustainable blue economy*[56] highlights the importance of ocean knowledge. It refers to work on a Digital Twin of the Ocean, to be a component of the Destination Earth initiative, as well as an upcoming Ocean Observation Initiative. These actions can deepen the information base for future work on EBA in MSP.

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[49] See https://www.emodnet.eu/en/portals
[50] Copernicus Marine Service, About the links with EMODnet, web page (accessed 27 April 2021), available at: https://marine.copernicus.eu/about/links-with-emodnet
[51] MarsP, Data specification for Maritime Spatial Planning INSPIRE data model, December 2019, available at: https://marsp.eu/media/files/61/marspwp5d51mspinspiredatamodel.pdf
[52] http://maps.helcom.fi/website/mapservice/
[53] https://helcom.fi/action-areas/monitoring-and-assessment/monitoring-and-assessment-strategy/
[54] https://basemaps.helcom.fi/
[55] EMODnet, Guide for the EMODnet marine spatial planning data model, Working Paper, February 2021: https://www.emodnet-ingestion.eu/media/emodnet_ingestion/org/documents/emodnet_data_model_guide_for_msp_wkpaper_08_02_21.pdf
See also the TEG recommendations: https://op.europa.eu/en/publication-detail/-/publication/f4d14782-19ba-11ec-b4fe-01aa75ed71a1/language-en/format-PDF/source-234524493
[56] European Commission, on a new approach for a sustainable blue economy in the EU – Transforming the EU's Blue Economy for a Sustainable Future, COM(2021) 240 final, May 2021, available at: https://ec.europa.eu/oceans-and-fisheries/ocean/blue-economy/sustainable-blue-economy_en

3.7 Using SEA and EIA to strengthen the integration of EBA in MSP

The EU Directives on Strategic Environmental Assessment (SEA) and Environmental Impact Assessment (EIA) establish procedures to ensure that the significant environmental effects of plans, programmes and projects are considered in decision-making. The SEA Directive does so for certain programmes and plans, the EIA Directive for projects.

3.7.1 What do the SEA and EIA Directives bring for EBA in MSP?

The SEA Directive is directly relevant for EBA in MSP. The Directive calls for an assessment of certain plans and programmes which are likely to have significant effects on the environment, including those on biodiversity: it thus is coherent with the MSP Directive's provisions on EBA.

The preparation of a maritime spatial plan will require an SEA procedure that assesses its impacts on the environment in the sense of the SEA Directive, including the marine ecosystem but also covering e.g. air, that often would not be considered as part of MSP (or even EBA work)[57]. When it considers interactions between the plan and ecosystems, **SEA can play a key role in ensuring and enhancing EBA in MSP**. While the SEA Directive does not refer to an ecosystem-based approach, this is emphasised in the *Guidance on Integrating Climate Change and Biodiversity into Strategic Environmental Assessment* (2013), which should be consulted for good practice when planning and carrying out SEAs for maritime spatial plans[58]. If applied effectively, for example on the basis of the 2013 guidance, the SEA process can become a central mechanism for EBA in MSP[59].

Maritime spatial plans can lay the groundwork for major blue economy projects: for example, they can identify locations and requirements for wind power facilities. An **EIA procedure** will assess a single project's impacts on the environment. It can draw on the information and key issues identified in the broader perspective in the SEA for the plan. The EIA process is likely to require further ecosystem monitoring. This data will focus on the potential impacts of the project itself, though for major projects such as large wind farms, the impacts are likely to be relevant for EBA in the overall plan. Moreover, data gathered in the EIA process can provide more detailed insights into the wider ecosystem relevant for an EBA. MSP practitioners and other officials should seek to ensure that data gathered for EIA procedures remains available and feeds into the wider MSP process (specifically the *developing* and *assessing* steps).

Both SEA and EIA work will consider the environmental objectives set across the EU regulatory framework, such as those in the MSFD, and can assess their integration into MSP. The work for SEA and EIA will require data on environmental conditions and can draw on data gathered under the MSFD and other EU legislation cited above. Work under SEA and EIA may also identify key gaps and areas to improve monitoring and data gathering.

3.7.2 What key opportunities and challenges might be encountered?

Several Member States, such as Germany and Portugal, have carried out **SEA in parallel with the preparation of maritime spatial plans**. The steps of the SEA can thus review and reinforce work for EBA. In terms of the five MSP steps, this means that SEA work is

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[57] An SEA should consider likely effects on the environment, including on biodiversity, population, human health, fauna, flora, soil, water, air, climatic factors, material assets, cultural heritage, including architectural and archaeological heritage, landscape and the interrelationship between all those different dimensions.

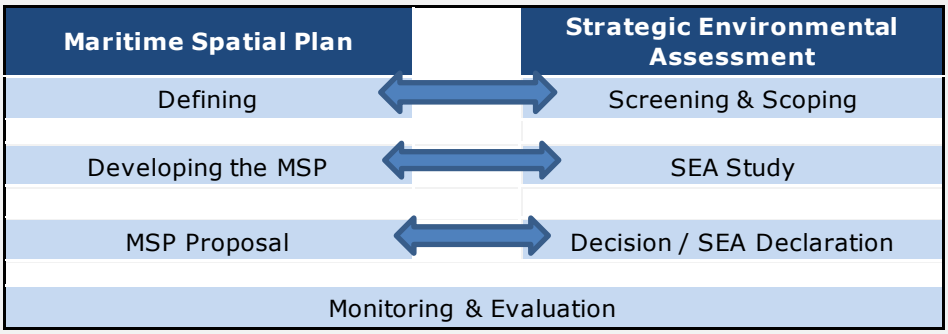
[58] McGuinn, J., et al, Guidance on Integrating Climate Change and Biodiversity into Strategic Environmental Assessment (prepared for the European Commission), 2013. Available at: https://ec.europa.eu/environment/eia/pdf/SEA%20Guidance.pdf

[59] PanBaltic Scope, EBA in MSP – a SEA inclusive handbook, 2019. Available at: http://www.panbalticscope.eu/wp-content/uploads/2019/12/EBAinMSP_FINAL-1.pdf

carried out across the *defining, developing,* and the *assessing* steps. In doing so, the SEA process can thus better play its **strategic role**, also helping planners identify and consider concrete alternatives that may strengthen EBA (see the box below).

Aligning SEA and MSP steps: an example from Portugal

In Portugal, the SEA was carried out in parallel with the development of country's recent MSP. The figure below provides an overview of the alignment between the two processes.



In some Member States, SEA is by law or by tradition carried out at a later stage in the planning process, for example when a draft of the plan has been prepared. In terms of the MSP steps, in these cases SEA is carried out only in the *assessing* step. Even where this is the case, SEA can still provide a valuable review of the integration of EBA in MSP.

The SEA process can address many of the key principles of EBA: for example, the 2013 guidance on addressing climate change and biodiversity in SEA (cited above) highlights the importance of addressing uncertainty. The table below presents key issues from the guidance in terms of the three main themes of EBA set out in section 2. The table shows that SEA can play a particularly important role in terms of the first theme, on marine ecosystems, and the third, on organising the MSP process.

Table 2: Links between SEA and the three themes of EBA in MSP

EBA theme	Key issues for SEA to address
Capturing the integrity, functioning and dynamics of marine ecosystems	• Identify key biodiversity issues early in the process (and review them as new issues emerge) • Analyse the long-term, evolving environmental baseline trends • Investigate how climate change and biodiversity interact with each • Take an integrated, ecosystems approach to planning • Assess cumulative effects
Incorporating human activities and their socio-economic considerations	• Consider long-term trends • Use ecosystem services as a framework
Organising the MSP process with regards to governance and management	• Consider the objectives, commitments and targets set in policy • Be comfortable with uncertainty, and use tools such as scenarios to address uncertainties linked to complex systems and imperfect data • Prepare for adaptive management, linked to monitoring • Identify and assess resilient alternatives • Base recommendations on the precautionary principle and acknowledge limitations of current knowledge • Monitor effectiveness to support adaptive management

Source: Based on McGuinn J., et al, Guidance on Integrating Climate Change and Biodiversity into Strategic Environmental Assessment, 2013

Both SEA and EIA Directives have provisions for public participation, and these can be linked to actions for public and stakeholder engagement for EBA. Member States can go beyond these provisions to put in place innovative mechanisms: for example, in Ireland a technical steering group bringing together stakeholder representatives and government bodies for the SEA of an offshore renewable energy plan remained in place to oversee environmental monitoring actions recommended in the assessment[60].

One challenge is that, although the 2013 guidance on climate change and biodiversity in SEA (cited above) discusses how SEA and EIA can incorporate an analysis of ecosystem services, the integration of ecosystem services into actual SEA work has been slow. The analysis of these services can consider both economic returns from marine ecosystems as well as how coastal and other communities value the sea and healthy marine ecosystems (ecosystem services are discussed further in section 4 and factsheets on tools to assess and monetise them are provided in Annex I).

3.8 How can the EU regulatory framework support cross-cutting processes?

3.8.1 Cross-border cooperation

EU legislation, including the MSP Directive, provides a common framework for protecting ecosystems and governing human activities in the marine environment. A key challenge for EBA is to assess and manage ecosystems when they cross national and other administrative boundaries. Cross-border cooperation is a key challenge for EU seas: the MSFD and other EU legislation call for transboundary cooperation. Notably, the MSFD calls for cooperation via the structures set up by Regional Sea Conventions, including coordination of work on the technical aspects of good environmental status, such as the selection of indicators or setting of common threshold values (see the box below). The European Commission has supported these actions, including by financing cross-border MSP projects in Europe's regional seas.

Examples of MSFD coordination work in the EU's regional seas

HELCOM (Baltic Marine Environment Protection Commission), and OSPAR, for the northeast Atlantic, have undertaken a range of activities to coordinate and strengthen Member State work for the MSFD. This includes analytical work, for example on establishing threshold values for biotic and abiotic elements. HELCOM has developed guidelines for coherent monitoring efforts across Member States in the region[61].

In cooperation with VASAB (Vision & Strategies Around the Baltic Sea), HELCOM has established a Joint Working Group on Maritime Spatial Planning to ensure cooperation among the Baltic Sea Region countries for coherent regional MSP processes. In 2010, the countries agreed on broad scale MSP principles: the first (of ten) is on the ecosystem approach[62]. In 2016, a Guideline for the implementation of ecosystem-based approach in MSP in the Baltic Sea area was agreed by both HELCOM and VASAB parties[63]. Baltic Sea countries are working on joint actions addressing the ecosystem-based approach, to be included in the Baltic Sea Action Plan 2030.

The OSPAR Secretariat has developed a measures and actions programme to support coordination on MSFD measures[64] and is implementing the OSPAR Data and Information Management Strategy,

[60] González A, et al, Towards a better understanding of SEA effectiveness in Ireland, Impact Assessment and Project Appraisal, Vol. 37, 2019. Available at: https://doi.org/10.1080/14615517.2019.1580475
[61] https://helcom.fi/action-areas/monitoring-and-assessment/monitoring-and-assessment-strategy/
[62] https://vasab.org/wp-content/uploads/2018/06/HELCOM-VASAB_BROAD-SCALE_MSP_PRINCIPLES-1.pdf
[63] https://vasab.org/wp-content/uploads/2018/06/Guideline-for-the-implementation-of-ecosystem-based-approach-in-MSP-in-the-Baltic-Sea-area-1.pdf
[64] https://www.ospar.org/work-areas/cross-cutting-issues/map

including the development of an information management system to facilitate data sharing as well as reporting for the MSFD.

UNEP/MAP, Secretariat for the Barcelona Convention, facilitates the work to apply an ecosystem approach for achieving and maintaining Good Environmental Status (GES) of Mediterranean Sea and coasts, also involving cooperation with non-EU countries. This approach incorporates ecological objectives for coastal ecosystems and landscapes, and thus addresses land sea interactions as part of an ecosystem approach.

There has also been cooperation across regional seas. The Black Sea workshop for this study called for greater cooperation on EBA and MSP with structures in the Mediterranean, building on ICZM work in each sea.

EU legislation such as the MSFD highlights the important role of regional sea cooperation, and regional sea structures have supported work for an ecosystem-based approach in MSP can build on regional sea cooperation: an example is Baltic coordination on the development of methods to assess marine green infrastructure, among other topics.

3.8.2 Stakeholder and public engagement

The EU regulatory framework calls for stakeholder and public consultation, and this can be the basis for supporting stakeholder mobilisation into the MSP process. Stakeholder consultation is a corner stone of the implementation of the MSFD and of the WFD, and of the establishment and implementation of management measures for Natura 2000 protected sites. Both the SEA and EIA Directives call for cross-border consultations where this is relevant (i.e., when the plan or programme or project is likely to have significant effects on the environment of another Member State), building on the Espoo Convention on Environmental Impact Assessment in a Transboundary Context and its Kyiv Protocol on Strategic Environmental Assessment (SEA). While these international agreements set out a common process, Member States can go further, as Germany has done (see the box below).

Cross-border consultation in the SEA for Germany's federal MSP

In Germany, the Federal Maritime and Hydrographic Agency (*Bundesamts für Seeschifffahrt und Hydrographie*) leads on the preparation of maritime spatial planning for Germany's economic exclusion zone (EEZ). As part of this work, the agency has carried out several activities for cross-boundary SEA, including the following:

(a) establishing direct contact with neighbouring countries to share ecosystem diagnoses;
(b) stakeholder consultation, and ensuring traceability in how comments influence decisions;

The process (ongoing in late 2020) included bilateral exchanges with officials in neighbouring Member States as well as a call for written comments. The agency launched an English-speaking web page and blog to inform stakeholders and the public, including in neighbouring countries, on the MSP process (https://wp.bsh.de/en/).

Member States can also go further in developing the transboundary dimension of such assessments: for example, a review of EIA and SEA of plans and projects in the North Sea found many similarities in the approaches; however, when assessing plans and projects for wind power, not all countries assessed cumulative effects outside their waters[65].

[65] SEANSE, Comparison of North Sea EIAs and SEAs of maritime spatial plans and wind energy development, July 2019. Available at: https://northseaportal.eu/downloads/

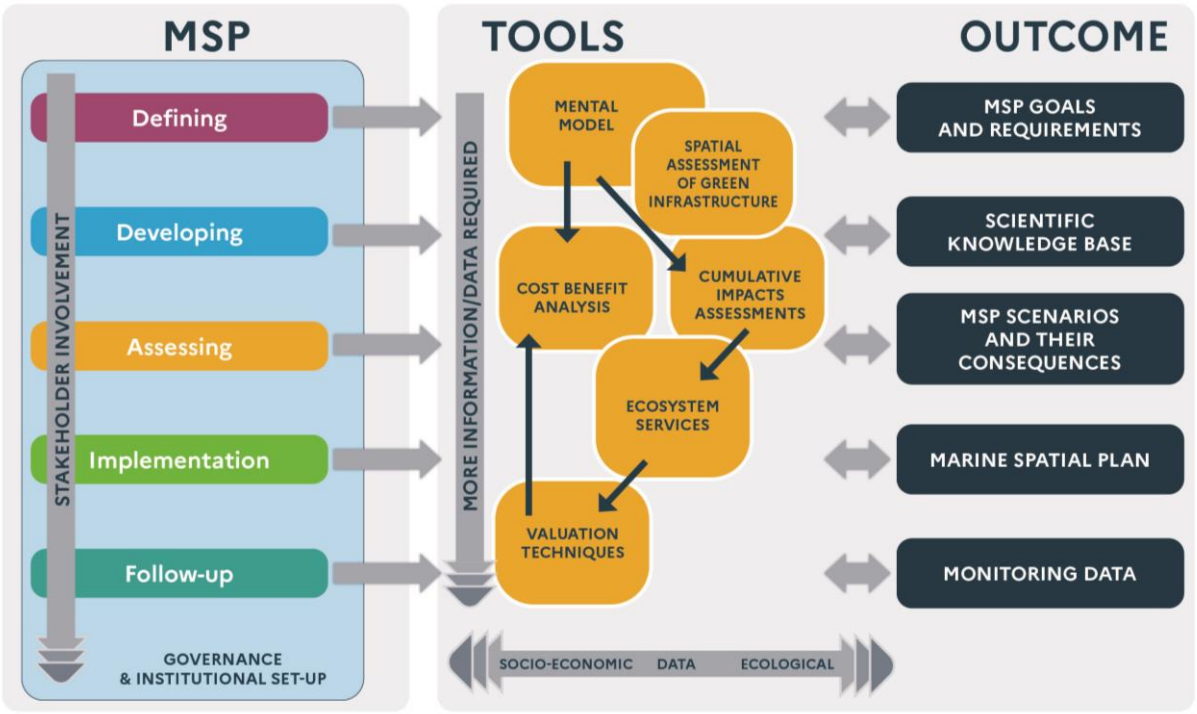
4 HOW TO INTEGRATE EBA IN MSP? A STEP-BY-STEP APPROACH

This section provides a practical approach for EBA in MSP for each of the five steps of the MSP cycle (see section 2.3). These steps are, again:

1. **Defining:** setting the frame for MSP, organising the MSP process and identifying its priority objectives and principles (societal goals)
2. **Developing**: building the knowledge base including stocktaking and analysing data and other information
3. **Assessing**: Assessing and weighing planning alternatives
4. **Implementing**: Implementing the plan
5. **Follow-up**: Evaluating results and performance

The figure below provides a schematic outline of the practical approach. The red arrows indicate how the outcomes of the MSP steps feed into the tools. The black arrow on the far right indicates that certain tools can provide deeper assessments for the integration of EBA – but depend on the availability of more extensive data.

Figure 5: Outline of the practical approach in relation to the MSP process, its primary outcomes and the tools that may be applied



Note: The position of the tools indicates their data requirements, how they relate to the science disciplines and sustainability dimensions and possible interrelatedness/dependency. While the figure shows key tools for EBA in MSP, it is not intended to provide an exhaustive picture. Moreover, tools may be used in more than MSP step.

The following pages identify, for each of the first four MSP steps from *defining* to *implementation*, key actions to be taken and an overview of what the EU regulatory framework can bring, drawing on the detailed overview of EU policies and legislation in Section 3, as

well as the role of cross-cutting processes such as stakeholder engagement. (Please note that the last step, *Follow-up*, is covered in detail in section 5 on monitoring, reviewing and evaluation EBA in MSP.)

For each MSP step, a checklist asks key questions and points to potential issues that practitioners should consider for each of the three categories of EBA principles (see section 2.2). Where possible, recommendations are presented on how to address specific issues or overcome challenges, but the primary aim is to make sure that all the main issues were at least considered. How to best address them is the next step and it is up to practitioners to consider this in the context in which they are working. There could be good reasons not to address a specific issue at a given time, but these reasons should be acknowledged, including to stakeholders, and reconsidered in subsequent cycles of the adaptive MSP process.

This practical approach also includes an introduction to selected tools which can be applied to address one or more points in the checklist. These tools are presented for the *developing* and *assessing* steps – but they could be used in other steps of the planning cycle as well. Annex I provides further information on the tools via a set of factsheets that present key practical information for using them.

There is, however, no one-size-fits-all solution for integrating EBA in MSP: this is a context-specific process that needs to be adapted to regional sea, national and sub-national conditions – and within each country, it should be adapted over time as environmental, socio-economic or institutional settings change. The practical approach provided here thus presents a series of ideas, methods and tools for officials, practitioners and stakeholders to consider.

4.1 Defining

4.1.1 What key actions in this step?

The key actions for EBA in MSP to be taken in the *Defining* step include:

- Identifying **key policy objectives and other societal goals** that will drive the MSP process. From an EBA perspective, it is important that all relevant objectives – i.e., environmental, social and economic objectives – are considered, including priorities and objectives of local communities, often obtained through stakeholder involvement. It is worth considering different perspectives relevant for prioritisation (see box in section 2.3 on weak and strong sustainability). This step can build on a desk study of the policy and strategic documents that are deemed relevant, so their objectives and obligations are duly considered.
- Identifying the **appropriate boundaries** and **defining the social-ecological system** to be considered in the MSP planning process. From an EBA perspective, it is essential that the spatial boundaries consider both those of the natural system as well as relevant jurisdictional or administrative boundaries. The definition of the social-ecological system involves the relevant sectors and ecosystem components that may occur within those boundaries or depend on the resources that come from that space (e.g. benefiting from ecosystem services today and in the future).

4.1.2 What does the EU regulatory framework bring?

In the *defining* stage, the **EU Regulatory framework** will bring important societal goals to be addressed in MSP. These include, notably, the objective of good environmental status of marine waters under the MSFD, a goal that is incorporated in the MSP Directive. Section 3 of this guidance cites other key goals, such as Biodiversity Strategy's target to

protect 30 % of the EU's sea areas by 2030 (including 10 % for strict protection) and its call to ensure marine ecosystem connections.

Strategic environmental assessment (SEA) can accompany the process for EBA in MSP, as described in section 3.7: the *defining* step can also be the moment to begin the screening process under SEA.

The MSFD and other EU Directives highlight the roles of the secretariats for the Regional Sea Conventions, whose work – together with EU-funded projects – can provide policy objectives and legal requirements (as in the Mediterranean under the Barcelona Convention and its Protocols); data on ecosystems and human activities; common methods for MSP; and analyses providing insight into ecosystem issues in a cross-border context. In the *defining* stage, cross-border and regional sea cooperation should be defined.

4.1.3 What are key issues for cross-cutting processes?

Key to the setting up of objectives and management principles (e.g. when and how to apply the precautionary principle), but also to the setting of the system boundaries that will be the basis for the MSP process, is **stakeholder engagement** throughout the process where all relevant stakeholders (e.g. sectoral, environmental NGOs, science, government) provide input on: societal issues and objectives to be considered; and the appropriate spatial boundaries (e.g., natural ecosystem, administrative, jurisdictional boundaries).

It is important that decisions on "who to involve when" in the MSP process consider stakeholders representing all relevant sectors, organisations representing environmental interests (such as managers of Marine Protected Areas and representatives from environmental civil society organisations), local communities and small-scale activities such as local fishing groups and the research sector (the relationship between scientific expertise and stakeholders is described in section 4.2.3 below). The groups who should be involved may include communities and sectors beyond Member States' administrative boundaries, possibly including those in non-EU countries within the regional sea.

The choice of stakeholder engagement mechanisms is also important. There is no one-size-fits-all solution but rather a context-specific process that can be adapted as socio-economic settings, national interests or priorities change. This, therefore, requires the stakeholder process to be flexible and perceptive of the changing needs of stakeholders, the possibilities for specific stakeholder involvement approaches and the tools to apply. Several levels of involvement are possible for stakeholders and the general public: they range from information, consultation and deliberation to collaboration, co-decision-making or even process responsibility[66]. Depending on this level of involvement, different methods and tools can be used and combined. Examples include online or on-site meetings, thematic groups, world cafés, participatory mapping or participatory scenario-building.

In terms of **cross-border cooperation**, the identification of spatial boundaries needs to consider the ecological functioning and dynamics of the marine ecosystems, and potentially the required level of detail (e.g., spatial and temporal scales or the description of the human activities involved) that will need to be considered in assessments carried out for capturing current and future challenges and conflicts on marine space, and for comparing alternative options for its management. Actions for stakeholder engagement and cross-border can and should be linked, as suggested in the following box.

[66] Giacometti, A., et al. Handbook: Process, Methods and Tools for Stakeholder Involvement in MSP. BONUS BASMATI Deliverable 2.3, February 2020, www.bonusbasmati.eu

Looking beyond national borders

Addressing transboundary issues can build on existing Regional Sea Conventions (RSC), in cooperation with other regional organisations such as regional fisheries management organisations (RFMOs), as they can facilitate the mobilisation of other countries and stakeholders at the transboundary scale. The organisation of transboundary workshops involving stakeholders from different countries, or the organisation of bilateral meetings with stakeholders absent from current governance, can also be considered as part of the transversal processes in several of the key MSP steps. For example, this can help sharing data, results, and consolidating assessment results accounting for wider knowledge and understanding. In some cases, specific attention needs to be given to the involvement of stakeholders and sector representatives that are not formerly represented in existing regional organisations, e.g. representatives from economic interests that operate at the international scale (e.g. shipping) and which activities influence directly or indirectly the ecosystem falling within the administrative boundaries of the MSP.

4.1.4 An EBA checklist

The following checklist identifies key EBA issues to consider when undertaking this step. This checklist can also provide a set of issues to be reviewed in the SEA process accompanying the MSP process, as well as in other evaluations.

Table 3: EBA Checklist for the *Defining* step. Each of the questions may be ticked.

Key Topics	Practical guidance: issues to consider
Key policy objectives and other societal goals	✓ Do the goals consider (a) ecological (protection, capturing ecosystem services), (b) maritime sector (development, reducing pressures/ensuring sustainability) and (c) wider societal (protection, risk reduction, amenities) components? Are some (tangible) goals not considered? Is this justified? ✓ Are goals (and related targets/operational objectives) and priorities between goals, set or developed with a strong stakeholder component? ✓ Which societal goal(s) and/or indicators are given priority? How is it justified (e.g. on the basis of science, stakeholder processes or their combination)?
Appropriate boundaries and definition of the social-ecological system	✓ Which "spatial area" should be considered in the MSP process? Does the scale incorporate ecological, administrative or jurisdictional boundaries? ✓ What should be an appropriate time horizon for the assessment scenarios? Does it account for long-term structural changes and uncertainty? ✓ Does the spatial area capture appropriate boundaries? How are these boundaries dealt with? What is the likelihood that these are "hard" boundaries? For example, the "Large Marine Ecosystems" that are at the basis of the MSFD regions were selected such that they can be treated as separate entities even though fluxes of biota or nutrients can be expected to cross boundaries. This is even more likely if member states' EEZs are used within the MSFD regions, even more so for specific projects (e.g. offshore wind farms or N2000 sites) within such an EEZ. ✓ Are trans-boundary issues (e.g. between EU member states and third countries, among EU member states or sometimes between federal states) considered? And addressed? ✓ Are these fluxes or influences from outside the boundaries explicitly considered? In the knowledge base? In management? In stakeholder interactions?
Stakeholder mobilisation	✓ Who is involved, at which stage and with which role? Are boundaries of the MSP an outcome of the stakeholder process – or a set condition? Are measures selected via a stakeholder prioritization – or bilateral "negotiations"? which results are "agreed" in a more consultative process? ✓ How are stakeholders mobilized? From the start and based on the definition of the system's boundaries? At all steps of the MSP design and implementation process? With which role (bringing knowledge, providing feedbacks on results, contributing to prioritisation, co-selecting...)? ✓ Are there specific "connections/bridges" between the "MSP stakeholder" mobilization and other stakeholder processes (carried out under ICM/ICZM, MSFD, WFD…)? When and how?

Key Topics	Practical guidance: issues to consider
	✓ Are stakeholders from "outside" of the MSP boundaries involved in the stakeholder process? For example, those representing activities outside of the MSP area (including land) that may be impacting the area itself or benefiting from ecosystem services delivered by the area, or that might be affected by management measures taken within the area. Is this coherent with the overall functioning of the ecosystems and fluxes investigated and benefiting from ecosystem services delivered by the area, or that might be affected by management measures taken within the area. Is this coherent with the overall functioning of the ecosystems and fluxes investigated? ✓ Which communication mechanisms and tools are put in place for sharing assessments and results with different audiences? How are complex issues presented and shared, including on transboundary issues and challenges?

4.2 Developing

4.2.1 What are the key actions in this step?

Key actions in the *Developing* step include:

- Building a **knowledge base** that helps assess the performance of the MSP against set policy objectives and societal goals,
- Taking account of the relevant boundaries at an **appropriate level of detail** to represent the **integrity and functioning of the ecosystem,** how this may be impacted by the **human activities and their pressures** and the importance of **ecosystem services** that are delivered and benefit to socio-economic activities
- The application of specific **tools** that will have consequences on the degree of **uncertainty** in the outcome of the analyses.

4.2.2 What does the EU regulatory framework bring?

In the *developing* step, the EU regulatory framework will bring data and knowledge for the ecosystems-based approach. Section 3 outlines the importance of data collected for the MSFD as well as the WFD, CFP and the Nature Directives. EU platforms such as EMODnet can be valuable for bringing these and other data sources together. At this step, SEA work can be valuable in accompanying, reviewing and strengthening EBA activities. This can include work to prepare the SEA study. Moreover, an appropriate assessment under the Habitats Directive may be necessary to review possible impacts on Natura 2000 sites: as noted in section 3.3, this could be integrated in the SEA process.

4.2.3 What are key issues for cross-cutting processes?

In the *developing* step, the mechanisms for stakeholder engagement can be used to contribute to and discuss research and analytical work for EBA, bringing together scientific and stakeholder knowledge. These mechanisms should thus include ways for stakeholders to contribute to the knowledge base: ideally, the mechanisms integrate expert and stakeholder knowledge (see the box below).

Interdisciplinary and transdisciplinary processes to integrate knowledge

Scientific investigation and dissemination often take place on a purely disciplinary basis, that is, within one academic field and focusing on information and knowledge within that field. Science has increasingly adopted *multidisciplinary* approaches that bring together different fields of knowledge. For work at the science/policy interface – where work on EBA in MSP lies – *participatory* methods are used to bring together experts with stakeholders, though these often focus on

single areas of scientific work. *Interdisciplinary* approaches go a step further, integrating disciplines to develop integrated assessments, and *transdisciplinary* methods will bring together experts and stakeholders for information exchange and joint assessment work[67].

4.2.4 What tools are useful in this step?

The main issue in the *developing* step is to deal with the complexity inherent to EBA. This means that it is not feasible to look systematically at all issues, including every aspect of the ecosystem and its causal relationships, all the time, which could cause confusion, obscure the most important issues and lead to an allocation of scarce human resources to issues that have limited relevance. It is important therefore to work on priority ecosystem components (identified in the defining step) and identify their main causal links with human activities. This requires sound screening and priority-setting methods that bring together expertise and contributions from a wide range of researchers and stakeholders.

Creating a *mental model* in a participatory exercise can provide the backbone for work on knowledge for EBA. The mental model will convey to what extent environmental and socio-economic considerations shape the knowledge base. The availability of information then will determine which other tools can be applied and the depth of their analysis (see the box below and Annex I for the toolbox – the next section cites key related tools for the *assessing* step).

Using mental models

A *mental model* (or conceptual model, also called a linkage framework and a mind map) is used to represent the ecological system that the MSP will address and in particular the potential interactions with economic and social sectors or activities. For the ecosystem, key components and aspects need to be identified, based on research and on societal values. The mental model thus incorporates priorities from policy documents and the stakeholder process. Moreover, the work on the mental model should take place in a participatory process, to ensure that both scientific expertise and stakeholder knowledge are incorporated.

There are no impediments to developing and applying a mental model on this basis: the extent of existing data and information will shape the degree of complexity in the model, for example the number and detail of the categories – for example, in terms of the level of detail for economic and social sectors and activities or for the ecosystem and its components – and whether or not a comprehensive approach is taken in terms of defining the social-ecological system or only part of it is considered.

The results of the mental model can drive the development of the knowledge base. It may guide interdisciplinary scientific work to connect natural and the social sciences. As such it provides the basis of the application of other tools such as the Cumulative Impacts Assessments (CIA) or Cost Benefit Analysis (CBA). Of course, strengthening the knowledge base may also identify adjustments to be made to the mental model, either in the *assessing* step or in a future cycle.

Assessing and mapping marine green infrastructure can be used to aggregate complex information on marine ecosystem components, their ecological value, connectivity and contribution to the supply of ecosystem services (see the box below and Annex I for further details and sources).

[67] Wright Morton, L., Eigenbrode, S. D., Martin ,T. A.. 2015. Architectures of adaptive integration in large collaborative projects. Ecology and Society 20(4):5. http://dx.doi.org/10.5751/ES-07788-200405

Assessing and mapping marine green infrastructure

Marine green infrastructure can be interpreted as a spatial network of ecologically valuable areas which are significant for the maintenance of ecosystem health and resilience, biodiversity conservation and delivery of multiple ecosystem services essential for human well-being (see also section 3.3 above). The delineation of marine green infrastructure can encompass various criteria which characterise the marine ecosystem, its biological values, functionality, and service supply. Marine green infrastructure will include MPAs as core areas for maintaining biodiversity, but it goes beyond them to include other important areas for conservation (these can be *other effective area-based conservation measures*, as defined by IUCN) in order to ensure the connectivity, functioning and resilience of marine ecosystems. Mapping of marine green infrastructure can be based on the spatial distribution of marine ecosystem components and assessment of their ecological value, connectivity and contribution to ecosystem service supply. Marine green infrastructure can be linked to green infrastructure in coastal and terrestrial areas.

The Baltic case study[68] illustrates a methodology for marine green infrastructure mapping, tested at regional sea scale, and its potential for application in MSP for preserving essential structures and functions of marine ecosystems, including those not included in MPA networks, thereby enhancing the connectivity of the network and contributing to the good environmental status of marine waters.

In general, two complementary approaches for green infrastructure mapping have been suggested by the Joint Research Centre of the European Commission - physical mapping of existing green infrastructure components (including protected areas, ecological networks, and other valuable natural areas) and ecosystem-service based mapping targeting delivery of multiple ecosystem services. So far most of the efforts in mapping and assessment of marine ecosystem service are limited to potential supply; however, for mapping of green infrastructure the ecosystem condition, vulnerability to cumulative pressures as well as service supply and demand relation should be also considered. A crucial aspect in green infrastructure mapping is connectivity analysis and identification of ecological corridors, which still shall be explored in marine context. Connectivity analysis can be structural (based on the landscape/seascape characteristics) or species specific – linked to environmental conditions that enables the spreading of species be-tween sites. One of the first attempts for integrating the green infrastructure concept in MSP was in Sweden – a so called "Green Map" was developed by weighted aggregation of spatial data on the distribution of nature values (birds, mammals, fish, and benthic habitats) and used to identify so called "n-areas", where special consideration must be given nature values.

In relation to socio-economic considerations, attention needs to be given to assessing the importance of sectors that impact marine ecosystems and to economic activities that benefit from marine ecosystems or affected by their current degradation. A first screening to prioritise sectoral human activities can use information on the socio-economic importance at the aggregated and national scales also provided as a result of the MSFD's Economic and Social Assessment. This includes all established sectors considered major contributors to the EU blue economy, i.e. marine living resources, marine non-living resources, marine renewable energy, port activities, shipbuilding and repair, maritime transport and coastal tourism.

Identifying which *ecosystem services* are supplied as well as their uptake in the socio-economic system – if possible together with some valuation of their benefits – can be used to assess which sectors benefit and which are adversely affected by the MSP. This assessment can extend beyond national boundaries, building on the outcomes of the *Defining*

[68] Published in: ACTeon, Baltic Environmental Forum, Fresh Thoughts, GRID-Arendal and Wageningen Research, Study on integrating an ecosystem-based approach into maritime spatial planning: Project case-study reports, August 2021 (prepared for the European Commission – the European Climate, Infrastructure and Environment Executive Agency, CINEA), available at: https://op.europa.eu/en/publication-detail/-/publication/707ddfe7-353c-11ec-bd8e-01aa75ed71a1/language-en/format-PDF/source-238648827

step. The box below describes the use of ecosystem services assessment in the Northern Adriatic case study[69].

Assessing the socio-economic importance of ecosystem services: an illustration from the Northern Adriatic Sea

The socio-economic importance of ecosystem services has been assessed for the Northern Adriatic Sea as part of the present study. Building on existing knowledge characterising ecosystem services, different methods were applied for assessing the importance and value of benefits related to the use of these services. The study obtained information from: available statistics, reports and web sites; semi-structured interviews with sectors' representatives; and, a dedicated citizens' survey (1000 citizens from Slovenia, Croatia and Italy interviewed) where results were used for performing a choice-experiment analysis to derive monetary values for the biodiversity and of the marine ecosystems, its quality and pollution, and its capacity to support leisure activities and tourism.

The assessment stressed the diversity and socio-economic importance of ecosystem services delivered by the Northern Adriatic Sea for its three riparian countries and beyond. The assessment faced many challenges, including: (a) the inadequate administrative scale at which statistics and data exist; (b) assumptions needed for adapting aggregated data (at national and regional scale) to the specific ecosystem investigated, or for aggregating local data to the ecosystem scale – limiting the use of socio-economic data produced under the MSFD; (c) the different metric used for assessing the economic dimensions, an issue for all ecosystem service valuation studies, limiting the possibility to compare monetary values obtained for different sectors and ecosystem services.

The work to map green infrastructure and to categorise ecosystem services can aggregate large amounts of data and assessments: these methods can identify spatial locations that are ecological hotspots. They therefore help to present complex ecological and ecosystem service information in a consolidated and user-friendly way for stakeholders and decision makers, giving holistic overviews of marine and coastal ecosystems and their contribution to human well-being, in line with EBA principles (see the box below).

Ecosystem services in land-sea interactions: an example from Latvia

The Baltic case study[70] illustrates work in Latvia on the potential of ecosystem service mapping to address land-sea interactions: the case study shows how this mapping can identify trade-offs between off-shore and coastal (on-shore) development interests. Moreover, it can be used to assess the impacts of alternative scenarios (in this case for the development of wind power) on coastal ecosystems and the well-being of coastal communities.

Three overall considerations concerning data and tools are worth noting. First, the result of the work in this *developing* step will help determine the selection of appropriate tools in subsequent steps (this selection of tools, as well as the identification of the results that are being sought, should be done in collaboration with stakeholders). Second, it is key to be aware of the saying that "the perfect is the enemy of the good" (or more literally "the best is the enemy of the good") and make good use of available information and if necessary,

[69] Published in: ACTeon, Baltic Environmental Forum, Fresh Thoughts, GRID-Arendal and Wageningen Research, Study on integrating an ecosystem-based approach into maritime spatial planning: Project case-study reports, August 2021 (prepared for the European Commission – the European Climate, Infrastructure and Environment Executive Agency, CINEA), available at: https://op.europa.eu/en/publication-detail/-/publication/707ddfe7-353c-11ec-bd8e-01aa75ed71a1/language-en/format-PDF/source-238648827

[70] Ibid.

of simple tools, while keeping in mind the need to improve the knowledge base and methods in the future.

Finally, throughout this work, an understanding of the dynamic nature of the whole social-ecological system is important to assess observed trends or anticipate possible consequences of future trends. Long, consistent time-series is a prerequisite for the former (a strongly decreasing trend in the past five years could suggest a problem but not if it falls well within the observed fluctuations over the longer timescale), while the latter requires information on potential external drivers, whether natural such as climate changes, or anthropogenic such as macro-economic or cultural changes, and how these may affect the social-ecological system including in the long-term future.

4.2.5 An EBA checklist

The following checklist identifies key EBA issues to consider when undertaking the *developing* step (and this list can be useful for the SEA process as well as in other evaluations).

Table 4: EBA checklist for the *Developing* step. Each of the questions may be ticked.

Key topics	Practical guidance: issues to consider
Capturing the integrity, functioning and dynamics of marine ecosystems	✓ What aspects or components of ecological integrity and/or biodiversity are explicitly incorporated in the knowledge base (i.e. mental model)? Note that ecological integrity includes both the structure (i.e. biodiversity) and functioning of the system ✓ Are all essential aspects of biodiversity (i.e. the structural components) covered and with what level of detail (e.g. broad groups such as birds or fish or specific species)? ✓ Ecological functioning of the structural components determines the provisioning of ecosystem services which contribute to human well-being and as such can be incorporated into (economic) markets. Thus, ecological functioning should be explicitly included if the capacity to supply ecosystem services needs to be considered. ✓ Was an appropriate indicator selection process applied? Which indicators capture essential aspects/components of the ecosystem? MSFD indicators for D1, D3, D4 and D6 are obvious candidates. ✓ Were ecosystem interactions considered? This allows an assessment of both direct and indirect impacts. Indirect impacts also include knock-on effects of the direct impacts caused by human activities such as through food web interactions. ✓ How is the dynamic nature of the ecosystem accounted for? This may be from empirical evidence from within the ecosystem, i.e. the variation over time of activities or ecosystem components or by considering exogenous drivers of socio-economic processes or environmental change (e.g., climate scenarios) and a mechanistic understanding of how these may affect the ecosystem. ✓ If exogenous drivers are expected to push the dynamics of important ecosystem components or aspects outside historic boundaries, then empirical evidence from existing monitoring programmes which have always operated within those boundaries may not be adequate.
	✓ Was an appropriate indicator selection process applied? Which indicators capture relationships of essential ecosystem interactions? Longer time-series are more likely to reflect the dynamics of the ecosystem. Is there information (including future projections) on the main exogenous drivers? ✓ What spatial or temporal scales are feasible given the available information? For example, the spatial scale may be determined by the spatial resolution; , the temporal scale, by the monitoring frequency.
Incorporating human activities and socio-economic considerations	✓ Does the knowledge base include both an ecological and a social (or socio-economic, also including institutional) component? ✓ Are all the relevant socio-ecological interactions considered? ✓ Are ecosystem services considered, including the benefits they deliver to different socio-economic activities and how current degradation of marine ecosystems impact their delivery?

Key topics	Practical guidance: issues to consider
	✓ What are the socio-economic (qualitative, quantitative and/or monetary) values of these services? Which methods can be applied to assess these values? ✓ How will socio-economic activities evolve in the future – both activities (including land-based) that impose pressures on marine ecosystems and activities benefiting from ecosystem services delivered?
Governance and institutional set-up	✓ Are there mechanisms for accessing – or mobilizing – the most recent scientific knowledge? (e.g. the setting up of a scientific committee, the funding of research activities supporting the planning process, activities aimed at synthetizing and structuring research results…) How active/effective is this mechanism? ✓ Is scientific knowledge from both the social and ecological components of the system mobilized? Which type of knowledge is effectively used? ✓ Do the "scientific results" mobilized cover the entire relevant spatial and temporal scale – including the deep sea, coastal areas or land? Or is it limited to research in the area itself? ✓ Are there adequate mechanisms put in place to ensure synergies with other policies and implementation processes that are essential to MSP?
Acknowledge uncertainty	✓ Is uncertainty acknowledged or, better, incorporated in the applied methods and tools? To what extent, i.e. for which of the components/aspects or relationships in the knowledge base? ✓ Which aspects of uncertainty can be addressed? ✓ Spatial representation of uncertainty? ✓ Complex systems come with new uncertainties that cannot be tackled through standard sensitivity analysis.

4.3 Assessing

4.3.1 What are the key actions in this step?

Key actions in the *Assessing* step include:

- The selection and application of appropriate **methods and tools** that incorporate EBA in the analysis of different planning options and thus support the selection of a sustainable pathway for the maritime spatial plans.
- These tools need to use **interdisciplinary** methods and expertise to assess the environmental, social and economic dimensions.
- As part of this work, key **uncertainties** need to be explicitly identified for stakeholders and policy makers involved in MSP decisions.

4.3.2 What does the EU regulatory framework bring?

In the *assessing* step, the SEA and appropriate assessment studies will provide insights that can strengthen EBA. Consultation mechanisms under the SEA Directive (together with those for cross-border consultation under the Kyiv Protocol) can reinforce stakeholder engagement.

It can be valuable to work with mechanisms for stakeholder engagement under other parts of EU legislation: section 3.4 above, for example, suggests that the Advisory Councils and FARNET (the European Fisheries Areas Network) – both under the Common Fisheries Policies – could provide opportunities.

In this step, different maritime planning options will be assessed. It will be valuable to seek potential synergies with measures under other EU legislation, such as the MSFD and WFD.

4.3.3 What are key issues for cross-cutting processes?

In the *assessing* step, the mechanisms to bring together experts, stakeholders and decision-makers will be crucial: all participants need to understand the extent of the information, the methods and tools used to assess different planning options – together with the strengths and limitations of both the information base and the methods and tools.

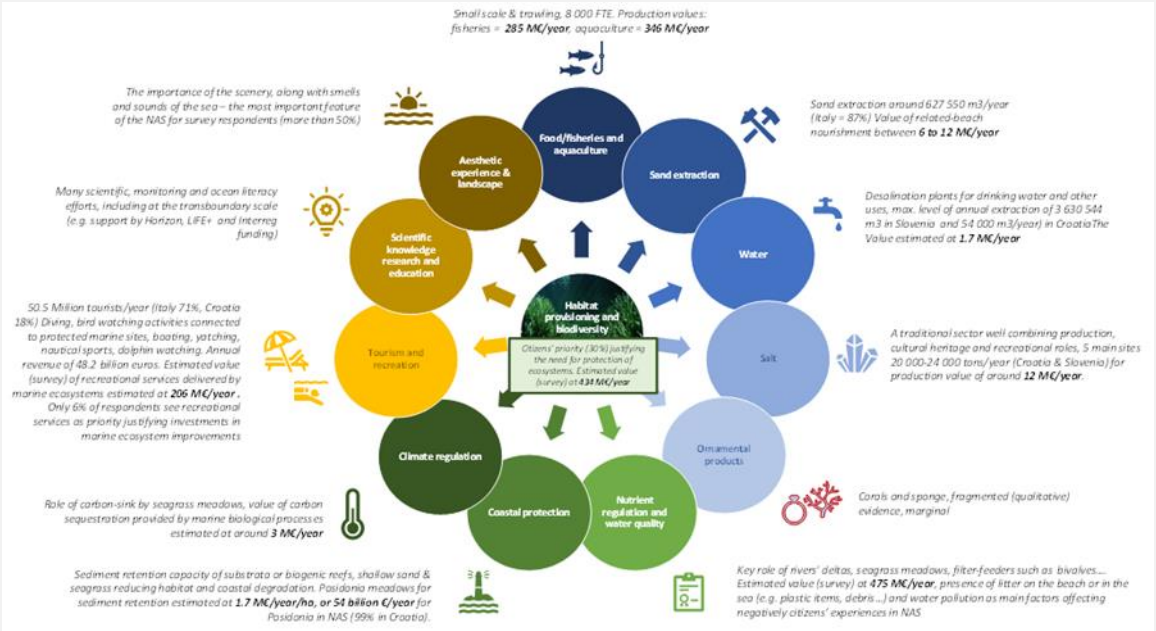
Because of the importance of stakeholder involvement in the MSP process, be it for contributing to the setting up of objectives, collecting stakeholder knowledge to strengthen assessments, or discussing options and identifying potential impacts of planning pathways, specific attention is required to share and communicate complex issues and causal relationships (see the box below).

It will also be crucial to **communicate uncertainties** to stakeholders and decision-makers. Here, a formal system may be useful, for example using the following classification[71]:

- There can be different levels of uncertainty, such as:
  - Statistical uncertainties in monitoring data
  - Scenario uncertainties that arise from the assumptions and methods to develop different scenarios when comparing planning options
  - Recognised ignorance (i.e., incomplete knowledge) about underlying mechanisms and relationships in ecosystems and links between ecosystems and social systems
- In addition to these "epistemic uncertainties" in data, knowledge and tools, there are natural variabilities in both human and natural systems that add to the uncertainty any projections

Communicating to stakeholders

The development of targeted documents in layman language, using schematic diagrams, illustrative (non-technical) maps, and synthesis tables will facilitate stakeholders' mobilisation and contribution throughout the MSP planning process. The figure below provides an example of a schematic diagram showing the diversity and socio-economic importance of ecosystem services (please see Annex I for a larger version of this figure).



[71] Based on: Gissi, E., et al, Addressing uncertainty in modelling cumulative impacts within maritime spatial planning in the Adriatic and Ionian region, PLoS ONE, 2017, https://doi.org/10.1371/journal.pone.0180501

4.3.4 What tools are useful for this step?

This section introduces several tools that can support the assessment the ecological and socio-economic outcomes of alternative MSP scenarios. The analysis of the information gathered in the *developing* step may vary from soliciting expert opinions to more formalised approaches involving specific tools. Expert opinions can provide useful insights in cases or for issues where information and resources do not allow in-depth analysis. When expert opinions are used for the assessment, this should be carried out within a transparent process that includes stakeholders (see the box below).

A trial EBA assessment in the Netherlands

The analytical work underpinning EBA in MSP can be carried out in an iterative process – this can identify data and other gaps that then can be addressed in further work. The Netherlands case study[72] shows how a "trial assessment" used several tools, including cumulative impacts assessment (CIA) and cost-benefit analysis (CBA), to compare MSP options. Although initially not planned, an adaptive cyclical MSP process took place.

At first, data gaps – along with constraints in terms of time and resources – meant that a full CIA could not be carried out; instead, the assessment used a structured process to gather expert analysis of potential impacts on key ecosystem components. These results were presented to the active stakeholder engagement process, while the outcomes helped to identify the data needs for deeper assessment.

The use of various spatial, simulation and modelling tools can provide quantitative results for MSP decisions – these tools involve, however, key uncertainties and assumptions that need to be made explicit and the implications, weaknesses and strengths of the results should be discussed with stakeholders and decision-makers.

Key tools that can be used include the following:

- Cumulative impacts assessment (CIA)
- Cost-benefit analysis (CBA)
- Multi-criteria decision analysis
- Decision-making tools that work with uncertainty, such as Real options analysis (ROA), the Dynamic Adaptive Policy Pathways (DAPP) approach and Robust Decision Making (RDM).

The use of *CIA* to guide risk-based decision-making is partly determined by the availability and quality of the information. If adequate spatially explicit information exists of all the relevant ecosystem components as well as the human activities and their pressures, then spatially explicit MSP scenarios can be assessed. If this is not the case, then the tool can at least prioritize sectoral human activities in terms of their potential threat to environmental societal goals. Then if the knowledge basis allows an extension of the CIA so that it (1) includes supply of ecosystem services or even (2) the valuation of those services, then the outcome of the assessment can also provide information on the consequences of ecosystem degradation on capacity to supply services for the social-ecological system, respectively the cost (or actually decrease in benefits) of this degradation. The box below provides an overview of several CIA tools; further information can be found in Annex I, the toolbox.

[72] Published in: ACTeon, Baltic Environmental Forum, Fresh Thoughts, GRID-Arendal and Wageningen Research, Study on integrating an ecosystem-based approach into maritime spatial planning: Project case-study reports, August 2021 (prepared for the European Commission – the European Climate, Infrastructure and Environment Executive Agency, CINEA), available at: https://op.europa.eu/en/publication-detail/-/publication/707ddfe7-353c-11ec-bd8e-01aa75ed71a1/language-en/format-PDF/source-238648827

Approaches for cumulative impact assessment

The mental model (see the *developing* step above) should provide the basis for *cumulative impact assessment* by identifying which activities, pressures and ecosystem components should be considered and at what spatial scale. The work in *developing* step should also determine if ecosystem services should be included. Several operational tools for CIA exist and have been applied in many Member States (for example, Tools4MSP and Symphony – see Annex I for further information). They differ in terms of their information requirements and the results they can provide. All are risk-based approaches, where risk of impact on the ecosystem (and hence of not achieving environmental policy objectives) is assessed using more or less elaborate methods requiring quantitative data or expert judgement. They therefore can be applied in both data-rich and data-poor situations. Which tool to apply and how should be determine by the results of the defining step – for example, which maritime activities and ecosystem components should be included in the CIA.

A key challenge will be to understand how the impacts on key ecosystem components and features. To address this, the assessment of green infrastructure (described in section 4.2 above on the *developing* step) could be linked to CIA work on the environmental impacts of alternative MSP scenarios. This requires that all key ecosystem components identified in the mental model are covered; also, that the assessment understands both how key human activities affect those components. For example, if the importance of specific areas is largely determined by the seabed habitats, then bottom trawling could be considered a threat whereas other fishing operations (e.g. pelagic trawl or gillnets) may not. This would therefore also require detailed information on the type of fishing expected to take place.

Cost-benefit analysis can compare the socio-economic consequences of planning options. This may deliver an aggregated economic indicator such as the net present value of all net benefits, or a combination of qualitative, quantitative and monetary impacts (negative – costs and positive – benefits) that helps capture the economic implications of different MSP scenarios or options. Data availability and quality is a major issue when applying CBA, in particular in relation to: (1) the quality of the basic data that help characterising the socio-economic importance of activities and sectors of the various sectoral human activities, (2) having an appropriate baseline or reference scenario against which the different MSP scenarios or options will be assessed, or (3) the extent to which the societal implications of ecosystem degradation will be accounted for. A key limitation of CBA, however, is that it is difficult to assign monetary values to all ecosystem components and services and to all societal values. For decision-making, several tools can help identify possible trade-offs among different societal goals across planning options. One commonly applied tool is *Multi-Criteria Decision Analysis* (or Assessment), which draws on stakeholder preferences for various objectives to weigh different planning options.

Assessment and decision-support tools that address uncertainty will also be valuable in light of one of the key principles of EBA: to deliver **adaptive management**. Key uncertainties include global changes (notably climate change), socioeconomic developments and the functioning of complex ecological systems. For the development of a maritime spatial plan, decisions will have to be made in the face of these uncertainties. Assessment methods that have been developed and applied in other policy areas, such as climate change and flood risk management, can be valuable (see the box below).

The goal of the assessment using these and other tools is to compare how alternatives in the management of maritime space contribute to different societal goals and policy objectives, and how they address trade-offs between different goals and objectives (for example, environmental versus socio-economic goals) and different uses of marine space, accounting for (cumulative) impacts on ecosystems and impacts on other sectors (e.g. beneficiaries of ecosystem services) as well as for interactions between different spatial areas of the marine space.

Decisions tools that address risks and uncertainties

Different methods have been developed to support decision-making and the selection of optimal investments under conditions of risk and uncertainty for the management of natural resources in the context of climate change[73]. Selected examples of approaches that might be relevant to marine policy and to MSP are presented below.

- **Real options analysis** (ROA)[74] assesses the value of flexibility that can then be integrated into CBA or CEA frameworks. It investigates future possibilities to expand, shrink, delay, speed up, or terminate investments. Although it is mainly focused on investment in physical assets, its core principles could help to address risk and uncertainty in the management of natural resources to prioritise actions that can be easily adapted and modified.

- The **Dynamic adaptive policy pathways (DAPP) approach**[75] aims to support the development of an (adaptive) plan that is able to deal with high uncertainty conditions, similar to those experienced in planning for the management of marine ecosystems. Central to the approach is the exploration of **adaptation pathways** that describe a sequence of actions or investments over time to achieve pre-specified objectives under uncertain changing conditions. It builds on the identification of **adaptation tipping points** that specify conditions under which a given portfolio of actions will fail and thus when new actions will be required to achieve the objectives. The adaptation pathway analysis helps to identify actions and management rules that might be seen as very promising under current knowledge, but that might lead to dead ends if external conditions vary significantly, or others that might be less promising initially but able to easily shift to (prepare for) other actions if conditions change significantly.

- **Robust Decision Making** (RDM) identifies combinations of physical and socioeconomic factors that best distinguish futures in which a given policy meets or misses its goals, in combination with deliberation processes that help stakeholders linked to the decision to reach a common understanding of the challenges and a consensus on action (even if they disagree on expectations about the future)[76].

When assessing different options for sharing marine space, the comparison should be made with the current or reference or business as usual (with no additional action taken as compared to the current situation) option to understand if inaction is a better or worse option. The analytical work will be most valuable if it does not simply compare a single proposed option with the business as usual (without additional action) situation, but rather develops insights that stakeholders and policy makers can use to explore the options and possibly to identify improved pathways for MSP.

4.3.5 An EBA checklist

The following checklist identifies key issues to consider when undertaking the *assessing* step (and this list can be useful in the SEA process as well as in other evaluations).

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[73] See, for example, Hallegatte, S., Shah, A., Lempert, R., Brown, C. and Gill, S. (2012). Investment decision making under deep uncertainty: Application to climate change (Policy Research Working Paper 6193). https://doi.org/10.1596/1813-9450-6193; Watkiss, P., Hunt, A., Blyth, W. and Dyszynski, J. (2015). 'The use of new economic decision support tools for adaptation assessment: A review of methods and applications, towards guidance on applicability'. *Climatic Change*, 132, 401–416, https://doi.org/10.1007/s10584-014-1250-9.

[74] See, for example, an application in the field of flood risk management: Jarl, M., Kind Jorn, H., Baayen, W.J. and Botzen, W. (2018). Benefits and limitations of Real Options Analysis for the practice of river flood risk management. Water Resources Research. https://doi.org/10.1002/2017WR022402

[75] See https://www.deltares.nl/en/adaptive-pathways/

[76] See also the comparison between RDM and DAPP in: Kwakkel, J., Haasnoot, M. and Walker, W.E. (2016). 'Comparing Robust Decision-Making and Dynamic Adaptive Policy Pathways for model-based decision support under deep uncertainty'. *Environmental Modelling & Software*, 86, 168-183, https://www.sciencedirect.com/science/article/pii/S1364815216307186

Table 5: EBA Checklist for the Assessing step. Each of the questions may be ticked.

Key topics	Practical guidance: issues to consider
Inter-disciplinary science addressing all dimensions of sustainability	✓ All three dimensions of sustainability (i.e. environmental, social and economic) explicitly considered? ✓ Which disciplines are supporting the MSP process? Do these disciplines cover the different functions, biodiversity, ecological interactions, economic activities and socio-economic dimensions – or is it limited to a specific sustainability dimension (see next row) and hence scientific discipline? Does it seem justified? ✓ In particular, are human and natural science disciplines mobilized? And are there disciplines addressing "land-based pressures"? ✓ Are there specific mechanisms for making interdisciplinarity operational (an integrated socio-economic-ecological model, interdisciplinary research activities and assessments, specific interdisciplinary workshops, and/or funding mechanisms that favour interdisciplinarity)
Selection and application of tools	✓ Which methods to apply for assessing the ecological, social and economic impacts of different planning and management scenarios? The environmental dimension can e.g. be covered using CIA, while the social and/or economic dimensions can be captured with CBA. ✓ How best to combine methods and tools to deliver a truly integrative picture of likely impacts and trade-offs of different planning scenarios? Integration towards a social-ecological system can build on coupling CBA and CIA or widening CIA by considering ecosystem services impacted and their economic values (see valuation techniques in Annex I). ✓ Which main external drivers and trajectories are considered when designing the plans? As climate, socio-economic development at sea and on land, developments in connected ecosystems can affect the areas considered, which methods and approaches are applied to best capture future changes in these drivers and their likely effects on maritime sectors and marine ecosystems? ✓ Which level of detail for such assessments in relation to the decisions to be taken? The requirements of assessment tools selected, combines with the quality and uncertainty of (scientific) advice, depends on the desired level of detail required for assessing impacts on different ecosystem components or ecosystem services and their beneficiaries.
Acknowledge uncertainty	✓ To what extent do the tools applied consider uncertainty? The level of confidence in both the applied data, relationships (e.g. pressure-state, dose-effect) or parameters should be reported. ✓ Have decision tools that incorporate risks and uncertainties been employed? ✓ How is uncertainty presented to decision-makers, and discussed within stakeholder processes, so that it helps choosing the most robust management option? ✓ How is uncertainty considered into the management process? Which mechanisms are put in place for (large) uncertainties to be taken into account and for adaptive management to take place?

4.4 Implementing

4.4.1 What are the key actions in this step?

Key actions for the *Implementing* step include:

- Implementation of the plan, keeping in mind where an EBA might require a **precautionary approach** to address **uncertainty.**
- The **integration** of the plan's implementation with that of other management plans, including in terms of governance and stakeholder processes established (see below).
- The establishment of **appropriate monitoring systems** to track implementation of the MSP and of its ecological and societal implications.

- Following an **adaptive management** approach to address unexpected changes in ecosystems and socio-economic systems – and to take on board new policy goals that may be developed.

4.4.2 What does the EU regulatory framework bring?

In the implementing stage, monitoring of ecosystem conditions and their interactions with economic and social systems will need to continue. Environmental monitoring programmes under EU legislation, including the MSFD and the WFD, will play a valuable role.

The implementation of the MSP will run in parallel to the implementation of programmes of measures under the MSFD and the WFD, the implementation of management plans for Natura 2000 sites, as well as other plans and programmes developed under EU legislation: Member States will have the opportunity to ensure synergies between their maritime spatial plans and these different initiatives and measures.

Maritime spatial plans may identify spatial options for new investment projects, such as wind farms. The preparation of such projects will require environmental impact assessments (and possibly appropriate assessments under the Habitats Directive). This process can draw on data gathered for work on EBA in MSP; detailed environmental surveys for EIA procedures can also generate new data that can be valuable for EBA work as the MSP cycle continues.

The EU regulatory framework may bring new policy goals – some of which may need to be addressed in MSP before review, evaluation and revision of the plan. For example, the Biodiversity Strategy presents a goal to expand protection of marine areas to 30 % of the EU's seas by 2030. Legislative proposals in preparation in the first half of 2021 are expected to call for habitat restoration targets[77].

4.4.3 What are key issues for cross-cutting processes?

The stakeholder engagement mechanisms created in the first steps of the MSP process can be valuable during the implementation stage. In Ireland (as noted in section 3.7), stakeholder mechanisms set up during the SEA process for an offshore energy plan then followed monitoring work.

Attention is required to establish an adequate stakeholder process and governance that facilitate the implementation and monitoring of the plan, including by establishing mechanisms that ensure synergies with other management plans implemented in parallel.

4.4.4 How can adaptive management address uncertainty?

In most cases, the implementation process is likely to involve decision-making based on insufficient or incomplete knowledge: even for the foreseeable future, it is unlikely that all information will be available for assessing the main causal relationships between human activities, their pressures, the functioning and state of marine ecosystems and the ecosystem services they deliver. Even in information-rich countries and regional seas, unexpected changes can take place and are likely to affect maritime activities and marine ecosystems: such unexpected changes might be related to unpredictable global changes (such as climate events, natural or man-made disasters and also human pandemics) or to ecosystem dynamics that are not yet fully understood. Consequently, uncertainty will be part of the

[77] See: https://ec.europa.eu/environment/strategy/biodiversity-strategy-2030/eu-nature-restoration-targets_en

MSP process, and provisions are needed to identify the main sources of uncertainty, account for them in planning and respond to unexpected situations in a timely manner, so as to minimize negative impacts.

Section 4.3 discusses uncertainty and risk in the *assessment* phase. There are two key ways to deal with uncertain risks in implementation.

First, if a potential negative impact can be expected – based on assessments such as CIA – then the precautionary principle may be invoked to reduce the activities that are expected to contribute most to this risk of impact. If the assessments provide spatially explicit results, then the MSP could prevent certain activities from occurring in especially sensitive areas, such as marine green infrastructure. In the face of potential risks or considerable uncertainties, require decision makers should discuss with stakeholders the thresholds for an acceptable risk of cumulative impacts prior to implementation.

Second, the EBA principle of adaptive management recognises uncertainty as a fact: adaptive management needs to consider the capacity of systems to respond to changes and then favour feedback loops that can redirect pressures. Consequently, plans should give priority to measures and actions that will be relevant and cost-effective whatever the conditions, but that can be easily reverted or that can pave the way for complementary actions with limited effort. This learning-by-doing approach requires sound monitoring to help adapting solutions when outcomes of decisions are uncertain because of complex system dynamics.

While it is easy to outline these approaches, the literature review has found few good examples of their applications[78]. Consequently, officials, MSP practitioners and stakeholders in Member States will need to learn by doing and to share the lessons.

4.4.5 An EBA checklist

The following checklist identifies key EBA issues to consider in the *implementing* step (and this list can be useful in the SEA process as well as in other evaluations).

Table 6: EBA Checklist for the Implementing step. Each of the questions may be ticked.

Key topics	Practical guidance: issues to consider
Implementation of the plan	✓ Does the outcome of the assessing step require actions taken based on the precautionary principle? Has a potential risk to societal goals been identified? Is there cause for concern from the identified uncertainties? ✓ Is it a principle that is explicitly spelled out in the MSP and accompanying documents? Is it a principle that has been discussed and agreed by stakeholders mobilized in the process? ✓ On which topics – and based on which arguments – is precaution referred to? Mainly uncertainty in effects of pressures, or also in future socio-economic developments and parts of the social system? ✓ In particular, are some areas (i.e. Green Infrastructure) set as "protected" on the basis of the precautionary principle?
Integrated and Adaptive Management	✓ Are specific mechanisms in place for "connecting" the MSP with other management/plans – in particular (a) sector development and policies – including inland (agriculture, land use planning, waste management), (b) MSFD; (c) ICM; (d) WFD, (e) biodiversity/nature protection…?

[78] For the study's analysis of the literature review, please see: Strosser, P., et al, Study on Integrating an Ecosystem-based Approach into Maritime Spatial Planning: What are the lessons from current practice in applying Ecosystem-Based Approaches in Maritime Spatial Planning? Results from the literature review, August 2021 (prepared for the European Commission – the European Climate, Infrastructure and Environment Executive Agency, CINEA), available at: https://op.europa.eu/en/publication-detail/-/publication/be6c1830-2d63-11ec-bd8e-01aa75ed71a1/language-en

Key topics	Practical guidance: issues to consider
	✓ Is this coherent with the analysis of the main pressures, problems and activities considered in the MSP? If not, which ones are missing in particular? ✓ Are specific methods (e.g. sensitivity analysis, pathway analysis/robust management analysis…) developed to support "adaptive management? If yes, are the results of these methods fully considered when defining "maritime space sharing/allocation" and the definition of management measures? ✓ Are there mechanisms put in place (e.g. monitoring programmes, regular policy evaluation mechanisms, revision processes…) for supporting regular evaluations and, if needed, adaptations in the MSP? What type of adaptation? For example: in the defining step changes in the boundaries, in the developing step an extension/improvement of the knowledge base (e.g. from additional monitoring), another analysis in the assessing step or the revision of certain measures in a next implementation step.
Stakeholder involvement and Governance	✓ Which governance mechanisms put in place for steering and monitoring the implementation process? Which role for stakeholders in particular? And which mechanisms established with other implementation processes such as MSFD, WFD, ICZM…. to deliver cost-effective implementation?

4.5 Follow-up

The main activities in the *Follow-up* step include:

- **Monitoring and evaluating** the implementation of EBA in MSP;
- Analysing **ecological and societal impacts** as captured by monitoring, complemented by additional studies and interviews of stakeholders, to evaluate *ex-post* the performance of the MSP in contributing to the achievement of set policy objectives and societal goals and in delivering positive impacts overall;
- Initiating additional **adaptive management** cycles if needed.

The *follow-up* step is addressed in more detail in Section 5 on the monitoring, evaluation and review of EBA in MSP.

5 HOW TO MONITOR, EVALUATE AND REVIEW THE INTEGRATION OF EBA IN MSP?

5.1 What do the monitoring, evaluation and review of EBA in MSP involve?

Monitoring, review and evaluation are linked to a key principle of EBA: adaptive management. This principle involves both continuous learning and improvement (as discussed in section 2), and also the recognition that the planning cycle is indeed circular, with regular reviews and revisions. This chapter presents a set of steps and key issues for Member States and stakeholders to consider in the monitoring, review and evaluation process – it focuses on EBA, though many points may be relevant for the process overall. Moreover, the ideas suggested here will need to be adapted to the context and existing approach in each Member State.

The MSP Directive refers to monitoring and review in its Preamble and in Article 6 (see the box below). The Directive links the monitoring of implementation with the revision or updating of maritime spatial plans and in turn the updates should be linked to the reviews carried out at least every ten years. The Directive refers to "revision or updating" of maritime spatial planning in its Preamble and the "review" of plans in Article 6, implying the regular amendment of plans as part of a cycle, to improve them and adapt them better to changing circumstances.

The MSP Directive calls on Member States to monitor, review and revise their plans

"*Maritime spatial planning should cover the full cycle... [including]* ***revision or updating, and the monitoring of implementation****…*" – Preamble (18) (emphasis added)

"*Maritime spatial plans shall be* ***reviewed*** *by Member States as decided by them but at least every ten years*." – Article 6(7) (emphasis added)

Monitoring, evaluation and review thus are part of a dynamic process which aims to improve the implementation and impacts of the MSP. While the MSP Directive suggests that review occurs at a defined stage at the end of the planning cycle, monitoring and evaluation can happen at other stages of the MSP process: for example, how well EBA is integrated during the preparation of a plan; and in implementation, tracking if MSP actions are leading to negative outcomes in order to make necessary adjustments to the plan. Monitoring, evaluation and review of EBA will need to consider both the plan itself as well as the process (a distinction highlighted in section 2.1.2 above).

In this work, it is valuable to remember that the term 'monitoring' can refer to both ecosystem monitoring and monitoring of the process and the plan. Both are important, and the two will overlap: monitoring the process for EBA in MSP should include monitoring ecosystems and their interactions with human activities affected by the plan, as the latter can assess the performance of the EBA in MSP and show how the achievement of environmental goals may have been affected by the plan. The box below discusses the distinction between two types of monitoring.

Monitoring the process and monitoring the environment are both valuable for EBA in MSP

Monitoring can refer to both ecosystem monitoring and monitoring of the process related to the plan. EEA's glossary provides separate definitions for the two types of monitoring:

- *Environmental monitoring* is the "Periodic and/or continued measuring, evaluating, and determining environmental parameters…". For EEA, this covers all aspects from driving forces and pressures on the environment to the state of the environment.
- *Monitoring* of a process is "a combination of observation and measurement for the performance of a plan, programme or measure…".

Consequently, it will cover, for example, monitoring of activities under the MSP – whether restrictions on economic activities or the development of new ones, such as building wind farms – have gone ahead without unexpected impacts on the ecosystem; and also, issues such as governance and stakeholder engagement, which are key parts of EBA. As described in Section 3, environmental monitoring for EBA will draw on work under the MSFD and other parts of the EU regulatory framework.

5.2 Integrating monitoring, review and evaluation into the MSP cycle

A separate study for the European Commission on *Systems and tools for assessment, monitoring and revision of maritime spatial plans*[79] proposes a set of steps for reviewing and evaluating MSP. These steps include setting objectives, planning stakeholder engagement, identifying targets and the baseline, and then monitoring. The table below shows how these steps can be implemented to address EBA-oriented elements of plans. The table also links these monitoring and review steps to the MSP cycle: as it can be seen, these actions take place *throughout the MSP cycle*.

Table 7: Evaluation and review of the degree to which EBA in integrated in the MSP cycle

Steps in the MSP cycle	Steps for monitoring and reviewing MSP	What is EBA-specific about in this step?	Links to the EU Regulatory framework and beyond
Defining	1. Setting objectives and priorities	*Identifying and incorporating all relevant societal goals and policy objectives for the MSP project*	*International, EU, regional sea and national legislation and policies provide priorities for ecosystems and biodiversity*
	2. Planning stakeholder engagement	*Ensuring stakeholder engagement throughout the MSP cycle*	*Linking MSP stakeholder engagement to related activities in other parts of the EU regulatory framework*
Developing		*Gathering information on the full social-ecological system (thus including the ecosystem)*	*Ensuring that appropriate environmental monitoring data and information from the relevant EU Regulatory frameworks (e.g. MSFD) are available and used*
Assessing	3a. assessing the performance of the MSP using indicators and (if	*Using indicators across all the dimensions of sustainability*	*The SEA process can review the work thus far and help define key indicators for ecosystem monitoring, implementa-*

[79] Systems and tools for assessment, monitoring and revision of maritime spatial plans, including in the context of the implementation of Directive 2014/89/EU, 2021

Steps in the MSP cycle	Steps for monitoring and reviewing MSP	What is EBA-specific about in this step?	Links to the EU Regulatory framework and beyond
	available) targets		*tion, monitoring and evaluation of the plan*
	3b. Using appropriate tools	*A checklist is provided to evaluate the level of integration of EBA based on the tools (see Annex I)*	*The SEA process can review how well tools for EBA were used in the development phase and provided additional analysis if needed*
	3c. Establish a baseline assessment	*The assessment of ecosystem status, and ecosystem services delivered, prior to implementation will provide the baseline for the evaluation at the end of the cycle*	*SEA reports can set out the baseline to be considered at the evaluation stage*
Implementing	4. Monitoring activities	*Monitoring continues during MSP implementation*	*Environmental monitoring will be linked to the MSFD and other processes*
		More detailed monitoring will be required linked to new projects in the MSP area	*EIA of major projects will provide detailed environmental monitoring*
		Yearly reports or mid-term evaluations can identify key areas for strengthening EBA	*The SEA can identify key EBA topics for monitoring and reporting during implementation*
Follow-up	5. Evaluation	*Ensuring EBA-oriented questions and criteria, drawing on monitoring of the ecosystem (including the human activities), governance and participation*	*SEA and EIA work in previous steps will provide background and baselines for the evaluation*
Next cycle	**Revision**		

As shown in the table, the SEA process can play a key role in determining if EBA is well integrated in the first three MSP steps: the box below discusses how SEA can be used in this way.

Using the SEA process to evaluate the integration of EBA in the first MSP steps

Evaluation is often seen as an "*ex post*" activity that comes at the end of the planning cycle, while SEA is seen as an important step at the start. But monitoring, review and evaluation can take place throughout the cycle, and the SEA process can play a key role, in particular for EBA:

As indicated in Table 7, SEA can review how the ecosystem-based approach is integrated in the first two steps of the cycle – defining and developing. This will work best if SEA accompanies the preparation of an MSP, rather than being a stand-alone process (see Section 3.7 for an example how SEA can accompany the MSP steps).

The SEA report can identify key indicators to be monitored during implementation: both ecosystem indicators as well as planning indicators. It can also set out the baseline that a mid-term or ex-post evaluation should consider.

In Table 7, **the review step is part of the next cycle**: the review will build on the evaluation and will go further, revising objectives, approaches for stakeholder engagement and the development and assessment of the ecosystem or the whole social-ecological system. As set out in Section 2, implementing EBA in MSP is a cyclical process of ongoing development, implementation, learning and improvement.

This cyclical process is a key element of adaptive management, an EBA principle. Adaptive management is not limited, however, to changes from one cycle to another: there may be a need for MSP adapt to change during the cycle. This might arise from changes to social-ecological systems, such as the construction of large infrastructures such as offshore windfarms; unexpected changes to ecosystems such as the introduction of an invasive species; and the introduction of new policy goals at international, EU or national levels. The following section considers questions of *who*, *how* and also the *when* for review and evaluation.

5.3 Key issues for review and evaluation

5.3.1 Who will carry out the review and evaluation of EBA in MSP?

There isn't a single answer to this question: it will depend on national approaches and choices for evaluation. Options include:

- The team in charge of the MSP, possibly supported by external experts who undertake much of the evaluation work.
- An independent team within the same government body or in a separate government body, possibly the team or office that carries out the SEA.
- A set of roundtables of independent and government experts that report their findings to the body in charge of MSP – this was a key mechanism used in Massachusetts, in the US (see the box below).
- A group of peer reviewers, potentially from other Member States, perhaps in a process organised at regional sea or EU level (the box below provides an example of this process from the WFD)

Expert forums and peer reviews:
Examples of two methods for EBA review and evaluation

Expert and stakeholder forums. In **Massachusetts**, experts and stakeholders meet regularly to discuss progress and issues for the state MSP, called the Ocean Management Plan. These groups include a Scientific Advisory Council, an Ocean Advisory Commission bringing together government bodies and stakeholders, and various working groups. The participants highlight key issues that should be addressed in the reviews of the Plan, which take place every five years, and contribute their knowledge to the review process. (Please see the separate case study on Massachusetts[80] for further information.)

Peer reviews. The system of country-to-country peer reviews, pioneered by OECD, has been used to support Member State implementation of the Water Framework Directive[81]: Member State authorities submit their draft River Basin Management Plans and other issues for review by officials visiting from other countries. Each set of visits strengthens national implementation of the WFD, while the process overall identifies common issues for implementation that are then addressed in EU-wide technical workshops.

[80] Published in: ACTeon, Baltic Environmental Forum, Fresh Thoughts, GRID-Arendal and Wageningen Research, Study on integrating an ecosystem-based approach into maritime spatial planning: Project case-study reports, August 2021 (prepared for the European Commission – the European Climate, Infrastructure and Environment Executive Agency, CINEA), available at: https://op.europa.eu/en/publication-detail/-/publication/707ddfe7-353c-11ec-bd8e-01aa75ed71a1/language-en/format-PDF/source-238648827

[81] See, for example: https://www.aquacoope.org/peertopeer/en/

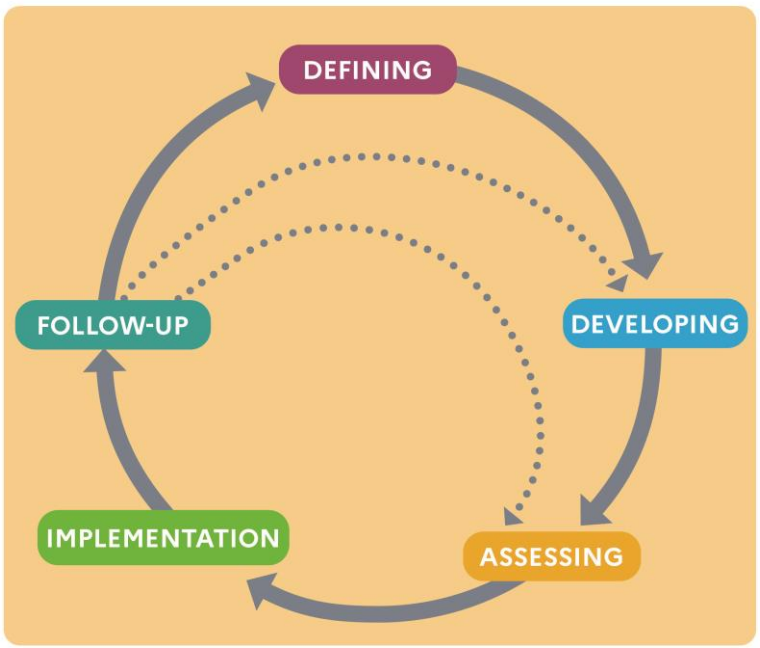
These mechanisms can be combined – for example, expert stakeholder forums and a peer review method could both provide input to an evaluation carried out by an independent government office. Of course, this list is not exhaustive: Member States can find other ways to organise evaluations. And sometimes, stakeholders such as NGOs prepare their own reviews or evaluations to influence an official one. When should reviews and evaluations be carried out?

As shown in Table 8 above, review and evaluation of EBA can take place throughout the MSP cycle:

- At the *defining* and *developing* stages, the SEA process – if it runs in parallel to the preparation of the plan – can review the choices made for EBA in the MSP process.
- At the *assessing* stage, the SEA process can review how indicators and tools were used as a basis for EBA in the MSP process.
- During *implementation*, regular reviews or mid-term evaluations can draw on both environmental monitoring results as well as monitoring of the plan itself to identify issues and mid-course changes.
- Of course, the *follow-up* stage is the key moment for review of both the MSP and the process to integrate EBA across the MSP steps.

The figure below (an excerpt of the one in section 2) illustrates how review and evaluation can take place throughout the planning cycle. This approach will moreover help to put in place an important EBA principle, adaptive management, on a continuous basis.

Figure 6: The MSP cycle with some of the most common internal feedback loops as the consequence of adaptive management



5.3.2 What are the activities for carrying out review and evaluation?

This section proposes a set of activities for carrying out review and evaluation, drawing on the European Commission's guidance as well as other literature on evaluation. It presents an approach that looks at both the process for a plan, as well as the intended outcomes in terms of ecosystems and human-ecosystem interactions. This is not the only approach. A peer review, for example, might focus on the process, for example on issues such as the

data and tools used to integrate EBA. An expert-focused review and evaluation such as the one used in Massachusetts might mainly address outcomes. And, as indicated above, both could be integrated into a broader review and evaluation.

- Setting up the evaluation framework

The first step in evaluation could outline how the process and the plan were expected to work in terms of integrating EBA in MSP: what activities should have taken place and how they should have contributed to the intended goals and outcomes for EBA in MSP. This description, which can be called the intervention logic or a theory of change, looks to map the expected causal links between the societal objectives, activities and expected outcomes. This description can be done through a causal diagram[82].

Evaluation methodologies then usually call for a set of evaluation criteria and questions to be answered. Annex III provides an example of the types of evaluation questions that can be asked about EBA in MSP. Moreover, the checklists in section 4.1.1 to 4.1.6 provide a set of operational questions for addressing EBA in MSP that can be used when evaluating the process.

- Identifying indicators

Another important element of the evaluation framework is the establishment of key indicators to measure implementation and of outputs and outcomes. Indicators can be quantitative or qualitative. They can include environmental indicators – for example, indicators linked to MSFD descriptors, to the Natura 2000 network and to the EU Biodiversity Strategy to 2030 will illustrate valuable aspects of EBA. Indicators can also cover key areas of implementation of the plan: they could build, for example, on the indicators that are produced as output of key assessment tools illustrated in Annex I. The SEA for a plan can identify key indicators to be tracked during implementation and considered in evaluation. The box below provides an overview of key EU-level indicator sources that can be considered.

Indicators for EBA in MSP

The choice of indicators to monitor EBA in MSP can draw on the EU regulatory framework, on data and indicators available at regional sea level, and on indicators to assess the extent of integration of EBA, such as the framework provided here in Annex I. As for monitoring, indicators can be used both the physical environment and the plan itself. Indicators can provide insights into all three areas of EBA identified in section 2. This overview shows possible sources for indicators in terms of the main areas of EBA they can cover. The use of common indicators taken from the EU regulatory framework can help make review and evaluation comparable across Member States.

Indicator sources	EBA: marine ecosystems	EBA: human activities	EBA: governance
MSFD descriptors	✓	✓	
WFD state & pressures data	✓		
Nature Directives and Natura 2000 site data	✓	(✓)	
Common Fisheries Policy	✓	✓	
Sustainable Blue Economy Framework	✓	✓	✓
Evaluating output indicators of applied EBA tools (see Annex I)	✓	✓	✓

[82] See for example, the diagram proposed for EU evaluations in the European Commission's Better Regulation Toolbox, Tool 46 : https://ec.europa.eu/info/files/better-regulation-toolbox-46_en

The list of indicator sets is intended as a starting point – it is not exhaustive. As MSP is a spatial exercise, map-based data can provide valuable indicators. While indicators are valuable, it should be recognised that they provide only one facet of the work for evaluation and review. Moreover, at present data gaps are a concern for the MSFD and other sources of data for EBA: consequently, it may be difficult to establish a baseline of environmental data against which the role of the MSP can be considered. The reviews of the first and second plans for the German Federal State of Mecklenburg-West Pomerania illustrate some of the drawbacks. While this experience focuses on monitoring MSP overall, it reinforces the idea – highlighted by the Massachusetts experience in the box above – that expert and stakeholder input are valuable in monitoring and evaluating EBA and ecosystem changes alongside indicators.

Monitoring and reviewing MSP in Mecklenburg-West Pomerania

In Mecklenburg-West Pomerania[83], monitoring the first MSP (in place from 2006), focused on a complex, indicator-based system that sought to understand if the MSP was achieving its aims. Several difficulties were encountered including data availability; the fact that MSP was only one governance mechanism affecting the seas (making it hard to determine the source of impacts); and difficulties tracing land-sea interactions, in particular economic interactions. The MSP was integrated with the Federal State's land use planning; on land, indicator data was more available and had been used for a much longer time.

For the Federal state's second MSP, in place from 2016, a more articulated approach has been taken, drawing on stakeholder feedback, the experience gathered from the implementation of the plan, and an overview of the external factors – "how the world is evolving" – as new uses of marine space are regularly being proposed.

- Gathering information and involving stakeholders

This work requires the collection of the necessary information to flesh out the indicators and reply to evaluation questions. This may involve gathering environmental monitoring data for the period of time that is being evaluated, carrying specific measurements to complement available monitoring data, and involving stakeholders to gather a more qualitative assessment of the indicators.

Stakeholder and expert groups can play a key role in reviewing evaluation approaches and then providing data, information and perspectives on the plan and relevant implementation actions. Some of these stakeholder groups may have been defined during the development of the plan (steps 'Defining' and 'Developing') – and it is valuable to widen the net where possible, to ensure that new perspectives are considered, for example through the use of transparent and broad-based methods for stakeholder engagement.

- Analysing data and information to reach conclusions and recommendations

The final step is crucial. In some cases, the data and information will lead to clear and obvious conclusions. But often, they will provide a complex and not fully clear picture. In this final step, it is valuable to distinguish three main elements: findings, conclusions and recommendations.

[83] Based on: Holger Janssen (Agency for Spatial Planning and State Planning Rostock Region), MSP in Germany – Insights from Mecklenburg-Western Pomerania (presentation to the UNESCO-IOC online seminar, Sharing National MSP Practices Worldwide: Germany, 16 February 2021). Available at: https://www.mspglobal2030.org/wp-content/uploads/2021/02/MSPglobal_Seminar_MSPpractices_Germany_EN.pdf

- ***Findings*** are the facts that are gathered during the evaluation. Findings proceed from setting out the quantitative and qualitative evidence gathered against all evaluation questions and show both positive and negative aspects in a clear and objective way. Contradictory findings should also be presented clearly. So should uncertainties and gaps in information; indeed, acknowledging uncertainty is a key principle of EBA itself.
- ***Conclusions*** come from judgements based on the findings. As findings might not be fully clear cut, and may indeed point in different directions, reaching conclusions might require weighing the validity and reliability of the data gathered and the data sources (for instance, the reliability of environmental monitoring data as well as an overview of areas where data are lacking). It might also happen that it is not possible to reach a definite conclusion on key issues. The precautionary approach is a key part of EBA, and the conclusions should identify areas where data available – and data gaps – call for precaution.
- ***Recommendations*** are proposed actions for the next cycle based on the conclusions. For instance, these recommendations can propose further objectives to be incorporated (defining step of the next cycle); additional research and data to be gathered (developing step); and further stakeholder engagement (all steps). Integrating EBA into MSP brings in other pieces of the EU regulatory framework; the recommendations arising from an MSP evaluation might also be relevant for the implementation of the MSFD, the Nature Directives and other processes, for example to strengthen synergies among them.

Draft findings, conclusions and recommendations can be discussed – and potentially even co-developed – with key stakeholders. The conclusions and recommendations should provide a balanced starting point for the new cycle, which will start with the update and revision of the plan, and they can identify new opportunities for the integration of EBA in MSP.

5.3.3 What will work best in your Member State and regional sea context?

This section has presented a structured approach for the evaluation and review of EBA in MSP. Work under other parts of the EU regulatory framework such as the MSFD will provide key inputs for evaluation and review, including a well-structured approach to environmental monitoring (see section 3). Other inputs can be valuable: for example, there may be common regional sea approaches, and these could strengthen cross-border information exchange and greater harmonisation among neighbouring Member States.

- Nonetheless, key common points for monitoring and evaluation include the following:
- Evaluation, monitoring and review are key steps for ensuring the EBA principle of adaptive management
- They should cover the key aspects of the previous sections – integration between EBA in MSP and in other parts of the EU regulatory framework, and implementation of EBA across the MSP steps
- Stakeholder engagement is as valuable in this work as it is in other EBA activities
- Indicators provide a valuable instrument – but are not sufficient
- A structural analytical framework can help to ensure that the main EBA issues are covered

As noted at the start of this section, the evaluation and review of EBA in MSP may be shaped by existing, national approaches and traditions. The key, whichever approach is followed, is to support and promote learning and adaptive management.

REFERENCES

This section provides the main sources for the study. It includes the sources cited in this guidance as well as other key sources reviewed over the course of the work.

ACTeon (2021, forthcoming). Analysis of the reported results of the MSFD Economic & Social Assessment.

ADRIPLAN (2017). Tools4MSP Geoplatform. http://data.adriplan.eu/

Altvater, S. et al (2019). EBA in MSP – a SEA inclusive handbook, Pan Baltic Scope. Available at: http://www.panbalticscope.eu/results/reports/

Backer, H. and Frias, M. (Eds.) (2013). Planning the Bothnian Sea – key findings of the Plan Bothnia project. Digital edition. ISBN 978-952-67205-5-5.

Barbanti, A., et al (Eds.) (2015). Developing a Maritime Spatial Plan for the Adriatic-Ionian Region. CNR-ISMAR, Venice, IT.

Beaumont, N. J., et al. (2007). Identification, Definition and Quantification of Goods and Services Provided by Marine Biodiversity: Implications for the Ecosystem Approach. Marine Pollution Bulletin, vol. 54, no. 3, Mar. 2007, pp. 253–65, doi:10.1016/j.marpolbul.2006.12.003.

Bergström, L., et al. (2019). Cumulative Impact Assessment for Maritime Spatial Planning in the Baltic Sea Region. Pan Baltic Scope.

BlueMed (2018). Strategic Research and Innovation Agenda (SRIA). 1–38. http://www.bluemed-initiative.eu/publications/

Borja, A., et al (2017). Bridging the gap between policy and science in assessing the health status of marine ecosystems. In *Frontiers in Marine Science*, https://doi.org/10.3389/978-2-88945-126-5

ten Brink, P., et al (2016). The health and social benefits of nature and biodiversity protection. A report for the European Commission (ENV.B.3/ETU/2014/0039), Institute for European Environmental Policy, London/Brussels, https://ec.europa.eu/environment/nature/biodiversity/intro/docs/Health%20and%20Social%20Benefits%20of%20Nature%20-%20Final%20Report%20Main%20sent.pdf

Bundesamt für Seeschifffahrt und Hydrographie (2009). Umweltbericht zum Raumordnungsplan für die deutsche ausschließliche Wirtschaftszone (AWZ) in der Ostsee. 1–475, https://www.bsh.de/SiteGlobals/Forms/Suche/Servicesuche_Formular.html?nn=1651816&templateQueryString=Raumordnungsplan&cl2Categories_Themen=offshore

Campostrini, P., et al (2018). Develop a basin scale analysis/initial assessment strongly MSP oriented for the Western Mediterranean, https://www.msp-platform.eu/practices/msp-oriented-initial-assessment-report

Davis, K.J., et al (2019). 'Estimating the economic benefits and costs of highly-protected marine protected areas'. *Ecosphere*, 10(10), https://esajournals.onlinelibrary.wiley.com/doi/full/10.1002/ecs2.2879

Department for Environment Food and Rural Affairs UK (2014). East Inshore and East Offshore Marine Plans, https://www.gov.uk/government/publications/east-inshore-and-east-offshore-marine-plans

Doru Mattescu, R. et al. (2017). Cross border maritime spatial planning in the Black Sea – Romania and Bulgaria (MARSPLAN-BS). Case study 1 (Eforie, Coastal erosion).

Ecorys (2013). Study in support of policy measures for maritime and coastal tourism at EU level. Final report of a study for the European Commission, DG Maritime Affairs & Fisheries.

Ehler, C. and Douvere, F. (2009). Marine Spatial Planning: a step-by-step approach toward ecosystem-based management. Intergovernmental Oceanographic Commission and Man and the Biosphere Programme. IOC Manual and Guides No. 53, ICAM Dossier No. 6. Paris: UNESCO. (English), p. 18. https://doi.org/10.4324/9781315666877-2

EMODnet (2021). Guide for the EMODnet marine spatial planning data model, Working Paper, available at: https://www.emodnet-ingestion.eu/media/emodnet_ingestion/org/documents/emodnet_data_model_guide_for_msp_wkpaper_08_02_21.pdf

Estévez, R. and Gelcich, S. (2015). 'Participative multi-criteria decision analysis in marine management and conservation: Research progress and the challenge of integrating value judgments and uncertainty'. *Marine Policy*.

Estreguil, C., et al 2019. Strategic Green Infrastructure and Ecosystem Restoration. EUR 29449 EN, Publications Office of the European Union, Luxembourg, 2019, ISBN 978-92-79-97294-2, doi:10.2760/06072, JRC113815.

European Commission (2012). Guidance for 2012 reporting under the Marine Strategy Framework Directive. DG Environment, Brussels.

European Commission (2018). Economic and social analysis for the initial assessment for the Marine Strategy Framework Directive. DG Environment, Brussels, p. 66 (MSFD Guidance Document 1).

European Commission (2015). Ecosystem Services and the Environment. In Science for Environment Policy, In-depth Report 11 produced for the European Commission, DG Environment by the Science Communication Unit, UWE, Bristol (Issue 11). https://doi.org/10.2779/57695.

European Commission, DG MARE (2020). The EU Blue Economy Report 2020, available at: https://blueindicators.ec.europa.eu/published-reports_en

European Commission (2020). An EU Strategy to harness the potential of offshore renewable energy for a climate neutral future, COM(2020) 741 final, November 2020, available at: https://ec.europa.eu/energy/topics/renewable-energy/eu-strategy-offshore-renewable-energy_en

European Commission (2021). On a new approach for a sustainable blue economy in the EU – Transforming the EU's Blue Economy for a Sustainable Future, COM(2021) 240 final, May 2021, available at: https://ec.europa.eu/oceans-and-fisheries/ocean/blue-economy/sustainable-blue-economy_en

European Commission, DG MARE (n.d.). Blue indicators dashboard. Blue indicators online dashboard. Available at: https://blueindicators.ec.europa.eu/access-online-dashboard

European Commission (2017). Study on the precautionary principle in EU environmental policies: Final report (prepared by Milieu Ltd), 2017, available at: https://op.europa.eu/en/publication-detail/-/publication/18091262-f4f2-11e7-be11-01aa75ed71a1/language-en

European Commission Decision (EU) 2017/848 of 17 May 2017 laying down criteria and methodological standards on good environmental status of marine waters and specifications and standardised methods for monitoring and assessment, and repealing Decision 2010/477/EU, p. 74.

European Commission (2000). Communication from the Commission on the precautionary principle, COM(2000)1

European Commission (2021). Proposal for making harmonized MSP plan data available across Europe. Results of the work of the Technical Expert Group (TEG) on MSP data. https://op.europa.eu/en/publication-detail/-/publication/f4d14782-19ba-11ec-b4fe-01aa75ed71a1/language-en/format-PDF/source-234524493

European Marine Board (2019). Valuing Marine Ecosystems. Taking into account the value of ecosystem benefits in the Blue Economy. Future Science Brief, N° 5 April 2019. Available at: https://www.marineboard.eu/valuing-marine-ecosystems

European Commission (2021). Strategic guidelines for a more sustainable and competitive EU aquaculture for the period 2021 to 2030, COM(2021) 236 final, Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2021:236:FIN

Giddings, B., Hopwood, B., O'Brien, G. (2002). Environment, economy and society: fitting them together into sustainable development, Sustainable Development, Volume 10, Issue 4, November 2002, pp. 187-196, https://doi.org/10.1002/sd.199

Giacometti, A., et al (2020). Handbook: Process, Methods and Tools for Stakeholder Involvement in MSP. BONUS BASMATI Deliverable 2.3, available at: www.bonusbasmati.eu

Hallegatte, S., et al (2012). Investment decision-making under deep uncertainty: Application to climate change (Policy Research Working Paper 6193). https://doi.org/10.1596/1813-9450-6193.

Hanley, N., et al (2015). 'Economic Valuation of Marine and Coastal Ecosystems: Is it currently fit for purpose?' *Journal of Ocean and Coastal Economics*, 2(1), http://dx.doi.org/10.15351/2373-8456.1014

HELCOM-VASAB (2016). Guideline for the implementation of ecosystem-based approach in Maritime Spatial Planning (MSP) in the Baltic Sea area.

Henry, S., et al (2019). Potential approaches for stakeholder engagement on MSP and outcomes of pilot testing. EU Project. Grant No: EASME/EMFF/2015/1.2.1.3/03/ SI2.742089. Supporting Implementation of Marine Spatial Planning in the Northern European Atlantic (SIMNORAT). Agence Française pour la Biodiversité – Université de Bretagne.

Hogg, K., et al, (2019). A governance toolkit for managing small-scale fisheries in Mediterranean Marine Protected Areas. FISHMPABLUE 2 project – Interreg MED.

IOC-UNESCO (n.d.) Maritime Spatial Planning facts, http://msp.ioc-unesco.org/about/msp-facts/

IOC-UNESCO, Marine spatial planning: A Step-by-Step Approach toward Ecosystem-based Management, 2009, https://www.mspglobal2030.org/resources/key-msp-references/

Jarl, M., et al (2018). Benefits and limitations of real options analysis for the practice of river flood risk management. Water Resources Research, https://doi.org/10.1002/2017WR022402

Jones, N., Graziano, M. and Dimitrakopoulos, P. G. (2020). 'Social impacts of European Protected Areas and policy recommendations', *Environmental Science and Policy*, 112, 134–140. doi: 10.1016/j.envsci.2020.06.004.

Kavadas, S., Maina, I. (2015). Multi-Criteria Decision Analysis as a tool to extract fishing footprints: application to small scale fisheries and implications for management in the context of the Maritime Spatial Planning Directive. Mediterranean Marine Science 16(2):294-304. DOI:10.12681/mms.1087

Kwakkel, J H., Haasnoot, M. and Walker, W.E. (2016). 'Comparing Robust Decision-Making and Dynamic Adaptive Policy Pathways for model-based decision support under deep uncertainty'. *Environmental Modelling & Software*, 86, 168-183.

Liquete, C., et al. (2015). Mapping green infrastructure based on ecosystem services and ecological networks: A Pan-European case study. Environmental Science and Policy, 54, 268–280. Available at: https://doi.org/10.1016/j.envsci.2015.07.009

Long R.D., et al (2015). Key principles of marine ecosystem-based management, Marine Policy, Vol. 57, July 2015, available at: https://doi.org/10.1016/j.marpol.2015.01.013

Manea, E., et al (2020). 'Towards an ecosystem-based Marine Spatial Planning in the deep Mediterranean Sea'. *Science of the Total Environment*, 715, https://doi.org/10.1016/j.scitotenv.2020.136884

McGuinn, J. et al. (2013). Guidance on Integrating Climate Change and Biodiversity into Strategic Environmental Assessment. https://ec.europa.eu/environment/eia/pdf/SEA%20Guidance.pdf

McMeel, O., Tonné, N. and Calewaert, J.-B. (2019). Human health and EU maritime policy: Closing the loop. H2020 SOPHIE Project. doi: 10.5281/zenodo.3663620.

Menegon S., et al. (2018). 'Addressing cumulative effects, maritime conflicts and ecosystem services threats through MSP-oriented geospatial webtools'. *Ocean & Coastal Management*, 163, 417–436. doi:10.1016/j.ocecoaman.2018.07.009.

Nieminen, E., et al (2018). 'The economic benefits of achieving Good Environmental Status in the Finnish marine waters of the Baltic Sea'. *Marine Policy*, 99, 181–189. https://doi.org/10.1016/j.marpol.2018.10.014

Noordzeeloket (2013). Economic and social analyses for the Marine Strategy Framework Directive. Part 2: Programme of measures, Marine litter, https://www.noordzeeloket.nl/en/policy/europese/background-documents/background-documents-2/economic-analysis-2/@166834/economic-social/

Norton, D., Hynes, S. and Boyd, J. (2018). Valuing Ireland's Coastal, Marine and Estuarine Ecosystem Services. EPA Research, report n°. 239. Available at: https://www.epa.ie/publications/research/water/Research_Report_239.pdf

Norwegian Ministry of Climate and Environment (2015). Update of the integrated management plan for the Barents Sea – Lofoten area including an update of the delimitation of the marginal ice zone. Available at: https://www.regjeringen.no/contentassets/d6743df219c74ea198e50d9778720e5a/en-gb/pdfs/stm201420150020000engpdfs.pdf

OECD (2017). *Marine Protected Areas: Economics, Management and Effective Policy Mixes*. OECD Publishing, Paris, https://read.oecd-ilibrary.org/environment/marine-protected-areas_9789264276208-en#page4

PanBaltic Scope (2019). EBA in MSP – a SEA inclusive handbook. Available at: http://www.panbalticscope.eu/wp-content/uploads/2019/12/EBAinMSP_FINAL-1.pdf

Piet, G., et al, (2017). Making ecosystem-based management operational, https://aquacross.eu/sites/default/files/D8.1_Making_ecosystem-based_management_operational_v2_13062018.pdf

Plan Bleu, ACTeon and Arcadis (2019). Socioeconomic analysis of marine litter key best practices to prevent/reduce single use of plastic bags and bottles, https://planbleu.org/en/publications/socioeconomic-analysis-of-marine-litter-key-best-practices-to-prevent-reduce-single-use-of-plastic-bags-and-bottles/ (in French).

Programme Seventh Framework. (2013). MESMA Central Exchange, http://www.mesmacentralexchange.eu/home.html

Ramieri, E., et al. (2014). Methodological handbook on Maritime Spatial Planning in the Adriatic Sea, http://www.shape-ipaproject.eu/Download.asp?p=documents-download&GrdDownload-Page=2&id=wp4-action-4-5

Ruskule A., et al, 2019. Green Infrastructure Concept for MSP and Its Application Within Pan Baltic Scope Project. Final Report. Pan Baltic Scope. Available at: http://www.panbalticscope.eu/wp-content/uploads/2019/12/PBS_project_green-infrastructure_report_FINAL.pdf

Russi, D., et al (2016). Socioeconomic benefits of the EU Marine Protected Areas. Report prepared by the Institute for European Environmental Policy (IEEP) for DG Environment, https://ec.europa.eu/environment/nature/natura2000/marine/docs/Socio%20-Economic%20Benefits%20of%20EU%20MPAs.pdf

Schmidtbauer Crona, J., et al. (2017). The ecosystem approach in Maritime Spatial Planning: a checklist toolbox. Baltic Scope project. http://www.balticscope.eu/content/uploads/2015/07/BalticScope_Ecosystem_Checklist_WWW.pdf

SEANSE (2020). Strategic Environmental Assessment on North Sea energy: summary report, available at: https://northseaportal.eu/downloads/

SEANSE (2019). Comparison of North Sea EIAs and SEAs of maritime spatial plans and wind energy development. Available at: https://northseaportal.eu/downloads/

Stancheva, M. et al. (2017). Cross-border Maritime Spatial Planning in the Black Sea – Romania and Bulgaria (MARSPLAN-BS). Case study 3 (Burgas, Land-sea interactions). https://www.msp-platform.eu/sites/default/files/marsplan-bs-burgas_lsi.pdf

Stelzenmüller, V., et al (2013). 'Monitoring and evaluation of spatially managed areas: A generic framework for implementation of ecosystem based marine management and its application'. *Marine Policy*, 37, 149–164.

Sumaila, U.R. (2001). Generational Cost Benefit Analysis for Evaluating Marine Ecosystem Restoration. Sea Around Us: North Atlantic, p. 3, http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.114.1543&rep=rep1&type=pdf

Swedish Agency for Marine and Water Management (2017). Symphony – a tool for ecosystem-based marine spatial planning. https://www.havochvatten.se/en/eu-and-international/marine-spatial-planning/swedish-marine-spatial-planning/the-marine-spatial-planning-process/development-of-plan-proposals/symphony---a-tool-for-ecosystem-based-marine-spatial-planning.html

Swedish Agency for Marine and Water Management (2019). Swedish National Marine Plan. https://www.havochvatten.se/en/eu-and-international/marine-spatial-planning/swedish-marine-spatial-planning.html

UNEP/MAP (2018), Conceptual Framework for Marine Spatial Planning in the Mediterranean, http://paprac.org/storage/app/media/Meetings/MSP%20Conceptual%20Framework%20EN.pdfhttp://paprac.org/storage/app/media/Meetings/MSP%20Conceptual%20Framework%20EN.pdf

van der Ploeg, S., de Groot, D., Wang, Y. (2010). TEEB Valuation Database: Overview of Structure, Data and Results. Foundation for Sustainable Development. (http://www.teebweb.org/wp-content/uploads/2017/03/teeb_database_teebweb.xlsx).

Watkiss, P., et al (2015). 'The use of new economic decision support tools for adaptation assessment: A review of methods and applications, towards guidance on applicability'. *Climatic Change*, 132, 401–416, https://doi.org/10.1007/s10584-014-1250-9

Wright Morton, L., Eigenbrode, S. D., Martin ,T. A.. (2015). Architectures of adaptive integration in large collaborative projects. Ecology and Society 20(4):5. http://dx.doi.org/10.5751/ES-07788-200405

WWF (2020). Position paper: ecosystem-based approach for Marine Spatial Planning in the EU. https://www.wwf.eu/?360836/Position-paper-ecosystem-based-approach-for-Marine-Spatial-Planning-in-the-EU

WWF, Guidance paper: Ecosystem based Maritime Spatial Planning in Europe and how to assess it, 2021, https://wwfeu.awsassets.panda.org/downloads/wwf_eb_maritime_spatial_planning_guidance_paper_march_2021.pdf

ANNEX I. FACTSHEETS FOR EBA TOOLS

This "toolbox" provides factsheets for key analytical tools that can support EBA in MSP. The following factsheets are provided:

- Constructing a **mental model**;
- **Mapping stakeholders** and **interests** relevant to your MSP
- **Cumulative effects** (impact) **assessment**;
- **Mapping marine green infrastructure**;
- Assessing the **social and economic importance of ecosystem services** provided by marine ecosystems;
- ***Ex-ante* assessment** of the impacts of maritime spatial plans.

References to methods and tools that address risks and uncertainties are provided in the main text of the guidelines (see section 4.3.4), but further details are not provided here as there is not sufficient evidence on their application in the marine and maritime policy fields.

The factsheets present tools that address a specific component of EBA in MSP. The tools in this Annex can be used in combination; moreover, MSP planners and practitioners can consider using MSP software such as SeaSketch[84] to ensure that ecosystems and the services they deliver are given due attention at each step of planning (key stakeholders can be involved via such applications). Finally, this toolbox focuses on a set of key tools, but it does not intend to be exhaustive: a range of further tools could be valuable for work on EBA in MSP[85].

[84] See e.g. SeaSketch, a software service for participatory and collaborative mapping https://panorama.solutions/en/solution/seasketch-web-based-tool-participatory-marine-spatial-planning ; or

[85] One example among several of further tools is Seascape character assessment (https://www.interregeurope.eu/policylearning/good-practices/item/821/seascape-character-assessment/). Another is ecological sensitivity mapping, which BirdLife International has highlighted as a valuable tool for EBA in MSP (see: https://www.birdlife.org/sites/default/files/how_to_apply_the_ecosystem-based_approach_in_marine_spatial_planning.pdf).

Constructing a mental model

Why is it important?

The mental model (sometimes referred to as conceptual model or linkage framework) is the tool that links the societal objectives identified in the defining step to the development of the knowledge base in the developing step. The mental model helps to capture the main components of the socio-ecological system, along with their main (causal) relationships. It provides the basis for identifying components and relationships for which knowledge will need to be developed to support the MSP process. The mental model can be co-developed as part of the stakeholder participation process. At the same time, it is an input to the identification of stakeholders that are to be involved in the MSP planning process as representatives of key components of the socio-ecological system.

What can help you in carrying out such an assessment?

It is recommended to work from a standardised categorisation of sectoral activities, their pressures and relevant ecosystem components. These should be aligned to the requirements of the main policy frameworks (e.g. MSFD) but in practice can often be obtained from existing tools, such as CIA. Often regional mental models are already available such as in the ecosystem overviews prepared by the International Council for the Exploration of the Sea (https://www.ices.dk/advice/ESD/Pages/Ecosystem-overviews.aspx).

For the construction of new mental models, there are computer-based tools which can help to combine the pressures of different activities and characterise their cumulative impacts on marine ecosystems (e.g. http://www.mentalmodeler.org/).

Is it easy to apply? Practical challenges you might face when applying mental models

A mental model can always be applied. The difference lies in its complexity in terms of the level of detail of the sectors/activities or the ecosystem, or the extent to which ecosystem services or the full social-ecological system is considered. To address these differences in complexity, the typologies used in the mental model can be categorised in hierarchies. The use of such hierarchical categories allows flexibility in the combination of categories covering different levels of detail into one typology that can be used at a later stage to guide assessments covering different levels of detail fitting the requirements of the relevant stakeholders.

More important than its structure is the process set to develop the mental model. Indeed, co-building the mental model with stakeholders is essential to its relevance and usefulness. It helps to capture stakeholders' knowledge on particular (direct and indirect) causal relationships. It will build understanding and ownership on assessments carried out in the following planning steps that will address these causal relationships.

When can constructing a mental model help?

The mental model links the societal goals and stakeholder processes to (the development of) the knowledge base. To structure this process, it is helpful (if not necessary) to work from common typologies with varying level of detail to match the requirements of the specific MSP project and its institutional and environmental context.

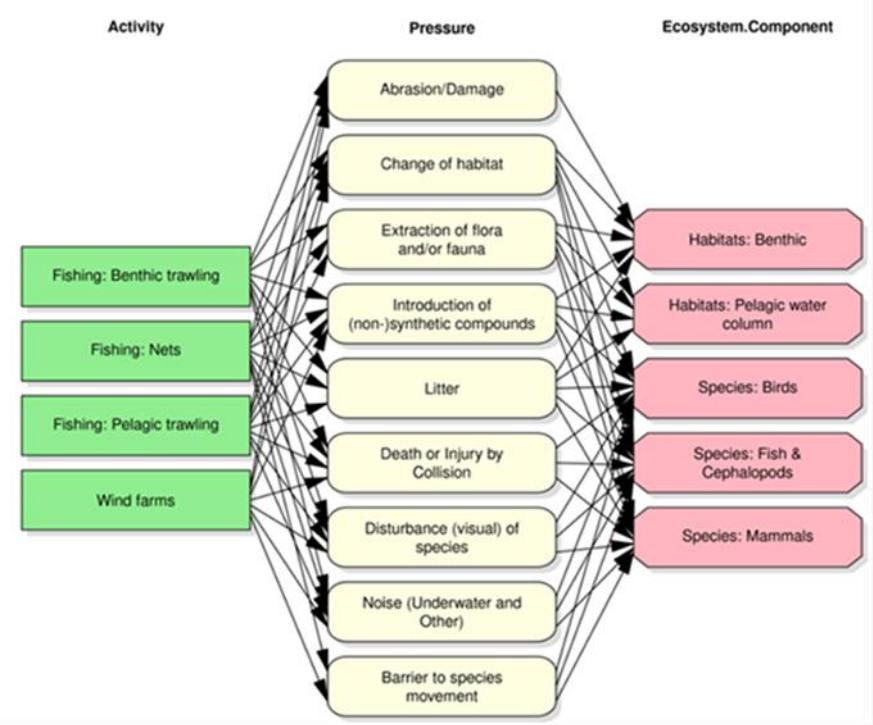
What are the options to consider when developing and applying a mental model?

1. Option 1 - Only part of the sectors, pressures or ecosystem components deemed relevant according to experts are considered. Within this level, there may be a gradual (sub-level) improvement as it is expanded to include more sectors, pressures or ecosystem components, or to better specify the spatial component of causal relationships identified.

2. Option 2 - The mental model includes both ecological considerations as well as socio-economic aspects. It covers the whole social-ecological system – from drivers to economic activities to benefits from ecosystem services) and requires interdisciplinary scientific expertise on the different components and causal relationships of this system.
3. Option 3 - The development of the mental model is firmly embedded in a stakeholder participation process, helping to identifying a wider set of causal relationships (including indirect causal relationships via value chains and territorial developments that might be more difficult to capture).

An illustration of a mental model from the North Sea case study

The mental model presented below identifies the different pressures from selected sectoral activities and illustrates how these may impact different ecosystem components via so-called impact chains or linkages. Categories considered in this mental model are identified to match those used in the Marine Strategy Framework Directive.



How can you evaluate your progress towards EBA when applying a mental model?

This guidance is intended to allow the monitoring of progress towards increasingly more EBA integrated into an MSP or an assessment of existing MSP case studies in terms of the degree to which EBAs are incorporated. To that end the following qualitative criteria allow a (fairly basic) first inventory of the degree of EBA in an MSP. The higher numbers indicate a more advanced application of EBA in MSP.

1. Mental model does not exist and the sectors or how they potentially impact the ecosystem are not explicitly considered. The categories of activities, pressures or ecosystem components are not defined or agreed upon.

2. Only part of the sectors, pressures or ecosystem components deemed relevant according to experts are considered. Within this level there may actually be a gradual (sub-level)

improvement as it is expanded to include more sectors, pressures or ecosystem components.

3. The development of the mental model is firmly embedded in a stakeholder participation process.

4. The mental model includes both ecological considerations as well as socio-economic. It covers the whole social-ecological system and requires interdisciplinary scientific expertise.

Mapping stakeholders and interests relevant to MSP

Why is it important?

Stakeholder consultation and mobilisation is a requirement in the MSP Directive and in many pieces of EU environmental legislation. While attention is often given to the philosophy and ambition of stakeholder mobilisation (from simple information to co-decision, consultation being the most widely applied approach), less attention is given to who has been involved and with which role. Of particular importance from an EBA perspective is to ensure that stakeholders representing the different interests of the socio-ecological system are considered and involved. This involvement will need to reach beyond representatives from the traditional maritime sectors to include: stakeholders representing policies influencing anthropic activities imposing pressures on marine ecosystems (e.g. stakeholders from the fisheries or agriculture policies); stakeholders representing beneficiaries of ecosystem services; stakeholders representing interests located in other countries that are connected to the ecosystem, either directly (e.g. fishers from other countries fishing in the marine ecosystem considered) or indirectly (e.g. representatives from the value chains of marine products whose decisions impact on local practices).

That's where stakeholder mapping (or stakeholder analysis) can help! It focuses on identifying a system's internal and external stakeholders and mapping whose interests should be taken into consideration when developing a programme or plan.

What can help you in carrying out such an assessment?

The identification of relevant stakeholders can build on the mental model established to capture the main building blocks of the socio-ecological system considered. You can identify organisations and stakeholders relevant for each building block from drivers (e.g. official representatives of a given policy) to beneficiaries of ecosystem services (e.g. the association of coastal tourism for the area considered).

In addition, and within an iterative process, you can ask stakeholders who is important for the management of marine space and why this is so. You will then be able to identify the degree of influence and the level of interest of each stakeholder over the relevant issues, challenges or possible (societal) objectives of the MSP, and their current involvement (with which role and via which mechanisms) in parallel policy (e.g. MSFD, WFD…) processes. This will help you define your MSP planning stakeholder process and governance, and how best to connect to other policy stakeholder processes.

Is it easy to apply? Practical challenges you might face when applying stakeholder mapping

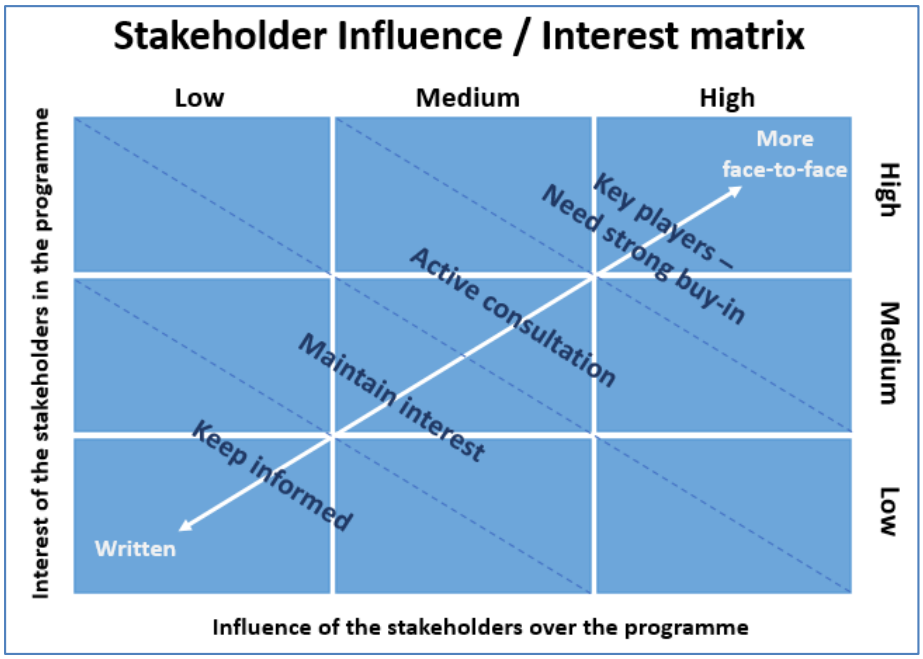
Making a long list of stakeholders is rather easy. More difficult is to ensure that relevant stakeholders for the different economic, social and environmental interests are identified, and that their importance and influence is captured in a robust manner. Indeed, it is important to move away from a simple deduction to a thorough analysis of who matters and why, building on the analysis of the different (regulatory, knowledge, financing, social…) links that connect different organisations and stakeholders. When you are part of a formal (MSP) process, you will need to ensure that key (formal) partners understand the importance of stakeholder mapping and are ready to build on its results to develop a new MSP stakeholder process, or to adapt an existing one. Also, the importance and level of influence of an organisation can be rather subjective depending on who assesses it: thus, you need to ensure that the stakeholder mapping process builds on a wide range of sources and contributions that need to be compared/combined to strengthen the assessment.

The mapping of stakeholders, carried out in parallel to the development of the mental model, is required at the *defining* stage, when designing your MSP process. It helps you to decide who to involve and when, and to develop the governance approach – identifying

mechanisms required for establishing synergies with stakeholder processes required under other regulatory requirements (MSFD, WFD, SEA…). Of particular importance is ensuring your mapping helps to identify key representatives from environmental interests, from interests and sectors benefitting from ecosystem services, and from interests beyond administrative (national boundaries) that need to be associated to your planning process.

The figure below presents one way to map stakeholders in terms of their influence on the process and their interest in it. This approach groups stakeholders into four groups: the most important are key players to be involved as much as possible; the second group of stakeholders should be involved via active consultation methods; for others, their interest in the process needs to be maintained or they need to be kept informed. When mapping stakeholders in this way, it is also valuable to identify a third dimension, the level of support of each stakeholder, for example by categories: stakeholders that strongly support the process, those opposed as they fear their interests will be harmed, and those whose position may not be known but whose support will be needed.

Figure 7: Illustration of a stakeholder mapping output



Source: Henny Portman, MSP Stakeholder management, a refresh, in Blog on Portfolio, Programme and Project Management, 2014, available at: https://hennyportman.wordpress.com/2014/11/21/msp-stakeholder-management-a-refresh/

What are the options to consider when mapping stakeholders?

1. Option 1 – Identify all relevant stakeholders via the review of the available literature, the desk analysis of the governance (of different sectors, policy implementation) complemented by a limited number of semi-structured interviews with key stakeholders. This should help you to identify a wide range of "primary" stakeholders directly impacting on, or benefitting from, marine ecosystems.
2. Option 2 – Carry out a wide stakeholder survey (not limited to traditional maritime sectors, targeting also local authorities, social/cultural/territorial services and stakeholders), using a short questionnaire. This can help you to identify different categories of stakeholders in terms of importance and influence, and thereby develop your governance (e.g. who is consulted versus who is associated to decisions)
3. Option 3 – Apply the previous options and present/discuss results within a stakeholder participation workshop so as to consolidate and design your governance mechanism according to perceptions, views and wishes.

Further reading?

If you would like to know more about possible approaches and existing experiences:

- On the **Importance/influence matrix** to capture the degree of influence and level of interest of different stakeholders – look at the presentation of the tool in Wageningen University's guide on multi-stakeholder partnerships: http://www.mspguide.org/tool/stakeholder-analysis-importanceinfluence-matrix
- Read the article **Stakeholder analysis in Marine Planning**, by Thomas Gunton, Murray Rutherford and Megan Dickinson - https://www.researchgate.net/publication/228641686_Stakeholder_Analysis_in_Marine_Planning
- Find also sources of inspiration at the following blog post on stakeholder mapping: https://www.smaply.com/blog-stakeholder-maps?utm_medium=cpc&utm_source=google&utm_campaign=search&gclid=CjwKCAjwoZWHBhBgEiwAiMN66ZXxBtJ7_us-EYSaDeGBjv09ZOrrxVniJ8PzRKP24rb86DUFUTaGERoC0L4QAvD_BwE

Cumulative Effects Assessment (CEA)

Why is it important?

Many activities, maritime or land-based, put pressures on marine ecosystems. Taken in isolation, each pressure might have limited impacts on a given marine ecosystem. Considered together, and even when the pressure from each activity is limited, they can threaten the health of marine ecosystems, disturb the functioning of maritime spaces or directly or indirectly affect the development of marine fauna and flora. Thus, it is essential that tools and methods that help "aggregating pressures" and assess their cumulative impacts on the health of marine ecosystems are applied – to ensure cumulative impacts are limited and do not threaten the functioning and integrity of marine ecosystems.

What can help you in carrying out such an assessment?

Different assessment methods and computer-based tools can help to combine the pressures of different activities and characterise their cumulative impacts on marine ecosystems.

Example of tools	What the tools deliver
Tools4MSP - Developed and applied in the Adriatic-Ionian Region, Tools4MSP includes a cumulative impact assessment tool that helps to capture the cumulative impacts of maritime activities on the marine environment. It aims to identify pressures (and related Maritime Uses) to which the Adriatic-Ionian environmental components are more sensitive, along with maritime activities at the origin of these pressures affecting specific environmental components and areas that are more vulnerable to current maritime activities.	• Cumulative impact maps. • Sea use overlay analysis maps. • Generation of statistical outputs on impact scores (plots and tables) for single sea uses and environmental components. • Analysis of gaps in terms of data availability and input data based on data availability maps and statistical outputs
BSII CAT – developed for the Baltic Sea as part of the Pan Baltic Scope project, it helps to assess cumulative impacts and identify potential environmental implications of different planning scenarios.	• Impact scores for all pressures and ecosystem component combinations, impact sums for each pressure layer and ecosystem component layer. • Data layers that are included in the assessment as GIS raster files with a 1x1 km grid, and the results presented with a 1 x 1 km grid
Symphony - Developed for the Swedish Agency for Marine and Water Management, Symphony helps to assess cumulative environmental impact of different options for sharing marine space.	• GIS based map with the predicted cumulative impacts for the coastal and marine areas of the Baltic Sea

Depending on the resources available (in terms of type of knowledge available, its spatial disaggregation but also human resources mobilised for carrying out the assessment), you will need to adapt the approach chosen and consider whether or not to apply the methods illustrated above.

Is it easy to apply? Practical challenges you might face when applying CIA/CEA

The literature provides hints on many challenges, such as:

- The absence of Geographical information spatial data with appropriate coverage or resolution.
- Limited knowledge on some ecological components (e.g. pelagic habitats and plankton
- There is spatio-temporal inhomogeneity among dynamic environmental components (sea-birds, mammals and turtle datasets) with coarser resolution datasets compared to EUNIS marine habitats (100 m×100 m) and differing nominal scales (e.g. individuals/km2 versus presence-absence indicators)
- Limited relevant information on land-based pressures (e.g. industrial pollutants, eutrophication, marine litter) and on transport dynamics
- Limited knowledge on pressure-effect relationships
- Over-simplified assumptions and functions that limit the potential for application in support to decision making processes.

And probably many more – particularly, if you happen to dive into it for the first time. Clearly, you will need to closely interact with many experts and professionals representing different sectors to capture properly their different pressures and how they affect marine ecosystems. However, it is worth the effort if you adequately balance the efforts allocated to make it work and the importance of the decisions to be taken.

When can CEA/CIA assessment help?

CEA/CIA can help at different stages of the MSP process. In particular:

- When **analysing the current situation** and challenges faced, identifying zones and areas where cumulative impacts are significant – today and in the future – and may threaten (some aspect or component of) ecosystem health and hence limit specific human activities taking place in these areas;
- When comparing different alternatives of the sharing of maritime space in terms of where best to locate economic activities and protected areas to reduce pressures on marine ecosystems and facilitate the economic development of activities depending on ecosystems in good health;
- Help with **communicating** on the multiple connections between human activities and the marine ecosystem with some prioritisation between them, present an integrated (spatial) vision and understanding of pressures imposed on marine ecosystems – and the consequences of the different MSP options on the health of the ecosystem and its associated policy objectives.

It can also help with structuring data and information from different sources (on individual sectors and their pressures) in a coherent manner while providing the means for identifying gaps in information (e.g. the absence of knowledge on specific pressures from a given sector) that would need to be fulfilled. Whenever available, CIA models are suitable tools that incorporate multiple sources of information, including from expert judgement in order to overcome the lack of knowledge when decisions are needed.

What options to consider when applying CIA/CEA?

1. Sometimes the "cumulative effects" of multiple pressures of a single sector (e.g. catches and disturbance of seabed habitats in case of fishing) or different entities (e.g. one windfarm on another). But any single-sector CEA/CIA is a misnomer.

2. Only some of the sectors, pressures or ecosystem components deemed relevant according to the mental model are considered (e.g. instead of "fish" there is a distinction between "pelagic fish" and "demersal fish" or "commercial" and "non-target" or could

even include specific indicator species. This level may actually consider many sub-level improvements until the CEA/CIA covers the full mental model.

3. Quality of the CEA/CIA is determined by the available data/information/knowledge. As such we can again consider many sub-level improvements as the knowledge base improves from qualitative (expert judgement) to semi-quantitative (expert judgement scorings often based on categories) to fully quantitative. This gradual improvement is likely to occur as a gradual process where for one impact chain at a time the risk of encounter (exposure) may be estimated from the spatial distribution of activities, pressures and/or ecosystem components. Ultimately this can be based on representative GIS data.

4. The full assessment of (risk of) impact also requires information of the sensitivity of an ecosystem component. Similar to exposure this may be estimated from population dynamics' information.

5. Until now all CEA/CIA only consider the cumulative effects/impacts of the aggregated pressures (from all activities) on the components representing ecosystem state as that is what current environmental policy is concerned about. An extension of CEA/CIA could also include (the supply of) ecosystem services (see next section).

6. As ecosystem-based management is expected to consider the whole social-ecological system, ultimately the CEA/CIA would need to be linked to the social (i.e. socio-economic) system so that the cumulative impacts on quality of life / human well-being can be assessed.

How can you evaluate your progress towards EBA when applying CEA/CIA?

This guidance is intended to allow the monitoring of progress towards increasingly more EBA integrated into an MSP or an assessment of existing MSP case studies in terms of the degree to which EBAs are incorporated. To that end the following qualitative criteria allow a (fairly basic) first inventory of the degree of EBA in an MSP. The higher numbers indicate a more advanced application of EBA in MSP.

1. Cumulative Effects Assessment or Cumulative Impacts Assessment (CIA) are not considered

2. It may occur that the MSP process claims that cumulative effects of a single sector are considered, e.g. in case of the planning of offshore windfarms only the "cumulative effects" of one windfarm on the other, or different pressures caused by the offshore wind activity. A single-sector CEA/CIA is a misnomer.

3. Several sectors, pressures or ecosystem components are considered, and their effect/impacts are assessed

    - Only part of the sectors, pressures or ecosystem components deemed relevant according to the mental model are considered. This level may actually consider many sub-level improvements until the CEA/CIA covers the full mental model.
    - Quality of the CEA/CIA is determined by the available data/information/knowledge. As such we can again consider many sub-level improvements as the knowledge base improves depending on the quality of the information available (from expert judgement to fully quantitative information). This improvement is likely to occur as a gradual process where for one impact chain at a time the spatial distribution of activities, pressures and/or ecosystem components may be ultimately based on representative GIS data.

4. Until now all CEA/CIA only consider the cumulative effects/impacts of the aggregated pressures (from all activities) on the components representing an ecosystem state as that is what current environmental policy is concerned about. An extension of CEA/CIA could also include the capacity to supply ecosystem services.

5. As ecosystem-based management is expected to consider the whole social-ecological system ultimately the CEA/CIA would need to be linked to the social (i.e. socio-economic) system so that the cumulative impacts on human well-being can be assessed.

Further reading?

If you would like to know more about possible approaches and existing experiences :

- **Tool4MSP –**look at ADRIPLAN (2017) Tools4MSP and visit the geoplatform. http://data.adriplan.eu/. Read more in *Barbanti A, et al, (2015a), ADRIPLAN: Developing a Maritime Spatial Plan for the Adriatic-Ionian Region* and *Menegon S, et al, (2018b) Tools4MSP: an open source software package to support Maritime Spatial Planning. PeerJ Comput Sci 4 e165*.
- **BSII CIA Toolbox (BSII CAT) –** read *Bergström L, et al, (2019) Cumulative Impact Assessment for Maritime Spatial Planning in the Baltic Sea Region*.
- **Symphony.** Read also *Swedish Agency for Marine and Water Management (2017) Symphony – a tool for ecosystem-based marine spatial planning* and visit the agency's internet site: https://www.havochvatten.se/en/swam/eu--international/marine-spatial-planning/symphony---a-tool-for-ecosystem-based-marine-spatial-planning.html

Mapping marine green infrastructure

Why is it important?

The EU's 2013 Strategy on Green Infrastructure defines green infrastructure (GI) as a:

> "…strategically planned network of natural and semi-natural areas with other environmental features designed and managed to deliver a wide range of ecosystem services. It incorporates green spaces (or blue if aquatic ecosystems are concerned) and other physical features in terrestrial (including coastal) and marine areas."

The Strategy calls for the use of GI across Europe as a standard element of spatial planning. While GI is often used only for terrestrial features, it can be equally applied to marine areas; these are called marine GI here, to underline the links between marine and terrestrial natural areas.

Mapping marine GI can help to aggregate complex scientific information and knowledge on structure and functions of marine ecosystems and the services they provides: doing so can identify ecological hotspot areas as well as the connections among them, facilitating integration of ecological aspects into MSP. Marine GI thus includes Marine Protected Areas (MPAs) as core areas for maintaining biodiversity, but it also goes beyond them to ensure connectivity of the network.

What can help you in mapping marine GI?

GI mapping can involve two complementary approaches: physical mapping of existing GI components (including protected areas, ecological networks and other valuable natural areas) and ecosystem-service based mapping that identifies areas delivering ecosystem services. GI concepts and mapping approaches at different scales are relatively well established in terrestrial areas. For example, a comprehensive methodology for EU level GI mapping was proposed by the European Environmental Agency (EEA)[86]. In the marine realm, the application of GI is a new approach seen in only a few cases, such as the Green Map developed for Sweden's MSP and the exploration of GI mapping by the Pan Baltic Scope project at regional sea level.

Examples of GI mapping tools	What the tools deliver
EEA methodology for terrestrial GI mapping tested in a continental case study covering the EU-27 territory, but applicable at different spatial scales for planning. It integrates mapping of the natural capacity of ecosystems to deliver services with mapping and connectivity analysis of essential core habitats.	• Maps on the natural capacity of the EU-27 territory to deliver regulating & maintenance ecosystem services. • Maps of core habitats of key species or functional groups and wildlife corridors within the EU-27 territory. • All mapping results normalised and integrated in a GI map, where areas with the highest scores for ecosystem service supply and/or core habitats represent the core GI network, while wildlife corridors or transitional habitats among core areas represent the subsidiary GI network. • Results presented with a 1 km x 1 km grid

[86] Liquete, C., et al. (2015). Mapping green infrastructure based on ecosystem services and ecological networks: A Pan-European case study. Environmental Science and Policy, 54, 268–280.

Swedish Green Map for MSP, developed by Swedish Agency for Marine and Water Management. It aggregates information on the distribution of nature values (birds, mammals, fish, and benthic habitats) to be considered in MSP.	• The map, built via the weighted aggregation of data from Symphony eco-system component layers, indicates the ecological values of Swedish marine waters on a gradient from low to high. • Results used to identify areas where special consideration should be given to natural values, extending the MSP beyond existing and planned MPAs.

Pan Baltic Scope approach to marine GI mapping, tested at the scale of regional sea. Represents a bottom-up approach by aggregating spatial data on the distribution of 30 ecosystem components to identify areas of high ecological value and high ecosystem service supply potential.	• Map indicates the aggregated ecological and ecosystem service values of each grid cell (1 km x 1 km). • 30 % of the Baltic Sea area with the highest scores for aggregated ecological and ecosystem service supply value proposed to be recognised as marine GI.

Marine GI mapping is data and knowledge demanding. It requires high-resolution data on distribution of marine ecosystem components essential for ecosystem service supply and maintenance of biodiversity. If relevant spatial data sets are available, their assessment in relation to ecosystem services supply and ecological value and aggregation of assessment results can be relatively easy organised. However, the proper GI mapping requires connectivity analysis, which in-depth knowledge and data on species migration patterns as well as specific connectivity analysis tools or modelling skills.

Is it easy to apply? Practical challenges you might face when mapping marine GI

The main difficulties in applying the GI concept to the marine environment relate to the complexity of marine ecosystems and the scarcity of spatial data suitable for the mapping and assessment of marine ecosystem services. Knowledge and data gaps limit the content and quality of the marine GI mapping results.

Furthermore, marine GI mapping should include connectivity analysis, which is an essential criterion for functionality of ecological networks. Connectivity analysis can be structural (based on the seascape characteristics) or species specific – i.e., linked to environmental conditions that enable the diffusion of species among sites and the functional interconnections among sites that are important at different life stages of the species. Suitable methodologies for connectivity analysis of marine ecosystem to be applied for marine GI mapping still need to be developed.

Proper ecosystem services mapping should cover actual ecosystem service supply, defined by i) spatial variations in biota, ecosystem functioning and hence service provision; ii) ecosystem conditions and the vulnerabilities of ecosystem services to cumulative pressures; and iii) ecosystem service supply and demand relationships. All these aspects would have to be integrated in marine GI mapping and assessment.

When can marine GI mapping help?

Marine GI mapping can be applied to support the implementation of EBA within the MSP process: notable, it can improve understanding of the functioning of the marine ecosystems and their contributions to human well-being. Marine GI mapping results can be fed into different stages of the MSP process. In particular:

- In the *defining* stage - helping to identify ecosystem components essential for maintaining marine ecosystem health and human well-being as well as to set MSP objectives and targets
- In the *developing* stage – supporting exploration of ecological aspects in the development of spatial planning solutions by guiding potentially harmful developments away from ecologically valuable and sensitive areas as well as supporting the consideration of ecological values in the cross-border coordination of planning solutions.

- In the *assessment* stage – using GI mapping to in the impact assessment of alternative scenarios (for example, in SEA procedures), in socio-economic analyses, and in the identification of mitigation measures to reduce negative impacts on GI.
- In the *implementation* stage – applying GI mapping in environmental impact assessments of investment projects.
- In the *follow-up* stage – for monitoring changes in ecosystem conditions in marine GI areas and the impacts of MSP and other policy actions.

Furthermore, GI mapping can support nature conservation authorities in improving the coherence of the existing MPA network by assessing the connectivity of an MPA network and helping to identify areas of high ecological value not included in the network, thus guiding field investigations of potential MPAs.

Interested by further reading?

If you would like to know more about marine GI….

- Estreguil, C., et al, 2019. Strategic Green Infrastructure and Ecosystem Restoration: geospatial methods, data and tools, EUR 29449 EN, Publications Office of the European Union, Luxembourg, ISBN 978-92-79-97294-2, doi:10.2760/06072, JRC113815. Available at: https://ec.europa.eu/jrc/en/publication/strategic-green-infrastructure-and-ecosystem-restoration
- Liquete, C., et al. (2015). Mapping green infrastructure based on ecosystem services and ecological networks: A Pan-European case study. Environmental Science and Policy, 54, 268–280. Available at: https://doi.org/10.1016/j.envsci.2015.07.009
- Pan Baltic Scope case study on testing marine GI mapping at the Baltic Sea scale: Ruskule A., et al, 2019. Green Infrastructure Concept for MSP and Its Application Within Pan Baltic Scope Project. Final Report. Pan Baltic Scope. Available at: http://www.panbalticscope.eu/wp-content/uploads/2019/12/PBS_project_green-infrastructure_report_FINAL.pdf

Assessing the social and economic importance of ecosystem services provided by marine ecosystems

Why is it important?

Much attention is given today to the importance of services provided to society by ecosystems (so called ecosystem services), and the role ecosystems do and can play in cost-effectively addressing a wide range of challenges (pollution, climate change, flood risks, crop pollination, human and animal health…). In some cases, however, their quantification is not sufficient for people and stakeholders to understand how important these services are for society as a whole or for different socio-professionals and social groups. Also, it is not easy to compare tonnes of carbons, tonnes of fish or contribution to reduced coastal risk. It can then be useful to capture the importance of these services in terms of who benefits from these (e.g. groups of inhabitants, parts of territories, socio-economic sectors…), how important these beneficiaries are (e.g. how many inhabitants, fishers, tourists, children…) and the monetary values (a single metric) of benefits obtained from enjoying these services (e.g. additional sector's added-value that is produced as a result of benefitting from the ecosystem service, or values given by inhabitants to express the importance of the service..).

What can help you in carrying out such an assessment?

The basis for assessing the socio-economic importance of ecosystem services is… a **robust understanding and the ecosystem services delivered** in terms of (a) which services, (b) where (the coastal or marine place and space where the ecosystem service is delivered) and (c) how much (tonnes of carbon stored, reduction in coastal erosion risk, volumes of water that can be extracted, quantities of salt that can be naturally provided, specificities of a marine and coastal landscape, the self-purification capacity of a given coastal marshland, etc.)[87]. This captures the supply of ecosystem services for which the demand and use by humans and society, and the socio-economic importance of this demand/use is to be assessed. Note that not all ecosystem services might have current societal uses and socio-economic benefits attached to them: these are potential ecosystem services that might, however, have socio-economic importance in the future[88].

Assessing the **socio-economic importance of ecosystem services** requires first to collect data and information on who is benefitting from the different services provided, including beyond administrative borders, e.g. when fishers from other countries benefit from fish resources or from spawning grounds located in your marine areas, or tourists that are coming from abroad. Efforts are also required to assess the size of beneficiary populations (e.g. how many fishers, visitors – local inhabitants or tourists, salt producers, children involved in educational activities linked to the sea, etc.) and related ecosystem service demand (e.g. tonnes of fish fished, volumes of water extracted, etc.). Then, information can be collected for **estimating the monetary values of the benefits** that result from these services, with many different approaches and methods existing for estimating these monetary values (see summary table in annex).

- For services and products for which there is a market (e.g. fish, salt, carbon (building on the price of carbon on international markets), water, etc.), you will collect **data on the sale price of products or on the sector's added value**. In some cases, you will also highlight the socio-economic importance of a given product's value chains (e.g. in terms of companies, employees, added values for operators involved in processing and

[87] How to identify and quantify the different types of services marine and coastal ecosystem delivers is described elsewhere in this toolbox and is not further developed here.
[88] What economists define as option values. An option value reflects the value of the marine and coastal ecosystem (services) as a potential source of benefit in the future.

selling products), or the strategic importance of the production for the domestic market or for the country's exports.

- In other cases, you will assess benefits that ecosystem services deliver by **estimating how much it would cost to build an infrastructure delivering an identical service** (e.g. building a wastewater treatment plant that would have the same cleaning capacity as the self-purification of a coastal marshland). Or you will estimate how much it costs (in terms of time spent, car amortisation, fuel and maintenance costs) to visitors to visit a specific site (such as protected marine areas that host emblematic biodiversity and landscape).
- For some of the services for which there is no market (e.g. the delivery of a specific landscape, biodiversity), and for non-use values[89], how their importance can best be understood by … directly asking inhabitants and people! So called non-market valuation techniques build on citizens' surveys that collect information on people's practice and use of marine and coastal areas, their understanding of their current state and of ecosystem services delivered, and on their willingness to pay and by how much for changes in (some of) the ecosystem services delivered as compared to the current situation.

If you do not find socio-economic data for services delivered by your own marine area, you can: (a) use as proxy socio-economic data available in the literature on the importance of ecosystem services elsewhere (this is called "value transfer"). You will probably need to adapt these data to account for differences between the original study area and your own ecological and socio-economic context; or (b) realise that the qualitative and quantitative data you have on the type and numbers of beneficiaries is sufficient to stress how important a given service is (assessing monetary values is not an end in itself…).

How important ecosystem services are for society can be analysed as a desk study… or benefit from the views and practice of stakeholders benefitting from these services. Indeed, semi-structured interviews with professionals are key for characterising the socio-economic importance of a service for a given sector when information is scarce or not readily available, and also to identify the right socio-economic indicators (whether in absolute or relative terms) that "make sense" to capture the societal importance of a given service[90]. Stakeholder focus groups or workshops also help sharing and consolidating results, identifying additional data or re-visiting assumptions made for estimating socio-economic benefits delivered by ecosystems.

What do I need to apply different methods and approaches? Food for thought[91]

Proposed method	Data requirements & challenges	Capacity and skills	Resources (financial and human)
Assess value with market and financial data	Quantity and price of products (e.g. fish) sold, added-value of the fish sector, use of products (value chains, exports…) – usually available at administrative unit scale and not marine scales thus requiring some "data adaptations", information on small operators that might be locally important often not included/lacking	Knowledge on available sector statistics, skills in semi-structured interviews (of professionals)	Limited – 1-2 days for one service (depending on the fragmentation and diversity of the sector considered, importance of informal component, etc.)

[89] Values that are self-transcendent, linked to cultural identity, heritage values, or linked to the satisfaction of knowing that others including future generations will benefit from using the service.
[90] Experience shows, e.g. that the total value of carbon using carbon market price, has less meaning for some stakeholders that the additional costs required to reduce GHG emissions from different sources if carbon storage from seagrass would not take place.
[91] Assuming a good analysis and description of the state of the marine ecosystems, pressures, and ecosystem services delivered is already available.

Proposed method	Data requirements & challenges	Capacity and skills	Resources (financial and human)
Assess values with costs of infrastructure that deliver the same service	Costs (investment, operation and maintenance costs) of infrastructure that can deliver a similar service (e.g. dike for coastal defence, wastewater treatment plant for self-purification…). Consultation of a couple of professionals and experts for reviewing cost figures can help	Expertise on the infrastructure considered can help, but not necessary	Less than a day (depending on the number of references investigated and the accuracy required)
Non-market valuation techniques (contingent valuation, choice-experiment)	Access to samples of citizens for (online, phone or face-to-face) interviews. Need a sufficiently large sample (250 persons min) for ensuring statistical robustness. Scepticism from some stakeholders on the relevance of such values (as a result of the difference between claimed values and what people are effectively ready to pay). Apart for monetary values, provide useful information on people's practices and priorities for different ecosystem services for example. When contingent valuation is applied, it gives a total economic value for an overall improvement in marine ecosystem quality, and not necessarily values for individual ecosystem services.	Survey development, statistics & econometrics	Time consuming – 30-35 days of expert for questionnaire development, testing, checking and statistical analysis Survey costs depending on sample size and interview technique (around EUR 15 000 to 20 000 for 1000 internet-based interviews depending on countries, more expensive if face-to-face)
Transfer of values	Reports and scientific articles that have assessed the socio-economic value of given services (can be challenging to find existing studies that have investigated ecosystems that are similar to the marine ecosystems considered in the MSP), contextual data (on ecosystem, socio-economic indicators like income levels, etc.) for adapting source data. Using value transfer results is often not well accepted/considered when ecosystem values are shared and discussed with local stakeholders (can lead to negative reactions versus valuation in general).	No specific skills required	A couple of days for a sound literature review, meta-analysis and adaptation of values to local context

There is also computer-based software that can help you in carrying out such assessments. See for example InVEST[92], a suite of free, open-source software models created by the Natural Capital Project, and used to map and value the goods and services from nature that sustain and fulfil human life. Building on quantitative methods for integrating ecosystem services, which include food production, recreational opportunities, and water purification, into management decisions, these tools help to map the importance of ecosystem services in biophysical or economic terms.

When can the assessment of the value of ecosystem services help?

The assessment of the societal importance of ecosystem services (in terms of who, how many/where and how much in monetary terms) can shed light on the societal implications

[92] http://maps.coastalresilience.org/network/

of the current situation and of alternatives at different stages of the MSP process. In particular:

- When **analysing the current situation** and challenges faced, identifying who benefits from the services delivered by different marine areas and ecosystems and by how much. This can stress the need to protect marine ecosystems (including beyond current marine protected areas) because of the societal importance of the ecosystem services these areas provide. A retrospective assessment of trends in the values of ecosystem services delivered (e.g. in the last 20 years) can also highlight ecosystem services that were important in the past for the socio-economic development of marine and coastal territories and sectors, but that have been lost as a result of the degradation of the marine space;
- When **comparing different alternatives** for sharing maritime space in terms of where best to locate economic activities and protected areas. For each alternative, for the Maritime Spatial Plan that is proposed for public consultation or the plan that is eventually adopted, one can assess the impacts of the proposed plan on ecosystem services delivered in terms of who will benefit (and by how much) from the plan, or to the contrary which beneficiaries of today's ecosystem services might be negatively affected and have socio-economic losses;
- Help with the **communication** on the importance of coastal and marine space in a more integrated manner demonstrating the importance that coastal and marine ecosystems have for everybody (inhabitants, tourists, different ecosystem sectors, society as a whole in relation to carbon storage and climate change, etc.) and for society as a whole, much beyond the maritime sectors traditionally considered in MSP. Communication should not be limited to monetary values, but combine qualitative, quantitative and (whenever relevant) monetary information that together will bring an understandable narrative that can help each of us understand the importance of the socio-ecological marine and coastal system. It should also build on schematic diagrams and tables that help to capture the importance of ecosystem services for all of us and for society (see the figure on the following page).

What options to consider when assessing the socio-economic importance of ecosystem services?

1. Option 1 – Start with a **qualitative assessment of ecosystem services**, building on the available (scientific) evidence of services delivered by the marine ecosystems targeted by your MSP. List ecosystem services and areas that contribute to their delivery, as well as sectors, activities and territories that benefit from these services. Distinguish in particular beneficiary scales, from the local scale (e.g. part of the coast and communities benefitting from small scale fisheries) to the global scale (e.g. carbon storage that responds to the objectives and priorities of a national strategy addressing climate change). Sharing this information with stakeholders, and assessing how different planning options affect areas delivering services and thus their beneficiaries, can already bring attention to marine areas that need to be protected or receive specific attention in the MSP.
2. Option 2 – **Quantify** as much as possible the absolute and relative importance of sectors benefitting from these services. Assess how many tonnes of fish are fished, the number of people that benefit from a given service (e.g. the number of tourists that visit each year a specific site known for its biodiversity) or employment in a sector (e.g. number of jobs in the salt extraction sector), considering both total numbers and relative numbers (e.g. the share of fisheries from a given marine ecosystem in the total fisheries sector of the country) as relative numbers help to capture how important and strategic a sector can be.

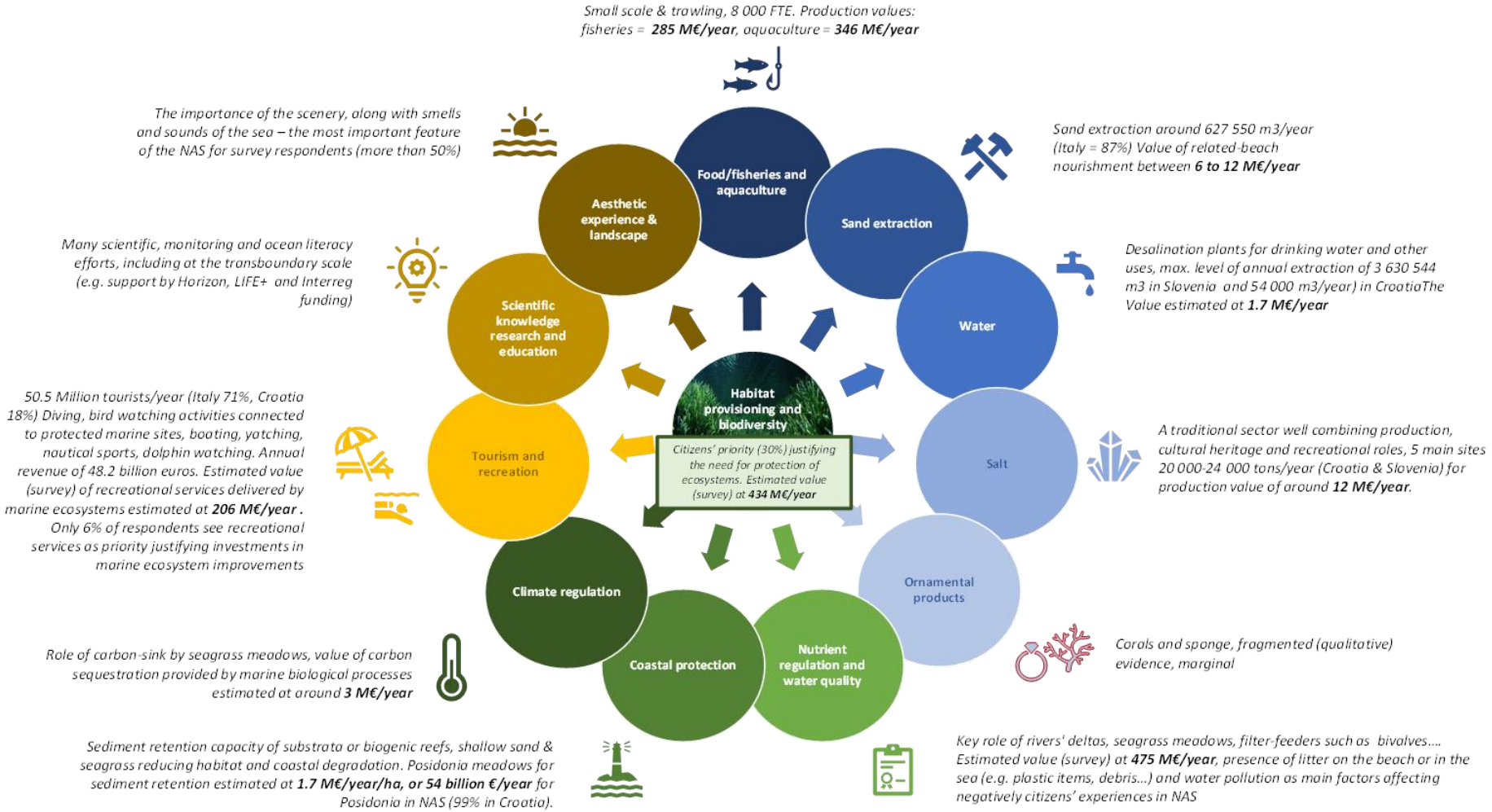


Figure 8: Illustrating the diversity and societal importance of ecosystem services: example from the Northern Adriatic Sea

3. Option 3 – **Mobilise all available knowledge for assessing monetary values** demonstrating the economic importance of ecosystem services delivered for benefits provided. You will need to dig into many sector and territorial databases and extract information from the available (scientific and grey) literature. You will then obtain different monetary indicators for different sectors and services delivered: as the monetary indicators you will estimate do not have the same metrics (e.g. some will be production values, others added value, others revenues from the sale of tickets to visit a marine protected area), it will not be easy to compare them. Similar to the quantitative indicators above, do provide absolute and relative indicators.
4. Option 4 – Carry out a **willingness to pay survey**, or organise a dedicated stakeholder process, for assessing monetary values translating people's priorities. This requires some resources (see above). At the same time, it provides information beyond monetary values on people's and stakeholders' practice, perceptions and priorities. And this information can be very valuable for setting MSP priorities, or for guiding the development of ocean literacy / communication activities.

How can you evaluate your progress towards EBA when assessing marine ecosystem services?

This guidance is intended to allow the monitoring of progress towards increasingly more EBA integrated into an MSP or an assessment of existing MSP case studies in terms of the degree to which EBAs are incorporated. To that end the following qualitative criteria allow a (fairly basic) first inventory of the degree of EBA in an MSP. The higher numbers indicate a more advanced application of EBA in MSP.

The following criteria refer to the *assessment* of ecosystem services.

1. No consideration of ecosystem services.

2. There is at least the recognition that the state of the ecosystem is relevant because it represents the capacity to supply ecosystem services beyond the obvious services (mostly provisioning of seafood when fisheries or mariculture are involved). This would require at least the explicit consideration of the Common International Classification of Ecosystem Services.

3. The next step up can consist of several small steps where the ecosystem services considered increase from a specific selection, as in Veidemane et al., 2017, towards a comprehensive overview of all ES, as in Culhane Frid, C., Royo Gelabert, E., Robinson, L., 2019. This would provide the decision-maker with information on the extent to which specific MSP scenarios would affect the capacity to supply certain services across the full breadth of ecosystem services.

4. Instead of applying a one-to-one linkage between ecosystem state and ES supply, combining this information with a valuation of the different ES (see valuation factsheet) would then be another improvement that would provide the decision-maker with a weighting of those ecosystem services based on (preferably monetary) values representing societal preferences. As this still represents the demand-side perspective, it reflects the potential service supply and how this is valued by society.

5. A full assessment of ES is conducted consisting of both the supply-side and demand-side perspective. This final step would show for each MSP scenario how this contributes in terms of actual monetary values to human wellbeing. As such this can now become part of the full cost-benefit analysis (see factsheet).

The assessment of ecosystem services can include the *valuation* of these services. The following criteria refer specifically to valuation.

1. No consideration of ecosystem service values.

2. Only values from provisioning services for goods traded on the market are considered. That is, the economic 'consumptive use' value of food and other raw materials (e.g. minerals, energy, oil and gas, genetic and medical resources etc.) are incorporated in the decision making process.

3. The next level up could be the 'partial' consideration use values from ecosystem services other than provisioning (i.e. regulatory and cultural services):

    - Direct non-consumptive use: this can mean the incorporation of values to other sectors with direct reliance on the marine space outside primary production. Sectors like tourism and recreation, accommodation, ports and transport, research and education, coastal real estate and so forth benefit from various ecosystem services provided by the marine environment as a result of proximity and/or need.
    - Indirect use: this can incorporate values of important regulatory services provided to local coastal communities and governments in the form of avoided damages and/or substitution of manmade alternatives. For example, coastal protection and flood control offered by oyster reefs or wave dampening and water regulation offered by seagrass/seaweed beds provide services; in the absence of these ecosystem services, there could be monetary damage or a need for government spending to regulate with manmade alternatives.

4. 'Full' inclusion of all use values from ecosystem services other than provisioning (i.e. regulatory and cultural services):

    - Direct non-consumptive use: spiritual and cultural uses of marine spaces by various individuals and communities are included in the decision-making process for an equitable consideration of the well-being of all stakeholders directly impacted.
    - Indirect use: flow on impacts from intrinsically connected ecosystems are considered. For example, regulatory services such as maintaining nursery population and habitats, gene pool protection, seed and gamete dispersal etc. are vital to the primary production sectors (e.g. fisheries and aquaculture) as well as education and research. Disruption to these services could mean significant economic losses in the future, and therefore, including the value of such services will allow for more informed decision making.

5. Inclusion of non-use values. To consider the full impact from decisions made in relation to the marine space on all stakeholders, directly or indirectly involved, non-use values must also be included. This is because even individuals or communities geographically detached from the marine space can have strong associations or costs and benefits linked to how the marine area is used and preserved for future generations. In some cases, there can be iconic, heritage or cultural identities linked to certain marine areas (e.g. the Great Barrier Reef in Australia) or specific endangered species. Therefore, in order for decisions to be equitable and socially inclusive, non-use values also need to be incorporated.

Interested by further reading?

If you would like to know more about ecosystem service valuation and methods that can help in doing that…. Look at:

- Science for Environment Policy (2015)[93]. An overview of ecosystem services and their assessment in the context of the EU Biodiversity Strategy. The report defines ecosystem ser-

[93] Science for Environment Policy. (2015). Ecosystem Services and the Environment. In In-depth Report 11 produced for the European Commission, DG Environment by the Science Communication Unit, UWE, Bristol (Issue 11). https://doi.org/10.2779/57695.

vices and their role for biodiversity and provides a mapping and assessment of services regarding biodiversity, as well as detailed description on valuation techniques and studies of these services. The final section deals with the importance of systems thinking.

- Beaumont, N. J., et al. (2007)[94]. The authors identify and define ecosystem goods and services provided by marine biodiversity and use case studies to provide an insight into the practical issues with quantifying and valuing ecosystem services. There are 7 case studies in total: 1) Atlantic frontier from the Shetland Islands to Rockall Trough, 2) the sea mount Banco D. João de Castro located in the Azores Archipelago between the islands of São Miguel and Terceira, 3) Isles of Scilly, 4) Belgian part of the North Sea, 5) Flamborough Head on the north-east coast of England, 6) the Gulf of Gdańsk in the south-east of the Baltic Sea, and 7) Lister Deep of the Wadden Sea. While a limited number of ecosystem services (i.e. only provisional) are assigned values, the discussions provide insight into the type of values associated with ecosystem services and the difficulties in conducting valuation studies.
- van der Ploeg and de Groot (2010)[95]. It provides a database containing 1310 estimates of monetary values of ecosystem services from various studies. Of which, over 224 values from 43 studies are related to ecosystem services found in Europe. The large majority of these studies are also on ecosystems within coastal, marine and wetland areas. The studies considered in this database form a good repository of practical examples for valuating ecosystem services.

You might want also to check what is currently developed in your own Member State to **map and assess the state of ecosystems and their services** in their national territory as part of the implementation of the EU's Biodiversity Strategy[96]. Some information on the socio-economic values of coastal and marine ecosystems might have been collated and organised as part of this mapping and assessment.

And finally, look at the **ecosystem service valuation case study** that has been carried out as part of the present study in the **Northern Adriatic Sea**: it will illustrate the diversity of data and information that has been mobilised and collected, as well as a choice experiment survey that has been implemented to collect views and values from a sample of 1000 inhabitants from Italy, Croatia and Slovenia.

[94] Beaumont, N. J., et al. "Identification, Definition and Quantification of Goods and Services Provided by Marine Biodiversity: Implications for the Ecosystem Approach." Marine Pollution Bulletin, vol. 54, no. 3, Mar. 2007, pp. 253–65, doi:10.1016/j.marpolbul.2006.12.003.

[95] van der Ploeg, S., de Groot, D., Wang, Y., 2010. TEEB Valuation Database: Overview of Structure, Data and Results. Foundation for Sustainable Development. (http://www.teebweb.org/wp-content/uploads/2017/03/teeb_database_teebweb.xlsx).

[96] See https://ec.europa.eu/environment/nature/knowledge/ecosystem_assessment/index_en.htm.

Assessing *ex-ante* the social, economic and environmental impacts of Maritime Spatial Plans

Why is it important?

Sharing marine space entails managing conflicts between different maritime uses and balancing socio-economic development and the protection of marine ecosystems, accounting for requirements set under the existing regulatory framework as well as the priorities set in sector development strategies and of (coastal) territories. When options for sharing marine space are proposed, it is then important to assess and share the potential social, environmental and economic impacts expected from the application of these options, highlighting how conflicts will be addressed and managed and with which implications (and for whom). This information helps stakeholders representing different sectors imposing pressures on marine ecosystems, or benefitting from the services they deliver, to understand the implications of proposed options (for them and for others) or of the draft Maritime Spatial Plan (MSP) presented for consultation.

What can help you in carrying out such an assessment?

Different assessment methods can be applied, building in particular on other tools and methods that are presented elsewhere in the guidance, in particular the assessment of cumulative impacts or effects, or the assessment of ecosystem services and their valuation. In particular:

- A **Multi-Criteria Analysis** (MCA) that provides qualitative or quantitative information on expected social, economic and environmental impacts along with knowledge on how implementable and feasible the proposed plan is (including in terms of social acceptability, coherence with existing instruments already in place, etc.);
- A **Cost-Benefit Analysis** (CBA) that translates social, economic and environmental impacts into monetary information, and helping to compare (qualitatively or with computed indicators such as the Net Present Value (NPV) aggregating all costs and benefits over a given time horizon using a discount rate) the costs of setting up, implementing and enforcing the plan with the benefits expected from its implementation.

In practice, the two methods can be seen as being part of the same continuum of *ex-ante* assessment methodologies: an MCA can include monetary indicators capturing the importance of costs or of a given cost category (e.g. investments), or of specific benefits; similarly, a cost-benefit analysis can combine qualitative, quantitative and monetary information (without estimation of an NPV) and be complemented with assessments of the implementability and feasibility of the plan. The MCA offers, however, a more flexible framework that can give attention to conflicts and how these are likely to be addressed (or not) by different options or by the proposed MSP. Both methods aim at providing knowledge that supports discussions, exchanges and decisions, and are by no means "taking the decisions".

Both methods follow similar logical steps that can benefit from stakeholders' mobilisation and contributions (e.g. to identify impact categories and main criteria to be considered, provide information and data on the importance of impacts, discuss draft results and assess uncertainty…):

- Identifying the **system considered** for the analysis (as well as its main spatial units) and the **criteria, or categories of costs and benefits**, that need to be considered in the analysis;
- Defining the **reference conditions** or the baseline scenario capturing how the (eco-)system will evolve over time without any MSP adopted and implemented;
- **Collect data and information** for assessing scores, or estimating the (monetary) importance of costs and benefits over time. Store the information in a well-structured

database that will facilitate the assessment of the different criteria (costs and benefits) and the comparison between different MSP options. Some information on costs and benefits can be found in: the different reports Member States are producing for supporting the development of their MSFD or WFD programme of measures, assessment carried out for specific measures (e.g. establishing and managing a Marine Protected Area) or studies that have investigated a given environmental challenge or sector (e.g. fisheries);

- If relevant and/or required (e.g. because of conditions set in existing national regulation):
  - For the MCA – define different weights attached to individual criteria, and estimate **an overall aggregated MCA indicator** for each option that helps to rank planning options, or that demonstrates that the draft MSP has added-value overall;
  - For the CBA: aggregate costs and benefits over time using a discount rate and estimate **the NPV for each option** that helps to rank planning options, or that demonstrates that the draft MSP will deliver net benefits;
- Carry out a **sensitivity analysis** on key parameters and assumptions, and assess the robustness of the results (and of the potential ranking between options)
- **Present the different results** (the MCA matrix comparing the scores of the different options as compared to the reference situation/baseline, or summary tables presenting costs and benefits, combining qualitative, quantitative and monetary information) of the proposed spatial planning options or of the draft MSP presented for consultation, along with the main areas of uncertainty.

	Advantages	Disadvantages
MCA	Easy to understand (and owned by) stakeholders when indicators reflect well the priorities and concerns of a diversity of stakeholders and sectors including local authorities and civil society. A good support for discussions and exchanges within stakeholder processes – because of the absence of methodologies for translating (easy to understand) impacts or implementation challenges into monetary terms.	The setting of weights and calculation of an aggregated single indicator complexifies the method's results, potentially hiding tradeoffs and the diversity of issues considered. Need to select a limited set of indicators so it can be easily used, requiring prioritisation of issues covered and not considering some of them (if too many indicators, difficult to use)
CBA	Puts all positive and negative impacts into monetary terms/a common metric so they can be more easily compared, assessing the balance between negative (costs) and positive (benefits) impacts. Estimating NPV of costs and benefits helps aggregating, and comparing, impacts that take place in the short, medium and long terms – useful when long time horizons are considered. Strengthened when qualitative, quantitative and monetary information is provided and combined, as it helps understanding the importance of impacts (costs or benefits) beyond their monetary value.	When NPVs are estimated, reduces the transparency and usefulness of the assessment if individual costs and benefits are not presented at the same time. Methodological challenges in translating environmental impacts into monetary values (might require dedicated assessment and surveys – see the ecosystem service valuation tool – with additional costs and time taken) or estimating wider economic impacts. Possible negative reactions from some stakeholders when monetary valuation of biodiversity and natural resources is carried out, considering that *nature does not have a price*.

To be relevant to an MSP process, it is important that the two methods account for spatial issues, challenges and conflicts, as well as where sectors, impacts, costs and benefits are or will be located within the space considered (including beyond administrative boundaries

and considering impacts on land-based sectors and value chains). This can be done by assessing impacts, costs and benefits individually for the different units (e.g. dedicated fishing areas, protected areas, areas where maritime transport is possible, etc.) that make up the entire marine ecosystem considered.

Depending on the resources available (in terms of type of knowledge available, its spatial disaggregation but also human resources mobilised for carrying out the assessment), you will need to adapt the complexity of the approach chosen, focusing on key impacts, costs and benefits if time and resources are limited.

Is it easy to apply? Practical challenges you might face when applying CIA/CEA

From a conceptual point of view, comparing the + and – of proposed options for sharing maritime space is relatively easy. Challenges that can be faced include:

- The absence of data for, or imperfect information on, a wide range of impact indicators, costs or benefits. Information might not be specific to the marine site investigated when national data is used. As a result, many assumptions are made that can reduce the added-value of these "inte-grated assessments" – that can still remain useful for stirring debates among stakeholders for collating perceptions and priorities.
- While you will find information on environmental and (direct) economic impacts, knowledge on social impacts, in particular in relation to local communities and fragile social groups, is scarce or difficult to link to the maritime and marine issues considered. Information on macro-economic impacts is often non-existent, although this might be an issue only for very large MSP which might have significant impacts on the functioning of the economy.
- Information on impacts is rarely disaggregated spatially at scales and for units that are relevant to an MSP thinking and process.

It is essential that methodological choices and results at key methodological steps of the MCA/CBA are shared with stakeholders: this ensures they contribute to consolidating the assessments carried out, and gain a clearer (collective) understanding of what these assessments deliver or not, along with the main areas of uncertainty.

When can ex-ante assessments such as MCA & CBA help?

MCA and CBA can help when **comparing different alternatives** of the sharing of maritime space in terms of where best to locate economic activities and protected areas to reduce pressures on marine ecosystems and facilitate the economic development of activities depending on ecosystems in good health. When well presented and communicated, the results can also strengthen the communication on the possible options or on the MSP selected, highlighting its added value for society as a whole, while explaining clearly how conflicts have been addressed and their implications.

Interested by further reading?

If you would like to know more about MCA and CBA… specifically, on applications of the methods to marine ecosystem and protection issues, not applied to the assessment of different MSP options…

- Kavadas S., et al, Multi-Criteria Decision Analysis as a tool to extract fishing footprints and estimate fishing pressure: application to small scale coastal fisheries and implications for management in the context of the Maritime Spatial Planning Directive, Mediterranean Marine Science, https://doi.org/10.12681/mms.1087.
- Davis, K.J., et al, 2019. Estimating the economic benefits and costs of highly-protected marine protected areas. Ecosphere, Volume10, Issue10. October 2019. https://esajournals.onlinelibrary.wiley.com/doi/full/10.1002/ecs2.2879
- Plan Bleu, ACTeon and Arcadis, 2019. Socioeconomic analysis of marine litter key best practices to prevent/reduce single use of plastic bags and bottles. (Available in English

and French): https://planbleu.org/en/publications/socioeconomic-analysis-of-marine-litter-key-best-practices-to-prevent-reduce-single-use-of-plastic-bags-and-bottles/

- Russi D. et al (2016). Socio-Economic Benefits of the EU Marine Protected Areas. Report prepared by the Institute for European Environmental Policy (IEEP) for DG Environment. Available at: https://ec.europa.eu/environment/nature/natura2000/marine/docs/Socio%20-Economic%20Benefits%20of%20EU%20MPAs.pdf

ANNEX II. OVERVIEW OF EBA PRINCIPLES

The Malawi Principles for the Ecosystem Approach were developed in a 1998 meeting at Lilongwe. These principles, as presented by the Secretariat for the Convention on Biological Diversity[97] are:

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

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

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

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

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

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

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

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

Principle 9: Management must recognize the change is inevitable.

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

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

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

The 12 principles are intended to be complementary and interlinked.

Various international organisations, national authorities and experts have built on these 12 principles in their presentation of the ecosystems-based approach and ecosystems-based management. The work in our project has drawn in particular on the review sources presented in Long et al. (2015), which reviews 13 presentations of EBA (and EBM) prepared between 1994 and 2010 and identifies the common principles. These are presented in the following list, in order from those found in the most sources to those found in the least:

- **Consider ecosystem connections**
- **Appropriate spatial & temporal scales**
- **Adaptive management**
- **Use of scientific knowledge**
- **Stakeholder involvement**
- **Integrated management**
- **Sustainability**
- **Account for the dynamic nature of ecosystems**
- **Ecological integrity and biodiversity**
- **Recognise coupled social-ecological systems**

[97] This list is taken from the CBD website: https://www.cbd.int/ecosystem/principles.shtml

- **Decisions reflect societal choice**
- **Distinct boundaries**
- **Interdisciplinarity**
- **Appropriate monitoring**
- **Acknowledge uncertainty**
- Acknowledge ecosystem resilience
- Consider economic context
- Apply the precautionary approach
- Consider cumulative impacts
- Organisation change
- Explicitly acknowledge trade-offs
- Consider effects on adjacent ecosystems
- Commit to principles of equity
- Develop long-term objectives
- Use all forms of knowledge
- Use incentives

Long et al highlight the top 15 principles – those highlighted in bold above – as the main ones found across different sources. These principles overlap, also with the 11 principles that are not highlighted. The original Malawi principles and the overview provided in Long et al and the sources identified in that paper were the key inputs for the presentation of EBA in section 2.2 of this guidance. Moreover, most of the 11 principles not highlighted are addressed in some form or another in this guidance, for example via the use of key EBA tools presented in Annex I.

Finally, it can be noted that two related concepts – ecosystem-based management and the ecosystem approach – are mostly used interchangeably with EBA.

ANNEX III. QUESTIONS FOR THE REVIEW AND EVALUATION OF EBA IN MSP

This Annex proposes a set of questions that could be used in the review and evaluation of EBA in MSP. These questions are intended to provide ideas, to be adapted to the context and stage of MSP, rather than be a fixed cooking recipe.

One approach is to identify EBA-focused questions for key evaluation criteria. These may fit well if this evaluation approach is used to review the plan as a whole. The box below provides a set of possible questions for the following three criteria:

Coherence: How well was EBA integrated in the MSP process? In the plan and its implementation, how well was work on EBA in MSP integrated with related work under other international, EU and national frameworks?
Adaptation: Have the process and the plan addressed key changes in the natural world or the policy framework?
Results: To what extent were EBA goals achieved?

Possible evaluation questions

Coherence

A. Breadth

To what extent did the preparation…

- Capture the complexity of the functioning of marine ecosystems?
- Investigate human-ecosystem connections and integration?
- Account for uncertainty and support adaptive management? Effectively organise stakeholder mobilisation and the science-policy interface?
- How can each of these areas of EBA be improved in the next policy cycle?

To what extent did analytical tools address EBA?

B. Policy objectives

Did the MSP incorporate relevant ecosystem and biodiversity goals from the MSFD, Birds and Habitats Directives, CFP and other EU policies and legislation?

Did the MSP incorporate all relevant national, EU and international goals for ecosystems and biodiversity?

Have relevant goals changed or been introduced during the MSP's implementation?

How can coherence on policy objectives be improved in the next MSP cycle?

C. Policy implementation

Has the implementation of EBA in the MSP worked in harmony with national implementation of the MSFD? Are there areas for improvement?

Has the implementation of EBA in the MSP worked in harmony with national implementation of the Birds and Habitats Directive and with the Natura 2000 network? Are there areas for improvement?

Has monitoring drawn on data gathered for these policies and legislation?

How can monitoring for EBA in MSP be improved in the next MSP cycle?

Adaptation

What changes occurred in physical processes that could affect ecosystems and social-ecological systems (including climate change)?

What changes occurred in relevant social and economic systems?

What changes occurred in policy objectives?

How did the MSP address these changes?

Results

To what extent did implementation of the MSP support the MSFD's GES objectives? Did it support the Nature Directives and other EU biodiversity objectives?

To what extent were the MSP's own EBA objectives achieved?

More detailed questions can be used to guide information gathering, discussions and analysis. For example, the following box provides further questions for section A, breadth, in the box above.

Possible questions for key areas of EBA

Capturing environmental issues

How well did monitoring and research gather information on marine ecosystems?

How well did EBA tools assess marine ecosystems (and their land-sea interactions)?

How can data and tools be improved?

Incorporating relevant human activities and socio-economic considerations

How well did monitoring and research gather information on human-ecosystem connections and integration?

How well did EBA tools assess human-ecosystem connections and integration?

How can data and tools be improved?

Organising the MSP process

Were areas for uncertainty and lack of knowledge explicitly identified and acknowledged in the preparation of the plan?

To what extent was new knowledge used to modify the plan or its implementation?

What are key areas of EBA uncertainties going into the next MSP cycle?

How effectively was stakeholder engagement organised for the MSP, including for its implementation?

How effectively was the science-policy interface organised?

In addition, questions could consider how specific EBA tools were used. For each of the tools that will be presented in Annex V, we have identified a checklist: initial checklists are set out in Annex I.

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