

# Ecosystem Services in Maritime Spatial Planning



## KEY MESSAGES

1. **Ecosystem services are all the goods and services that flow from the ecosystems to human societies. Extent of ecosystems and their condition define the ecosystem's capacity to provide services and these valuable assets should be accounted for maritime spatial planning (MSP).**
2. **Modelling and valuation of service flows between ecosystems and people provide information on the importance of ecosystem assets and on the pressures resulting from ecosystem service use.**
3. **The flow of services describes the actual use of services by the society. Ecosystem service flows resulting from high demand of services can exceed the capacity of an ecosystem to provide services and negatively affect the future supply of ecosystem services. Using ecosystem services over the ecosystem's capacity to provide them is thus not sustainable and should be avoided.**
4. **In the future, instead of focusing on flows of ecosystem services at a certain time period, sustainable planning should acknowledge the key ecosystem assets producing the services and their value.**
5. **Ecosystem accounting can provide tools and measures to support MSP.**

## Ecosystem services are directly linked to sustainable Maritime Spatial Planning

Maritime spatial planning (MSP) is an increasingly used tool where human activities are analyzed and organized in marine areas to achieve ecological, economic and social sustainability. The MSP process is participatory, integrating the views and values of stakeholders about the marine and coastal areas. Since 2014, it is a mandatory, yet country specific, process according to the EU's MSP Directive (2014/89/EU).

Ecosystem-based approach (EBA) is as a core principle for MSP. EBA aims for an integrated management of the human activities and their impacts on the marine ecosystems. The overall goal is to guarantee the health of the ecosystems while using the marine resources sustainably. One of the key elements in achieving EBA in MSP is incorporating the marine ecosystem services into the MSP process<sup>1</sup>. Ecosystem services are all the goods and services that flow from the ecosystems to human societies.

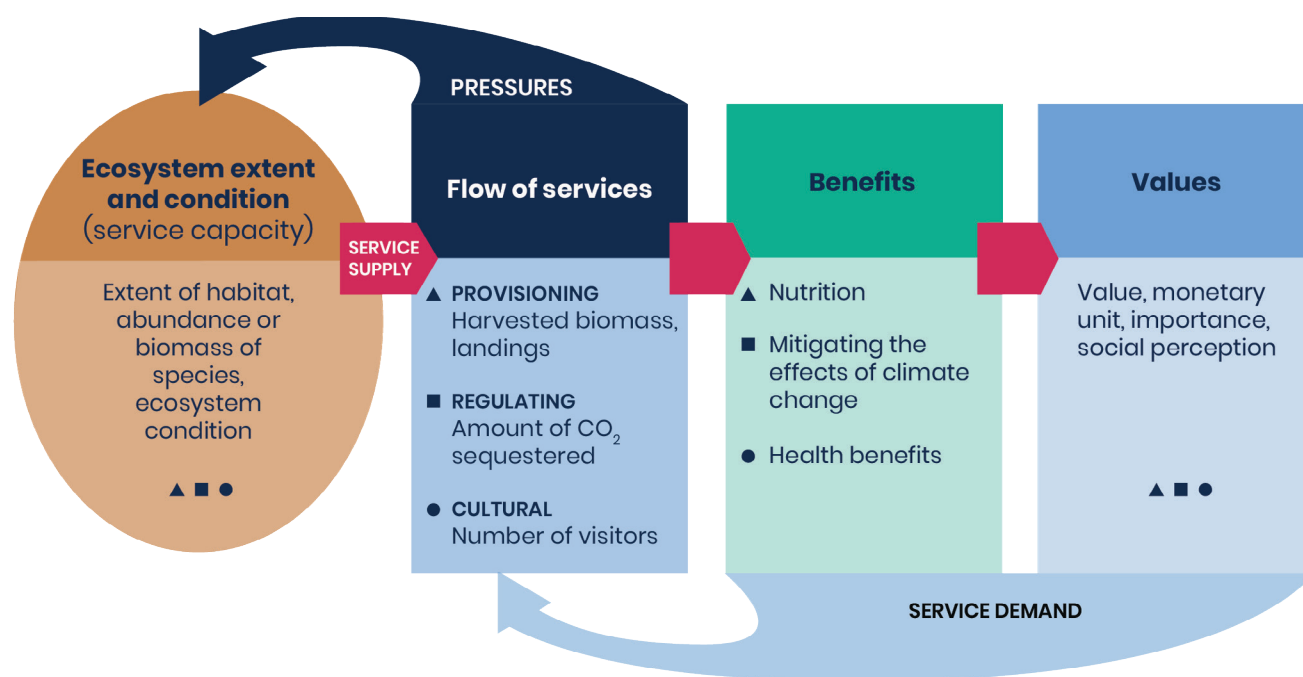
They can be grouped into 1) regulating and maintenance services such as carbon sequestration 2) provisioning services such as fish and 3) cultural services such as recreational experiences<sup>2</sup>.



# Ecosystem accounting

Human well-being is dependent on well-functioning ecosystems. Understanding which ecosystems are the most critical units for the service provision is crucial for guaranteeing the flow of services in the future. Ecosystem accounting is a framework that links information on ecosystems and their services to economic sectors and societal benefits<sup>3</sup>. It will be included in the regulation of European environmental economic accounts (EU 691/2011). Ecosystem accounts shall provide consistent information on the ecosystem's extent, condition and the flows of the services to the society. Both extent and condition determine the ecosystem's capacity to provide services (fig 1.).

The flow of services describes the actual use of services by the society. The high demand of services can result in the service flow exceeding the capacity of an ecosystem if the use of services affects negatively the future supply of services. Therefore, in order to design efficient and sustainable marine spatial plans, it is vital to understand the linkages and tradeoffs between the use of ecosystem services, and the condition and extent of ecosystems. Ecosystem accounting aims to set standardized measures and methods to monitor and assess these linkages and trade-offs.



**FIGURE 1** The flow of services. Adopted from SEEA EA framework<sup>3</sup> and cascade model<sup>4</sup>.

## Mapping and modelling of ecosystem services in the Baltic Sea

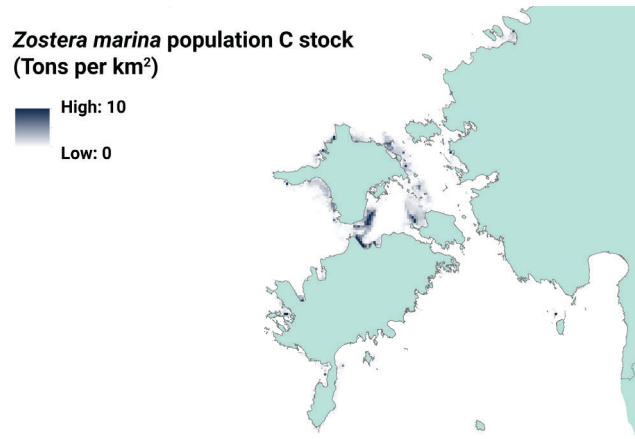
Including ecosystem services into MSP enables us to acknowledge the full variety of different uses and values of marine areas. However, one of the key challenges in mapping ecosystem services in marine realm is harmonization of ecosystem data as the data sources and methodologies differ greatly. Moreover, analyzing the tradeoffs of different services is challenging.

To respond to these challenges, the MAREA project created a generic approach for mapping and modelling of ecosystem services and applied this methodology jointly in Finland, Estonia and Latvia. Our approach relies



on ecosystem accounting framework. The first step of our approach is mapping and modelling of ecosystem extent based on species occurrence and distribution in order to identify the key areas for service supply. The second step is to model ecosystem processes which requires a more advanced methodology on quantification of ecosystem service flows and their intensity. This step needs data on occurrence of species, their biomasses and functioning (fig 2).

This two-step approach is suitable for the modelling of services whose production is directly linked to the species abundance and their biomasses, such as carbon sequestration. However, the supply of cultural services is generally not well described only by the distribution of species or their functioning. Thus, we added a third step where the key locations for recreational services were modelled based on other environmental factors such as wind conditions, and the results were combined with information from recreational visitor survey.



**FIGURE 2** Modelling results on *Zostera marina* standing carbon stock.

## Focus on valuable ecosystem assets

In the future, instead of focusing on flows of ecosystem services at a certain time period, sustainable planning should acknowledge the key ecosystem assets i.e. species, habitats, and their value. Proper valuation of ecosystem assets requires sound understanding of the current and future flows of ecosystem services and how they affect the ecosystem's capacity to provide services. It is also necessary to understand how management actions affect the ecosystem extent, condition and service flows. If these knowledge needs are fulfilled, decision makers have an opportunity to assess the true consequences of their decisions about the sea space usage and related tradeoffs. It would also create a baseline for other applications, such as ecological compensation.

### REFERENCES

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