eMSP NBSR
Emerging Ecosystem-based Maritime Spatial Planning Topics in the North and Baltic Sea Regions

Co-funded by the European Union

Policy Brief

Climate-smart MSP

Published in January 2024

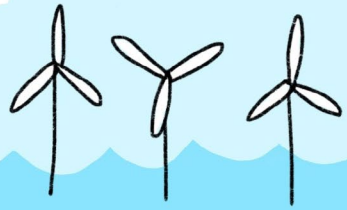
marine spatial planning

MSP in a changing CLIMATE

models with updated data

cooperation between institutions

reevaluation



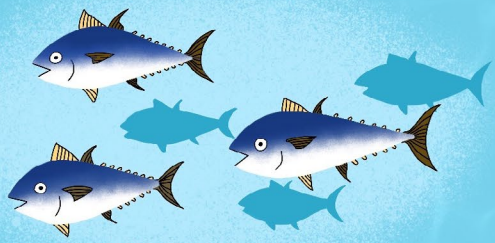
green technology

minimizing pollution overfishing habitat loss

restoring natural habitats

protecting climate refugia

adaptability



1. The changing climate is changing what we are planning in MSP

Preconditions for marine management and planning are changing due to multiple environmental and societal developments – not least due to progressing climate change. Climate change is expected to cause multiple severe changes in the marine environment and ecosystems. Ocean temperatures are already increasing, while ocean pH levels will decrease, causing acidification. Simultaneously, there will be a decline in ocean oxygen levels. Changing physical conditions may trigger shifts in ocean currents with large systemic ramifications and extreme events such as heatwaves will become more frequent. Even though climate change is progressing slowly there is a possibility of tipping points that lead to rapid changes such as collapses of crustacean populations due to ocean acidification. Systemic tipping points such as weakening of the Gulf Stream with large-scale and multiple effects are also possible.

Consequences of climate change in the North Sea and Baltic Sea regions are largely similar, but there can be significant local differences in the outcomes. Overviews of consequences of climate change are available for the North Sea in Quante and Colijn (2016) and OSPAR (2023), and for the Baltic Sea in the HELCOM Climate fact sheet (HELCOM/Baltic Earth 2021) and the Baltic Earth Assessment Reports (BEAR) from 2022 (see also figure 1). The Baltic Sea and parts of the North Sea are particularly vulnerable to the climate change (EEA 2023).

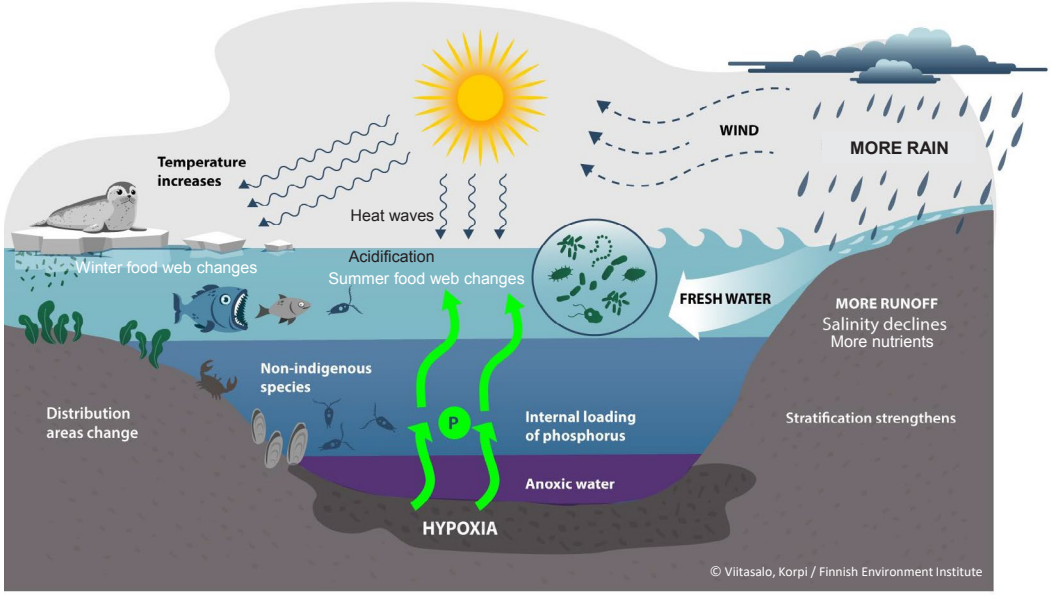


Figure 1: Consequences of climate change in the Baltic Sea area (© Markku Viitasalo and Marianna Korpi, Finnish Environment Institute)

A combined effect of physical and chemical changes is that marine ecosystems will undergo structural and functional changes, and species will experience shifts in their geographical ranges, including seasonal variations. River runoff is also increasing causing higher nutrients emissions from agriculture lands. While the exact ecological repercussions of climate change and timescales cannot be predicted with full certainty, a redistribution and change of marine habitats and species will take place. These effects will reduce the resilience of marine ecosystems and lead to redistribution and loss of marine ecosystem services, which can have negative economic and social consequences. Sea level rise and expected increase of storminess will also negatively affect coastal settlements and livelihoods in different sectors. People will be affected by varying combinations of the effects, including health effects. Some changes in locations of ecosystem services (e.g. fish species) may bring positive outcomes to coastal communities.

Climate change will change the ways we are using and conceiving the seas not only through its impacts on ecological, social and economic systems. **An important change factor are the actions societies take** to reduce greenhouse gas emissions, to capture and store carbon, and to adapt to climate change. This change in how we use the sea is inevitable, because not taking such actions is not an option. In many respects, **the change to climate-neutral economy is permanent**.

Climate change is expected to progress in the coming decades (Quante and Colijn 2016), which was dramatically manifested in 2023 when several all-time climate records were broken (Ripple et al. 2023) The forecasted severe impacts of climate change add to already existing challenges of marine management and planning such as overexploitation and pollution. A further complication follows from the uncertainties related to forecasting occurrence of impacts spatially (where?) and temporally (when?). These increased challenges and uncertainties require new approaches to MSP and knowledge provision for it.

Ripple et al. (2023). The 2023 state of the climate report: Entering uncharted territory, BioScience, https://doi.org/10.1093/biosci/biad080

2. Climate-smart maritime spatial planning

Climate-smart MSP as coined by Frazão Santos et al. (2020) refers to approaches in MSP that integrate climate change considerations into planning evidence (including adaptation needs), support efforts to reduce or capture greenhouse gasses (climate mitigation) and help to reduce negative impacts of climate change (climate adaptation). Climate-smart MSP, importantly, strengthens resilience of marine ecosystems , as well as maritime sectors and coastal communities.

Processes and methods for doing all this need to be tailored to local and/or regional conditions, taking into account the related MSP traditions and institutional frameworks and the specific impacts of climate change on local environment, economies and communities. Coordination and policy coherence between MSP and climate policy are essential to implement climate smart MSP in practice (Frazão Santos et al. 2020; Queirós et al. 2021; UNESCO-IOC 2021).

The literature on climate-smart MSP recommends a range of actions to mitigate and adapt to climate change in marine areas. Key actions include investments in research and improved knowledge production and ways of handling and sharing data. These are needed to respond to uncertain and dynamic futures where climate change adversely affects the supply of marine ecosystem services and, through them, human systems and communities (Queirós et al. 2021). In addition to scenario analysis and projections of changes in the marine environment, accelerating climate change requires climate-smart MSP to be anticipatory and adaptive and prepared to respond to rapidly changing conditions (Frazão Santos et al. 2016; Gissi et al. 2019; Queirós et al. 2021). Synergistic MSP solutions that simultaneously address climate change mitigation and adaptation in a nature-inclusive manner can contribute to the overall resilience and preparedness of coastal and marine areas and societies in the face of climate change (UNESCO-IOC 2021).

3. Collection of climate-smart MSP practices and recommendations

This policy brief is based on views collected from the eMSP partners through several steps during the project. The process was iterative including several steps of written contributions by the participating countries, dedicated workshops on climate change and collection of inputs to the draft policy brief. The Figure 2 shows six types of inputs that led to the policy brief.

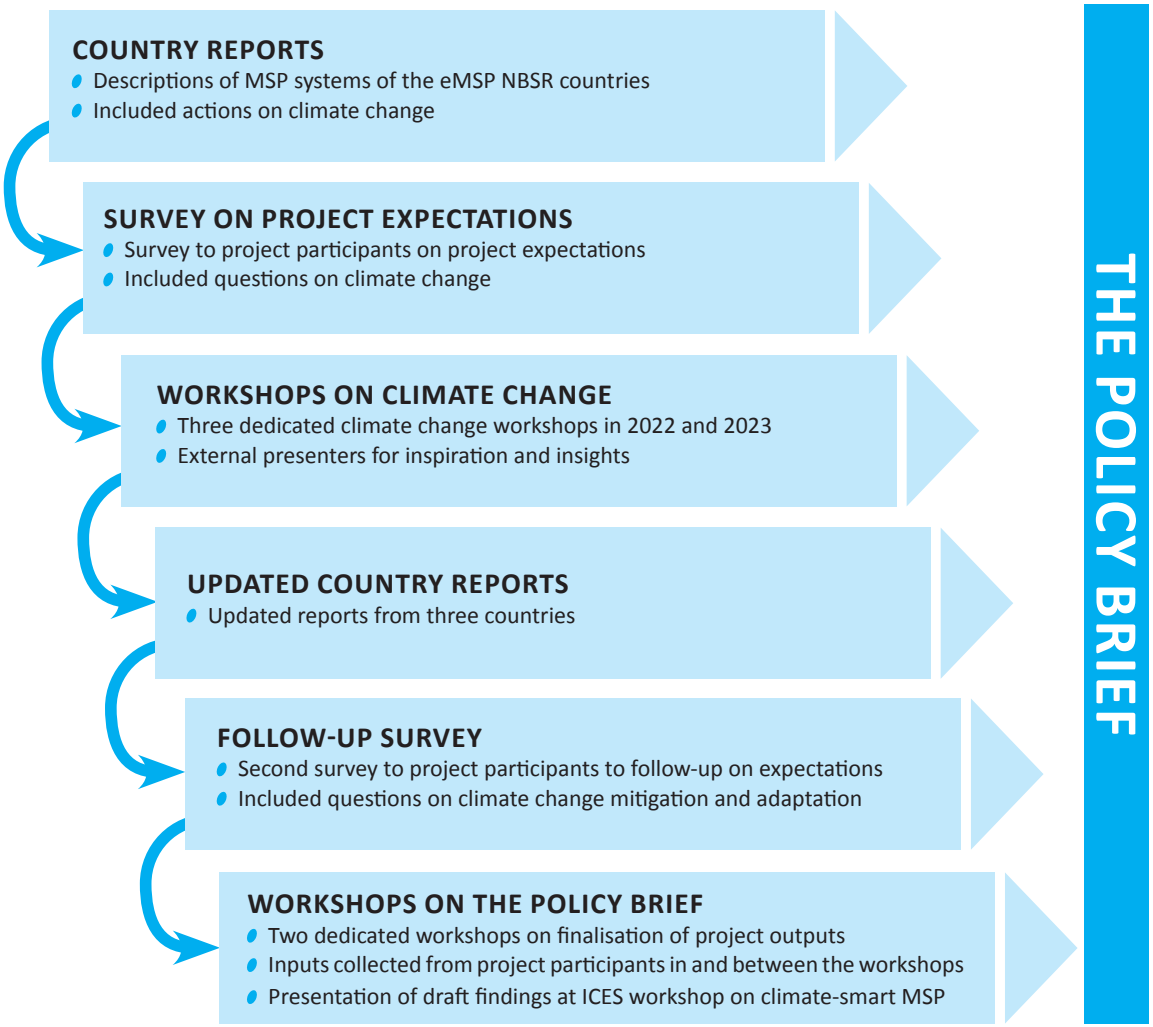


Figure 2: Policy brief process

4. Inclusion of climate change in MSP in the North and Baltic Sea regions

The evidence collected from the eMSP partner countries clearly shows that climate change mitigation is most readily included in MSP through offshore renewable energy production (Table 1). Securing areas for wind energy production and electricity transmission has been one of the main drivers of MSP, and most countries are currently dedicating large areas to offshore wind. Other sources of renewable energy have also been considered but have less often received spatial designations in marine plans.

The EU has set renewable energy production as an overriding public interest with a purpose of expediating deployment of renewable energy productions. The EU set offshore renewable targets in the Offshore Renewable Energy Strategy published in 2020 but the Member States have already set national targets twice as high to achieve 111 GW of offshore renewables by 2030*.

In both North Sea and Baltic Sea regions governments have recently agreed on offshore renewable targets. In the Esbjerg declaration in 2022 Denmark, Germany, Belgium and the Netherlands agreed to tenfold offshore wind energy capacity to 150 gigawatts by 2050. In the same year, Denmark, Sweden, Finland, Germany, Poland, Latvia, Lithuania and Estonia agreed in Marienborg declaration to sevenfold the offshore wind capacity to 19,6 gigawatts in the Baltic Sea by 2030.

Table 1 further shows that some countries assess or at least consider climate impacts of planning decisions and favour carbon neutral maritime activities. Calculation and further research on what would be the greenhouse gas emissions of different planning solutions and maritime sectors is important. Carbon storage – either as technical or nature-based solution (Blue Carbon) – is also considered in many countries but this is still in its infancy.

Climate change adaptation is also considered in the marine plans of all eMSP countries. Coastal defence or protection against erosion and storm surges is an issue, especially in countries with shallow waters and sandy coasts. While coastal erosion has been dealt with in these countries for centuries, climate change is expected to worsen the conditions. Provisions in the plans include both coastal defence, buffer zones and areas for sand extraction.

Enhancement of nature conservation and applying other types of nature-based solutions to increase climate resilience – for instance by including climate refugia areas – are found important in many of the countries. The most common finding pertaining to climate adaptation in the countries is still to increase research and knowledge on the impacts of climate change and related risks and threats. Inclusion of climate adaptation into MSP is clearly an area that needs further development. This is an urgent need as climate change is a pressing issue and emphasises the need for related monitoring and evaluation.

* Delivering on the EU offshore renewable energy ambitions, COM(2023) 668 final

Table 1. The topics and perspectives that are emphasized in different countries' MSP work.
C=practiced or included in the plan currently; F=identified as a future action or as knowledge need

	MITIGATION ACTIONS						ADAPTATION ACTIONS							
countries	Wind energy areas in MSP (incl. cables)	Other renewable energy	Research/assessment of carbon footprint[1] of planning decisions	Multi-use solutions	Carbon storage (technical)	Carbon-rich ecosystems as carbon storage	Research/modelling on CC impacts and threats	Coastal defence	Positive impacts of CC (e.g. fishing, shipping)	Nature conservation/nature-based solutions for resilience	Refugia areas	Consider cumulative effects in relation to CC	Storm risks considered in MSP	Scenario-work considers CC
Åland	C + F		C	F		C + F	F				C	F		
Belgium	C + F	C + F	C	F				C + F		F				
Denmark	C + F	C			C		F	C	F					
Finland	C + F		C	F		F	C + F	C + F	C + F	C + F	C + F			C
France	C + F	C	F	F		C + F	C + F	C + F						C
Germany (EEZ area)	C + F	C	F	C		C + F	F		C + F	C			C	
Poland	C + F	C			C		C	C		C		F	C	
Sweden	C + F		C				C + F			C	C + F	C		
The Netherlands	C + F	C		C	C		F	C	C			C		

'Carbon footprint' is the quantity of greenhouse gas emission emitted into the atmosphere by an individual, organization, process, product or event from within a specified boundary. (https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/carbon-footprint)

5. Recommendations for climate-smart MSP

We conclude that countries are rather climate mitigation ready with a strong emphasis on planning for renewable energy production at sea. There is some concern that this is not always done in ways that fully respect the interests of other sea users or the marine ecosystems. Furthermore, as the readiness to plan for climate adaptation is still only developing, we conclude that the countries in the North and Baltic Sea region need to rapidly increase their capacity and skills for applying a broader range of MSP practices to become climate-smart and resilient. This requires also inclusion of the relevant sectors and authorities in ways that support climate-smart MSP.

Good practices and recommendations for making MSP more climate change ready were collected throughout the project. These include both actions that are already taken by the countries, actions found important to take in future or knowledge needs identified by the countries. Also literature provided inspiration for climate-smart MSP recommendations. Draft recommendations were discussed and further elaborated in two projects workshop in autumn 2023 and online commenting between the workshops.

The following scheme presents recommendations on how to make MSP more climate-smart in three blocks targeted as messages to (1) policymakers, (2) marine planners and (3) knowledge providers.

An overarching key message is that policymakers, marine planners and knowledge providers can support each other and need each other for making MSP climate-smart. This also requires that marine use sectors and civic actors are made aware and enabled to engage - they are the drivers of both problems and solutions.

Block 1 in the scheme: Political support for climate-smart and resilient MSP (messages for policymakers)

Policymakers set political targets and the legislative basis for MSP, but are also responsible for climate-related actions in maritime sectors and environmental protection beyond MSP. The recommendations listed here therefore not only target MSP policymakers.

A key message is that coordination is needed across the sectors to make national, sea basin and EU ocean governance climate-smart as a whole. MSP is an important element of ocean governance but in many countries the mandate of MSP is limited. The broader umbrella of coastal and ocean governance encompasses a range of sector policies (energy, transport, food, etc.), nature conservation policies and other environmental policies (e.g. pollution abatement). By identifying necessary climate actions across various dimensions of ocean governance, it becomes easier to identify specific measures and actions to be implemented by MSP or other marine policies.

It is imperative to look beyond national borders. Countries need to collaborate with their neighbours and on a sea basin level to address the various climate change dynamics at the right scales. Working with other countries can also enhance the necessary learning. By way of setting science policy priorities and sufficient funding, policy makers can also steer and strengthen climate-change related, multi-disciplinary marine research.

The private sector is already under way with important steps towards climate neutrality. Policymakers can support this either by introducing incentives or at least by ensuring a level playing field for businesses (e.g. phasing out subsidies for fossil fuel). If MSP is to be directed towards climate-smart practices, the incentives need to be aligned across sectors and institutional levels.

Lastly, climate-smart MSP and ocean governance need **a consistent climate-aware narrative** across sectors and actors guiding decision-making. This narrative needs to be **derived from and anchored in civil society** by raising awareness and enabling citizens and communities to engage and support climate-smart planning decisions.

The eMSP project experimented with a **community of practice (CoP)** approach of organizing collaboration between different types of actors. Encouraged by the lessons learned (see a policy brief on CoP at https://www.emspproject.eu/results/) we recommend using the CoP approach for enhancing climate-smart MSP at national and sea basin levels.

Block 2 in the scheme: The MSP planning system to support resilience (messages for marine planners)

Marine planners are the planning authorities and practitioners – sometimes consultants – that run the MSP processes, make the plans, and supervise and monitor implementation of MSP. The recommendations to planners are presented as integral elements of a **new planning system designed to support climate resilience**. Recommendations for a resilient planning system, actions for climate adaptation and mitigations are presented as one "package" to underline the holistic perspective of climate-smart MSP. The recommendations on adaptation and mitigation actions indicate if the action in question is to be included in the plan itself (=**P**) or already should be addressed in the pre-planning phase (=**PP**).

Adaptation and mitigation actions are complementary rather than alternatives. The current negative impacts of progressing climate change are expected to worsen in the coming decades. Societies need to invest in climate adaptation action in coastal and marine regions and concurrently invest in climate mitigation actions to stop global warming as soon as possible. Climate adaptation and mitigation actions together form the core of a climate resilient MSP system that supports preparedness and capabilities to adjust to changing conditions.

Ecosystem-based MSP is the cornerstone of climate-smart MSP.

Both adaptation and mitigation actions include nature-based solutions, where nature's capacity to cope with climate change is utilized and enhanced. Healthy ecosystems are better able to capture and store carbon, which is why MSP needs to contribute to enhancing protection and restoration of marine ecosystems. Underlining the importance of ecosystem-based MSP is also a call to safeguard ecosystems in the face of pressures from other uses, especially when designating marine areas for renewable energy production.

This scheme does not specify which elements of climate-smart MSP are particularly important to **include in monitoring and evaluation of MSP**. This is because climate change considerations in MSP have implications for all dimensions of monitoring and evaluation of MSP. Monitoring and evaluation should consider, for

instance, how a warming climate may change the context of planning (ecosystems, economic activities), and contribute to the assessment and measuring of the carbon footprint of planning decisions and maritime sectors. Monitoring and evaluation should also consider how well MSP-relevant climate policy targets are included in MSP. Knowledge providers will need to provide relevant data and knowledge to allow monitoring indicators to be developed that can form a basis for evaluation.

Block 3 in the scheme: Knowledge needs and data practices (messages for knowledge providers)

Knowledge providers come in many shapes and forms. They are both scientists, but also experts representing different maritime sectors, civil society organisations and even local communities and interest groups. MSP authorities themselves often collect relevant data to then analyse them for their purposes. Not to miss any of those perspectives and sources of knowledge **the knowledge-base for MSP should be co-created in collaboration with different types of knowledge providers** - in consultation with stakeholders. In the scheme, the recommendations for knowledge providers are grouped under the themes the specific knowledge supports: the planning system, climate adaptation and climate mitigation.

POLITICAL SUPPORT FOR CLIMATE-SMART AND RESILIENT MSP (MESSAGES FOR THE POLICYMAKERS)

- Set targets and tasks for all sectors of administration ("climate-smart ocean governance").
- Establish national and sea basin level fora for maritime sectors, scientists, and MSP and maritime management authorities for understanding climate change impacts and actions.
- Make the necessary legal or policy decisions to steer MSP systems towards climate resilience.
- Provide clear policy targets for offshore renewable energy and emission reduction.
- Strengthen cross-border and sea basin collaboration in planning to enhance climate mitigation and adaptation efforts. Coordinate actions across borders, including the land-sea divide.
- Increase and target financing for multidisciplinary, climate-related marine research.

MSP SYSTEM TO SUPPORT RESILIENCE (MESSAGES FOR THE PLANNERS)

Enhance climate resilience in MSP

- Take a holistic approach that combines mitigation and adaptation efforts to enhance resilience. Be aware of both climate-risks and broader system resilience.
- **Strengthen the ecosystem approach, because it is the cornerstone for climate-smart MSP!**
- Enhance mutual learning of different aspects of climate change and resilience, aim for a climate-smart narrative.

Strengthen anticipatory and adaptive capacity

- Develop adaptiveness of planning in terms of planning evidence as well as in terms of planning solutions.
- Strengthen MSP systems' capacity to anticipate and adapt to future changes, not only to minimise the damages.
- Strengthen practices and inclusiveness of stakeholder engagement also from climate change perspectives (Climate and Blue Justice).

PP = in pre-planning, **P** = in the plan

CLIMATE ADAPTATION

Minimise impacts on marine ecosystems

- Include climate refugia for the fauna and flora into plans. **(P)**
- Support nature conservation through planning, because enhanced ecosystem services support adaptation and resilience. **(PP, P)**

Minimise impacts on human sectors and settlements

- Enhance coastal protection in planning solutions (nature-based and artificial solutions to prevent erosion and to protect coastal settlements). **(P)**
- Minimise CC impacts to sectors in planning solutions (e.g. shipping safety and dock height vis-à-vis storms). **(P)**
- Include climate change into MSP scenarios: impacts, threats and new economic potential. **(PP)**

CLIMATE MITIGATION

Increase production of offshore renewable energy

- Plan go-to areas, but avoid valuable habitats and MPAs as well as adverse effects on other users of the sea. **(P)**
- Reserve areas for researching and piloting different types of offshore renewable energy solutions. **(P)**

Reduce carbon footprint of maritime sectors

- Assess climate impacts of the planning designations. **(PP)**
- Include carbon footprint as an element in Strategic Environmental Assessment (SEA). **(PP)**
- Enhance multi-use of sea areas, including the carbon footprint as a design criteria. **(PP, P)**
- Favour low carbon or carbon neutral activities in MSP. **(P)**

Increase carbon capture and storage at sea

- Plan areas for technical carbon capture solutions. **(P)**
- Safeguard and enhance nature-based carbon capture through planning solutions (Blue Carbon) **(P)**

KNOWLEDGE NEEDS AND DATA PRACTICES (MESSAGES FOR THE KNOWLEDGE PROVIDER)

- Ecosystem-based studies to balance climate mitigation actions with marine ecosystems and social justice (system resilience).
- Assess climate impacts cumulatively in relation to other human pressures, e.g. eutrophication and fishing.
- Include climate consideration into Monitoring & Evaluation.
- Research on social-ecological marine systems in the changing climate.
- Enhance data sharing processes nationally and internationally: format, storage, display, diffusion, standardization and harmonization
- Invest in cross-border and sea basin communication and collaboration in analysis and data practices
- Improve spatial presentation and visualization of CC impacts.
- Increase knowledge on physical-chemical changes at sea: warming, acidification, sea level, sediment drift, salinity.
- Increase knowledge on vulnerabilities of habitats and species.
- Model geographical changes in species distributions, identify corridors important for ecological connectivity.
- Study (spatially) climate change hot spots, bright spots and nature refuge areas, including social and economic perspectives.
- Study how climate risks affect sectors and different groups of people (climate risk = hazards + exposure + vulnerability).
- Down-scale global climate models to planning area level.
- Present climate change scenarios and pathways in short/mid-term (decadal scale) vs. long-term ("end of century" scenarios).
- Assess and inventory renewable energy resources and energy potential (wind, wave, currents).
- Quantify greenhouse gas emissions of sea activities and of alternative planning decisions, also at the sea basin level.
- Compare carbon footprint of sea-based activities to their land-based counterparts.
- Research conditions for and potential of multi-use also from climate mitigation perspective.
- Research the potential of natural carbon capture (seaweed, etc.), including the climate mitigation potential of protection and restoration of habitats.

The conceptual scheme presenting recommendations on how to make MSP more climate-smart in three blocks targeted as messages to (1) policymakers, (2) marine planners and (3) knowledge providers.

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Citation: Varjopuro, R., Rekola, A.and K. Gee (2023). Policy Brief on Climate-smart MSP. Download from https://www.emspproject.eu/results/

Acknowledgements & Disclamer

This policy brief has been developed within in the eMSP project. It is based on insights from the persons participating in the project and workshops does not necessarily mirror the views of their organisations and nations.

We thank all those who contributed their time and knowledge to developing the policy brief. Your knowledge and insights have been much appreciated. Thanks also to our expert reviewer, Catarina Frazão Santos from the University of Lisbon, for valuable comments on earlier drafts of this policy brief.

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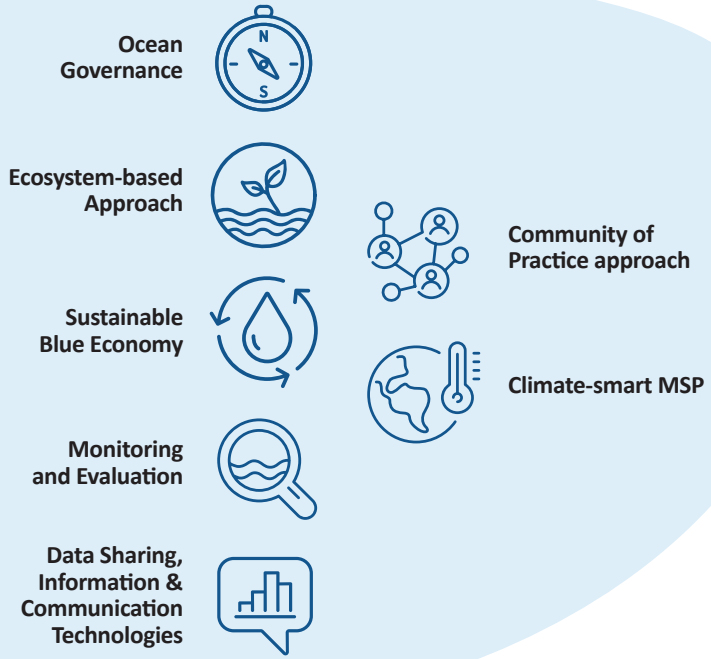
Find all project deliverables at www.eMSPproject.eu/Results



The eMSP NBSR project, implemented from September 2021 to February 2024, provided a platform for marine spatial planners and other experts to collaboratively advance MSP practice. It addressed five urgent emerging MSP topics through a community of practice-based approach that enabled joint learning across professions and across the North Sea and Baltic Sea areas.

Project work took into account the European Green Deal, climate change and how climate-neutrality targets can be addressed in MSP.

The planners and experts were supported by a method mentoring team and a scientific advisory board.

Netherlands Enterprise Agency
Ministry of Agriculture, Nature and Food Quality of the Netherlands
Ministry of Infrastructure and Water Management of the Netherlands
SHOM
Swedish Agency for Marine and Water Management
Syke
Varsinais-Suomen liitto
Egentliga Finlands förbund
Regional Council of Southwest Finland
HELCOM
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