

**VALUABLE PRACTICE: Offshore wind farm location optimisation****Description**

To support the energy transition at sea, the Finnish MSP plan identifies potential areas for Offshore Wind Farm (OWF) development. The areas aim to guide the development of OWF to locations where energy production is both viable and the impacts of the development on marine nature and the environment and the possible conflicts with other sea uses are minimized.

Experts at the Finnish Environment Institute evaluated the suitability of the whole Finnish sea area for OWF development on a 100 m resolution using a geospatial zoning analysis. The analysis was done within the SmartSea project and the other project partners also contributed to the work. The analysis was based on approximately 150 indicators, which define whether certain areas are suitable for OWF development. The indicators consider conditions related to biodiversity, multiple social topics, such as social impacts and landscape scenery, and a few economic variables such as profitability. These analysis results were used in the planning process to delimit the final areas that are shown in the MSP plan. All the identified areas are located at least 10 kilometres from the coast in a depth of 10–50 metres.

**Practice typology**

(iv) Zoning

**Topics addressed**

<b>Main</b>	A. Climate change mitigation [A.1 Renewable energy production, storage and transportation]
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**Sectors/Activity involved**

Offshore renewable energy. Indirectly multiple marine sectors and qualities of the marine environment are considered as factors that impact the delineation of the potential areas.

**Stakeholders involved**

The main administrative stakeholders involved in the process are the coastal regional councils, the Finnish Ministry of Environment and the Finnish Environment Institute, who conducted the spatial analysis. In addition, stakeholders from all marine sectors were included into the process. This work is described in more detail below.

The purpose of the work was to use the results of the modelling analysis to create area demarcations for the MSP plan map. Collaboration in making the planning decisions guided the work on defining which of the potential areas were considered most important, how they should be delineated and at which scale they should be presented in the plan.

The first delineation of the potential areas was based on the modelling results. The areas were presented to all stakeholder groups, including OWF developers, in regional workshops during the vision phase of the MSP planning process. Stakeholders outside of the wind energy sector thought that the areas were too large and were very likely to lead to conflicts between marine activities. Due to the feedback, the size of the areas was made smaller. After this another workshop aimed solely on the wind energy sector was organized. There the discussions focused on the new smaller areas and the modelling process in general. After the discussions the MSP planners delimited the final proposal of the potential OWF areas. An open opportunity for all stakeholders to comment on the plan draft and the identified potential OWF areas was provided as a part of the public hearings process.

**Geographical scope**

National (Finnish maritime areas).

**Governance context**

The MSP authorities are not responsible for the permitting or zoning of offshore wind farms. Strategic MSP provides a collaborative platform for stakeholders and shared information for more detailed legally guiding planning. In Finland regional planning guides the OWF development in the territorial waters and the responsible authority for natural resource management in the state-owned territorial water areas is Metsähallitus.

**How this MSP practice can support the EU Green Deal**

The practice of identifying suitable areas for offshore wind energy production supports the objectives of renewable energy production (A1) and more specifically the development of marine renewable energy installations (A1.1). The practice guides the planning of placement of the OWF development and aims to minimize the impacts on nature and the environment and potential conflicts to other sea uses, such as fisheries and maritime transportation. The areas do not rule out other sea uses nor are any production targets set for them.

If fully developed the areas could reach 15 GW in energy production. Although, this estimate is not precise. In practice the technical requirements for OWFs will define how much energy could be produced in the areas. The areas match the level of generalization suitable for strategic level MSP and form an easy-to-understand overview of the scale of OWF development that is required to meet certain objectives.

The practice serves important information into the national scale discussion and sends a positive indicator of the MSP plan as a promoter of sustainable OWF development. As additional materials for looking at the whole picture of energy production at sea, the OWF areas from regional land use plans and the permit application process are presented in the background materials for the plan.

The Finnish MSP plan presents spatially overlapping suitable or potential areas for different marine uses. The aim is to convey a message to the marine sectors that different actors have overlapping interests in certain areas, which need to be considered when planning activities. Having information on the most suitable areas for OWF can promote the multi-use of sea space by identifying areas where the co-existence of wind energy production with certain uses could be possible. Having these areas on a map can facilitate the discussion when considering possibilities of multi-use, such as OWF and fishing or aquaculture, in certain sea areas.

**Challenges/gaps/inconsistencies still to be addressed**

Challenges/gaps/inconsistencies still to be addressed (indicate to which phase of the process they relate). This will feed the work on task 3.2. There are things that still need to be addressed related to OWF development and location optimization related to both the modelling approach and factors included in it as well as the information that is desired by both MSP authorities and OWF developers. The issues presented below do not undermine the value of the practice and their validity is dependent on the context where the practice is applied.

- ✓ The cumulative effects of OWF development have not yet been considered and further knowledge on the topic is required for making sustainable planning decisions. For example, collaboration and sharing of information across borders on OWF development with the neighbouring countries is required to form a comprehensive overview of the future of the sector and its impacts on the marine environment and the different sea



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uses. However, this valuable practice supports planning which aims to mitigate and/or control the pressures caused by OWF development. While this does not replace the need for evaluating the cumulative effects, it provides a well-founded way of taking the pressures into consideration in MSP.

- ✓ Suitable areas for OWF are also located outside of the delimited areas. The permitting of OWF is under strong pressure as it needs to consider both individual projects and their cumulative impacts. If the area is outside of the areas delimited in the MSP plan, a lot of the knowledge base supporting the development of OWF in the specific area is lost.
- ✓ Seasonal changes in the use of sea areas such as fishing practices and ice conditions still need to be better considered when defining areas suitable for OWF.
- ✓ The OWF developers have identified a need for no-go zones, which would define which areas are definitely not suitable for development.
- ✓ The modelling approach does not consider the connections of the OWF to the power grid nor the possible impacts of the cables transferring the energy to the grid both on marine and the coastal areas.
- ✓ The regional plans in Finland also have zoning for OWF. These areas are synchronized with the results achieved in MSP. Depending on the planning cycle in the regions this takes time from one to five-six years. Strategic MSP is the only planning tool in the EEZ and a clear distribution of the responsibilities for directing the development of OWF in the EEZ needs to be defined.

### Replicability /Elements which can be capitalised

The process can be replicated in other countries. However, it is important to consider that the analysis can only consider factors where suitable data is available. To make a comprehensive analysis a large variety of high-quality data is needed, which makes the practice dependent on open data or its implementation will require considerable investments in data production and collection. The analysis is done using a spatial prioritization analysis software Zonation, which is openly available for all users and the description of the method is available in a scientific publication (Virtanen et al. 2022).

When implementing the valuable practice there are certain issues which are important to consider:

- ✓ The analysis can only delimit the potential areas for OWF development. The definition of the actual sites requires extensive fieldwork and mapping, which is expensive and currently done mostly by the OWF developers, at least in the Finnish context.
- ✓ The technological development in offshore wind energy production and the increase in understanding and data on the marine environment creates a need to repeat the analysis with new parameters. As the analysis is replicable, allocation of resources for doing so in the future is advisable.