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DANISH MARITIME AUTHORITY

DRAFT STRATEGIC ENVIRONMENTAL ASSESSMENT OF THE DANISH MARITIME SPATIAL PLAN

SCOPING REPORT



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1 Introduction

The Danish Maritime Authority is currently drafting amendments to the Danish Maritime Spatial Plan (MSP). The proposed changes have been drafted with a view to amending the MSP in response to the public consultation on Denmark's first MSP and the political agreement on the MSP from June 2023, covering protection of the marine area and designation of sites for further offshore wind farms, CO₂ storage and a number of smaller projects pursuant to the Danish Act on Maritime Spatial Planning.

The amendment to the MSP does not in itself confer the right to obtain permits within certain areas, but the plan establishes the spatial framework within which authorities can issue permits under the relevant sectoral legislation.

The amendments to the MSP follow the same principles as the earlier planning. Activities for which development zones are designated can therefore only be carried out within zones designated for them. Special utilisation zones have also been designated, e.g. for shipping, but this does not restrict the activity outside these zones. Nor do the amendments place any restrictions on fishing. Finally, the amendments provide for nature and environmental protection areas.

The amendments to the Danish MSP are covered by the requirement to assess the impact on the environment laid down in Section 8(1) of the Danish Environmental Assessment Act (Miljøvurderingsloven)¹. An environmental report therefore has to be prepared.

The SEA must provide for a high level of environmental protection by assessing the likely significant impact of implementing the plan and any reasonable alternatives to it. The SEA also helps to incorporate environmental considerations into the preparation and publication of the amended MSP.

The SEA should be based on whatever information may reasonably be required in the light of current knowledge and assessment methods, the contents and level of detail in the MSP, the stage in a decision-making process the plan has reached, and the extent to which some matters may be better assessed at a

¹ Consolidated Act no 1225 of 25/10/2018 on environmental assessment of plans and programmes and of specific projects

different stage in that process, cf. Section 12(1) and (2) of the Environmental Assessment Act.

Before preparing the environmental report a scoping of the SEA must be carried out. This document includes a draft scoping of the contents of the environmental report. The report also defines the scope of the information to be included in the SEA of Denmark's amended MSP. A more detailed discussion of the legal basis and process for environmental assessment and scoping can be found in section 2.

1 Draft amendments to the Danish maritime spatial plan

1.1 Maritime spatial planning

A draft Executive Order on Denmark's Maritime Spatial Plan was sent out for public consultation on 31 March 2021. The MSP acquired legal force when the Executive Order was adopted. Public authorities could not then issue permits for facilities and activities contrary to the provisions of the MSP.

The MSP constitutes the overall plan for the Danish marine areas. The possibility of continuing existing activities at sea is not changed by the MSP. The MSP only establishes the overall framework within which public authorities can issue permits or adopt plans for different purposes and activities. The MSP does not change whether permits can be issued under sectoral legislation or plans adopted under other legislation in an area designated for the activity in question. However, it does require any subsequent sectoral planning and granting of permits for activities to comply with the area designations in the MSP and the provisions relating to these. Areas designated in the MSP can also be used without restriction until they start to be used for the purpose for which they were designated, provided that this use is consistent with the provisions of the MSP.

The MSP designates areas that can be used for specific types of activity and construction, and the area allocation is based on zones. The marine areas are divided into four zone types:

- > **Development zones:** development zones contribute to economic development and growth. For activities and uses for which development zones are designated, permits may be issued for the relevant purpose within the areas designated for this. Other areas are then kept free from these activities and uses. The development zones cover renewable energy and energy islands, oil and gas exploration and extraction, CO₂ storage, new transport infrastructure projects, aquaculture including shellfish production and fish farming, and natural resource extraction.
- > **Special utilisation zones:** marine areas designated for specific uses cover pipelines, cable corridors for renewable energy, protective measures for aviation, compensation excavations around the Great Belt bridge, specific land reclamation projects, and shipping corridors. Special utilisation zones designate areas for these activities and uses, but do not prevent them from being carried out elsewhere. The amendments to the MSP are expected to result in special utilisation areas being designated for marine archaeology and cultural heritage sites.
- > **Nature and environmental protection areas:** nature and environmental protection areas cover marine strategy areas, Natura 2000 sites (habitat areas, bird protection areas and Ramsar areas), conservation areas and

nature and wildlife reserves. The areas cover existing and projected future nature protection areas.

- > **General utilisation zones:** the general utilisation zones cover all of the areas in the MSP not designated for other purposes.

Fishing, shipping, recreational use and tourism are permitted in all areas unless prohibited under other legislation.

1.2 Proposed amendments to the MSP

Based on the public consultation, proposed amendments to the MSP have been discussed at the political level. The negotiations resulted on 7 June 2023 in the "Agreement between the Government (Social Democrats, Liberals, Moderates), the Socialist People's Party, Denmark Democrats, Liberal Alliance, Conservative People's Party, Red-Green Alliance, Radical Left, Danish People's Party, the Alternative and the New Right, on Denmark's marine spatial plan". The agreement provides the framework for maritime spatial planning. On this basis, the Executive Order on the Danish MSP will be issued no later than 30 September 2023, and a proposed amendment to the Executive Order on Denmark's Maritime Spatial Plan in response to the public consultation and the political agreement on the MSP will be published no later than this also.

With the agreement in the Danish MSP, the parties agreed, among other things, on:

- A doubling of the area designated in the MSP for renewable energy and energy islands from approx. 15 per cent of the sea area in the current MSP to approx. 30 per cent of the sea area, to provide for a significant expansion of renewable energy production in Danish waters to support the national climate policy and to make Denmark and Europe independent of fossil energy.
- Increased protection of nature at sea by creating better conditions for nature and biodiversity. To achieve this, the MSP designates more than 30 per cent of the area for nature conservation, and gradually increases the proportion of strictly protected areas at sea from approx. 4 per cent of the sea area in the current MSP to 8 per cent of the sea area protected by 2028 and 10 per cent under strict protection by 2030. This will double the area under strict protection in 2028 compared to the current MSP, and Denmark will meet the 2030 target from the EU's biodiversity strategy at sea.

A number of other changes will be made to the MSP, e.g. concerning marine archaeology and cultural heritage and CO₂ storage. The changes cover new designated areas, release of areas for other uses and adjustments to existing designations. The amendments also include new provisions for marine archaeology and cultural heritage.

The amendments to the Danish MSP are thus expected to bring about concrete changes in area designations for renewable energy and energy islands, CO₂ storage, specific transport infrastructure projects, aquaculture, natural resource extraction, cable corridors for renewable energy, specific land reclamation projects, nature and environmental protection areas and shipping corridors, and areas designated for marine archaeology and cultural heritage.

Maritime spatial planning is also based around five elements:

- > Ecosystem-based approach
- > Inclusiveness
- > Incorporation of the best available knowledge
- > Coexistence
- > Interaction between land and sea

Ecosystem-based approach

The preparation of Denmark's amended MSP has taken an ecosystem-based approach. The Act on Maritime Spatial Planning also stipulates that the amended MSP should take account of Denmark's marine strategy. The MSP provides for designated marine strategy areas as well as areas that are expected to be designated as protected or strictly protected marine areas.

The ecosystem-based approach to maritime spatial planning reflects the same holistic thinking behind Denmark's Marine Strategy II, which is based around four headings²:

- > Ecosystem-based management is a *geographical approach*. It covers the management of ecosystem components and human activities which exist in the same geographical area.
- > Ecosystem-based management looks at *relationships* – not just within the ecosystem but also between ecosystems and people. This also recognises that humans are an integral part of the environment – and hence part of the problems and the solutions.
- > Ecosystem-based management focuses especially on *cumulative effects*. Human activities often affect ecosystems in a complex manner. Here it is important to understand the effect of the sum of the impacts on an ecosystem.
- > Ecosystem-based management is about recognising the many *different goals and interests* in play at sea. An ecosystem may have multiple

² Danish Ministry of Environment and Food: Danish Marine Strategy II, Part 1 – Good environmental status, initial analysis, environmental targets, April 2019

functions (ecosystem services), but maybe not all at once. For example, a sandbank may be used to erect wind turbines, and to extract sand and gravel; it may be used as a fishing ground or it may be a protected habitat for fish. Some activities can coexist while others cannot.

Inclusiveness

Area designations in Denmark's amended MSP leave room for continued maritime innovation and development rather than just designating areas for existing technologies. This means, for example, that where an area is designated for renewable energy, we would not expect it to list the types of installation for exploiting renewable energy for which permits could be issued, e.g. wind turbines, wave energy or tidal power, or PtX plants. Future technologies can thus be accommodated within the MSP.

To provide for the necessary inclusiveness in the planning, the amended MSP also designates overlapping development zones for multiple purposes where the specific area has to be stated in connection with individual approvals. So the designation of areas for development zones does not restrict the use of the respective areas for other activities which are not covered by the MSP if these other activities are compatible with the purpose of designating the area as a development zone. However, permits for other uses within the designated areas can only be issued in consultation with the Minister responsible for the sector for which the area is designated.

Incorporation of the best available knowledge

The amendments to the Danish MSP are based on the best available knowledge. The MSP has been drafted in collaboration with an inter-ministerial steering committee and working group made up of governmental authorities responsible for maritime activities and protection of the sea. These authorities have provided data and shared knowledge on the different purposes, which are catered for in the MSP.

Coexistence

The MSP seeks to promote coexistence between various relevant activities and uses while taking account of nature and environmental obligations and interests. The aim, among other things, is to create a better framework for the sectors and interests which are catered for in the MSP.

In drafting the amendments to the MSP, the possibilities for coexistence were evaluated to determine whether several different types of construction or activity could be accommodated within the same area, and whether they could happen simultaneously or at different times. The final evaluation of the possibilities for coexistence is not expected until permits etc for concrete projects in these areas are processed. This assessment also considers where in the whole maritime space the activities take place – on the surface, in the water column, on the seabed or underground – which could allow different sectors and interests to use the same area.

In the vast majority of cases, however, the possibility of different installations and uses co-existing within the same area will depend on a concrete assessment in

connection with specific permits etc. or plans for activities and uses. The granting of permits etc. or adoption of plans must therefore be subject to consultation with the relevant competent ministries.

Interaction between land and sea

The amendments to the Danish MSP take account of the relationship between construction and area use in the Danish maritime areas on the one hand, and land-based infrastructure on the other, such as pipelines carrying hydrocarbons that run across land and sea, future bridge and tunnel projects, ports, and municipal and local planning.

The coastal waters are mainly expected to be kept free from large physical installations which are provided for in the MSP, and which could seriously obstruct or impede e.g. shipping, fishing, tourism and recreational use of the sea. However, it is also expected that the amended MSP will still consider the possibility for future development of coastal installations e.g. ports and coastal defences, which are not covered by the MSP. Among other things, this is intended to support coordination with municipal planning.

2 Scoping and strategic environmental assessment

2.1 Legal basis and process for strategic environmental assessment

The MSP is subject to the requirement for strategic environmental assessment (SEA) in the Environmental Assessment Act, cf. Section 8(1) no 1 of the Act. The SEA will be carried out according to the five steps shown in Figure 3-1.

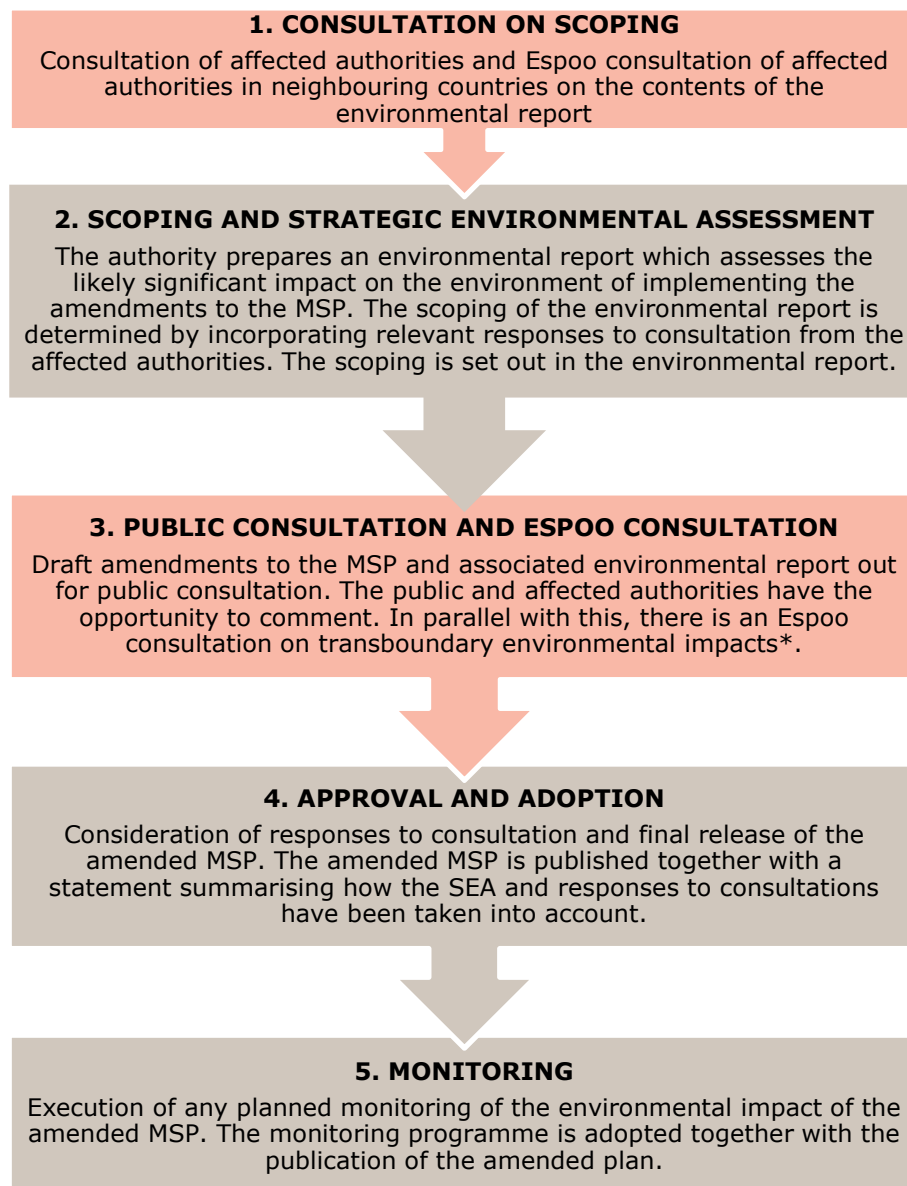
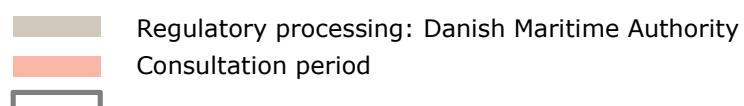


Figure 3-1: Graphical overview of the phases in the SEA process.



Current phase in the SEA process

*The Danish Maritime Authority is the environmental authority for the purposes of Espoo consultation

2.2 Purpose and content of the scoping

This report has been produced to define the scope of the SEA and determine the level of detail. No requirements have been laid down as to the content or scoping of the environmental report, so the scoping has been based on criteria that have been found to be relevant, including identifying:

- > The environmental impacts which derive directly or indirectly from the amended MSP
- > The environmental impacts which are expected to be addressed later in the overall approval process.
- > The relevant environmental targets (national/regional/international) to be included in the SEA.
- > Evaluation criteria associated with the identified environmental impacts, including a mapping of data needs and data availability

The Environmental Assessment Act requires the environmental report to contain a description and evaluation of the likely significant impact on the following environmental factors:

- > biodiversity
- > population
- > human health
- > flora
- > fauna
- > soil
- > land
- > water
- > air
- > climatic factors
- > material assets
- > landscape
- > cultural heritage, including churches and their surroundings
- > architectural and archaeological heritage
- > major man-made and natural disasters and accidents
- > resource efficiency
- > the relationships between these factors

The purpose of the scoping is then to determine whether and to what extent the plan may be expected to have a significant impact on one or more of the factors listed above. Where it is judged that one or more of these factors will be

significantly impacted, or if a significant impact on one or more of these factors cannot be ruled out, this will be elaborated on in the environmental report.

A number of activities being planned for in connection with the amendments to the MSP are also being planned for in Denmark's neighbouring countries. There will therefore be a special emphasis on establishing a methodological approach to assessing cumulative impacts at the plan level, both between the Danish designations and with the equivalent designations in Denmark's neighbouring countries.

The scoping of the environmental report thus defines the information needed to produce an environmental report which identifies, describes and assesses the likely significant impacts on the environment from implementing the plan and any reasonable alternatives. The level of detail in the SEA depends on the level of detail in the MSP, as well as the stage it has reached in the decision-making process.

2.3 Approach and method in the SEA

The SEA makes an objective-based assessment where the designation of zones in the amended MSP is viewed against the environmental targets applicable to the different parts of the marine area. The assessment is also based on the environmental factors which are described in Section 1(2) of the Environmental Assessment Act. The environmental factors cover a range of specific environment topics which are used as a basis for describing possible environmental impacts in section 2.5. The likely significant environmental impacts are described for each of these environmental factors, both in isolation and across different factors.

The assessments are qualitative and are based on identified evaluation criteria. The evaluation criteria are based on national goals and purposes behind the designation of specific areas for particular purposes or activities. It is assessed whether the expected likely impact is significant or insignificant. The assessments are based on existing knowledge and experience from carrying out strategic environmental assessments as well as information that may reasonably be expected to be considered in light of current knowledge and assessment methods.

The SEA will assess whether the impacts can be averted by changing the plan, reduced by taking precautionary measures, or compensated for.

The starting point for the SEA is a description of the existing environmental status. This is followed by a brief description of the expected development of the existing environmental status if the amended MSP is not published (the null alternative).

2.4 Assessment of environmental impacts across national borders

Under the Espoo Convention³, Denmark is required to involve all of the countries that could potentially be affected by the amendments to the Danish MSP in the SEA process.

If a plan is expected to have a significant impact on the environment in another country, the planning authority must inform the Minister for the Environment (via the Danish Environmental Protection Agency) as soon as possible, with a view to consulting neighbouring countries, cf. Environmental Assessment Act, Section 38(1).

The neighbouring countries that could be affected by the amendments to the Danish MSP are involved in the SEA process at the same time and in the same way as the Danish public, Danish stakeholders and other authorities.

Step one in the Espoo process is the dispatch of an Espoo notification in which Denmark notifies the countries that could be affected by the plan. The purpose of the notification is both to ask the countries concerned whether they want to participate in the SEA process, and to ask whether they have any comments on the draft scoping note sent to them or any other topics they would like examined in the environmental assessment of the transboundary impacts. The countries concerned must also be informed of the timetable for the amended MSP and the SEA and the type of the decision that may be made at the end of the process, with guidance on how to appeal.

Step two in the Espoo process is a consultation of the affected countries that have asked to participate in the SEA procedure. The material for this consultation includes an SEA report on the transboundary environmental impacts the amendments to the Danish MSP could have on the affected countries as well as a draft of the amended MSP. The neighbouring countries are invited to comment on the SEA.

If a country has questions or comments on the SEA of the transboundary impacts, these must be resolved with that country before the amended MSP can be published.

2.5 Likely significant environmental impacts

The potential likely significant impacts on the environmental factors listed in the Environmental Assessment Act are reviewed below, in order to identify whether any of these environmental factors can be assumed from the outset, on the basis of existing knowledge, not to be seriously affected by the publication of the amended MSP.

³ Executive Order of 25 February 1991 on Environmental Impact Assessment in a Transboundary Context

2.5.1 Biodiversity, flora and fauna

This section focuses on the organisms which are included in the SEA and the pressure factors which could have a significant impact on species or biotopes. Table 2-1 summarises the groups of organisms/biotopes where a significant environmental impact cannot be ruled out. This is also linked to the pressure factors already identified in Denmark’s Marine Strategy which will also be included in the SEA. The individual environmental issues are discussed below.

Table 2-1 *Flora and fauna and possible pressure factors resulting from amendments to the Danish MSP. Pressure factors which are covered are marked with an ‘X’.*

Organism/habitat and possible pressure factors	Included in the SEA
Bottom fauna/biotopes	
Physical presence of structures	X
Impact on wave formation at sea	X
Changed bottom conditions (integrity of the seabed)	X
Pollutants	X
Sediment dispersion	X
Hydrographic changes	X
Oxygen loss	X
Reef effects	X
Magnetic fields*	
Eel grass	
Birds	
Collision risk	
Blocking	X
Behavioural changes (e.g. territorial or breeding behaviour)	X
Displacement/habitat loss	X
Hydrographic changes	X
Reef effects	X
Bats	
Collision risk	
Fish	
Physical presence of structures	X
Changed bottom conditions	X
Pollution	X
Sediment dispersion	X
Reef effects	X
Hydrographic changes	X

Magnetic fields*	
Marine mammals	
Hearing damage	X
Flight behaviour	X
Blocking from physical structures	X
Change of behaviour	X
Protected areas	
Bird protection areas/Ramsar areas	X
Natura 2000 habitat areas	X
Other protected areas	X

*Dealt with separately in section 0.

Bottom fauna (biotopes)

The sea contains different habitats and species which are crucial to biodiversity. The different uses of the sea can have both positive and effects on biodiversity in an area. The designation of areas as development zones retains the existing possibility of issuing permits for projects and activities within a number of sectors. These potential projects/activities can affect ecosystem components and the integrity of the seabed (habitat types at the bottom of the sea). The spatial planning framework can therefore preserve the existing scope for significant impacts on the environment, such as where the amendments to the MSP allow for continued activities that cause sediment dispersion, discharges of hazardous substances etc.

On the other hand, structures such as turbine foundations, bridge piers and energy islands, which can still be authorised or planned for after the publication of the amended MSP, can contribute increased biodiversity by providing an artificial reef or sandbank effect, for example. Biodiversity, flora and fauna are included in the SEA of the amended MSP.

In connection with the SEA of the MSP, information will be collected on the location of known stone reefs, mussel beds, sandbanks and cold seeps, and shallow bays and coves, where this is relevant to coastal area designations in the proposed amendment. The SEA will focus on the designation of zones in the amended MSP and the possible impact on ecosystem components from the subsequent issue of permits etc. within these zones. The extent of the impact and the likelihood of significant impact on the bottom fauna will be assessed from an oceanographic standpoint. Indirect effects on the bottom fauna (e.g. hydrographic changes resulting from potential dams or bridge piers) will also be included in the assessment. The total area in which the integrity of the seabed could be impacted will be assessed as far as possible. The assessment of the potential impacts will be made at a general level and focus on the cumulative effects. A more detailed assessment of the impact on the bottom fauna will be carried out when permits etc. are issued for concrete construction projects or activities or when plans are adopted under other legislation.

Eel grass

Eel grass is an indicator species for the environmental status in coastal waters. Eel grass only occurs close to the coast and is limited to depths up to 6-8 metres.

It is expected that the amended MSP will designate development zones in coastal waters in which projects can be planned for and authorised. Eel grass is among other things impacted by physical structures, sediment dispersion, nitrogen emissions and hydrographic changes. However, the designation of areas in coastal waters for development projects such as bridges and tunnels in the amended MSP is judged to be so limited that eel grass will only be affected in isolated cases and so does not constitute a significant impact on the environment. Indirect effects on eel grass relating to the clarity of the water are addressed under Pollution. The effect on eel grass is therefore not assessed further in the SEA.

Birds

Birds that migrate over the sea are at risk of colliding with wind turbines. This occurs especially during the spring and autumn migrations, when the birds follow distinct corridors. However, structures at sea, such as energy islands and transformer platforms, can also act as resting places for sea birds and so have a positive effect.

Changes in area use in territorial waters could potentially effect bird behaviour. Behavioural changes may include changes in breeding and territorial behaviour or changes in migration routes. Behavioural changes could ultimately effect the birds' ability to reproduce. There is insufficient knowledge to confirm that behavioural changes in birds resulting from activities at sea could have a potential significant impact on bird populations. The issue is therefore not addressed any further in the SEA of the amended MSP.

Experience from previous SEAs of the placement of wind farms has shown that the risk of birds colliding with wind turbines and being killed is relatively low. However, it is not impossible that an expansion of the development zones for renewable energy proposed in the MSP pursuant to the political agreement to expand offshore wind from May 2023 could have an impact on birds' migration routes, if expanded development zones for wind farms produce a blocking effect. The issue will be assessed further in the SEA of the amended MSP.

Some marine areas are also important overwintering, resting and feeding areas for particular species of birds. They may be displaced or disturbed after the adoption of areas for e.g. wind turbines and other renewable energy infrastructure. Their feeding grounds may also change because of e.g. hydrographic changes, changes of the integrity of the seabed or because of pollution.

The SEA will focus on pressure factors which could potentially result from public authorities planning for and issuing permits etc. for concrete projects that will be possible after publication of the amended MSP. The potential impacts on birds'

migration routes, overwintering areas, resting areas and feeding grounds from these pressure factors will be assessed in the proposed amendment based on a number of scenarios for the expansion of designated areas for renewable energy. The assessment will take account of the overall level of detail of the MSP based on information on major migration routes and feeding grounds for birds listed in Annex I to the Birds Directive, as well as important overwintering areas for sea birds. Objectives for safeguarding the interests of sea birds in relation to displacement and possible coexistence are also included in the SEA of the MSP.

Finally, it is likely that designating new zones for the establishment of many offshore wind farms will have an impact on the marine climate and climatic processes. Large-scale offshore wind farms can have an impact because of the effect on the wind speed and force, whereby the turbines “take power out of the wind” and indirectly affect wave formation out at sea. To the extent that it is possible to assess this effect, it will also be included in the environmental report.

Bats

Bats are protected and are covered by the Habitats Directive. Bats can collide with wind turbine blades. In the worst case, this could have a significant impact on bat populations passing through or living in the area around the planned development zones for renewable energy, if these areas are designated for wind turbines.

Collisions with wind turbines could present a threat to bats if wind farms are established in bats’ migration corridors. The risk of bats colliding with offshore wind turbines is low, as bats generally stay close to the coast. However, migrating bats have been observed at a distance of 22 km from the coast (Sjollema et al. 2014).

The majority of the areas which are expected to be designated as development zones for renewable energy in the amended MSP will not be in coastal areas, so the publication of the amended MSP will not have any significant impact on bats.

Fish

After the publication of the amended MSP, activities that could affect fish may still be permitted. It is not impossible that the pressure factors that could have a possible significant effect on fish populations will still be permitted in the form of the physical presence of structures, changed bottom conditions, poorer water quality and oxygen loss (see also section 2.5.1 on Bottom fauna. Apart from physical changes in the environment, fish may also be affected of water quality, including local oxygen levels and emissions of hazardous substances (see also section 2.5.4 Water).

The amendments to the MSP are expected to mean that include that further areas will be kept free from fixed installations that could affect the fish populations that lay eggs on the seabed. Fish will therefore be included in the assessment of biodiversity, flora and fauna in the SEA.

The SEA will take account of the overall level of detail of the MSP on the basis of best available knowledge on major spawning and breeding grounds for fish. The assessment is based on available information from literature at databases and from the Danish Fisheries Agency's fisheries statistics.

It also takes a high-level view on the basis of best available knowledge of potential emissions of nitrogen and hazardous substances in the designated zones. The assessment will be based on the environmental status within the designated zones and their sensibility to nitrogen (for example, sensitive areas include eel grass beds and stone reefs and areas with limited currents).

Marine mammals

Cetaceans, including harbour porpoises, are strictly protected as they are listed on Annex IV to the Habitats Directive. Seals and harbour porpoises are furthermore protected in several Natura 2000 areas, whereas they provide a part of the basis of the appointment of protection.

Harbour porpoises are particularly sensitive to underwater noise, and it has been shown that this can result in hearing impairment (Southall et al. 2007), flight behaviour (Däne et al. 2013, Thompson et al. 2010, Tougaard et al. 2009) or communication problems (Tougaard 2014) in harbour porpoises. This is assessed further in the SEA under cumulative effects.

It is not impossible that, after the designation of zones in the amended MSP for different purposes and projects, it will still be possible to issue permits to establish activities which could affect marine mammals, and so this will be addressed further in the SEA. In the SEA the designated areas will be assessed at a general level based on knowledge of relative density of harbour porpoise populations and the importance of feeding grounds for common seal and grey seal.

The SEA will also focus on the cumulative effects of the designation of zones in the amended MSP.

Invasive species

In the amended MSP, zones are designated in which authorities can still issue permits for activities that could potentially introduce invasive species into the Danish marine environment. However, these effects were previously assessed in the SEA of Denmark's first marine spatial plan.

In view of this, it is felt that the amendments to the MSP will not result in any increased risk of introducing invasive species into the Danish marine area. The issue will not be addressed further in the SEA.

Internationale nature protection areas

The EU's nature protection directives include the Birds Directive and the Habitats Directive. All Danish Ramsar areas on the list of wetlands of international importance are covered by or coincide with EU bird protection areas and are therefore subject to the same protection.

Natura 2000 sites are internationally protected nature areas, which are designated for a number of species and habitats. It is not impossible that the MSP could have a significant impact on habitats and species for which Natura 2000 sites have been designated. It is also possible that other parts of the amended MSP could affect habitats and species in Natura 2000 sites. The impact on international nature protection areas will be assessed in the SEA.

Other nature protection areas

The areas classified as nature and environmental protection areas in the amended MSP are marine areas designated for protection and ~~strict protection~~ in the programme of measures in the Danish Marine Strategy, as well as national marine conservation areas. The nature protection areas are designated in the programme of measures in the Danish Marine Strategy pursuant to the Marine Strategy Directive for the conservation of a good marine environment in the future.

Other protected areas will be assessed in the SEA of the amended MSP.

Magnetic fields

Magnetic fields will form around all power cables, which could potentially affect marine mammals and fish. Subsea cables typically carry direct current (DC), which means that the current runs in one direction only. The EIA for COBRACable, for example, showed that the magnetic field around a static power cable similar to COBRACable is of the order of 7 μT on the seabed (Danish Nature agency 2015). For comparison, the Earth's own magnetic field in Denmark is 50 μT , and so many times greater than the magnetic field around the cable.

Static fields are generally not suspected of causing environmental impacts and the effect on the marine fauna is considered to be insignificant.

In contrast to DC cables, fish can detect electric and magnetic fields around AC installations, but as AC is rarely used for subsea cables over long distances, magnetic fields are not considered to have any significant impact on fish. Nor are there any sources to suggest that electromagnetic fields impede fish migrations. The issue will not be addressed further in the SEA.

2.5.2 Population and human health

Shipping and safety of navigation

The designation of development zones will take account of designated shipping corridors in the MSP. One purpose of this is to improve the safety of navigation.

It is expected that further shipping corridors will be designated in the amended MSP, to be kept free from fixed installations. There is not expected to be any significant environmental impact on shipping as a result of changes to the overall spatial planning for area use in the marine areas. The safety of navigation is therefore not assessed further on the SEA.

Fishing

The amendments to the MSP do not entail any restrictions on fishing. Any future restrictions on fishing will be linked to permits issued for the establishment of permanent installations which require safety zones to be defined around them. Whether and to what extent this will arise will depend on the economic development of the individual sectors. The current plans for developing offshore wind will involve constructing more permanent installations at sea that require safety zones to be established. However, the number of these permanent installations is not expected to have a significant impact on fishing.

Fishing is therefore not included as a separate part of the environmental factor relating to population.

Recreational interests

Recreational interests at sea include sailing, fishing, surfing, rowing and diving. The designation of areas for general use is expected to support the use of the areas for recreational purposes but the amended MSP is not expected to designate areas for recreational purposes only.

Recreational interests will not be assessed further in the SEA of the MSP.

2.5.3 Soil and land areas

The amendments to the MSP are not expected to have any impact on the soil. The effect on the seabed is assessed in section 2.5.1. Soil and land areas will not be assessed further in the SEA.

2.5.4 Water/water quality

Pollution

The environmental factor water includes surface water, groundwater and seawater. The water quality depends to a large extent on the clarity of the water, which is determined by the levels of nitrogen and organic material. Sediment dispersion is discussed in section 2.5.1. Water quality also depends on the levels of pollutants and hazardous substances. Oil and gas exploitation and shipping are the primary sources of emissions of pollutants and hazardous substances at sea, while aquaculture is the primary source of emissions of nitrogen from activities at sea.

Aquaculture emits nitrogen, phosphorus and organic material and so contributes to pollution and potential loss of oxygen, especially in coastal waters. The adoption of the amended MSP sets out the spatial framework within which authorities can issue permits and adopt plans for e.g. aquaculture, but the amendments to the MSP do not change whether an authority can issue a permit under sectoral laws or adopt plans in accordance to other legislation in areas that are designated for that activity.

It is not impossible that the overall spatial planning for area use in the marine areas could affect the concentrations of nitrogen, phosphorus and organic

material in locally defined (coastal) parts of the marine area with limited and/or sub-optimal flow conditions. The issue will therefore be included in the SEA.

The SEA is based on existing knowledge where the likely impact on local biological and hydrographic conditions and targets for these are assessed on the basis of different scenarios for the use of the development zones expected to be designated for aquaculture in the MSP.

The change in the overall spatial planning for area use in the marine areas does not bring any increase in shipping and so will not increase emissions of hazardous substances into the sea. Emissions of hazardous substances from shipping will not be assessed further in the SEA. On the other hand, emissions of hazardous substances may be included as part of the cumulative impacts.

2.5.5 Air

Emissions into the air from e.g. flaring and shipping are regulated internationally through the Gothenburg Protocol and the EU Directive on emission ceilings (the NEC Directive 2001/81/EC). This sets emission ceilings that Denmark has to comply with.

Apart from emitting CO₂, which is a greenhouse gas (GHG), shipping may be associated with emissions of polluting air particles such as sulphur oxides (SO_x) and nitrogen oxides (NO_x). The amendments to the MSP will not affect the amount of shipping and will therefore not be assessed further in relation to the impact on the air from shipping will therefore not be assessed further in the SEA of the MSP.

Emissions of CO₂ from all activities in the marine area are addressed under Climatic factors.

2.5.6 Climatic factors

Renewable energy

Production of renewable energy could potentially replace other sources of energy which pollute the air and water and emit CO₂. A sufficient number of designations of development zones for sustainable energy can contribute to implementing the political agreement for more offshore wind from May 2023 and thereby have a significant positive impact on the climate. Climatic factors will therefore be assessed further in the SEA.

Along with emissions of CO₂ from activities, the marine area may also absorb CO₂ from the atmosphere. However, the changes to area designations in the MSP are not expected to affect the general capacity of the marine area to absorb CO₂. The CO₂ uptake capacity of the marine area is therefore not covered in the SEA.

In the SEA climatic factors are assessed on the basis of different scenarios for the expansion of developments zones for renewable energy and the extent to which these scenarios could contribute to a reduction in the total emissions of CO₂ and so help to achieve the goal of reducing Denmark’s CO₂ emissions, with a positive impact on climatic factors.

The amendments to the MSP designate a number of areas for future storage of CO₂ in the geological formations on the seabed. The impact from these activities could in itself cause emissions of CO₂ from e.g. increased ship traffic from the port to the storage location. However, this impact is expected to be minimal compared to the reduction in CO₂ emissions from activities in Denmark which will now enable the capture and storage of CO₂. An assessment of the impact from these activities will therefore be included in the SEA.

2.5.7 Material assets

In this context, material assets are man-made and natural assets that provide a basis for exploitation, whether the exploitation involves acquiring resources or using an area for a specific purpose, e.g. recreational use. In the SEA the impact of the material assets listed below will be assessed further:

Table 2-2 Material assets included in the SEA of amendments to the Danish MSP

Material assets included in the SEA of Denmark’s MSP
Natural:
Rock, sand and gravel
Fish and shellfish
Recreational use of areas
Shipping
Geological formations for CO₂ storage
Offshore wind resources
Biodiversity
Man-made:
Pipelines
Cables
Wind turbines and other renewable energy infrastructure
Infrastructure (bridges/tunnels)
Aquaculture

The SEA of the MSP distinguishes between natural and man-made material assets.

Natural resources include – as shown in Table 2-2 – rock, sand and gravel used as raw materials, populations of fish which can be caught and recreational use of marine areas. Even though wind is not a physical material asset, wind will be

included in the SEA as wind can potentially be transformed into electricity. Man-made material assets include offshore physical installations and artificially established aquacultures.

The focus of the SEA will be on the designation of areas in the amended MSP which could create possible conflicts of interest. Potential conflicts may arise where the planned use prevents some other use of the area (e.g. wind turbines could be an impediment to fishing or the extraction of natural resources from the seabed). Other types of conflict could arise where activities that can still be permitted after the amendments to the MSP affect the value of other material assets, such as a coastal wind farm affecting the price of holiday cottages and/or homes, tourism or recreational interests. Coastal areas are also expected to be kept largely free from physical installations, which could sustain a significant positive impact on the recreational use of coastal areas.

An assessment of the impact of the amended MSP on material assets will be included in the SEA.

2.5.8 Natural resource consumption

Future construction activities may require increased consumption of natural resources, including major backfill operations such as the expansion of Holmene in Hvidovre and the construction of Lynetteholmen in Copenhagen, and the establishment of energy islands. The amended MSP designates development zones for renewable energy and energy islands, in which authorities can plan for and issue permits etc. for the establishment of energy islands.

The expected impact of natural resource consumption from the designation of zones in the MSP was evaluated as part of the SEA of Denmark's first MSP (2021). The amendments to the MSP designate only slightly more areas for natural resource extraction. Extraction will also be limited to a few already designated areas with depths of less than 6 metres. There is not therefore expected to be any separate impact from the amendments to the MSP.

Natural resource consumption will not therefore be included in the SEA of the amended MSP.

2.5.9 Landscape

Visual conditions

Some installations at sea can be seen from land and so affect the visual experience of the marine area from the shore. The amended MSP designates development zones for sustainable energy in which authorities can still issue permits for installations including wind turbines. On the other hand, some areas will be kept free from wind turbines or other renewable energy infrastructure. It is not impossible that permits could continue to be issued after the amendments to the MSP for e.g. wind turbines, which could affect the visual conditions. Given the distance from the coast and coastal areas, these effects will be so limited

that they are not expected to be significant.

Landscape and visual impacts will therefore not be assessed in the SEA of the amended MSP.

2.5.10 Cultural heritage, including churches and their surroundings and architectural and archaeological assets

Marine archaeology

For the first time, the amended MSP designates several smaller zones for marine archaeology and cultural heritage. These zones could lead to increased recreational use of the areas in the form of possible future dive tourism. The impacts from human activities from the establishment and later use of these areas will be included in the environmental report.

Marine archaeology and cultural heritage under the sea will therefore be included in the SEA of the amended MSP.

2.5.11 Major man-made and natural disasters

At a general level, the designation of areas for specific uses could potentially provide a basis for determining which activities are being carried out in a given area and thereby improve the consideration given to the different users of marine areas and resources.

There is not thought to be any significant impact on the environment from the general risk arising from the amendments to the MSP.

Major man-made and natural disasters will therefore not be assessed in the SEA.

2.5.12 Resource efficiency

The designation of a significant areas for renewable energy, in which it will still be possible to issue permits etc. for the exploitation of wind power and establishment of energy transmission lines to transport and distribute the energy from the production sites to costumers, will ensure that the MSP supports the possibility of a substantial increase in resource efficiency.

Maritime spatial planning can in itself serve as a tool for promoting sustainable management and effective use of natural resources. So it is possible that the amendments to the MSP could have a significant positive impact on resource efficiency.

Resource efficiency will therefore be assessed in the SEA at an overall level. In the SEA goals and objectives for resource efficiency will be evaluated against the proposed designation of development zones for renewable energy and zones for

cable corridors, zones for nature and environmental protection and general utilisation zones arising from the amendments to the MSP.

2.5.13 Cumulative effects

As a part of the SEA, an overall assessment of the cumulative impact on the environment from the proposed amendment to the MSP allowing parts of the marine area to be used or various activities will be carried out. The environmental report will focus on the effects that run across activities or derive from a development where multiple zones are designated for the same purpose, including across national borders. There will also be an emphasis on evaluating the cumulative impact of the amendments to the MSP and the published plan.

The designation of zones in the MSP and resulting restrictions and continued scope for activities could have impacts of a cumulative nature in the relationships described below:

- > Cumulative effects where several activities of the same type may still be permitted within the same geographical area
- > Cumulative effects where different types of activity which have the same effect on the environment may still be permitted
- > Cumulative effects where different types of activity which have different effects may still be permitted
- > Cumulative effects resulting from cross-border activities may still be permitted

The designation of areas in the amended MSP for the development of fixed installations, which include the possibility for the authority to issue permits etc. that could potentially have a blocking effect on birds’ migration routes and displace resident birds and marine mammals. This development must be seen in conjunction with other countries’ plans to designate areas for activities and fixed installations in their territorial waters.

Table 2-3 summarises the possible cumulative effects to be assessed in the SEA.

Table 2-3 Overview of cumulative effects to be assessed in the SEA of the amended MSP.

Cumulative effect	Planned use
Blocking of birds’ migration routes	Infrastructure (bridges), renewable energy
Displacement of sea birds and marine mammals	Renewable energy and cumulative effect with other human activities
Emissions of greenhouse gases	Shipping

Pollution of the sea	Aquaculture
Accidents	Infrastructure (bridges/tunnels), energy, navigation corridors, infrastructure (aviation)
Underwater noise (seismic and piling works)	Energy (renewable), CO ₂ storage, natural resource extraction
Visual changes	Energy (renewable), infrastructure (bridges/tunnels), aquaculture
Changes to the seabed	Energy, infrastructure (bridges/tunnels), aquaculture (oyster and mussel beds)

Cumulative effects of the MSP are therefore included in the SEA.

3 Overview of potential effects

Table 3-1 provides a summary of all the environmental issues and the potential impact on them, as discussed in section 2.5.

Table 3-1 Overview of environmental issues and the potential impact on them

Environmental issue	No or insignificant effect	Significant impact cannot be ruled out
Biodiversity, flora and fauna		
Seabed (biotopes)		X
Impact on wave formation		X
Natura 2000		X
Marine mammals		X
Bats	X	
Birds		X
Fish		X
Eel grass	X	
Invasive species	X	
Internationale nature protection areas		X
Other nature protection areas		X
Population and human health		
Shipping and safety of navigation	X	
Recreational interests	X	
Soil and land areas		
Soil	X	
Land	X	
Water		
Pollution		X
Impact on marine processes from changes in wave formation		X
Air		
Air particles	X	
Climatic factors		
Renewable energy		X
Greenhouse gases		X
Material assets		
Waste	X	
Aquaculture (fish farms)		X
Aquaculture (oyster and mussel beds)		X
Aquaculture (cultivation of mussels in the water column)		X
Aquaculture (seaweed)		X
Energy (oil/gas)		X
Energy (renewable)		X
Fishing		X
Gas pipelines		X
Recreational use		X

Natural resource extraction		X
Shipping		X
Increased insurance premiums		X
Transport infrastructure		X
Tourism		X
Wind resources		X
Landscape		
Visual conditions		X
Light	X	
Cultural heritage		
Marine archaeology		X
Major man-made and natural disasters		
Accidents at work	X	
Plane crashes	X	
Oil spills	X	
Unexploded ammunition (UXO)	X	
Resource efficiency		
Materials for construction	X	
Energy (assessed under climatic factors)		X
Cumulative effects		
Waste	X	
Barrier effects (birds, marine mammals, fish)		X
Electromagnetic fields		X
Greenhouse gas emissions		
Displacement/habitat loss		X
Pollution		X
Physical pressure from installations		X
Invasive species	X	
Collision risk	X	
Airborne noise		X
Magnetic fields	X	
Oil spills	X	
Permanent change in hydrographic conditions		X
Sediment dispersion		X
Accidents		X
Underwater noise		X
Visual changes	X	
Changes to the seabed		X

3.1 Assessment criteria, indicators and data needs

Table 3-2 suggests several criteria and indicators for use in assessing the likely significant impacts on the environment identified in section 2.5. The table also

provides an overview of the data needed to carry out the SEA of Denmark's first MSP.

Table 3-2 Environmental factors, assessment criteria, indicators and data needs If a specific data need is not covered, the SEA will be based on a qualitative expert assessment.

Assessment criterion	Indicator	Base data
Biodiversity, flora and fauna		
Effect on bottom fauna (biotopes)	Extent of possible effects on areas with stone reefs, biogenic reefs, sandbanks and cold seeps.	Known stone reefs, mussel beds, sandbanks and cold seeps, bays and coves. Overview of bottom substrates
Impact on area of distribution for birds listed in the Birds Directive, Annex I	Extent of possible impact on distribution areas for birds listed in Annex I Extent of possible blocking of migration routes for birds listed in the Birds Directive, Annex I.	Resting areas for migrating birds listed in Annex I. Overwintering areas for sea birds. Important feeding grounds for breeding sea and coastal birds. Known migration routes for birds listed in Annex I.
Impact on fish populations	Extent of possible impact on spawning grounds for table fish Extent of possible impact on water quality in growth areas for fish. Extent of possible impact on the area of distribution for table fish Possible impact on migration routes for fish.	Identified spawning and growth areas for fish. Incidence of table fish Information on potential emissions of nitrogen and hazardous substances.
Impact on populations of harbour porpoise Impact on populations of grey seal and common seal Impact on cetaceans	Extent of possible impact on the presence of harbour porpoises in their area of distribution Extent of possible impact on the occurrence of grey and common seals and cetaceans in their area of distribution	Incidence of harbour porpoises Incidence of grey seal and common seal and cetaceans
Impact on nature and environmental protection areas	Extent of possible impact on nature and environmental protection areas, including international protection areas and areas designated for protection in the programme of measures in the Danish Marine Strategy,	Mapping of areas designated under the Birds Directive and the Habitats Directive. Mapping of areas designated for protection in the programme of measures in the Danish Marine Strategy.

	and marine conservation areas.	Mapping of national marine conservation areas.
Impact on wave formation	Extent of possible indirect impact on biodiversity	Extracts from existing studies
Water		
Impact on water from emissions of nitrogen and hazardous substances Impact on marine processes from changes in wave formation	Extent of possible impact on water quality. Assessment of different scenarios for local biological and hydrographic conditions and goals for these Impact of potential emissions of nitrogen and incidence of nutrients and hazardous substances. Extent of the impact on marine processes from changes in wave formation	Qualitative
Climatic factors		
Reduced emissions of CO ₂ and other greenhouse gases	Possible impact of changes in CO ₂ emissions	Expected production (GW) of renewable energy in planned areas. Targets for reducing CO ₂ emissions.
Material assets		
Impacts on material assets and conflicts of interests between planned use and other use(s). Impacts from nearby wind turbines from reduced wind force in the "shadow" of large wind farms	Assessment of possible impact resulting from potential economic losses and loss of social value from planned area use. Impact of nearby wind turbines from reduced wind force in the "shadow" of large wind farms	Fisheries statistics Tourism statistics Wind patterns Intensity of recreational interests Existing assessments of large-scale shadow effects
Resource efficiency		
Impact on resource efficiency from designating zones for renewable energy	Assessment of expected efficiency gains and exploitation of marine areas and resources.	Qualitative
Cumulative impacts		
Impacts on		

<ul style="list-style-type: none"> > nature protection areas > biodiversity > aquatic environment > Material assets 	<p>Assessment of the extent of the impacts</p>	<p>The methodological approach taken will allow an impact zone to be determined and assessed on the basis of international experience.</p>
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3.2 Objectives and goals included in the SEA

From a review of laws, strategies and action plans which might include goals and objectives and guidelines relevant to the assessment of environmental impacts, the following objectives in Table 3-3 have been identified as relevant to the SEA.

Table 3-3: Objectives and goals relevant to the SEA.

Source	Objectives
<p>Directive 2014/89/EU of the European Parliament and the Council of 23 July 2014 establishing a framework for maritime spatial planning</p> <p>(Implemented by Danish Act no 615 of 8 June 2016 on Maritime Spatial Planning, as amended)</p>	<p>To promote economic growth, development of marine areas and sustainable use of marine resources, by applying an ecosystem-based approach.</p> <p>To promote the coexistence of different relevant activities and uses, taking account of the interaction between land and water.</p> <p>To strengthen cross-border cooperation, especially between EU Member States bordering on the same marine areas.</p>
<p>EU Habitats and Birds Directives</p>	<p>Requirement to achieve a favourable conservation status for designated habitats and species, and to maintain the integrity of the designated areas</p>
<p>Denmark’s Marine Strategy II</p>	<p>Environmental goals and associated descriptors with targets to achieve or maintain good environmental status in the marine environment by 2020.</p>
<p>Danish Climate Act 2019</p>	<p>Reduction in greenhouse gases (by 70%) by 2030</p>
<p>UN Sustainable Development Goals</p>	<p>SDG 7: Affordable and clean energy, including target 7.2: By 2030, increase substantially the share of renewable energy in the global energy mix.</p> <p>SDG 13: Climate Action, including target 13.2: Integrate climate change measures into national policies, strategies and planning.</p>

	SDG 14: Life below water, including target 14.2: By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans.
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The designation of development zones for renewable energy might also have an effect on the implementation of EU's Roadmap to a Resource Efficient Europe⁴.

⁴ Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: Roadmap to a Resource Efficient Europe, COM/2011/0571

4 Monitoring of amendments to the Danish MSP

According to Section 12(4) of the Environmental Assessment Act, the environmental report should include a description of the planned measures for monitoring the possible environmental impacts of the amendments to Denmark's MSP. The monitoring will allow us to assess whether the proposed changes will produce the impacts on the environment projected in the SEA.

As part of the SEA, it will be determined whether a separate programme for monitoring the environmental impacts should be established or whether this can be done through existing monitoring activities.

5 References

- Brandt M.J., A.C. Dragon, A. Diederichs, M.A. Bellman, V. Wahl, W. Piper, J. Nabe-Nielsen, G. Nehls (2018). Disturbance of harbour porpoises during construction of the first seven offshore wind farms in Germany. *Mar. Ecol.Prog.Ser.* Vol 596:213-232.
- Däne M. et al (2013). Effects of pile driving on harbour porpoises (*Phocoena phocoena*) at the first offshore wind farm in Germany. *Environmental Research letters* 8: 025002.
- DMU (National Environmental Research Institute of Denmark) (2006). Havvindmøllers effekter på miljøet (Environmental impact of offshore wind turbines). Danish Energy Agency DMUNyt Year 10, no. 16 - 15 December 2006
- Krijgsveld K.L., Akershoek K., Schenk F., Dijk F., Dirksen S (2009) Collision risk of birds with modern large wind turbines. *Ardea - Wageningen*.
- Madsen P.T., Wahlberg M., Tougaard J., Lucke K., Tyack P. (2006) Wind turbine underwater noise and marine mammals: implications of current knowledge and data needs. *MEPS*: 309: 279-295
- Danish Nature Agency (2015) Environmental Impact Statement. COBRACable. Maj 2015. Produced by Energinet.dk and NIRAS.
- Danish Nature Agency and Danish Energy Agency (2014) Horns Rev 3 wind farm - Environmental impact statement and environmental report. Produced by Orbicon
- Petersen, J.K. (ed.) (2018). Menneskeskabte påvirkninger af havet: Andre presfaktorer end næringsstoffer og klimaforandringer (Man-made impacts on the sea; other pressure factors than nutrients and climate change). DTU Aqua-rapport nr. 336-2018. Department for Aquatic Resources, Technical University of Denmark. 118 pp. + annexes.
- Sjollema A.L., Gates E., Hilderbrand R.H., Sherwell J. (2014) Offshore activity of bats along the mid-Atlantic coast. *Northeastern naturalist* 21(2): 154-163
- Thompson et al. (2010). Assessing the responses of coastal cetaceans to the construction of offshore wind turbines. *Marine Pollution Bulletin* 60: 1200-1208.
- Tougaard et al (2009). Pile driving zone of responsiveness extends beyond 20 km for harbour porpoise (*Phocoena phocoena* (L)) *Journal of the Acoustical Society of America* 126: 11-14.
- Tougaard, J. (2014). Vurdering af effekter af undervandsstøj på marine organismer. Del 2 – Påvirkninger. (Assessment of the effects of underwater

noise on marine organisms). Part 2 – Impacts. Aarhus University, DCE – Danish Centre for Environment and Energy, 51 p. - Technical report from DCE - Danish Centre for Environment and Energy no 45.