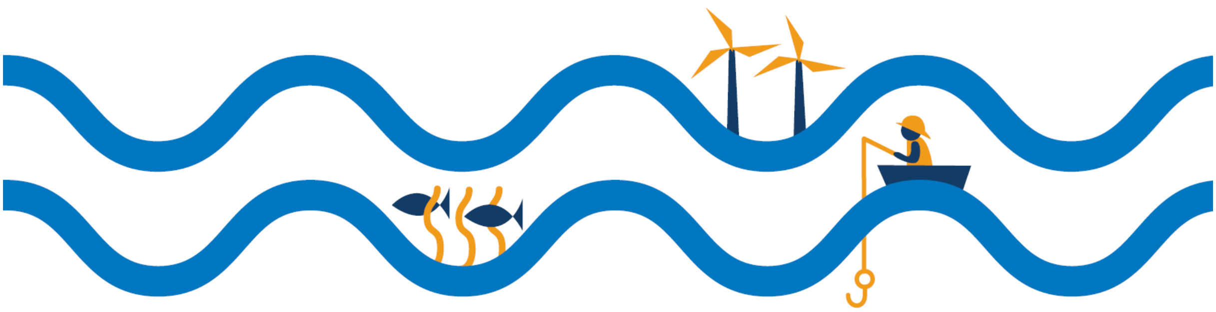
ESTONIAN MARITIME SPATIAL PLAN

IMPACT ASSESSMENT REPORT

The maritime spatial plan is a tool for the long-term plan of the use of the sea in order to ensure both the economic benefits of the use of marine resources and the value of the sea and the coast as a socially and culturally important area.

The maritime spatial plan takes into account the fact that any human activity is based on the achievement and maintenance of good status of the marine environment.



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INTRODUCTION

This Impact Assessment (hereinafter IA) is being carried out for the Estonian Maritime Spatial Plan. The preparation of the Estonian Maritime Spatial Plan and the IA of the plan has been initiated by the Government of the Republic Order No. 157 of 25 May 2017. The aim of the MSP is the long-term planning of the use of the Estonian marine space, which takes into account social, economic, cultural as well as environmental impacts and needs in a balanced way.

The overall objective of the Strategic Environmental Assessment (SEA) is to take environmental considerations into account in the preparation and implementation of the plan, thereby ensuring a high level of environmental protection and promoting the principles of sustainable development. Well-established common practices, supported by the SEA Directive and Estonian legislation, is rather a natural environment-centered approach. However, the impact on the social (including health), cultural and economic environment is also important when implementing plans. Therefore, the so-called **Extended Impact Assessment** is carried out on the Maritime Spatial Plan, i.e., the MSP impact assessment process integrates the SEA with the assessment of the social, cultural, and economic impacts.

The plan and IA have been prepared by OÜ Hendrikson & Ko (chief expert Riin Kutsar, chief planner Pille Metspalu) in cooperation with the experts of the University of Tartu, Estonian Marine Institute of the University of Tartu, Centre for Applied Social Sciences of the University of Tartu, Tallinn University, MTÜ Hiiu Purjelaeva Selts and OÜ Roheline Rada (OÜ Hobikoda). In addition, the entire plan and IA were prepared together with several good partners such as the Estonian Ornithological Society, Estonian Fund for Nature, Praxis, Department of Marine Systems of Tallinn University of Technology, Tallinn University of Technology, MTÜ Eesti Merebioloogia Ühing, MTÜ Pro Mare, Artes Terrae, etc. The Ministry of Finance organizes the preparation of the plan and the impact assessment and the Government of the Republic establishes it.

1 PURPOSE AND NATURE OF THE ESTONIAN MARITIME SPATIAL PLAN

The Maritime Spatial Plan is a tool for long-term planning of the use of the sea. The aim of maritime spatial planning is to agree on the principles of the use of the Estonian marine area in the long term in order to attain and maintain a good status of the marine environment and to promote the maritime economy.

The plan under assessment is a national level strategic document guiding the spatial development of the marine area. The plan addresses the long-term vision of the Estonian marine area, defines the principles of spatial development, and provides general guidelines and conditions for the use of the marine area. Interconnections with the land include functional links between the sea and the land, such as ports and cables for prospective cooperation. The guidelines for land-based spatial planning are provided to help ensure that the plan is feasible. The MSP does not impose binding conditions on land.

The Estonian maritime spatial planning focuses on the combined use of the marine area and new uses of the sea. For traditional uses, such as fishing, maritime transport, the rules of using the sea are already well established and do not require significant additional regulation. Guidelines for all uses are provided to accommodate new uses of the sea into the marine space.

Among the new uses of the sea, the maritime spatial plan determines the basic spatial locations of the wind energy development areas together with the necessary infrastructure objects outside the wind energy development areas. Preservation areas for underwater cultural heritage will also be established as new spatial locations. In order to direct aquaculture areas, the plan sets out the information on areas with suitable growth potential for shellfish and algae cultivation and defines areas that are not suitable or excluded from the plan for this activity. In case of aquaculture areas (fish farming, shellfish and algae farming), the plan sets clear guidelines and conditions for development activities. Other uses of the sea are not defined as spatially binding areas.

The Maritime Spatial Plan is the basis for issuing superficies licenses and environmental permits determining the more precise use of the sea (hereinafter referred to as license). The lifespan of the maritime spatial plan and its use have been considered as a basis for spatial development of approximately 15 years, ie until 2035.

2 IMPACT ASSESSMENT METHODOLOGY

2.1 THE ECOSYSTEM-BASED APPROACH

The principle that the Maritime Spatial Plan must be based on an ecosystem-based approach has been internationally recognized in recent years. The EU Maritime Spatial Planning Directive also states that the Member States shall apply the ecosystem-based approach to the establishment and implementation of the Maritime Spatial Plan (Article 5 (1)).

The principle of the ecosystem-based approach in the Baltic Sea Region has been embodied in the guidance documents of the HELCOM VASAB MSP Working Group and in the framework of the Baltic Scope project.

The guidance material is titled "The Ecosystem-Based Approach in the Maritime Spatial Plan – A Checklist Toolbox" and guidelines for the aforementioned project implementation in Estonia, drafted in the framework of the Baltic Scope project,[1] highlights the following:

1) Maritime Spatial Planning must become the basis for directing economic and other activities at sea to avoid conflicts between different sectors and to ensure the sustainable use of marine areas and the preservation of the marine environment.

The planning process and the impact assessment shall be carried out simultaneously, taking into account as far as possible the environmental impact, including socio-economic, cultural, and health impact, of the implementation of the plan, in order to ensure sustainable and balanced spatial development.

2) Because the marine environment offers a wide range of benefits to mankind, environmental activities are largely horizontal in spatial planning, meaning that other areas must be planned in an environmentally sensitive way. Taking into account the marine environment is the only way to ensure the development of a sustainable maritime economy.

This comprehensive impact assessment provides an important input for the implementation of the ecosystem-based approach to Maritime Spatial Plan (see Chapter 4 for more details), the most important part of which is, among other things, the environmental considerations set out in the framework of the strategic environmental impact assessment and their consideration in the implementation of the planning solution.

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[1] Implementation of the Marine Strategy Framework Directive in Maritime spatial Planning, Estonian Marine Biological Society 2018

3) As the sea is very dynamic in nature and knows no national borders, such horizontal impacts should be considered for the Baltic Sea as a whole and not separately for all countries. Therefore, Member States should, wherever possible, respecting international law and conventions, cooperate with the third countries concerned in the relevant marine areas.

In the preparation of the Maritime Spatial Plan, the potential transboundary impact was also assessed (see Chapter 4.9), and international cooperation with several countries took place. An important role is also played by the ongoing Baltic Sea projects and international seminars where the Ministry of Finance will introduce the Estonian Maritime Spatial Plan process (e.g., Pan Baltic Scope, BalticRIM, LandSeaAct, The Gulf of Finland Science Days, MSP Global Conference, Connecting Seas Conference, etc.). More specifically, cooperation and inclusion are discussed in Chapter 5.

In addition, Chapter 4.8 of the Impact Assessment Report - Cumulative impacts - has assessed the planned impacts of the Maritime Spatial Plan in conjunction with, for example, the proposed wind energy development areas in the Latvian maritime area.

4) The Maritime Spatial Plan must be based on an ecosystem-based approach. An important measure to ensure integrated ecosystems is to support Blue Sea Economy initiatives during the Maritime Spatial Plan. An ecosystem-based approach gives priority to protecting marine ecosystems while recognizing the need for society to maximize the profit from the use of marine resources. The Blue Growth Strategy emphasizes the need to harness untapped marine resources (such as seaweed and shellfish) for the creation of new jobs and economic growth, while protecting biodiversity and preserving the ecosystem services that our healthy marine and coastal ecosystems provide.

So far, knowledge on the management of the Blue Economy has been inadequate, and as a result of the impact assessment, areas suitable and unsuitable for the development of aquaculture have been proposed, taking into account existing knowledge and studies. A study has been carried out on marine areas suitable for growing shellfish and/or algae[2], and a model has been created for the economic benefits from the exploitation of marine resources, including aquaculture (The Marine Economic Benefit Model)[3]. In 2019, KAUR commissioned a survey to develop a methodology for evaluating the benefits of selected marine ecosystems and to model the maps of their ecosystem benefits

[2] Identification of areas suitable for invertebrate and algae cultivation, Estonian Marine Institute, University of Tartu 2016

[3] Estonian economic model: The Marine Economic Benefit Model (Model of Economic Profit, Costs and Benefits of Using Marine Resources to Assess Current Economic Activities in the Marine Area), Praxis Center for Policy Studies 2017

to the entire Estonian marine area[4]. On the basis of this work, the Marine Economic Benefit Model was complemented by ecosystem services (PlanWise4Blue)[5].

The HELCOM / VASAB Ecosystem-Based Approach Guide[6] outlines a number of principles that must be followed when drafting the Maritime Spatial Plan and conducting Impact Assessment to ensure an ecosystem-based approach.

1) **Taking account of environmental objectives, maintaining and achieving good environmental status, and the precautionary principle**. The overall objective is that the Maritime Spatial Plan ensures the long-term good environmental status of the marine area, and thus the precautionary principle should be used when planning activities and assessing impact. Activities that, according to current scientific knowledge, are expected to have a significant impact on the marine ecosystem, and the impact of which may not be sufficiently predictable at present or in certain parts, will require additional specific research and risk consideration at subsequent planning stages or at a project level.

During the preparation of the plan, both the planning and impact assessment expert group have worked closely together to avoid significant adverse environmental impacts at the earliest possible stage of strategic planning, i.e. to select suitable development areas for the new uses of the marine area and to avoid key wildlife sensitive areas, proceeding from the prevention and precautionary principle. At the strategic level it provides assurance that sensitive areas and issues have been taken into account and that preventive mitigation measures have been put in place to prevent potential adverse effects at the next level of authorization and to avoid conflicts between different uses of the sea and reduce environmental risks. Where appropriate, recommendations for the implementation of monitoring measures will be provided by the expert group.

The sensitivity mapping methodology[7] recommended by the European Commission has been used in the development of the planning solution and impact assessment. The methodology has been described in more detail both in the explanatory memorandum to the planning solution (Chapter 5.6.2) and in

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[4] Base analysis for Selected Ecosystem Services in Marine Areas (commissioned by KAUR), OU Hobikoda, 2019

[5] Nõmmela, K, University of Tartu CASS; Kotta, J., OÜ Hobikoda; Piirimäe, K., OÜ Roheline Rada Supplementing the model of economic benefits from the use of marine resources with ecosystem services; Commissioned by Ministry of Finance, 2019 (https://www.rahandusministeerium.ee/et/system/files_force/document_files/mudeli_taiendamine_okosusteemiteenustega_aruanne.pdf)

[6] Guideline for the implementation of ecosystem-based approach in Maritime Spatial Planning (MSP) in the Baltic Sea area, 2016

[7] *THE WILDLIFE SENSITIVITY MAPPING MANUAL. Practical guidance for renewable energy planning in the European Union;* https://circabc.europa.eu/sd/a/6a1d06ae-ef34-478a-a322-006b09079efb/20200429%20WSM%20Manual.pdf

Chapter 2.3 of the Impact Assessment below (also throughout Chapters 4.2 and 4.3 of the Impact Assessment).

All environmental protection principles were applied in the development of the maritime spatial plan and impact assessment, including the prevention and precautionary principles, resulting in the elimination of overlaps with Natura 2000 sites for new marine uses, such as wind energy development areas and fish farms, already at the current strategic level (including protected marine areas of nationally protected natural objects overlapping with Natura 2000 sites). The application of the prevention principle to preserve and achieve the state of the environment is more effective than implementing the precautionary principle.

Therefore, the prevention principle was applied in the cases where the impact assessment indicated that it is sufficiently likely that adverse effects on the conservation objectives and integrity of the Natura 2000 site from the implementation of wind farms or fish farms cannot be ruled out. The position has been taken by placing Natura 2000 sites (as well as national protected natural objects) under protection that the primary objective in the selected areas is the habitat types and species in need of protection and the exercise of other interests and implementation of activities in those areas which is not in line with the conservation objectives of the protected area are secondary.

Based on the best available information the sensitive areas for ecosystems, i.e. the areas that are important as habitats or foraging habitats for a particular marine habitat or species (including the movement corridors and migrations of birds, bats, seals, potential fish spawning grounds, etc.), were excluded from the selection of new marine uses. See Chapter 4 of the Impact Assessment for more details.

In addition, the precautionary principle was applied throughout the impact assessment, which, among other things, set precautionary measures for the next level of the authorization in order to specify and assess the possible significant environmental impacts if more precise volumes, technical solutions and time feasibility become clear. The ENVIRONMENTAL MEASURES proposed in the Impact Assessment is the basis for the operational guidelines and conditions set by the plan which will be the basis for future decisions concerning the maritime area, including the issue of authorizations.

2) **Consideration of the best available knowledge.** In-depth and up-to-date knowledge can best help protect the components of the marine ecosystem. These include understanding the state of the marine environment as well as understanding the various social and cultural values of the marine area.

Extensive thoroughness has been considered a priority in assessing the impacts of maritime spatial planning as a strategic development document. In addition to the usual environmental impact assessment, attention has also been paid to social, economic and cultural impacts.

The main complaint from the public and stakeholders in impact assessment processes is often that the impact assessment processes do not include sufficient field research in a specific planning area on site and that there is insufficient scientific data to predict impacts. The meaning behind the term "research" has also been left undefined. This is often understood by the public as narrowly conducting fieldwork in the area being researched and assessed. However, in the process of impact assessment, it is an extended concept which means the performance of an established research task, i.e. it may be the performance of fieldwork in a specific area, but also the analysis and mapping, modelling etc of the data based on the existing information.

The preparation of the maritime spatial plan and its impact assessment is based on the best available knowledge at the time of drafting the documents - the best specialists in their field and their expertise have been involved, information from previous surveys in the whole marine area (relevant environmental data layers and reports), additional analyses/studies based on it and modelling performed covering the whole marine area, have been taken into account. The impact assessment is based not only on international practice but also on international knowledge of the effects of new marine uses, in particular wind farms and aquaculture, on the marine environment.

According to Directive 2001/42/EC, the SEA Directive, the SEA report should include the information that may reasonably be required taking into account current knowledge and methods of assessment, the contents and level of detail in the plan or programme, its stage in the decision-making process and the extent to which certain matters are more appropriately assessed at different levels in that process in order to avoid duplication of the assessment. In the opinion of the Supreme Court (this is explained in Hiiu Maritime spatial Planning case[8]), this refers instead to the scientific data reasonably available at the time of the assessment, including, if necessary, to be collected with new research.

In the course of compiling the maritime spatial plan, in addition to the existing information, several additional analyses and studies have been conducted (see also http://mereala.hendrikson.ee/uuringud.html), which summarize the overall picture of the Estonian maritime area in various topics. During the compilation and preparation of the maritime spatial plan the following basic analyses/ studies commissioned by the Ministry of Finance have been prepared, for example:

- Implementation of the Marine Strategy Framework Directive in Maritime spatial Planning, Estonian Marine Biological Society 2018
- Collection and analysis of baseline data for assessing social and cultural impacts, OÜ Hendrikson & Ko, 2017
- Survey of bats migrating south or southwest across the sea from the island of Saaremaa, Estonian Fund for Nature, 2017

[8] https://maakonnaplaneering.ee/documents/2845826/18586325/3-16-1472+Hiiu+Tuul.pdf/a44b906e-e5a9-4f72-b2c5-cfe0258db0d3

- Compilation of data on migratory corridors of birds in the Estonian marine area, creation of corresponding map layers and analysis of the impact of wind farms on bird feeding areas, Estonian Ornithological Society, 2017
- Identification of suitable fish farming areas in the Estonian marine area, EULS Institute of Veterinary Medicine and Animal Husbandry, 2017
- Economic Benefits of Using Marine Resources (Model of Economic Profit, Costs and Benefits of Using Marine Resources to Assess Current Economic Activities in the Marine Area), Praxis Center for Policy Studies 2017
- Analysis of ice conditions and drawing of maps (ice probability map and ice cover duration map, *worst-case scenario* map based on 2010/2011, hummock ice probability map, etc.), TUT Institute of Marine Systems, 2016

- Identification of areas suitable for invertebrate and algae cultivation, Estonian Marine Institute, University of Tartu 2016
- Assessment of the distribution and marine use of seals NGO Pro Mare, 2019
- Bird staging area analysis, Estonian Ornithological Society, 2019
- Do the offshore wind turbines with the height of about 300 m affect the migration of birds and how? Estonian Ornithological Society, 2021
- Guide to methodological recommendations for visual impact assessment to promote the development of offshore wind farms, Artes Terrae 2020

A number of new studies on the state of the marine area have also been completed during the preparation of the Maritime Spatial Plan and this Impact Assessment Report, such as:

- Possible effects of offshore wind farms planned for Estonia on fish in the Baltic Sea, University of Tartu, 2020
- Survey of bats at sea around Saaremaa from July to October 2018, Estonian Fund for Nature, 2019
- Survey of bats in the Gulf of Riga and Finland from June to October 2020. Phase II of identification of the marine areas important for bats, Lutsar, L; Estonian Fund for Nature, 2021
- Survey of seabed biota and habitats to assess the distribution of Natura and HELCOM habitat types and to elucidate the CO2 sequestration potential of the sea, Estonian Marine Institute, University of Tartu, 2020

In addition, the innovative tool PlanWise4Blue (http://www.sea.ee/planwise4blue) was used to assess the environmental impacts of Estonian maritime spatial planning, which assesses the cumulative impact of planned human activities on various natural values (see also Chapter 4.8). Such an impact assessment is based on the following scientific information and working principles:

- The tool is based on the best available information on natural values, including the latest monitoring and mapping work. All important natural values have been mapped or modelled at all points in Estonian maritime space. The application includes the information on seabed habitats, fish (including fish spawning grounds), birds and mammals.

- The tool is based on the best available scientific information on how different human activities cumulatively affect different natural values. The available scientific information has been gathered into the application in such a way that it is possible to calculate the impact of specific human activities on a specific nature value on a factual basis. For example, it is possible to calculate the extent to which the construction of a wind farm potentially increases or decreases the area of a seabed habitat for each point in the sea area. The data have been obtained for the application either during monitoring measurements and/or experimental work.
- There are a total of 257 surveys on wind farms (including surveys of seals and birds in the maritime portal), including 120 surveys on fish and 102 surveys on seabed habitats and their condition.

3) **Development of alternative solutions.** Reasonable alternatives must be developed, taking into account the environmental, socio-economic, and cultural impact involved and the measures proposed to avoid or mitigate them. The planning process must reflect, in a transparent manner, the trade-offs between different maritime interests and users in the different uses of the marine area.

According to the Environmental Impact Assessment and Environmental Management System Act, the SEA report should include an overview of the reasons on the basis of which the alternative development scenarios were selected during the preparation of the strategic planning document and an overview of how the best alternative development scenario was obtained. The development of the maritime spatial plan and this impact assessment took place in parallel, which enabled the information identified in the impact assessment process to be taken into account on an on-going basis in the planning solution for the development of the so-called best alternative development scenario.

It has been described in more detail in Chapters 2.2. and 2.3 and throughout Chapter 4 how the principal locations identified in the current plan for new marine uses, including the areas suitable for wind energy development, Preservation areas for underwater cultural heritage were developed and how the areas suitable and/or unsuitable for the plan activities were defined (e.g. aquaculture areas), on the basis of which the guidelines and conditions for the implementation of the plan were in its turn developed.

The purpose of the Impact Assessment was to determine the suitability of the proposed development areas for the new uses of the marine space (e.g., development areas suitable for wind energy, see the detailed description of the development of suitable areas in the Plan, Chapter 5.6.2 and in addition check chapters from this report 2.3, 4.2 and 4.3).

During the preparation of the plan, both the planning and the impact assessment expert group have worked closely together to rule out significant adverse environmental effects at the earliest possible stage of strategic planning. The aim has been not to plan new uses for the marine area, including, for example, wind energy development areas as well as aquaculture areas, for sensitive or unsuitable marine areas, in order to avoid adverse effects on Natura 2000 network conservation objectives and significant adverse environmental effects on wider marine life.

While it was not possible or reasonable to spatially define the development areas in the plan for some areas of activity, the impact assessment identified, for example, the areas unsuitable for fish farming and set out specific mitigation measures for the implementation of the activities. This was done by mapping sensitive areas, which are often used at the level of a species group, habitat type or species that are sensitive to development and associated impacts (species-rich areas). Thus, the solution of the maritime spatial plan was developed in close cooperation on the basis of the information and knowledge received by the drafters of the plan, various members of the impact assessment expert group, involved authorities as well as stakeholders.

Mapping suitable or unsuitable areas for development activities and thereby assessing the impact will help to avoid the environmental risks associated with implementation at subsequent planning stages or at the project level.

The planning guidelines and conditions for already regulated traditional maritime uses (e.g. maritime transport, seabed infrastructure) have been analyzed by an impact assessment expert group. By considering the suggestions of the experts, the wording of the guidelines and conditions has been specified in the plan.

The process and methodologies that the expert group considered to be the best planning solution has been described throughout the impact assessment report. The adverse effects related to the implementation of the planning solution on the conservation objectives of Natura 2000 sites or significant adverse effects on the marine ecosystem and, if necessary, precautionary measures for the next level of the authorization (which is the basis for setting the conditions of the plan) have been identified for the planning team on an ongoing basis.

It has also been emphasized in the professional literature[9] that in order for the strategic assessment of environmental impact to effectively fulfil its objectives, the assessment should be fully integrated into the planning process. The strategic environmental assessment has a significant impact on the decision-making process only in this way, from specifying the original objectives of the plan up to the implementation of the decisions and monitoring of the actual effects. The parallel ongoing procedures allow for a continuous and up-to-date exchange of information with good timing. On the one hand, the strategic environmental assessment provides the planners with the necessary

[9] Handbook on Strategic Environmental Assessment, Peterson, K., Kutsar, R., Metspalu, P., Vahtrus, S. ja Kalle, H. 2017 - https://www.envir.ee/sites/default/files/raamat_2017_final.pdf

information, and on the other hand, depending on how the plan takes shape, it is possible to make a more accurate assessment of its environmental impact.

4) **Mitigation measures**: The aim of the measures is to prevent and reduce possible significant adverse effects on the environment and to avoid adverse effects on the integrity and conservation objectives of the Natura 2000 site. To achieve this, planning must take into account environmental objectives, including marine biodiversity and the maintenance of a network of protected areas.

The prevention and precautionary principles out of environmental protection principles were applied in the development of the maritime spatial planning solution and impact assessment. The main objective of this impact assessment of maritime spatial plan is to identify the likely adverse effects on the conservation objectives of Natura 2000 sites and significant adverse effects on the marine ecosystem with the aim to avoid these already at the strategic level. The methodology for mapping sensitive areas was used for this purpose in the impact assessment.

This helps prevent or reduce the number of potential site-specific conflicts later in the development process with less room for manoeuvring. In addition, the impact assessment report identified, based on the best available knowledge, the proposed activities that could have an adverse effect on the conservation objectives of Natura 2000 sites or significant adverse effect on the marine ecosystem and proposed measures for the reduction and mitigation of the impact for their elimination. The impact assessment analysis anticipates the adverse effects of the proposed activities on the conservation objectives of Natura 2000 sites and significant adverse effects on the marine ecosystem and identifies which impacts need to be assessed more accurately at the authorization level of the project by taking into account the site and location specific and technological solutions. It provides developers with relevant information and certainty about environmental issues (conditions) that may need to be taken into account as they develop their initial project concept. It can also be more cost-effective in the long run. If possible, mitigation measures are taken into account in the early planning process; it is likely to be technically easier and cheaper to integrate them at the project level. This, in turn, can lead to the development of new, creative, and innovative solutions.

The implementation of the principles of environmental protection and the methodology used in the impact assessment have been described in more detail in the first section of this list.

5) **Participation and communication.** All relevant authorities and stakeholders, as well as the wider public, are involved at an early stage in the planning and impact assessment process. Participation processes must take into account existing power structures, resources, and the diverse needs of stakeholders.

An ecosystem-based approach is created involving different stakeholders throughout the planning and impact assessment process. See Chapter 5 for details.

6) **Adaptation.** Changes in nature and in the management of ecosystems are inevitable. Sustainable use of the ecosystem should be accompanied by a process that involves monitoring, reviewing, and evaluating both the process and the outcome, as changing circumstances and new knowledge may require tailored guidance at project level evaluation.

The plan includes an action plan that maps the follow-up activities for the implementation and application of marine-related activities and the specification and ongoing updating of marine area information. In addition, as a result of the impact assessment, the conditions and guidelines for the authorization level have become part of the planning solution.

Taken together, the ecosystem-based approach implies that the use of marine space should be planned in a way that ensures the long-term viability of marine ecosystems. This, in turn, means that planning decisions should be considered primarily from the perspective of maintaining good state of ecosystems and the environment, by proceeding from the prevention and precautionary principles and by taking into account the conclusions of this impact assessment and the proposed mitigating precautionary measures. Chapter 2.3 describes how environmental considerations have been taken into account when developing a planning solution, taking into account the above principles of the ecosystem-based approach.

See chapter 4.2 of the Plan for an overview of the consideration of the proposals made in the Impact Assessment.

2.2 FOCUS ON ASSESSING THE RELEVANT IMPACT OF THE MARITIME SPATIAL PLAN

In addition to the coherence between different uses of the sea, it is important to take into account broad-based environmental considerations from the early stages of planning. The sustainable use of the marine environment is based on directing the various uses of the sea, taking into account their nature and natural conditions. Therefore, the potential impact of the use of the sea on the natural, social, and cultural environment and the economic environment were analyzed in an integrated way parallel to the development of the planning solution. Broad-based impact analysis has made it possible to direct activities both spatially and through guidelines and conditions set out in planning, with the aim of achieving and maintaining good environmental status. The impact assessment has been carried out, taking into account the degree of accuracy of the planning document and the extent of its content.

The Spatial Planning Solution provides an overview of the uses of the marine area and provides guidelines and conditions for the sustainable development of each use, also taking into account other uses. **For many uses (fisheries, aquaculture, maritime transport, marine rescue, pollution control, border management, seabed infrastructure, marine tourism and recreation, nature protection, marine culture, national defence, mineral resources, and dumping), the Maritime Spatial Plan does not foresee significant spatial changes.** Legislation and maritime practices are already well established in many of these areas of use (e.g. maritime transport, etc.). Following the implementation of the plan, the existing situation in the maritime space for these uses will remain predominant, also in terms of environmental impact. In order to direct aquaculture areas the plan sets out information on the areas with suitable growth potential for shellfish and algae cultivation and defines the areas that are not suitable or excluded from the plan for this activity. With regard to combined use, both planning and impact assessment provides guidance on developments in the field through guidelines and conditions.

The Maritime Spatial Plan focuses primarily on new uses of the sea where development interest already exists or is predictable due to good preconditions: **aquaculture and energy production**. In order to develop these areas and promote combined use, the plan defines both guidelines and conditions and, for wind energy, spatial development areas. See the following subchapter 2.3 about how the suitable and/or unsuitable development areas for new marine uses and precautionary and mitigation measures were developed to implement the proposed activity. For new uses, the plan can be seen as a document that creates new opportunities and can also have environmental impacts.

2.3 TAKING INTO ACCOUNT ENVIRONMENTAL CONSIDERATIONS IN THE DEVELOPMENT OF THE MSP

One of the most important new uses of the marine area is **wind energy development**, for which the spatial development areas are determined in the plan, in addition to guidelines and conditions.

The sensitivity mapping methodology[10] recommended by the European Commission has been used in the development of the planning solution and impact assessment (see also the description in Chapter 2.1, article 1). It is considered to be an effective tool for identifying naturally sensitive areas (i.e. biologically diverse areas that need to be protected) where the development of renewable energy (or other planned marine activities) may affect the conservation of good environmental status of biological diversity and the

[10] *THE WILDLIFE SENSITIVITY MAPPING MANUAL. Practical guidance for renewable energy planning in the European Union;* https://circabc.europa.eu/sd/a/6a1d06ae-ef34-478a-a322-006b09079efb/20200429%20WSM%20Manual.pdf

integrity of the areas[11] and provide a basis to apply prevention and/or precautionary principles through the impact assessment process.

The mapping of areas suitable for spatially planned activities in the marine area, including wind energy, and of sensitive wildlife areas, will help to identify:

- Environmental risks related to the development areas of the proposed activities and their implementation for protected natural objects, including Natura 2000 network sites and marine habitats and biota (discussed in Chapter 4.2).
- Sets out the conditions for the licensing phase of proposed activities and the baseline task of the impact assessment, which must be the basis for assessing significant adverse impacts at the project level

The preparation of maritime spatial planning and impact assessment were based on the best available marine surveys/analyses and expert assessments (several marine analyses were prepared in the planning process to map sensitive areas, see subchapter 2.1 (2) for a more detailed description). This impact assessment has suggested the avoidance of key wildlife sensitive areas already at the strategic level. The impact assessment was based on the basic principles of environmental law and it applied the prevention principle which prohibits the activities that pose a threat to the environment (i.e. significant environmental disturbance or adverse effects on the conservation objectives of Natura 2000 site or significant adverse effect on the marine ecosystem) and the precautionary principle which obliges to mitigate uncertain environmental risks as much as possible.

In order to achieve and maintain the good environmental status of the sea, the planning solution has foremost taken into account the network of natural areas protected both internationally and nationally (Natura 2000), including the planned (protected areas planned in EELIS) areas, and the spatially planned new uses of the sea were excluded for these areas, in particular wind energy development areas which could have an adverse effect on the environment. In 2020 the proposals have also been made for the establishment of two EEZ marine protected areas. These proposals are currently being processed. Thus, this impact assessment has recommended to refrain from describing the proposed restrictions on the protected area due to the economic use of these areas (see Chapter 4.2.6 for more details) up to the completion of the relevant procedures.

The development areas of wind energy were fist determined based on the conditions suitable for wind energy (wind, sea depth, icing, wave height), on the basis of which the suitable areas for the construction of wind farms were selected. The selected wind energy areas were already specified during the

[11] *Guidance document on wind energy developments and EU nature legislation. 18.11.2020, Guide of the European Commission.* *https://ec.europa.eu/environment/nature/natura2000/management/docs/wind_farms_en.pdf*

preparation of the draft plan, by excluding the overlaps with the first known naturally valuable areas on the basis of the information available at that time, including Natura 2000 network sites and national protected areas and the most important known migration corridors of birds[12].

In order to reduce the effects (visual impact, noise, shading, etc.) on people, the areas of wind turbines closer to the mainland than approximately 11.1 km (incl. from permanently inhabited islands) were excluded. In order to avoid conflict the areas of wind farms in special areas of national defence were excluded, as well as in the areas unsuitable for national defence for other reasons (see Figure 2.3-1). The overlap with water traffic areas and bird migration areas of major importance was avoided when designating the innovation area, the compliance with the depth limit (up to 40 m) was not considered important when proceeding from the innovative technology. The initial analysis of the impacts already in the draft plan stage helped to develop the best possible solution for the strategic level.

[12] Compilation of data on migratory corridors of birds in the Estonian marine area, creation of corresponding map layers and analysis of the impact of wind farms on bird feeding areas, Estonian Ornithological Society, 2017

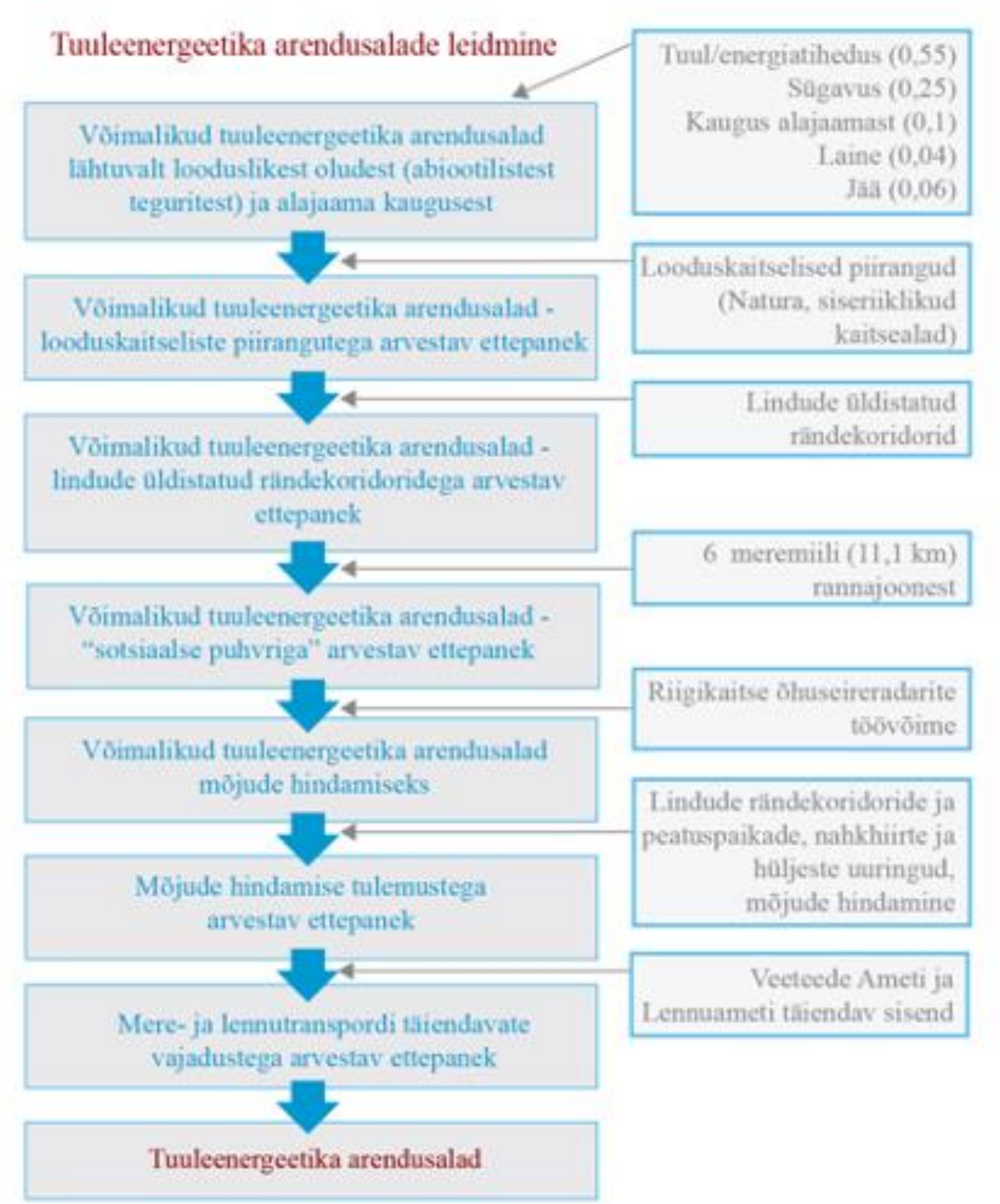

Figure 2.3-1. Finding areas suitable for the development of wind energy

In order to prepare the main solution for the selected wind energy development areas, several detailed studies were commissioned under the leadership of the Ministry of Finance, including:

- analysis of bird staging areas [13], how the height of wind turbines affects the birds staging area[14],

[13] Basic study of maritime spatial planning "Analysis of bird staging areas" Estonian Ornithological Society, 2019

[14] Whether and how can the offshore wind turbines with the height of about 300 m affect bird migration? Estonian Ornithological Society, 2021

- Assessment of the distribution and marine use of seals [15] etc.

The more detailed list of surveys has been provided in Chapter 2.1, article 2.

During the analysis of bird staging areas, all known bird information was mapped in the Estonian marine area. Bird experts also took into account the migratory corridors of marine area birds and designated sensitive areas for birds. In addition to the sensitive areas, the IA also mapped the main migratory corridors of terrestrial birds above the sea and consequently proposed a reduction in wind energy development area No 1 (see Chapter 4.2.2 and Figure 4.2.2-4).

The areas suitable for the development of wind energy have been repeatedly reviewed by the experts of birds, bats and seals outside the expert group throughout the development of the planning solution and no additional proposals have been made to change the development areas of wind energy.

The assessment of wind energy development areas and the effects of their implementation is based on the starting points for the development of wind energy defined in the plan (see also the explanatory memorandum to the plan, Chapter 5.6.3). The rapid development of technology should be taken into account in the long-term planning of wind energy. During the life of the plan the dimensions of the wind turbines increase, both the top height and the diameter of the rotor increase even faster. In developing the planning solution, the design of the wind turbines has been based on both international experience and the assessments of wind energy developers. The recommendation of the planning expert team is based on the following indicators:

- **The tip height of the wind turbine** is in the order of 300 m.
- **The diameter of the blade (rotor)** is in the order of 250 m.
- The **wind turbine foundation** shall be of the gravity type or similar in its effects. The expected diameter of the foundation is less than 100 m (probably 60 m).
- **The distance between the wind turbines in one wind farm** is between 4 and 7 blade diameters, with a minimum of 800m.
- **The minimum distance between the wind farms** will be approximately 8 rotor diameters of the rotor of a later wind farm, with a minimum of 2 km.

Both the power of the wind turbines and other parameters depend on the specific location and layout, as well as the time of realisation. Therefore, the more detailed assessment of the environmental impacts at the level of authorization is needed.

[15] Basic study of maritime spatial planning “Estonian maritime spatial plan: assessment of seal distribution and marine use”. Report of applied research, contract No. 1.9-1 / 404-1 I., Jüssi; M., Jüssi, 2019.

Along with the wind energy development area, their potential cable connections to the land must be considered. The planning solution proposed possible cable corridors, and the role of the impact assessment was to assess their impact at the strategic planning document level, in particular on the conservation objectives of the Natura 2000 sites. As the exact technological solutions for the proposed activity are unknown at this stage of the planning process, the IA suggested alternative locations for cable corridors, which would exclude any impact on the conservation objectives of the Natura 2000 network (see Chapter 4.3 for details). The assessment of Natura 2000 sites brought out proposals for amending the planning solution and required amendments were made in the MSP. The impact assessment did not preclude the laying of cables in the proposed corridors and pointed out that the laying of cables at other locations is more economically feasible. However, in such a case, an appropriate location alternative at the project level of wind farms would have to be found, which long-term impact on the conservation objectives of the Natura 2000 network would be excluded.

Pursuant to the disclosure of the main solution the following specifications of the main solution have been made in relation to the wind energy development areas (and consequently the impact assessments have been specified throughout in Chapter 4):

- Addition of the starting points for wind energy planning (see Chapter 5.6.2 of the explanatory memorandum to the plan).

  The purpose of adding the relevant subchapter was to clarify which development trends and indicators of wind energy have been taken into account in the development of the planning solution.

- Abandonment of wind energy development area no. 3 (in the northwest of Harilaiu).

  The area of the wind energy development area no. 3 was only 15 km^2, incl the area passes through the water traffic area where the location of wind turbines could appear to be complicated. The area was partly located in an important sensitive area of Hülgerahu as a winter stopover and spring migration area for waterfowl and was therefore with high risk of development.

- Specification of the possibilities of joint use of the sea area (see the explanatory memorandum of the plan, Chapter 5.1).

  Based on the facts highlighted by the trawlers' interest group and input from line ministries, the bottlenecks were identified that are not expected to allow the joint use of the same sea area for active trawling and wind energy development.

- Improving the guidelines and conditions for the development of wind energy based on trawling and the completed visual impact assessment guide (see 4.4.1 for details).

The additional inputs from interest groups and ministries enabled to specify the conditions for the development of wind energy. Based on the visual impact assessment guide[16] completed by the beginning of 2021, the conditions were supplemented and the approach to impact assessment was reviewed.

- Specification of the impact of wind energy development on birds (for more details see Chapter 4.2.2).

  The approximate top height of the wind turbines was also determined during the specification of the starting points for wind energy planning. In order to achieve relevance, an additional expert assessment[17] was ordered from the Estonian Ornithological Society to assess the impact of approximately 300 m high wind turbines on birds as the most affected part of wildlife.

- Specification of the the conceptual locations of the offshore grid (for more details see chapter 4.3).

  Based on the additional input of Elering AS the basic locations of the cable corridors related to wind energy development area no. 2 were specified (in addition to the land crossing of the Sõrve foothills, the sea area south of the Sõrve peninsula was assigned as the location).

- Designation of wind energy reserve areas (for more details, see the explanatory memorandum to the plan in Chapter 5.6.5)

  The areas suitable for the development of wind energy that overlap with the areas of historically more intensive trawling have been designated as the reserve areas on the basis of the interim decision of the Government of the Republic (29 April 2021).

The starting point for the impact assessment corresponding to the generalization level of the plan (incl SEA) has been the ecosystem approach, which has been described in Chapter 2.1 above. The impact assessment of maritime spatial planning has already recommended the avoidance of important sensitive areas of wildlife at the strategic level based on the prevention and precautionary principles and has ensured at the strategic level that sensitive areas have been taken into account and that the adverse effects of the proposed activity on the conservation objectives of the Natura 2000 site and the significant adverse effects on the marine ecosystem have been addressed.

[16] http://mereala.hendrikson.ee/dokumendid/Uuringud/Meretuuleparkide_visuaalse_mõju_hindamise_juhend_final.pdf

[17] Whether and how can the offshore wind turbines with a height of about 300 m affect the migration of birds?, Estonian Ornithological Society, 2021

The plan sets the conditions for the level of authorization, including preventive precautionary and/or mitigation measures to prevent possible adverse effects on Natura 2000 sites and significant adverse effects on the marine ecosystem. Following the mapping of naturally sensitive areas and the impact assessment carried out during the planning procedure and impact assessment, the locations suitable for wind energy development have been developed, where it is possible to plan further activities at the authorization stage under the assumptions set by the plan and impact assessment for wind farm planning.

In the cases where marine mapping for wildlife needs to be clarified and the impact of the proposed activity depends on technical solutions, it is proposed to include in the conditions of the planning solution that the respective studies need to be clarified or further performed at the authorization stage. In addition, the impact assessment has proposed the inclusion of various studies in the action plan of the plan, which would require additional information collection in the maritime area and would provide better input during the authorization processes. As a feature of the marine environment, it should be borne in mind that there is much less data on the marine environment than on land and that the collection of new data covering the whole marine area is time consuming.

The second new area of marine use in Estonian maritime spatial plan is **aquaculture (fish, algae and shellfish farming)**. The mapping methodology for sensitive areas described above was also used to identify potential suitable and/or unsuitable areas for aquaculture. The impact assessment revealed that the maritime spatial plan does not specify specific principal locations for this use and that aquaculture development is permitted throughout the marine area, except in the areas unsuitable for aquaculture or excluded from this activity. In order to direct aquaculture areas, the plan provides information on the areas with suitable growth potential for shellfish and algae cultivation. Aquaculture areas will be identified within the authorization procedure (incl environmental impact assessment), taking into account the specific guidelines and conditions of the area set out in the maritime spatial plan by considering the location of the sensitive areas of wildlife and unsuitable areas for aquaculture.

With regard to fish farming, more extensive exclusion zones have been established, i.e. the establishment of fish farms in the areas of protected natural objects, including the Natura 2000 network, is prohibited and excluded. This prevention principle and condition minimizes the expected impacts of fish farming (based on the so-called "worst case scenario", i.e. in the light of currently known technology) on natural value sites and their conservation objectives. The major impact of fish farming is associated with changes in water quality and the loss of seabed habitats near the farm (see chapter 4.2.5 for details).

The maritime spatial plan also establishes **Preservation areas for underwater cultural heritage** in the area of Tallinn Bay, near Käsmu, Abruka and Ruhnu, as new spatial locations. At the request of the National Heritage Board and taking into account the terms of reference of the board, additional areas were found for flooding wrecks near the ports, by taking into account, among other things, nature conservation conditions. The Abruka Nature Conservation Area, originally proposed by the board, overlapped with the conservation area of the same name in the Kura kurgu Special Protection Area. Therefore, in order to avoid possible associated environmental risks, the impact assessment expert group proposed to move the Abruka Nature Conservation Area north of the originally designated location outside sensitive marine protected areas. The plan took the made proposal into account.

The impact assessment has also addressed the cumulative and synergistic effects of the various proposed activities. The guidelines provided in the plan favour cluster solutions, i.e. the co-development of several different uses of the sea, e.g. the effects of nutrients released from fish farms into the water will be mitigated by shellfish and algae farming. In order to achieve positive socio-cultural and economic synergies, the development of aquaculture, in particular the establishment of shellfish farms but also fish farms, is a priority in the wind energy development areas.

3 RELATIONSHIP OF THE MARITIME SPATIAL PLAN TO STRATEGIC PLANNING DOCUMENTS AND ENVIRONMENTAL POLICY

3.1 RELATIONSHIP TO RELEVANT PLANNING DOCUMENTS

The relationship between the plan and the relevant planning documents, including international framework documents and planning guidelines, is described in Chapter 2 of the Plan. Starting points. The relevant section of the Plan sets out the main approaches and agreements that underpin the Maritime Spatial Plan. The following is a brief overview of the Estonian spatial plan related to maritime spatial planning.

National Spatial Plan *Estonia 2030+*

National planning emphasizes the efficient and sustainable use of the marine area and Estonia's openness to the sea and sets out general directions for achieving this as a principle theme development. In the field of energy production, national planning foresees strong development in wind energy, including in the offshore area. In the longer term, the development of energy networks provides for the possibility of connecting to Latvia by submarine cable. In order to increase the security of supply on the islands and the introduction of local renewable energy sources, the aim has been to establish a high-voltage loop connecting West-Estonian islands and the mainland, which will allow better connection of offshore wind farms to the grid. The planning predicts an increase in international trade flows using sea transport. National planning also identifies major global trends with a spatial impact, which also have a major impact on the future use of the marine area:

- shifting the focus of the global economy to Asia;
- transition to a knowledge-based economy;
- population aging;
- urbanization;
- changes in climate
- increasing the influence of ecological values;
- transition to the widespread use of renewable energy;
- the fast growth of the so-called green and silver economies.

National planning provides a general basis for the Maritime Spatial plan in the form of spatial trends.

County-Wide Spatial Plans

The valid plans of Estonian counties concern land. However, maritime affairs play an important role in the planning of marine counties, reflecting in overall trends, mobility, and infrastructure through ports and maritime transport, as well as in recreation and rescue capacity. Most of the issues related to the sea have been dealt with in Saaremaa that is located in the middle of the sea.

The **Saare County-wide spatial plan** sees an increasing role for the blue economy - trade, shipbuilding, fishing, boat storage, repair, and production, etc. The development of small craft harbors will be promoted, small craft harbors of national and county importance and community harbors will be distinguished. The county plan states that restoring the passenger ship connection to Latvia and visiting Saaremaa harbors by more cruise ships is a priority for tourism. The trend is that ports are increasingly multifunctional, fulfilling many functions other than mooring and enabling traditional fishing. The multifunctional use of ports has been prioritized for further development. The Saare County-wide spatial plan notes that the locations of offshore wind farms will be determined by a national Maritime Spatial Plan.

The spatial vision of the **Lääne County-wide Spatial Plan** specifically highlights openness to the sea and fast maritime connections. Business areas are being developed near ports. The Spatial Development Principles outline recreational opportunities for coastal areas.

The **Harju County-wide Spatial Plan** sets the guideline for openness to the sea - the attractiveness of the coastal area in terms of residential preferences and economic activity. The development potential of ports has been especially emphasized.

The **Lääne-Viru County-wide Spatial Plan** gives priority to sea access (incl., sets the rule for beaches of recreational value to be accessible from public roads every 500 m in sparsely populated areas and every 200 m in densely populated areas) and maritime connections facilitating the development of the recreational economy. For the development of maritime tourism, a chain of ports along the coast, consisting of various small craft harbors, is planned to complement the land connections.

The **Ida-Viru County-wide Spatial Plan** emphasizes the role of the Port of Sillamäe with the international cargo and passenger port. The plan links the sea to the diverse recreational, economic potential of Ida-Viru County's cultural environment, natural and industrial landscapes, highlighting the development of the resort, spa, and marine tourism on the north coast.

Maritime county plans have also linked the sea to the theme of valuable landscapes. In some counties, marine areas have been seen as parts of valuable landscapes (e.g., Harju County, Lääne-Viru County). Coastal areas with attractive nature and unique coastal culture have been designated as valuable landscapes in all counties. The Saare County-wide Spatial Plan most closely associates the marine area with valuable landscapes. For example, land use conditions for valuable landscapes require the preservation and restoration of marine culture-related features on the sea-bound landscapes - historic berths, net shelters, trawl ramps, piers, agar collecting sites, etc; nor should the location of new buildings on the sea-side landscape disturb the sea views.

County plans highlight the regional importance and specificity of the sea and thus serve as an input for the preparation of a maritime spatial plan.

Hiiu Island MSP

The plan established in 2016 sets out the general conditions for the use of Hiiu Island MSP. Ship transport, pipelines and cables, waste, mineral extraction, agar fishing, recreation, development areas of wind energy, and aquaculture are identified (aquaculture can be developed outside the designated areas, if necessary).

The Supreme Court ruling of 08.08.2018 has abolished Hiiu County Governor's Planning Order No. 1-1/2016/114 with regard to the development areas of wind energy production.

The Hiiu Island Maritime Spatial Plan will remain valid as a separate document from the national Maritime Spatial Plan. The methodological experience of Hiiu Island Maritime Spatial Plan has been taken into account in the preparation of the national plan.

Pärnu Bay area MSP

The spatial plan established in 2017, bordering Pärnu County, defines the use of marine space, which takes into balanced account the different interests and spatial development needs at sea. The time horizon of the planning is 2030+. The Maritime Spatial Plan covers an area of ca 2600 km 2. Areas covered by the plan are fisheries, aquaculture, maritime transport, and related infrastructure, recreation and tourism, cultural goods, renewable energies, dumpsites, infrastructure outside of maritime transport, national defence, and maritime safety. For each area, principles are outlined for future development, licensing, impact assessment, and planning other activities in the marine area. The use of the sea in Pärnu Bay has been discussed in more detail. Functional relationships between land and sea are shown. Proposals for legislative changes have been made to extend the scope of rights for local governments to operate within one nautical mile in the marine area in the future. The activities required to implement the Maritime Spatial Plan are outlined

The Pärnu County Maritime Spatial Plan will remain valid as a separate document from the national maritime spatial plan. The methodological experience of Pärnu County Maritime Spatial Planning has been taken into account in the preparation of the national plan

3.2 COMPLIANCE WITH ENVIRONMENTAL OBJECTIVES

The following section provides an overview of the international, European Union, and national environmental objectives relevant to the planning document and describes how these objectives have been taken into account in the preparation of the planning Document.

Water Framework Directive 2000/60/EC

The EU Water Framework Directive (2000/60/EC) is a piece of legislation designed to provide a coherent framework for action to plan and organize water protection in the European Union. The directive sets out, among other things, environmental objectives. Among other things, measures must be taken to prevent the deterioration of surface water bodies.

The framework for action established by the Directive covers all other water directives and sets as the main objective of water protection the achievement of good status for all waters (including surface water and groundwater) by 2015.[18] The implementation of the requirements of the Water Framework Directive and the framework for action set out therein is carried out nationally through water management plans.

The vision of the plan to be assessed underlines the good environmental status of the marine area. As a general principle of the planning solution, it has been developed, taking into account, in particular, the network of protected areas both nationally and internationally (including areas under planning). No new uses have been spatially planned for these areas, which could have adverse impacts on the environment.

Marine Strategy Framework Directive 2008/56/EC

The Marine Strategy Framework Directive provides the framework within which the Member States shall take the necessary measures to achieve or maintain good environmental status in their marine waters by 2020 at the latest. Marine Strategies shall adopt an ecosystem-based approach to the management of human activities, ensuring that these activities are under overall pressure to achieve good environmental status and that the ability of marine ecosystems to respond to human-induced change is not compromised while ensuring the sustainable use of marine goods and services for present and future generations. The Directive contributes to the coherence of the various policies, agreements, and legislative measures affecting the marine environment and aims at ensuring the integration of environmental concerns into such policies, agreements, and measures.

The achievement of the objectives of the Marine Strategy Framework Directive in Estonia is achieved through the Estonian Marine Strategy.

The vision of the plan to be assessed underlines the good environmental status of the marine area. As a general principle of the planning solution, it has been developed, taking into account, in particular, the network of protected areas both nationally and internationally (including areas under planning). No new

18 https://www.envir.ee/et/eesmargid-tegevused/vesi/veemajanduskavad/veepoliitika-raamdirektiivi-rakendamine

uses have been spatially planned for these areas, which could have adverse impacts on the environment.

European Union Strategy for the Baltic Sea Region

The strategy unites eight EU Member States around the Baltic Sea - Estonia, Lithuania, Latvia, Poland, Sweden, Germany, Finland, and Denmark. The strategy has three general objectives:

- saving the sea,
- connecting the region,
- increasing well-being

and a wide range of policy and cross-cutting issues stemming from these objectives:

- capacity building,
- climate change,
- cooperation with neighboring non-member countries,
- spatial planning.

The plan emphasizes the good environmental status of the sea and the importance of the conservation of fish stocks. The conditions set, in conjunction with the legislation, help to reduce the use of hazardous substances and their associated impacts. The plan sets conditions for compensatory measures for the fish farms that potentially release the most nutrients into the sea. The plan designates waterways and reflects fairways. Erection of potentially obstructing structures (e.g., wind turbines) on fairways under the conditions of the plan is excluded. Important areas affecting maritime safety (e.g., wind energy, aquaculture) are subject to conditions to specify the synergy during the licensing process. The plan does not regulate issues related to agriculture, forestry, education, and health.

Estonian Marine Strategy

The main objective of the EU Marine Strategy Framework Directive (2008/56/EC; MSRD) is to maintain or achieve, by 2020, at the latest, good environmental status (GES) in its marine environment, which can be achieved through taking national measures. Each country needs to develop and implement a Marine Strategy for its maritime domain to promote the sustainable use of the seas and preserve marine ecosystems.

The implementation of the Marine Strategy takes place in six-year cycles, with one cycle consisting of the assessment of the status of the marine area, the development and subsequent updating of the monitoring program, and the establishment, implementation, and updating of the corresponding Action Plan.

The Action Plan of the Estonian Marine Strategy[19] takes into account the already established development plans and their implementation plans, and new measures have been proposed in addition to the measures already implemented and being implemented. Measures include the establishment of a network of marine protected areas in the Estonian EEZ, the establishment of regional plans for aquaculture to manage potential environmental pressures, the enhancement of marine pollution response capacities to respond to environmental emergencies at sea, and other activities.

The Maritime Spatial Plan is in line with the main objective of the Marine Strategy. The activities outlined in the Marine Strategy Action Plan are largely in line with those needed to implement the Maritime Spatial Plan.

The Climate Policy Principles until 2050

The Climate Policy Principles Document was prepared under the leadership of the Ministry of the Environment and with the support of stakeholders. For the first time, this document agreed on a long-term vision of Estonia's climate policy and on the path towards it. According to the vision of climate policy, by 2050, Estonia will be a competitive, low-carbon emission economy. The country's readiness and capacity to minimize the negative impacts of climate change and to make the most of the positive impacts are assured. Estonia's long-term target is to reduce its greenhouse gas emissions by almost 80 percent by 2050 compared to 1990 levels. Moving towards this target will reduce greenhouse gas emissions by approximately 70 percent by 2030 and 72 percent by 2040 compared to 1990 levels. The Climate Policy Principles Document contains policy guidelines covering the whole economy), sectorial policies to mitigate climate change in the areas of energy and industry, transport, agriculture, forestry, and land use, and sectorial policies to adapt to the impacts of climate change

In line with the climate policy goal to ensure a low-carbon emission economy by 2050, the Maritime Spatial Plan has placed great emphasis on the balanced development of wind energy and the identification of appropriate areas.

The Development plan for adaptation to climate change until 2030[20]

The main objective of the development plan is to increase the preparedness and capacity of the national, regional, and local levels to adapt to the impacts of climate change.

The Development Document provides a framework for action to reduce Estonia's vulnerability to the impacts of climate change. The Development Plan

[19] https://www.envir.ee/sites/default/files/meetmekava_032017_f.pdf

[20] https://www.envir.ee/sites/default/files/kliimamuutustega_kohanemise_arengukava_aastani_2030_1.pdf

was drawn up on the basis of in-depth studies and analyses to identify the impact of climate change on priority areas and adaptation measures to be implemented over a period of time up to 2030 as part of a long-term vision for 2100.

The Development Plan sets eight sub-objectives according to the priority areas of the established economic and administrative structure in the Republic of Estonia (separately and partly in synergy). The measures required are set out according to the objectives.

The need for adaptation to climate change has been taken into account in the design of the Maritime Spatial Plan. Attention has been paid to rescue capabilities, the natural environment, and the balanced development of the blue economy. Energy has a significant focus on finding suitable areas for wind energy development.

EU Biodiversity Strategy up to 2030

The biodiversity strategy addresses the root causes of biodiversity loss such as the unsustainable use of land and sea, overexploitation of natural resources, problems related to pollution and invasive alien species.

The strategy aims to make the biodiversity considerations an important part of the EU's overall economic growth strategy. Among other things, the strategy proposes to establish binding targets to restore damaged ecosystems and rivers, improve the condition of EU protected habitats and species, bring pollinators back to farmland, reduce pollution, increase urban landscaping, promote organic farming and other biodiversity-friendly farming practices and improve the condition of European forests.

The strategy sets out the specific measures to help Europe's biodiversity to recover, including by making at least 30% of Europe's land and marine areas protected areas, i.e. at least 30% of the EU's land area and 30% of its marine area should be protected and at least a third of the protected areas, i.e. 10% of the EU's land area and 10% of the EU's marine area, should be strictly protected.

The general objective of the maritime spatial plan is to ensure that the good environmental status of the marine area is maintained and achieved. The use of marine areas provided for in the maritime spatial plan leaves at least 30% scope for marine protection.

4 DESCRIPTION OF THE ENVIRONMENT AFFECTED AND THE IMPACT OF IMPLEMENTING THE PLAN

4.1 HYDROMETEOROLOGY AND HYDRODYNAMICS

4.1.1 Water temperature and salinity

Water temperature and salinity largely determine the ecosystem characteristics of the area, including, e.g., species composition. The temperature and salinity fields of the Baltic Sea are characterized by great variation in time and space, due to complex topography, strong gradients both horizontally and vertically, and great variability of the atmosphere at different time scales.

The exchange of water in the Baltic Sea with the ocean is limited as it occurs only through the narrow and shallow straits of Denmark. Saltier water flowing through the Strait and Beld Strait does not easily mix with lower density Baltic Sea water and tends to sink into deeper basins. At the same time, less saline surface water flows out of the Baltic Sea. The boundary between the two masses of water, called the halocline, consists of a layer of water whose salinity changes rapidly. For example, in the Baltic Sea offshore and in the Gulf of Finland, a halocline is located approximately 60 to 80 meters deep. The halocline acts as a lid, limiting water mixing in the vertical direction.

In the deeper parts of the open sea (> 80 m), there is usually a triple layer of temperature and salinity in summer and a double layer in winter. The seasonal upper mixed warm and fresh layer is typically 10-30 m thick, and its temperature and salinity depend on the hydrometeorological conditions of a particular period. Salinity in the upper layer is usually between 6 and 7.5 g/kg, and the temperature does not normally exceed 20°C. Below the upper mixed layer is a seasonal jump layer in temperature and salinity that separates the upper layer from the cold intermediate layer. The temperature of the intermediate layer generally varies between 1 and 4°C, and the salinity varies between 7 and 8g/kg. Below the intermediate layer, at a depth of 60-100 m, is the salinity jump layer, under which is in turn warmer (5-6 °C) and saltier (10-12 g/kg) water from the North Sea. The water in the bottom layer is often hypoxic or even anoxic. In winter, the upper mixed layer usually reaches the halocline, i.e., 60 to 80 m deep [21].

Water temperatures reach their peak in the Estonian coastal sea, usually in late July and August. In calm and sunny weather, shallow coastal areas can warm up quickly, but as the wind intensifies, coastal water mixes with cool offshore water or is replaced completely by offshore water. In the autumn, when the sea

[21] Estonian Marine Strategy Action Plan for Achieving and Maintaining Good Environmental Status of the Estonian Marine Area and the Strategic Assessment of the Environmental Impact, 2015 (compiled by: Tallinn University of Technology Marine Systems Institute, OÜ Alkranel)

loses heat to the atmosphere, the opposite is true: calm and cool weather cools off the coastal water more quickly, but over a period of time, the currents bring warmer water to the coast again.

During the coldest months, water temperatures throughout the sea remain suboptimal (<10 °C). During the warmest month, water temperatures on the surface are above optimal almost throughout the marine area (>18ºC), taking into account average temperatures for the warmest month (August for the surface layer, September for the bottom layer) and the coldest month (March).

Impact of the MSP

There is no direct environmental impact of the planning solution on the salinity or temperature of the water (except on the soil directly in contact with the cable).

Significant impacts in the larger salinity regime can be related, in particular, to changes in the intensity of water exchange between the Baltic Sea and the North Sea or to changes in rainfall patterns. The impact of wind turbines on currents and mixing has been extensively studied in connection with the large offshore wind farms planned in the southern part of the Baltic Sea (Rennau et al., 2012[22]). In these circumstances, taking into account the impact of wind turbines on the transport of water and substances is very important in the context of the environmental condition of the Baltic Sea as a whole, as the area is essential for water exchange between the Baltic Sea and the North Sea.

To assess the integrated and maximum impact of the wind turbines, approximately 1200 wind turbines planned for the shallow sea area between Germany, Denmark and Sweden were taken into account (which was the most extensive modelled scenario, where the wind turbines were located at a distance of 400-800 m after a narrow channel of 20 km and the diameter of the foot of the wind turbine placed in the water was calculated to be up to 10 m). According to the study, the construction of offshore wind farms on this scale has a relatively small effect on water exchange in the Baltic and North Seas - maximum salinity changes in the deeper layers of the region can reach about 0.3g/kg, which is significantly lower than natural seawater salinity variation - 5-10 g/kg[23].

[22] Rennau, H.; Schimmels, S.; Burchard, H. *On the Effect of Structure-Induced Resistance and Mixing on Inflows into the Baltic Sea: A Numerical Model Study. Coast.* Eng. 2012, 60, 53–68

[23] Clark S.; Schroeder F.; Baschek B. *The influence of large offshore wind farms on the North Sea and Baltic Sea – a comprehensive literature review. HZG REPORT* 2014-6 // ISSN 2191-7833. https://www.hzg.de/imperia/md/content/hzg/zentrale_einrichtungen/bibliothek/berichte/hzg_reports_2014/hzg_report_2014_6.pdf

There is no direct environmental impact of the planning solution on the salinity or temperature of the water (except on the soil directly in contact with the cable.

4.1.2 Wind

The Estonian wind climate is shaped by the frequent low-pressure and high-pressure alternation, or cyclonic activity, characteristic of the northern part of the temperate zone, which causes windy weather. The intensity of cyclical activity in the Baltic Sea area depends on the general atmospheric circulation over the Atlantic and the Eurasian continent, generally defining the speed and direction of the wind blowing in the Estonian territory, and seasonal variability - the strongest winds and more frequent storms are characteristic of the period October to January, the period with the days of weaker wind and longer lulls is usually from May to August. The direct impact of the Baltic Sea on winds is mainly limited to islands and coastal areas (about 10 km from the coast to the sea and a 20 km wide inland zone), where the power of the winds gathering speed over a wide water field gradually declines due to the obstacles in the form of forests and hills. In addition to higher wind speeds, there are more winds and breezes in the coastal areas compared to the hinterland. Because of the presence of breezes, i.e., the land and sea winds, the direction of the wind on the coast is often different from that of inland winds.

The average annual wind speed is 150 meters to 8.5 to 9 meters per second in sea areas west of the islands, with gusts above 30 m/s. The average annual wind speed in the open middle part of the Gulf of Riga is 8 to 8.5 m/s, with gusts 26 to 28 m/s. The winds of the Väinamere Sea are heavily shaded by islands and the mainland, with annual average wind speeds of less than 8 m/s, however, gusts can still exceed 29 m/s. In the Gulf of Finland, both the wind speed and the intensity of the gusts are clearly decreasing in the west-east direction: the open western part of the Gulf has an average wind speed at the height of 150 m at 8-8.8 m/s, eastern only 7 to 7.5 m/s and gusts > respectively 30 m/s and below 28 m/s.

The number of days with storm winds (>15 m/s) and strong winds is also rapidly decreasing from the coast in the direction of inland. Offshore and windy coasts have an average of up to 40 storm days per year, but in the transitional coastal zone, there are usually 10-20 storm days above the sea and 10-20 km inland, mostly less than 10.

Long-term average wind energy (energy density, W/m^2) is 150 m high in the central part of Gulf of Riga, averaging 700-780 W/m^2 and 810-880 W/m^2 offshore west from Saaremaa, 800-840 W/m^2 near Hiiu Island, in the Gulf of Finland the energy density decreases in the western part (750 W/m^2) to the east (550 W/m^2).

Impact of the MSP

The activities proposed in the context of Maritime Spatial Plan are not of a scale capable of affecting the regional wind climate and have no national or transboundary impact on the spread of air and pollutants. Large wind farms have the strongest local impact on the wind (speed, turbulence, direction, mixing of air layers in the layer close to the substrate), but their impact disappears depending on the configuration of the wind farm to be built within 7 to 9 km of the outermost wind turbine. Wind speeds are affected in offshore wind farms and to varying degree within this area:

- the strongest effect on wind occurs directly downwind of the wind turbine rotor (from a few meters to twenty meters), where the kinetic energy of the wind can theoretically decrease by up to 59.3% (Betz limit, also expressed as a ratio or Cp = 0.593) compared to the initial, in reality the Cp factor weighted by the frequency distribution of the wind speeds of newer modern offshore wind turbines is between 0.3 and 0.4. The Cp factor depends on the wind speed and the wind turbine is optimized to receive maximum wind energy at speeds of 6–11 m/s, when the Cp factor is in the maximum range of 0.4–0.5 in case of the most efficient wind turbines.

  Due to the cubic dependent relationship between wind speed and energy (wind energy is proportional to wind speed cube and vice versa, wind speed is proportional to the cubic root of wind energy), the average wind speed in and around the wind farm cannot theoretically decrease from the Betz limit. The decrease of wind speed below the Betz limit is only possible for a short time, with a very low impact zone and in exceptional situations (very low wind speed) where the cross-section of the wind turbines acts as the on-site physical obstacle to air movement (similar to a building wall or a single tree);

- the height of the wind turbine rotors (which affects the wind) above sea level is between 40 meters in the lower position and 300 meters in the upper position of the rotor during the current maximum and the period covered by the maritime spatial plan. The maximum effect remains as a decreasing cone behind each rotor in each individual wind turbine, and the impact on the wind directly at sea level (40 m from the lower operating limit of the rotor to the sea level) is weakly affected. The effect is also insignificant from the upper operating limit of the wind turbine rotor (approximately 300 m above sea level).

  It should be noted that the distance between the wind turbines in a wind farm depends on the diameter of the rotors (and thus indirectly on the wind turbine power), usually between 4-8 rotor diameters and as the theoretical energy efficiency is limited by the Betz limit (actually with even lower value Cp=0.3-0.4), then the real rate of wind energy reduction in the Estonian maritime spatial plan modelled with perspective future wind turbines (rotor diameter 200 m, tower height 150 m) in a rectangular park with 100 wind turbines (the so-called worst case scenario, distances of wind turbine of 4-8 diameters) remains within 8.8-17.8% on average.

The decrease in wind speed is thus smaller in proportion to the cubic root. Only the area most affected by the wind farm was taken into account and the area around the wind farm (7-9 km) was excluded, where the impact decreases very rapidly due to the absence of surface roughness factors (wind turbines), however, the climatic factors that cause the wind (and restore the wind speed and other properties) (air pressure difference, thermal difference of the substrate and gradient) are retained[24];

- the change in wind direction due to wind turbines occurs only due to the general increase in surface roughness (identical to the change in surface roughness due to transition from sea to land, forest effects, construction effects and other physical obstacles that alter the roughness of the substrate) and thereby to a lesser extent than, for example, the change in forest cover on land, as due to the offshore wind turbines there is no change in the thermal properties of the substrate (the sea surface remains free and the radiation regime and thermal properties do not change) less to the change in thermal properties (the sea surface remains free and the radiation regime and the thermal properties do not change) and the average change in wind direction is only 2 degrees counterclockwise, which is insignificant as an influence on water flow or currents.

  However, the air flow behind the wind turbines is more turbulent than in the undisturbed area of the wind farm and this strongly just behind each wind turbine (altitude range from 40 to 280 meters above sea level) in the form of a cone decreasing downwind for a few hundred meters (depending on the current wind speed) and the difference in turbulence disappears at the distance of 2 km from the wind turbine. The natural transition in the coastal zone (from sea to land), where both the surface roughness and the nature of the substrate change (radiation and thermal regime) is many times larger vertically and horizontally (at least 10 km towards the sea and vertically within the atmospheric boundary layer) and changes in turbulence due to land use changes (afforestation or clear-cutting areas, densely populated areas, hedges) are more turbulent than wind turbines scattered in the offshore wind farm (distance of 4-8 rotor diameters).

Consequently, the effect of the offshore wind farm on the wind outside the offshore wind farm can be considered insignificant and the wind parameters significantly affected only locally in the wind farm just behind the wind turbines as a descending cone downwind of the rotor. At sea level the impact of wind farms on the winds and thus on marine life is insignificant, as the slight decrease in wind speed in the wind farm immediately above the sea does not affect the wave, thermal regime or oxygen diffusion at sea level and both in and around the wind farm the climatic factors influencing wind generation (air

[24] The technical data of the wind turbine manufacturers (Enercon, Siemens Gamesa Renewable Energy, MHI Vestas Offshore Wind and GE Renewable Energy) have been used in the estimates

pressure gradient, thermal gradient) have remained unchanged and the original wind characteristics are restored (similar to what happens on land between the areas with different surface roughness). The wind speed and other properties will recover due to the general regional air pressure gradient and within very limited area (a few kilometres) and time (a few to tens of minutes).

Air quality may also be affected to a limited extent by ship traffic, but air exchange on the high seas is so good that pollution levels are not exceeded locally or regionally. Possible mitigation measures to reduce air pollution include the use of fuels with lower sulfur content, the use of main engines with lower NO_x emissions, and general speed limitation, which reduces the fuel consumption of ships. In exceptional cases (inversion, a lull in warm weather), ship emissions may only exceed the emission limits when stationary or manoeuvring with the engine running in the port/aquatic area/roadstead. The mitigating measures, in this case, could be in particular, better logistics (shorter downtime with the main engine running, fewer ships main engines running at one time in port), and use of ships with a lower level of pollution.

The activities proposed in the context of Maritime Spatial Planning are not of a scale capable of affecting the regional wind climate and have no national or transboundary impact on the spread of air and pollutants.

4.1.3 Ice conditions[25]

In the Estonian marine area, at least in Pärnu Bay and the Väinameri Sea, ice cover occurs every year. In extremely mild winters (e.g., 2007/2008), ice is only found in Pärnu Bay and the Gulfs of Väinameri. In harsh winters (e.g., 2010/2011), the entire Estonian sea area is covered with ice, and even on the west coast of Hiiumaa and Saaremaa, ice is present for 30 days.

On average, Pärnu Bay, Väinameri Sea, and Narva Bay are covered with ice 50% of the time (December 15 to May 1), but in severe winters, the figure can be 85%. In the western and central parts of the Gulf of Finland, the ice period is shorter - 30% on average and 60% during severe winters. However, in the western and central parts of the Gulf of Finland, an important barrier to offshore activities is the ice drift and its potential damage to offshore and coastal facilities.

[25] The chapter is largely based on a basic research of Maritime Spatial Plan: Analysis of ice conditions and drawing of maps (ice probability map and ice cover duration map, worst case scenario map based on 2010/2011, hummock ice probability map, etc.), TUT Institute of Marine Systems, 2016

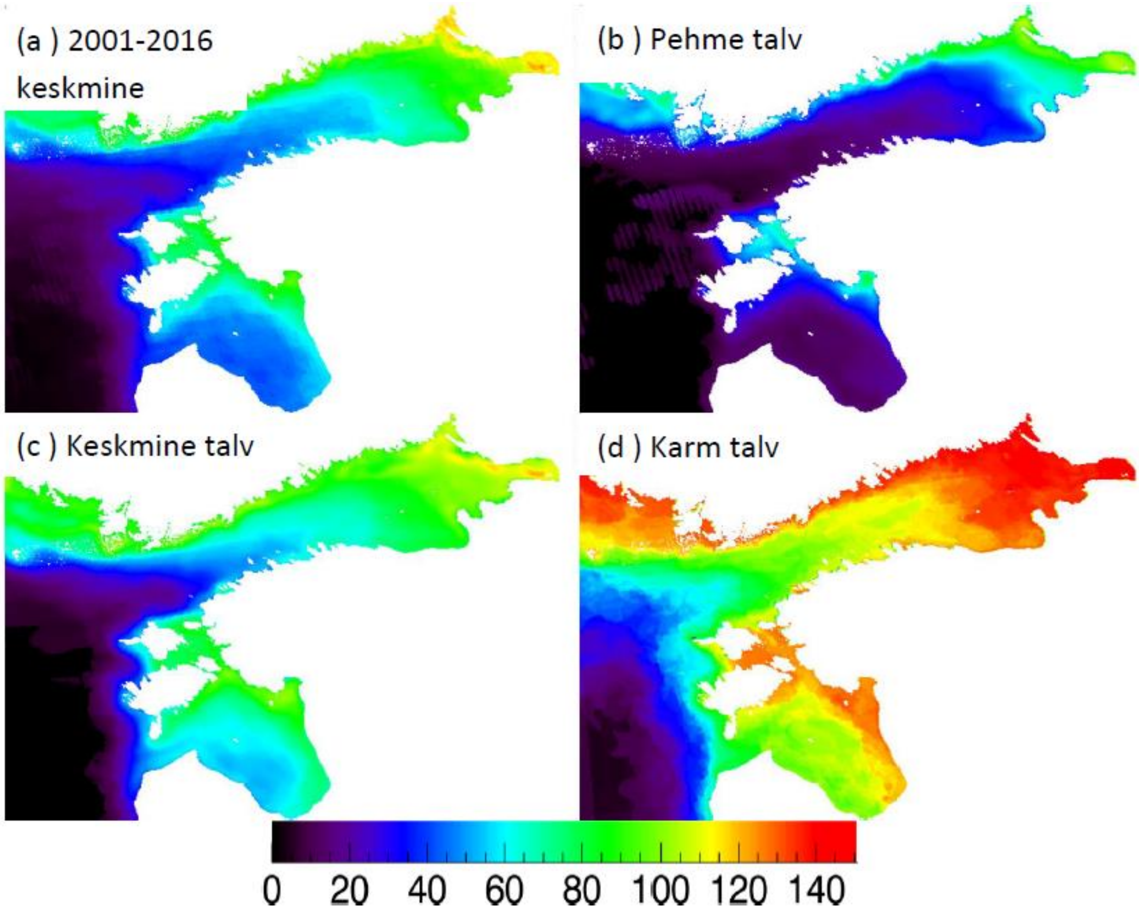

Figure 4.1.3-1. Figure (a) shows the average duration of the ice season in days 2000-2016 at each network point. The duration of the ice season in days with different winter scenarios: (b) mild winters average, (c) average winters average, and (d) harsh winters average. Source: TUT Institute of Marine Systems, 2016.

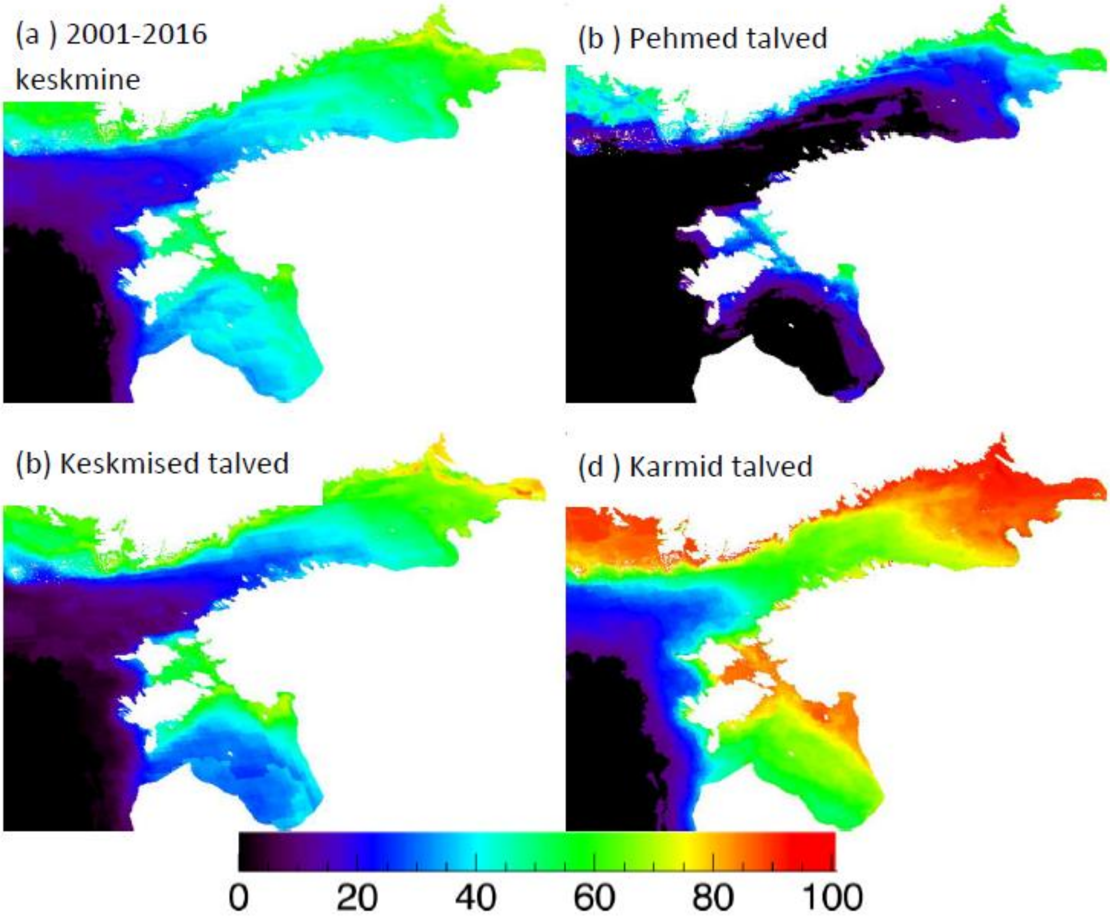

Figure 4.1.3-2. The figure shows the probability (%) of ice occurrence at each point of the space during the period 2000-2016. The likelihood of ice occurring in different winter scenarios: (b) mild winters, (c) average winters, and (d) severe winters. (source: TTU Institute of Marine Systems, 2016)

Drifting ice occurs mainly in areas with a shorter average duration of ice cover - the western and central parts of the Gulf of Finland, the open part of the Gulf of Riga, and the western coast of Saaremaa. In these areas, the sea is deeper, and the coastline does not allow ice cover to anchor permanently, such as in the Väinameri Sea between islands and mainland or in the closed Gulf of Pärnu. The western part of the Gulf of Finland (north of Hiiu County and Vormsi) is characterized by ice flows both east-west (mean 0.02 m/s) and north-south (mean 0.025 m/s). Meanwhile, in the central part of the Gulf of Finland (Paldiski to Kunda), due to the elongated shape of the Gulf of Finland, the drift along the Gulf dominates with an average speed of up to 0.04 m/s. Ice drift is likely to cause damage to stationary offshore installations in the western and central parts of the Gulf of Finland and in the open part of the Gulf of Riga. In these areas, ice fields of tens of square kilometres can drift at 0.23 m/s for 30 to 40 km within 48 hours.

The movement of drift ice causes the formation of hummock ice, which makes it difficult for ships to move during the winter. The analyzed data show that a significant number of hummocks were formed in the border areas of fast ice, where drift ice was piled up/pushed by wind and currents. In severe winters, hummocks can occur in most marine areas of Estonia, including the western

Gulf of Finland, where they can persist for a period of 30 days. The areas most affected by the hummocks are Pärnu Bay, Väinameri, and Narva Bay, as these areas also have the longest ice cover duration.

Impact of the MSP

In the western and central parts of the Gulf of Finland and in the opening of the Gulf of Riga, drift ice and the potential damage to offshore and coastal structures are important barriers to maritime activities. Due to the ice conditions, it is necessary to take into account, with more precise designs of facilities (wind turbine type, fish farms, etc.) for the marine area or at the project level that the facilities need to be more resilient to the impacts of ice.

In connection with the formation of ice cover and the movement of hummock ice, it is also necessary to protect the proposed submarine cables in the shallow coastal area in such a way that the cable cannot be broken by the ice. One way to protect the cables from ice would be to immerse them in seabed sediments or to bury the cables. This ensures the safety of wind farms, fish farming facilities, etc., and avoids environmental risks.

In the stage of drawing up the Maritime Spatial Plan, it will not be known, due to the strategic nature of the plan, what the specific solutions will be for the proposed activities, e.g., traffic load related to the maintenance of wind farms (icebreaking works) or possible changes to the sea ice mobility and their consequences, e.g., on seals, as animals may gather for farrowing on fairways maintained by icebreakers or in wind farms with the standing ice. Therefore, at the project level of the proposed activities, it is necessary to assess how the proposed activity, in synergy with other similar development activities, will have an impact on ice cover changes and sea ice mobility. Also, what is the impact of ice-breaking activities during the ice period.

The proposed activities of the maritime spatial plan will not affect regional ice conditions.

ENVIRONMENTAL MEASURES:

1. In connection with the formation of ice cover and the movement of hummock ice, it is also necessary to protect the proposed submarine cables in the shallow coastal area in such a way that the cable cannot be broken by the ice.
2. Upon more precise design of facilities (wind turbine type, fish farms, etc.) for the marine area or at the project level, that the facilities need to be more resilient to the risks arising from ice conditions.
3. At the project level of the proposed activities, it is necessary to assess how the proposed activity, in synergy with other similar development activities, will have an impact on ice cover changes and sea ice mobility. Also, what is the impact of ice-breaking activities during the ice period.

4.1.4 Waves and currents

The currents of the Baltic Sea depend on the direction and strength of the wind. Water flow along the Estonian coast in the eastern direction is more common. The water level is raised by strong western winds and lowered by east winds. In extreme cases, fluctuations have been 2–2.5 m above and 1.2 m below the mean water level. The wave height is usually 1-2 m, the offshore wave height is 5-6 m during a storm, and up to 10 m during an exceptional western storm. The wave height is 6 meters in the Gulf of Finland and 3-4 meters in the Gulf of Riga. Temporary, short-term elevations and decreases in water levels depend on the topography of the coast and local wind conditions. Changes in water levels are smallest on the offshore coast and increasing towards the eastern part of the Gulf of Finland.

The characteristic current velocity in the surface layer of the Estonian marine area is 10–20 cm/s. However, currents are highly volatile and highly dependent on the local wind. The inertia period, the period of Baltic Sea self-oscillation, and mesomastic processes (synoptic scale) dominate the variability. Maximum current velocities in excess of 1 m/s have been recorded for occasional strong coastal jets in the straits (e.g., Suur Strait) and along the coast (e.g., Gulf of Finland). As the sea area is vertically stratified during the summer months, the vertical distribution of currents is also characterized by stratification. It is important to note that in the deeper layers of the sea (including near the seabed), currents of 40-50 cm/s may occur.

Impact of the MSP

Offshore installations, including aquaculture installations, wind turbines and the associated infrastructure, where waves, currents and mixing in the immediate vicinity are directly affected by obstacles placed in the water. The concomitant effects are rather local and, in case of aquaculture facilities, depend on the chosen technology.

The areas suitable for the development of wind energy found in the Estonian maritime spatial plan are dominated by weak unstable currents caused by winds. Long-term effects on currents/ecosystems due to changes in wind characteristics within 10 km of the offshore wind farm is insignificant, as the changes in wind speed as an average of the wind farm area are very small due to the sparse location of the wind turbines (the distance between wind turbines is 4-8 rotor diameters): the wind energy affecting the formation of waves at sea level (0-40 m above sea level below the wind turbine rotors) is reduced by less than 5% for a park with 100 wind turbines (200 m rotor, wind turbine spacing

4 diameters, tower height 150 m, rectangular arrangement in the worst case scenario) [26].

This decrease in speed, combined with a 2 degree change in direction, cannot significantly change the generation, direction, or intensity of wind currents. Considering the distance between the wind turbines (4-8 rotor diameters) and the largest diameter variant of the foundation (gravitational foundation, diameter of the widest part of the cone foot is expected to be 50-60 m for potential 10+ MW wind turbines, up to a maximum of 100 m), it is possible only in the worst-case scenario in very shallow water, where the foundation is cylindrical instead of a truncated cone. The Estonian maritime spatial plan excludes the construction of wind turbines closer than 6 nautical miles (approx. 11.1 km) to the coast. (See Chapters 4.1.1 and 4.1.2).

In case of the ratio between such an obstacle and the area open to the movement of water, it is not possible to have a significant adverse effect by considering the speed of water flow in the currents. Other results of modelling the impact of offshore wind farm foundations in the Baltic Sea have provided a similar assessment[27].

There are no permanent changes in wind speed, directional turbulence and other characteristics due to the wind farm: the changes disappear outside the wind farm within 7-9 km downwind and within 1 km headwind at the latest. At the same time the climatic factors affecting the wind characteristics of the wind farm are not affected which ensures the full recovery of wind properties outside the area of influence of the wind farm, as well as the area of the wind farm after its liquidation for a longer period of time.

However, the impact of wind turbines on water flow and currents has so far been considered to be insignificant and local. The activities planned by the planning solution do not have a significant impact on the waves and currents; the impacts on the facilities tend to remain local (Also check chapter 4.1.2 Wind).

The activities planned by the planning solution do not have a significant impact on the waves and currents, the effects in case of facilities tend to remain local.

4.1.5 Water quality

Seawater quality refers to the set of values and status estimates used to assess the status of seawater. The quality (status) of seawater is assessed through a

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[26] The significance assessment is agreed, the 5% and 10% limits are more widely used in science. Thus, the phenomenon should be affected by at least 5% or 10%, and this difference should be in addition to the natural variability.

[27] Rennau, H., 2011. *Natural, numerical and structure-induced mixing in dense gravity currents: idealised and realistic model studies. PhD thesis, Uni Rostock*. https://www.io-warnemuende.de/tl_files/staff/burchard/pdf/thesis_hannes.pdf

number of different assessment instruments, depending on the geographical coverage of seawater within the scope of different legal instruments. In Estonia, the methodology for assessing seawater quality differs between coastal waters (up to 1 m from the coastline towards the high seas from the datum line) and offshore. Estimates of coastal water status are based on the evaluation matrix of the EU Water Framework Directive (Estonia's own assessment system is provided by the Minister of the Environment Regulation No 19[28]).

The aggregate status used to characterize coastal waters consists of two components - the ecological status and chemical status. Depending on the magnitude of the human impact, the ecological status of coastal bodies of water is assessed on a 5-point scale: from very good status with little or no anthropogenic changes to biological status to very poor status (biological parameters deviate very much from the reference conditions, or there is no biota). The biological parameters assessed are divided into three 'quality elements': phytoplankton, benthic flora, and benthic fauna. The physical and chemical parameters of the seawater (nutrient concentrations and water transparency) are additional parameters used to explain the state of the biological parameters and the causes of the changes. The chemical status of a body of water is assessed on a 2-point scale: good - priority pollutants are below a threshold value established as an ecological quality standard; poor - the content of the priority substance is above the quality standard[29].

The hydromorphological quality indicators for determining the ecological status class of the coastal water body are the bottom surface load index of the coastal water body (abbreviation PÕKI) and coastline load index of the coastal water body (abbreviation RAKI), which are calculated by using the following indicators: naturalness of currents, alternation of water depth and its naturalness, naturalness of the bottom in different ecological zones and the rate of anthropogenic changes in the coastline.

The official assessment of the ecological and aggregate status of the Estonian coastal waters dates from 2019. According to the latter the ecological status of the Estonian coastal water reservoirs (abbreviation RVK) in Haapsalu Bay and Matsalu Bay is poor, the status is “moderate” in case of RVK of Muuga-Tallinn-Kakumäe and RVK of Pärnu Bay. All other coastal waters are "moderate". The assessment of the overall status is "poor" for all coastal water bodies (Figure 4.1.5-1 and Figure 4.1.5-2.). The ecological as well as chemical status of coastal water bodies is also provided separately, by single coastal water bodies in the respective annual reports of the National Environmental Monitoring and

[28] Regulation No. 19 of the Minister of the Environment of 16 April 2020 “List of surface water bodies, procedure for determining surface water bodies and territorial sea status classes, values of quality indicators of ecological status classes of surface water bodies and values of quality indicators of non-surface water bodies” (hereinafter Regulation No. 19)

[29] https://www.keskkonnaagentuur.ee/et/eesmargid-tegevused/vesi/meri/rannikuveekogumite-seisund

is displayed in the map application of water bodies of the Environment Agency[30].

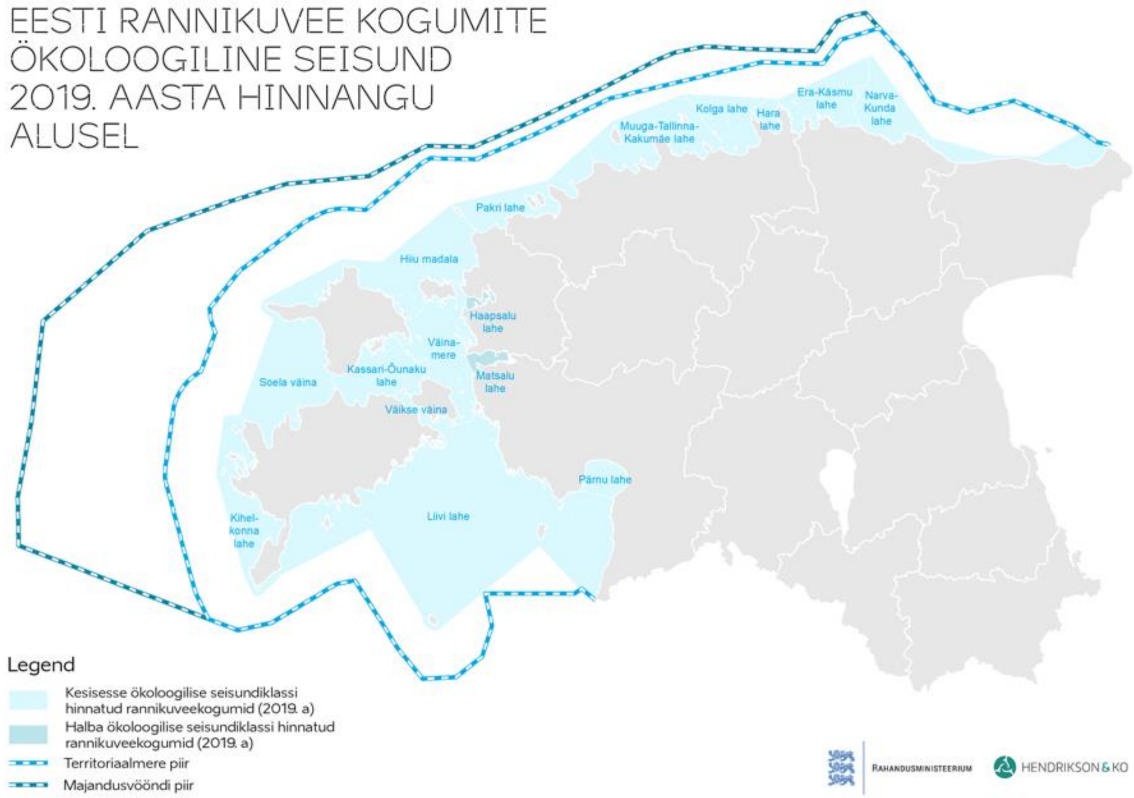


Figure 4.1.5-1. Ecological status of Estonian coastal water bodies based on 2019 assessment (Source: Environment Agency)

30 https://kaur.maps.arcgis.com/apps/MapSeries/index.html?appid=fd27acd277084f2b97eee82891873c41

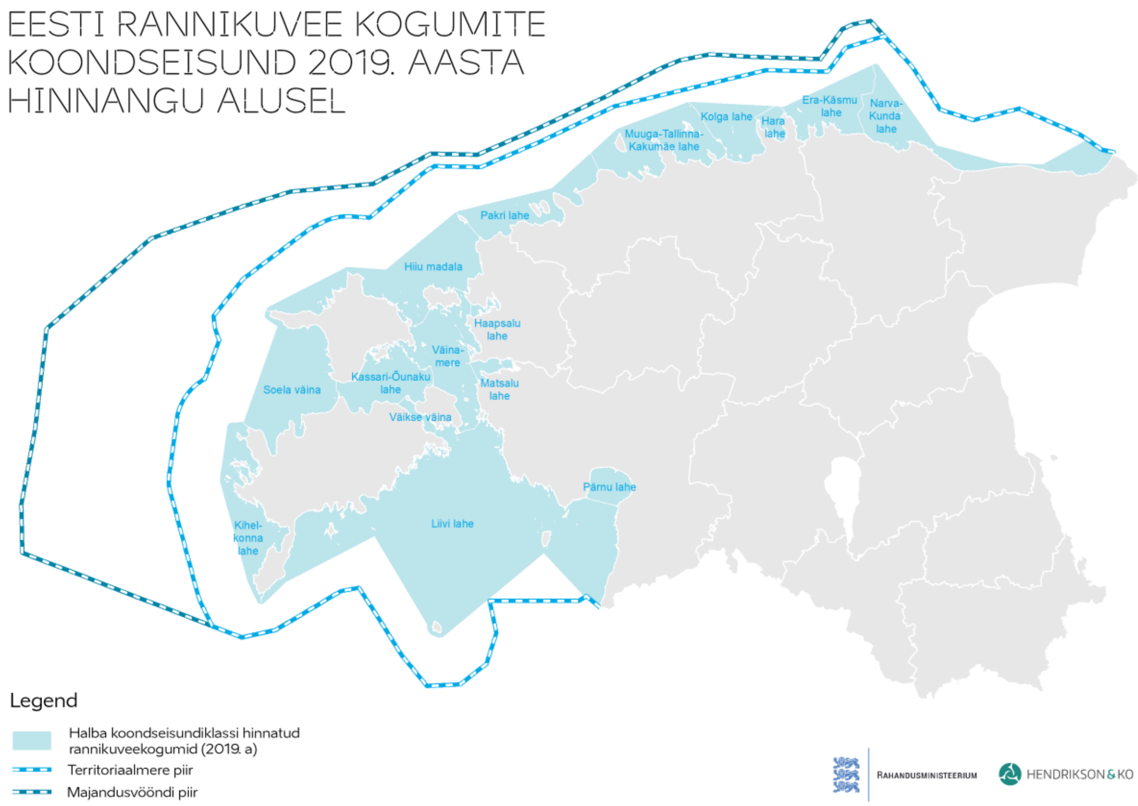


Figure 4.1.5-2. Aggregate status of Estonian coastal water bodies based on 2019 assessment (Source: Environment Agency)

Marine areas outside the coastal zone are assessed according to the guidelines of the EU Marine Strategy Framework Directive. The MSFD describes the status of a marine area on the basis of eleven Good Environmental Status (GEA) attributes, of which Indicator 5 includes indicators of eutrophication.

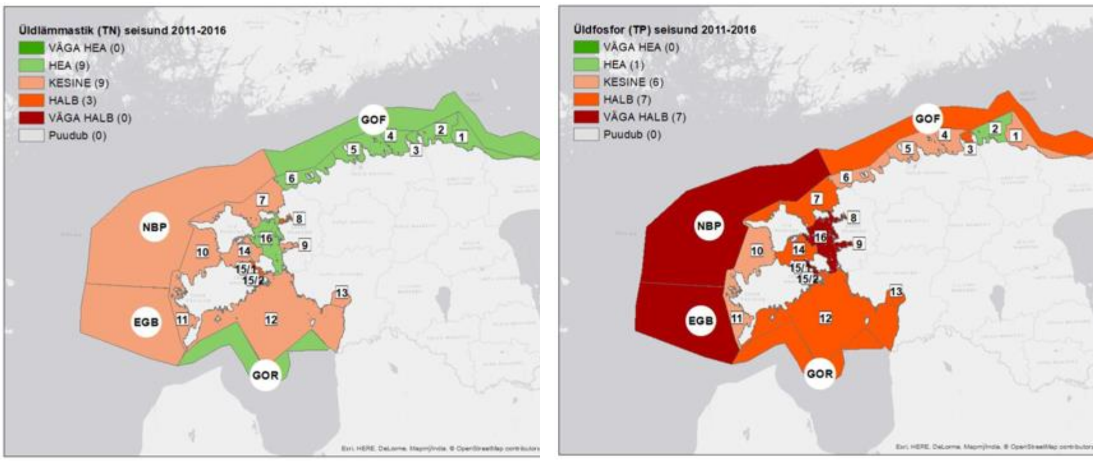
Eutrophication is one of the biggest environmental problems in the Baltic Sea today. Eutrophication is caused by the accumulation of nutrients (especially nitrogen and phosphorus compounds) in the marine environment. Due to the nature of the Baltic Sea basin (located in a rainy climate zone, intensive land use) and hydrological features (water exchange with the ocean is very limited, long water retention time is up to 30 years), nutrient accumulation in the Baltic Sea environment is also a natural process, fueled by human activity. The manifestations of eutrophication are a number of simple and complex symptoms, both by individual ecosystem components and at the level of the ecosystem as a whole, including both positive (high secondary production including planktonic fish biomass) and numerous negative (increased primary production - algal blooms, deficiency of oxygen in the demersal water layers, depletion of species diversity) and other phenomena.

The state of the eutrophication of the Estonian marine area has been extensively evaluated in the context of reporting under the EU Marine Strategy Framework

Directive (TUT MSI, 2017[31]). The status assessment methodology is based on a comparison of measured values with predetermined threshold values and is reported on a five-class scale similar to the Water Framework Directive methodology. The units of assessment are the coastal water bodies and the distribution of the high sea areas according to the HELCOM division. Corresponding threshold values are determined either by Estonia's own regulation or according to the values used by relevant HELCOM working groups.

Nitrogen and phosphorus indicators were evaluated as for nutrient concentrations in seawater. Assessments of the total nitrogen concentration in summer were generally in the good and poor classes. Assessments of the total nitrogen concentration in summer were generally in the poor, bad, and very bad classes. The three coastal water bodies between the mainland and the islands and the northern basin of the Baltic Proper were assessed to be in very poor status. Assessments of winter concentrations of inorganic nitrogen were mostly in the poor and very poor class. Nine coastal water bodies were not assessed due to the lack of monitoring data. Assessments of the state of winter phosphate concentrations were mostly in a very poor class. Also, nine coastal water bodies were not assessed due to the lack of monitoring data. Water bodies to the west of the mouth of the Gulf of Finland were in a very poor state.

The nutrients of the Estonian coastal seawater come from many different sources. Land-based sources play a greater role in the areas closer to the coast, while in the case of offshore areas, the movement of seawater and the exchange of water between the various basins of the Baltic Sea are of greater importance.



31 EL merestrateegia raamdirektiivi (2008/56/EÜ)kohane merekeskkonna seisundihinnang teemadeleutrofeerumine ja hüdrograafilised muutused (D5 ja D7), TTÜ MSI 2017, https://www.envir.ee/sites/default/files/d5_d7.pdf

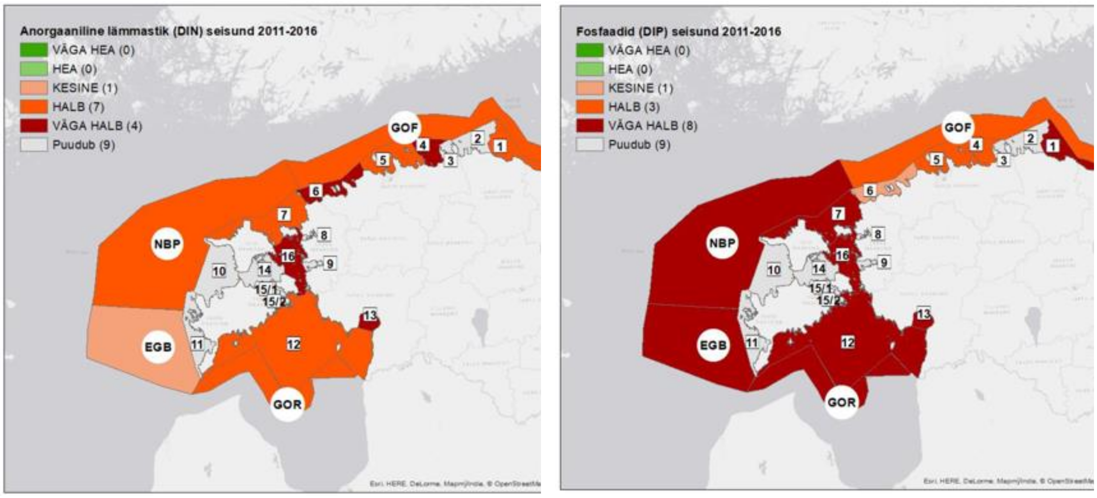


Figure 4.1.5-3. Estimates of the status of the Estonian marine area based on four nutrient indicators in 2011-2016 (Source: TUT MSI, 2017)

Condition assessments based on chlorophyll-a content (mg/m^3) were mostly in the poor category, with four water bodies also in a very bad class (Figure 4.1.5-4). In water bodies where the GES (Good Environmental Status) for this indicator has been achieved, this may be due to the fact that data have only been collected once every six years. In general, there is a discrepancy between estimates for coastal and offshore areas. The difference may be due to the data aggregation methodology since arithmetic averages are used in offshore areas and median averages in coastal areas.

Assessments of phytoplankton biomass (mg/m^3) status were mostly in the moderate, poor, and very poor class, with good status achieved in three coastal water bodies. The variability in estimates of water bodies in the Gulf of Finland may also be due to the frequency of data collection (some water bodies are not adequately covered by monitoring and estimates are based on a small amount of data).

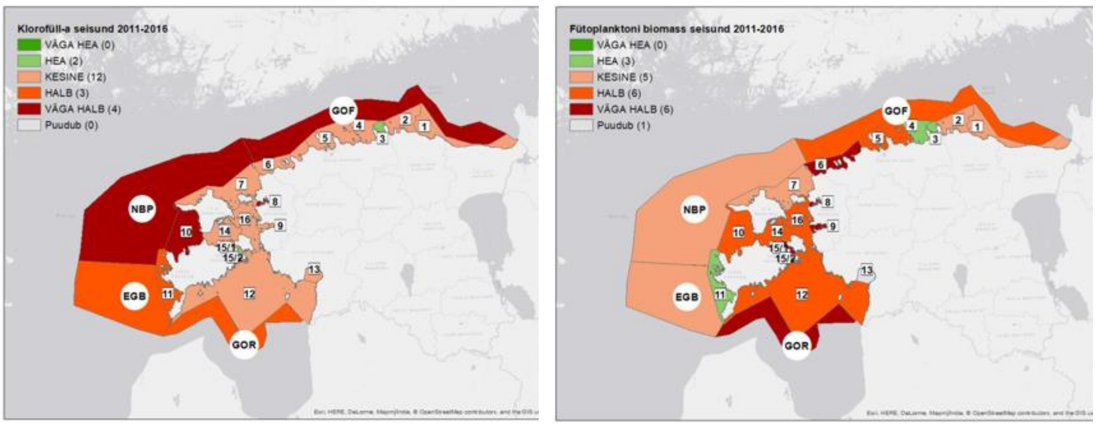


Figure 4.1.5-4. Status assessments of phytoplankton indicators (chlorophyll a and phytoplankton biomass) in the Estonian marine area according to MSFD reporting (Source TUT MSI 2017)

The status assessments based on the transparency of the seawater (Secchi depth) were mostly in the poor class, with four bodies of water also in bad, three in very bad, and two in the good class (Figure 4.1.5-5). Again, two coastal water bodies of the Gulf of Finland qualified for a good class, where only one year of monitoring was performed during the assessment period, and thus this assessment is of low reliability. Three indicators were considered as indicators based on the oxygen concentration of seawater: the Deepwater Oxygen Deficiency Indicator, the oxygen content of the demersal water of the shallow coastal sea, and the oxygen consumption in the deepwater layer. Estimates were given only for the Deep-Water Oxygen Deficiency Indicator, as there is no common methodology or monitoring data for the other two indicators. The results again showed moderate status for offshore areas.

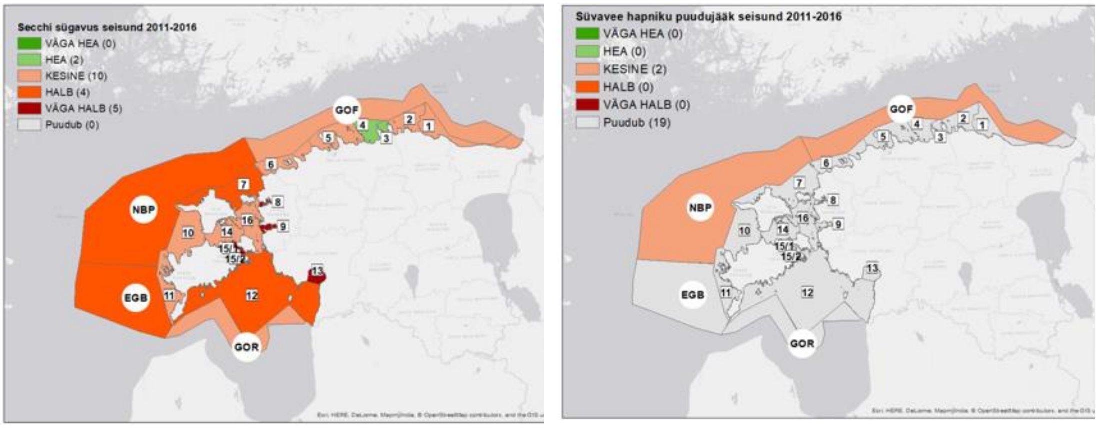


Figure 4.1.5-5. Status assessment of water transparency and oxygen concentration-based indicators in Estonian marine area according to MSFD reporting (Source TUT MSI 2017)

In addition to the above, a number of indicators used mainly for shallow coastal waters were used to provide an overall assessment of eutrophication, such as:

- the proportion of opportunistic species in benthic communities,
- depth distribution of benthic vegetation,
- depth distribution of bladderwrack,
- percentage of perennial species in communities,
- zoobenthos community index,
- soft-bottom benthic fauna.

The status estimates for all of the above-mentioned indicators were significantly better than those based on physical and chemical parameters.

The aggregate assessment of eutrophication (Figure 4.1.5-6) was obtained by aggregating the assessment results of the individual indicators according to the methodology used in the HELCOM HOLAS eutrophication report. According to the aggregate assessment, the Estonian marine area is divided into "very bad," "bad," and "poor" status classes, which is dominated by the "bad" status class

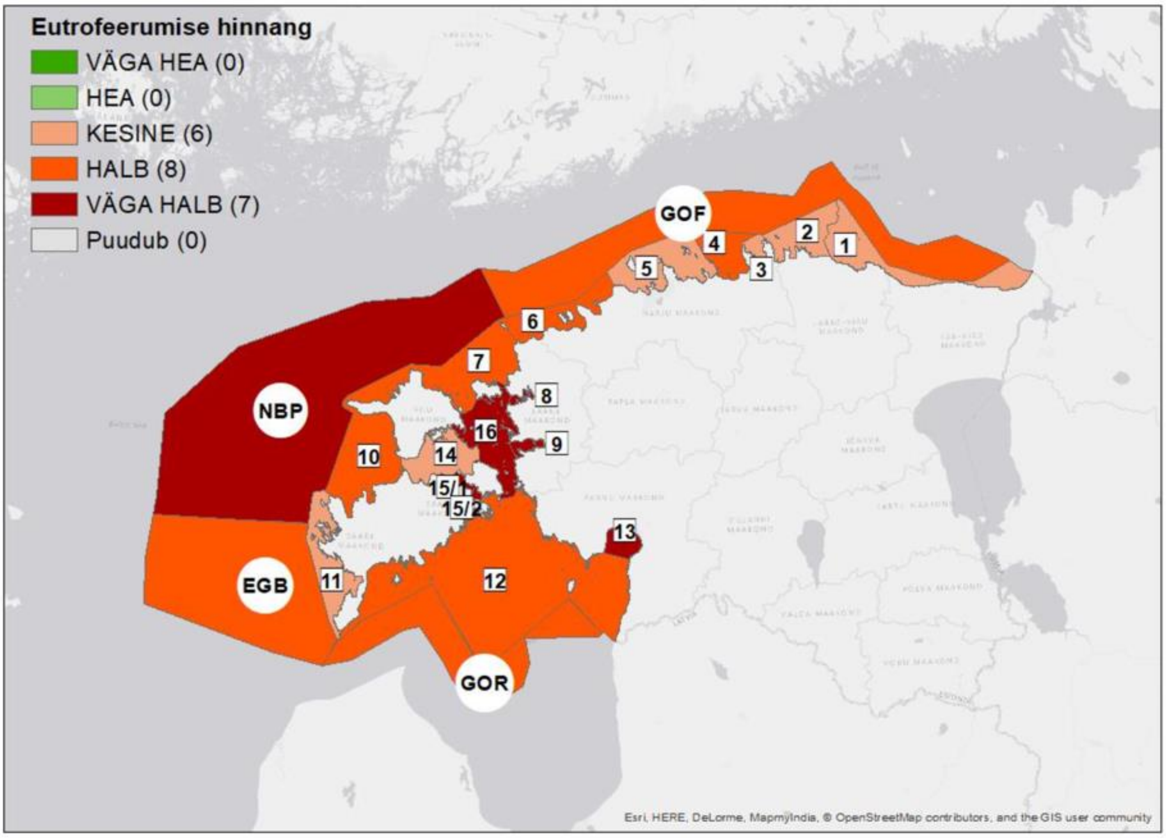


Figure 4.1.5-6. The general assessment of the state of eutrophication (aggregated assessment of all indicators) for the Estonian marine area according to the GES assessment of the Estonian marine area according to MSFD (source TUT MSI 2017).

Impact of the MSP

In the case of the shallow coastal sea and the Väinameri Sea, it can be assumed that the main influencers of the condition are on land, and the impact itself is manifested through the nutrient flow from inland. In the offshore area, water exchange with other marine areas and the overall level of eutrophication in the Baltic Sea are the major influencing factors.

The impact of the proposed planning solution on a larger scale (assessment units at the level of offshore or coastal water bodies) is likely to be very minimal since the spatial activities foreseen in the planning are all local and have very little impact on the larger scale nutrient flows. None of the status assessments at the assessment unit level are likely to be affected by any of the activities provided by the planning (in any case, the status class of the spatial assessment unit will not change due to the planned activity).

At the same time, several proposed activities (e.g., the establishment of fish farming, installation of wind turbines, etc.) will have a short-term or spatially limited impact on water quality. For example, there can be a certain impact on water quality during the construction phase of the wind farm, where the following earthworks are carried out: leveling the bottom where necessary at the location of each wind turbine installation, stabilizing the foundation base with the filling, filling the foundation cone with sand and laying the cable. For all operations causing bottom disturbances, the impact on water quality will depend on the amount and quality of sediment discharged from the bottom to the water column and the prevailing hydrodynamic conditions. The impact on water quality during the construction phase of the wind farm and the cable corridore is negative but is likely to be insignificant due to its short-term and local impact and small impact compared to natural variability and other human activities. At the licensing level, it is necessary to assess the impact of the proposed activities on a site-by-site basis and to provide more specific measures to reduce the adverse impacts.

In mining, the main impact on water quality is the generation of suspended matter in the water column. More specific measures to minimize impact must be foreseen in the extraction licensing process.

Large-scale changes in water quality may be associated with fish farms. Impact from the fish farm can be divided into local and larger-scale processes, which require different approaches and depend on the precise size and technology of the fish farm being planned.

With open fish cages that today are the most commonly used, the biggest contributor is the nutrient leaking from the fish cage (nitrogen and phosphorus), which is released into the environment in very different forms - feed, fish excrement, and fish mucus. Local nutrient and organic matter accumulation cause significant problems in the immediate vicinity of the cages. At the same time, in offshore conditions where water movement is intense, this local impact is negligible as substances leaking from the cages are dispersed over large sea areas.

Local impact is related to adverse events due to increased nutrient concentrations. These include, for example, increased organic matter content in the seabed below fish cages, oxygen depletion, loss of biota, increased water nutrition, the proliferation of pelagic micro-algae, changes in macro-algae and invertebrate communities, and mass exchanges in the immediate vicinity of opportunistic species. Depending on the specific location of the development and/or existing pressures, the extent and nature of local changes/impact may vary widely. Therefore, the assessment of the impacts of a particular fish farm should take into account, in particular, the technological features of the fish farm and all local features (e.g., the character of the coastal slope, the openness aspect) and hydrological conditions (the nature of tides and waves) affecting the movement of nutrients released from the fish cage in the marine environment (including the rate of nutrient dissolution).

Measures which directly affect the availability of nutrients in the water column are suitable for mitigating local impacts. These may include algae and shellfish farming near fish cages, technological techniques to prevent nutrient leaching from the fish cage (for example, collecting feed residues and feces in or in the immediate vicinity of the cage) as well as chemical bonding or more efficient dilution of fish farming nutrients. Such measures will make it possible to reduce the negative impacts of the added nutrient flow in the immediate vicinity of the fish farm. It is important to consider the development and location specifics. The intensity of the negative impacts is highly dependent on the fish farm's own parameters and natural conditions in the immediate vicinity of the fish cage. Negative environmental impact is particularly likely to occur in sea areas with limited water exchange (nearshore locations, locations hidden from the wind, narrow and deep bays, extensive shallows). Consequently, during the preparation of the planning solution, unsuitable or excluding areas for the development of the fish farm (resulting from the worst technological scenario) have been identified due to the precautionary principle. In the course of the planning solution the protected natural objects were identified as unsuitable areas for fish farming, including Natura network areas, with the aim of excluding any possible adverse effects on the protected natural values (see also Chapter 2). In addition, the planning solution directs the establishment of fish farms to deeper (> 5 m) and more open sea areas in order to reduce the local impact of pollution. In the deeper sea areas nutrients are better dispersed due to the intensive movement of water, in addition, the deeper sea areas usually have less affected biota (seabed habitats, fish spawning grounds, etc.).

The purpose of the maritime spatial plan is to promote the development of the blue maritime economy and nutrient-neutral aquaculture, i.e. the condition of the marine environment should not deteriorate as a result of the planned activities. The impact of aquaculture, including fish farming, depends largely on the technology chosen and the species cultivated. The aquaculture sector is undergoing rapid technological development (e.g. semi-enclosed on-board fish farming systems, closed cages, etc.), which has the potential to develop nutrient-neutral and nutrient-removing aquaculture. The selection of fish farming technology and the assessment of the environmental impacts related to this activity is carried out at the level of authorization.

Large-scale processes include nutrient balances in sea basins, which depend on the total nutrient load in the Baltic Sea on the one hand and on climatic factors on the other. The latter determines the movement of nutrients between marine sediments and the water column. It is also important to understand the natural dynamics of nutrient loads in the basin, which, as a rule, depends on climatic and other large-scale factors. For example, the overall nutrient load in the north-eastern part of the Baltic Sea is directly related to the amount of precipitation in the region, and the resulting difference in nutrient loads between years can be dozens of percent.

There are other ways of smoothing out large-scale processes to maintain the overall nutrient balance of the basin. In particular, activities that take into account the overall metabolism, such as the use of local feed (production of fish feed from raw materials from the same basin) are suitable measures. Alternative solutions to balance the nutrient balance of the basin can also be used as compensatory or mitigation measures. For example, more most effective nutrients removal options can be developed for the other nutrient load sources flowing into the same basin drains into nutrient loading sources can contribute in more efficient treatment of the settlement and industrial wastewater, reduction of agricultural burden resulting from the land use or other options of removal of nutrients from the marine environment, such as additional fishing[32] or picking of coastal rejects. It is important to understand the magnitude of the impact of all processes and measures, i.e., larger basins need to consider the transport of nutrients and water between basins, the metabolism between the water column and the seabed. A more detailed national analysis is needed because without adequate assessment of water exchange, and nutrient flows between different parts of the sea, adequate regional measures (e.g., by coastal bodies of water) cannot be proposed, which in turn can lead to inefficient use of resources and unreasonable fish farming costs. On the basis of a more detailed study, it is possible to assess the importance of the proposed load on the marine environment in the context of a natural process.

The development of algae and shellfish farming has the potential to contribute to the achievement and maintenance of the good status of the marine environment by contributing to the removal of nutrients from the marine environment. Based on the average growth rate of shellfish, it is already possible to remove 35 tons of nitrogen and 2.7 tons of phosphorus per 1 km^2 of marine waters from the coastal area of West Estonia at the estimated rate of one year. In addition to nutrient removal, this shell farm significantly increases the transparency of water within a radius of about 1 km^2 and reduces the risk of local algal blooms due to, for example, fish farming or other human activities that add nutrients to the marine environment. Consequently, it is prudent to place shellfish farms in the vicinity of fish farms in the coastal sea, as this combination can compensate for the nutrient fluxes from fish farms to the sea and keep the water in the vicinity of the fish farm transparent. However, it should be borne in mind that shellfish farming, and algae farming may, in some cases, also have negative impacts such as local over-nutrition of the seabed, but such impacts are smaller in magnitude than similar environmental impacts of fish farms[33,34]. The plan, therefore, favors algae and shellfish farming as a measure to mitigate the impacts of other activities (e.g., fish farming) and does not preclude their creation in protected natural areas where aquaculture could also help to improve the status of the marine environment. However, the development of shellfish and algae cultivation in protected areas must be guided primarily by the conservation objectives of the protected area and the

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[32] Developing measures to compensate for nitrogen and phosphorus loads directed to the sea through fish farming; J.Kotta, R.Eschbaum, G.Martin, University of Tartu 2019

[33] Kotta, J.; Futter, M.; Kaasik, A.; Liversage, K.; Rätsep, M.; Barboza, F.R.; Bergström, L.; Bergström, P.; Bobsien, I.; Díaz, E.; Herkül, K.; Jonsson, P.R.; Korpinen, S.; Kraufvelin, P.; Krost, P.; Lindahl, O.; Lindegarth, M.; Lyngsgaard, M.M.; Mühl, M.; Sandman, A.N.; Orav-Kotta, H.; Orlova, M.; Skov, H.; Rissanen, J.; Šiaulys, A.; Vidakovic, A.; Virtanen, E. 2020. *Response to a letter to editor regarding Kotta et al. 2020: Cleaning up seas using blue growth initiatives: Mussel farming for eutrophication control in the Baltic Sea. STOTEN*, 709, 136144.

[34] Andreas Holbach, Marie Maar, Karen Timmermann, Daniel Taylor. 2020. *A spatial model for nutrient mitigation potential of blue mussel farms in the western Baltic Sea. Science of The Total Environment,* 736,139624.

legislation applicable therein, and therefore the plan requires that the impact be specified in cooperation with the Environmental Board.

The impact on water quality during the construction phase of the wind farm and the cable corridore is negative but insignificant due to its short-term and local impact and its impact is small compared to natural variability and other human activities.

Large-scale changes in water quality may be associated with establishment of fish farms. Fish farm effects can be divided into local and large-scale processes that require different approaches. The development of algae and shellfish farming has the potential to contribute to the achievement and maintenance of good status of the marine environment by contributing to the removal of nutrients from the marine environment. Therefore, the planning solution should favour multitrophic aquaculture.

The impact of the proposed planning solution on a larger scale (assessment units at the level of offshore areas or coastal water bodies) is not relevant since the spatial activities foreseen in the planning are all local and have very little impact on the larger scale nutrient flows, therefore, the implementation of the maritime spatial plan does not foresee the occurrence of significant adverse effects by implementing the envisaged environmental measures and recommendations at the level of authorization.

ENVIRONMENTAL MEASURES:

1. Possible measures to mitigate the impact of the planned activities on the water quality in the Estonian marine area are very area and activity specific and should be envisaged in the planning of each specific development project. At the licensing level, it is necessary to assess the impacts of the proposed activities on a site-by-site basis and to provide more specific measures to minimize the adverse effects.
2. The effects of wind farms during construction will be short-term and can be mitigated by technical measures proposed at the project level. The installation of wind turbines does not have a lasting effect on water quality. However, at the level of authorization, the effects of the proposed activities should be assessed on a site-by-site basis and, where necessary, more specific measures should be taken to minimize the significant adverse effects.
3. The main impact of mining on water quality is the generation of suspended matter in the water column. More specific measures to minimize impacts must be foreseen in the licencing process.
4. The impact of aquaculture, including fish farming, depends to a large extent on the technology chosen and the species cultivated. The fish farming sector is undergoing rapid technological development (e.g. semi-enclosed on-board fish farming systems, closed cages, etc.), which enables to develop nutrient-removing aquaculture. The selection of fish farming technology and the assessment of the environmental impacts of this activity is carried out at the level of authorization. Nutrient-neutral

aquaculture should be favoured, i.e. the proposed activity should not lead to the deterioration of the marine environment.

5. Measures that directly affect the availability of nutrients to the water column are appropriate to mitigate the local effects of the fish farm. These may include algae and shellfish farming near fish cages, technological techniques to prevent nutrient leaching from the fish cage (for example, collecting feed residues and feces in or in the immediate vicinity of the cage) as well as chemical bonding or more efficient dilution of fish farming nutrients. Further measures to minimize the impact must be foreseen in the licensing process.

PROPOSALS FOR THE ACTION PLAN:

1. Understanding the magnitude of the effects of all processes and measures is important to smoothing out large-scale processes in fish farms. Larger basins must take into account the transport of nutrients and water between basins, the metabolism between the water column and the seabed. A more detailed national analysis is needed because without adequate assessment of water exchange and nutrient flows between different parts of the sea, adequate regional measures (e.g., by coastal bodies of water) cannot be proposed, which in turn can lead to inefficient use of resources and unreasonable fish farming costs.

4.2 HABITATS AND BIOTA

4.2.1 Fish

Due to the low and variable salinity in the Baltic Sea, spreading of fish of both marine and freshwater origin is prevented, and therefore the number of species is lower than in the sea with normal salinity. At the same time, the fish populations of the Baltic Sea are numerous, which is characterized by the fact that about 1% of the total catch of the world's sea is caught here. One of the main assets of the Baltic Sea is its fish stock.

There are about 30 species of marine fish in Estonian waters, 10 species of migratory fish, and about 20 species of freshwater fish in the coastal sea. These three groups may be further subdivided into different groups according to origin, systematics, the importance of fisheries and nature conservation, reproductive biology, etc. However, species still have very different preferences for habitats and spawning grounds: while some species require deeper areas of the Baltic Sea for spawning, depending on their oxygen and salinity conditions, other species depend on free passage for freshwater spawns or spawn at different depths at the coastal area, due to different preferences in terms of temperature, salinity, substrate, etc.

Many fish species in the Baltic Sea live under stress due to the local salinity and temperature, which makes them more sensitive to environmental changes. And as elsewhere in the world and in the Baltic Sea, Estonian fish fauna is mainly affected by human activity, which has resulted in a decrease in both species richness and the abundance of most fish species. In addition to fishing, there are other human activities that affect fish abundance in the Baltic Sea, such as migration barriers on rivers flowing into the Baltic Sea and river pollution, which are a limiting factor for many fish species in the Baltic Sea. Anoxia in the deeper areas of the Baltic Sea is primarily affected by nutrient inflows resulting from land use, and the proportion of the pollution load resulting from the use of marine is still low. However, it is an important problem for fish spawning in the deeper areas of the Baltic Sea, such as cod and flounder, so it is important that marine area use does not increase the concentration of biogenes.

The vast majority of the indicators of the Marine Strategy Framework Directive for fish in the state of the Estonian marine environment in 2018[35] did not meet the level of good environmental status, which was mainly due to overfishing, but also the situation of spawning grounds for salmon and flounder. There are also species endangered and the ones with limited spread in our waters, such as whitefish, whose scarce extinct local populations could be fatally affected by even the smallest damage to the spawning grounds.

In general, shallow coastal waters (less than 15 m) and offshore shoals are more important for fish than sea areas. Most spawning grounds and juvenile fish breeding sites are located in the shallower coastal areas (up to 5 m), or they are crossed by species heading for spawning in freshwater (check Figure 4.2.1-3 to 4.2.1-6). More open sea areas with depths> 5 m may be spawning grounds for Baltic herring (check Figure 4.2.1-1) and Baltic flounder (Figure 4.2.1- 2). The deepest areas of the Estonian EEZ are generally unsuitable for spawning because they lack the conditions - the required salinity and oxygen regimes - necessary for spawning sea fish (cod, flounder, sprat (check Figure 4.2.1-6 to 4.2.1-8). For several fish species, information has been gathered from the researchers in the Baltic Sea region within the HELCOM PanBalticScope project based on available data who have mapped the key habitats and spawning grounds for more important fish species by using models[36] that take into account species-specific criteria for different fish species, such as salinity, depth, exposure to waves, extent of the photic zone, water transparency, etc. (see figures below). These are modelled map layers that indicate potential spawning grounds based on previous research and knowledge that there are natural conditions for spawning in these areas.

[35] Estonian Maritime Institute, University of Tartu. " The state of the Estonian marine environment 2018". Report, 2018. https://www.envir.ee/sites/de-fault/files/mere_seisund_2018.pdf

[36] The maps prepared based on the models have been validated by experts of the relevant species and countries.

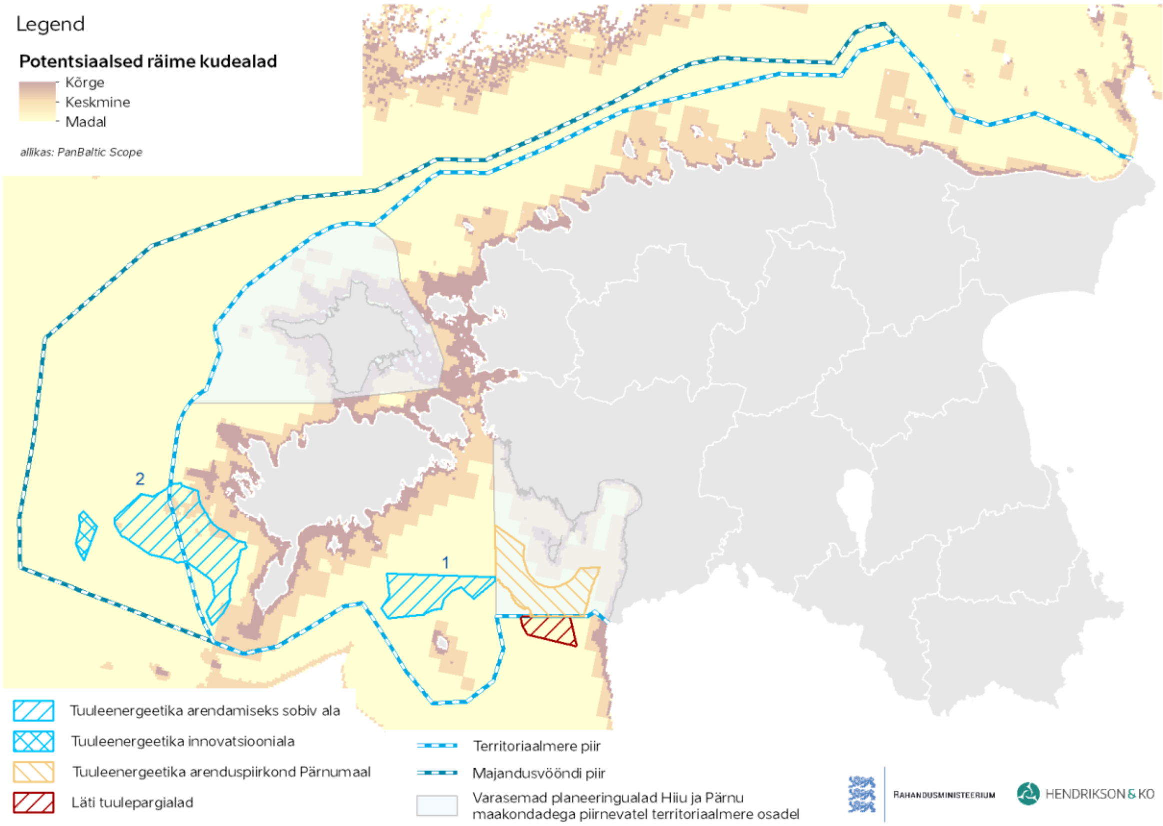

Figure 4.2.1-1. Potential spawning grounds for herring (source: Pan Baltic Scope)

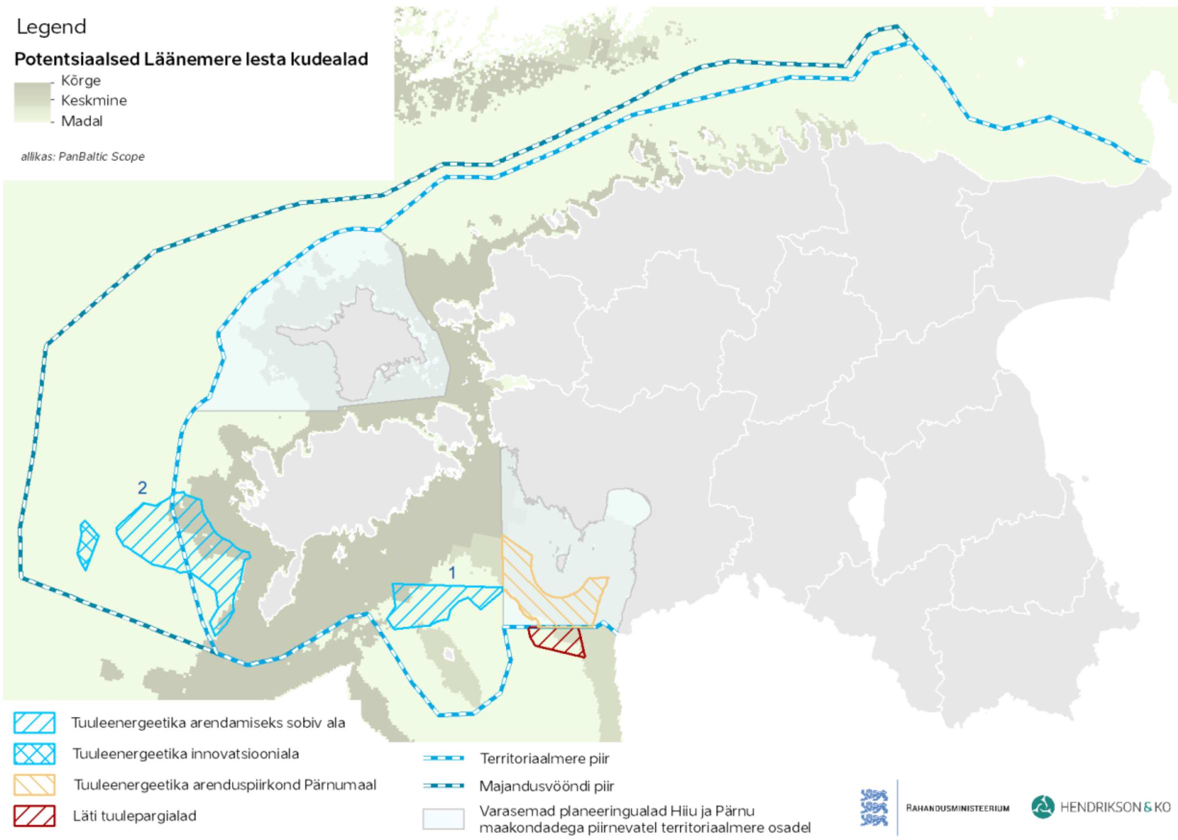

Figure 4.2.1-2. Potential spawning grounds for Baltic flounder (source: Pan Baltic Scope)

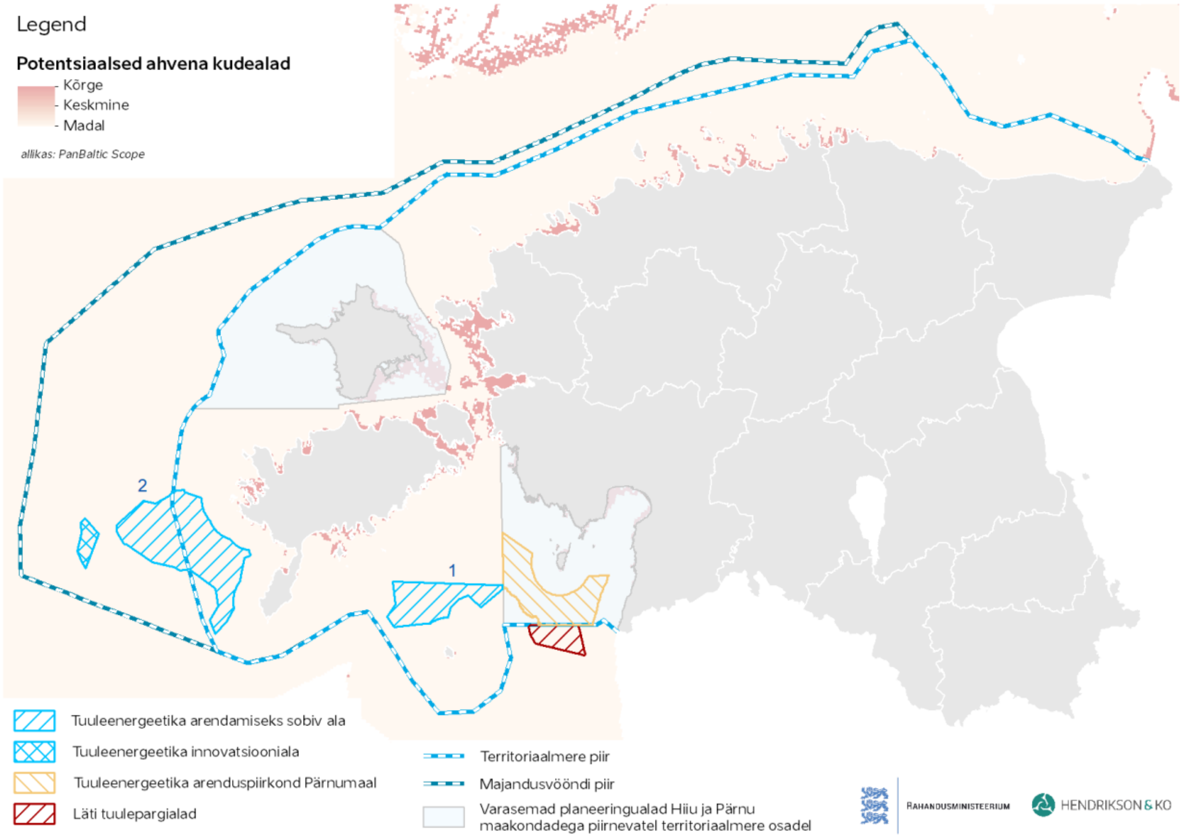

Figure 4.2.1-3. Potential spawning grounds for perch (source: Pan Baltic Scope)

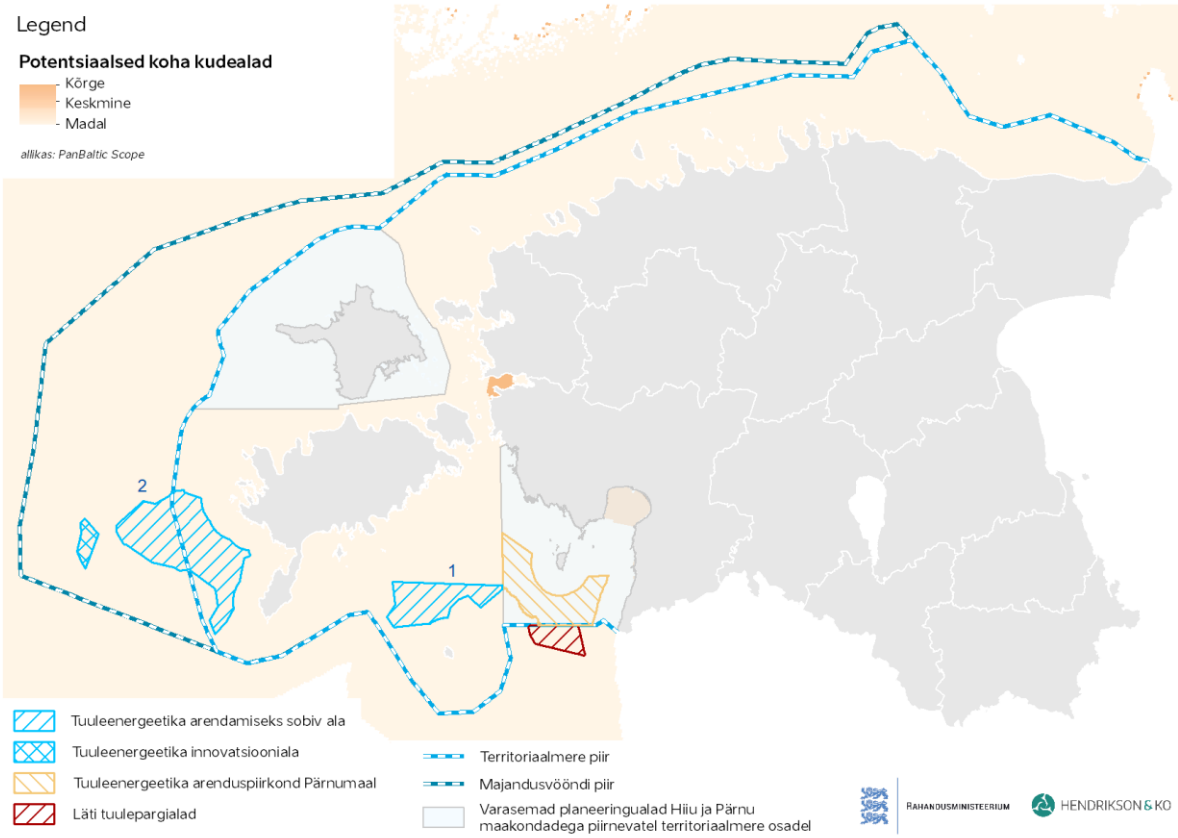

Figure 4.2.1-4. Potential spawning grounds for pikeperch (source: Pan Baltic Scope)

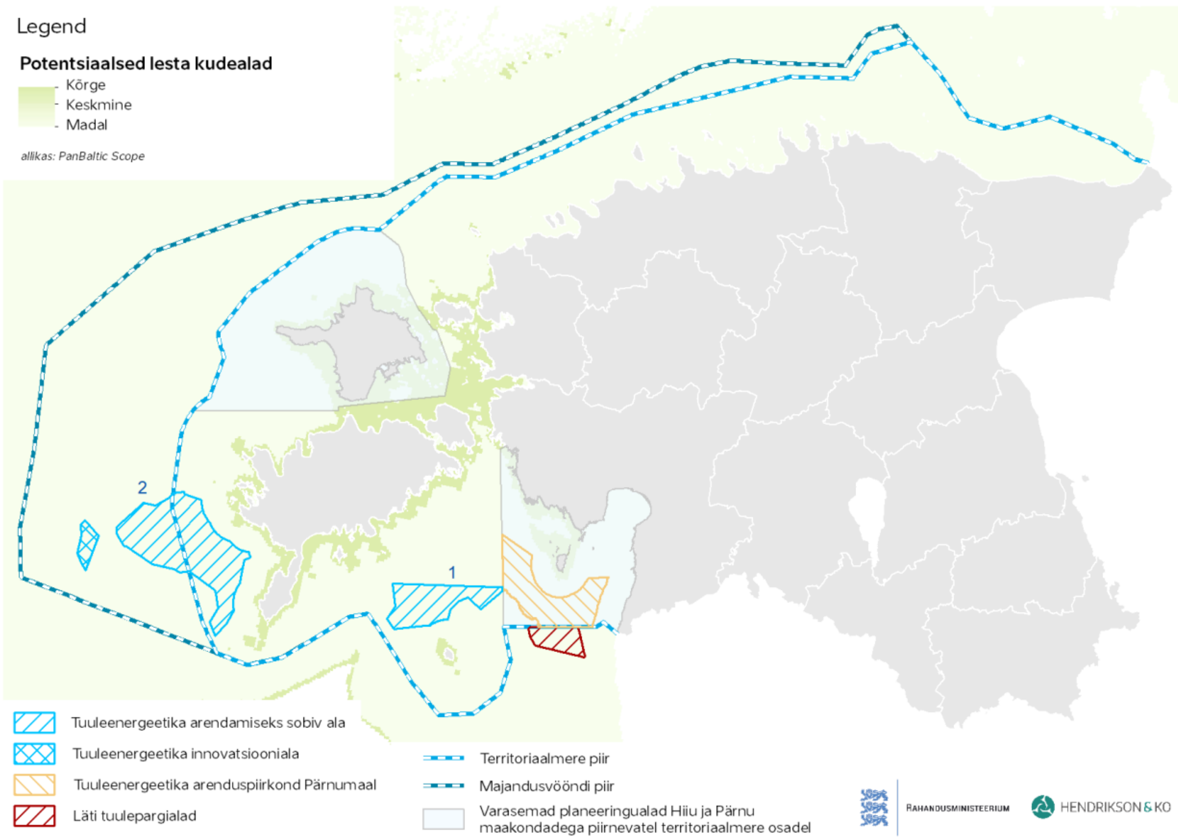

Figure 4.2.1-5. Potential spawning grounds for flounder (source: Pan Baltic Scope)

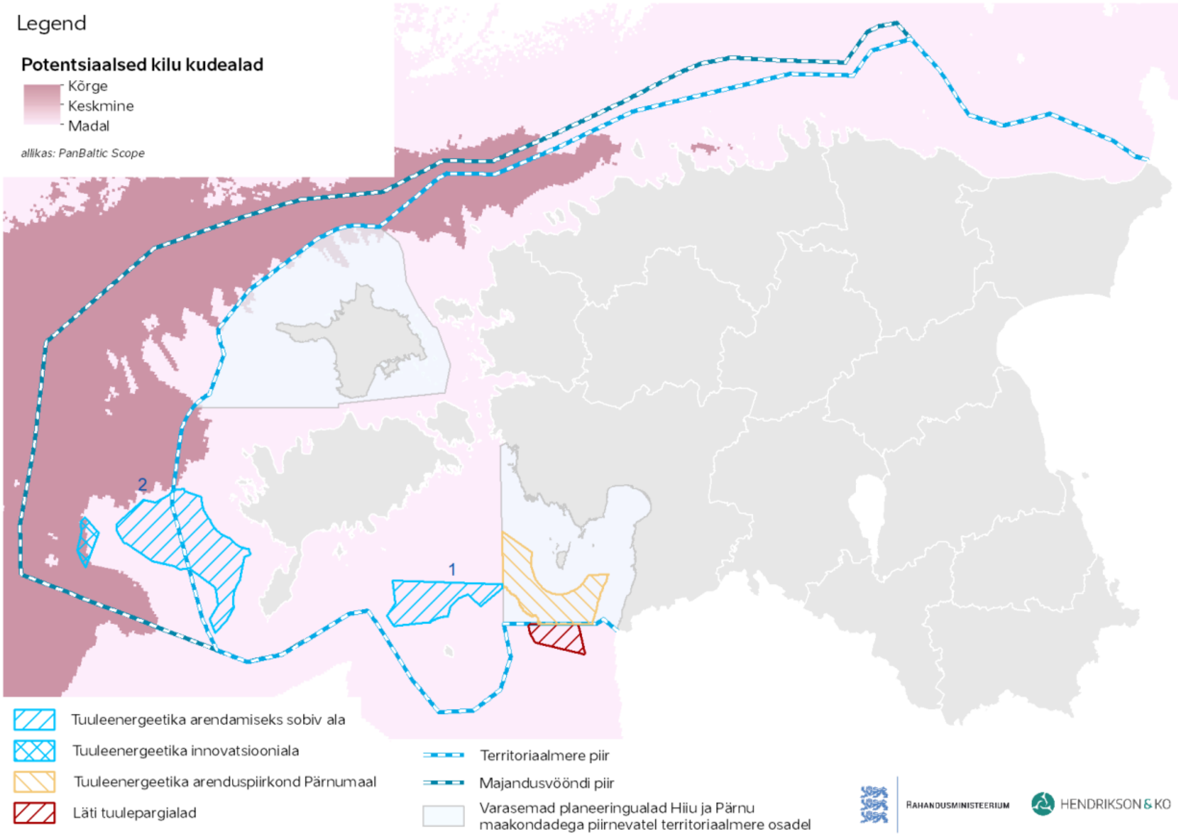

Figure 4.2.1-6. Potential spawning grounds for sprat (source: Pan Baltic Scope)

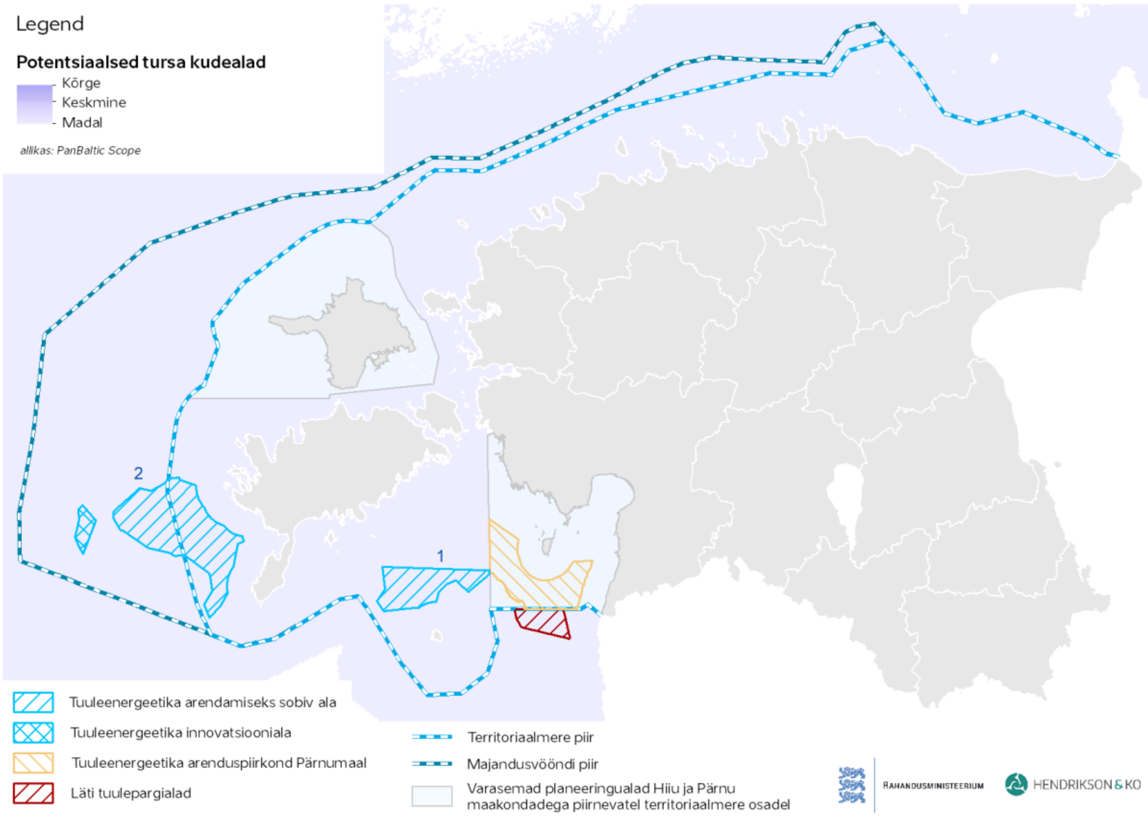

Figure 4.2.1-7. Potential spawning grounds for cod (source: Pan Baltic Scope)

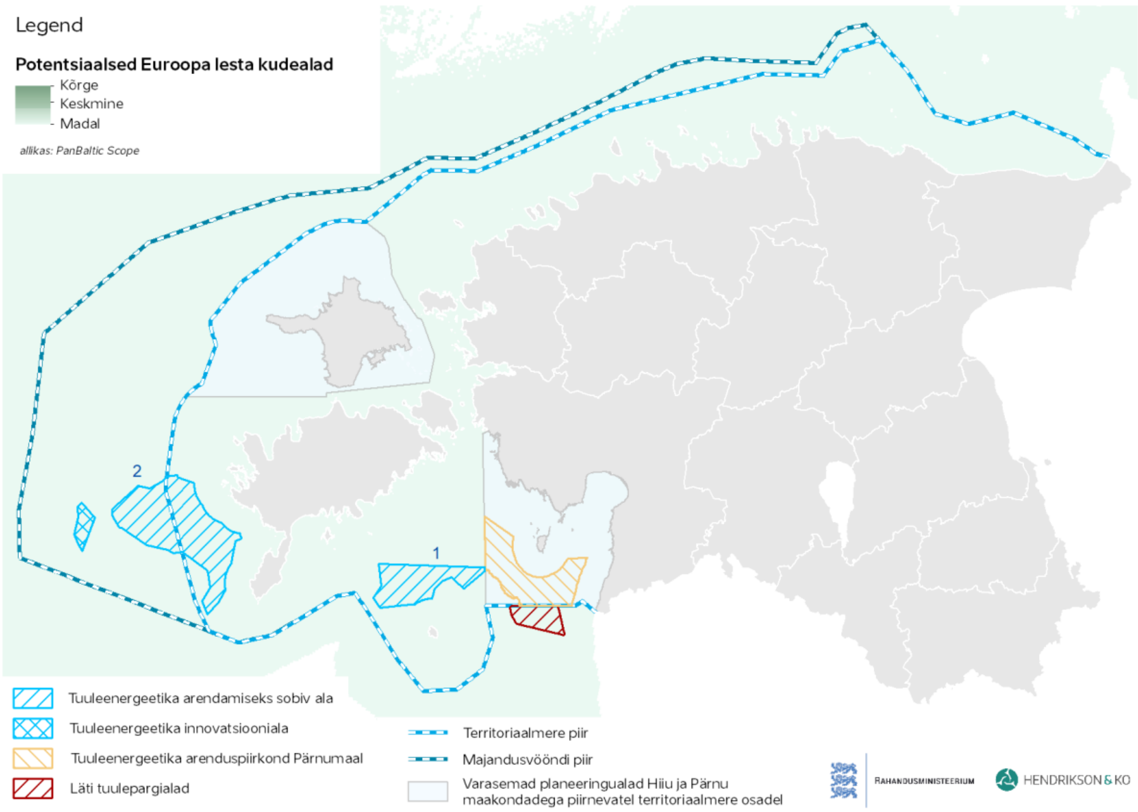

Figure 4.2.1-8. Potential spawning grounds for European flounder (source: Pan Baltic Scope)

Impact of the MSP

As fish are distributed throughout the marine area, most marine activities interact with fish and fisheries. Many traditional uses of the marine area have, over the years, achieved a balance and it has been established by law how the use of the marine area is permitted (including minimal or no damage to the fish) whereas, in case of a threat, procedure monitoring and surveillance have been provided. Such uses of the marine area include maritime transport with the construction and dredging of ports, dumping, and selection of new dumping areas, use of deposits, and other marine area use with a long tradition. These uses will not increase significantly according to the Maritime Spatial Plan, and therefore the implementation of the Maritime Spatial Plan will not lead to greater and uncontrolled impact on the fisheries. The most important aspect of these activities is to ensure that, when altering the seabed, the potential fish spawning areas are taken into account.

Another important aspect that needs to be considered is the suspended matter and its spread, which can kill the offspring of fish even when settling on the spawn and larvae further away from the marine area being manipulated. Therefore, in addition to the immediate spawning grounds, the distribution of suspended matter must be taken into account when altering the seabed. No environmental license is generally granted for the use of marine areas that release significant suspended matter into the water column during the fish spawning period.

According to the Maritime Spatial Plan, areas suitable for the development of wind energy are envisaged to be somewhat offshore and in deeper areas of the sea. Large-scale fish farming is also conditionally directed to deeper sea areas. Given that the majority of fish spawning grounds and juvenile fish feeding grounds are located in the shallow waters, and coastal areas (up to 5 m in depth) or they are passed through by species heading for spawning in freshwater, conservation of these areas is essential for the sake of maintaining and reproduction of the good status of fish stocks, and this Impact Assessment Report, therefore, recommends that offshore fish farms be established in the marine areas with the depths of at least 5 m (check Figure 4.2.1-9).

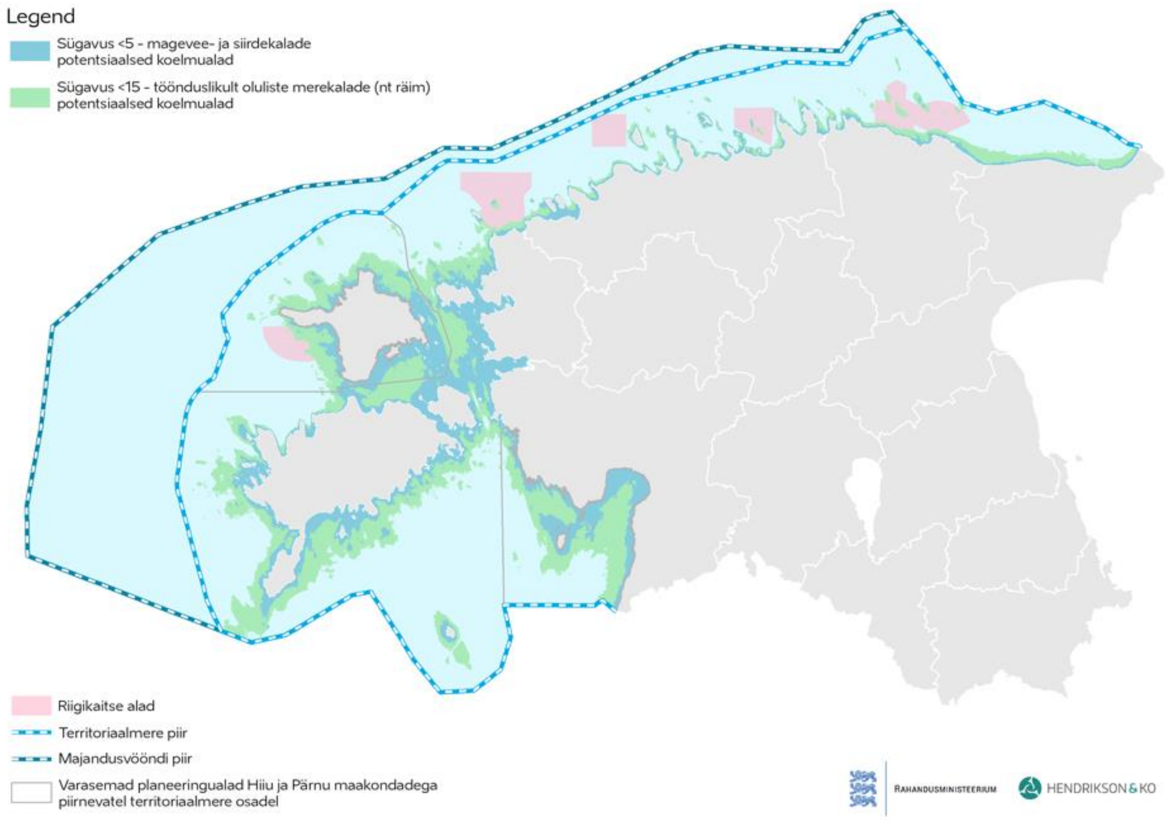

Figure 4.2.1-9. Sensitive areas for fish (potential spawning grounds important for young marine fish)

Based on the knowledge of the depth preferences of the spawning grounds of commercially important fish species (Baltic flounder up to ~ 30 m, herring ~ 15 m), salinity data and some other spawning ground criteria, the potential spawning grounds of the Baltic flounder modelled within the Pan Baltic Scope project (Figure 4.2.1-1 and 4.2.1 -2) and to some extent also herring spawning grounds overlap with the energy production areas and deeper sea areas suitable for fish farming in the draft plan.

The potential spawning grounds overlapping with wind energy development areas need to be further investigated at the authorization level to determine the extent to which these or some other species actually spawn in the areas concerned or the importance of the spawning grounds within the proposed area. To this end, the maritime spatial plan stipulates that when planning the new activities in the maritime area, it should be ensured during the authorization procedure that there will be no significant adverse effects on the fish spawning grounds.

For some new and intensifying uses of the marine space, such as energy production, aquaculture, and recreational industries, there is little experience of environmental impact assessment and ex-post evaluation. Experiences from other marine areas are helpful, although there are few analogs in the Baltic Sea, especially those with a long history.

In 2020 M. Rohtla has completed a review and analysis of the literature entitled "Possible impacts of offshore wind farms planned in Estonia on fish in the Baltic Sea" [37], by using the reports and research articles describing the results of research conducted primarily in the North Sea as well as elsewhere as the sources of literature. The following assessment of the impact of wind farms on fish is largely based on the assessments and conclusions provided in M. Rohtla's report.

The impacts related to the construction of offshore wind farms are divided into the impacts of construction, operation and dismantling. The operational and physical impacts are related to the location of the wind farm and submarine cable. However, the operational noise of the wind turbines and the electromagnetic fields of the submarine cables during the operation phase of the wind turbines also have an impact on the fish. According to current knowledge the biggest potential negative impacts of the planned offshore wind farms on the Estonian coastal sea are probably the activities during construction and dismantling works.

The construction work may be accompanied by construction noise and unfavourable effects on the fish due to the suspended matter generated during earthworks. Although construction and dismantling works are relatively short-term in nature, these activities involve significant environmental disturbances other than increased noise levels (e.g. due to increased ship traffic), such as the installation of gravity-based foundations and the burial of electrical cables on the seabed will re-float sediments from the seabed, which could lead to the death of fish in their early stages of development. Thus, it has been found that such work should be carried out during the period there is no reproduction of fish and juveniles are able to leave the area (e.g. in mid-summer) [38].

The impact of construction noise associated with the construction, operation and dismantling phase of offshore wind farms is the most extensive, but in case of the planned offshore wind farms in Estonia it is not so acute due to the planned use of gravity-based foundations that do not require the drilling or ramming of the seabed of the tower. The operating noise of wind turbines is more or less constant, but (depending on the strength of the wind) it is still relatively quiet compared to, for example, ship noise. In general, scientists are currently of the opinion that the operating noise of wind turbines can only disturb fish in the immediate vicinity of wind turbines and that there are no significant negative effects. The results of the recently published noise impact modelling have also indicated that the construction and operating noise from

[37] Potential impacts of offshore wind farms planned for Estonia on fish in the Baltic Sea (University of Tartu, 2020) https://www.kalateave.ee/images/pdf/Uuringud/Eestisse_planeeritavate_avamere_tuuleparkide_v%C3%B5imalikud_m%C3%B5jud_L%C3%A4%C3%A4nemere_kaladele.pdf

[38] Sama, mis eelmine

the offshore wind farms does not have a significant impact on the Norwegian fish and mammal populations (Wang, W (2019) [39].

Depending on the type of fish and the intensity of the noise, the fish will definitely hear the operating noise of the wind turbines from different distances. According to the current knowledge sprat and especially herring from amongst the ones in the Baltic Sea are likely to be the most vulnerable to the potential negative effects of offshore wind farms. In other words, these species could potentially be most affected by the operating noise of wind turbines. These species have the best hearing out of the important commercial fish in the Baltic Sea and are likely to sense the wind turbine operating noise even from tens of kilometres away. The sea areas suitable for offshore wind farms overlap in part with the herring spawning grounds (see Figure 4.2.1-1), which may deter herring spawning groups from such spawning grounds due to the proximity of the noise source.

As herring is concentrated in large shoals during spawning, the noise from the wind turbines during spawning can interfere with the mutual communication and shoaling of the fish. However, no studies have yet proven that the herring spawning groups are somehow disturbed by the noise from offshore wind farms (no specific studies have been conducted) [40]. The fish monitoring at Utgrunden wind farm off the Swedish coast caught herrings with flowing roe near the wind turbines[41]. Due to the precautionary principle, when planning the wind farms at the authorization level, more detailed studies should be carried out at the authorization level on spawning grounds of potential fish (especially herring) found in the area of the wind farm and within its outreach and on possible blockage of access to the spawning grounds (e.g. studies describing the impact of wind turbine noise on fish migration, including the spawning grounds important for the mass migration of commercially important fish) and, if necessary, provide for the necessary mitigation measures at the level of the authorization (ensuring fish migration in the wind energy development areas, noise reduction measures, etc.).

The re-suspended sediments and their impacts occur only during the construction phase of the wind farms (installation of gravity-based foundations in the wind farms planned for Estonia and burial of electric cables on the seabed) and thus their impact is relatively short-term and avoidable, for

[39] Wang, W. (2019). *Significance of offshore wind farm sound on marine populations. Master's thesis. Norwegian University of Science and Technology.* 95 pp. (Thesis referred by M.Rohtla)

[40] Potential impacts of offshore wind farms planned for Estonia on fish in the Baltic Sea (University of Tartu, 2020) https://www.kalateave.ee/images/pdf/Uuringud/Eestisse_planeeritavate_avamere_tuuleparkide_v%C3%B5imalikud_m%C3%B5jud_L%C3%A4%C3%A4nemere_kaladele.pdf

[41] Bergström, L., Kautsky, L., Malm, T., Ohlsson, H., Wahlberg, M., Rosenberg, R., Åstrand Capetillo, N. (2012). *The effects of wind power on marine life. A Synthesis. Report* 6512. https://www.su.se/polopoly_fs/1.120458.1358860002!/menu/standard/file/Effects%20of%20wind%20power%20on%20marine%20life.pdf

example, when carrying out construction work beyond spawning period and using devices to warn/repel fish[42].

Given that, to the best of our knowledge, flounder is one of the most hearing-impaired groups of fish and, moreover, relatively tolerant of the effects of re-suspended sediments, it can be here assumed that operating noise and re-suspended sediments are unlikely to affect the sustainability of the local flounder population[43].

Offshore wind farms may be accompanied by electromagnetic fields in their operational phases, which may affect both marine mammals and fish. Submarine cables can be AC or DC cables. The fish species that use the Earth's magnetic field for orientation and navigation may be affected to some extent by artificial electromagnetic fields caused by AC electrical cables for offshore wind farms and the like. It is known that the strength of artificial electromagnetic fields transmitted from submarine cables to the environment decreases abruptly when moving away from the cable, and therefore it is possible that significant biological effects will only occur if the fish are in the immediate vicinity of the cable.

Even if several studies have indicated that many fish perceive electric and/or magnetic fields, there is still very little evidence that fish are adversely affected by the electromagnetic fields generated by submarine cables[44,45,46]. Today, submarine cables are predominantly powered by direct current cables (HVDC, short for high-voltage direct current), which have indicated that the Earth's own magnetic field is many times larger than that of an electric cable[47]. In case of maritime spatial plans of other countries, such as Germany and Denmark, the electromagnetic effects associated with the construction of electric cables have also been considered insignificant.

The DC cable should be preferred when building the wind farms, as this will only create a magnetic field around the cable that will not have a significant

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[42]Potential impacts of offshore wind farms planned for Estonia on fish in the Baltic Sea (University of Tartu, 2020 https://www.kalateave.ee/images/pdf/Uuringud/Eestisse_planeeritavate_avamere_tuuleparkide_v%C3%B5imalikud_m%C3%B5jud_L%C3%A4%C3%A4nemere_kaladele.pdf

[43] The same as previous

[44] Gill, A. B., Bartlett, M., Thomsen, F. (2012). *Potential interactions between diadromous fishes of U.K. conservation importance and the electromagnetic fields and subsea noise from marine renewable energy developments. Journal of Fish Biology* 81: 664-695.

[45] Westerberg, H., Lagenfelt, I. (2008). *Sub-sea power cables and the migration behaviour of the European eel. Fisheries Management and Ecology* 15: 369-375.

[46] Öhman, M. C., Sigray, P. and Westerberg, H. (2007). *Offshore Windmills and the Effects of Electromagnetic Fields on Fish. AMBIO: A Journal of the Human Environment* 36: 630-633.

[47] SEA of the Danish Maritime Spatial Plan https://www.envir.ee/sites/default/files/KKO/KMH/taani_mereala_planeerimise_ksh_dokument.pdf

adverse effect. In case of AC cables it is recommended that the measures reducing the potential adverse effects of the cables should be applied. Where possible, the burial of cables on the seabed or careful shielding should be considered. The mitigation measures in the construction and installation of the cable are also necessary, as the cumulative effects of different power cables in the Baltic Sea could become a problem in the future.

However, the effects of electromagnetic fields generated by submarine cables can be further reduced and even eliminated in the future due to technical progress and continuous improvement of cable shielding (e.g. it is theoretically already now possible to build submarine cables that do not emit electromagnetic fields to the environment, i.e. zero-emission submarine cables)[48]. More detailed cabling measures to minimize impacts need to be provided in the authorization process. Whenever possible, the best available technology should be used for the construction of the wind farms.

In certain situations the construction of wind farms may also have a positive effect on the number of fish, as the foundations of the wind turbines and towers (including substations) add a hard substrate to the seabed, which often have a local effect of concentrating and/or increasing the production of fish[49].

The production of energy affects spawning grounds with the spread of noise and suspended matter during the construction phase, which can be avoided by shifting the construction phase beyond the spawning time, while the impacts of the fish farm are longer lasting.

In fish farms, fish are close together with each other, which is why fish diseases and parasites, which are transmitted and can infect fish freely living on nature, spread there. Antibiotics, drug residues, and disinfectants used in fish farms can affect the natural ecosystem. The selection of farmed fish depends on whether the (alien) species that come out of the farm can live independently and establish free-living populations or alter the genetic structure of wild populations. In order to avoid this impact or to disseminate a significant impact, the risks associated with biosecurity must be assessed at the licensing level, both at the individual project level and in conjunction with the activities of the area in the near vicinity (e.g., assessing and determining the distances of fish farms of different companies to avoid biosecurity risks). We also recommend that a buffer be included in the area applied for the establishment of fish farms (e.g. when applying for an authorization) to establish the possible nearby fish farm for ensuring biosecurity.

Energy production and aquaculture will certainly have indirect impacts, including positive ones. For example, changes in the environmental balance

[48] Potential impacts of offshore wind farms planned for Estonia on fish in the Baltic Sea (University of Tartu, 2020) https://www.kalateave.ee/images/pdf/Uuringud/Eestisse_planeeritavate_avamere_tuuleparkide_v%C3%B5imalikud_m%C3%B5jud_L%C3%A4%C3%A4nemere_kaladele.pdf

[49] The same as previous

(wind turbine foundations and bases, cages, algae, and shellfish farming infrastructure, fish feed released into the marine environment and feces of farmed species) will also alter the species balance of the area. The changing environment will attract and favor some species, while the abundance of other species may decline. At the same time, shellfish and algae farming has certainly a positive impact on the fish on a large scale, as it helps to reduce the problems of over-nutrition in the Baltic Sea. Therefore, shellfish farming, and algae farming can be used as a mitigation measure to capture phosphorus and nitrogen from fish farms (see also Chapter 4.1.5 Water quality) and therefore the planning solution should encourage multitrophic aquaculture.

Energy production in the sea area also has a potential impact on fish fauna through connecting cables, which during the construction phase, when being embedded into the seabed, affect spawning areas, similarly to other seabed alteration activities. In addition, during their operation, and depending on their physical characteristics, cables have a potential negative impact on fish migration, especially in shallower areas. Electric cables have been shown to slow fish migration somewhat, but this impact can be minimized by shielding the cables. More specific cable laying measures to minimize impact must be foreseen in the licensing process.

Special national defence areas are predominantly located in the Gulf of Finland. The use of ammunition and explosives may have a direct impact on fish in the area. National defence activities (munitions blasting, mine clearance) can directly kill or damage fish or scare them away from the area (spawning grounds). Ammunition and hazardous substances can also enter the marine environment. However, the threat to fish stocks is rather theoretical and, even then, short-term. Major blasting in the water should be planned so that it does not occur in a fish spawning season and in an area where a large amount of fish has accumulated in the restricted area. As a mitigation measure, fish can be pushed out of the area with smaller charges before using larger explosive charges. It is advisable to draw up a protection management plan for the national defense sites, which will map the environmental risks of the activities to the marine biota and measures to prevent or reduce them.

The protected part of the Estonian marine area includes predominantly coastal and shallow water areas. The larger protected marine areas designated as the marine areas determined as Natura 2000 networks cover a large part of the coastal waters of Western Estonia and its islands, including, for example, the whole Väinameri Sea and extensive areas around the Sõrve peninsula in Saaremaa. In the coastal waters of the Gulf of Finland, the Natura special protection areas are less extensive and include areas such as Osmussaar, Pakri islands and Kolga Bay, and the marine area of Lahemaa National Park. If, as a rule, a protected marine area has a positive impact on fish, the restrictions may also have negative impacts. For example, protected areas have seen an explosion of the abundance of cormorants. The amount of critically endangered eels consumed by cormorants (the main causes of the critical state of the population are fishing and the impact of environmental changes (e.g. Rohtla et al 2021[50])) is estimated to be in the same size class as the ones caught by people in the Baltic Sea[51].

The implementation of the maritime spatial plan is not expected to result in the significant adverse effects on any species of fish based on the available information, by applying the following foreseen environmental measures at the level of authorization.

ENVIRONMENTAL MEASURES:

1. Given that the majority of fish spawning grounds and juvenile fish feeding grounds are located in the shallow waters and coastal areas or they are passed through by species heading for spawning in freshwater, conservation of these areas is essential for the sake of maintaining and reproduction of the good status of fish stocks, **therefore this Impact Assessment Report recommends that fish farms to be established in the marine areas with the depths of at least 5 m**.
2. During the implementation of the activities proposed in the Maritime Spatial Plan (in particular wind energy development and aquaculture), it is necessary to specify the impact within the licensing process and, where appropriate, to implement mitigation measures for fish.
3. Energy production affects the spawning grounds with the spread of noise and suspended matter rather during the construction and dismantling phase, which can be avoided by shifting the construction and dismantling phase beyond spawning time.
4. Due to the precautionary principle the design of wind farms at the authorization level should be subject to more detailed studies on the potential fish spawning grounds and blocking of access to spawning grounds in the wind farm area and within its outreach (e.g. studies describing the impact of wind turbine noise on fish migration, including spawning grounds important for the mass migration of commercially important fish[52]) and if necessary, provide for mitigation measures (ensuring fish migration in the wind energy development areas, noise reduction measures, etc.). In order to mitigate the effects during construction, the condition should be set that noisy activities (e.g. laying

[50] Mehis Rohtla, Maidu Silm, Jouni Tulonen, Päärn Paiste, Håkan Wickström, Melanie Kielman-Schmitt, Ellen Kooijman, Väino Vaino, Redik Eschbaum, Lauri Saks, Aare Verliin, Markus Vetemaa, Conservation restocking of the imperilled European eel does not necessarily equal conservation, ICES Journal of Marine Science, Volume 78, Issue 1, January-February 2021, Pages 101–111, https://doi.org/10.1093/icesjms/fsaa196

[51] Hansson S., Bergström U., Bonsdorff E., Härkönen T., Jepsen N., Kautsky L., Lundström K. 2018. *Competition for the fish – fish extraction from the Baltic Sea by humans, aquatic mammals, and birds. ICES Journal of Marine Science*, 75: 999–1008.

[52] If experimental noise studies (or any ohter studies) are carried out in the Estonian sea area, in the course of which it turns out that there is no impact of noise as to certain fish species on migration, then this result can be proceeded from and further relevant studies can be waived. If a noise study reveals that noise is an obstacle to fish migration, further detailed studies are required to map fish migration corridors.

wind turbine foundations) do not take place during the spawning season and in an area where a large number of fish have accumulated in the restricted area.

5. More specific cabling measures to minimize the impacts should be provided for in the authorization process, if needed. Whenever possible, the best available technology should be used for the construction of wind farms. The DC cable should be preferred, as this will only create a magnetic field around the cable that will not have an adverse effect. In case of AC cables, burial, careful shielding or other mitigation measures should be considered.
6. For both proposed new activities and existing activities in the marine area, the most important thing to do is to ensure that any spawning areas of the fish are taken into account when altering the seabed.
7. The potential biosecurity risks associated with aquaculture must be assessed in the licensing process, both at the individual project level and in conjunction with the activities of a near vicinity fish farm (e.g., to assess and determine the distance between farms of different companies to avoid biosecurity risks). We also recommend that the area applied for the establishment of fish farms (e.g. when applying for a superficies licence) be taken into account in order to ensure the biosecurity of the buffer by establishing a fish farm in a possible area.

We also recommend that a buffer be included in the area applied for the establishment of fish farms (e.g. when applying for superficies licence) to establish the possible nearby fish farm for ensuring biosecurity.

PROPOSALS FOR THE ACTION PLAN:

1. Identification of spawning grounds of important fish species in the Estonian marine area (modeling and research).
2. It is advisable to draw up a protection management plan for the national defense sites, which will map the environmental risks of the activities to the marine biota and measures to prevent or reduce them.
3. It is necessary to provide for time constraints areas on the use of recreational craft in the municipal comprehensive plans which are bordered by marine areas.
4. Development of the bases for the determination of buffers between different farms to ensure the biosecurity of fish farms. The extent of the buffer depends on the specific circumstances (species, depth, technology).
5. Impact of wind farm noise on herring migration. The aim is to identify significant (disturbing) noise level for herring.

4.2.2 Birds[53,54]

More than 60 waterfowl species are associated with the Estonian marine area during their life cycle. In the Estonian waters, waterfowl stop during different seasons, for example, for moulting, wintering, and migration. Waterfowl nesting on the coast and on small islets feed and breed their younglings at sea. In addition, many terrestrial birds are linked to the sea through migration.

The importance of the Estonian coastal sea to waterfowl is primarily due to its geographical location, as it remains directly on one important branch of the East Atlantic migratory route. This branch is used by most Arctic waterfowl species on their way from Eurasian Arctic breeding grounds to wintering areas extending to South Africa. The Estonian marine shoals are suitable migration stops for replenishing the fats for further migration; these shoals are also used as wintering areas. Despite the relatively small area of our aquatic environment, a significant proportion of all birds of some species stop here. According to rough estimates, for example, 48% of the migratory populations of the scaup, 25% of the migratory populations of long-tailed ducks, and 20 - 22% of scoters can stage in our waters.

Bird protection in Estonian marine areas is mainly based on the so-called Birds Directive (Council of Europe Directive on the conservation of wild birds, 2009/147/EC), which obliges EU Member States to implement special measures to protect regularly occurring migratory species, designating the most suitable areas, both in number and size, for their protection as bird sanctuaries. To meet the requirements of the Birds Directive, Estonia established a network of Natura Site of Community Importance at the beginning of this century, which includes, among other things, 26 areas that include marine areas. One of the main reasons for the inclusion of marine birds into the composition of Site of Community Importance was the presence of migratory staging areas of international importance. Important Site of Community Importance for the staging of offshore species are the Site of Community Importance of Kabli, Kahtla-Kübassaare, Koorunõmme, Vilsandi, Tagamõisa, Kura Gorge, Küdema Bay, Nõva-Osmussaar, Pakri, Pärnu Bay and the Väinameri Sea. Outside the boundaries of the bird protection areas, important staging areas are located in national protected areas (Apollo marine shoal nature reserve) and in protected areas (Hiiu shoal and Gretagrund conservation area). The extension of the Neugrund Nature Reserve and the Kõpu Nature Reserve is to be mentioned as protected areas designed as of today. A discussion of Natura 2000 Site of Community Importance can be found in Chapter 4.3. The Special Protection Area Network was created at the beginning of this century and reflects the state of knowledge at the time. The network covers well the area's most important

[53] The chapter is largely based on the basic research of the Maritime spatial Plan "Analysis of bird staging areas" Estonian Ornithological Society, 2019

[54] Whether and how do about 300 m high offshore wind turbines affect bird migration?, Estonian Ornithological Society, 2021

for birds in shallow coastal waters, but most of the data on the high seas have only been collected since the establishment of the network of Site of Community Importance.

As part of the preparation of the Estonian Maritime spatial Plan, the available information on the results of the census of birds staging in the high seas and coastal waters since 2000 was collected for analysis. As a result of the analysis, the abundance forecasts of staging birds with a resolution of 1 km² were prepared covering the entire Estonian marine area. In addition, existing knowledge on the main autumn and spring migration corridors for different bird groups (land birds, geese, black geese, swans, arctic waterfowl) was gathered. Based on the importance of the high seas as bird staging areas as well as migratory corridors, the whole sea was divided into three types of areas (Figure 4.2.2-1):

- **'sensitive areas'** - according to best available knowledge, the most important areas of the high seas for birds that stage and/or fly over the sea. Long-term activities - the construction of high artificial objects (wind farms, bridges) on the high seas, and activities with significant spatial impact on the seabed and its biota (e.g., the establishment of new mines) - in sensitive areas should be avoided;
- **most suitable areas for wind energy development due to birdlife** - as wind energy development is one of the major new uses in Maritime Spatial Plan with a potentially significant impact on birds, the most suitable wind energy development areas have been identified. These are areas where, with today's knowledge, the negative impact of wind farms on birds would be minimal;
- **remaining unclassified areas** - areas outside the previous areas.

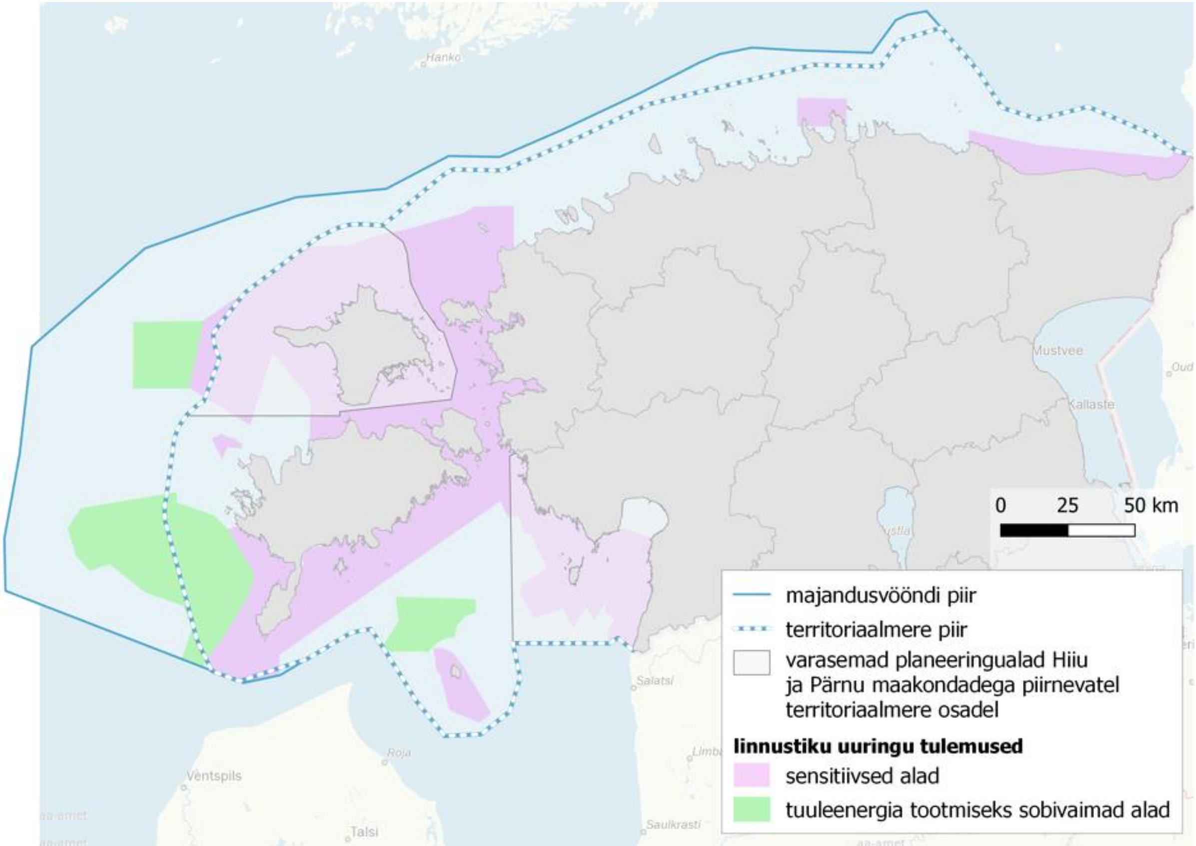

Figure 4.2.2-1. Sensitive areas of the Estonian marine area from the point of view of birds and the most suitable areas for the development of wind energy (source: "Analysis of bird staging areas" Estonian Ornithological Society, 2019)

Figure 4.2.2-2 shows the sensitive areas for birds, where in addition to the sensitive areas identified in the marine area (incl the most important migration directions), migration corridors above the sea area important for terrestrial birds have been added.

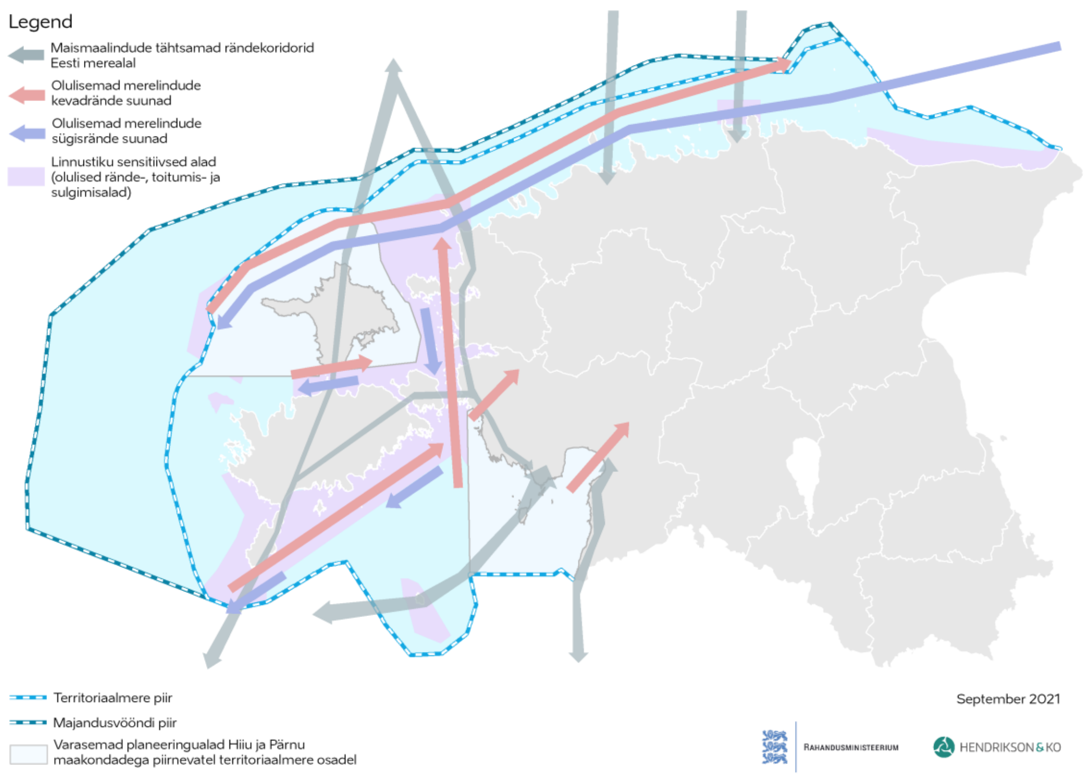

Figure 4.4.2-2. Sensitive areas for birds (source of drawing: “Bird staging area analysis.” Estonian Ornithological Society, 2019)

Impact of the MSP

The implementation of the Maritime Spatial Plan will not bring (significant) changes to many uses (fisheries; sea transport; search and rescue, pollution control and border management; seabed infrastructure; marine tourism and recreation; protected nature; marine culture; cultural monuments; national defense; dumping, and permanent connections) and for most areas of activity, the current use and regulation of the marine space will continue through existing legislation. From the standpoint of birds, it is important to assess the uses of the marine areas that are likely to have a significant impact on bird species. Of the marine uses planned by the Maritime Spatial Plan, this is primarily wind energy alongside proper infrastructure (cables, substations).

The development of wind energy means the construction of massive objects in the maritime area. The impacts associated with the construction of wind farms on birds are usually divided into four major categories: habitat loss or alteration, obstacles on flying and migration routes (barrier effect), collisions with wind turbines, disruptive and repulsive effects. The disturbing and repulsive effects are of the utmost importance in case of important staging areas for waterfowl when the birds are no longer able to use their preferred habitats or use these significantly less.

It is appropriate for the level of accuracy of the Maritime Spatial Plan to find suitable locations for the wind energy development areas, and mitigation through technical solutions, etc., can be applied in the next steps (licensing process), if necessary. The Maritime Spatial Plan Solution identifies areas for development in wind energy, which, among other things, take into consideration bird-based considerations. To minimize the impact, the wind energy development areas have been placed outside the existing marine area bird protection areas (Natura 2000 Special Protection Areas). In addition, an analysis of birds was carried out (EOÜ, 2019), which in the light of existing knowledge identified the most important areas of the marine area for stopping and migrating birds, i.e. the so-called sensitive areas - the areas most important for waterfowl migration, feeding and staging. The development areas of wind energy proposed in the Maritime Spatial Plan are largely outside these sensitive areas. The study also identified the marine areas most suitable for the development of wind energy, which largely overlaps with the planned wind energy development areas (Figure 4.4.2-1). On the basis of the information currently available, the location of the planned wind energy development areas can be considered successful from the point of birds in case of area 2 and partly also in case of area 1. The proposed wind energy development area 1 in the Gulf of Riga will overlap with a migratory corridor for land birds, so the Impact Assessment Task Group will propose an adjustment to the planning solution as shown in Figure 4.4.2-4. The proposal was taken into account in the planning solution and thus the areas suitable for the development of wind energy do not overlap with the most important migration corridors of terrestrial birds (as of May 2021). The wind energy development area no. 3 is located partly in the sensitive area of Hülgerahu, which is especially important as a winter stop for waterfowl but also as a spring migration area for waterfowl. The wind energy development area no. 3 (northwest of Saaremaa) has been removed during the planning process due to, among other things, bird protection reasons.

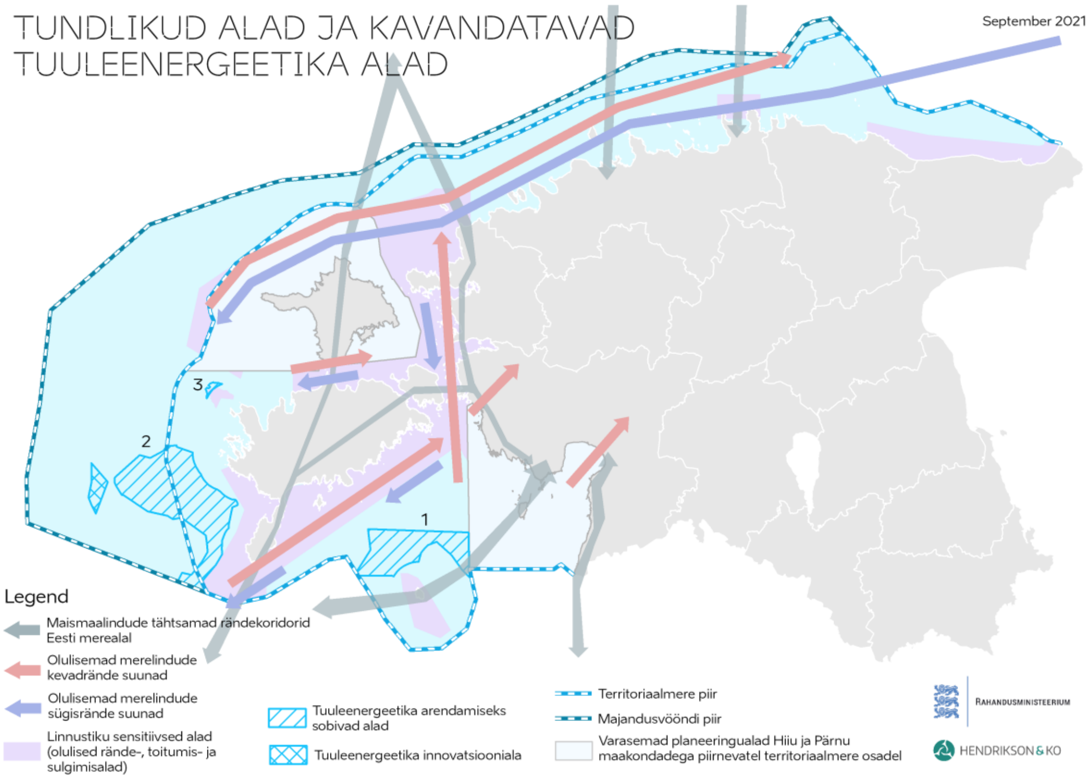

Figure 4.2.2-3. Location of the initial wind energy development areas (as of 2019) in relation to the areas sensitive to birds

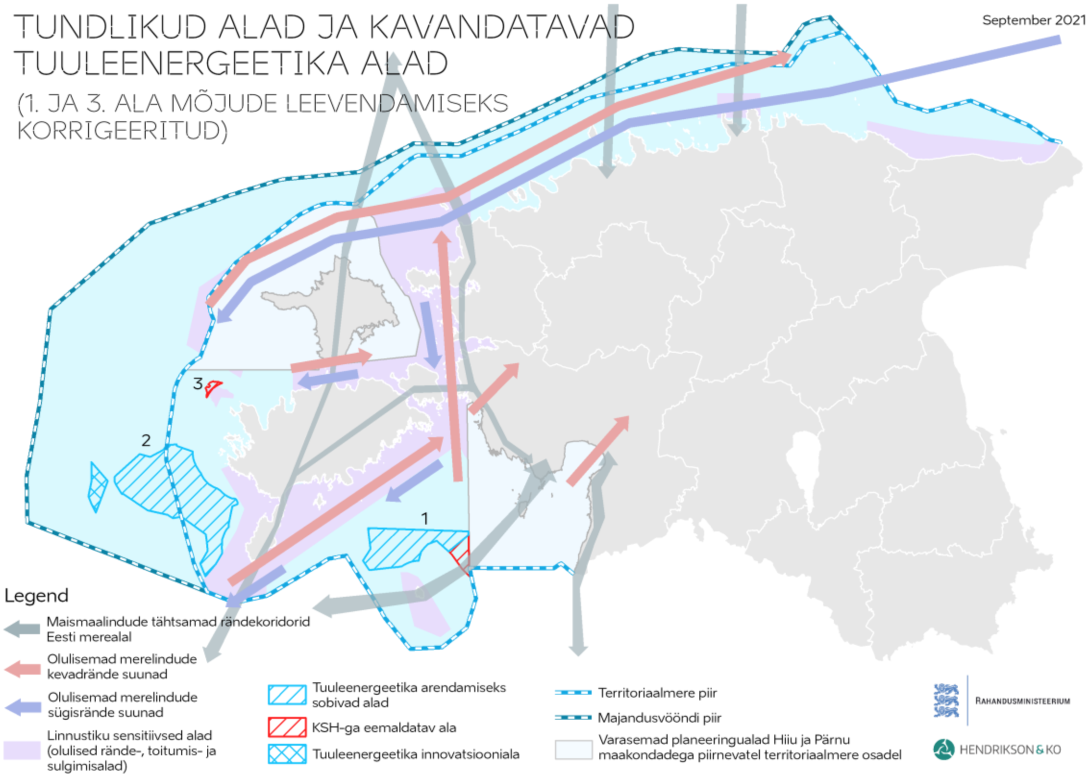

Figure 4.2.2-4. Proposal for the adjustment of the wind energy development areas 1 and 3 in the maritime spatial planning solution

Thus, the use of the areas suitable for wind energy development in the **most important areas** for birds (sensitive areas for waterfowl and migratory corridors for terrestrial birds) will not lead to habitat destruction or alteration, obstructions to flying and migration routes (barrier effects), wind collisions with wind turbines or disruptive and repulsive effects. The wind farms in the marine area are an obstacle to birds on flying and migratory routes (they will avoid these by flying around and thus the length of their migration route increases and the amount of energy consumed during migration increases to such an extent that they have a negative impact on the population) and pose a risk of collisions for birds which causes injuries to the birds or, in the worst case, death[55].

Bird flight altitude and risk of collision. The starting point of the Estonian maritime spatial plan is about 300 metres high wind turbines. Such wind turbines are not yet in production and the data on their effects on birds are not yet available. Based on the studies carried out in parks with lower wind turbines

[55] Compilation of the data on the migration corridors of birds in the Estonian sea area and creation of relevant map layers and preparation of an analysis of the impact of wind farms on bird feeding areas, Estonian Ornotology Society 2017

and general knowledge about the flight altitude and behaviour of birds, conclusions can be drawn that are also valid for higher wind turbines, including altitudes up to about 300 metres.

The flight altitudes of birds above the sea exceed one kilometre and it is impossible to find the wind turbine dimensions that completely eliminate the risk of collisions with birds. The general rule is to reduce the flight intensity of birds according to the increase in altitude. Most seabirds fly in the lower 20-metre air layer and only mainly seagulls reach the altitude of the working zone of wind turbine rotors. The birds of prey and black storks cross sea areas predominantly in the altitude range threatened by wind turbines. The flight altitudes of the Passeriformes are distributed over a wide range of altitude.

The flight altitude depends on the species, time (season and night/day), the reason for the flight (migration or "local flight"), weather, geographical location (above land, near the beach, above high seas) and the presence of a wind farm. The lower the lower limit of the working range of a rotating rotor, the more dangerous the wind turbines are in terms of collision risk. As the altitude increases, the number of flying birds usually decreases, and in case of high-rotating rotors a large proportion of (water) birds fly below the working area of the rotors. Even if the flight altitudes overlap with the working areas of the rotors, the risk of collision at the bottom of the working areas is lower than at the height of the rotor axes.

From the point of view of the risk of collision, wind turbines are all the more dangerous the larger the total working area of the rotors. In case of a single wind turbine an increase in the rotor radius is accompanied by an increase in the area of the rotor working area; at the same time, as the radius of the rotor increases, the distance between the wind turbines increases and the total number of wind turbines decreases, which all in all can reduce the sum of the operating areas of the rotors of the entire wind farm. The Belgian Offshore Wind Farm Monitoring Report[56] concludes that the turbines with a greater distance between the sea level and the lower limit of the rotor working zone cause fewer collision casualties and higher turbine densities lead to greater number of collisions.

As the height of the wind turbines and the working area of the rotor increase, so does their rated power and the distance between the wind turbines, and all in all there are fewer of them per unit area. Most species have a lower risk of death in case of the wind turbines with a high rated power and a large rotor area, as there are fewer of them per unit area. Therefore, in order to reduce the negative impact of fatalities, it is recommended to use fewer but larger wind generators in the proposed wind farms. It is also recommended that the minimum height of the wind turbine blade be 25 meters above sea level (provided that it can be specified, increased to 30 or 35 metres if necessary, on the basis of a study carried out during the authorization procedure). Height

[56] Degraer, S., Brabant, R., Rumes, B., & Vigin, L. (2020). *Environmental Impacts of Offshore Wind Farms in the Belgian Part of the North Sea: Empirical Evidence Inspiring Priority Monitoring, Research and Management. Brussels*.

adjustment is necessary in particular to reduce the risk of collisions with waterfowl.

In conclusion, most birds use sensitive areas for migration and staging. However, the risk of collision cannot be completely ruled out in the areas suitable for the development of wind energy. The level of collision risk and possible mitigation measures can be specified after the following on-site inspections in the authorization stage:

- The eastern part of the area no. 1 suitable for the development of wind energy in the Gulf of Riga is located near the significant migration corridor of terrestrial birds (incl birds of prey) across the sea. There, in order to specify the width and location of the migration corridor and to determine the effects of a specific wind farm, it is necessary to carry out a radar survey of birds covering the migration periods of at least two years in parallel with visual observations.

- In case of the area no. 2 suitable for the development of wind energy in the west of Saaremaa, it is necessary to specify which part of all migratory terrestrial birds do not use the main migration route, i.e. do not fly along Sõrve peninsula to Säär and from there across the sea to Kuramaa, but takes the direction from the west coast of Saaremaa towards Gotland. This, too, needs to be clarified at the stage of the authorization procedure with a radar survey of birds covering the migration periods of at least two years, carried out in parallel with visual observations.

Barrier effect. The barrier effect is a behavioural reaction of birds to the wind farm, which increases the flight distance of the birds. The barrier effect is stronger in case of pochards, divers and razorbills as to waterfowl, but its negative impact through the extension of the migratory route has mostly been assessed as marginal. If there are many wind farms on the same migration route, the cumulative effect may be significant. In case of birds of prey, the barrier effect can lead to a significant change in migratory behaviour and some birds that have encountered a wind farm during their flight may return to the mainland. It has been found that the impact of wind farms on birds can be reduced by leaving a wider corridor for birds in the main wind direction, and the barrier effect can be reduced by leaving sufficient free sea space between neighbouring wind farms.

The location of the wind turbines has an impact on how many of the migratory birds pass through the wind farm and which part avoids it by trying to pass the wind farm. Considering that the distance between the wind turbines is four to five times the diameter of the rotor, the distance between the wind turbines in the planned offshore wind farms in Estonia will be 800–1000 m and even larger in case of larger wind turbines. In this case the proportion of birds entering the wind farm is expected to be higher than in most offshore wind farms where such studies have been carried out. Some more sensitive species groups (divers, some pochards) will be avoiding the wind farms even at a distance of 1 km between the wind turbines.

Waterfowl avoid the wind farm less if the distance between the wind turbines is greater. Due to the lack of data on passeriformes and birds of prey, it is difficult to make generalizations. The larger the number of birds entering the wind farm, the smaller the barrier effect. At the same time the risk of death increases. Birds prefer to fly in these areas of the wind farm where neighbouring wind turbines are further apart. If the wind turbines are arranged in rows and the distance between the wind turbines is greater than the distance between neighbouring winds of the same row, birds prefer to fly in the corridors between the rows. Based on previous research, it has been found that the best way to reduce the movement barrier of birds and also the risk of collisions is to place wind turbines in clusters and to leave windmill-free corridors on the high seas in the large wind energy development areas that enable the birds to easier pass the wind farms.

The width of an efficient corridor could be at least 5 kilometres, but it has been indicated within wind farms that the birds also make more use of the areas where individual wind turbines (or part of a wind turbine) have not been built, meaning that any corridor wider than normal wind turbine distance is assumed to more or less coincide with the predominant direction of flight, mitigation of the barrier effect at least in case of waterfowl:

- The wind energy innovation area in the EEZ has a small area and there is no need for internal corridors.
- The area no. 1 suitable for the development of wind energy in the Gulf of Riga is favourably located in relation to the predominant migratory destination of birds (SW-NE) and does not represent a significant obstacle to migration. The main migration route runs between Saaremaa and the area suitable for wind energy production, where the eastern part of the development area has already been adjusted during the impact assessment, by removing the part of the terrestrial bird migration route (13% of the area).
  Therefore, there is no need for SW-NE corridor within the development area. At the authorization stage the preliminary study should specify the actual width of the migratory flow of terrestrial birds near the eastern part of the development area in Kihnu-Ruhnu direction (to determine whether the available free area is sufficient) and to clarify other information necessary to assess the risk of collision (species flight intensity and flight altitudes). A corridor for water traffic has been planned in the direction of the southern coast of Saaremaa-Ruhnu, which should ensure the most direct crossing possible for Roomassaare-Ringsu shipping line. The water traffic corridor is sufficient to facilitate the journey of birds flying in the direction of the southern coast of Saaremaa - Ruhnu.
- The area no. 2 in the west of Saaremaa, which is suitable for the development of wind energy, has a large area and would need to leave a free flight corridor for birds in order to reduce the barrier effect of birds. Therefore, a radar survey of birds covering migration periods of at least two years should be carried out in the area during the authorization phase, in parallel with visual observations, in order to identify the main migratory patterns of birds. Given the principle of combined use set out

in the maritime spatial plan, the planning of the waterway area for vessels (currently in the direction of NNW-SSE) should, where possible, be designed to better coincide with the expected predominant migratory direction of birds (NNE-SSW). Birds will then be able to use the area as a migration corridor, as the width of the passageway required for shipping is calculated to be approximately 6250 m for area 2.

In sensitive areas, long-term (or irreversible) offshore activities should be avoided, in particular the construction of high-rise objects (wind farms, bridges) and major alterations to the seabed (e.g., the establishment of new mines).

Further wind energy development within and outside the designated areas, irrespective of the location of the sensitive area, is required. The main purpose of the studies is to clarify the suitability of the proposed wind farm from bird protection perspective. In addition, the studies allow specifying possible conditions and mitigation measures for carrying out the activities. The studies should include a census of staging waterfowl in all seasons, in addition to visual and radar surveys of migratory birds in the case of migratory corridor areas. The preferred method for counting staging waterfowl could be ship counting, except for areas that are very shallow or very far from the home ports of the ships. The exact research methodology will be developed as part of project development.

Maritime Spatial Plan also identifies prospective cable corridor locations to connect wind farms to land. The impact of laying submarine cables occurs primarily during construction and are local in nature. The disadvantageous impacts of cable laying can be reduced by the appropriate technical solution and site selection at the project solution level as well as by the selection of the timing of the works.

In the light of current knowledge, the MSP solution in terms of wind energy priority areas 1, 2 and the spatial location of the innovation area takes into account the important staging areas and main migration corridors of the birds, and the application of the following environmental measures will not have a significant adverse effect with the MSP solution.

The wind farm areas can have a disruptive and deterrent effect on more sensitive bird species. The areas suitable for the development of wind energy, which are known to be of minor importance as staging areas for birds but which are used to some extent by different bird species, may have local habitat destruction or alteration and disturbing and repulsive effects. Although migration over the high seas has not been explained in any field study in Estonia, it should be considered probable that there is an obstacle on the migration route (barrier effect).

The collisions with wind turbines cannot be ruled out for any wind farm, so the significance of the local level impact of each planned wind farm and the mitigation measures to be implemented should be identified in the authorization procedure. The main way to minimize these local impacts is to locate the wind farms to the place where the impact on birds would be minimal. In addition, when developing a specific wind farm, it is possible to apply the technical solutions that minimize the impact, such as the location, size, number of wind turbines, the height of the wind blades above sea level, etc.

ENVIRONMENTAL MEASURES:

1. **Proposal for adjustment of the planning solution according to Figure 4.2.2-4**.
2. It is recommended to use modern large wind turbines (the starting point of the plan allows the use of large wind turbines). As the height of the wind turbines increases, the number of wind turbines (per area) decreases and the risk of collision (death) for most bird species decreases.
3. To stipulate as the condition of planning that the minimum permissible height of the wind turbine blade above sea level is 25 metres, provided that it can be specified (increased to 30 or 35 metres, if necessary) on the basis of the study carried out during the authorization procedure.
4. The eastern part of the area no 1 suitable for the development of wind energy in the Gulf of Riga is located close to a significant migratory corridor of terrestrial birds (including birds of prey) across the sea. At the authorization stage the actual width of the migratory flow of terrestrial birds near the eastern part of the development area in the direction of Kihnu-Ruhnu (to clarify whether the existing free area is sufficient) and other necessary matters for collision risk assessment (species flight intensity and altitudes) should be specified. To this end, it is necessary to carry out a radar survey of birds covering the migration periods of at least two years in parallel with visual observations (the methodology should generally follow the survey protocol established in Germany as a standard (BSH, 2013)).
5. In case of area no. 2 suitable for the development of wind energy in the west of Saaremaa, it is necessary to specify at the authorization stage which part of all migratory terrestrial birds do not use the main migration route, this means not going along Sõrve peninsula to Säär and from there across the sea to Kuramaa, but taking the direction from the west coast of Saaremaa towards Gotland, in which case the wind energy development area may remain on the migration route. This needs to be clarified at the authorization stage by a radar survey of birds covering at least two years of migration, carried out in parallel with visual observations (the methodology should generally follow the survey protocol established in Germany as a standard (BSH, 2013)).
6. In view of the principle of combined use set out in the maritime spatial plan, the vessel traffic area (currently in the direction NNW-SSE) should be specified at the level of authorization, where possible, to better match the expected predominant migratory direction of birds (NNE-SSW). Birds will then be able to use the area as a migration corridor, as the width of the passageway required for shipping is calculated to be approximately 6250 m for area 2.

7. The impact of short-term activities (such as disturbance resulting of offshore activities or reduced water transparency) can be reduced by choosing the time of the activities.
8. The disadvantageous effects of cable laying can be reduced by the appropriate technical solution and site selection at the project solution level as well as by the selection of the timing of the works.

4.2.3 Seals[57]

Two seal species are common among marine mammals in Estonia - gray seal (*Halichoerus grypus*) and ringed seal (*Pusa hispida*).

Ringed seal is a species with occasional distribution in the Baltic Sea, with subpopulations comprising the coasts of Estonia on the Väinameri Sea/Livonian Gulf and the Gulf of Finland. Animals move between different subpopulations rarely, and rather at the level of individual specimens. The key habitats for ringed seals in Estonia are the Väinameri Sea and the Gulf of Riga - these areas are associated with seal wintering and reproduction areas (Figure 4.2.3-1). During the ice-free period, the main animal resting areas are in the Väinameri Sea and in the southern estuaries of the Väike and Suur Strait (Figure 4.2.3-2). There is regular migration between these areas, in particular south of the Suur Strait, where a migration corridor of vital importance has developed (Figure 4.2.3-3). In addition, the existence of sea ice, whose types, extent and location vary from year to year, is indispensable for the successful reproduction of animals.

The resting areas, mainly in the Väinameri Sea and the southern estuaries of the Väike and Suur Strait, are of great importance throughout the year. The islets of Hiiumaa are abandoned when the sea freezes, but they are used from ice to ice, and in warm winters this use can be practically year-round. Nutrition areas are of great seasonal importance from May to November. The migratory areas are associated with a period of intensive feeding and the main migratory route is important from May to November.

[57] The chapter is largely based on the basic research of the Maritime Spatial Plan “Estonian Maritime Spatial Plan: Assessment of the spread of seals and use of sea”. Report of applied study, contract no. 1.9-1 / 404-1. I., Jüssi; M., Jüssi, 2019.

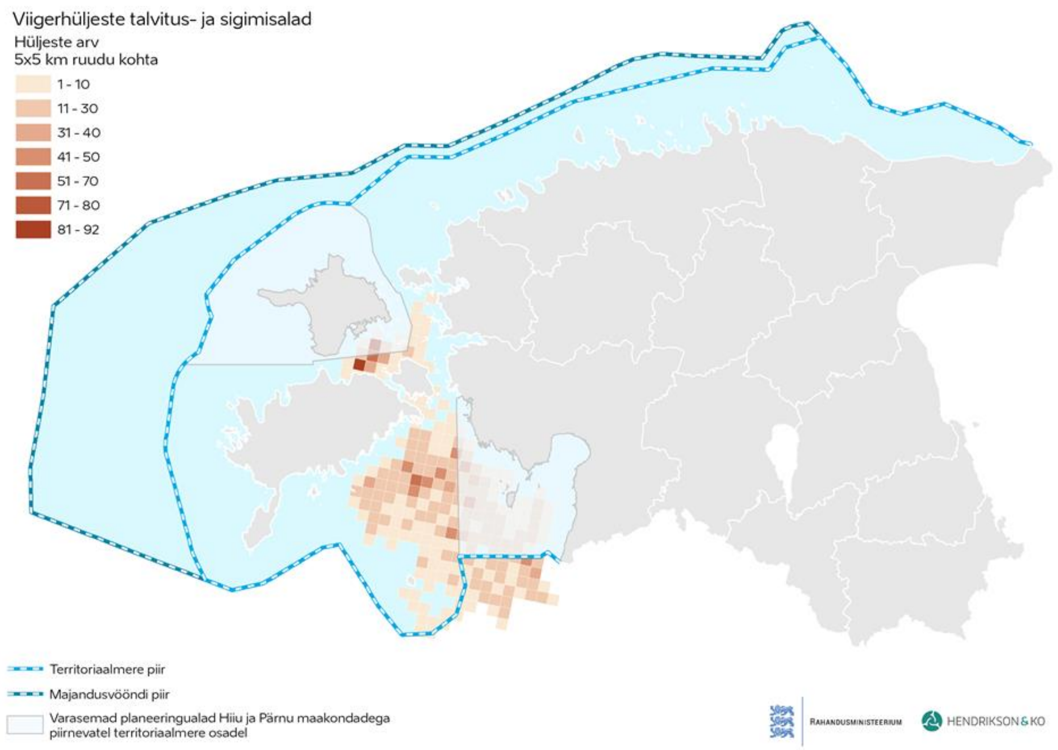

Figure 4.2.3-1. Sensitive areas for ringed seals, and ringed seal wintering and breeding areas (darker areas are more intensively used). Source: Assessment of the distribution and marine use of seals". Report on Applied Research Contract No. 1.9-1/404-1. I., Jüssi; M., Jüssi, 2019.

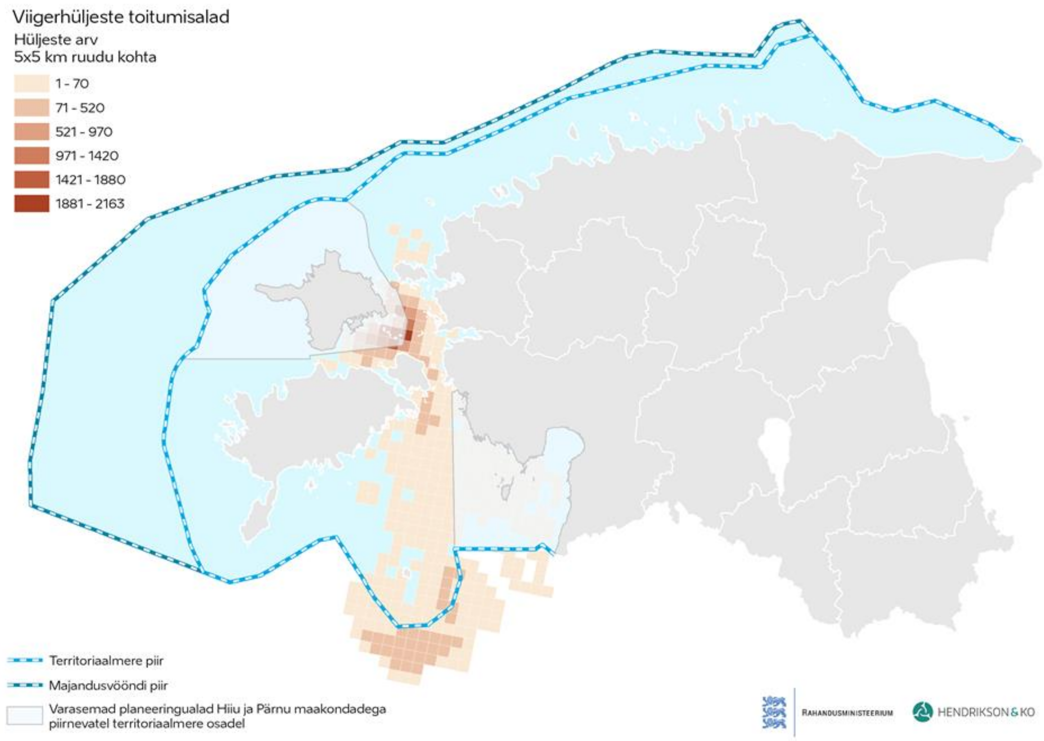

Figure 4.2.3-2. Sensitive areas for ringed seal, ringed seal feeding areas (darker areas are more intensively used). Source: Assessment of the distribution and marine use of seals". Report on Applied Research Contract No. 1.9-1/404-1. I., Jüssi; M., Jüssi, 2019.

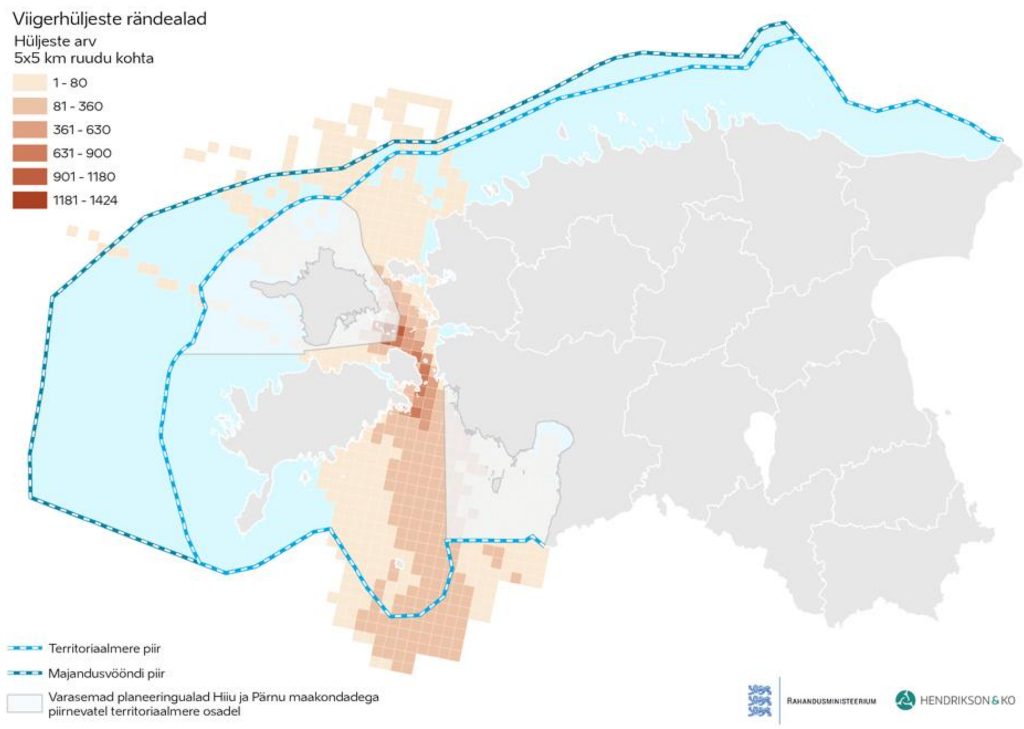

Figure 4.2.3-3. Sensitive areas for ringed seal, ringed seal wintering and breeding areas (darker areas are more intensively used). Source: Assessment of the distribution and marine use of seals". Report on Applied Research Contract No. 1.9-1/404-1. I., Jüssi; M., Jüssi, 2019.

Gray seals are freely mobile throughout the Baltic Sea (Figure 4.2.3-2), but are associated with specific rookery areas and marine areas during the ice-free period and over the years. The animals are prevalent in the central part of the Baltic Sea at the coast of Sweden, Finland and Estonia. This species freely uses the coastal waters of entire Estonia. The most important rest areas are predominantly covered by the existing protection regime (permanent habitats for gray seals). The Gray seal is a highly adaptable species that is often accustomed to human activities.

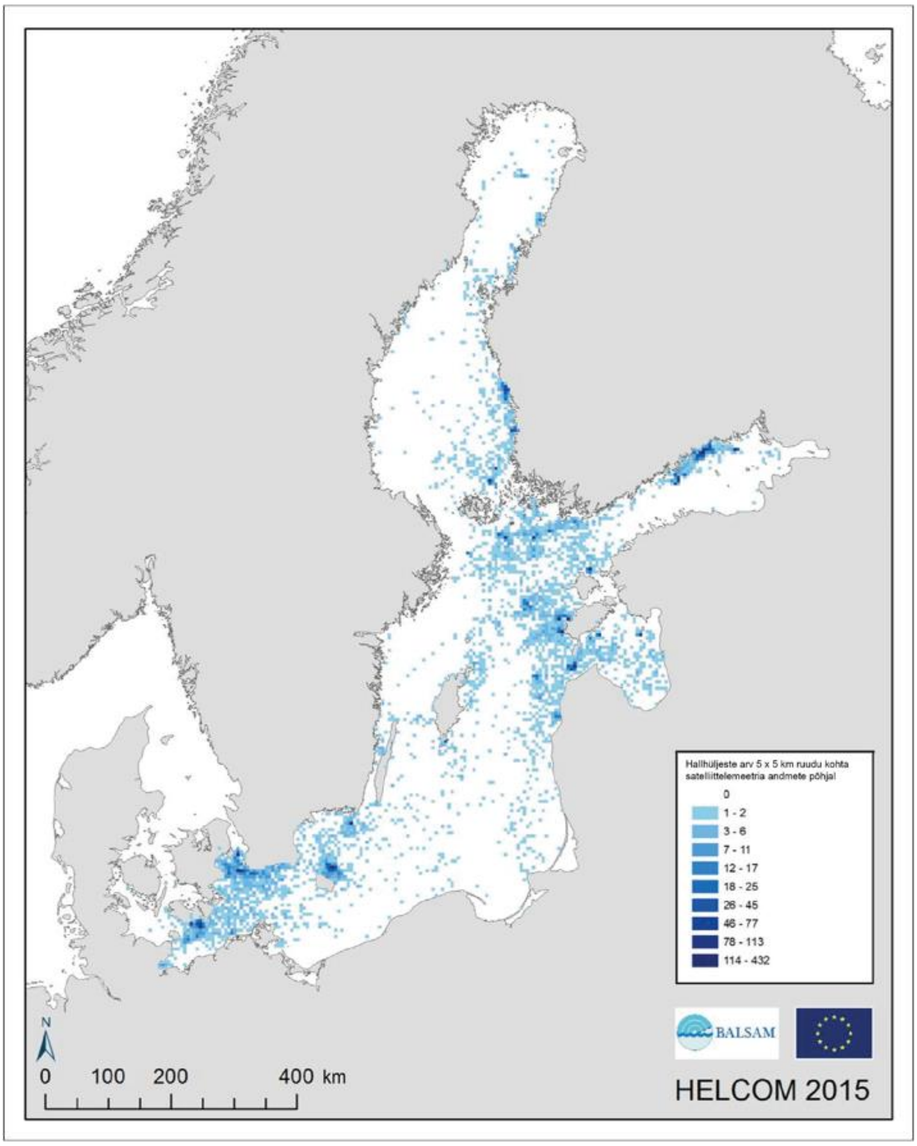

Figure 4.2.3-4. Distribution pattern of gray seal in the Baltic Sea based on telemetry data from HELCOM (source: HELCOM 2015)

While the good environmental status of the gray seal population of the Baltic Sea in the Estonian marine area has been achieved by assessing its abundance, distribution area and distribution pattern, the good environmental status of the ringed seal has not been achieved[58].

Among the most important anthropogenic factors affecting seals and the well-being of their populations are sensitivity to environmental pollution, mortality in fishing nets (by-catch), and disturbance in breeding grounds. For ringed seals, the impacts of climate change on breeding success are also particularly important. In winter, when suitable ice is not formed or does not persist, the species cannot successfully breed. Particularly in the case of the ringed seal, as

[58] "Environmental status of Estonian marine area 2018 ", Ministry of the Environment 2018 https://www.envir.ee/sites/default/files/mere_seisund_2018.pdf

a more endangered and sensitive species, it is important to avoid the additional impacts of anthropogenic factors.

Impact of the MSP

The implementation of Maritime Spatial Plan will not lead to (significant) changes in many uses of the marine area and in terms of most of the areas of activity, the current use of marine area and the regulation will continue through existing legislation. The uses of the marine area addressed in Maritime Spatial Plan do not contradict the established patterns of marine use of ringed seals and gray seals. The key habitats are covered by various nature conservation measures in the plan. For example, the Väinameri Sea region is an existing protected area, which the plan does not direct to use differently from the current use, and the implementation of the plan will not bring any changes to the ringed seal (or gray seal) population there.

Maritime spatial Planning identifies areas suitable for the development of wind energy, which are predominantly outside marine areas of importance to seals. The Gulf of Riga wind energy development area partially overlaps with the areas used by ringed seals. At the same time, marine mammal experts see no conflict between wind energy development and the use of the marine area by the ringed seal in the Gulf of Riga. The areas suitable for the development of wind energy that overlap with historically more intensive trawling areas will be designated as reserve areas (the reserve areas can be used from 2027), including the central part of the planned development area no. 1 for the Gulf of Riga, which provides wider movement corridors for seals (telemetry refers to the ability of ringed seals to travel long distances on the high seas, e.g. to the mouth of the Great Strait or in case of gray seals from Irbe Strait to Allirahu in an almost straight line). While the choice of location for wind energy uses can be considered successful in the level of precision of the maritime spatial plan, it is necessary to pay attention to the environmental aspects related to marine mammals and consider the need for more detailed research at the authorization level of each project.

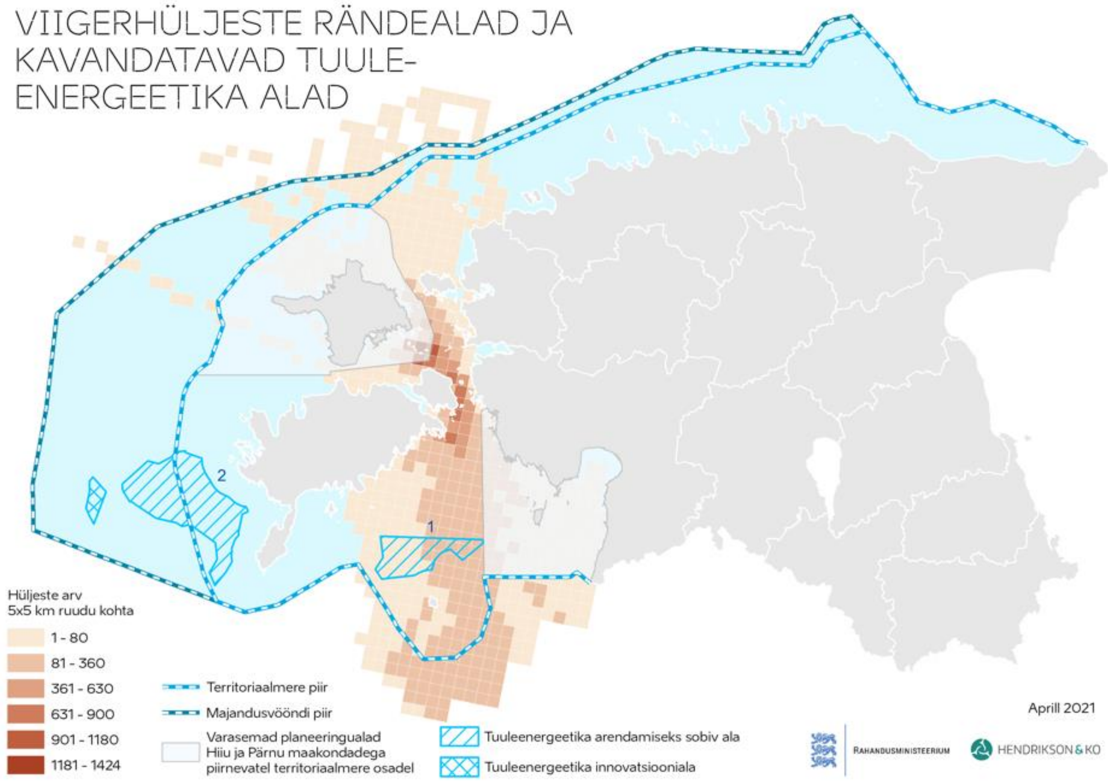

Figure 4.2.3-5. Ringed seal migration areas and proposed wind energy development areas. Source: “Assessment of spread of seal and marine use”. Report of applied study, contract no. 1.9-1 / 404-1. I., Jüssi; M., Jüssi, 2019; aggregate map Hendrikson & Ko

The impact of wind farms on marine mammals is manifested primarily during the construction phase, and the significance of this impact depends on the technical solution used. For example, the manner in which wind turbines are secured will depend on the intensity of the underwater noise involved and the amount of volatile float that may adversely affect the migration and living conditions of seals in the wind farm during the construction period.

In terms of impact during operation, for example, the disruptive impacts of ship traffic related to the maintenance of wind farms, or possible changes to, for example, marine ice mobility, icebreaking, etc. This also means, for example, planning a maintenance waterway to wind farms where disturbance to ringed seals would be minimized. However, the impact during construction and operation will be specified in the development of specific project solutions, which will clarify the exact locations of the wind turbines, the technical solutions, including cables, maintenance procedures, etc.

Maritime Spatial Plan does not provide for new national defense areas or extend existing ones, but it does take into account the current spatial needs of national defense. The implementation of maritime spatial plans will not bring about changes in the implementation of national defense activities; the status quo for marine mammals is maintained. Existing national defense areas remain in the

Gulf of Finland, and a special area south of the Kõpu Peninsula (Hiiu Island area of the Maritime Spatial Plan) is being planned. These areas are not important habitat for breeding and reproduction of the ringed seal, but the potential area of influence is the gray seal as species spreading on the entire marine area. The use of ammunition and explosives may have a direct impact on marine mammals both in the water and on ice in the area. National defense activities (mine control, various exercises) can directly damage or, in the worst case, kill nearby seals. Ammunition and hazardous substances to which marine mammals are a particularly sensitive species may also be released into the marine environment. When carrying out national defense activities in these areas, it is necessary to pay attention to the environmental aspects highlighted and to cooperate with species conservation experts to minimize the impact of the activities, e.g., to prepare an environmental protection plan.

Developing offshore aquaculture is not an activity of major impact for marine mammals. However, the establishment of fish farms in the sea must take into account the potential damage caused by gray seals. It is widely known that the gray seal is a highly adaptable species that grow accustomed to human activities and, unlike the ringed seal, even takes advantage of it, comes to catch fish, for example, in ports, near fishing traps, and aquaculture facilities. This is certainly important when planning fish farms - keep in mind that they can attract animals and cause so-called "pressure" from seals, which can disrupt activity.

The implementation of the maritime spatial plan does not envisage the occurrence of significant adverse effects on seals by applying the prescribed environmental measures and recommendations at the level of authorization.

ENVIRONMENTAL MEASURES:

1. During the implementation of the activities proposed in the Maritime Spatial Plan (in particular the development of wind energy), the impact assessment process needs to include clarification of the impacts, including the necessary expertise and, where appropriate, mitigation measures for marine mammals. The need for further research needs to be considered within each specific project.

PROPOSALS FOR THE ACTION PLAN:

1. It is advisable to draw up a protection management plan for the national defense sites, which will map the environmental risks of the activities to the marine biota, including seals, and measures to prevent or reduce them.

4.2.4 Bats[59,60]

So far, 14 species of bats have been identified in Estonia, which falls into two groups with different adaptations. Brown long-eared bats, Northern bats and species belonging to the Myotis genus winter in Estonia (or neighboring countries), undertaking only regional migrations from summer habitats to hibernation sites. Nathusius's pipistrelle, Common pipistrelle, and Soprano pipistrelle and Common noctule are migratory and fly to winter in southern Europe.[64] The habitats, breeding and feeding areas of bats are generally terrestrial. According to relatively limited knowledge to date, marine areas are primarily associated with bat migration, but there are also species that make foraging flights above the sea.

The research on bats at sea has become a topical issue with the establishment of offshore wind farms (Ahlén et al., 2007). It should be borne in mind that bats are able to cross large areas of the sea. Isolated overseas bats have been found in the Faroe Islands, Iceland, as well as in oil rigs and ships in the North Sea, sometimes these have been the species originating from America (Ahlén, 2009; Russ et al., 2001). When crossing the Gulf of Riga bats do not need to take such long flights. The distance at the narrowest point of the Kura kurk is only 29 km.

In Sweden 11 species of bats have been observed above the sea, 10 of which are also present in Estonia: water bat (Myotis daubentonii), pond bat (Myotis dasycneme), park bat, dwarf bat, pygmy bat, lesser white-fronted gull, great crested grebe, northern bat, silver bat and brown-eared plover (Ahlén, Baagøe & Bach, 2009). In Estonia previous studies have indicated that northern bats, park bats, great crested grebe and unspecified bat (Myotis) fly more than 1.5 km from the shore above the sea (Lutsar, 2012; Lutsar, 2013; Lutsar, 2016).

In addition, there are reports of bats flying over the sea in the Estonian territorial waters seen from the passenger and yacht ships. In one case the species of a bat was determined by a photograph - it was a great crested grebe that landed on a yacht in the morning in the west of the Sõrve Peninsula at dawn (L. Lutsar's species identification, data from Mart Jüssi from 2011[61]).

Only a few studies have been carried out in the marine area, covering very limited marine areas. So far, bats have been studied above the sea in Estonia in three areas: around Kõpu peninsula (Lutsar, 2012), in the Gulf of Finland in the shallows of Tallinn, in Kuradimuna and Uusmadala (Lutsar, 2013), in Veiserahu, south of Saaremaa (2016) and in three places around Saaremaa in

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[59] The chapter is largely based on the basic research of the Maritime Spatial Plan "Survey of bats at sea around Saaremaa from July to October 2018" Estonian Fund for Nature, 2019

[60] In March 2021, based on the work "Bat survey in the Gulf of Riga and the Gulf of Finland from June to October 2020. Phase II identification of important marine areas for bats", Lutsar, L; Estonian Fund for Nature, 2021

[61] The same as previous

2018: in Mustpank, near Irbe axle buoy no. 1 and again in Veiserahu (Lutsar, 2019) which was the first stage in the implementation of point 10.9 of the Action Plan for the Conservation of Bats (Vespertilionidae) - Identification of Marine Seas Important for Bats. The 2020 survey “Bat survey in the Gulf of Riga and Gulf of Finland from June to October 2020”. Phase II of the identification of important marine areas for bats was a continuation of the above work. The observations in 2020 took place at three points in Veiserahu, Kihnu Shoal and Neugrund[62].

According to current knowledge it can be assumed that migratory species are rare in the Gulf of Finland in autumn and their relative abundance is lower there than in the vicinity of Saaremaa. Bats are not expected to gather in autumn on the Northern Estonian peninsula, as there is a migration route from Finland to Estonia across the sea. The bats flying across the Gulf of Finland to Estonia are likely to reach scattered near the Estonian islands and coast. It can be assumed that the bats will gather on the southern coast of Saaremaa in autumn, especially on the Sõrve peninsula (the main direction of autumn migration is to the southwest), where they are waiting for suitable weather to cross the Gulf of Riga. The moving towards the west to Sweden is less likely, but it cannot be ruled out.

The existing information suggests that the autumn migration of bats is more active just in Kura kurk. On a few favourable nights migrating bats can head west from Saaremaa. Little is known about the spring migration of bats. The bat population is smaller in spring than in autumn, as not all of them survive the winter. Thus, during spring migration, the probability to meet bats at sea is smaller than in autumn. So far, the autumn migration of bats has been mainly observed, as the largest numbers can be expected at that time and based on the direction of migration it can be assumed where in the sea bats can fly more in numbers.

In case of bat migration it is important to note that when flying over the sea bats usually fly up to 10 m above sea level, but at the sea objects (masts, wind turbines, etc.) bats rise much higher, for example when flying around the blades of wind turbines. Bats, especially migratory species, may congregate in certain areas close to the coast, waiting for the weather suitable to cross the sea. Migration is possible only in case of relatively quiet weather and favourable wind direction. According to the bat survey[63] bats flew over the sea when the wind speed was 0.3–7.7 m/s (0.4–7.1 m/s based on the 2020 survey). At the same time, based on the study, bats were mostly detected above sea level at wind speeds below 5–6 m / s.

[62] The same as previous

[63] "Survey of bats at sea around Saaremaa from July to October 2018" Estonian Fund for Nature, 2019

The Action Plan for Protection of Bats [64] points out that the main general hazards of the Estonian bat fauna are the loss and degradation of both summer and winter habitats, deaths in wind farms and traffic, environmental poisons, and natural influences.

[64] Action plan for the protection of bats (*Vespertilionidae*). Approved by the Directive no. 1-1/17/150 of the Director General of the Environmental Board of 15 March 2017 https://www.keskkonnaamet.ee/sites/default/files/liigikaitse/nahkhiirlaste_tk.pdf

Impact of the MSP

Bats mainly use the marine area for the migratory period flyover, and there is no contact with the aquatic environment. Bats may be affected by activities that disrupt bat flight corridors and migratory routes, thus increasing the risk of bats being killed. Wind energy is the only potential activity affecting bats in maritime spatial planning.

Bats may be killed in offshore wind farms located in important flight corridors (migratory routes). The more intensively used the migration route, the more specimens can be killed.

The larger wind energy development areas proposed in the Maritime Spatial Plan are located in the Gulf of Riga and west of Saaremaa (Figure 4.2.4-1). According to current knowledge, the planning solution can be considered suitable for the migration of bats, as the expected main migration direction from the southern coast of Saaremaa (Sõrve spit) to Latvia in Courland has been left open. There are nature reserves in this area which ensure the preservation of the migration corridor. The planned migration corridor also runs across the Gulf of Riga above the islands of Kihnu and Ruhnu, where the plan does not foresee development areas of wind energy either.

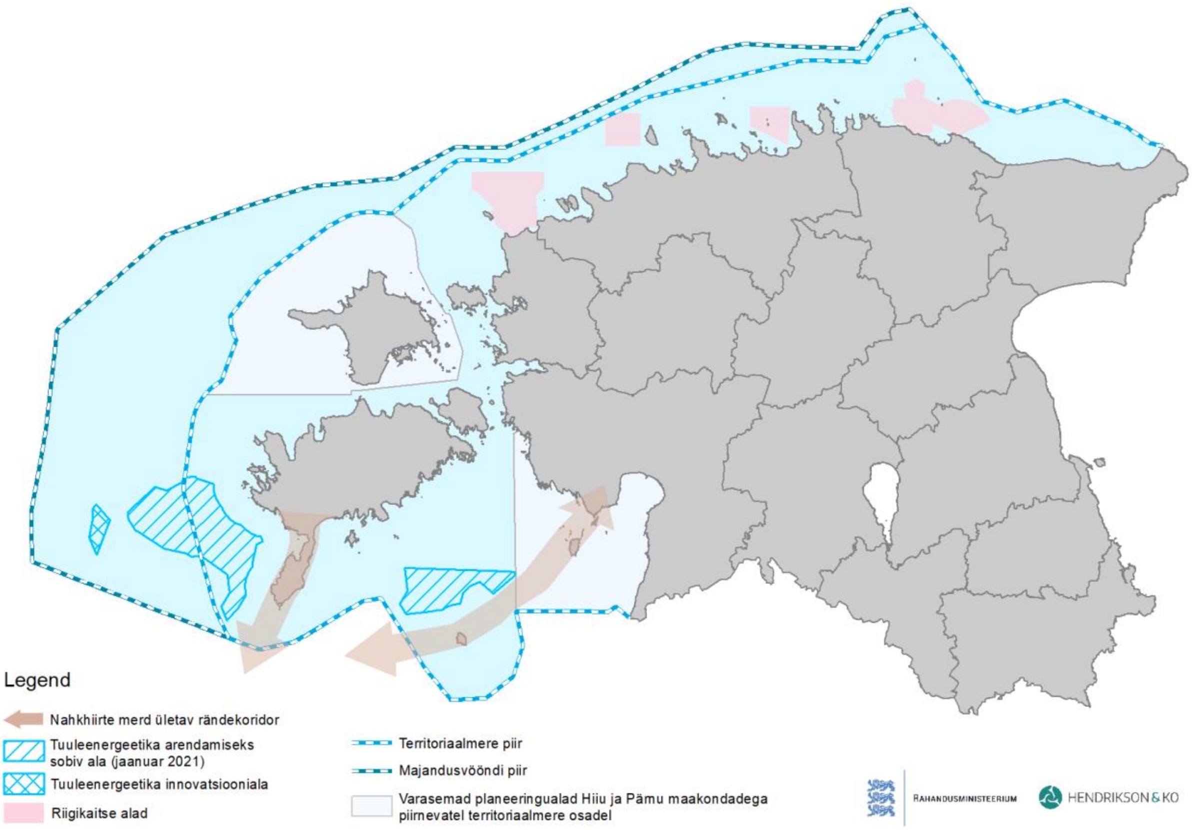

Figure 4.2.4-1. Sensitive areas for bats (source: “Survey of bats at sea around Saaremaa from July to October 2018” Estonian Fund for Nature, 2019 and “Survey of bats in the Gulf of Riga and Gulf of Finland from June to October 2020. Phase II of the identification of important marine areas for bats”) Estonian Fund for Nature, 2021)

The potential conflict between wind turbines and bats is mitigated by the fact that wind turbines operate at higher wind speeds (average wind speed in the wind farm area above 9 m/s) with little or no bat activity. The wind turbines start working with the wind speed of about 5 m/s and by taking the migration speed of bats (approx. 5-6 m/s) into account, the migration usually takes place in relatively quiet weather when the wind turbines do not work or operate at slow revs with low risk to bats.

Knowing the relationship between wind speed and bat flight activity will allow wind turbines to be stopped at certain times and at certain wind speeds in the future to protect bats. According to the survey conducted in 2020[65], the autumn migration of bats was most active at the end of July and in August, the most active period of which within this short period of about 19-30 August and in the period from 22:00 to 4:00. This is a very limited period of time, so it is possible to develop technological solutions for wind turbines in the future, where it would be possible, for example, to limit the rotor speed of the wind turbine until the wind turbines stop automatically during a certain period of time. Whenever possible, wind farms should always use the best available technology to minimize the potential related effects.

In the light of current knowledge, it can be said that the maritime spatial planning solution for the spatial arrangement of priority areas for wind energy is consistent with the anticipated migration routes of bats and the proposed environmental measures regarding the spatial plan will not result in significant adverse impacts on bats.

ENVIRONMENTAL MEASURES:

1. In the further development of wind energy development areas, it is necessary to assess in more detail the occurrence of effects and significance of the effects on bats. In the context of the authorization procedure, the effects should be specified by including the necessary expertise and, if necessary, studies should be carried out in the marine area to be developed and, if necessary, mitigation measures should be applied. The monitoring of bats should be continued during construction and operation of the wind farm.
2. It is important to keep the main migratory routes of bats free from wind farms (to mitigate the risk of collision) or to provide for appropriate mitigation measures if necessary. For example, limiting wind turbine rotor speed to stall (during migration); installation of ultrasonic repellants on wind turbines that guide potential bats in the area away from the wind farm, etc.

65 “Bat survey in the Gulf of Riga and Finland from June to October 2020. Phase II identification of important marine areas for bats”, Lutsar, L; Estonian Fund for Nature, 2021“

PROPOSALS FOR THE ACTION PLAN:

1. The research on bats in the Estonian marine area should be continued in order to gather information on the most important migration directions and intensities of bats, as well as on the relations between wind speed and bat flight activity.

4.2.5 Seabed habitats and biota

Seabed habitats

Habitat types considered important for nature conservation in the European Union were listed in 1992 in Annex I to the Habitats Directive (92/43/EEC on the conservation of natural habitats and of wild fauna and flora), which combines habitat types from land, sea, and freshwater. There are a total of eight marine habitat types in Annex I of the Habitats Directive, of which six occur in the Estonian marine area (in brackets the Habitats Directive Annex I code):

- sandbanks flooded with seawater (1110, hereinafter "sandbanks"),
- river estuaries (1130),
- mudflats and sandflats (1140, hereinafter "flats") expose with a low tide,
- coastal lagoons (1150),
- wide shallow coves and bays (1160),
- reefs (1170).

Sandbanks and reefs can be considered fully seabed habitat types as they are not related to the shape of the coastline or the land. Far from the coast, in offshore conditions, the presence of river estuaries, mud and sand flats, coastal lagoons, and wide shallow coves and bays, as all these habitat types are directly related to the coastline[66]. Habitats of reefs (1170) and sandbanks (1110), which are more widespread in the Estonian marine area, are, therefore, the focus of attention in the context of Estonian Maritime Spatial Plan.

Seabed habitat mapping was started in Estonia in 2005, and approximately one third (38%) of the Estonian marine area has been covered by inventories (spring 2019) (Figure 4.2.5-1). With respect to the extent of the marine area covered by the inventories, it should be borne in mind that, as of now, 38% coverage is obtained by aggregating the areas of the survey polygons of all mapping areas, regardless of specific mapping techniques and density of sampling points. All mapping work to date has been project-based, and the results are based on a very sparse sampling point network for large area mapping. The greater the distances between the sampling points, the less reliable the maps are. Detailed

[66] Habitats directives, inventory of the marine habitats in the selected areas in the Estonian EEZ, TÜ EMI, 2016

knowledge of the seabed is derived from the points visited at sea. Estimates of the distribution of the seabed substrate and biota for the area between the sampling points are obtained through indirect mathematical methods - interpolation or directed modeling.

Major unmapped areas within the territorial sea are located in the eastern part of the Gulf of Finland and the western and northwestern parts of the territorial sea. Seabed habitats in the EEZ are much less mapped compared to the territorial sea (Figure 4.2.5-1).

In 2018, modeling of the distribution of reefs and sandbank habitat types for the entire Estonian marine area was performed based on the available materials (Figure 4.2.5- 2).

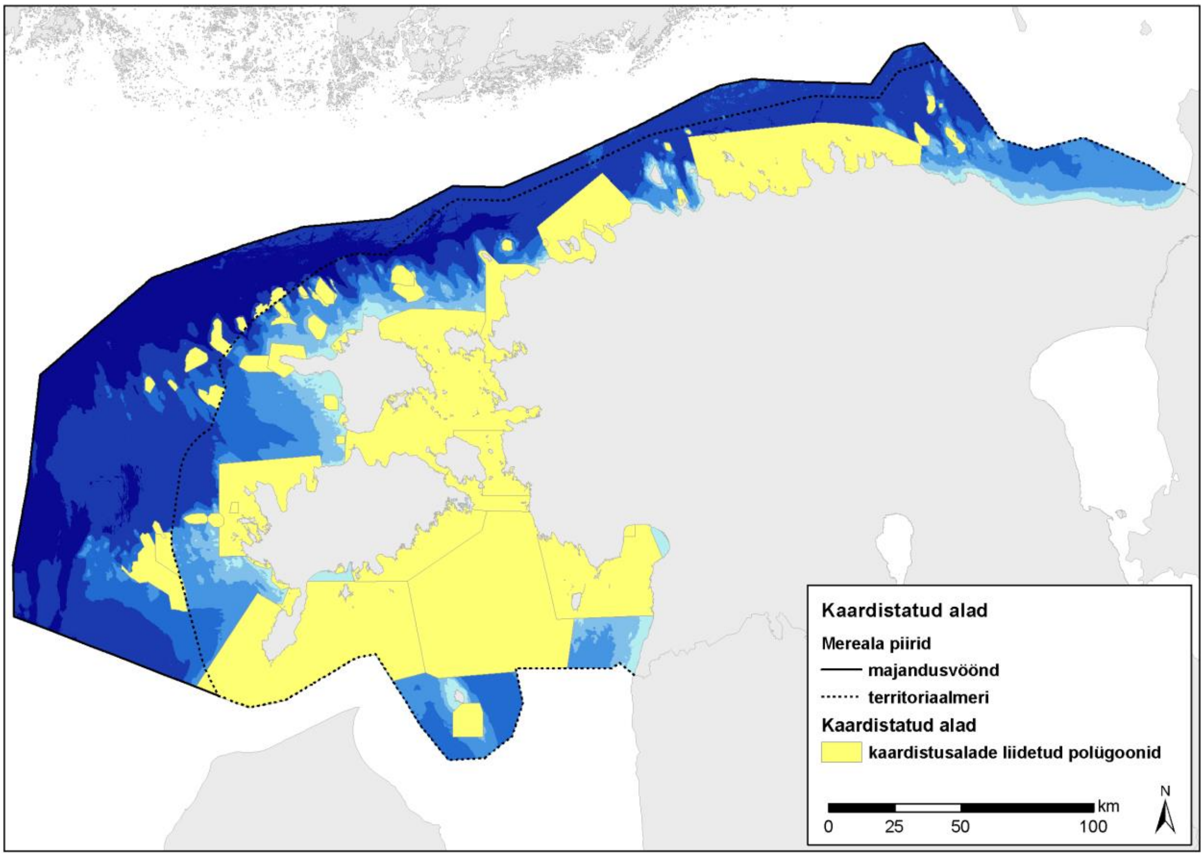

Figure 4.2.5-1. Areas mapped in the Estonian marine area (source: Estonian Maritime Institute, UT, as of spring 2019)

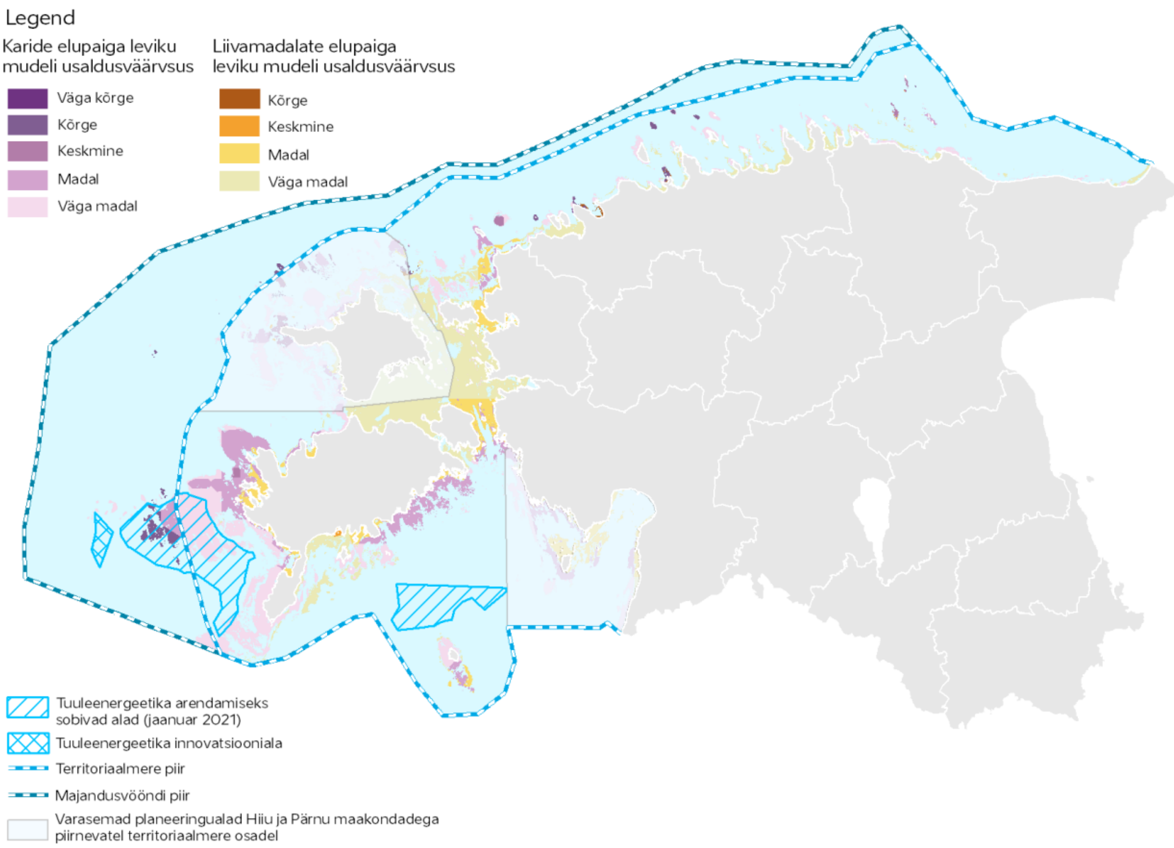

Figure 4.2.5-2. Modeled distribution of habitat types in Annex I of the Habitats Directive - reefs and sandbanks - with the reliability of the habitat distribution model in the Estonian marine area (Source of the map material: Updating map data of Estonian marine habitats, UT Estonian Marine Institute 2018[67])

According to the Marine Strategy Framework Directive (MSRD), it is also necessary to consider general large-scale habitats in the environmental assessment. EU Commission Decision 2017/848[68], which establishes the main types of MSFD seabed habitats, has only recently been published, and, therefore, no MSFD seabed habitats have been mapped in Estonia. However, in 2018, MSFD has conducted modeling of the distribution of key types of seabed habitats, based on the same source data as the previous Habitats Directive habitat modeling (Figure 4.2.5-3). The mereRITA project "Innovative solutions for the assessment and monitoring of the Estonian marine environment and natural values[69]" is underway, in the course of which several innovative solutions will be developed to enable the mapping and assessment of marine ecosystems and the development of blue economy.

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[67] The reliability of the habitat distribution model provided in the figure is due to the density of sampling points - the higher the density of samples taken from the seabed, the higher the reliability of the habitat model in a specific area.

[68] eur-lex.europa.eu/legal-content/ET/TXT/PDF/?uri=CELEX:32017D0848&from=NE

[69] mereRITA website: https://sisu.ut.ee/mererita/avaleht

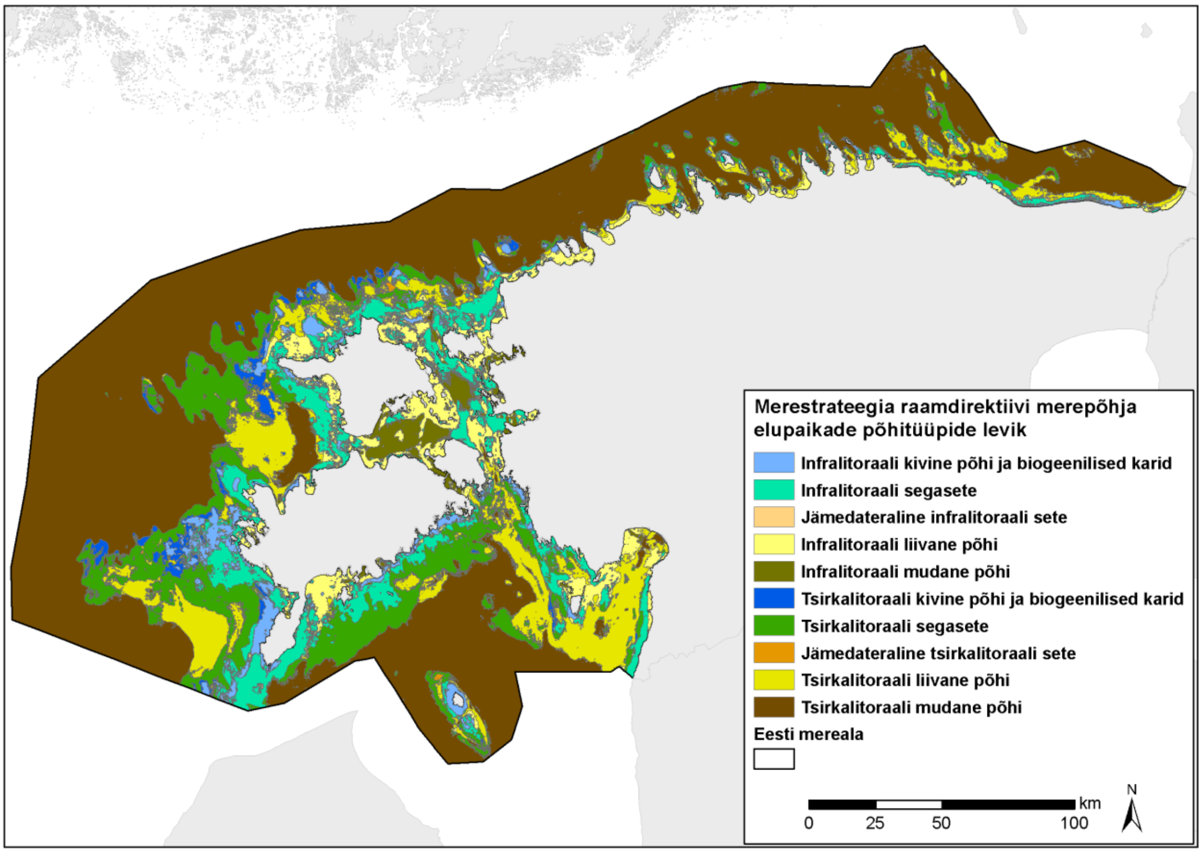

Figure 4.2.5-3. Modeled distribution of the main types of MSFD seabed habitats in the Estonian marine area. (Source: Estonian Maritime Institute, UT 2018)

In addition, a modeled distribution map of HELCOM [70]seabed biotopes (HELCOM HUB or *Helcom underwater biotope and habitat classification system*), level 3, is available from earlier studies (Figure 4.2.5-4)[71].

[70] Baltic Marine Environment Protection Commission - Helsinki Commission

[71] Reporting of the NEMA project: "Habitats directive of modeling the distribution of marine habitat types and EUNIS level 3 habitats in the Estonian EEZ", UT Estonian Maritime Institute, 2016. http://nema.bef.ee/en/

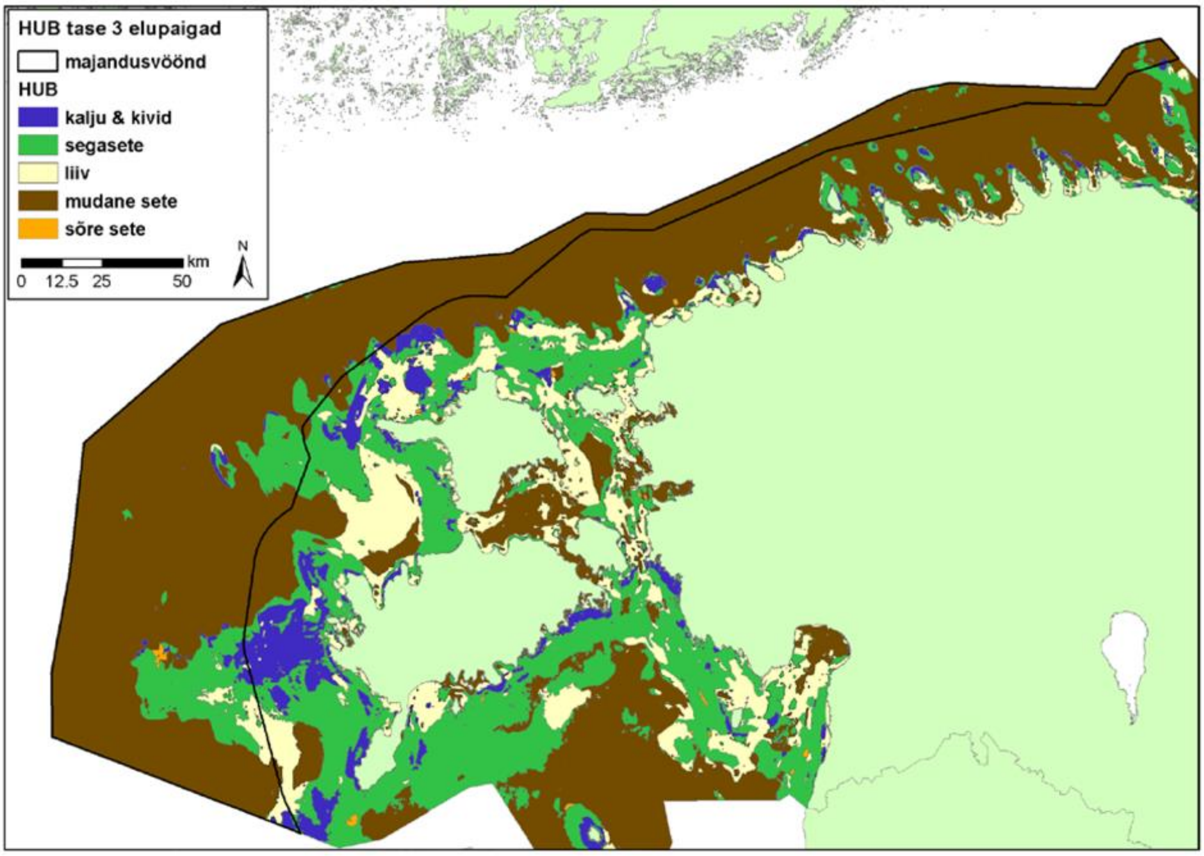

Figure 4.2.5-4. Modeled HELCOM HUB Level 3 Habitat Distribution in the Estonian Marine Area (Source: Estonian Marine Institute, UT 2016)

In 2018, the status of reefs, sandflats, and sandbanks from the seabed habitats was assessed for reporting in accordance with the Estonian Marine Strategy[72] and all three habitat types were found to be in a favorable state. In addition, oxygen deprivation and macrofauna communities in soft-bottom areas were assessed. Their assessment is predominantly favorable in the Estonian marine area, but no good status was achieved in the Väinameri Sea, Pärnu Bay, and the eastern and offshore parts of the Gulf of Finland.

In 2020 the study "Study of seabed biota and habitats to assess the distribution of Natura and HELCOM habitat types and to elucidate the CO2 sequestration potential of the sea" (Estonian Marine Institute, University of Tartu, 2020) [73] was completed, which, as one of the areas, examined the marine area in the west of Saaremaa proposed for the development of wind energy set out in the maritime spatial plan This project carried out studies on the chemical and

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[72]"Environmental Status of Estonian Marine Area 2018" Report, 2018. https://www.envir.ee/sites/default/files/mere_seisund_2018.pdf

[73] Study of seabed biota and habitats to assess the distribution of Natura and HELCOM habitat types and to elucidate the CO2 sequestration potential of the sea "(Estonian Marine Institute, University of Tartu, 2020) https://www.envir.ee/sites/default/files/inventuuri_lopparuanne_02.06.2020.pdf

physical characteristics of the seabed biota and habitats and the water column within that part of the territorial sea.

During the inventory the distribution of the Habitats Directive habitat type 1170 (reefs) was identified in the study area (total area 228 km^2, 48% of the study area). No other seabed habitat types or species in the directives or other lists of natural values were found in the study area. The presence of a habitat type in the Habitats Directive in an area does not in itself require its separate protection. Based on the information available in the marine area under Estonian jurisdiction, the habitat type of reefs covers an area of 3421.3 km^2.The existing natural areas in Estonia cover 19.2% of this. The Estonian areas offered by the HELCOM network of marine protected areas (includes both natural areas and Site of Community Importance) cover 27.8% of the reef habitat type present in all Estonian marine areas. Estonia has reported that the reefs of the habitat type in the Estonian marine area are in a favourable nature conservation status.

Considering that no objects of nature protection importance were identified in the study area other than the Habitats Directive habitat 1170 (reefs), which has been already sufficiently covered by the existing network of protected areas in Estonia, and by taking into account the two potential new marine protected areas in the immediate vicinity of the study area (the ongoing extension of Vilsandi National Park and the proposal to establish an offshore protected area in the EEZ, see Chapter 4.2.6 for more details), the expert group that conducted the study does not see a direct need to establish new nature protection restrictions in the study area if the planned and pending protected areas will be realized and will ensure the preservation of the favourable status of the habitat type 1170.

Seabed habitats

In the Estonian marine area, macroscopic seabed biota is formed of flora (large algae and higher plants) and benthic fauna. In terms of species composition, the biota is quite diverse, with both marine and freshwater species.

Seabed vegetation. On the basis of the data from the years 1992 - 2018, 60 major vegetation taxa (including 57 species and taxa *Ulotrix, Pseudolithoderma,* and *fontinalis* the genus level) have been recorded in the Estonian marine area.

The most frequently occurring species in the Estonian marine area are Vertebrata fucoides, Cladophora glomerata, and *Ceramium tenuicorne*. The species/ taxa of the brown algae are the most abundant in the Estonian marine area. The differences between vegetation species/taxa in the HELCOM sub-basins are relatively small, with the Gulf of Riga being the most abundant in species.

Large vertebrates. According to the data of the years 1992-2018, 92 zoobenthos taxa (including 73 species and 19 taxa) data are registered in the Estonian marine area.

The most frequently occurring invertebrates in the Estonian marine area are the blue mussel (*Mytilus trossulus*), Baltic clam (*Limecola balthica*) and barnacle attaching to the substrate (*Amphibalanus improvisus*). 59% of the benthic species/taxa belong to the arthropod family. Species diversity is highest in the Gulf of Riga lower basin and lowest in the eastern Gotland basin.

Impact of the MSP

Seabed habitats and biota are influenced by two types of anthropogenic factors:

- local factors (in particular mechanical impact on the seabed, local sources of pollution);
- regional influences (general level of eutrophication in the Baltic Sea, the total level of hazardous substances).

The spatial solutions to the activities to be established by the plan are primarily of local impact and are related to the mechanical impact of the activities on the seabed (disturbance, removal, replacement of the seabed substrate). The specific impact is very specific to the site and the proposed activity, so it is possible to assess the impact of the activities during the licensing process for specific projects.

From the standpoint of the seabed and its biota, the development of wind energy is one of the most important areas of activity proposed in the Maritime Spatial Plan, which may include direct actions that locally affect the seabed. According to current experience, the impact on seabed habitats and biota associated with wind energy development are in particular foundations of wind turbines and erosion control[74,75,76,77].

Impact on benthic habitats. Of the proposed activities, technical developments, i.e., any physical intervention in the seabed environment, will have a greater impact on the seabed habitats. There are reefs (1170) and sandbanks (1110) in the planned wind energy development areas of the EU Habitats Directive Annex I habitat types of conservation value, see Figure 4.2.5-2.

In particular the construction of wind farms on the seabed will have an impact by occupying or destroying the habitat under the foundation of the specific wind turbine or substation and power cables. Depending on the specific conditions of the seabed, it may be necessary to prepare the seabed for installation of the foundation. Prior to the installation of gravitational foundations it may be necessary to level and strengthen the seabed.

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[74] Boehlert, G. W., and Gill, A. B. 2010. *Environmental and ecological effects of ocean renewable energy development: A Current Synthesis. Oceanography*, 23: 68-81

[75] ICES. 2012. *Report of the Workshop on Effects of Offshore Windfarms on Marine Benthos - Facilitating a closer international collaboration throughout the North Atlantic Region (WKEOMB), 27–30 March 2012, Bremerhaven, Germany*. ICES CM 2012/SSGEF:13. 57 pp.

[76] Lindeboom, H. J., Kouwenhoven, H. J., Bergman, M. J. N., Bouma, S., Brasseur, S., Daan, R., Fijn, R. C., *et al*. 2011. *Short-term ecological effects of an offshore wind farm in the Dutch coastal zone; a compilation. Environmental Research Letters*, 6.

[77] Linley EAS, Wilding TA, Black K, Hawkins AJS, Mangi. 2007. *Review of the effects of offshore windfarm structures and their potential for enhancment and mitigation*.

To date, gravitational foundations have been developed that do not require the prior preparation of the seabed (eg Gravitas[78], Seatower[79]), but may require filling with concrete to fill the gap between the seabed and the foundation after installation. The capacity of wind turbines as well as other parameters depend on the specific location and layout, as well as the time of realization of wind farms. Depending on the height of the wind turbines and diameter of the rotor, as well as the distances between the locations of the wind turbines (i.e. the location of the foundations).

The extent of the impact depends on the technical details and material of the foundation and the area of the seabed below the foundation, i.e. the smaller the power wind turbines and the larger the foundations, the greater the impact. The larger the area of the foundation and the area of the seabed under it, the greater the loss of natural seabed at a particular location.

The preference should be given to the foundation structures with the smaller "footprint" when constructing wind farms in the future alongside with technological developments (including taking into account that their physical construction in the construction stage does not cause significant and extensive noise and sediment movement and, for example, the seabed being prepared will be affected to a minimum). When establishing the offshore wind farms, the location of wind turbines should be based primarily on the location of habitat types and, if possible, the installation of wind turbines in an area with habitats of reefs (1170) of high nature conservation value should be foremost avoided.

The current technological solutions of the wind turbine foundation are the most suitable gravity-based foundation for the conditions of the Estonian marine area, which can be solved both as a monolith and as a combination of several smaller interconnected elements. In the case of more sensitive habitat, a monolithic foundation should be preferred, as in this case, the impact will be one-off (when one monolithic foundation block is laid on the seabed). The foundation material should be as close as possible to the natural substrate (surface roughness, neutral chemical reaction). Enriching the exterior surface of the foundation with natural rock material may also be considered. This allows the creation of an attachment substrate that is as natural as possible, to which marine organisms can attach. In the case of material facilitating attachment of biota, a so-called reef effect is expected[80], which is a very complex phenomenon with both positive and negative impacts. Positive impacts include an increase in biomass attached to the seabed, an increase in the species

[78] https://www.arup.com/-/media/arup/files/publications/g/gravitas_brochure_final_press_quality2.pdf

[79] http://seatower.com/

[80] An artificial reef is a man - made structure or structure that has been laid on the seabed, either intentionally or unintentionally, and serves as a basis for the growth and production of marine life (Hoffmann et al. 2001)

diversity of the benthic biota, and the foundations of wind turbines attracting fish (easier access to food, shelter, spawning substrate, etc).

The reef effect is also accompanied by negative impacts, such as the accumulation of dead biomass at the wind turbine foundation and nutrient enrichment of sediments - local eutrophication symptoms; the possible promotion of alien species (the so-called ' *stepping stone* ' effect); and the formation of hard substrates at depth ranges where they do not occur naturally (in turn, colonization of species is unpredictable). Experiments on colonizing a new substrate conducted in the northern Baltic Sea have shown that it is very difficult to predict which species will colonize a particular new substrate in the high seas. Each specific site is different in its conditions, and evaluation (and study) of substrate colonization should be made prior to the implementation of a particular project. Seabed disturbance experiments conducted in Estonia (Neugrund shallow, limestone bottom) have also shown that disturbance of the limestone seabed - mechanical damage - produces changes that can be observed over many years. The soft bottom uses erosion barriers and increases the area of impact of the foundation of each particular wind turbine. Thus, when using erosion barriers, natural material from land-based sources should be used to minimize the impact.

When dismantling wind turbines, it must first be assessed whether removing the foundation can cause more damage than leaving it in the marine environment. Perhaps the option of removing the foundation should be preferred, but in some cases, it may be expedient not to dismantle the foundation.

The development of offshore wind farms will also involve the laying of seabed cables. Their specific impact will also depend on the technology used for the laying of the cable on the seabed, the material of the cable covering, and the voltage inside the cable, which must be addressed in more detail in the licensing and assessment of the proposed activities. Today, cable installation technology has advanced in the direction where laying the cable on the seabed is accompanied with protection thereof along its entire length from potential damage. One of the more commonly used methods of protecting a cable is by burying it in seabed sediments, which ensures safety and avoidance of economic damage, as well as mitigating the environmental impact of some (magnetic field, heat). The construction of cable corridores does not, by its very nature, destroy the habitat under the cable corridore and has a limited geographical impact. In the case of a soft seabed, a temporary groove is created to bury the cable, and the sediment will fall on the installed cable. A sufficient burial depth of the cable to protect the cable from the main external influences is generally considered to be 1- 1.5 m. The success and methods of burial in the sediments are highly dependent on the seabed geology. The establishment and subsequent operation of the cable corridore will not significantly affect the distribution of habitats. For a particularly hard substrate, there is no significant change in habitat distribution, for a soft substrate there may be some habitat loss and habitat diversification through the addition of hard substrate, but under certain conditions, the added hard substrate (the cable itself) may get buried under soft sediment, in which case the distribution and health of the habitat is not comparable to the previous situation, especially in offshore areas. All in all, the establishment of a cable corridore to the spread of habitats has a small and short-term impact during both construction and operation.

An important parameter characterizing the status of the seabed habitats is the quality of the habitats (compliance of the biota with the typical structure and preservation of the biological function of the abiotic components of the environment). The establishment of a cable corridore can affect habitat quality through changes in the substrate and the distribution of species important to the habitat. As the cable corridore is a particularly hard substrate added to the seabed and its associated additional reef effect, a greater change is expected to occur in the habitat quality in particular on soft bases, as the addition of a hard substrate and a reef effect will increase the species diversity of this habitat through additional substrate formation.[81],[82]. The impact on hard bottoms is minimal since the addition of substrate does not fundamentally alter the conditions of the species populating the habitat. To date, apart from isolated cases [83], the magnetic and electric fields associated with the cables have no impact on benthic biota and individual species, so the impact of these fields on the species composition cannot be assessed. In conclusion, it can be expected that the installation and further operation of the cable corridore will have only a minor and short-term impact on the quality of the seabed habitats.

Impact on benthic biota. Benthic vegetation is a component of benthic biota that primarily inhabits the photic zone of the seabed. The vegetation communities vary depending on the substrate. In offshore conditions (openness to waves), as a rule, soft beds (sandy and clayey seabeds) have no vegetation. The benthic vegetation of the hard bottoms consists primarily of algae, which have a typical zonality in accordance with the depth in the northern Baltic Sea. In the shallower part, there is usually a green algae zone, followed by the brown algae or bladderwrack zone, and in the deepest part (up to 30 m in the open sea condition), the red algae zone. As a rule, the bladderwrack zone is the richest in biomass and species.

Cable routing creates a substrate suitable for attachment to the bottom vegetation at depth ranges where it may not have been present (especially on soft bottoms). Under hard substrate conditions, the hard substrate formed in the case of the cable corridore is not significantly different from that of the natural substrate, and thus no impact on the species composition of benthic vegetation is expected. Thus, the added substrate has a significant local impact only on soft bottoms, which is rather rare in the wind energy development areas

[81] Ambrose, R. F., and Anderson, T. W. 1990. Influence of an artificial reef on the surrounding infaunal community. Marine Biology [Mar. Biol.], 107: 41-52.

[82] Langhamer O. 2012. Artificial Reef Effect in relation to Offshore Renewable Energy Conversion: State of the Art. Sci. World J. 2012:1–8. doi:10.1100/2012/386713.

[83] Scott, K., Harsanyi, P., and Lyndon, A. R. 2018. Understanding the effects of electromagnetic field emissions from Marine Renewable Energy Devices (MREDs) on the commercially important edible crab, Cancer pagurus (L.). Marine Pollution Bulletin, 131: 580-588.

proposed in the Maritime Spatial Plan. To date, the electromagnetic impacts of cables on benthic species have not been identified.

The benthic fauna is composed of both sessile (sedentary) and mobile species. The sessile species need either a hard substrate to attach or softer sediment to dig itself into. For species attaching to a hard substrate (e.g., shellfish), the addition of a hard substrate is primarily additional habitat and often allows for a more complex, three-dimensional habitat[84]. This has often led to the abundance of anchored benthos and the increased biomass in the vicinity of wind farms.

The impact of fitting the cable lines on the soft-bottom benthos may occur particularly in close proximity to the cable through the change of sediment dynamics[85],[86]. In the vicinity of cables and other artificial structures, usually under favorable hydrodynamic conditions, forms in sediments will begin to proliferate[87],[88] The electromagnetic impact on mobile species has been described several times[89]. Mostly it has been either fish or crabs. Such impacts have not been described in our waters, and knowledge to date tends to indicate a lack of impacts.

As a separate risk, cable corridores can be highlighted as potential contributors to the spread of alien species, in particular by forming an uninterrupted network of hard substrates in the area of soft sediment.[90] In this way, species attaching to a hard substrate will be able to propagate along the cable corridores in a

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[84] Kerckhof F, De Mesel I, Degraer S (2016). Do wind farms favour introduces hard subatrata species? In: Degraer S, Brabant R, Rumes B, Vigin L (eds.): Environmental impact of offshore wind farms in the Belgian part of the North Sea: Environmental impact monitoring reloaded. Royal Belgian Institute of Natural Sciences, OD Natural Environment, Marine Ecology and Management Section: 61-75.

[85] Davis, N., van Blaricom, G. R., and Dayton, P. K. 1982. Man-made structures on marine sediments: Effects on adjacent benthic communities. Marine Biology [Mar. Biol.], 70: 295-303.

[86] Hall, S. J. 1994. Physical Disturbance And Marine Benthic Communities - Life In Unconsolidated Sediments. Oceanography and Marine Biology: an Annual Review, 32: 179-239.

[87] Coates D, Vanaverbeke J, Vincx M, others (2012) Enrichment of the soft sediment macrobenthos around a gravity-based foundation on the Thorntonbank. Offshore Wind Belg Part North Sea Head Underst Environ Impacts R Belg Inst Nat Sci Manag Unit North Sea Math Models Mar Ecosyst Manag Unit Bruss:41–54

[88] Coates, D. A., Deschutter, Y., Vincx, M., and Vanaverbeke, J. 2014. Enrichment and shifts in macrobenthic assemblages in an offshore wind farm area in the Belgian part of the North Sea. Marine Environmental Research, 95: 1-12.

[89] Hutchinson, Z, Sigray, P, He H, Gill, A, King J, Gibson, C (2018) Electromagnetic Field (EMF) Impacts on Elasmobranch (shark, rays, and skates) and American Lobster Movement and Migration from Direct Current Cables. Sterling (VA): U.S. Department of the Interior, Bureau of Ocean Energy Management. OCS Study BOEM 2018-003. Sterling (VA): U.S.

[90] Ricciardi, A., and Rasmussen, J. B. 1998. Predicting the identity and impact of future biological invaders: A priority for aquatic resource management. Canadian Journal of Fisheries and Aquatic Sciences [Can. J. Fish. Aquat. Sci.], 55: 1759-1765.

situation where this would naturally be impossible. Cables may also be associated with low-frequency vibration propagation, especially near wind turbines, which in turn may cause changes in the distribution of benthic fauna on the local scale[91].

To mitigate the impacts of cables, for example, in case of a cay, it is useful to consider burying the cable. For hard substrates (such as "reef" habitat types), it is not practical to bury or cover the cable in deeper parts of the high seas. Where possible, the external surface of the cable should be neutral and allow the organisms to attach. At the same time, protecting the cable in the shallow coastal area, which is therefore strongly affected by ice and storms, is indispensable (recommended depth approx. 1.5 meters). In addition to the shallow areas, international shipping lanes and intersections with other cables or pipelines are potential risk areas. Solutions for advanced cable protection methods are being developed in the design of wind farms.

In addition to wind energy, aquaculture is another type of marine use that is directly related to seabed habitats and biota. The impact of aquaculture on seabed habitats and biota depends on many factors - environmental factors at a given location, the type of aquaculture, and the technology used. Fish farms are primarily associated with eutrophication. The impact of the fish farm is by the nutrients added to the marine environment through the fish farm (see Chapter 4.1.5), which may alter the ecological conditions of the seabed biota, thereby causing changes in the species composition of the biota and the quality of the habitat. At the same time the shellfish and algae farming can remove nutrients from the marine environment and their effect is rather to reduce the level of eutrophication (see Chapter 4.1.5 for more details). The impacts associated with fish farming depend to a large extent on the location of the proposed activity, technology and the species cultivated, so the associated impacts need to be further assessed in the authorization procedure and, where necessary, the measures to mitigate significant adverse effects need to be developed. As technology advances, the aim should be to encourage only nutrient-neutral fish farming in the marine environment.

The implementation of the maritime spatial plan does not envisage the occurrence of significant adverse effects on the seabed habitats and biota by applying the prescribed environmental measures and recommendations at the level of authorization.

ENVIRONMENTAL MEASURES:

1. The implementation of the uses of the marine areas considered in the Maritime Spatial Plan will have an impact primarily on the local level (mechanical intervention on the seabed, etc.). Because the impacts are

[91] Solan, M., Hauton, C., Godbold, J. A., Wood, C. L., Leighton, T. G., and White, P. 2016. *Anthropogenic sources of underwater sound can modify how sediment-dwelling invertebrates mediate ecosystem properties. Scientific Reports*, 6: 20540.

site and activity specific, impacts are assessed at the licensing level for most areas activities and can be mitigated as appropriate.
2. The selection of different foundation types and technologies for wind turbines shall take into account and assess the environmental impact of their construction and dismantling on the seabed and its biota.
3. In the areas suitable for the development of wind energy, it is recommended that the location of the wind turbines is based on the location of the habitat types. Avoid installing wind turbines in areas of habitats of high conservation value where possible.
4. As technology advances, preference should be given to smaller "footprint" foundation structures, i.e. the smaller the area of the seabed under the foundation (and the part to be prepared for it), the lower the loss of natural seabed at a specific location (incl it must be taken into account that their physical construction during the construction and dismantling phases would not cause significant and extensive noise and would not cause significant sediment movement).
5. To mitigate the effects of cables connecting wind farms to land, consider burying of cables when they pass through a soft substrate (e.g., sandbank habitat type), whereas for hard substrate (e.g., reef habitat type), burying and coating of the cables in deeper offshore areas is not feasible. Where possible, the external surface of the cable should be neutral and allow the organisms to attach.
6. The effects related to the offshore fish farm should be further assessed in the licensing procedure and, if necessary, mitigation measures should be developed. As technology advances, the aim should be to encourage only nutrient-neutral fish farming in the marine environment.

4.2.6 Protected natural objects

Approximately 19% of the entire Estonian marine area (including the exclusive economic zone) is covered by various types of protected natural objects. The existing network of marine protected areas is very unevenly distributed. All of the existing protected areas are located in the territorial sea. There are predominantly special conservation areas and protected areas for the protection of the sea. The list of protected natural objects in the Maritime Spatial Plan area is given in the following table, and protected sea areas are illustrated in Figure 4.2.6-1.

Table 4.2.6-1. Protected natural objects related to the Estonian maritime spatial plan (the table does not include information on natural objects located in the area covered by Hiiu and Pärnu maritime spatial plans)

Area name	Code
Special conservation areas	
Gretagrundi Conservation Area	KLO2000344
Kahtla-Kübassaare Conservation Area	KLO2000309
Karala-Pilguse Conservation Area	KLO2000310
Kasti lahe Conservation Area	KLO2000312
Kaugatoma-Lõu Conservation Area	KLO2000313
Küdema lahe Conservation Area	KLO2000318

Kolga lahe Conservation Area	KLO2000003
Koorunõmme Conservation Area	KLO2000315
Kura kurgu Conservation Area	KLO2000316
Kuressaare lahe Conservation Area	KLO2000316
Nõva-Osmussaare Conservation Area in Harjumaa and Läänemaa	KLO2000165 KLO2000166
Pakri Conservation Area	KLO2000167
Paljassaare Conservation Area	KLO2000168
Pammana Conservation Area	KLO2000222
Prangli Conservation Area	KLO2000169
Riksu ranniku Conservation Area	KLO2000327
Ruhnu Conservation Area	KLO2000328
Siiksaare-Oessaare Conservation Area	KLO2000330
Sutu lahe Conservation Area	KLO2000331
Tagamõisa Conservation Area	KLO2000332
Vaindloo Conservation Area	KLO2000037
Väikese väina Conservation Area	KLO2000048
Väinamere Conservation Area (Läänemaa and Saaremaa)	KLO2000241 KLO2000339
Nature reserves	
Allirahu Nature Reserve	KLO1000146
Apollo meremadaliku Nature Reserve	KLO1000674
Puhtu-Laelatu Nature Reserve	KLO1000176
Rahuste Nature Conservation Area	KLO1000305
Silma Nature Reserve	KLO1000197
Sääre Nature Reserve	KLO1000662
Suurupi Nature Reserve	KLO1000612
Toolse Nature Reserve	KLO1000180
Uhtju Nature Reserve	KLO1000017
Landscape protection areas	
Kasti Landscape Protection Area	KLO1000485
Kübassaare Landscape Protection Area	KLO1000295
Kolga lahe Landscape Protection Area	KLO1000495
Letipea Landscape Protection Area	KLO1000516
Vormsi Landscape Protection Area	KLO1000220
National parks	
Lahemaa National park	KLO1000511
Matsalu National park	KLO1000300
Vilsandi National park	KLO1000250
Permanent habitat	
Kerju Gray Seal Permanent Habitat	KLO3000094
Krassi Island Gray Seal Permanent Habitat	KLO3000092

Proposed protected areas[92]	
Krassi Nature Reserve	-
Laidevahe Nature Reserve (extension)	PLO1001325
Neugrundi Nature Reserve	PLO1000854
Paljassaare Nature Reserve	-
Mustjõe ranna Landscape Protection Area	-
Vilsandi National park (extension)	-

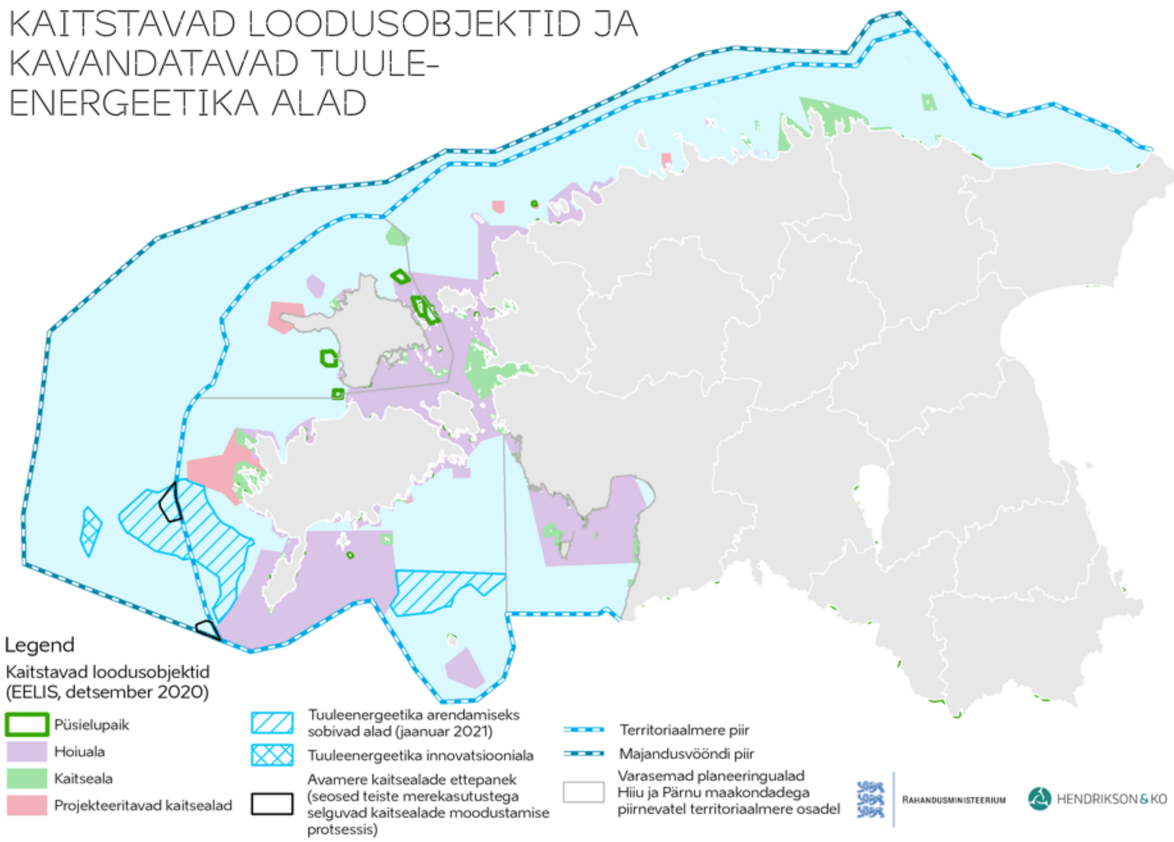

Figure 4.2.6-1. Protected natural objects on the marine area

Most protected natural objects on the marine area are also internationally protected within the Natura 2000 network of nature and/or special protection area. The impact on Natura sites is assessed in a separate chapter in the Natura Assessment Form (Chapter 4.3).

This chapter outlines the environmental aspects of nationally protected natural objects without international protection, which are related to the implementation of the plan. Out of the existing protected areas, Uhtju Nature Reserve is partially outside of the Natura special protection areas, and Apollo Shoal Nature Reserve is entirely outside the Natura special protection areas.

[92] In the proposed protected that are highlighted are areas covering the new marine area or extensions to existing protected areas

Also, all proposed new protected areas and planned extensions to existing areas provided in Table 4.2.6-1 are located outside the Natura site network..

Until now the protection of marine areas has taken place in Estonia by area, and the reasons for the protection have mostly been the presence of either birds or marine mammals. In a few cases seabed habitats have also been considered as protected natural values. So far, the effectiveness of the existing protected areas and measures in the Estonian marine area has not been assessed, nor has the coherence of the network been assessed or taken into account when creating the network of protected areas. This would require a comprehensive analysis of a separate marine area, led by the Ministry of the Environment and the Environmental Board, which are responsible for the protection and selection of nature reserves and Natura 2000 sites.

At the time of preparing the maritime spatial plan there were essentially no protected areas in the Estonian EEZ. Only a small part of one protected area, considering the extent of the EEZ, also reached the EEZ - about 43 km^2 of the Kura kurgu Conservation Area is located in the EEZ. The need to protect the marine natural values of the exclusive economic zone has been emphasized both at the world level (CBD) and in the Baltic Sea region (HELCOM). In the course of the project, which ended in 2020[93], it has been proposed to establish two protected areas in the exclusive economic zone (areas 73.3 and 36.7 km^2). The larger of them (according to the proposal "Kolgi shallow marine reserve") partially overlaps with the wind energy development area proposed in this plan[94].

Impact of the MSP

With regard to protected nature, the main objective of the Maritime spatial Plan shall be the sustainable use of marine space in a manner **that ensures the preservation of protected natural objects and marine reserves and their**

[93] "Preparation of the proposal for offshore protected areas in the Estonian EEZ", responsible executor: Martin G; EMI 2020 (https://mereinstituut.ut.ee/et/projektid/avamere-kaitsealade-ettepaneku-koostamine-eesti-majandusvoondis)

[94] The grounds for protection in the context of the EEZ are as follows: The area is representative of the "reefs" habitat type. An important part of the habitat type of the “reefs” of the Habitats Directive located in the Estonian EEZ is located in the area (25.58% of all reefs in the EEZ are located in the area). The habitat type “reefs” in the area is in a very good condition - the human impact is currently limited to indirect effects (general level of eutrophication in the Baltic Sea, general pollution load of hazardous substances), there are practically no local anthropogenic pressures. The area is a “hot-spot” for biodiversity in terms of seabed biota (UT Estonian Marine Institute 2020a). The area is a spawning ground for Baltic flounder, autumn spawning herring, shorthorn sculpin and long-spined bullhead, an important feeding area for juvenile cod and an important feeding area for European and Baltic flounder (UT Estonian Marine Institute 2020b). The site is an important Special Protection Area (previously identified in the studies as an important non-protected Special Protection Area). The area is especially important for the resting and migrating area of long-tailed duck, divers (gull and red-throated diver) and small gulls (different species use the area as migration stops, as a wintering area and as a summer feeding area) (UT Estonian Marine Institute 2020c).

conservation objectives and does not impede the achievement of conservation objectives. To achieve these goals, the main principles applied in the planning are:

- The plan map reflects all the natural features protected at sea and does not target other areas of activity for those areas that may be expected to have adverse impacts (e.g., wind energy);
- It is established as a guideline that the use of the marine area in protected natural objects is subject to the site's conservation objectives and restrictions.

The plan identifies three areas for the development of wind energy- in the Gulf of Riga (No. 1), in the East Gotland Basin (No. 2) to the west of Saaremaa and in the North Sea Basin (No. 3). The choice of the spatial location of wind energy development areas was based on the location of protected areas and was taken as an exclusionary factor in order to exclude direct impacts on protected areas (e.g. physical changes to the seabed (including habitat destruction) and changes in waves, water movement, etc.). Protected areas have been established to preserve Estonia's natural wealth, and therefore human activities that cause environmental disturbances in these territories are either restricted or even prohibited. The selection of the spatial location of wind energy development areas was based on the location of the protected areas and was taken as an exclusionary factor in order to exclude direct impacts on the protected areas (e.g. physical changes to the seabed (including habitat destruction) and changes in waves, water movement, etc.). The protected areas have been established to preserve Estonia's natural wealth and therefore human activities that cause environmental disturbances in these territories are either restricted or even prohibited. During the planning process the planning of the wind energy development area no. 3 (northwest of Saaremaa) has been removed. The planning of the area was abandoned for the reasons of nature conservation, among other things: the area was partly located in an important sensitive area of Hülgerahu as an area for winter stopping and spring migration of waterfowl, and was therefore with high development risk.

However, the wind energy development areas designated by the plan may have indirect impacts on adjacent parts of the protected area (suspended matter spread, noise during construction, etc). The potential for indirect impacts on birds, including protected nature objects related to bird protection, is largely minimized by site selection at the strategic planning level. In addition to excluding the development of wind energy in nature reserves, the development of wind energy in other marine areas is also directed to the areas of low ornithological value (see also Chapters 4.2.2 and Figure 4.2.2-4). To this end, an analysis of bird staging areas and migration routes was carried out during the maritime spatial planning process, the results of which indicate that the planned wind energy development areas 1 and 2, as well as the innovation area, are located outside the sensitive marine areas for birds.

However, the more specific impacts related to the wind energy development areas need to be addressed in the subsequent stages of wind energy development in the context of specific projects, once the exact location, volume, technology, etc. of the proposed activity has been identified and mitigation measures should be implemented, if necessary (e.g. required buffer zones). Here it is appropriate to highlight the environmental aspects related to the planning of wind energy development areas for nationally protected natural objects without international protection (including the proposed natural objects which are provided for in EELIS, i.e. the table below does not include the proposal to establish two protected areas in the EEZ discussed above).

Table 4.2.6-2 Impact of wind energy development areas on national (planned) protected natural objects

Natural object protected or planned to be protected	Conservation objective	Impact assessment
Apollo Shallow Nature Reserve (KLO1000674)	The conservation objective is to protect Apollo shallow and its biota; habitat types: underwater sandy shoals (1110) and reefs (1170); species: long-tailed duck (*Clangula hyemalis*), little gull (*Larus minutus*), black grouse (*Melanitta nigra)* and woodpecker (*Somateria mollissima)*.	The plan envisages the wind energy development areas to be more than 100 km and these will not endanger the Apollo shallow or its conservation values.
Uhtju Nature Reserve (KLO1000017)	The conservation objective is to protect marine and coastal habitats, important staging and nesting sites for birds and protected species: habitat types reefs (1170) and small islands and islets (1620); species: ringed seal (*Phoca hispida*) and gray seal (*Halichoerus grypus*); razorbill (*Alca torda*).	The plan envisages the wind energy development areas to be more than 200 km away and Uhtju Nature Reserve will not be affected.
Kura kurgu Conservation Area (KLO2000316)	The conservation objective is to protect marine and coastal habitats: reefs (1170), primary embankments with annual vegetation (1210), coastal meadows (1630 *), small islands and islets (1620), sandy beaches with permanent vegetation (1640), gray dunes (2130 *), blue pearl communities (6410) and species: gray seal (*Halichoerus grypus*). Bird species whose habitats are protected are: red-throated diver (*Gavia stellata*), diver (*Gavia arctica*), cormorant (*Phalacrocorax carbo*), mute swan (*Cygnus olor*), small swan (*Cygnus columbianus bewickii*), gray goose (*Anser anser*), white-cheeled eagle (*Branta leucopsis*), blackbird (*Branta bernicla*), wigeon (*Anas penelope*), common teal (*Anas crecca*), mallard (*Anas platyrhynchos*), pintail (*Anas acuta*), Northern shoveler (*Anas clypeata*), gadwall (*Anas strepera*), greater scaup (*Aythya marila*), common eider (*Somateria	The wind energy development areas 1 and 2 envisaged in the plan are adjacent to the Conservation Area. The location of wind areas has taken into account both the location of bird protection areas and the location of sensitive sea areas for birds / migratory birds, which is the main option for minimizing impacts at the strategic level. Kura kurgu Conservation Area as an important stopping place / migration area for birds will be preserved and the most important flight corridors to the Conservation Area will be preserved. The mitigation measures set out in the impact assessment report and the implementation of the conditions and guidelines set in the planning solution have adverse effects on the Conservation Area of Kura kurk. When developing wind energy development areas, the potential environmental impacts of the location and/or technical solutions proposed in the project solution should be further considered and assessed in the authorization process, including the

Natural object protected or planned to be protected	Conservation objective	Impact assessment
	mollissima), long-tailed duck (*Clangula hyemalis*), velvet scoter (*Melanitta fusca*), common goldeneye (*Bucephala clangula*), lesser kestrel (*Mergus albellus*), red-breasted merganser (*Mergus serrator*), common merganser (*Mergus merganser*), pied avocet (*Recurvirostra avosetta*), common ringed plover (*Charadrius hiaticula*), grey plover (*Pluvialis squatarola*), red knot (*Calidris canutus*), little stint (*Calidris minuta*), alpina (*Calidris alpina*), bar-tailed godwit (*Limosa lapponica*), spotted redshank (*Tringa erythropus*), ruddy turnstone (*Arenaria interpres*), razorbill (*Alca torda*) and black guillemot (*Cepphus grylle*).	effects on the birds of the Conservation Area. The maritime spatial plan foresees possible submarine cable locations that will also pass through the Conservation Area. The selection of the location of the cables avoids passing through the habitats to be protected. According to the data of the current conservation management plan of 2017-2026 of Kura kurgu Conservation Area, Vesitükimaa Conservation Area, Vesitükimaa islets and Vesitükimaa permanent habitat of gray seal, the planned cable corridors do not pass the habitat types of the area, including the only marine habitat, reefs and these will remain as they are. The potential disruptive effects of the proposed cables on the gray seal are expected to be temporary and not significantly different from the usual shipping disruption. Adverse effects on the gray seal are not expected. In case of specific development projects, the locations of the cable corridors may change and their impact will need to be assessed in the context of the authorization procedure, together with the design of the wind farms. At the level of authorization, suitable locations, technologies, etc. of the cables should be found that do not have an adverse effect on the protected natural objects.
Krassi Nature Reserve (proposed)	The proposal to establish the protected area (for the extension of the existing Krassi Conservation Area and establishment of Nature Reserve) was made in 2010 with the aim of ensuring the integrity of Krassi marine area in the Gulf of Finland and the preservation of habitats.	The plan envisages wind energy development areas to be more than 140 km away and the planned Krassi Nature Reserve will not be affected.
Kõpu Marine Reserve (proposed)	The proposal to establish the protected area was made in 2012 with the aim of preserving the unique ecosystem of the Kõpu coastal sea, which is an important bottleneck for birds on the eastern Atlantic migration route.	The plan envisages wind energy development areas to be more than 140 km away and the planned Kõpu marine reserve will not be affected.
Laidevahe Nature Reserve (PLO1001325,	The protected area will be extended, in particular, to the Conservation Area adjacent to the protected area and and to a	The wind energy development area no. 1 planned by the plan is located

Natural object protected or planned to be protected	Conservation objective	Impact assessment
proposed extension of the protected area)	small extent outside the sea. Conservation objectives are still related to, among other things, bird protection.	approximately 25 km south of the proposed Nature Reserve in Laidevahe. When developing the wind energy development area, the possibility that the Nature Reserve is expanding should be taken into account, and it is necessary to proceed from the protection regime of the area in force at a particular time. It is necessary to specify the environmental impacts of the location and/or technical solutions proposed in the project solution in the process of the authorization procedure and, if necessary, to develop the mitigation measures.
Neugrund Nature Reserve (PLO1000854, proposed nature reserve)	The proposal to establish the protected area was made in 2010 primarily with the aim of protecting the Neugrund underwater crater, bird staging areas and marine habitat types.	The plan envisages the wind energy development areas to be more than 140 km away and the proposed Neugrund Nature Reserve will not be affected.
Paljassaare Nature Reserve (proposed)	The proposal to establish the protected area (expansion of the existing Paljassaare Conservation Area and establishment of a Nature Reserve) was made in 2009 primarily with the aim of protecting birds and marine habitats.	The plan envisages the wind energy development areas to be more than 150 km away and the proposed Paljassaare Nature Reserve will not be affected.
Mustjõe Beach Landscape Protection Area (proposed)	The proposal to establish the protected area was made in 2012 with the aim of ensuring the favourable status of protected animal species and habitat types, preserving the stands of the historic manor park and ponds of the spa and ensuring the preservation of the migration corridor.	The plan envisages the wind energy development areas to be more than 160 km away and the proposed Landscape Protection Area will not be affected.
Vilsandi National park (proposed extension of the protected area)	The proposal to expand the national park was made in 2012 with the aim of preserving the integrity of the offshore shallows in the west of Saaremaa and ensuring the integrity of the habitat of the area's marine life and birds.	The plan envisages the wind energy development area no. 2 adjacent to the area of the planned extension of the national park. When developing the wind energy development area, the possibility that the National Park is expanding should be taken into account, and it is necessary to proceed from the protection regime of the area in force at a particular time. It is necessary to specify the environmental impacts of the location and/or technical solutions proposed in the project solution in the process of the authorization procedure and, if necessary, to develop mitigation measures.

With regard to aquaculture, the plan gives priority to the balanced development of the sector in naturally suitable places. In terms of environmental impact aquaculture clearly distinguishes between the environmental impacts of the classic (fish farming) and innovative (algae and shellfish farming) aquaculture sectors, which are also the basis for targeting marine use as to the protected areas. The main impacts of fish farms on the marine environment, given the so-called known technology (as the worst technological scenario), are the release of nutrients and favouring of eutrophication, which results in the disturbance of the natural balance and, in the worst case, the destruction of biota and habitats close to farming.

The impact of the fish farm can be mitigated by the selection of appropriate location, technology (nutrient neutral), scale and intensity of farming (described in more detail in Chapter 4.1.5). Based on the precautionary principle, maritime spatial planning directs the establishment of fish farms outside the protected natural areas, as well as to deeper and more open marine areas, where nutrients are better dispersed and the impacts on the conservation values and the environment have been minimized.

One area (currently known as Kolgi shallow marine reserve) has been proposed as a possible new nature reserve in the EEZ, currently overlapping with wind energy development area no. 2 in this plan. The proposal for the establishment of the protected area also includes the description of the restrictions proposed for the protection, which stipulates that the following should be restricted in the protected area: construction (all renewable energy installations: wind and gravity-based foundations for wind turbines, high voltage DC and AC cables; communication cables); extraction of mineral resources; dredging and dumping; fishing with gear that damages the seabed; any disturbance to the seabed. **The description of the restrictions finally proposed for protection will become clear during the process of establishing protected areas, which will take place beyond the maritime spatial planning process**.

The proposals for the establishment of two marine reserves in EEZ have been made and are being processed. Therefore, it would be reasonable to refrain from describing the proposed restrictions on the protected area due to the economic exploitation of these areas until the end of the respective procedures.

In the degree of accuracy of the maritime spatial plan, the potential for adverse effects on protected natural objects have been minimized. When implementing activities under the licensing process, it is possible to specify the impact and, if necessary, to apply environmental measures.

ENVIRONMENTAL MEASURES:

1. The two areas have been proposed in the EEZ as potential new nature reserves. The proposals for the establishment of two marine reserves in EEZ have been made and are being processed. Therefore, it would be reasonable to refrain from describing the proposed restrictions on the protected area due to the economic exploitation of these areas until the end of the respective procedures.

2. The development of the wind energy development area should take into account the possibility that Laidevahe Nature Reserve or Vilsandi National Park will expand and it is necessary to follow the protection regime of the area in force at a particular time. It is necessary to specify the environmental impacts of the location and/or technical solutions proposed in the project solution in the process of the authorization procedure and, if necessary, to develop mitigation measures.
3. The more specific impacts of wind energy development areas should be addressed in the subsequent stages of wind energy development in the framework of specific projects, once the exact location, volume, technology, etc. of the proposed activity has been determined and mitigation measures (including necessary buffer zones) have been implemented, if necessary.
4. In case of specific development projects the locations of the cable corridors may change and their impact should be assessed in the context of the authorization procedure, together with the design of the wind farms. At the level of authorization suitable locations, technologies, etc. of the cables should be found that do not have an adverse effect on the protected natural objects.

PROPOSALS FOR THE ACTION PLAN:

1. The effectiveness of existing protected areas and measures in the marine area has not been evaluated, and the coherence of the network has not been evaluated or taken into account. This would require a comprehensive analysis of a separate marine area under the leadership of those responsible for nature reserves and Natura 2000 network sites, i.e. the Ministry of the Environment and Environmental Board.

4.2.7 Affect on terrain

The impact on the landscape can be assessed both through human perception (so-called social impact caused by visual change, see Chapter 4.4.1.6) and as an impact on the natural environment.

The following chapter focuses on the landscape in a natural geographical view. Landscape as an ecological phenomenon, a geosystem, has developed in the interrelationships of natural parts (seabed, water system, vegetation). The landscape in this approach is the natural geographical basis for many components of the natural environment. Landscapes, in turn, are based on landforms with their own matter. Landscapes are characterized by their constant change, both by themselves and by human influence. Until now, the majority of scientific literature on landscapes and also practice has focused on terrestrial landscapes. One of the basic works of Estonian natural geography, I.Arold's "Estonian landscapes" (UT Publishing House 2005), also focuses on terrestrial landscapes.

Marine landscape ecology is a young discipline, where the first serious scientific review of the application of research methods and concepts was published only in 2017. Marine landscape ecology is based on the principles known from landscape ecology, exploring places and locations, their composition, configuration and relationships that correlate with the region's ecosystems and biodiversity. The focus is on the links between ecological processes and spatial patterns in marine environments. At the same time marine landscapes may not only denote the physical geography of the underwater landscape, but also describe the change in the chemical composition of the water column. These so-called chemical landscapes play an important role in the ecology of pelagic organisms. Most of the ecology of marine landscapes sees the sea as a mosaic of places that offer different habitats[95].

The important topics of landscape ecology are the coherence and fragmentation of landscapes, boundary dynamics, as well as connections with resource management[96]. These issues are also transferable to the ecology of marine landscapes. However, there are also views that, as the dynamics and characteristics of marine areas differ so much from those of terrestrial landscapes, analogues with the ecology of terrestrial landscapes should be avoided.

Until now, the prevailing understanding is that although the marine environment can be considered more homogeneous in terms of landscape, it is also characterized by the gaps or unevenness of marine landscapes in environmental conditions, both in time and space. The gaps are affected by both internal and external factors, i.e. marine landscapes change as a result of both natural processes and human impact, and it is often very difficult to make a clear distinction between the causes of change. Minimizing the potential fragmentation of marine landscapes, "preserving blue corridors", will help to ensure the sustainability of habitats and biota.

Impact of the MSP

The landscape as a geosystem is formed by the interconnections of parts of nature and is also a component that affects them. All parts of the natural environment in interaction mentioned in Chapters 4.1 and 4.2 of this report are therefore ecologically relevant to the landscape. Fundamental changes and significant adverse effects on a natural component can also affect landscapes. The most significant influencing factors may be the uses of the sea, the formation or intensification of which is provided for in the planning solution, and which may also affect the landforms during which the physical intervention in the seabed environment takes place.

In particular, the potential influencing factor is the offshore wind farms that the maritime spatial plan envisages. Extraction and dumping of mineral resources and infrastructure on the seabed may also have an impact. From an ecological point of view, an important issue is coherence, avoiding fragmentation and isolation in the areas sensitive to biota.

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[95] Wu, J (2017) Seascape ecology and landscape ecology:Distinct, related and synergistic in Pittman, SJ. Seascape Ecology.
[96] Wiens and Moss (2005) in Pittman, SJ. Seascape Ecology.

In the course of the impact assessment of the maritime spatial plans of the neighbouring countries, the impact of the planning solution on the marine landscapes has not been dealt with in the natural geographical sense. In the scientific literature the ecological perspective of marine landscapes has become a more active research area during recent years, especially through the issue of biota and habitats (see Chapter 4.2.5). The rapidly developing technological capability for the study of the marine environment suggests that in the near future it will be possible to better distinguish the role of various impact factors and provide more accurate assessments of the planned activities.

The Estonian maritime spatial planning solution has been developed by taking the natural components and the impact on them into account throughout. Additional conditions have been set for the protection of biota, which, for example, provide instructions for the extraction and dumping of mineral resources to avoid shallow sea areas, fish spawning grounds, protected natural objects as the location. The areas suitable for the development of wind energy have been selected to avoid spatial overlaps with natural values. The areas sensitive to birds and important migration corridors for birds and bats, as well as marine patterns and key habitats for ringed and gray seals, have been taken into account.

The impact on fish has been analyzed, by setting additional conditions and the obligation to carry out research at the level of the superficies licence in order to ensure the conservation of fish stocks and to avoid the blocking of fish migration. In this way the principle of preserving sensitive areas, which can also be considered as 'blue corridors', has been applied, which can also be expressed in the importance of landscape coherence.

The assessment of the impacts on the various natural components provided in Chapters 4.1 and 4.2 of this report concludes that the implementation of the Maritime spatial Plan does not anticipate the occurrence of significant adverse effects by implementing the envisaged environmental measures and recommendations at the authorization level. Due to the above the impact of the implementation of the plan on the landscapes cannot be significant either. The impacts may occur in the interaction of different natural components, but as the predominant use of different marine uses is already in place, the implementation of the plan is not expected to result in significant adverse effects. Landscapes, including seascapes, are constantly changing, which is why it is important to follow the action plan for implementation of the plan, marine strategy and other monitoring measures that will be set with the strategic development documents and the ones already functioning.

4.3 EVALUATION OF NATURA 2000

In addition to the nationally protected natural objects, the planned area includes, in whole or in part, marine Natura 2000 sites. Natura 2000 is a Europe-wide network of protected areas which aims to ensure the conservation of rare or endangered birds, animals and plants and their habitats, or to restore, if necessary, the favorable status of threatened species and habitats across Europe. Natura 2000 sites of community importance and special protection areas have been designated pursuant to Council of Europe Directives 92/43 / EEC and 2009/147/EC. Possible direct and indirect impact on Natura sites have to be taken into account when planning activities with the plans.

The assessment of Natura is a process carried out in accordance with Article 6 (3) and (4) of the Habitats Directive 92/43/EEC. The assessment outlined in this work will be based on the following guidance documents:

- „ Evaluation of plans and projects that have a significant impact on Natura 2000 sites. Methodological guidance for the interpretation of Article 6 (3) and (4) of the Habitats Directive“[97];
- Kutsar, R.; Eschbaum, K. and Aunapuu, A. 2019. Guidelines for carrying out Natura assessment in the implementation of Article 6 (3) of the Habitats Directive in Estonia. (Environmental Board, 2020) [98];
- „*Wind energy developments and Natura 2000*“ (European Union, 2011)[99];
- *The Wildlife Sensitivity Mapping Manual. Practical guidance for renewable energy planning in the European Union* (European Union, 2020)[100].

The Natura assessment begins with the Natura pre-assessment phase, which aims to identify and determine the potential impact of a project or plan on a Natura 2000 site and to assess whether it is possible to objectively conclude that potential adverse impacts are excluded**. As Maritime Spatial Plan provides already for one of the new uses of the marine area for the development of wind energy, the likely impact on Natura 2000 sites is expected, and an appropriate assessment of Natura has been carried out.** In the case of plans with a higher level of generalization (as is the case with maritime spatial planning), Natura assessments will be carried out with the required level of precision, having regard to the degree of accuracy of the strategic planning document, which should allow identification of

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97 https://envir.ee/media/1376/download

98 Kutsar, R.; Eschbaum, K. ja Aunapuu, A. 2019. Guidelines for carrying out Natura assessment in the implementation of Article 6 (3) of the Habitats Directive in Estonia. Client: Environmental Board. https://envir.ee/media/1353/download

99 https://op.europa.eu/en/publication-detail/-/publication/65364c77-b5b8-4ab6-919d-8f4e3c6eb5c2

100 *THE WILDLIFE SENSITIVITY MAPPING MANUAL. Practical guidance for renewable energy planning in the European Union*; https://circabc.europa.eu/sd/a/6a1d06ae-ef34-478a-a322-006b09079efb/20200429%20WSM%20Manual.pdf

sensitive/threatened areas and conflicts/risks that need to be considered in future planning stages[101,102].

In the following, the impact of the Estonian MSP solution on the Natura 2000 network areas will be assessed according to the level of accuracy of the Maritime Spatial Plan.

- **Information on the planned activity**

The implementation of the Estonian maritime spatial plan and the uses of the maritime space covered in the plan based on their spatial location, established guidelines and conditions are considered as the planned activities in this assessment. The explanatory memorandum of the plan provides an accurate overview of the planned activities.

- **Characterization of the Natura sites affected by the proposed activity**

The total area of Natura 2000 network areas in the Estonian marine area is 6787 km², which is 18.6% of the total marine area. Eighty-seven sites of community importance and 27 special protection areas overlap with the Estonian marine area to a greater or lesser extent. However, 31 of these sites of community importance and 21 special protection areas have conservation objectives directly related to the marine environment, as well as overlapping with the Estonian maritime spatial planning area. Figure 4.3-1 illustrates the location of the Natura special protection areas in the proposed marine area, and an overview of the areas is provided in Table 4.3-1. The table lists the areas of Natura sites that are within the planning area and lists marine habitats/species for conservation purposes.

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[101] Kutsar, R.; Eschbaum, K. ja Aunapuu, A. 2019. Guidelines for carrying out Natura evaluation in the implementation of Article 6 (3) of the Habitats Directive in Estonia. Client: Environmental Board. https://www.envir.ee/sites/default/files/KKO/KMH/kemu_natura_hindamise_juhendi_uuendus_2020.pdf

[102] https://www.gov.si/assets/ministrstva/MOP/Dokumenti/CPVO/Usposabljanje/7nov19_assessment_off_plans.pdf

Figure 4.3-1 Location of Natura 2000 sites

Tabel 4.3-1 Natura 2000 network Special Protection Areas (LoA) and Site of Community Importance (LiA) are fully or partially covered by the Estonian maritime spatial plan territory

Name and Code	Area in the sea (km²)	Purpose fo protection[103]
Allirahu Site of Community Importance EE0040402	20	Marine habitat types (1 pc): reefs (1170). Marine species (1 pc): Gray seal. *+ 1 coastal and land-based habitat type.*
Gretagrundi Site of Community Importance EE0040500	147	Marine habitat types (2): sandbanks (1110) and reefs (1170).
Kahtla-Kübassaare Site of Community Importance EE0040412	103	Marine habitat types (5): sandbanks (1110), sandy and muddy foreshore (1140), coastal lagoons (*1150), wide shallow bays (1160), reefs (1170) *+ 15 coastal and land-based habitat types.*
Kahtla-Kübassaare Special Protection Area EE0040412	103	39 bird species.
Karala-Pilguse Site of Community Importance EE0040414	14	Marine habitat types (1 pc): coastal lagoons (1150). *+ 17 coastal and land-based habitat types and 1 species.*

[103] List of Natura 2000 sites to be submitted to the European Commission in accordance with the order (https://www.riigiteataja.ee/akt/304042017006?leiaKehtiv)

Name and Code	Area in the sea (km²)	Purpose fo protection[103]
Karala-Pilguse Special Protection Area EE0040414	14	11 bird species.
Kasti Bay Site of Community Importance EE0040418	27	Marine habitat types (5 pcs): sandbanks (1110), sandy and muddy foreshore (1140), coastal lagoons (*1150), wide shallow bays (1160), reefs (1170) *+ 10 coastal and land-based habitat types.*
Kasti Bay Special Protection Area EE0040418	27	8 bird species.
Kaugatoma-Lõu Site of Community Importance EE0040441	43	Marine habitat types (4 pcs): sandy and muddy foreshores (1140), wide shallow bays (1160), reefs (1170) *+ 13 coastal and land-based habitat types and 1 species.*
Kaugatoma-Lõu Bay Special Protection Area EE0040441	43	15 bird species.
Kaunispe Site of Community Importance EE0040420	0.02	Marine habitat types (1 pc): coastal lagoons (*1150). *+ 7 coastal and land-based habitat types.*
Kerju Site of Community Importance EE0040421	0.7	Marine species (1 pc): Gray seal. *+ 1 coastal and land-based habitat type.*
Kolga Bay Site of Community Importance EE0010171	22	Marine habitat types (3 pcs): underwater sandbanks (1110), coastal lagoons (*1150), reefs (1170). Marine species (1 pc): Gray seal. *+ 11 coastal and land-based habitat types.*
Kolga Bay Special Protection Area EE0010171	22	14 bird species.
Koorunõmme Site of Community Importance EE0040428	21	*+ 16 coastal and land-based habitat types and 2 species.*
Koorunõmme Special Protection Area EE0040428	21	3 bird species.
Krassi Site of Community Importance EE0010154	0.8	Marine habitat types (1 pc): reefs (1170). Marine species (1 pc): Gray seal. *+ 1 coastal and land-based habitat type.*
Irben Strait Special Protection Area EE0040434	1916	38 bird species.
Küdema Bay Site of Community Importance EE0040432	40	Marine habitat types (4 pcs): underwater sandbanks (1110), coastal lagoons (*1150), wide shallow bays (1160), reefs (1170). Marine species (1 pc): river lamprey. *+ 15 coastal and land-based habitat types and 3 species.*
Küdema Bay Special Protection Area EE0040432	40	12 bird species.
Lahemaa Site of Community Importance EE0010173	269	Marine habitat types (5): underwater sandbanks (1110), sandy and muddy foreshores (1140), coastal lagoons (* 1150), wide shallow bays (1160), reefs (1170). Marine species (4 pcs): spined loach, European bullhead, river lamprey, salmon. *+ 43 coastal and land-based habitat types and 8 species.*

Name and Code	Area in the sea (km²)	Purpose fo protection[103]
Lahemaa Special Protection Area EE0010173	269	65 bird species.
Laulasmaa Site of Community Importance EE0010122	0.02	Marine habitat types (1 pc): coastal lagoons (1150). *+ 6 coastal and land-based habitat types and 1 species.*
Letipea Site of Community Importance EE0060231	5	Marine habitat types (5 pcs): underwater sandbanks (1110), sandy and muddy foreshores (1140), wide shallow bays (1160). *+ 4 coastal and land-based habitat types.*
Mullutu-Loode Site of Community Importance EE0040443	0.1	Marine habitat types (1 pc): coastal lagoons (1150). *+ 14 coastal and land-based habitat types and 3 species.*
Mullutu-Loode Special Protection Area EE0040444	7.4	34 bird species.
Nõva-Osmussaare Site of Community Importance EE0040201	219	Marine habitat types (5): underwater sandbanks (1110), sandy and muddy foreshores (1140), coastal lagoons (* 1150), wide shallow bays (1160), reefs (1170). Marine species (2 pcs): European bullhead, river lamprey *+ 28 coastal and land-based habitat types and 2 species.*
Nõva-Osmussaare Special Protection Area EE0040201	219	17 bird species.
Pakri Site of Community Importance EE0010129	173	Marine habitat types (5 pcs): underwater sandbanks (1110), river estuaries (1130), coastal lagoons (*1150), wide shallow bays (1160), reefs (1170). *+ 17 coastal and land-based habitat types and 5 species.*
Pakri Special Protection Area EE0010129	173	18 bird species.
Paljassaare Special Protection Area EE0010170	1.4	44 bird species.
Pammana Site of Community Importance EE0040452	9	Marine habitat types (1 pc): coastal lagoons (1150). *+ 10 coastal and land-based habitat types.*
Prangli Site of Community Importance EE0010126	9	Marine habitat types (2 pc): coastal lagoons (*1150) and reefs (1170). *+ 11 coastal and land-based habitat types.*
Riksu Site of Community Importance EE0040461	17	Marine habitat types (1 pc): coastal lagoons (1150). *+ 11 coastal and land-based habitat types.*
Riksu Coast Special Protection Area EE0040461	17	8 bird species.
Ruhnu Nature Conservation Area EE0040462	0.9	Marine habitat types (1 pc): wide shallow bays (1160). *+ 14 coastal and land-based habitat types.*

Name and Code	Area in the sea (km²)	Purpose fo protection[103]
Siiksaare-Oessaare Site of Community Importance EE0040469	18	Marine habitat types (5): underwater sandbanks (1110), sandy and muddy foreshores (1140), coastal lagoons (* 1150), wide shallow bays (1160), reefs (1170). *+ 14 coastal and land-based habitat types.*
Siiksaare-Oessaare bays Special Protection Area EE0040469	18	41 bird species.
Sutu Bay Site of Community Importance EE0040472	17	Marine habitat types (3pcs): sandy and muddy foreshores (1140), coastal lagoons (*1150), wide shallow bays (1160) *+ 10 coastal and land-based habitat types.*
Sutu Bay Special Protection Area EE0040472	17	9 bird species.
Suurupi Site of Community Importance EE0010140	0.1	*+ 12 coastal and land-based habitat types and 2 species.*
Tagamõisa Site of Community Importance EE0040476	85	Marine habitat types (2 pcs): coastal lagoons (*1150), reefs (1170). Marine species (1 pc): Gray seal. *+ 25 coastal and land-based habitat types and 3 species.*
Tagamõisa Special Protection Area EE0040476	85	20 bird species.
Toolse Site of Community Importance EE0060271	3	Marine habitat types (2 pcs): underwater sandbanks (1110), wide shallow bays (1160). Marine species (1 pc): river lamprey. *+ 5 coastal and land-based habitat types and 1 species.*
Toolse Special Protection Area EE0060271	3	6 bird species.
Uhtju Site of Community Importance EE0060220	24	Marine habitat types (1 pc): reefs (1170). Marine species (2 pcs): Gray seal, ringed seal. *+ 1 coastal and land-based habitat type.*
Vaindloo Special Protection Area EE0060270	0.7	6 bird species.
Vesitükimaa Site of Community Importance EE0040490	8	Marine habitat types (1 pc): reefs (1170). Marine species (1 pc): Gray seal. *+ 11 coastal and land-based habitat types and 1 species.*
Vilsandi Site of Community Importance EE0040496	123	Marine habitat types (4): underwater sandbanks (1110), sandy and muddy foreshores (1140), coastal lagoons (*1150), wide shallow bays (1160). Marine species (2 pc): Gray seal, river lamprey. *+ 14 coastal and land-based habitat types and 4 species.*
Vilsandi Special Protection Area EE0040496	123	13 bird species.
Väike Site of Community Importance EE0040486	140	Marine habitat types (3 pcs): underwater sandbanks (1110), coastal lagoons (*1150), wide shallow bays (1160). Marine species (1 pc): ringed seal. *+ 15 coastal and land-based habitat types and 3 species.*

Name and Code	Area in the sea (km²)	Purpose fo protection[103]
Väinameri Site of Community Importance EE0040002	2106	Marine habitat types (6 pcs): underwater sandbanks (1110), river estuaries (1130), sandy and muddy foreshores (1140), coastal lagoons (*1150), wide shallow bays (1160), reefs (1170). Marine species (6 pcs): Gray seal, ringed seal, spined loach, European bullhead, river lamprey, European weatherfish. *+ 32 coastal and land-based habitat types and 17 species.*
Väinameri Special Protection Area EE0040001	2255	76 bird species.

- **The relevance of the proposed activity to the management of protection**

The proposed activities in the Maritime Spatial Plan are neither related nor necessary to the management of any Natura 2000 site and do not contribute directly or indirectly to the conservation objectives of the sites.

- **Assessment of likely adverse impacts on the integrity of Natura sites and achievement of conservation objectives and design of mitigation measures**

The spatial solution of the plan and the guidelines and conditions set out in the Plan are the basis for the prediction of the impact of the uses of the sea on the Natura 2000 network.

The principle of not targeting marine uses to Natura 2000 sites have been applied in the development of the Maritime Spatial Plan. For many uses (fisheries, aquaculture, maritime transport, maritime rescue, pollution control, border control, seabed infrastructure, maritime tourism and recreation, nature conservation, marine culture, national defense, mineral resources and dumping), the Maritime Spatial Plan does not foresee significant **spatial changes** and sets out the conditions and guidelines for the next steps of the proposed action. Targeting activities outside Natura 2000 sites will help prevent potential direct impact (e.g., physical alteration or destruction of habitats, etc.) onsite conservation objectives. The table below gives an estimate of the impact of the implementation of the Maritime Spatial Plan by activity.

Table 4.3-2 Forecast of the impact of the planned activities on Natura 2000 sites

The use of the marine area	Content designed by the plan	Appropriate assessment of Natura	Design of mitigation measures and recommendations for next steps
Aquaculture (fish farming; algae and shellfish farming)	The Maritime Spatial Plan does not designate spatial areas suitable for fish farming and algae and shellfish farming, as the technology of offshore fish farms and algae and shellfish farming is still in the development stage and therefore, the designation of suitable spatial areas may unduly restrict the development of a blue economy that respects environmental conditions. The establishment of fish farms and algae and shellfish farms in unsuitable areas determined by the planning solution must be avoided. The development of fish farms and algae and shellfish farming is guided through guidelines and conditions. One of the conditions set out in the plan is that the impacts associated with the establishment of a fish farm should be an acceptable burden for the state of the marine environment, and environmental measures should be implemented if necessary.	In terms of environmental impact, aquaculture clearly distinguishes between the environmental impacts of the classical (fish farming) and innovative (algae and shellfish farming) aquaculture sectors, which are also the basis for directing the use of marine areas regarding protected areas, including the Natura special protection areas. The main impacts of fish farms on the marine environment are the release of nutrients and the promotion of eutrophication, which can lead to changes in the natural balance. At the same time, shellfish and algae farming can remove nutrients from the marine environment and their impact is rather to reduce the level of eutrophication. The impact of the farm can be mitigated through appropriate site selection. The Maritime Spatial Plan directs the establishment of fish farms outside protected natural areas, including Natura 2000 network areas, as well as into deeper and more open sea areas, where nutrients are better dispersed and impacts on conservation values and the environment are minimal - therefore, the so-called unsuitable areas for fish farming have been designated. In the level of precision of the Maritime Spatial Plan, the chances of adverse impacts on the Natura special protection areas and their protection objectives have been minimized through the conditions and guidelines set for the implementation of the Plan. When implementing activities within the licensing process, it is necessary to specify the impacts and, if necessary, to implement environmental measures.	In the case of planning for fish farms and/or algae and shellfish farming, the environmental impacts of the location and/or technical solutions proposed in the project solution must be specified in the licensing process and a Natura assessment must be carried out if necessary. Adverse impact on the conservation objectives of the Natura 2000 site must be ruled out during the implementation of the proposed activity and as a result of the Natura assessment (and through the implementation of the mitigation measures proposed therein).
Maritime transport	The Maritime Spatial Plan reflects the fairways published in the navigation information and determines the water traffic areas on the basis of the main ship traffic directions and the current traffic density.	As the implementation of the Plan does not change the existing situation, no impact on Natura sites is expected during the implementation of the Plan.	-

The use of the marine area	Content designed by the plan	Appropriate assessment of Natura	Design of mitigation measures and recommendations for next steps
Maritime rescue, pollution control, state border guarding	The plan does not envisage any changes.	The plan does not envisage any changes in these areas and therefore the implementation of the plan is not expected to have an impact on Natura sites.	-
Energy production (wind energy, including cable connections)	The Plan identifies areas suitable for the development of wind energy, which, among other things, take into account the areas of the Natura 2000 network: wind energy development areas are directed outside Natura special protection areas and sites of community importance. The Plan also determines conceptual locations of the cable corridors for the connection of the planned wind farms to the onshore transmission network, which will be directed outside the Natura 2000 network areas if possible. Natura assessments have been carried out in the marine area for the conceptual locations of the cable corridors. The Plan determines the conditions necessary for the establishment of connections on the land.	The exclusion of spatial overlaps of areas suitable for the development of wind energy with Natura sites excludes any direct impact on the conservation objectives of Natura sites (see Figure 4.3-2). When planning a wind farm near a Natura site, temporary/indirect impacts may also occur in some cases, e.g., temporary impacts on nature species/habitats during construction (suspended solids, disturbance) The temporary impacts can be mitigated, if necessary, by clarifying the exact details of the activity within the project solution. The maritime spatial plan provides for the development of wind energy outside the Site of Community Importance of the Natura 2000 network and thus eliminates adverse effects within the areas. However, the mobile lifestyle of birds (e.g. migration) should also be taken into account, so that adverse effects (obstacles/deaths on migration, etc.) on Site of Community Importance, their coherence and birds may in some cases occur in wind turbines planned outside Natura sites. At the level of strategic planning, in the process of selecting suitable areas for the development of wind energy, the main option for minimizing the impact on birds and excluding significant adverse effects is the selection of location - the development of wind energy is favoured in areas of low ornithological value, which helps to minimize the cumulative effects on birds and maintain the coherence of Natura 2000 sites. As a result, an analysis of bird staging areas and migration routes was carried out in the Maritime spatial Planning process (see Chapter 4.2.2 for more details), the results of which indicate that the planned wind energy development areas 1, 2 and the innovation area are located outside the sea	The planning solution has been adjusted in accordance with the recommendations of the impact assessment report, including the circumstances set out in the Natura assessment, as follows: 1) In the planning process the planning of wind energy development area no. 3 has been abandoned , including for nature conservation reasons. 2) According to the proposals for the relocation of the submarine cable corridor, the impact on the conservation objectives of Natura 2000 Special Protection Areas and Sites of Community Importance is excluded (see Figure 4.3-5). 3) The measures proposed as a result of the Natura assessment as additional conditions/ guidelines in the explanatory memorandum to the planning solution to reduce the impact on birds. When developing the wind energy development areas, the environmental impacts associated with the location and / or technical solutions proposed in the project solution in the process of authorization procedure should be

The use of the marine area	Content designed by the plan	Appropriate assessment of Natura	Design of mitigation measures and recommendations for next steps
		areas sensitive to birds (i.e. which, according to current knowledge, are the most important areas for birds stopping on the high seas and / or flying over the sea). The wind energy development area no. 3 (2019 planning solution in the northwest of Saaremaa) was partly overlapping with the Special Protection Area of Hülgerahu, which is particularly important as a spring and winter staging site for waterfowl (it is important to ensure that migration is possible in order to ensure the coherence of the Natura network). In the planning process, the planning of wind energy development area no. 3 has been abandoned, for reasons such as nature conservation. The first basic cable connections in the offshore area proposed in the plan for wind farms (as of 2019) are planned mostly outside the Natura network areas. However, in some cases the cables were designed to pass through Natura sites (Figure 4.3-2): • the cable corridor from the wind energy development area no. 1 to Virtsu passes through **Väinamere Site of Community Importance and the Special Protection Area** in the sea for a section of approx. 5 km; • the perspective cable corridor from the wind energy development area no. 2 to Latvia passes **Kura kurgu Special Protection Area** in a sea section of approx. 28 km; •. the cable corridor running from the wind energy development area no. 2 to the village of Jaagupi or Haapsi through Saaremaa to the coast of Pärnumaa passes **Kaugatoma-Lõu Site of Community Importance and Kaugatoma-Lõu Bay Special Protection Area** in a few hundred metres long section and **Kura kurgu Special Protection Area** in the sea in the section of about 17 km. The impact of the construction of wind farms and associated cabling has been appropriately discussed in more detail in the next subsection.	specified and, if necessary, Natura assessment should be carried out. The adverse effects on the conservation objectives of the Natura 2000 site should be ruled out during the implementation of the proposed activity and as a result of the Natura assessment (and through the implementation of the mitigation measures proposed therein). In the level of precision of the maritime spatial plan, the possibility of adverse effects on the Natura sites and their conservation objectives through the conditions and guidelines set for the implementation of the planning solution is excluded.

The use of the marine area	Content designed by the plan	Appropriate assessment of Natura	Design of mitigation measures and recommendations for next steps
Seabed infrastructure	The plan will take into account existing seabed infrastructure but will not design any new infrastructure (except for the proposed cable corridors for the connection of wind energy development areas, which will be discussed under wind energy development). Otherwise, the implementation of the plan will not entail any changes, and the status quo will be maintained.	The plan does not envisage any changes to the existing seabed infrastructure, and therefore no impact on Natura sites is expected when the plan is implemented.	In the case of seabed infrastructure, planned on the basis of the conditions and guidelines of the Plan, the impact of any planned activity must be assessed in the licensing process and adverse impacts on the conservation objectives of the Natura 2000 site must be ruled out.
Sea tourism and recreation	The plan does not determine the development areas for sea tourism and recreation. The implementation of the plan will not bring about any significant changes but will set guidelines and conditions for the development of the sector.	As the implementation of the plan will not change the existing situation, no impact on Natura sites is expected when the plan is implemented.	-
Protected natural objects	No additional protected natural objects are planned in the Maritime Spatial Plan, although two new nature reserves have been proposed in the EEZ during the preparation of the Maritime spatial Plan (for more details, see Chapter 4.2.6). The plan takes into account the existing and planned network of protected areas.	With regard to protected natural objects, the plan does not change the current situation at the moment, and therefore no impact on Natura sites is expected during the implementation of the plan. Taking into account the existing network of protected areas indirectly contributes to the protection of Natura network sites, as the protection of Natura 2000 network sites is also ensured through the protection regime of national sites.	-
Marine culture	Maritime spatial planning does not determine specific areas of marine culture due to the degree of generalization.	As the implementation of the plan will not change the existing situation, no impact on Natura sites is expected when the plan is implemented.	-
Cultural monuments	With regard to cultural monuments, the maritime spatial plan does not envisage any significant changes. As a new use, the maritime spatial plan envisages four areas for the preservation of archaeological finds (wrecks) (in the area of Tallinn Bay, near Käsmu, Abruka and Ruhnu).	Preservation areas for underwater cultural heritage have been designed outside the Natura 2000 network to avoid the potential conflict with the conservation objectives of Natura sites. At the strategic level, the potential impact on Natura 2000 sites is therefore ruled out.	In the case of preservation areas for underwater cultural heritage planned on the basis of the conditions and guidelines of the Plan, the impacts associated with the proposed activity must be assessed each time in the licensing process and adverse

The use of the marine area	Content designed by the plan	Appropriate assessment of Natura	Design of mitigation measures and recommendations for next steps
			impacts on the conservation objectives of the Natura 2000 site must be ruled out.
National defense	Maritime Spatial Plan takes into account the spatial needs of national defense, but the plan itself does not envisage changes, but sets guidelines and conditions for the development of the area.	As the implementation of the plan will not change the existing situation, no impact on Natura sites is expected when the plan is implemented.	In the case of national defense objects planned on the basis of the conditions and guidelines of the Plan, the impacts associated with the proposed activity must be assessed each time in the licensing process and adverse impacts on the conservation objectives of the Natura 2000 site must be ruled out.
Mineral resources	No new deposits are planned with the Maritime Spatial Plan, the important to ensure that existing mineral resources remain minable is pointed out.	As the implementation of the plan will not change the existing situation, no impact on Natura sites is expected when the plan is implemented. At the same time, the plan leaves room for the creation of new deposits.	When creating new deposits, preference should be given to areas outside the Natura 2000 network. In carrying out the proposed activity, the accompanying impacts must be assessed and adverse impacts on the conservation objectives of the Natura 2000 site must be ruled out.
Dumping	No new dumping areas are planned with the maritime spatial plan. Priority shall be given to the use of existing dumping areas.	As the implementation of the plan will not change the existing situation, no impact on Natura sites is expected when the plan is implemented. At the same time, the plan leaves room for the creation of new dumping areas.	When creating new dumping areas, preference should be given to areas outside the Natura 2000 network. In carrying out the proposed activity, the accompanying impacts must be assessed and adverse impacts on the conservation objectives of the Natura 2000 site must be ruled out.
Permanent Connections	The plan does not envisage any new permanent connections, and the existing situation is maintained.	As the implementation of the plan will not change the existing situation, no impact on Natura sites is expected when the plan is implemented.	In case of the permanent connection planned on the basis of the conditions and guidelines of the plan, the possible effects of the proposed activity should be assessed at the level of authorization and adverse

The use of the marine area	Content designed by the plan	Appropriate assessment of Natura	Design of mitigation measures and recommendations for next steps
			effects on the conservation objectives of the Natura 2000 site should be ruled out.

Assessment of wind energy development areas, including perspective cable connections

The areas suitable for the development of wind energy. The Maritime Spatial Plan identifies two sea areas suitable for the development of wind energy (1 and 2) and also one innovation area, the location of which also includes Natura 2000 network areas: wind energy development areas are directed outside the protected Natura Site of Community Importance and Special Protection Areas. The areas are also planned outside the sensitive areas for birds, i.e. the most important staging places and migration areas. At the level of strategic planning the selection of a suitable location for wind energy development areas therefore minimizes and eliminates the possibility of significant adverse effects on the conservation objectives of Natura 2000 Site of Community Importance. The impact assessments have been provided in Table 4.3-3 by Natura Site of Community Importance and mitigation measures are identified to rule out any possible adverse effects on the integrity and conservation values of the Natura 2000 network.

Cable connections. The maritime spatial plan determines the basic cable connections of the proposed wind farms to the marine area with mainland. These proposed cable corridors (200 m wide) indicate the possibilities for connecting wind farms and have been assessed according to the level of detail of the strategic planning document. In case of specific development projects the locations of the cable corridors may change and their impact will need to be assessed in the context of the authorization procedure, together with the design of the wind farms. The basic cable corridors in marine area in the maritime spatial planning solution are generally located in such a way that they do not pass through predominantly Natura 2000 sites, but this has not been possible in certain locations. The proposed cable corridors pass through Väinamere Site of Community Importance and Special Protection Areas, Kura kurgu Site of Community Importance, Kaugatoma-Lõu Site of Community Importance and Kaugatoma-Lõu Site of Community Importance (see Figure 4.3-2), so an appropriate Natura assessment will be carried out for the key locations of the cable corridors.

The construction of the cables is expected to have a temporary and local impact. Impacts are generally limited in time to the construction period and spatially to the seabed, its habitats, vegetation and species in a specific location. Therefore, the natural areas from whose territory the cables pass are located in the area affected by the construction of the seabed cables. The impact of cables laid on the seabed (or in the ground) on birds is not significant and adverse effects on the conservation objectives of the Natura site will be ruled out in the implementation of mitigation measures. The estimates of the impact of cable corridors by Natura Special Protection Areas and Sites of Community Importance have been provided in Table 4.3-3.

The conditions necessary for the establishment of cable connections have been determined for the mainland as a proposal for a planning solution (cable corridors may also be constructed outside principal locations if this does not have a significant environmental impact). One of the conditions is that the adverse effects of the construction and operation of both the overhead line and underground cable on the conservation objectives of the Natura 2000 site should be ruled out by finding a suitable location and technical solution. The maps show the main locations outside the current planning area and the direct connection to the possible network connection points. The maritime spatial plan also points out that it is expedient for local governments to consider including in the comprehensive plan a condition that infrastructure facilities related to offshore activities (e.g. cable connections of wind farms) be planned in sensitive areas on land, if necessary, through public planning and design processes.

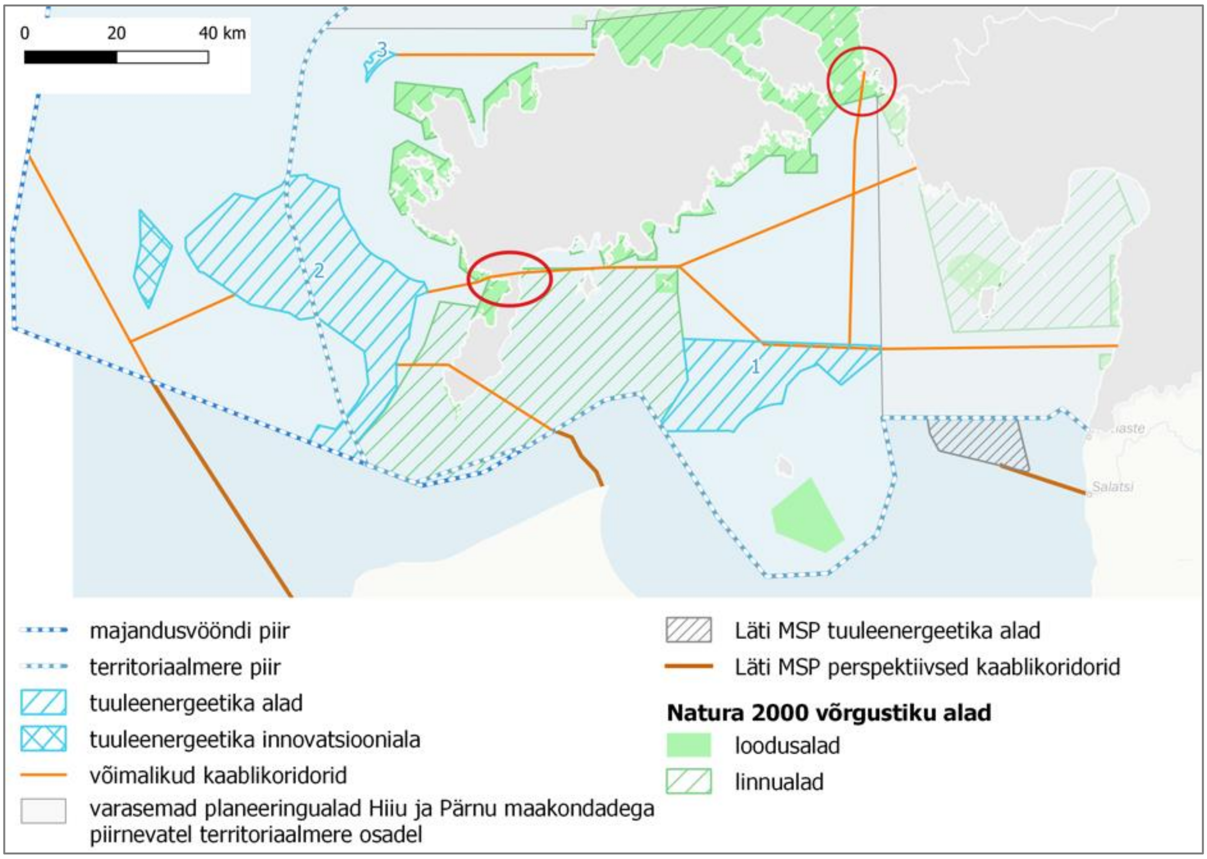

Figure 4.3-2 Natura 2000 network and planned wind energy development areas with possible proposed cable connections (red circles indicate the locations where the cable passes through Special Protection Areas) (as of November 2019).

The impact of the development of wind energy and the construction of related infrastructure is assessed by Natura sites in Table 4.3-3. As the development of wind energy in the selected areas may have a larger spatial impact, the present assessment is based on the precautionary principle and the impact on the Site of Community Importance up to 30 km from the wind energy development areas has been assessed. In addition, given the impact and nature of the cable-laying, Table 4.3-3 provides a more detailed assessment of the impact on the Natura sites that potential cable corridors pass through.

Table 4.3-3 Potential adverse effects on Natura 2000 sites

Natura 2000 sites	Protection objectives	Identification of impacts	Mitigation measures	Conclusion of the Natura assessment
Karala-Pilgus Special Protection Area (EE0040414)	11 bird species	The proposed wind energy development area (no. 2) is located at a distance of approximately 10 km from the Special Protection Areaand thus there are no direct physical impacts on the conservation objectives of the area. However, the mobile lifestyle of birds (e.g. migration) should also be taken into account, so that adverse effects (obstacles / deaths during migration, etc.) on the Special Protection Area, coherence of the areas and birds may in some cases occur in case of the wind turbines planned outside Natura sites.	At the strategic level the potential impact on the conservation objectives of the Special Protection Area has been minimized and thus a significant adverse effect on the integrity of the Natura 2000 site has been ruled out with the selection of location. There is no need to change the maritime spatial plan solution. Although most birds use sensitive areas for migration and stopping, the risk of collision and the barrier effect cannot be completely ruled out (see Chapter 4.2.2 for details). The risk of collision and the barrier effect can be mitigated through the following mitigation measures: ▪ It is recommended to use large modern wind turbines (the starting point of the plan allows the use of large wind turbines). As the height of the wind turbines increases, the number of wind turbines (per area) decreases and the risk of collision (death) for most bird species decreases. ▪ To stipulate as a planning condition that the minimum permissible height of the wind turbine blade above sea level is 25 metres with the proviso that it can be specified (increased to 30 or 35 meters if necessary) on the basis of the study carried out during the authorization application procedure. The magnitude of these risks and possible mitigation measures can be specified after the following on-site studies at the authorization level: ▪ The eastern part of the area no. 1 suitable for the development of wind energy in the Gulf of Riga is located near the significant migration corridor of terrestrial birds (incl birds of prey) across the sea. At the authorization stage, to specify the actual width of the migratory flow of terrestrial birds near the eastern part of the development area in the direction of Kihnu-Ruhnu (to clarify whether the existing free area is sufficient) and clarify other necessary matters for the collision risk assessment (species flight intensity and altitudes). To this end, it is necessary to carry out a radar survey of birds covering the migration periods of at least two years in parallel with visual observations. ▪ In case of area no. 2 suitable for the development of the wind energy in the west of Saaremaa, it is necessary to specify at the authorization stage which part of all migratory terrestrial birds do	During the development of the wind energy development areas, the potential environmental impacts of the location and / or technical solutions proposed in the project solution in the authorization application process should be further considered and assessed and, if necessary, the Natura assessment should be carried out for Karala-Pilgus Special Protection Area. As a result of the Natura assessment of the proposed activity, including the mitigation measures and the implementation of the conditions and guidelines set in the planning solution, adverse effects on the Karala-Pilgus Special Protection Area of the Natura 2000 network have been ruled out.

Natura 2000 sites	Protection objectives	Identification of impacts	Mitigation measures	Conclusion of the Natura assessment
			not use the main migratory route, this means not going along the Sõrve peninsula to Säär and from there across the sea to Kuramaa, but taking the direction from the west coast of Saaremaa towards Gotland, in which case the wind energy development area may remain on the migration route. This needs to be identified at the authorization stage by a radar survey of birds covering the migration periods of at least two years, carried out in parallel with visual observations. ▪ In view of the principle of combined use set out in the maritime spatial plan, the water traffic area of vessels (currently NNW-SSE) should be specified at the authorization level, where possible, to better match the expected predominant migratory direction of birds (NNE-SSW). Birds will then be able to use the area as a migration corridor, as the width of the passageway required for shipping is calculated to be approximately 6250 m for area 2. In the wind energy development areas the possible side effects of the Natura (pre-) assessment process for Karala-Pilgus Special Protection Area should be assessed at the authorization stage.	
Kasti bay Special Protection Area (EE0040418)	8 bird species	The proposed wind energy development area (no. 1) is located more than 20 km from the Special Protection Area and therefore has no direct physical impact on the site's conservation objectives. However, the mobile lifestyle of birds (e.g. migration) should also be taken into account, so that adverse effects (obstacles / deaths during migration, etc.) on the Special Protection Area, coherence of the areas and birds may in some cases occur in case of wind turbines planned outside Natura sites.	At the strategic level the potential impact on the conservation objectives of the Special Protection Area has been minimized and thus a significant adverse effect on the integrity of the Natura 2000 site with the selection of location has been ruled out. There is no need to change the maritime spatial plan solution. Although most birds use sensitive areas for migration and stopping, the risk of collision and the barrier effect cannot be completely ruled out (see Chapter 4.2.2 for details). The risk of collision and the barrier effect can be mitigated through the following mitigation measures: ▪ It is recommended to use large modern wind turbines (the starting point of the plan allows the use of large wind turbines). As the height of the wind turbines increases, the number of wind turbines (per area) decreases and the risk of collision (death) for most bird species decreases. ▪ As a planning condition, to stipulate that the minimum permissible height of the wind turbine blade above sea level is 25 meters, with the proviso that it can be specified (increased to 30 or 35 meters if necessary) on the basis of a study carried out during the authorization application procedure.	During the development of wind energy development areas the potential environmental impacts of the location and / or technical solutions proposed in the project solution in the authorization application process should be further considered and assessed and, if necessary, the Natura assessment should be carried out for Kasti bay Special Protection Area As a result of the Natura assessment of the proposed activity, including the mitigation measures and the implementation of the conditions and guidelines set in the planning solution, adverse effects on the Special Protection Areaof Kasti bay in the Natura 2000 network have been ruled out.

Natura 2000 sites	Protection objectives	Identification of impacts	Mitigation measures	Conclusion of the Natura assessment
			The magnitude of these risks and possible mitigation measures can be specified after the following on-site studies at the authorization level: ▪ The eastern part of the area no. 1 suitable for the development of wind energy in the Gulf of Riga is located near the significant migration corridor of terrestrial birds (incl birds of prey) across the sea. At the authorization stage, to specify the actual width of the migratory flow of terrestrial birds near the eastern part of the development area in the direction of Kihnu-Ruhnu (to clarify whether the existing free area is sufficient) and clarify other necessary matters for the collision risk assessment (species flight intensity and altitudes). To this end, it is necessary to carry out a radar survey of birds covering the migration periods of at least two years in parallel with visual observations. ▪ In case of area no. 2 suitable for the development of the wind energy in the west of Saaremaa, it is necessary to specify at the authorization stage which part of all migratory terrestrial birds do not use the main migratory route, this means not going along the Sõrve peninsula to Säär and from there across the sea to Kuramaa, but taking the direction from the west coast of Saaremaa towards Gotland, in which case the wind energy development area may remain on the migration route. This needs to be identified at the authorization stage by a radar survey of birds covering the migration periods of at least two years, carried out in parallel with visual observations. ▪ In view of the principle of combined use set out in the maritime spatial plan, the water traffic area of vessels (currently NNW-SSE) should be specified at the authorization level, where possible, to better match the expected predominant migratory direction of birds (NNE-SSW). Birds will then be able to use the area as a migration corridor, as the width of the passageway required for shipping is calculated to be approximately 6250 m for area 2 In wind energy development areas, the possible accompanying effects on the Special Protection Area of Kasti bay should be assessed during the authorization stage through the Natura (pre) assessment process.	

Natura 2000 sites	Protection objectives	Identification of impacts	Mitigation measures	Conclusion of the Natura assessment
Kaugatoma-Lõu bay Speciall Protection Area (EE0040441)	15 bird species	The proposed wind energy development site (No. 2) is located more than 11 km from the Special Protection Area and therefore has no direct physical impact on the site's conservation objectives. However, the mobile lifestyle of birds (e.g. migration) must also be taken into account, so that adverse effects (obstacles / deaths during migration, etc.) on the Special Protection Area, coherence of the areas and birds may in some cases occur in case of the wind turbines planned outside Natura sites. The proposed cable corridor passes through the Special Protection Area. The construction of the cables is expected to have a temporary and local impact. Impacts are generally limited in time to the construction period and spatially to the seabed, its habitats, vegetation and species in a specific location.	At the strategic level, the potential for impact on the conservation objectives of the Special Protection Area is minimized with the selection of the location. There is no need to change the maritime spatial plan solution. At the strategic level the potential impact on the conservation objectives of the Special Protection Area has been minimized and thus a significant adverse effect on the integrity of the Natura 2000 site with the selection of location has been ruled out. There is no need to change the maritime spatial plan solution. Although most birds use sensitive areas for migration and stopping, the risk of collision and the barrier effect cannot be completely ruled out (see Chapter 4.2.2 for details). The risk of collision and the barrier effect can be mitigated through the following mitigation measures: ▪ It is recommended to use large modern wind turbines (the starting point of the plan allows the use of large wind turbines). As the height of the wind turbines increases, the number of wind turbines (per area) decreases and the risk of collision (death) for most bird species decreases. ▪ As a planning condition, to stipulate that the minimum permissible height of the wind turbine blade above sea level is 25 meters, with the proviso that it can be specified (increased to 30 or 35 meters if necessary) on the basis of a study carried out during the authorization application procedure. The magnitude of these risks and possible mitigation measures can be specified after the following on-site studies at the authorization level: ▪ The eastern part of the area no. 1 suitable for the development of wind energy in the Gulf of Riga is located near the significant migration corridor of terrestrial birds (incl birds of prey) across the sea. At the authorization stage, to specify the actual width of the migratory flow of terrestrial birds near the eastern part of the development area in the direction of Kihnu-Ruhnu (to clarify whether the existing free area is sufficient) and clarify other necessary matters for the collision risk assessment (species flight intensity and altitudes). To this end, it is necessary to carry out a radar survey of birds covering the migration periods of at least two years in parallel with visual observations.	During the development of wind energy development areas the potential environmental impacts of the location and / or technical solutions proposed in the project solution in the authorization application process should be further considered and assessed and, if necessary, the Natura assessment should be carried out for Kaugatoma-Lõu bay Special Protection Areaa. As a result of the Natura assessment of the proposed activity, including the mitigation measures and the implementation of the conditions and guidelines set in the planning solution, adverse effects on the Special Protection Area of Kaugatoma-Lõu bay in the Natura 2000 network have been ruled out. The impact of the laying of the cables buried on the seabed (or in the ground) on the birds is not significant and an adverse effect on the conservation objectives of the Special Protection Area is excluded through a measure to mitigate the timing of the works.

Natura 2000 sites	Protection objectives	Identification of impacts	Mitigation measures	Conclusion of the Natura assessment
			▪ In case of area no. 2 suitable for the development of the wind energy in the west of Saaremaa, it is necessary to specify at the authorization stage which part of all migratory terrestrial birds do not use the main migratory route, this means not going along the Sõrve peninsula to Säär and from there across the sea to Kuramaa, but taking the direction from the west coast of Saaremaa towards Gotland, in which case the wind energy development area may remain on the migration route. This needs to be identified at the authorization stage by a radar survey of birds covering the migration periods of at least two years, carried out in parallel with visual observations. ▪ In view of the principle of combined use set out in the maritime spatial plan, the water traffic area of vessels (currently NNW-SSE) should be specified at the authorization level, where possible, to better match the expected predominant migratory direction of birds (NNE-SSW). Birds will then be able to use the area as a migration corridor, as the width of the passageway required for shipping is calculated to be approximately 6250 m for area 2 In wind energy development areas, the possible accompanying effects on the Special Protection Areaof Kaugatoma-Lõu bay should be assessed during the authorization stage through the Natura (pre) assessment process. The adverse effects of cable laying can be reduced through a suitable technical solution and site selection at the design level, as well as through the timing of the works.	
Kaugatoma-Lõu Site of Community Importance EE0040441	Marine habitat types (4 pcs): sandy and muddy foreshores (1140), wide shallow bays (1160), reefs (1170) Land and coastal habitat types at	The potential cable corridor is planned from wind energy development area no. 2 through Saaremaa to the coast of Pärnu County in the village of Jaagupi or Haapsi and it will pass through Kaugatoma-Lõu Site of Community Importance on a few hundred-meter section of the sea and land. There will be no registered place of finding of any of the protected species of the special area of conservation nor marine protected habitats along the cable corridor. At the same time, the corridor passes	In order to avoid adverse impacts, it is proposed to shift the underwater cable corridor so that it does not want overlap with the conservation objectives of the nature area, see Figure 4.3-4 showing the location of the alternative cable corridor	According to the proposal to shift the submarine cable corridor, Figure 4.3-4, the plan solution has been adjusted and a direct impact on the protection objectives of the Kaugatoma-Lõu Site of Community Importance has been ruled out. The details of the cable construction (location/technical solution, etc.) will be specified in the context of specific project solutions, which will also

Natura 2000 sites	Protection objectives	Identification of impacts	Mitigation measures	Conclusion of the Natura assessment
	the proposed cable location (2 pcs): coastal meadows (*1630), alvars - *6280).	through two coastal habitats of the Site of Community Importance (Figure 4.3-4) regarding which emergence of adverse impacts (e.g., reduction in area) cannot be excluded.		specify the nature, scale, and scope of the impact at the local level. Adverse impact on Natura 2000 sites can be ruled out through appropriate technical solution and site selection when laying cables.
Kura kurgu Special Protection Area (EE0040434)	38 bird species	The proposed wind energy development areas (no 1 and 2) are adjacent to the bird area. There are no direct physical impacts on the site's conservation objectives. However, the mobile lifestyle of birds (e.g. migration) must also be taken into account, so that adverse effects (obstacles / deaths during migration, etc.) on the Special Protection Area, coherence of the areas and birds may in some cases occur in case of the wind turbines planned outside Natura sites. The proposed cable corridor passes through the Special Protection Area. The construction of the cables is expected to have a temporary and local impact. Impacts are generally limited in time to the construction period and spatially to the seabed, its habitats, vegetation and species in a specific location.	At the strategic level the potential impact on the conservation objectives of the Special Protection Area has been minimized and thus a significant adverse effect on the integrity of the Natura 2000 site with the selection of location has been ruled out. There is no need to change the maritime spatial plan solution. Although most birds use sensitive areas for migration and stopping, the risk of collision and the barrier effect cannot be completely ruled out (see Chapter 4.2.2 for details). The risk of collision and the barrier effect can be mitigated through the following mitigation measures: ▪ It is recommended to use large modern wind turbines (the starting point of the plan allows the use of large wind turbines). As the height of the wind turbines increases, the number of wind turbines (per area) decreases and the risk of collision (death) for most bird species decreases. ▪ As a planning condition, to stipulate that the minimum permissible height of the wind turbine blade above sea level is 25 meters, with the proviso that it can be specified (increased to 30 or 35 meters if necessary) on the basis of a study carried out during the authorization application procedure. The magnitude of these risks and possible mitigation measures can be specified after the following on-site studies at the authorization level: ▪ The eastern part of the area no. 1 suitable for the development of wind energy in the Gulf of Riga is located near the significant migration corridor of terrestrial birds (incl birds of prey) across the sea. At the authorization stage, to specify the actual width of the migratory flow of terrestrial birds near the eastern part of the development area in the direction of Kihnu-Ruhnu (to clarify whether the existing free area is sufficient) and clarify other necessary matters for the collision risk assessment (species flight intensity and altitudes). To this end, it is necessary to carry out a radar survey of birds covering the migration periods of at least two years in parallel with visual observations.	During the development of wind energy development areas the potential environmental impacts of the location and / or technical solutions proposed in the project solution in the authorization application process should be further considered and assessed and, if necessary, the Natura assessment should be carried out for Kura kurgu Special Protection Area. As a result of the Natura assessment of the proposed activity, including the mitigation measures and the implementation of the conditions and guidelines set in the planning solution, adverse effects on the Special Protection Areaa of Kura kurgu in the Natura 2000 network have been ruled out. The impact of the laying of the cables buried on the seabed (or in the ground) on the birds is not significant and an adverse effect on the conservation objectives of the Special Protection Area is excluded through a measure to mitigate the timing of the works.

Natura 2000 sites	Protection objectives	Identification of impacts	Mitigation measures	Conclusion of the Natura assessment
			▪ In case of area no. 2 suitable for the development of the wind energy in the west of Saaremaa, it is necessary to specify at the authorization stage which part of all migratory terrestrial birds do not use the main migratory route, this means not going along the Sõrve peninsula to Säär and from there across the sea to Kuramaa, but taking the direction from the west coast of Saaremaa towards Gotland, in which case the wind energy development area may remain on the migration route. This needs to be identified at the authorization stage by a radar survey of birds covering the migration periods of at least two years, carried out in parallel with visual observations. ▪ In view of the principle of combined use set out in the maritime spatial plan, the water traffic area of vessels (currently NNW-SSE) should be specified at the authorization level, where possible, to better match the expected predominant migratory direction of birds (NNE-SSW). Birds will then be able to use the area as a migration corridor, as the width of the passageway required for shipping is calculated to be approximately 6250 m for area 2 In wind energy development areas, the possible side effects on the Kura kurgu Special Protection Area should be assessed during the application for authorization through the Natura (pre) assessment process. The adverse effects of cable laying can be reduced through a suitable technical solution and site selection at the design level, as well as through the timing of the works.	
Mullutu-Loode Special Protection Area (EE0040444)	34 bird species.	The proposed wind energy development area (no. 1) is located approximately 28 km from the Special Protection Area and thus there are no direct physical impacts on the site's conservation objectives. However, the mobile lifestyle of birds (e.g. migration) must also be taken into account, so that adverse effects (obstacles / deaths during migration, etc.) on the Special Protection Area, coherence of the areas and birds may in some cases occur in case of the wind turbines planned outside Natura sites.	At the strategic level the potential impact on the conservation objectives of the Special Protection Area has been minimized and thus a significant adverse effect on the integrity of the Natura 2000 site with the selection of location has been ruled out. There is no need to change the maritime spatial plan solution. Although most birds use sensitive areas for migration and stopping, the risk of collision and the barrier effect cannot be completely ruled out (see Chapter 4.2.2 for details). The risk of collision and the barrier effect can be mitigated through the following mitigation measures: ▪ It is recommended to use large modern wind turbines (the starting point of the plan allows the use of large wind turbines). As the height of the wind turbines increases, the number of wind	During the development of wind energy development areas the potential environmental impacts of the location and / or technical solutions proposed in the project solution in the authorization application process should be further considered and assessed and, if necessary, the Natura assessment should be carried out for Mullutu-Loode Special Protection Area. As a result of the Natura assessment of the proposed activity, including the mitigation measures and the

Natura 2000 sites	Protection objectives	Identification of impacts	Mitigation measures	Conclusion of the Natura assessment
			turbines (per area) decreases and the risk of collision (death) for most bird species decreases. ▪ As a planning condition, to stipulate that the minimum permissible height of the wind turbine blade above sea level is 25 meters, with the proviso that it can be specified (increased to 30 or 35 meters if necessary) on the basis of a study carried out during the authorization application procedure. The magnitude of these risks and possible mitigation measures can be specified after the following on-site studies at the authorization level: ▪ The eastern part of the area no. 1 suitable for the development of wind energy in the Gulf of Riga is located near the significant migration corridor of terrestrial birds (incl birds of prey) across the sea. At the authorization stage, to specify the actual width of the migratory flow of terrestrial birds near the eastern part of the development area in the direction of Kihnu-Ruhnu (to clarify whether the existing free area is sufficient) and clarify other necessary matters for the collision risk assessment (species flight intensity and altitudes). To this end, it is necessary to carry out a radar survey of birds covering the migration periods of at least two years in parallel with visual observations. ▪ In case of area no. 2 suitable for the development of the wind energy in the west of Saaremaa, it is necessary to specify at the authorization stage which part of all migratory terrestrial birds do not use the main migratory route, this means not going along the Sõrve peninsula to Säär and from there across the sea to Kuramaa, but taking the direction from the west coast of Saaremaa towards Gotland, in which case the wind energy development area may remain on the migration route. This needs to be identified at the authorization stage by a radar survey of birds covering the migration periods of at least two years, carried out in parallel with visual observations. ▪ In view of the principle of combined use set out in the maritime spatial plan, the water traffic area of vessels (currently NNW-SSE) should be specified at the authorization level, where possible, to better match the expected predominant migratory direction of birds (NNE-SSW). Birds will then be able to use the area as a migration corridor, as the width of the passageway	implementation of the conditions and guidelines set in the planning solution, adverse effects on the Special Protection Area of Mullutu-Loode in the Natura 2000 network have been ruled out.

Natura 2000 sites	Protection objectives	Identification of impacts	Mitigation measures	Conclusion of the Natura assessment
			required for shipping is calculated to be approximately 6250 m for area 2 In wind energy development areas the possible side effects of the Natura (pre-) assessment process for the Mullutu-Loode Special Protection Area should be assessed at the authorization application stage.	
Pärnu bay Special Protection Area (EE0040346)	43 bird species	The proposed wind energy development area (no. 1) is located approximately 16 km from the Special Protection Area, and thus there are no direct physical impacts on the site's conservation objectives. However, the mobile lifestyle of birds (e.g. migration) should also be taken into account, so that adverse effects (obstacles / deaths during migration, etc.) on the Special Protection Area, coherence of the areas and birds may in some cases occur in case of the wind turbines planned outside Natura sites.	At the strategic level the potential impact on the conservation objectives of the Special Protection Area has been minimized and thus a significant adverse effect on the integrity of the Natura 2000 site with the selection of location has been ruled out. There is no need to change the maritime spatial plan solution. Although most birds use sensitive areas for migration and stopping, the risk of collision and the barrier effect cannot be completely ruled out (see Chapter 4.2.2 for details). The risk of collision and the barrier effect can be mitigated through the following mitigation measures: ▪ It is recommended to use large modern wind turbines (the starting point of the plan allows the use of large wind turbines). As the height of the wind turbines increases, the number of wind turbines (per area) decreases and the risk of collision (death) for most bird species decreases. ▪ As a planning condition, to stipulate that the minimum permissible height of the wind turbine blade above sea level is 25 meters, with the proviso that it can be specified (increased to 30 or 35 meters if necessary) on the basis of a study carried out during the authorization application procedure. The magnitude of these risks and possible mitigation measures can be specified after the following on-site studies at the authorization level: ▪ The eastern part of the area no. 1 suitable for the development of wind energy in the Gulf of Riga is located near the significant migration corridor of terrestrial birds (incl birds of prey) across the sea. At the authorization stage, to specify the actual width of the migratory flow of terrestrial birds near the eastern part of the development area in the direction of Kihnu-Ruhnu (to clarify whether the existing free area is sufficient) and clarify other necessary matters for the collision risk assessment (species flight intensity and altitudes). To this end, it is necessary to carry out a	During the development of wind energy development areas the potential environmental impacts of the location and / or technical solutions proposed in the project solution in the authorization application process should be further considered and assessed and, if necessary, the Natura assessment should be carried out for Pärnu bay Special Protection Area. As a result of the Natura assessment of the proposed activity, including the mitigation measures and the implementation of the conditions and guidelines set in the planning solution, adverse effects on the Special Protection Area of Pärnu bay in the Natura 2000 network have been ruled out

Natura 2000 sites	Protection objectives	Identification of impacts	Mitigation measures	Conclusion of the Natura assessment
			radar survey of birds covering the migration periods of at least two years in parallel with visual observations. ▪ In case of area no. 2 suitable for the development of the wind energy in the west of Saaremaa, it is necessary to specify at the authorization stage which part of all migratory terrestrial birds do not use the main migratory route, this means not going along the Sõrve peninsula to Säär and from there across the sea to Kuramaa, but taking the direction from the west coast of Saaremaa towards Gotland, in which case the wind energy development area may remain on the migration route. This needs to be identified at the authorization stage by a radar survey of birds covering the migration periods of at least two years, carried out in parallel with visual observations. ▪ In view of the principle of combined use set out in the maritime spatial plan, the water traffic area of vessels (currently NNW-SSE) should be specified at the authorization level, where possible, to better match the expected predominant migratory direction of birds (NNE-SSW). Birds will then be able to use the area as a migration corridor, as the width of the passageway required for shipping is calculated to be approximately 6250 m for area 2 In wind energy development areas the possible side effects of the Natura (pre-) assessment process for Pärnu bay Special Protection Area should be assessed at the authorization application stage.	
Riksu coastal Special Protection Area(EE0040461)	8 bird species	The proposed wind energy development area (no. 2) is located approximately 8 km from the Special Protection Area, and thus there are no direct physical impacts on the site's conservation objectives. However, the mobile lifestyle of birds (e.g. migration) should also be taken into account, so that adverse effects (obstacles / deaths during migration, etc.) on the Special Protection Area, coherence of the areas and birds may in some cases occur in case of the wind turbines planned outside Natura sites.	At the strategic level the potential impact on the conservation objectives of the Special Protection Area has been minimized and thus a significant adverse effect on the integrity of the Natura 2000 site with the selection of location has been ruled out. There is no need to change the maritime spatial plan solution. Although most birds use sensitive areas for migration and stopping, the risk of collision and the barrier effect cannot be completely ruled out (see Chapter 4.2.2 for details). The risk of collision and the barrier effect can be mitigated through the following mitigation measures: ▪ It is recommended to use large modern wind turbines (the starting point of the plan allows the use of large wind turbines). As the height of the wind turbines increases, the number of wind turbines (per area) decreases and the risk of collision (death) for most bird species decreases.	During the development of wind energy development areas the potential environmental impacts of the location and / or technical solutions proposed in the project solution in the authorization application process should be further considered and assessed and, if necessary, the Natura assessment should be carried out for Riksu coastal Special Protection Area. As a result of the Natura assessment of the proposed activity, including the mitigation measures and the implementation of the conditions and guidelines set in the planning solution,

Natura 2000 sites	Protection objectives	Identification of impacts	Mitigation measures	Conclusion of the Natura assessment
			▪ As a planning condition, to stipulate that the minimum permissible height of the wind turbine blade above sea level is 25 meters, with the proviso that it can be specified (increased to 30 or 35 meters if necessary) on the basis of a study carried out during the authorization application procedure. The magnitude of these risks and possible mitigation measures can be specified after the following on-site studies at the authorization level: ▪ The eastern part of the area no. 1 suitable for the development of wind energy in the Gulf of Riga is located near the significant migration corridor of terrestrial birds (incl birds of prey) across the sea. At the authorization stage, to specify the actual width of the migratory flow of terrestrial birds near the eastern part of the development area in the direction of Kihnu-Ruhnu (to clarify whether the existing free area is sufficient) and clarify other necessary matters for the collision risk assessment (species flight intensity and altitudes). To this end, it is necessary to carry out a radar survey of birds covering the migration periods of at least two years in parallel with visual observations. ▪ In case of area no. 2 suitable for the development of the wind energy in the west of Saaremaa, it is necessary to specify at the authorization stage which part of all migratory terrestrial birds do not use the main migratory route, this means not going along the Sõrve peninsula to Säär and from there across the sea to Kuramaa, but taking the direction from the west coast of Saaremaa towards Gotland, in which case the wind energy development area may remain on the migration route. This needs to be identified at the authorization stage by a radar survey of birds covering the migration periods of at least two years, carried out in parallel with visual observations. ▪ In view of the principle of combined use set out in the maritime spatial plan, the water traffic area of vessels (currently NNW-SSE) should be specified at the authorization level, where possible, to better match the expected predominant migratory direction of birds (NNE-SSW). Birds will then be able to use the area as a migration corridor, as the width of the passageway	adverse effects on Riksu coastal Special Protection Area in the Natura 2000 network have been ruled out.

Natura 2000 sites	Protection objectives	Identification of impacts	Mitigation measures	Conclusion of the Natura assessment
			required for shipping is calculated to be approximately 6250 m for area 2 In wind energy development areas the possible side effects of the Natura (pre-) assessment process for Riksu coastal Special Protection Area should be assessed at the authorization stage.	
Siiksaare-Oessaare Special Protection Area (EE0040469)	41 bird species.	The proposed wind energy development area (no. 1) is located approximately 23 km from the Special Protection Area, and thus there are no direct physical impacts on the site's conservation objectives. However, the mobile lifestyle of birds (e.g. migration) should also be taken into account, so that adverse effects (obstacles / deaths during migration, etc.) on the Special Protection Area, coherence of the areas and birds may in some cases occur in case of the wind turbines planned outside Natura sites.	At the strategic level the potential impact on the conservation objectives of the Special Protection Area has been minimized and thus a significant adverse effect on the integrity of the Natura 2000 site with the selection of location has been ruled out. There is no need to change the maritime spatial plan solution. Although most birds use sensitive areas for migration and stopping, the risk of collision and the barrier effect cannot be completely ruled out (see Chapter 4.2.2 for details). The risk of collision and the barrier effect can be mitigated through the following mitigation measures: ▪ It is recommended to use large modern wind turbines (the starting point of the plan allows the use of large wind turbines). As the height of the wind turbines increases, the number of wind turbines (per area) decreases and the risk of collision (death) for most bird species decreases. ▪ As a planning condition, to stipulate that the minimum permissible height of the wind turbine blade above sea level is 25 meters, with the proviso that it can be specified (increased to 30 or 35 meters if necessary) on the basis of a study carried out during the authorization application procedure. The magnitude of these risks and possible mitigation measures can be specified after the following on-site studies at the authorization level: ▪ The eastern part of the area no. 1 suitable for the development of wind energy in the Gulf of Riga is located near the significant migration corridor of terrestrial birds (incl birds of prey) across the sea. At the authorization stage, to specify the actual width of the migratory flow of terrestrial birds near the eastern part of the development area in the direction of Kihnu-Ruhnu (to clarify whether the existing free area is sufficient) and clarify other	During the development of wind energy development areas the potential environmental impacts of the location and / or technical solutions proposed in the project solution in the authorization application process should be further considered and assessed and, if necessary, the Natura assessment should be carried out for Siiksaare-Oessaare bay Special Protection Area. As a result of the Natura assessment of the proposed activity, including the mitigation measures and the implementation of the conditions and guidelines set in the planning solution, adverse effects on Siiksaare-Oessaare Special Protection Area area in the Natura 2000 network have been ruled out.

Natura 2000 sites	Protection objectives	Identification of impacts	Mitigation measures	Conclusion of the Natura assessment
			necessary matters for the collision risk assessment (species flight intensity and altitudes). To this end, it is necessary to carry out a radar survey of birds covering the migration periods of at least two years in parallel with visual observations. ▪ In case of area no. 2 suitable for the development of the wind energy in the west of Saaremaa, it is necessary to specify at the authorization stage which part of all migratory terrestrial birds do not use the main migratory route, this means not going along the Sõrve peninsula to Säär and from there across the sea to Kuramaa, but taking the direction from the west coast of Saaremaa towards Gotland, in which case the wind energy development area may remain on the migration route. This needs to be identified at the authorization stage by a radar survey of birds covering the migration periods of at least two years, carried out in parallel with visual observations. ▪ In view of the principle of combined use set out in the maritime spatial plan, the water traffic area of vessels (currently NNW-SSE) should be specified at the authorization level, where possible, to better match the expected predominant migratory direction of birds (NNE-SSW). Birds will then be able to use the area as a migration corridor, as the width of the passageway required for shipping is calculated to be approximately 6250 m for area 2 In wind energy development areas the possible side effects through the Natura (pre-) assessment process for Siiksaare-Oessaare Special Protection Area should be assessed at the authorization stage.	
Sutu bay Special Protection Area (EE0040472)	9 bird species	The proposed wind energy development area (no. 1) is located approximately 18 km from the Special Protection Area, and thus there are no direct physical impacts on the site's conservation objectives. However, the mobile lifestyle of birds (e.g. migration) should also be taken into account, so that adverse effects (obstacles / deaths during migration, etc.) on the Special Protection Area, coherence of the areas and birds may in some cases occur in case of the wind turbines planned outside Natura sites.	At the strategic level the potential impact on the conservation objectives of the Special Protection Area has been minimized and thus a significant adverse effect on the integrity of the Natura 2000 site with the selection of location has been ruled out. There is no need to change the maritime spatial plan solution. Although most birds use sensitive areas for migration and stopping, the risk of collision and the barrier effect cannot be completely ruled out (see Chapter 4.2.2 for details). The risk of collision and the barrier effect can be mitigated through the following mitigation measures: ▪ It is recommended to use large modern wind turbines (the starting point of the plan allows the use of large wind turbines). As the	During the development of wind energy development areas the potential environmental impacts of the location and / or technical solutions proposed in the project solution in the authorization application process should be further considered and assessed and, if necessary, the Natura assessment should be carried out for Sutu bay Special Protection Area. As a result of the Natura assessment of the proposed activity, including the mitigation measures and the

Natura 2000 sites	Protection objectives	Identification of impacts	Mitigation measures	Conclusion of the Natura assessment
			height of the wind turbines increases, the number of wind turbines (per area) decreases and the risk of collision (death) for most bird species decreases. ▪ As a planning condition, to stipulate that the minimum permissible height of the wind turbine blade above sea level is 25 meters, with the proviso that it can be specified (increased to 30 or 35 meters if necessary) on the basis of a study carried out during the authorization application procedure. The magnitude of these risks and possible mitigation measures can be specified after the following on-site studies at the authorization level: ▪ The eastern part of the area no. 1 suitable for the development of wind energy in the Gulf of Riga is located near the significant migration corridor of terrestrial birds (incl birds of prey) across the sea. At the authorization stage, to specify the actual width of the migratory flow of terrestrial birds near the eastern part of the development area in the direction of Kihnu-Ruhnu (to clarify whether the existing free area is sufficient) and clarify other necessary matters for the collision risk assessment (species flight intensity and altitudes). To this end, it is necessary to carry out a radar survey of birds covering the migration periods of at least two years in parallel with visual observations. ▪ In case of area no. 2 suitable for the development of the wind energy in the west of Saaremaa, it is necessary to specify at the authorization stage which part of all migratory terrestrial birds do not use the main migratory route, this means not going along the Sõrve peninsula to Säär and from there across the sea to Kuramaa, but taking the direction from the west coast of Saaremaa towards Gotland, in which case the wind energy development area may remain on the migration route. This needs to be identified at the authorization stage by a radar survey of birds covering the migration periods of at least two years, carried out in parallel with visual observations. ▪ In view of the principle of combined use set out in the maritime spatial plan, the water traffic area of vessels (currently NNW-SSE) should be specified at the authorization level, where possible, to better match the expected predominant migratory direction of birds (NNE-SSW). Birds will then be able to use the area as a migration corridor, as the width of the passageway	implementation of the conditions and guidelines set in the planning solution, adverse effects on Sutu bay Special Protectio Area area in the Natura 2000 network have been ruled out.

Natura 2000 sites	Protection objectives	Identification of impacts	Mitigation measures	Conclusion of the Natura assessment
			required for shipping is calculated to be approximately 6250 m for area 2 In wind energy development areas the possible side effects through the Natura (pre-) assessment process for Sutu bay Special Protection Area should be assessed at the authorization stage.	
Tagamõisa Special Protection Area (EE0040476)	20 bird species.	The proposed wind energy development area (no. 2) is located approximately 21 km from the Special Protection Area, and thus there are no direct physical impacts on the site's conservation objectives. However, the mobile lifestyle of birds (e.g. migration) should also be taken into account, so that adverse effects (obstacles / deaths during migration, etc.) on the Special Protection Area, coherence of the areas and birds may in some cases occur in case of the wind turbines planned outside Natura sites.	At the strategic level the potential impact on the conservation objectives of the Special Protection Area has been minimized and thus a significant adverse effect on the integrity of the Natura 2000 site with the selection of location has been ruled out. There is no need to change the maritime spatial plan solution. Although most birds use sensitive areas for migration and stopping, the risk of collision and the barrier effect cannot be completely ruled out (see Chapter 4.2.2 for details). The risk of collision and the barrier effect can be mitigated through the following mitigation measures: ▪ It is recommended to use large modern wind turbines (the starting point of the plan allows the use of large wind turbines). As the height of the wind turbines increases, the number of wind turbines (per area) decreases and the risk of collision (death) for most bird species decreases. ▪ As a planning condition, to stipulate that the minimum permissible height of the wind turbine blade above sea level is 25 meters, with the proviso that it can be specified (increased to 30 or 35 meters if necessary) on the basis of a study carried out during the authorization application procedure. The magnitude of these risks and possible mitigation measures can be specified after the following on-site studies at the authorization level: ▪ The eastern part of the area no. 1 suitable for the development of wind energy in the Gulf of Riga is located near the significant migration corridor of terrestrial birds (incl birds of prey) across the sea. At the authorization stage, to specify the actual width of the migratory flow of terrestrial birds near the eastern part of the development area in the direction of Kihnu-Ruhnu (to clarify whether the existing free area is sufficient) and clarify other necessary matters for the collision risk assessment (species flight	During the development of wind energy development areas the potential environmental impacts of the location and / or technical solutions proposed in the project solution in the authorization application process should be further considered and assessed and, if necessary, the Natura assessment should be carried out for Tagamõisa Special Protection Area. As a result of the Natura assessment of the proposed activity, including the mitigation measures and the implementation of the conditions and guidelines set in the planning solution, adverse effects on Tagamõisa Special Protection Area in the Natura 2000 network have been ruled out.

Natura 2000 sites	Protection objectives	Identification of impacts	Mitigation measures	Conclusion of the Natura assessment
			intensity and altitudes). To this end, it is necessary to carry out a radar survey of birds covering the migration periods of at least two years in parallel with visual observations. ▪ In case of area no. 2 suitable for the development of the wind energy in the west of Saaremaa, it is necessary to specify at the authorization stage which part of all migratory terrestrial birds do not use the main migratory route, this means not going along the Sõrve peninsula to Säär and from there across the sea to Kuramaa, but taking the direction from the west coast of Saaremaa towards Gotland, in which case the wind energy development area may remain on the migration route. This needs to be identified at the authorization stage by a radar survey of birds covering the migration periods of at least two years, carried out in parallel with visual observations. ▪ In view of the principle of combined use set out in the maritime spatial plan, the water traffic area of vessels (currently NNW-SSE) should be specified at the authorization level, where possible, to better match the expected predominant migratory direction of birds (NNE-SSW). Birds will then be able to use the area as a migration corridor, as the width of the passageway required for shipping is calculated to be approximately 6250 m for area 2 In wind energy development areas the possible side effects through the Natura (pre-) assessment process for Tagamõisa Special Protection Area should be assessed at the authorization stage.	
Vilsandi Special Protection Area (EE0040496)	13 bird species.	The proposed wind energy development area (no. 2) is located at a distance of approx. 10 km from the Special Protection Area and thus there are no direct physical impacts on the protection objectives of the area. However, the mobile lifestyle of birds (e.g. migration) should also be taken into account, so that adverse effects (obstacles / deaths during migration, etc.) on the Special Protection Area, coherence of the areas and birds may in some cases occur in case of the wind turbines planned outside Natura sites.	At the strategic level the potential impact on the conservation objectives of the Special Protection Area has been minimized and thus a significant adverse effect on the integrity of the Natura 2000 site with the selection of location has been ruled out. There is no need to change the maritime spatial plan solution. Although most birds use sensitive areas for migration and stopping, the risk of collision and the barrier effect cannot be completely ruled out (see Chapter 4.2.2 for details). The risk of collision and the barrier effect can be mitigated through the following mitigation measures: ▪ It is recommended to use large modern wind turbines (the starting point of the plan allows the use of large wind turbines). As the height of the wind turbines increases, the number of wind	During the development of wind energy development areas the potential environmental impacts of the location and / or technical solutions proposed in the project solution in the authorization application process should be further considered and assessed and, if necessary, the Natura assessment should be carried out for Vilsandi Special Protection Area. As a result of the Natura assessment of the proposed activity, including the mitigation measures and the implementation of the conditions and

Natura 2000 sites	Protection objectives	Identification of impacts	Mitigation measures	Conclusion of the Natura assessment
			turbines (per area) decreases and the risk of collision (death) for most bird species decreases. ▪ As a planning condition, to stipulate that the minimum permissible height of the wind turbine blade above sea level is 25 meters, with the proviso that it can be specified (increased to 30 or 35 meters if necessary) on the basis of a study carried out during the authorization application procedure. The magnitude of these risks and possible mitigation measures can be specified after the following on-site studies at the authorization level: ▪ The eastern part of the area no. 1 suitable for the development of wind energy in the Gulf of Riga is located near the significant migration corridor of terrestrial birds (incl birds of prey) across the sea. At the authorization stage, to specify the actual width of the migratory flow of terrestrial birds near the eastern part of the development area in the direction of Kihnu-Ruhnu (to clarify whether the existing free area is sufficient) and clarify other necessary matters for the collision risk assessment (species flight intensity and altitudes). To this end, it is necessary to carry out a radar survey of birds covering the migration periods of at least two years in parallel with visual observations. ▪ In case of area no. 2 suitable for the development of the wind energy in the west of Saaremaa, it is necessary to specify at the authorization stage which part of all migratory terrestrial birds do not use the main migratory route, this means not going along the Sõrve peninsula to Säär and from there across the sea to Kuramaa, but taking the direction from the west coast of Saaremaa towards Gotland, in which case the wind energy development area may remain on the migration route. This needs to be identified at the authorization stage by a radar survey of birds covering the migration periods of at least two years, carried out in parallel with visual observations. ▪ In view of the principle of combined use set out in the maritime spatial plan, the water traffic area of vessels (currently NNW-SSE) should be specified at the authorization level, where possible, to better match the expected predominant migratory direction of birds (NNE-SSW). Birds will then be able to use the area as a migration corridor, as the width of the passageway	guidelines set in the planning solution, adverse effects on Vilsandi Special Protection Area in the Natura 2000 network have been ruled out.

Natura 2000 sites	Protection objectives	Identification of impacts	Mitigation measures	Conclusion of the Natura assessment
			required for shipping is calculated to be approximately 6250 m for area 2 In wind energy development areas the possible side effects through the Natura (pre-) assessment process for Vilsandi Special Protection Area should be assessed at the authorization stage.	
Väinamere Site of Community Importance EE0040002	Marine habitat types (3 pcs): sandy and muddy foreshores (1140), wide shallow bays (1160), reefs (1170) Marine species (6 pcs): Gray seal, ringed seal, spined loach, European bullhead, river lamprey, European weatherfish. Land and coastal habitat types at the proposed cable location (3 pcs): Small islands and wide (1620), coastal meadows	The potential cable corridor is planned from the wind energy development area No 1 to Virtsu and passes through the Väinameri Sea Site of Community Importance in the section of *ca* 5 km in the sea and to a small extent also on the land (islets, the coast). There will be no registered places of finding of any of the protected species, nor marine protected habitats along the cable corridor. At the same time, the corridor passes through coastal habitats (including priority habitat types) in the site of community importance (Figure 4.3-3) regarding which adverse impacts (e.g. reduction in area) cannot be excluded.	In order to avoid adverse impact, this assessment proposes to shift the underwater cable corridor so that it does not overlap with the conservation objectives of the Site of Community Importance see Figure 4.3-3, which shows the location of the alternative cable corridor. The location of the alternative cable completely avoids the passage of both terrestrial and coastal habitats and reefs from marine habitats, by thus preventing damage to these habitats. The alternative cable corridor partly passes through shallow sand habitats. Due to the nature of the shallow sand habitat (soft sediments) permanent and irreversible adverse effects on the habitat associated with the installation and operation of the cable can be prevented by technical solutions and the like. The habitat can restore later in the corridor of the cable sunk into the soft sediments (see also chapter 4.2.5).	According to the proposal to shift the underwater cable corridor, Figure 4.3-3, the plan solution has been adjusted and a direct impact on the conservation objectives of the Väinameri Site of Community Importance has been ruled out. The details of the cable construction (location/technical solution, etc.) will be specified in the context of specific project solutions, which will also specify the nature, scale and scope of the impact at the local level. Adverse impacts on Natura 2000 sites can be ruled out through appropriate technical solution and site selection when laying cables.

Natura 2000 sites	Protection objectives	Identification of impacts	Mitigation measures	Conclusion of the Natura assessment
	(*1630), alvars -*6280).			
Väinamere Special Protection Area EE0040001	76 bird species.	The proposed cable corridor passes through the Special Protection Area. The construction of the cables is expected to have a temporary and local impact. Impacts are generally limited in time to the construction period and spatially to the seabed, its habitats, vegetation and species in a specific location.	The adverse effects of cable laying can be reduced through a suitable technical solution and site selection at the design level, as well as through the choice of time to carry out the work.	The impact of the installation of cables buried on the seabed (or in the ground) on birds is not significant and an adverse effect on the conservation objectives of the Special Protection Area is excluded through a mitigation measure of choosing the time for the execution of the works.

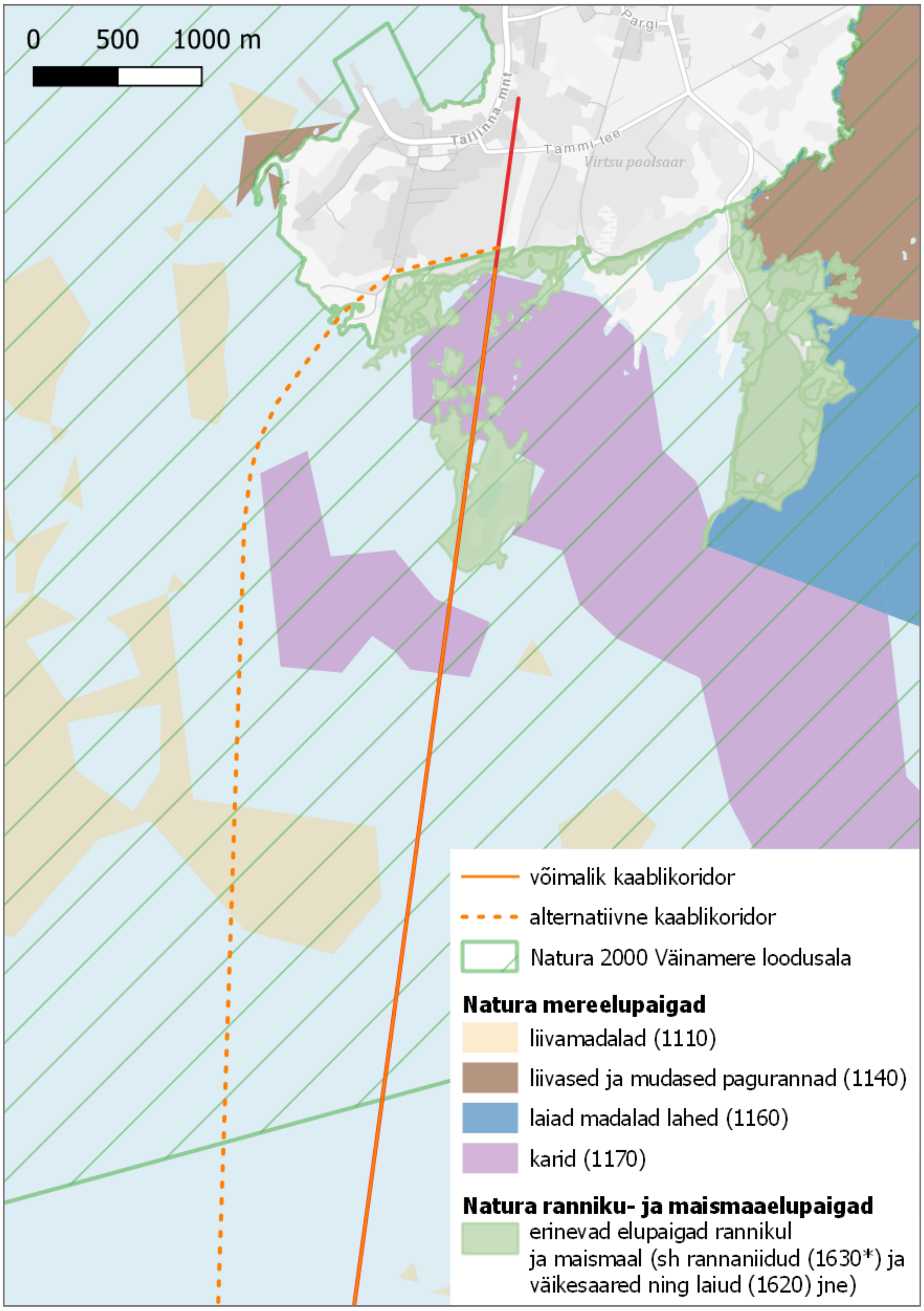

Figure 4.3-3 Proposed location of the cable corridor and a proposal (alternative cable corridor in the figure) for its relocation in the Väinameri Site of Community Importance based on the location of habitat types according to the site conservation management plan

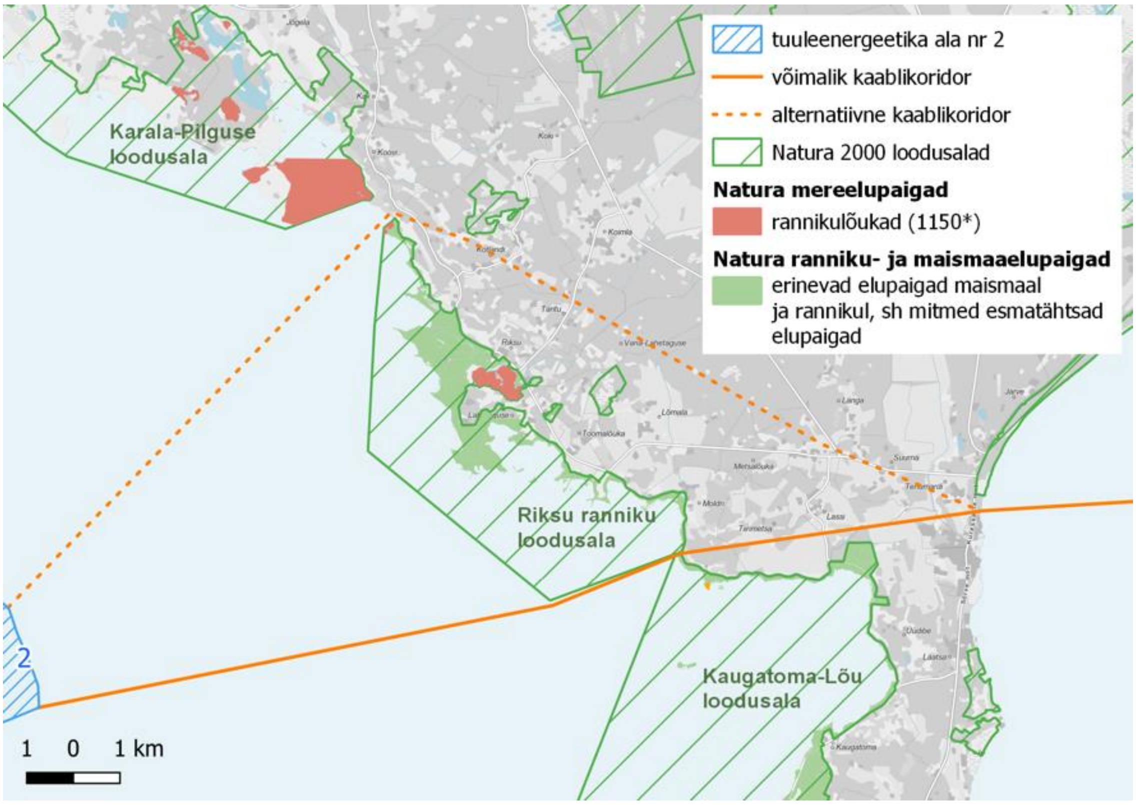

Figure 4.3-4 Proposed location of the cable corridor in Kaugatoma-Lõu Site of Community Importance and proposal (alternative cable corridor in the figure) to move it to an alternative location

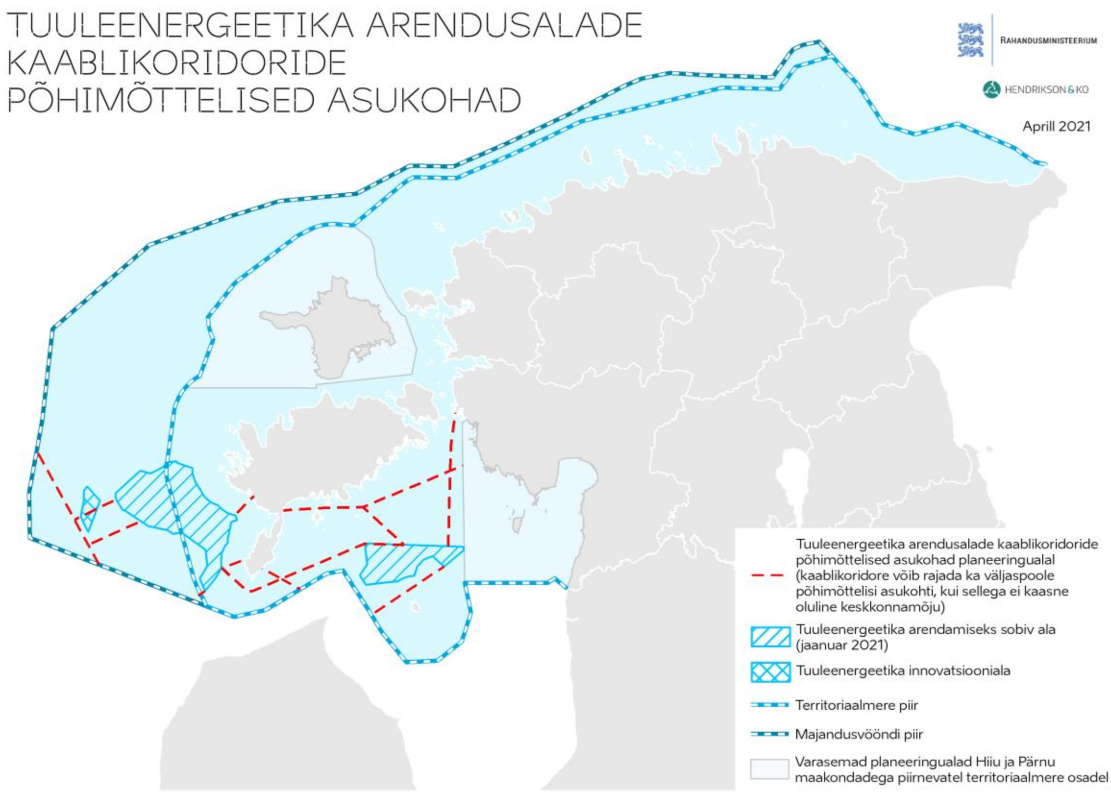

Figure 4.3-5 Wind energy development areas (as of April 2021) and the related infrastructure, i.e. principal locations of cable corridors, taking into account the conclusions of the Natura assessment

- **Results and conclusion of the Natura assessment**

The Estonian Maritime Spatial Plan addresses several uses of the sea, which do not envisage any spatial changes (or significant spatial changes) to the existing situation; therefore, it can be said that the implementation of the plan does not lead to a different situation for Natura 2000 sites. Such uses of the sea include fisheries; aquaculture; maritime transport; maritime rescue, pollution control, border guarding; seabed infrastructure; marine tourism and recreation; protected natural objects; marine culture; cultural monuments; National defense; mineral resources; dumping; permanent connections. **These uses do not have an adverse impact on Natura 2000 sites and conservation objectives when implementing the plan, in case the conditions and guidelines laid down for that purpose are complied with.**

Energy production is an area of activity for which the planning defines the basic spatial locations of the offshore area as wind energy development areas as well as the accompanying infrastructure (possible offshore substation and cable corridors outside the wind energy development areas). The location of the Natura 2000 network areas has been taken into account in the selection of the spatial solution and locations of the wind energy development areas in the maritime spatial plan, i.e. due to the precautionary principle these areas were excluded as development areas to ensure favourable status of Natura 2000 areas and their conservation objectives. No activities or sites are generally planned for Natura 2000 sites. With regard to the seabed cables passing through Natura areas (Väinamere and Kaugatoma-Lõu Special Protection Areas), the possibilities of impact were assessed in more detail, and in order to exclude adverse effects, it was proposed to change the location of the cables in the plan which has also been taken into account when changing the planning solution (as of January 2021).

The implementation of the Maritime spatial Plan will not have an adverse effect on the Natura 2000 network areas or their conservation objectives, by taking into account the environmental measures provided for in this Impact Assessment and the conditions set in the plan.

The degree of accuracy of the Maritime Spatial Plan (lacking detailed information on the locations/technical solutions of the proposed activities, etc.) does not foresee any adverse impacts on Natura 2000 sites or their conservation objectives, taking into account the conditions and guidelines laid down in the plan and the environmental measures provided for in this Impact Assessment to the licensing level.

As a result of the Natura assessment the alternatives for the location of submarine cables have been suggested in the new proposed corridors to exclude impacts on Natura 2000 sites and their conservation objectives. The amendments to Natura assessment have been taken into account when supplementing the planning solution. The details of the cable construction (location/technical solution, etc.) will be specified within the framework of specific design solutions, as a result of which the nature, extent and scope of the impact will be specified at the local level. Consequently, a further assessment of possible side effects through the Natura (pre-) assessment process at the authorization level is needed.

ENVIRONMENTAL MEASURES:

1. In case of activities planned in the maritime spatial plan, in particular the development of wind farms, the establishment and/or dumping of fish farms, the environmental impacts of the location and / or technical solutions proposed in the project solution in the process of the authorization procedure should be specified and, if necessary, a Natura assessment must be carried out. Adverse effects on the conservation objectives of the Natura 2000 site should be ruled out during the implementation of the proposed activity and as a result of the Natura assessment (and through the implementation of the mitigation measures proposed therein). The likelihood of potential adverse effects occurring can be prevented and reduced by continuing to take into account Natura conservation objectives and, if necessary, implementing mitigation measures when directing development to the next stages (at the level of authorization). The adverse effects of wind turbines and fish farms can also be ruled out, if necessary, through a suitable technical solution and

a more precise location selection design solution at the level of authorization.
2. In the case of specific development projects, the locations of the cable corridors may change, and their impact will need to be assessed in the licensing procedure, together with the design of wind farms. At project level, suitable cable locations, technologies, etc. that have no significant impact on the integrity of the Natura 2000 site and the site's conservation objectives shall be identified.
3. The adverse effects of cable laying can be reduced through a suitable technical solution and site selection at the design level, as well as through the selection of time for carrying out the work.
4. In the implementation of all marine uses planned on the basis of the terms and guidelines of the plan, the effects of the proposed activity on the conservation objectives of the Natura 2000 site should be each time assessed at the authorization level and, if necessary, to prevent the implementation of mitigation measures from adversely affecting the conservation objectives of the Natura 2000 site.
5. To reduce the risk of collisions and the barrier effect, the use of large modern wind turbines is recommended, as the increasing of the height of the wind turbines reduces the number of wind turbines (per the same area) and this reduces the risk of collisions for most bird species (death risk).
6. To eliminate and minimize the risk of collision and the barrier effect:
    - as a condition of the plan, to stipulate that the minimum permissible height of the wind turbine blade above sea level is 25 meters, with the provison that it can be specified (increased to 30 or 35 meters if necessary) on the basis of a study carried out during the authorization application procedure.
7. The magnitude of the collision risk and barrier effect and possible mitigation measures can be specified after subsequent on-site studies at the authorization level:
    - The eastern part of the area no. 1 suitable for the development of wind energy in the Gulf of Riga is located near the significant migration corridor of terrestrial birds (incl birds of prey) across the sea. At the authorization stage, to specify the actual width of the migratory flow of terrestrial birds near the eastern part of the development area in the direction of Kihnu-Ruhnu (to clarify whether the existing free area is sufficient) and clarify other necessary matters for the collision risk assessment (species flight intensity and altitudes). To this end, it is necessary to carry out a radar survey of birds covering the migration periods of at least two years in parallel with visual observations.
    - In case of area no. 2 suitable for the development of the wind energy in the west of Saaremaa, it is necessary to specify at the authorization stage which part of all migratory terrestrial birds do not use the main migratory route, this means not going along the Sõrve peninsula to Säär and from there across the sea to Kuramaa, but taking the direction from the west coast of Saaremaa towards Gotland, in which case the wind energy development area may remain on the migration route. This needs to be identified at the

authorization stage by a radar survey of birds covering the migration periods of at least two years, carried out in parallel with visual observations

- In view of the principle of combined use set out in the maritime spatial plan, the water traffic area of vessels (currently NNW-SSE) should be specified at the authorization level, where possible, to better match the expected predominant migratory direction of birds (NNE-SSW). Birds will then be able to use the area as a migration corridor, as the width of the passageway required for shipping is calculated to be approximately 6250 m for area 2.

4.4 SOCIAL AND CULTURAL ENVIRONMENT

4.4.1 Impact on socio-cultural needs and well-being

4.4.1.1 Starting points for socio-cultural impact assessment

The assessment of the impact on the social and cultural environment is inherently very closely linked to the development of a planning solution. The inherent part of planning is the shaping of the social and cultural environment, which makes it sometimes difficult to distinguish between planning and impact assessment. Due to the above, this chapter differs from the rest in its structure, and specific planning concepts are also presented. This approach, while different from the rest of the report, is necessary to convey the logic of impact assessment. In the field of social and cultural influences, there is no single standard; the involvement of different stakeholders is important. It is also important that people perceive changes in social and cultural environments differently, i.e., it is difficult to predict the nature and intensity of the impact.

The Estonian marine area fulfills a wide range of social and cultural needs and has a direct and indirect impact on human well-being. The sea offers a variety of resources for human well-being or opportunities stemming from the marine environment. This has led to the emergence of various uses of the sea: from traditional, such as shipping and shipbuilding, fishing to various recreational and sporting facilities, and the emerging blue economy sectors.

There are also very different cultural values associated with the Estonian marine area: material values (e.g., wrecks) and intangible values - historical-cultural, aesthetic, and identity values. Cultural values may or may not have direct economic or livelihood benefits, supporting identity, self-fulfillment, a sense of place, and the quality of the living environment in a wider sense.

Because the sea offers a wide range of benefits, user groups also differ in their social and cultural needs and values. They can also be considered as different communities of marine culture for the purposes of impact assessment. Estonian marine culture is created by a wide variety of marine areas and coastal users - fishermen, shipbuilders, vacationers, surfers, divers, recreational craft owners, and others. Today's Estonian marine culture is therefore also diverse: besides traditional shipping and fishing, and coastal lifestyle, new communities have emerged that have an equal interest in the use of the sea and the coast. With the increase in uses of the sea, the number of different marine culture communities and the pressure on the use of the sea and the coast is increasing. In the context of the assessment of the social and cultural impact of the marine area, the consideration of different interests and the sharing of the marine area are thus important issues.

The results of the cultural mapping of the Estonian coastal and marine area show that the entire Estonian coast is valuable in one way or another (see figures in Annex 2 to the report) - sparsely populated coastal areas are of natural and/or culturally valuable nature, recreational services and social infrastructure (such as community centers, shipbuilding sites, but also museums) that carry local marine culture are concentrated in coastal villages and towns. The coastal sea contains valuable landscapes (e.g., Neugrund Bank), wreckage areas, and marine areas used for water sports. What is planned in the marine area has a direct or indirect impact on the preservation of these values and uses and, thus, on the interests of the user groups. The Impact Assessment addresses the impact on the broader public interest (including international interest) as well as, where appropriate, on the narrow interest of the user group. Alongside the wider public interest, it is also important to consider the interests of local communities, whose well-being, income, and identity are directly dependent on what is planned in the marine area[104].

Regionally, the specific marine culture of a region and the interest of communities in a particular marine area depend on both the natural features and the historical background of the coastal sea: for example, the relatively shallow and warm sea of Lääne County offers somewhat different sea uses than the relatively cold sea coast of Ida-Viru County. The different nature of the marine area (e.g., wind conditions, salinity, ice cover, etc.) will, among other things, allow or limit new marine uses planned by the plan. The activities planned in the Maritime Spatial Plan will, therefore, where appropriate, also assess the regional socio-cultural impact (in addition to the coastal/marine area level) in addition to the overall impact.

As the proposed activities in the marine area can take place on the surface, in the water column or on the seabed, where appropriate, the location of socio-cultural[105] Regionally, the specific marine culture of a region and the interest

[104] The need to distinguish between general public and local interests stems from the fact that some users are more connected to the coast and the sea on a daily basis than others - eg holidaymakers use the sea/coast occasionally, holidaymakers in summer seasonally, etc. Thus, the dependence of different user groups on the maritime sector also differs. Due to the degree of accuracy of the MSP it is important to consider the impact in terms of *general interest-user group interest and general interest-local interest*.

[105] From the standpoint of impact assessment, it is not always necessary or possible to distinguish whether the impacy is cultural or social because they are intertwined and may also have an economic dimension. For example, the identity of the coastal fisherman derives from his place and area of activity, fishing has both a social impact (e.g., food) and a potential economic impact (e.g., additional income).

of communities in a particular marine area depend on both the natural features and the historical background of the coastal sea: for example, the relatively shallow and warm sea of Lääne County offers somewhat different sea uses than the relatively cold sea coast of Ida-Viru County. The different nature of the marine area (e.g., wind conditions, salinity, ice cover, etc.) will, among other things, allow or limit new marine uses planned by the plan. The activities planned in the Maritime Spatial Plan will, therefore, where appropriate, also assess the regional socio-cultural impact (in addition to the coastal/marine area level) in addition to the overall impact.

As the proposed activities in the marine area can take place on the surface, in the water column or on the seabed, where appropriate, the location of socio-cultural[106] impact will be highlighted.

Impact of the MSP

The plan has an overall positive long-term impact. The thoughtful development agreed upon in the plan as a guideline and condition will allow the expansion and sustainable management of the use of the sea. Positive impacts will be based on the well-thought-out opportunities for the sustainable development of new blue economy sectors such as aquaculture and wind energy. The plan values the marine culture and gives it a wider resonance. When designing a planning solution, the prevention or mitigation of significant adverse impacts has already been taken into account by setting conditions to prevent a negative impact (e.g., grouping, 11 km, etc.). The following sections of the Impact Assessment contain, where appropriate, proposals that mitigate and amplify impact from a socio-cultural perspective. See chapter 4.2 of the MSP for an overview of the consideration of the proposals.

In order to increase the positive impact, the socio-cultural impact assessment identifies three general issues that should be addressed when supplementing the planning solution. More detailed recommendations for supplementing the planning solution are given in the thematic subchapters.

- One of the key issues in the Maritime Spatial Plan is the combined use of the marine space, which can range from tolerating the different uses to synergistic combined use. The combined use of the marine area is also a new trend in terms of more general approaches and practices. According to the Muses project (*Multi-Use in European Seas*, 2018[107]), the success of proposed combined uses will depend on a thorough analysis of interactions, funding models and support

[106] From the standpoint of impact assessment, it is not always necessary or possible to distinguish whether the impacy is cultural or social because they are intertwined and may also have an economic dimension. For example, the identity of the coastal fisherman derives from his place and area of activity, fishing has both a social impact (e.g., food) and a potential economic impact (e.g., additional income).

[107] See the Report https://muses-project.eu/wp-content/uploads/sites/70/2018/10/D4.3-Sea-Basin-Syntheses.pdf

mechanisms, and the responsiveness of coastal communities for new uses, etc. From the standpoint of assessing the socio-cultural impact, the role of Maritime Spatial Plan is to highlight possible synergies at the national level, while also taking a helpful starting point.

- Enabling the plan. The Maritime Spatial Plan, as a national spatial plan, focuses primarily on major developments in new uses of the sea. In the case of new uses of the sea, which can also be developed closer to the coast, it is advisable to state this clearly. For example, the planning could consider promoting the development of local small-scale distributed energy solutions.
- Planning that supports innovation. Areas of the blue economy are rapidly evolving in terms of technology and institutional, financial, and other aspects, which can make it difficult in the plans to take into consideration the unforeseeable and unpredictable future. However, Maritime Spatial Plan should aim to support innovation and provide general guidance based on known values or threats (e.g., all energy equipment that needs to be anchored must take into account the preservation of cultural values, working with the Ministry of Defense to avoid historic explosives, etc. to find safe anchoring areas)

4.4.1.2 Fisheries

Fishing is one of the oldest uses of marine areas, divided into coastal and trawl fisheries in Estonia. Fishing is also a hobby. Although the number of people employed in fisheries has declined significantly over the last decade, fisheries continue to be a major socio-economic source of employment both on the islands and on the coast. As a traditional maritime industry, fishing contributes to the vitality and employment of the local community, as well as to the maintenance of coastal fishing settlements (coastal villages, boat, and net shelters, docks, ports, etc.) and intangible culture (from maritime traditions and knowledge of the sea in the way of fishing events and societies). As a traditional maritime branch, the land-sea interaction between fisheries is strong. From the point of view of impact assessment, these are the *cultural and social (as well as economic) effects of fishing*. The effects on fisheries depend on what the plan envisages and what may change in the fisheries sector as a result.

In the marine environment, the impact of fishing as an activity on the surface of the water occurs (while there is no significant environmental impact or visual disturbance), but other uses are restricted/influenced by, e.g., nets in the water column or bottom trawling (including trawler movement trajectories).

According to the Maritime Spatial Plan, developed and intensified marine areas will be preserved in the marine area, which means that the current more catch rich areas will be preserved. The plan also supports the rebuilding of fishery resources (spawning grounds) and access to both fisheries at sea and infrastructure on the coast (ports, landing sites). At a general level, the Maritime spatial Plan thus contributes to the social and cultural viability of fishing communities and has a long-term positive impact on fisheries.

However, there are certain differences from region to region: the marine areas around West Estonia surrounding the big islands are more suitable for the new marine uses such as wind energy, shellfish and algae farming. Thus, there is also a somewhat greater pressure in the “capacity” of the sea area in Western Estonia: for example, due to the design of wind farms the trawled sea areas in the Baltic Sea, west of the Sõrve foothills and in the Gulf of Riga, are decreasing to a small extent. Trawling within the wind energy development area is considered unlikely by fishermen due to its technical complexity. Thus, despite the fact that only 4.5% of trawl fisheries in the national perspective are located in wind energy development areas[108], yielding 7% of the catch, this is a significant regional impact. In order to mitigate the regionally significant socio-economic impact, it is necessary to reduce the overlap between wind energy and trawl areas (to adjust the extent of wind energy development areas) and / or to agree with the fishing communities on compensatory measures[109].

The maritime spatial plan does not prohibit the continuation of trawling in the wind energy development areas. However, if fishermen find that it is technically possible to engage in (to some extent) trawling, the stakeholder cooperation is needed for wind farms and trawling to work together.

There is very little overlap between the wind turbines' innovation area and the trawled sea area. Thus, there is no significant adverse socio-economic impact on trawling areas in the national perspective, the impact is in the regional perspective. There are no significant socio-economic adverse effects on coastal and recreational fishing: wind turbines are planned to be 6 nautical miles or more from the coast, thus preserving fisheries (see Figures 4.4.1.2-1 and 4.4.1.2-2).

There is very little overlap between the wind turbines' innovation area and the trawled sea area. Thus, there is no significant adverse socio-economic impact on trawling areas in the national perspective, the impact is in the regional perspective. There are no significant socio-economic adverse effects on coastal and recreational fishing: the wind turbines are planned to be 6 nautical miles or more from the coast, thus preserving the fisheries (see Figures 4.4.1.2-1 and 4.4.1.2-2).

[108] Ministry of Rural Affairs 2020

[109] An interim decision of the Government of the Republic (29 April 2021) designated those areas of the wind energy development areas proposed in the maritime spatial plan as reserve areas that coincide with the historically more intensive trawling areas (see the explanatory memorandum to the maritime spatial plan, Chapter 5.6).

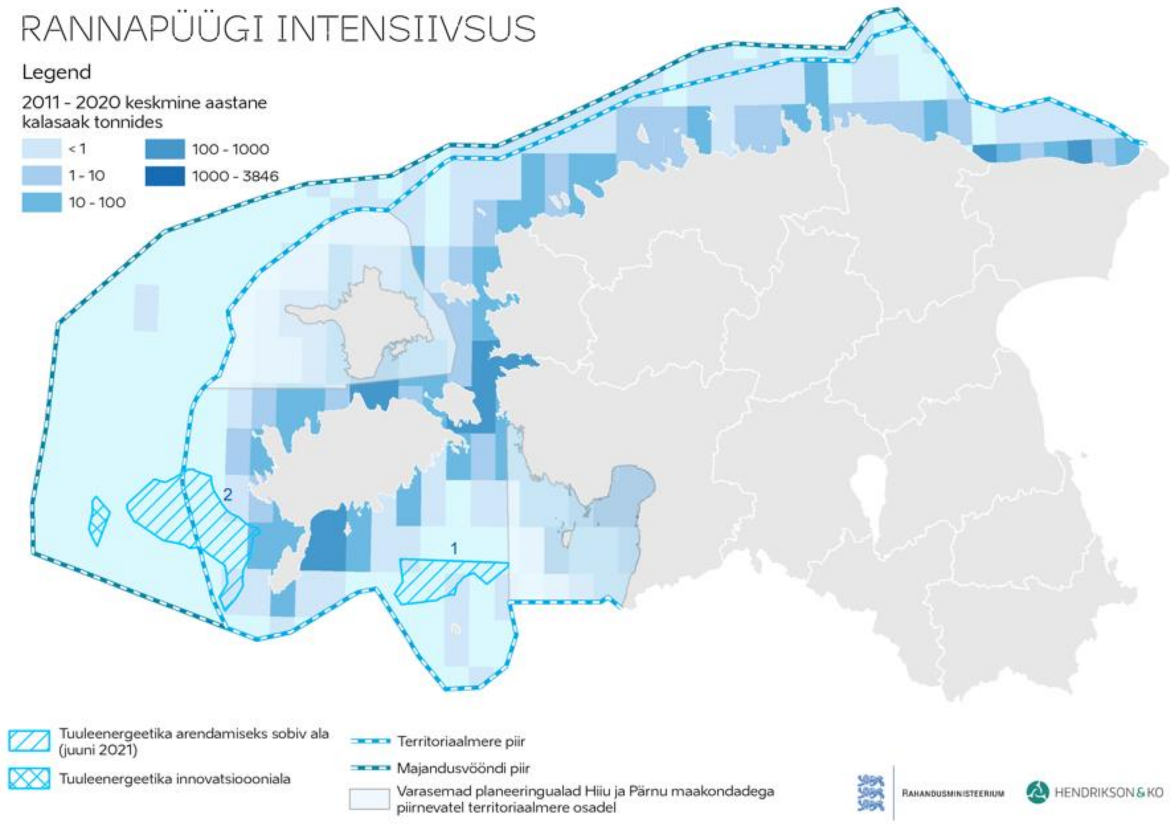

Figure 4.4.1.2-1 Coastal fishing and wind energy development

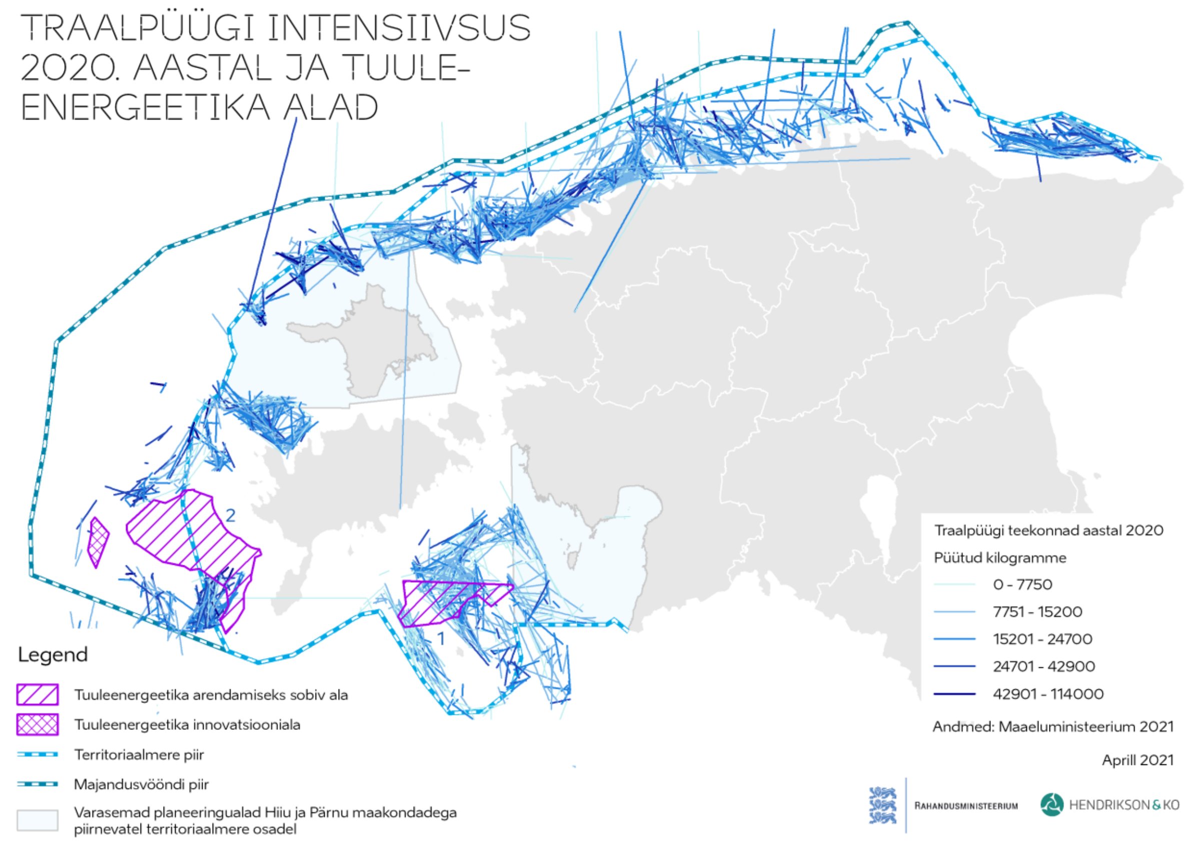

Figure 4.4.1.2-2 Trawling and wind energy

In terms of aquaculture, the plan does not define areas, but it sets out the conditions: fish farm development is preferred in the deeper high seas. With regard to shellfish and algae farming, the most suitable marine areas are highlighted. The conditions create a fundamental opportunity for trawling and fish farming (e.g., in the Baltic Sea) or algae farming and coastal fishing (e.g., in the Väinameri) in the same marine area. Based on the interest of the fishermen, the socio-cultural impact assessment proposes to consider including a condition in the MSP that also takes into account the interest of fishermen when applying for aquaculture permits: there would be no significant negative impact on the most used and yielding fishing grounds.

From the standpoint of the conservation and future uses of fishing grounds, maximum combined use is recommended - spatial concentration of activities rather than dispersal on the marine area, which is already supported by the planning for certain uses. As combined use pressures are expected to fall most heavily on the Hiiu Shoal, Baltic Sea, Väinameri Sea and Gulf of Riga waters, it is important, especially in these areas, to allow fishermen to enter new blue economy sectors if they wish, utilizing established prerequisites (seafaring skills, regional sea knowledge, etc).

4.4.1.3 Aquaculture

In Estonia, the aquaculture sector has so far been engaged in fish farming and gathering of agar, which is of interest to the food and confectionery industry and thus to the Estonian population at large. Aquaculture is a developing sector: developing technologies and fields of application (food industry, biotechnology, bioplastics, shellfish farming, for example, as the feed for fish farms, poultry, and domestic animals, etc.). There is potential for fish farms, algae and shellfish farming in Estonian waters.

The impacts of aquaculture on the water surface are local and of low impact (visual disturbance) and may occur in the water column as a growing medium and on the seabed (possible anchoring needs).

Fish farming. Maritime Spatial Plan does not designate fish farm areas but identifies areas that are expected to be inappropriate (e.g., national defense and nature protection, *ship-to-ship* areas, etc.), and shallow and more enclosed marine areas are also inappropriate. Fish farming supports combined use with algae and shellfish farming (for ecological reasons) and states that fish farming can only take place upon application of compensatory measures.

Fish farm planning needs to be done in cooperation with various authorities to ensure the functioning and safety of other important maritime sectors, such as the Maritime Administration to ensure vessel traffic, the Land Board in terms of deposits, etc. Concerning cultural impact, it is important to design fish farms in cooperation with the National Heritage Board, which supports ensuring the good condition of wrecks and maintaining water quality suitable for their preservation.

The conditions set out in the plan largely adjust the *state-developer* relationship (i.e., the guidelines from top to bottom). The terms do not explicitly state how the *developer-current user/stakeholder* relationship is weighed; therefore, decision-making may not be balanced. *The developer-current user* relationship is, for example, balancing the interests of fishermen and aquaculture: under the current planning solution, only spawning grounds are the basis for the decision, not, e.g., finding coherence in the designation of areas suitable for aquaculture in the fisheries used. The proposed activities may also affect coastal values and related activities (recreation, entrepreneurship), so local government involvement may be required. The socio-cultural impact assessment, therefore, proposes that further consideration be given to balancing the interests of the *developer-current user* and the *developer-local government in* the licensing procedure.

The plan excludes the combined use planning of wind farm cable corridors and fish farms, but not the combined use planning of wind farms and the fish farms. The socio-cultural impact assessment suggests that consideration be given to enabling this combined use. As both are new areas of development, public support for the development and implementation of the rules and practices of combined use is essential. The socio-cultural impact assessment proposes to include the topic of the development of rules and practices for combined use and their implementation in the planning agenda. The results of the Maribe project highlight the biggest barriers to entry into the blue economy (Table 4.2.1.4-1).

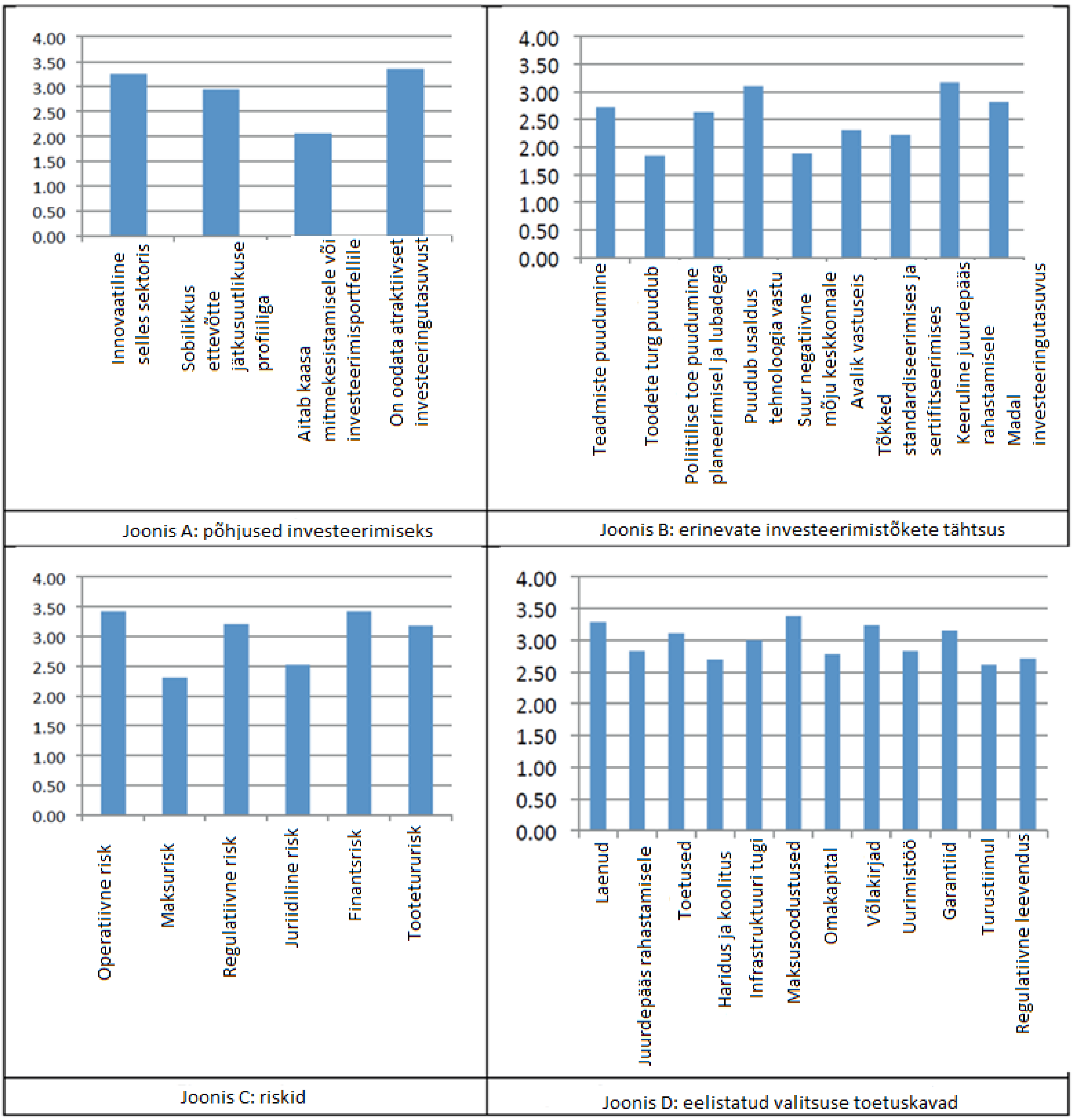

Figure 4.4.1.3-1. Reason, obstacles, and recommended public support for investing in the blue economy. (Source: Marine investment for the blue economy. Maribe project booklet: work packages, case studies, and results. http://maribe.eu/wp-content/uploads/2016/08/maribe-booklet-final.pdf)

Shellfish and algae farming Maritime Spatial Plan also does not define shellfish and algae farming areas, but rather guides development through conditions and identifies areas that are naturally most suitable for that. The potential for algae cultivation is wider, extending from the Baltic Sea to the Gulf of Finland and also covering the Väinameri Sea and the Gulf of Riga. Areas naturally suitable for shellfish farming lie west of the major islands. Farming is excluded in shipping lanes, STS areas, and areas used for national defense purposes. In the rest of the marine area, shellfish farming, and algae farming can be planned either independently or in combined use (with wind turbines and fish farms). Similarly, to the design of fish farms, the parties involved in the licensing procedure who have an interest in the operation of other economic sectors and in the protection of values are identified. The conditions and guidelines set out in the plan support the functioning of different sectors more broadly.

Because algae farming, in particular, is naturally possible over a wider marine area and is not subject to depth/openness constraints, farms can be located in both deeper and shallower seas, spatially overlapping with the areas of both trawl and coastal fisheries, and have an impact on the coast. Overlaps can lead to the emergence of both synergies and conflicts: for example, aquaculture supports land-sea interactions both on the coast (port operations and local employment) and more broadly (e.g., processing of produce; local marketing of certain products). Conflicts can occur, for example, in terms of fishing grounds and, in principle, with recreational water and coastal uses. In order to increase synergies and prevent/mitigate conflicts, it is important to involve both fishermen and the local authority in the location-based decision-making processes (e.g., within one nautical mile; the scope needs to be clarified as part of a comprehensive analysis of the potential rights and obligations of local authorities in the Maritime Spatial Plan. Involvement processes are foreseen at the licensing procedure stage but are expected to require further discussion on the issue of local government rights in the Action Plan**.** As a new field of application, there is potential for new land-sea interactions (see Figure 4.4.1.9-1 for more land-sea interactions*)*.

In order to encourage combined use, the socio-cultural impact assessment also proposes that consideration be given in principle to the combined use of aquaculture farms and solar and wave energy. The potential of wave energy is not considered high in Estonia - the main focus is on developing wind energy. At the same time, it cannot be ruled out that the establishment of farms and the development of energy technologies will create the opportunity and need to use other sources on a small scale. For example, the Maribe project (*Marine Investment for the Blue Economy*, see http://maribe.eu/) highlights the already existing combined uses in other marine areas: combined use of wave energy and algae farming. A wave trap will create a quieter sea area in the windward side, creating a suitable environment for algae cultivation; the energy produced enables the transport of both the wave trap and the algae farm, if necessary).

At the same time, solutions in one marine area may not be suitable for another marine area. Uncertainty is compounded by the lack of awareness of the direction in which technologies are evolving and, consequently, of new opportunities for synergies. However, from a socio-cultural impact standpoint, the Maritime Spatial Plan has to take an enabling approach and consistently support innovation, mitigating known risks based on value preservation needs or anticipated operational conflicts (e.g., when a device requires anchoring, it is necessary to consider the location of monuments, underwater cables, etc., similar to other operating conditions; certain combined uses are not possible - for example, national defense and wave energy).

Technologically, the nature of combined use in linking wind turbine areas and shellfish farming may also be the simultaneous use of the marine area, i.e., the shellfish lines are not directly attached to the wind turbine foundations, but farms use the same area in the sea. Synergies between activities can also be evident in other areas: e.g., shared service vessels and onshore infrastructures, shellfish farming lines can impede access to the space between wind turbines, which contributes to the security of the area's operation; shellfish lines can calm the waves somewhat, which reduces pressure on wind turbine structures [110].

4.4.1.4 Maritime transport

Maritime transport is also one of the longer-term uses of the sea, and therefore the cultural impact of maritime transport is widespread: besides material heritage (e.g., ancient finds, ships, maritime schools, shipbuilding sites, etc.,) intangible heritage, which still affects global values (e.g., the sea as freedom and opportunity) and regional perception of place (regional captains and captains' villages, home ports or construction sites of legendary ships, etc.) plays an important role. In Estonia, maritime transport has had very different purposes - e.g., Baltic German land exploration, from legal friendly trade to illegal spirit smuggling, from pleasure trips to fleeing the country.

Today's cultural and socio-economic impact of maritime transport is related to both passenger and freight transport and recreational shipping. Maritime transport related to the activities planned under the plan is also of a service nature. The impact of maritime transport in the water area can be manifested on the water surface (also on ice in the case of ice routes) and partly in the water column, on anchoring on the seabed. The most important basis for maritime transport is safety, which affects or even excludes certain other uses of the sea.

Maritime Spatial Plan reflects known shipping lanes and designates waterborne traffic areas based on traffic volume and directions elsewhere. Outside these areas, traffic is allowed, but it depends on the size and natural conditions of the ship and is rather rare. As a traditional form of marine use, maritime transport is, at the same time, a domain using the marine area that needs to also “accommodate” other activities. The operation of shipping lanes, which is subject to stricter conditions, is therefore essential for maritime transport. At the same time, other maritime uses can take place in waterborne traffic areas if there is a corresponding site-specific interest. The guidelines and conditions to be set have a positive overall and widespread impact on the functioning of maritime transport and other maritime uses.

Maritime Spatial Plan points out that naturally suitable harbors are often already in use and stipulates that when designing new small craft harbors, it is necessary to give priority to naturally suitable locations. In view of the land-sea interactions and the wider socio-economic benefits of the coastal area, it is advisable to design ports also where, in addition to the port's own services, it is possible to use other services of the area, visit sights, etc. within a reasonable

110 Maribe project: https://maribe.eu/blue-economy-growth-science-research-aquaculture-floating-offshore-wind-2/, *Maribe final report „Maribe recommendations for future funding calls in Blue Growth MUS and MUP”.*

distance. The need to take into account the functional hinterland of the port when selecting new small craft harbors is a proposal for the Action Plan: an input to complement the concept of small craft harbors or to prepare another development document.

Ports play an important role in land-sea interactions. The plan proposes a functional classification of ports. The socio-cultural impact assessment also suggests that the functional classification of new maintenance vessels of marine use be considered - the needs of new branches in ports may differ slightly from those of established branches.

The plan also reflects the ice routes typical of the Estonian marine area, also as marine transport, but there is no need to direct the topic further.

4.4.1.5 Maritime rescue, pollution control and guarding the state border

The need for maritime rescue, pollution control, and guarding the state border is present throughout the Estonian marine area due to wider social and national defense needs. In these functions, it is primarily important to ensure coverage and capability in the marine area.

The plan emphasizes the importance of ensuring maritime rescue capabilities throughout the water area, which in terms of land-sea interaction, means systematic planning of accesses and rescue infrastructure across the coastline (i.e., in cooperation between local governments and across local government boundaries). As Maritime Spatial Plan increases diversification of the use of the marine area and intensification of activities, the need for marine rescue is increasing. Addressing the issue is targeted at local government comprehensive plans while identifying a wider need for both maritime rescue and pollution control is important already at the national level, also considering what is planned by the Maritime Spatial Plan: for example, specific sea rescue in the area (for example, when the plan is implemented, new marine uses are expected to occur in the waters of the major islands and of western Estonia, which may require additional and/or region-specific maritime rescue (e.g., potential dangers are collisions wind turbines, encroachment on aquaculture facilities, etc.). The analysis of rescue capabilities and needs assessment at the national level is important in cooperation between the Police and Border Guard Board and interested parties - the assessment of socio-cultural impact proposes to consider including such activities in the Action Plan.

Marine pollution response capacity is concentrated mainly in the Tallinn area, but regional ports must also be prepared for pollution response. The plan considers it important to increase national pollution control capacity. The plan also identifies the growing problem of sea litter, but not the measures or responsible parties to raise awareness and solve the problems. The socio-cultural impact assessment proposes to include the topic in the Action Plan.

4.4.1.6 Energy production

The use of the marine area for the development of renewable energy is a new use of the sea in Estonia and thus an important focus of maritime spatial planning. As for the region, the greatest potential Estonia has for developing wind energy is offshore. As energy technologies evolve, the plan points out that in the longer term, the coastal sea can also be used for cooling and thermal energy (on a densely populated coast), and in the longer term, wider opportunities for renewable energy production (e.g., solar and wave energy) are envisaged.

Renewable marine energy has a broader positive and long-term impact. The design of wind farms has a significant impact on the achievement of national renewable energy targets and the direction of the carbon-neutral economy. Wind energy development also plays an important role in generating and transferring economic and social innovation and opportunities for additional employment (see also the impact of energy production on the economic environment in Chapter 4.6.4).

The Maritime Spatial Plan identifies offshore wind farm areas and innovation areas for the design of wind turbines on floating foundations. In both cases, the impact occurs both on the water surface, on the water column, and on the seabed. Wind energy development planning also necessitates the construction of cable corridors from land to wind farms, with the impact on the seabed. The Socio-cultural impact in wind farms is manifested by the visual impact on the water surface and the potential for combined use from the water column to the seabed. Combined use and visual impacts are important impacts that the IA focuses on.

The design of wind energy development areas in the plan was carried out by phased exclusion, where areas that are suitable for natural and wind conditions are gradually excluded from suitable areas for various reasons. Various national interests and needs and nature conservation interests have been taken into account when finding suitable areas for wind farms. The exclusion process has also taken into account the need to mitigate visual impacts and has set wind turbines at least 6 nautical miles from the shoreline (the distance of the wind turbine at the border of the wind zone, closest to the coast is ~ 11.1 km). Based on the interim decisions made during the exclusion, wind energy will not be developed in the Gulf of Finland as it is not feasible in the timeline of the planning. As a result of the exclusion, three development areas have been identified suitable for wind energy development, which are located in the Baltic Proper and the Gulf of Riga. The innovation area of wind turbines is farthest from the coast offshore. Depth variations in wind farm development areas are outlined, but the planning does not specify the stages/phases which area suitable for wind farms should be deployed first. The innovation area of wind turbines can also be immediately deployed. In terms of impact assessment, the methodology generally takes into account balancing different national interests and mitigating the local impact. Considering the need to balance national and local interests, wind turbines may cause visual disturbance for some groups of residents, despite the distance limitation (see further below for visual impact assessment). The infrastructure involved in the design of wind farms (e.g. cables, substations[111]) is expected to have little visual impact.

4.4.1.6.1 Combined use

For wind farms, the possibility of combined use with aquaculture is outlined, in particular with shellfish and algae farming, but fish farm planning is also possible.

For additional opportunities for combined use, the Muses project (*Multi-use in European Seas*[112]) highlights the possibility of combining marine tourism and wind farms in the Baltic Sea, as well as the combined use of diving and wind farms in case of high visibility.

A theoretical long-term option is also the combined use of wind farm areas with other forms of energy as opportunities and technologies develop (including solar and wave energy).

With regard to combined use, Plan4Blue[113] highlights the risk that the combined use areas may be designed too intensively: while pursuing multiple objectives, activities become mutually exclusive or endangering.

From the standpoint of the socio-cultural impact assessment, risks can be mitigated by combined zoning uses: for example, combined use area for wind turbines and shellfish, combined use area for wind turbines and marine tourism, etc. A set of rules can be agreed between interested parties on which parts of the wind farm can be used for visiting and diving, and under what rules, as well as which areas of combined use are so-called "closed." Deploying combined use is a time-consuming activity, and this Maritime Spatial Plan takes the first steps in implementing combined use. The role of the state in the development of combined use is support for the development and implementation of rules and practices, the promotion of bodies/platforms for co-operation and the setting of rules for possible combined use in the development licensing process (a similar recommendation is given in the aquaculture chapter for the Action Plan).

In addition to combined use, the socio-cultural assessment also makes the following suggestions for renewable energy production planning:

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[111] Based on the data of Elering AS the bottom area of the offshore substation platform is approximately 100 x 100 m, eg in the case of a 1500 MW station, the height of the building is up to 100 m, but the main part of it is the high-rise building of about 5-storey house.

[112] https://muses-project.eu/wp-content/uploads/sites/70/2018/10/D4.3-Sea-Basin-Syntheses.pdf

[113] Ida Maria Bonnevie (2019) Spatial analysis of co-location in MSP, Plan4Blue, Final conference 4–5 June 2019, presentation.

- the introduction of wind farms also requires the design of cable corridors on the seabed for connection. The proposal is to include, as a condition for the design of the cable corridors, the need for cooperation with the National Heritage Board (to avoid damaging the seabed's cultural assets) and the Ministry of Defense (to identify potential historic explosives and dangerous objects).
- the threshold for introducing a wind energy innovation area is relatively high, as the area is farthest from the coast. In principle, a cable connection to the innovation area would also be possible via the Venstpils-Hall corridor. The proposal is to consider highlighting the importance of the international corridor in MSP and/or to show the direction on the figures showing the possible cable connections (there is currently no connection to the cable corridor in the innovation area).
- to support marine renewable energy innovation on a broader basis and to include the topic in the Action Plan. It is expedient to develop cooperation in the field of innovation with Latvia and Finland.
- As the distributed generation is being developed globally, the planning could also consider promoting, for example, the development of local small-scale distributed generation solutions (single wind turbines, etc.

4.4.1.6.2 The visual impact of wind turbines

The construction of the wind turbines involves a visual change in the landscape both at sea and on land, the visual impact is perceived through landscape change. The importance of the landscape and the visual impact is reflected in the relation between the extent of the change and the receptivity of its recipient (i.e. the landscape and the observer) [114].

The effects on the landscape are mostly understood through the effects on and caused by a person, by understanding the human-perceived surroundings as a landscape. The landscape is an environment where social and economic activities take place, creating a basis for the framework of feelings, emotions and perceptions[115]. Arold has pointed out that in folk parlance, a landscape (field of view) is usually understood as a landscape which surrounds the observer in its forms and colours. The visible surroundings are named here according to the visual impression.

There is no legal definition of the concept of landscape in Estonian national law, but the European Landscape Convention, which entered into force for Estonia in 2018, defines the landscape as an area, **as perceived by people**, whose

[114] "Guidance material of methodological recommendations for visual impact assessment to promote the development of offshore wind farms" (Artes Terrae, 2021), p 7
[115] Arold, I. Estonian landscapes, p 9. Tartu Ülikooli Kirjastus 2005.

character is the result of the action and interaction of natural and/or human factors[116]. As the convention applies to the entire territory of a Contracting Party, including the maritime area, in addition to the land and inland waters, the Estonian legal space also includes the territorial sea as the landscape.

Estonian legislation does not deal with visual impacts or their assessment, nor are there any norms or standards for this. The visual impact of the wind turbines is both an environmental impact and an appropriate social impact under the Planning Act[117]. Therefore, the impact assessment proposes the mitigation measures for the authorization phase and for further studies.

Background

The visibility of wind turbines from the coast depends on many factors: the distance, height and location of the wind turbines; the height of the observation point and the landscape nature of the field of view, etc. The curvature of the earth will also play a role in the visibility of offshore wind turbines (see Figure 4.4.1.6.2-1 below).

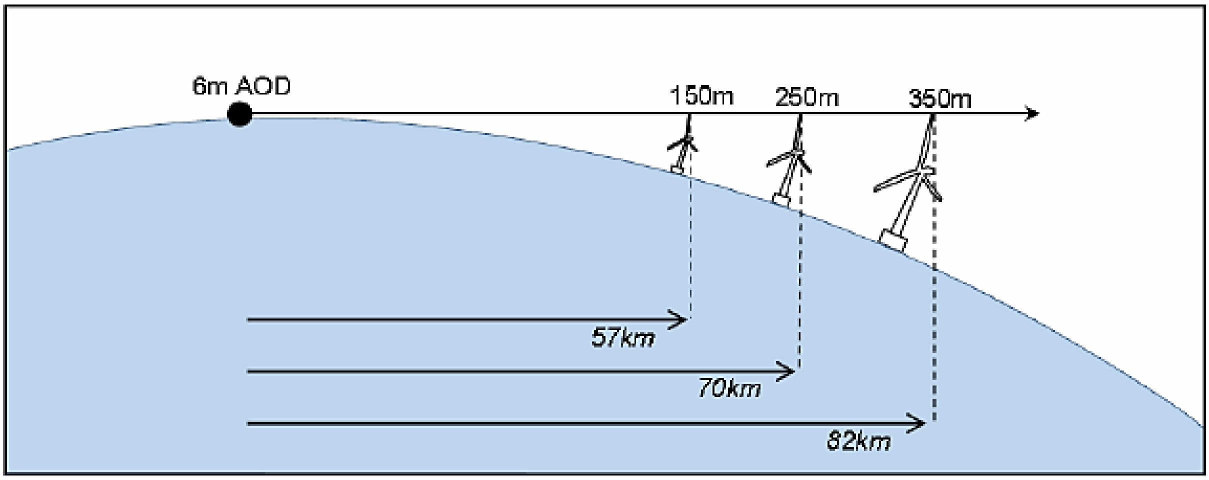

Figure 4.4.1.6.2-1. Impact of the curvature of the earth on visibility: due to the curvature the visibility of wind turbines decreases, but the visual acuity is primarily limited by the visual acuity of the human eye [118] (AOD stands for Above Ordnance Datum,i.e. height above sea level).

The visibility of the wind turbines varies by night/day and weather conditions: in the dark you can't see the wind turbines, but in the sea you can see the lights

[116] European Landscape Convention https://www.riigiteataja.ee/akt/228022018001, article 1 clause a

[117] Ministry of Finance, 2018. Recommendations for the preparation of a comprehensive plan Chapter 6. The legal framework and principles for the assessment of relevant impacts in this guidance material also apply to the assessment of the relevant impacts of a maritime spatial plan as a thematic plan of a national plan.

[118] White S., Michaels, S., King, H. (2019) *Seascape and visual sensitivity to Offshore wind farms in Wales: Strategic assessment and guidance. Stage 1- Ready reckoner of visual effects related to turbine size*. Report No 315

placed on top of the masts. Cloudy and foggy weather conditions [119] reduce the visibility of wind turbines, the latter are more visible in contrasting conditions[120] (e.g. in clear weather at sunset).

The **visual impact** of seeing the wind turbines depends on the observer's subjective perception (sensitivity), cultural value and landscape quality attributed to the observation point or view, extent of the change in view, previous experience and other factors[121].

The observer's experience is also different: although wind turbines may be a visual disturbance to some sections of the population, some sections of the population may be neutral or positive: wind turbines may be interesting and progressive. Negative and positive experiences can occur at the same time (e.g. wind turbines can be visually disturbing but recognized as necessary). The perception of the wind turbines as a disturbance can change over time - for example, getting used to wind farms can reduce the visual impact and make the new situation normal[122]. The visibility of wind turbines and the associated visual impact are therefore very multifaceted. The visual impact of each specific wind farm, as well as the combined effect of wind farms, and the sensitivity of the viewer will be determined during the impact assessment during each authorization procedure.

Visual impact of wind turbines

The visual impact of the wind turbines is especially evident on the west coast of Saaremaa, where the smaller wind turbine area (area 3) is located northwest of the Tagamõisa peninsula and the larger area (area 2) from Vilsandi to Sõrve. The nearest wind turbine is 6 nautical miles (*ca* 11.1 km[123]). In the Gulf of Riga,

[119] See, for example, the *Visibility Threshold Study conducted in New York State. New York State Offshore Wind Comprehensive plan* (2017), which took into account the prevailing local weather conditions by seasons and different times of day and found the probabilities of visibility of the proposed offshore winds at different distances from the coast.

[120] Visibility Threshold Study. *New York State Offshore Wind Comprehensive plan* (2017), NYSERDA Report 17-25s; Bishop, I.D., & Miller, D. (2007). *Visual assessment of off-shore wind turbines: The influence of distance, contrast, movement and social variables. Renewable Energy*.

[121] Visual impacts have been assessed in the scientific literature on various onshore wind turbines around the world, with offshore wind farms based primarily on European samples (Denmark, Germany and the UK) but increasingly also on US offshore wind farms (eg Rhode Island, Massachusetts and New York).

[122] Ladenburg J. (2009) *Visual impact assessment of offshore wind farms and prior experience. Applied Energy*.

[123] In addition to economic circumstances, the results of the GorWind (2010–2012, http://gorwind.msi.ttu.ee/home/info) project survey data have been taken into account in determining the closest distance of wind turbine areas from the coast in Estonia, on the basis of which about 41% of the respondents would accept wind turbines as a distance of 10 km from the coast (38% remained hesitant). In the planning solution the distance of the wind

wind turbines have the most visual impact on the island of Ruhnu (distance ~ 11 km), the wind farms are also visible from Kolka cape in Latvia (the location of the nearest possible wind farm in the area is about 21 km), which is why the impact is cross-border[124]. The innovation area is not expected to have a visual impact on the coastal viewer: there are wind turbines in the wind energy development area 2 between the innovation area and the coast, and the area is also furthest from the coast and outside the limit of the resolution of human eye (50+ km).

The scope and significance of the visual impact will be influenced by the guidelines and conditions set by the plan. The maritime spatial plan has already set conditions to reduce the visual impact. The basis for identifying additional necessary conditions was the guide "Guide to methodological recommendations for visual impact assessment to promote the development of offshore wind farms" completed in January 2021 (Artes Terrae, 2021[125]), which has also been used in this impact assessment.

As the draft plan has been supplemented with the starting points for wind energy planning after its publication (autumn 2020), it is also possible to analyze the impact of these parameters in more detail. For the purpose of visual impact assessment the following expected parameters have an impact: the height of the wind turbines (in the size class of 300 m), the diameter of the rotor (in the size class of 250 m), the minimum distance between the wind turbines (min 800 m) and the distance between wind farms (min 2 km). Following the publication of the main solution of the plan (2020), the scope of the wind energy development areas found for the first time has also changed slightly.

The impact assessment therefore focused on the visual impact of the wind turbine parameters and on the guidance material already set and required in the light of the guidance material. The assessment also highlights the link between the change in the scope of the wind energy development areas and the visual impact.

Visual effects due to the height of the wind turbines

The starting point for the maritime spatial plan is the wind turbines in the size class of 300 m. However, the wind turbines to be built closer to the coast in the first phase are likely to be lower due to the technologies available on the

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turbine areas was determined a little further than the results of the survey: 6 nautical miles or approx. 11.1 km from the coast.

[124] 21 km is outside the zone with the greatest impact (see further analysis), but a change in views is possible. As the wind turbines are expected to remain visible from only one view (northeast view), this is not a significant impact. The Latvian state has not submitted any proposals or views on this issue in the framework of cross-border co-operation, although the wind turbines remain visible.

[125] The abbreviation *guidance material* is used to refer to the document in Chapter 4.4.1.6

market. Given the models developed today and the rapid development of technology, the wind turbines closest to the coast are likely to be at least 200 m high[126].

The designing of the wind turbines in the height class of 300 m involves:

- the implementation of the plan will have a significant visual impact in certain areas, both on the coast and inland. Due to the height of the wind turbines, the impact area is not limited to the coast: the area with the highest local impact of 300 m high wind turbines is approximately 20 km from the wind farm (the wind farms are visible approximately within 50 km[127]). The area with the greatest local impact in case of the development area no 2 thus extends approximately 9 km to the mainland (see Figure 4.4.1.6.2-2), covering a part of Vilsandi National Park and the coastal zone in the southern direction, including the entire Sõrve Peninsula. The entire island of Ruhnu remains within the area with the greatest local impact of the development area no 1.

[126] At the stage of the impact assessment it is difficult to say the more precise size class, as the selection/height of the wind turbine will become clear during the authorization phase. It is probable that the design of wind turbines in the size class of approx. 250 m will be possible, as the models reaching the market are already in this size class.

[127] The scope of the sites is based on guidance material. The area with the greatest local impact is considered to be ~ 20 km from wind turbines, at or near which the wind turbines of 200 m and higher can cause significant visual effects. Approximately 50 km is the approximate visibility distance, this distance should be taken into account when assessing the visual impact.

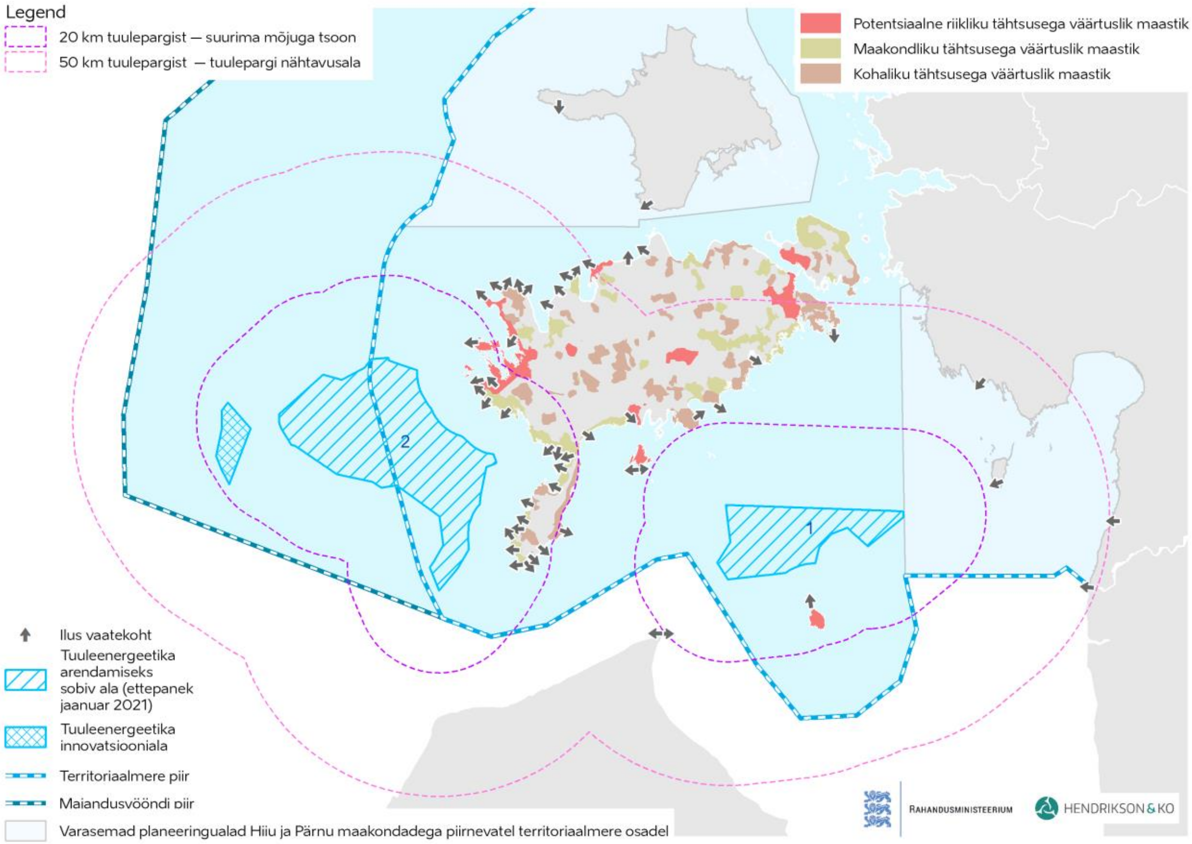

Figure 4.4.1.6.2-2. Area with the greatest local impact (approximately 20 km) and visibility distance (~ 50 km, maximum distance to the human eye in clear weather) calculated from the outer boundary of the wind energy development area

- The area with the greatest local impact should definitely be considered as an approximate distance - for example, both the island of Abruka and the Vätta peninsula are located on the border of the area with the greatest local impact, and the southern coast of Saaremaa is open to development area 1. The wind turbines closest to the coast of the development area 1 would be about 21 km from the end of Kolka cape in Latvia, which makes it possible for the area with the greatest local impact to reach the Latvian mainland.

- The impact will remain significant on the coast even if the wind turbines with a height of 200-300 m are planned in the farms closest to the coast, as the primary line of wind turbines is still 11.1 km from the coast. The extent of the local impact area may change. As the specific heights of the wind farms to be developed are not known at the planning stage of the marine area, the impact assessment is based on the height specified in the plan as a starting point. When planning individual wind farms and assessing landscapes/visual impacts at the level of authorization, the scope of the area with the greatest local impact should be specified based on the location of the specific wind farm, technical parameters, taking into account the specifics of the landscape, etc.

- The wind farms of different heights can be realized within the entire wind energy development area. The main solution of the plan as of August 2020 does not provide guidelines that adjacent wind farms should be of similar height. As the found wind energy development areas are relatively wide in some places (area 2 max approx. 35 km), the difference in the height of the wind farms located in the deeper offshore is not decisive. Visually, the most noticeable is the first row of wind turbines at different heights when viewed from the coast. This is especially true for the wind farms closest to the coast - 11.1 km off the coast.

The assessment of the significance of the impact is based on the analyses performed and scientific literature. For example, Sullivan (2013) [128], by comparing the already built wind farms, found that under good observation conditions the wind turbines of about 137 m high, 10–16 km from the coast, clearly attract the viewer's attention with contrast, colour, texture, glow and movement. Thus, the wind turbines developed to date (with a total height almost twice as high as in Sullivan's comparative analysis) [129] can be considered to have the greatest impact at the same distance (the wind turbine dominates visually). Recent analyses also point out the same[130]. As modern higher wind turbines are still largely undeveloped, the extent of the greatest local impact presented above is an estimated expert opinion and should therefore be considered as indicative.

The main possible measure to mitigate the effects of wind turbine altitudes would be to install the wind turbines offshore. Planning the wind turbines further offshore (e.g. 20 km off the coast to prevent the area with the greatest impact from falling to land) would mean the decrease of wind energy development areas by half. The moving of wind turbines further out to sea can therefore have a positive effect on reducing visual impacts, but it also increases the unit cost of renewable energy, which affects the wider population socio-economically.

[128] Sullivan, R.G., Kirchler,L.B., Cothren, J., Winters, L.J. (2013) *Offshore Wind Turbine Visibility and Visual Impact Threshold Distances. Environmental Practice,* Volume 15.

[129] Eg Haliade-X, with a top height of 248 m

[130] The expert opinions based on analyses have been provided according to the samples of the UK, for example, by White Consultants with Northumbria University, 2020. Offshore Energy Strategic Environmental Assessment. Review and Update of Seascape and Visual Buffer study for Offshore Wind farms. Final report for Hartley Anderson. The guide compiled by Artes Terrae (2020) also refers to this topic.

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The depth of Estonia's sea area is increasing rapidly as it moves away from the coast, which is a significant obstacle to the development of wind energy. By considering Estonia's renewable energy and climate goals and the strategic direction for renewable energy, it is not in the country's interest to reduce the development areas of wind energy to such a significant extent. In addition, as the wind turbines up to 300 m high can be designed, wind turbines would still be visible 20 km from the coast.

As a planning measure the next step would be to selectively design wind turbines for deeper seas in those coastal areas that are known to be the most valuable: near potential landscapes of national importance, i.e. Vilsandi National Park and Ruhnu Island. If the wind turbines were moved to a distance of approx. 20 km from the coast in these valuable landscapes, the result would be analogous to the above: the development areas of wind energy would decrease significantly, which again does not support Estonia's renewable energy and climate goals.

In addition, it can be pointed out from White Consultants et al. (2020)[131] that the significance of the impact on landscapes and thus the need for mitigation measures depends on how sensitive the landscape is to change. The sensitivity of the landscape depends on both the value of the landscape and the planned activity (extent of change). However, the highest class of valuable landscape (e.g. potential landscape of national importance or national park) does not mean that the landscape is automatically the most sensitive or equally susceptible.

At the time of the impact assessment the value classes and general descriptions of the landscapes are known on the basis of the thematic plan *Environmental conditions guiding settlement and land use (2007)* of the county which first addressed the topic of Saare county plan and valuable landscapes. However, the descriptions of the landscapes are not sufficiently precise and focused for the design of offshore wind turbines, there are no descriptions of the views (see explanation below). During the preparation of the maritime spatial plan the largest extent of the wind energy development areas is also known, however, the location of wind turbines (which also depends on the more detailed studies and analyses based on the conditions of the plan) and exact parameters (to be found out at the authorization stage) are unknown.

The landscape sensitivity assessment can therefore be carried out at the level of the authorization procedure. The moving of wind turbines farther to the sea to a smaller extent (e.g. by a few km, in a certain section, at a certain angle, etc.), reducing the height of the wind turbines, colouring the wind turbines, etc. may be one of the mitigation measures also in the context of the impact assessment conducted during the authorization phase. The topic of landscape

[131] Sama, mis eelmine.

sensitivity has been explained in more detail in the Guide to Visual Impact Assessment[132].

It is important that the sensitivity assessment is based on an additional analysis / inventory of the affected landscapes, including a review of the already identified valuable landscapes.

It can be seen from Figure 4.4.1.6.2-2 above that several of the valuable landscapes determined by the Saare County Plan 2030+ remain in the zone with the greatest local impact. As the zone with the greatest local impact may be wider, other coastal landscapes (e.g. potential landscapes of national importance Abruka, landscapes of the southern coast of Saaremaa), from which the wind energy development areas are visible, may also be significantly affected.

The inventory of the landscapes is important in order to create a renewed common basis on which to base more detailed planning and impact assessments of different wind farms. As the treatment of valuable landscapes in Saare county plan is land-centric and the status quo in the marine area is not expected to change significantly, the description of coastal landscapes is sometimes rather general. One of the valuable components of landscapes is the beautiful views of the sea, but their content is not sufficiently explained. The mapping carried out in the framework of the impact assessment of the maritime spatial plan (see below) revealed that certain usable viewing points are missing from the county plan, therefore the information may be somewhat inaccurate or changed.

The need for an inventory is also due to the fact that a general mapping based on one methodology is required, rather than mapping by different developers and presumably based on a different methodology. As several wind farms are expected to be visible from one valuable landscape, it is not practical for different developers to map the same onshore area multiple times. It is possible to carry out the inventory of landscapes, for example, within the framework of the comprehensive plan of Saare local municipality to be prepared or at another more general level or in cooperation with developers by areas. When inventorying/ assessing landscapes, it is expedient to take into account the existing mapping (incl county valuable landscapes, mapping of viewing points carried out within the framework of this impact assessment). The focus could be primarily on coastal landscapes, from which the planned wind energy development areas can be seen (up to approx. 5 km inland).

[132] See in more detail "Guidance material of methodological recommendations for visual impact assessment to promote the development of offshore wind farms", AB Artes Terrae OÜ, 2020.
http://mereala.hendrikson.ee/dokumendid/Uuringud/Meretuuleparkide_visuaalse_m%C3%B5ju_hindamise_juhend_final.pdf

In addition, in order to reduce **the visual impact on the wind farms closest to the coast (11.1 km), it is considered to add a guideline or condition that the design of wind turbines of the same altitude is preferred.**

Breakdown of wind areas

The approach to maritime spatial planning creates the potential to mitigate the visual impacts by setting a guideline: *the horizon must be sectioned (i.e. not completely covered by a wind farm)*. The plan also states that wind turbines should be located in as compact a group as possible (i.e. not scattered, but concentrated). These conditions are interpreted in the impact assessment as the planning of areas free of wind turbines in the wind energy development areas. The possibility of planning wind turbine free areas and their width will become clear during the superficies licence procedure and on the basis of more detailed analyses (incl. landscape analysis).

It is probable that the found wind energy development areas do not completely overlap with the wind farms, according to the plan to the extent of approx. 70%. In terms of visual impact assessment this also creates the potential for the breakdown of wind areas. This principle has also been taken into account in the plan, by setting the general guideline that *the areas/corridors free of wind turbines will be created in the development areas of wind energy due to different interests, which should perform as many different functions as possible.*

At the time of the impact assessment only one waterway corridor is known that could act as an articulator for the observer on the coast: Ringsu-Roomassaare waterway is planned (approx. 2 km minimum) through the wind energy development area 1. It is also known that wind farms should have a minimum distance of 2 km, but it is not known where these are located in the wind energy development areas. At the same time, the min 2 km wide distances between the wind farms and the given fairway width may not be sufficient to create a perceptible articulation of the horizon and the area free of wind turbines in both areas 1 and 2. In other words, the area free of wind turbines should be wider to perceive the articulation. The location of wind turbines also depends on more detailed research and analysis at the level of the authorization based on the conditions of the plan.

The extent of the areas free of wind turbines can be analyzed in more detail, if more information is available as part of the authorization procedure. As much of the more detailed information will be provided at the authorization level, the impact assessment will focus on which coastal areas need to be addressed in order to find the possibilities to retain the wind turbine-free areas when locating the wind turbines.

As part of the impact assessment the mapping of coastal views was carried out, based on the beautiful views of the county-wide spatial plans and the coastal sites of the Island Geopark. The additional viewing points were added to the established class I valuable landscapes (if not mentioned in the county plan[133]) and additional viewing points that emerged from the Instagram mapping. The sights were mapped as cultural and landscape values, the preservation of which is important for both local and regional visitors.

In case of the found sights the distance of the viewing point from the wind area and the presence / absence of free viewing directions was determined and the significance of the effect on the viewing point in the combined effect of these features was assessed. In addition, social media mapping was conducted on Instagram, which provided quantitative information on how many viewing points are estimated to be used and qualitative information on which values were associated with one or the other viewing point[134]. As a result of the visual impact assessment the following Figure 4.4.1.6.2-3 has been completed, the summary table of the analysis has been provided in Annex 3.

The mapping results indicate that for wind turbines in the size class of 300 m in height, the sites with the greatest local impact shown in Figure 4.4.1.6.-3 are the most affected, the wind area is closest to the coast and there are few windmill less views (red arrows in the diagram below). Such viewing points are located on the west coast of Saaremaa from the bank of Elda to the top of the Sõrve foothills (no. 16–29[135]) and in Ruhnu (no. 42). The view of Ruhnu Island is also cumulatively affected by the wind energy development areas planned in other maritime spatial plans (in the maritime areas of Pärnu and Latvia). The impact on these views is significant and the impact assessment addresses these coastal sections in more detail below.

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[133] For example, the seaviews have been set out as the value of Ruhnu Island, but no views were mentioned in the county planning materials.

[134] The mapping of social media was carried out on the basis of Instagram, the results of the mapping have been provided in Annex 3. Although there are some restrictions on the use of social media (eg younger and middle-aged users), users provide so-called direct and voluntary qualitative information on what the coast and sea area mean to them. Due to the nature of social media, posts that share a positive emotion dominate; sharing negative (unpleasant, sad, etc.) emotions is rather underrepresented. The mapped values primarily reflect the aesthetic, identity and recreational values of the coast and the sea, historical-cultural, especially in terms of tangible objects (eg lighthouses, ships, etc.), but less so in terms of intangible culture (place perception, stories, customs, etc).

[135] Excluding viewing point 17

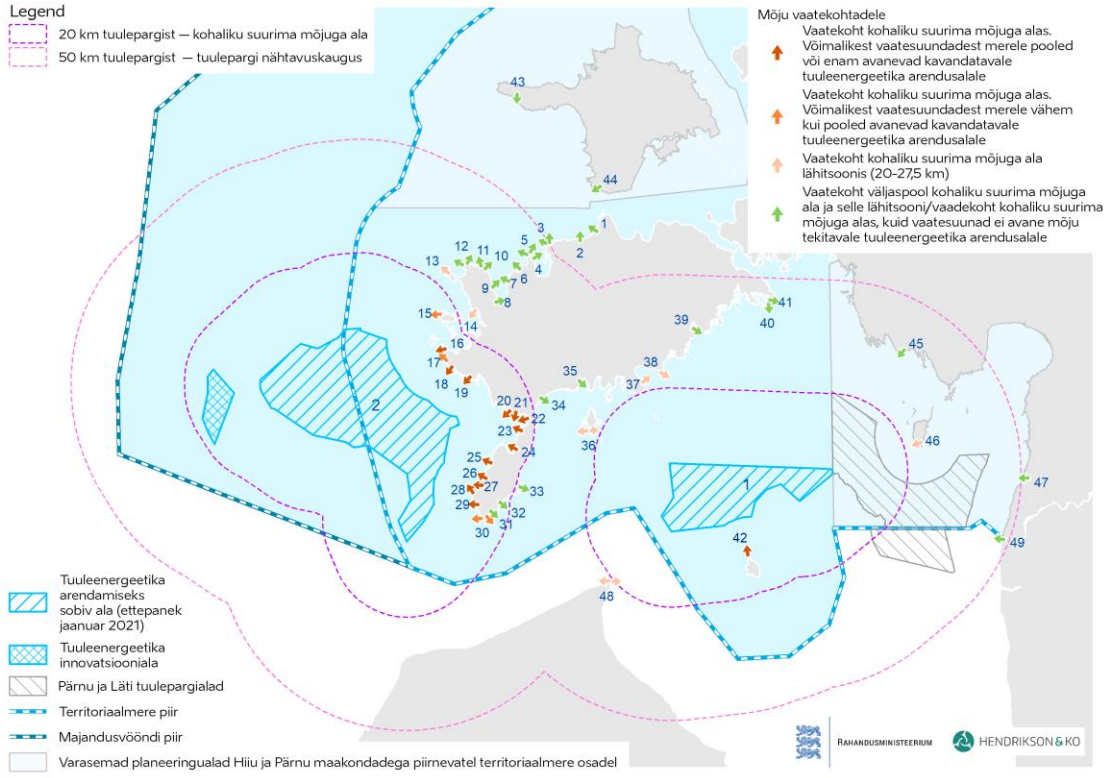


Figure 4.4.1.6.2-3. Results of the analysis of the viewing points carried out during the visual impact assessment (for more information on the number provided for each viewing point, see the analysis table, see Annex 3).

In addition to the sights that have been assessed as having a significant impact, it is necessary to consider viewing points 12, 15, 17 and 30[136] in the area with the greatest local impact (orange arrows in the figure) for more detailed planning of wind farms.

As the extent of the area with the greatest local impact is given in the plan as approximate, the mapping also distinguishes the viewing points that are approx. 20–27.5 km away from the wind energy development area[137]. Such viewing points are, for example, Abruka (no. 36, including the landscape of potential national importance), as well as Kolka cape (no. 48, international impact), which may need further planning precisely as these are located directly on the border of the area with the greatest local impact of the development area 1. It is reasonable to pay attention to viewing points 13 and 14 as these are located in a potential landscape of national importance. In case of viewing points 37 and 38 on the southern coast of Saaremaa, it is also appropriate to specify the magnitude of the impact.

[136] The mapping of the views carried out in the framework of the Maritime spatial Plan (Annex 3) is the input and background information for the impact assessment of the marine area.
[137] The range of 20-27.5 km is considered to be a moderately affected area. The distances of 20 and 27.5 km have been determined on the basis of previous surveys (see Annex 3)

The remaining mapped viewing points are located more than 27.5 km from the wind area and, due to the distance, the impact on the viewing points is expected to be moderate or insignificant. The viewing points in the area with the greatest local impact in the development area 2 (no. 31-33) are also classified in this class. The views of these sights open to the Gulf of Riga, so in case of the impact on these viewing points the visibility of the development area 1 has been taken into account.

In order to mitigate the visual impact in the viewing points where the impact is significant, when locating the wind turbines it is necessary to look for opportunities to leave areas free of wind turbines in the coastal sections of the west coast of Saaremaa and the northern part of Ruhnu in the areas suitable for the development of wind energy. As the west coast of Saaremaa is densely covered with beautiful viewing points, an area free of wind turbines in the wind energy development area cannot be created above every viewing point at sea. Spatially, however, there are certain coastal sections where the most significant sights are concentrated: from the end of Sõrve foothill to Kaunispen, on the beautiful seafront section of Lõmala-Kaugatoma road[138], in Tiirimetsa-Kaugatoma region and from Elda peninsula to Pilguse Bay.

The proposal of the impact assessment is to pay attention to the possibility of leaving / creating a wind-turbine-free area in the three coastal sections of the west coast of Saaremaa, as well as in the northern tip of Ruhnu (see the following figure). With more detailed planning of wind farms, it may become apparent that there is no need or opportunity to leave / create areas free of wind turbines. Therefore, a wind-turbine-free area may not be created over every stretch of coastline shown in the figure. Given the curvature of the coastline, the wind-turbine-free area may already be provided in some directions from the wind farm development area (e.g. between the coastline and the wind energy development area), but the issue needs further analysis at the authorization stage.

[138] The road was designated as a beautiful section of the road in the thematic plan *Environmental conditions guiding the settlement and land use*. The new county plan does not reflect beautiful road sections, but the thematic plan opens the background for determining beautiful views.

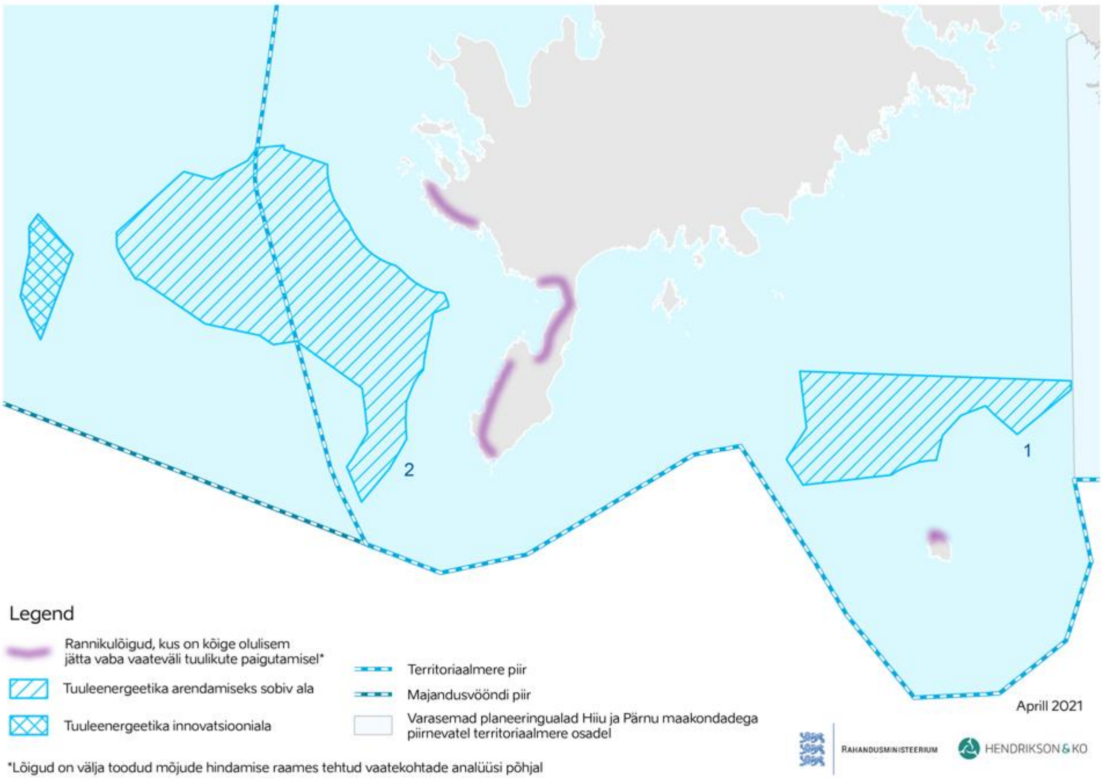


Figure 4.4.1.6.2-4. Coastal areas where, due to the concentration of views, it is necessary to look for possibilities to leave the area free of wind turbines

On the one hand, the proposal stems from providing more flexibility in the design of the wind-turbine-free area in a situation where a large part of the information affecting the location of the wind turbines (e.g. more detailed studies, analyses, etc.) becomes apparent in the next planning stage.

On the other hand, the proposal also stems from the fact that the level of accuracy of the mapping does not differ the viewing points so clearly that it is possible to give a clear preference to each other (the use of the viewing point of the top of Sõrve foothills comes out vigorously, but as stated above, there are also more free viewing sectors from this viewing point).Thus, in addition to the mapping carried out with the previous county plan, the more detailed landscape analysis[139] of the view is needed to specify the effects, as well as the opinion of the local government / community (incl how many viewing points are used by the local government in the general plan). The mapping carried out can therefore be used as a guide to the decision. The involvement of local

[139] For example, some viewing points also have significant views of the islands and peninsulas, others to a lesser extent. Landscape features and details are not as accurately mapped in the current level of mapping accuracy. Also, since it is possible to design about 300 m high wind turbines, which can be seen over mainland, it is all the more important to have visualizations to analyze the visibility of the wind turbines.

people in landscape decision-making is supported by the approach of the Landscape Convention.

The location and extent of the area free of wind turbines should be specified by the landscape architect at the stage of the authorization and in cooperation with the local government, including by preparing the visualizations that take into account the parameters of a specific wind farm(s). The visual impact assessment guide also provides instructions for making visualizations. As the planning / leaving of a wind-turbine-free area is expected to affect several wind farms, it is necessary to consider the free area cumulatively.

The analysis of the abandonment / creation of a wind-turbine-free area in one of the coastal sections shown can be carried out with more detailed planning, for example as follows:

1. to find out possible locations of wind turbines in the wind farm:

a. to find the primary location of wind turbines, taking into account various factors that preclude the location of wind turbines. At this stage it should be clarified whether the wind farm will become relatively compact or whether there will be sparser areas in the park, where there is a corridor with at least 2 km width between different wind farms, and so on.

2. in case of the found location of the wind turbines, analyze whether it is necessary and where it is possible to leave / create an area free of wind turbines. To take into account the landscape analysis of the views of the coastal section and the visual impact on the views, to use visualizations.

    a. The need to leave the area free of wind turbines is when the location of the wind turbines significantly affects the views of the coastal viewing points (i.e. the impact on the main direction / most valuable direction from the viewing point is significant).
    b. If necessary, consider the possibility of leaving the area free of wind turbines: for example, the area free of wind turbines may pass through the wind farm, the area free of wind turbines may form a corridor between different wind farms (or the waterway corridor) or the area free of wind turbines will not be left.
    c. The area free from wind turbines is not left, for example, if the wind farm is evenly dense (there are no sparse areas in the area that would support leaving / creating a free area).

2. To cooperate with the local government and the community in leaving / creating wind-free areas.
3. To cumulatively consider other proposed wind farms.
4. To document the course of the analysis of wind-turbine-free areas so that the decision-maker can follow the bases of considerations.

Another way to mitigate the impact on viewing points in the degree of precision of a maritime spatial plan is to compensate- this means that wind-turbine-free areas are not planned in the wind energy development areas and a significant change in views will be compensated in justified cases and on the basis of legislation (e.g. through the proposed local benefit instrument). The articulations in the development areas may occur for other reasons (e.g. corridor between wind farms, waterway, etc.), but landscape values in the form of views are not considered separately in this case. From the point of view of impact assessment this is not the preferred method, as it is possible to conflict with the guideline set by the plan itself: *the horizon should be articulated (i.e. not completely covered by the wind farm*). In addition, the opinion of the local government (community) on this is very important for the acceptance of the wind farms.

The plan has already paid attention to the compact (concentrating) arrangement of wind turbines. At the same time the visual impact assessment guide has also identified the condition that also supports the creation of wind-turbine-free areas in the wind areas: ***to avoid the formation of small groups of wind turbines on the outskirts of the wind farm, which appear to be separate sets from the main wind turbine row. The impact assessment proposes to include this in the planning as a condition for the authorization phase.***

Wind turbine formations

Different formations are possible when designing the wind farms (see Figure 4.4.1.6.2-5). In case of the built environment, Maslov et al. (2017) [140] point out that a regular and symmetrical arrangement is visually more pleasing than a chaotic (random) arrangement. The symmetrical regular arrangements are therefore preferred for visual impact mitigation.

140 Maslov jt (2017). *Evaluating the Visual Impact of an Offshore Wind Farm. Energy Procedia, Volume 105*

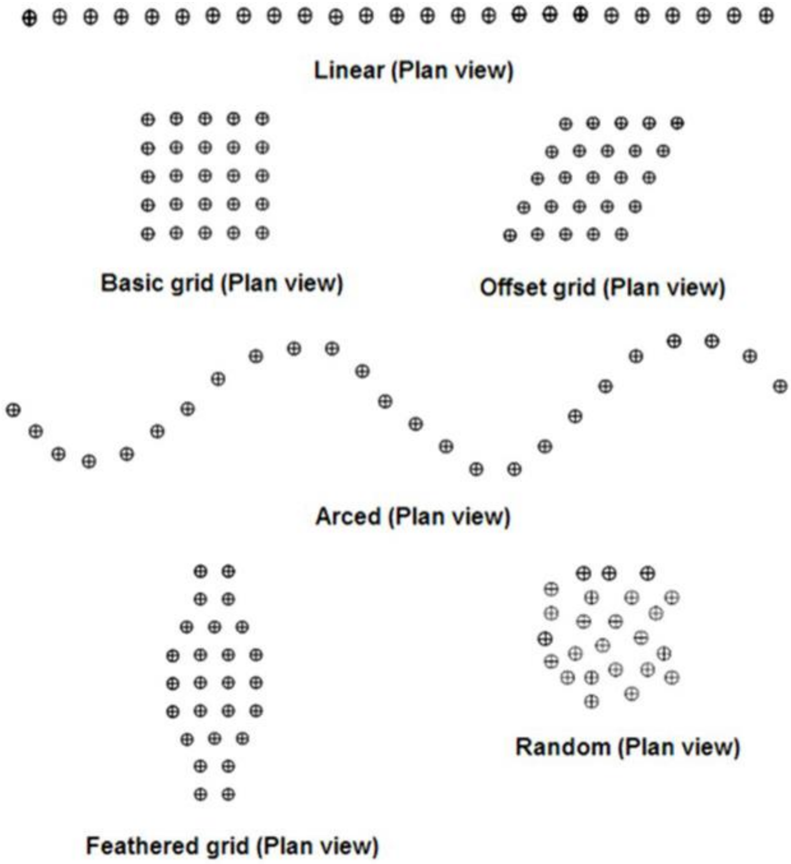


Figure 4.4.1.6.2-5. Wind farm formations[141]

At the same time a regular and thus more pleasant arrangement can open up in a few directions to the observer standing on the shore - even if the wind turbines are placed along straight or diagonal lines, the wind turbines aligned behind each other are visible for the viewer on the shore only in case of few rows or diagonals (see Figure 4.4.1.6.2-6). As the angle of view increases, the symmetry of the wind turbine placement inevitably decreases and the wind turbines are irregularly located in the sea area for the observer.

Figure 4.4.1.6.2-6. The placement and angle of view of the wind turbines affect visual symmetry / irregularity (Source: Scott et al. [142]). In a conventional grid,

[141] Nak Joon Choi, Sang Hyun Nam, Jong Hyun Jeong and Kyung Chun Kim (2014).CFD *Study on Aerodynamic Power Output Changes with Inter-Turbine Spacing Variation for a 6 MW Offshore Wind Farm settings*. Energies 2014, 7(11), 7483-7498

142 Scott, K.E., Anderson, C., Dunsford, H., Benson, J.F. and MacFarlane, R. (2005). *An assessment of the sensitivity and capacity of the Scottish seascape in relation to offshorewindfarms. Scottish Natural Heritage Commissioned Report* No.103 (ROAME No. F03AA06).

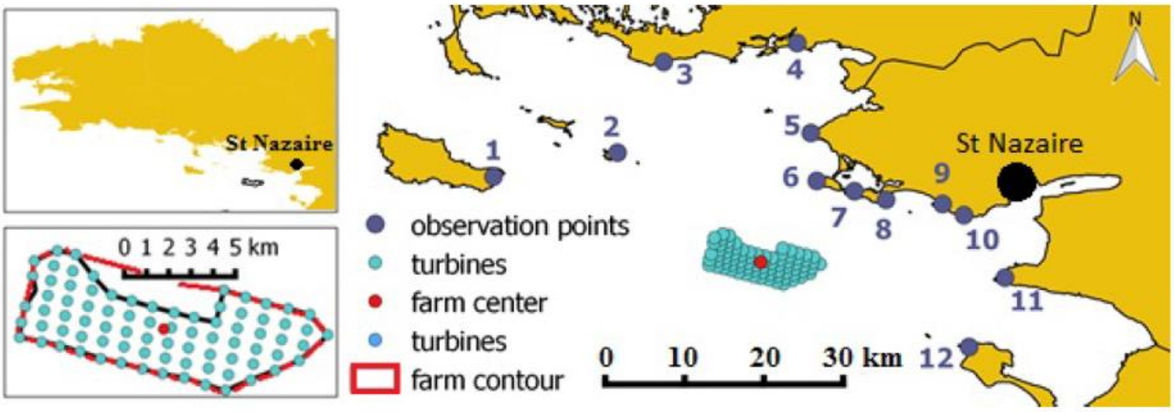
regular lines of wind turbines appear in the centre of the view, but not at the edge of the view.

In addition, the irregularity may be exacerbated by the fact that wider wind energy development areas (e.g. the northern part of no. 2) are developed by different developers who, due to the specific nature of the seabed and other factors, may wish to change the formation of the wind turbines (e.g. to place their wind turbine rows under another angle, etc. compared to the coastal formation). In terms of visual impact it is therefore possible that when viewed from the coast, there may be no view of the wind turbines located in a regular way.

To illustrate how the regularly arranged wind farm looks from different coastal viewing points, an example by Maslov et al. (2017) of the location, viewing points and visual profiles of the Saint-Nazare (France) wind farm (Figure 4.4.1.6.2-7 a; b) has been provided. In the example of Saint-Nazare, the wind turbines are 80 m high and the distance between the wind turbines is 1 km. The wind farm is about 10-30 km away from the different viewing points on the coast.

As shown by the figures of Maslov et al. the formations are better distinguished from observation points closer to the wind farm. In case of views opening from the viewing points 5, 6 and 8, the formation has both regular sections with wind turbines aligned behind each other and irregular sections. The existence of regular sections is expected to alleviate some of the visual impact on those sections of the coast where large areas of wind turbines near the coast are planned.

In case of more distant observation points the ability to distinguish formations decreases (e.g. points 2, 3 and 10 in the figure and the corresponding visual profiles below) or the importance of the formations is less important due to the distance from the wind turbine area (viewing point 4).



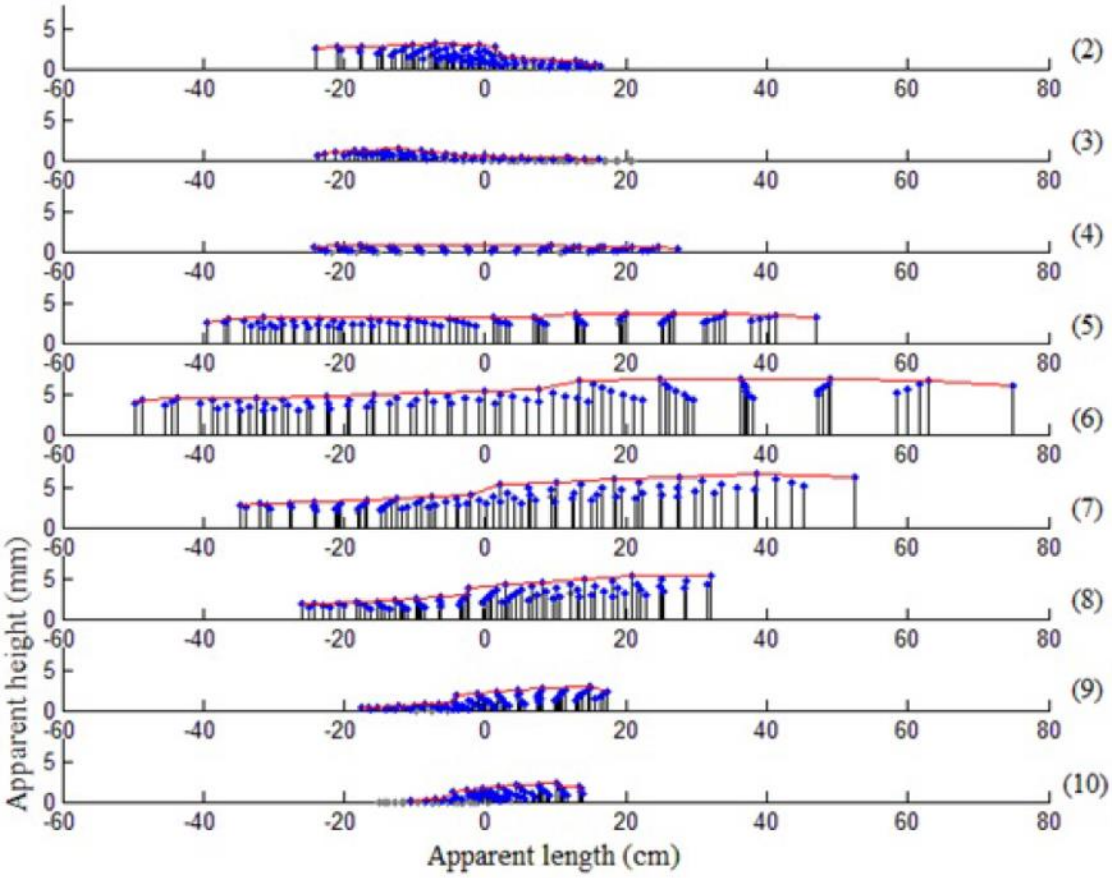


Figure 4.4.1.6.2-7 a;b. The observation points on the French coast and the opening possible wind turbine formations (the point number on the map corresponds to the number of the visual profile on the right vertical axis of the lower diagram. The left vertical axis represents the perceived height at the horizon and the horizontal axis the perceived distance. The diagram explains the difference in views of the same wind farm from different specific viewing points).

However, the regular placement of wind turbines behind each other can have an additional negative effect - the so-called wheel effect, where the rotor blades of wind turbines lined up behind each other overlap and the "rotating wheel" appears on the horizon that attracts the observer's attention. When planning the wind farms more precisely, the wheel effect should therefore be avoided if possible[143].

The impact assessment suggests considering the inclusion of a condition in the plan that when developing the wind farms of different developers, it is recommended to use regular formations where possible, which would reduce the visual impact of the wind turbines. Also it is recommended to avoid the wheel effect, if possible.

[143] The given guideline is also provided by the guidance material.

The location of the wind farms is also taken into account in the guidance material prepared in the framework of the preparation of the maritime spatial plan, which sets out guidelines both for individual wind farms and for these to be taken into account cumulatively when planning several wind farms in the same field of view. **The formations of the wind farms should be addressed within the impact assessment to be carried out during the authorization phase.**

Impact from the diameter of wind turbine rotors

The diameter of the rotors also increases with the height of the wind turbines. The rotor diameter of the wind turbines is related to the distance between the wind turbines (minimum 800 m). It follows that since the wind farms of different heights (and rotor diameters) may coexist in the wind energy development areas, it is also likely that the farms of different densities will coexist.

- From a coastal point of view, no additional visual impacts are expected if only one farm with the same parameters is realized in the full depth of the found wind energy development area or if the wind farm planned for a deeper offshore area is of the same density. In this case it is expected to be easier to arrange the wind turbine formations more regularly.

- Additional visual effects may occur if the wind farms planned behind each other have different densities and there may be several formations. This is most likely in the northern part of the wind area 2, where the width of the suitable wind area is about 35 km and it is expected that 2 or more wind farms can be planned from the coast towards the open sea. Due to the creation of several formations these development areas may appear to be less regular when viewed from the coast.

When planning the wind farms in more detail and assessing the visual impact, it should therefore be borne in mind that adjacent farms or the ones located behind each other may have different densities and may form several formations that may appear less regular when viewed from the coast.

Additional conditions for visual impact assessment

On the basis of the guidance material for the assessment of the visual impacts of offshore wind farms prepared within the framework of the preparation of a maritime spatial plan, it is expedient to set the following additional guidelines or conditions in the plan.

With regard to the general conditions it is recommended to emphasize the need to take into account the combined effect of wind farms in the plan. As the wind energy development areas are relatively large and the areas are expected to be divided into several farms, it is very important to consider the combined effect in order to mitigate the visual effects. The importance of synergies has also become apparent in case of the previously analyzed topics.

The guidance material covers the various aspects of visual impact and impact assessment in detail, including the examples of international experience. On the basis of the guidance material it is appropriate to bring those conditions to which it is important to pay particular attention to the authorization level.

At the level of authorization it is important in the process that the visual impact assessment is carried out methodologically, in accordance with the developed guidance material and by an expert in the field. During the process it is necessary that the methodological assessment of the visual impact starts at an early stage in the development of the wind farm. This helps to achieve the optimal placement of the wind turbines through the process. As mentioned in the previous impact assessment, the involvement of the local community/ government is very important.

The guidance material on which it is based need not be compiled by Artes Terrae (2021), but may be an equivalent recognized methodology. As other recognized methodologies can be used, it is not necessary to duplicate the more detailed steps of the analysis in the explanatory memorandum, as the instructions / sequence of work may slightly differ.

However, as one of the important tools for the wind farm designing is the production of visualizations, it is useful to set out in the explanatory memorandum the principles that visualisations must generally comply with, in particular truthfulness and verifiability. The steps used to create more detailed visualizations can already be based on the instructions used and it is not necessary to duplicate these in the explanatory memorandum.

Based on the guidelines the definitions of the *area with the local greatest impact and range of vision* have been used in the framework of the impact assessment, approx. 20 and 50 km of the found wind energy development area, respectively. As such zones provide important information on the design of the wind turbines in the size class of 300 m, consider including them in the plan.

Change in the scope of wind energy development areas

After the public display (spring 2020) the wind energy development area 3 (northwest of Harilaiu) has been removed from the plan, the scope of the development areas 1 and 2 has slightly decreased.

The removal of the wind energy development area 3 from the plan means that the impact on Vilsandi National Park as a potential valuable landscape of national importance will decrease and the view from the west and north, which are the main viewing directions of the place, will not change from the viewing point above Harilaiu lighthouse. However, as it is possible to design the wind turbines in the size class of 300 m in height, the wind farms in the wind energy development area 2 are expected to be visible in certain directions from Harilaiu area (see the analysis above).

The wind energy development area 2 has slightly decreased from the southern tip, which thus shortens the range of the wind farms visible from the tip of Sõrve foothills. The change has a small but positive effect in terms of visual effects.

The wind energy development area 1 has been slightly adjusted from the southwestern tip, which slightly reduces the visibility of wind farms from Ruhnu Island. The wind turbines would also be a few kilometres away from the important viewing point on Kolka cape in Latvia. However, as up to 300 m high wind turbines can be designed, the wind turbines are still visible (see the analysis above).

4.4.1.7 Sea tourism and recreation

Sea tourism and recreation is a growing and increasingly diversified area of maritime use. The interest groups in the field are both Estonian-based and international. Recreation has strong land-sea interactions, as more common activities take place on the beach (e.g., beach use, bathing) or rather near the coast (water sports, recreational fishing), and some sports can also take place in wider sea areas (e.g., sailing regattas). Both seaports and small craft ports are important for the functioning of marine tourism.

Maritime Spatial Plan does not designate marine tourism and recreational areas, but sets up supportive conditions, in particular with a view to the need for the combined use of the marine area. The plan supports the provision of recreational facilities in the overall level of accuracy of national planning (e.g., ensuring access to the sea, planning small craft harbors, etc.), but site-based planning is largely done through comprehensive plans.

Although much of the recreation area is planned on the land use plans of local governments, it is likely that user groups will expect the preservation of the *status quo* in the marine area. Maritime county cultural mapping in the context of Maritime Spatial Plan (June 2018) gave different input as in what marine area means to people: space, openness, and peace; the sea as a grounding means and a place for organizing thoughts, etc. Environmental psychologists have pointed out that the sea has a psychologically restoring impact on attention and concentration, which includes *feelings of absence* (mental distance from everyday life and disturbances) and *fascination* (effortless redirection of attention)[144]. Based on the above, user groups can be expected to expect preservation of a " *switchable environment* " on most of the coast, both for activities with softer values (e.g., sunset watching) and creative activities (e.g., photography and other arts). Devine-Wright (2009) points out that there is socio-cultural opposition to new developments (including energy projects) when they disrupt the emotional connections or identity creation related to a place[145]. The socio-economic interest in preserving the switching environment is also expected to apply to companies that have made investment decisions based on the vicinity of the sea or the sea view. Therefore, in terms of maritime

[144] Vt nt Hartig, Korpela, Evans, & Garling, 1996; Kaplan, Kaplan, &Brown, 1989; J. Aaron Hippa,*, Oladele A. Ogunseitan, 2011.

[145] Devine-Wright (2009), *Rethinking NIMBYism: The Role of PlaceAttachment and Place Identity inExplaining Place-protective Action*. Journal of Community & Applied Social Psychology.

tourism and recreation (but also in terms of broader identity creation), the consideration of visual impacts (e.g., the impact of wind turbines, in particular, Chapter 4.4.1.6.2), as well as noise, plays an important role. It is also important to consider the interests of local governments when planning activities in the marine area and to give them the opportunity to have a say in planning decisions. This topic has been specified in the wind energy guidelines in the planning solution after its publication (autumn 2020). The need to mitigate the visual effects has also been provided in the maritime tourism and recreation chapter of the plan.

Implementing the Maritime Spatial Plan would also create new opportunities for marine tourism and combined use of the areas - e.g., visiting wind and aquaculture farms and farms as potential new diving sites (see Chapters 4.4.1.3 and 4.4.1.6). Using this opportunity also means addressing the issue of " *ownership* " of the sea to a large extent: although the marine area is state property, there is a legitimate interest for planners of permanent maritime activities to know and control what takes place in the marine area they use in terms of security and property conservation. The overarching assessment of the socio-cultural impact assessment is, therefore, that enabling the combined use of the marine space requires the development of new rules and practices, with the support of the state.

The impact of offshore travel and sailing tourism is covered in Chapter 4.4.1.4 Maritime Transport.

4.4.1.8 Cultural Monuments

Several wrecks are protected as cultural monuments in the Estonian marine area. Wrecks are part of the wider maritime cultural heritage, and their survival is in the wider public interest. The relatively small community (divers, underwater archaeologists, rescuers) has a real opportunity to visit the wrecks and is therefore not a public good consumed by a wider public. At the same time, diving communities are international, and there is also international interest in Estonian wrecks.

What is planned at a marine area may have a direct physical impact on the wrecks: e.g., activities may endanger the survival or good condition of the wreck; indirectly, what is planned may also have an impact on the wreck's preservation environment or water quality.

In Maritime Spatial Plan, wrecks have been valued throughout, and conditions have been set to ensure that wrecks remain as they are. The updated planning solution as of June 2020 defines preservation areas for archaeological finds (wrecks) in the deeper marine area where there is no conflict with other important marine uses[146]. The designation of preservation areas ensures clearer rules, and also provides a direct spatial opportunity for the preservation of archaeological monuments. The need to

[146] Due to the complexity and cost of transporting wrecks it is advisable to relocate them to the storage area as close as possible, if necessary.

involve the National Heritage Board in several uses of the sea has also been highlighted. The Impact Assessment has, where appropriate, made proposals in the above chapters to clarify the conditions for the preservation of cultural monuments.

Maritime Spatial Plan favors the creation of so-called "diving parks" in high visibility marine areas, which support the possibility of exploring wrecks more widely and practicing diving as water sports. It also allows directing diving activities to wrecks. Maritime Spatial Plan thus has a positive impact both on the preservation of wrecks and on access to cultural sites. When specifying the main solution of the planning solution, the condition has also been added that diving competence is essential by the diving of wrecks (competent instructor, diving permit), which supports more informed practices when diving to the wrecks and thus maintaining the condition of the wrecks.

IA wishes to point out that not all wrecks in the marine area have been recognized as cultural monuments, but that does not mean that wrecks have no cultural value. Preservation of this value is currently not reflected in the broader chapter on marine culture or the chapter on cultural monuments. The socio-cultural impact assessment proposes to treat the seabed cultural assets as a single chapter, covering both monuments and non-protected wrecks.

4.4.1.9 Other uses of the sea, and land-sea interactions

Maritime spatial Planning also identifies protected natural sites, national defense, mineral resources, dumping, and permanent links as separate thematic areas and seabed infrastructures.

Protecting **natural objects** has both positive and negative social and cultural implications. Nature conservation is needed more broadly to preserve a clean marine and living environment, protection of specific sites to preserve marine biodiversity, which is why nature conservation is generally and more widely needed to meet people's social and cultural needs. Maritime Spatial Plan also takes into account the existing protected areas.

Similarly, to terrestrial planning, conflicts between nature conservation and marine activities that are considered socio-economically necessary may arise in the marine area. Maritime Spatial Plan sets out conditions for mitigating the conflict, highlighting the need to consider other interests and need for combined use in the design of new protected areas, while also assessing socio-economic impact. Planning thus has a positive impact on enabling combined use.

Maritime spatial Planning highlights the **areas used for national defense** that are mainly concentrated along the Gulf of Finland. Additional special areas of national defense may be created if necessary. Other activities in national defense areas are not unequivocally excluded: there is a time limit for combined use during exercises, but at other times the areas are open for navigation. Due to the specific nature of national defense exercises, no objects/facilities that could be damaged by the exercises (e.g., fish cages, aquaculture farm lines) can be located in the special national defense areas. Areas used by national defense thus have both positive and negative impacts on the combined use of the marine space and the consideration of the needs of different stakeholders.

Infrastructures on the seabed are necessary to ensure energy transmission. The plan outlines the planned submarine cable lines between the main islands, in the long run the submarine cables may also occur in the coastal sea on the coasts of the densely populated areas, if the coastal sea is used for cooling/ heat energy. The maritime spatial plan does not specify the exact locations of the cables, but guides action through guidelines and conditions: spatial aggregation of cables and cooperation with other stakeholders is important to reduce and avoid conflicts (e.g. consideration of cultural heritage) and increase safety (e.g. cable covering / burial, historical explosives to be identified).

The plan identifies **mineral deposits** and guides the further development of this branch through **mineral resources** guidelines and conditions. The conditions for the use of mineral resources are also aimed at enabling combined use, taking into account fish spawning grounds, cultural sites, nature conservation sites, and waterways. The designation of new deposits and mining reserves shall not be deemed to alter the planning. In principle, therefore, it is possible to designate new deposits also in areas where other interests have been identified. The socio-cultural impact assessment proposes to consider the need to complement the conditions in terms of other potential interests (including threats) (e.g., the need for cooperation with the Ministry of Defense on historical explosives, etc.).

Dumping in the marine area takes place to discharge dredged material into the sea. Maritime Spatial Plan outlines existing dumping areas, and it is also possible to design new dumping areas based on established guidelines. Dumping is not permitted in very shallow marine areas. The conditions for dumping are regulated by law.

Maritime Spatial Plan highlights the need for **permanent connections** but does not explicitly set guidelines or conditions: the permanent connections of both Tallinn-Helsinki and Saaremaa are planned as separate plans and to a greater degree of accuracy than national Maritime Spatial Plan. Permanent connections, however, have a very important direct and indirect (social, economic, cultural) impact on **land-sea interactions**. Maritime Spatial Plan highlights the most important land-sea interactions by topic, based on spatial interfaces. As Estonian marine areas are relatively diverse, the socio-cultural impact assessment proposes to supplement the Plan with the introduction of more regionally location-based land-sea interactions (see Figure 4.4.1.9-1).

The development of **land-sea clusters** is based on the Estonian Regional Development Strategy 2014-2020, the newly developed maritime strategies of the counties (2018-2019), and the cultural mapping of the maritime counties carried out in the framework of Maritime Spatial Plan. These clusters are based on the direct visions and development directions of the county strategies (e.g., the development of the Tallinn-Helsinki twin city in Harju County) as well as analytical generalizations based on the development strategy (e.g., Ida-Viru County as the Estonian adventure tourism region and ranking second as a place to visit after Harju County). The cultural mapping carried out in the context of the Maritime Spatial Plan provided input on regional specificities, strengths, and potential.

As county development strategies have recently been drafted, it is advisable to discuss and further develop land-sea clusters in the preparation of Estonia's new regional development strategy.

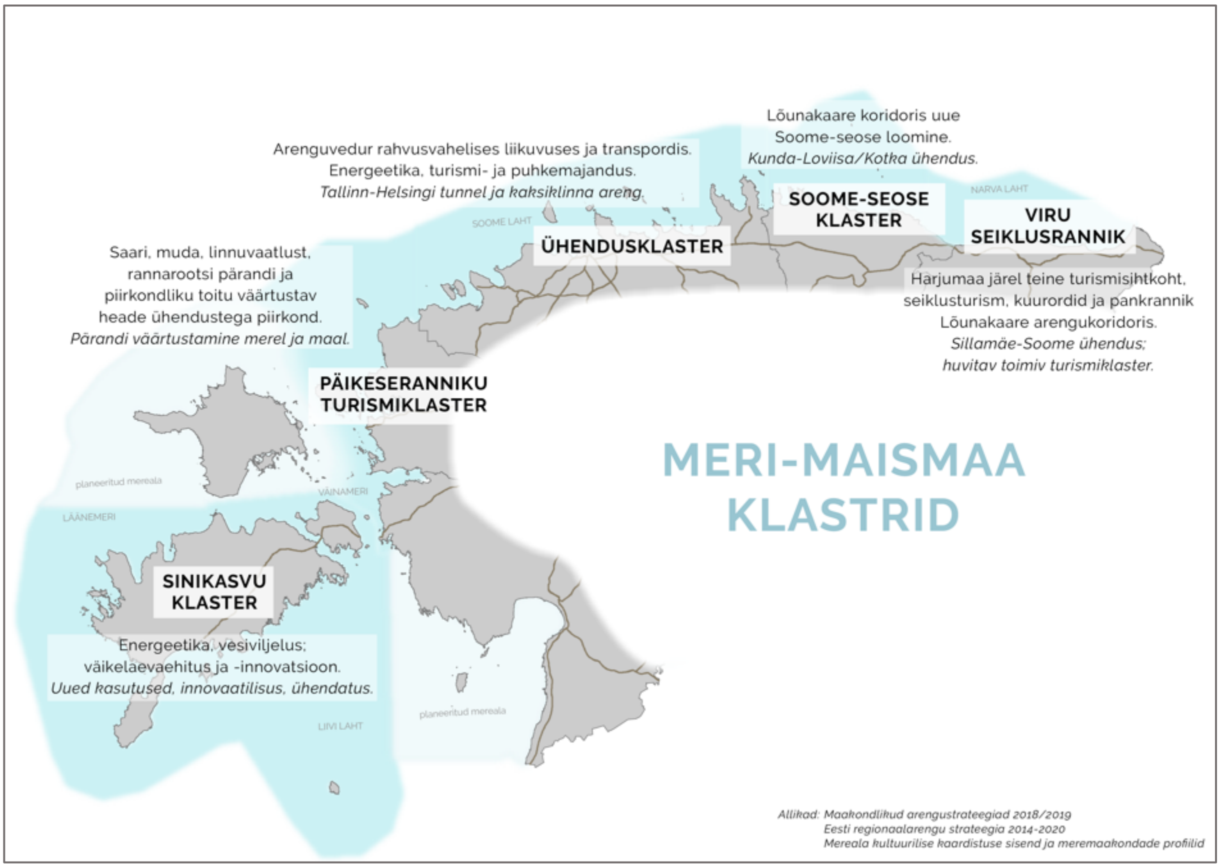


Figure 4.4.1.9-1. Land-sea clusters

Preventing or mitigating significant socio-cultural negative impacts have already been taken into account in the design of the Maritime Spatial Plan. The following are suggestions for further mitigating changes that are perceived negatively by some stakeholders/individuals. Implementation of the plan will have a long-term positive impact on the social and cultural environment. Combined use, enabling and innovative planning plays a key role in leveraging the positive impact. The suggestions below also reflect the potential for leveraging positive impact.

ENVIRONMENTAL MEASURES:

Suggestions to improve the planning solution:

1. In cases where statutory licensing processes do not reflect cooperation with stakeholders, consider including a clause in MSP that also takes into account fishermen's interest in applying for aquaculture licenses: to

avoid having a negative impact on the most used and yield rich fishing grounds.

2. Consider introducing the joint use of wind farms and fish farming in the chapter of fish farms of the main solution.
3. Consider including a condition that both fishermen and local government should be involved in decision-making processes in order to increase synergies and prevent/mitigate conflicts in the aquaculture sector, in case in the current legal space procedural processes do not reflect this need.
4. Consider the principle of enabling the combined use of aquaculture farms with renewable energy (e.g., solar and wave energy.
5. Consideration should also be given in the functional classification of the purpose of new marine use service vessels - the needs of new branches in ports may differ slightly from those of established ones.
6. Consider adding a condition for wind farm cable corridors that requires cooperation with the National Heritage Board (to avoid damaging seabed cultural assets) and the Ministry of Defense (to identify potential historical explosives and hazardous objects).
7. Consider highlighting in MSP the importance of an international network corridor for the development of wind farms and/or show the principle direction of connecting the innovation area in a schematic map showing possible cable connections.
8. Consider further guidelines to mitigate the visual impact related to the wind energy development:
    a. look for opportunities to leave / create the wind-turbine-free area in the wind energy development area no. 2 in the views from the three coastal sections of the west coast of Saaremaa, as well as in the views from the northern tip of Ruhnu to the development area no. 1.
    b. in case of the wind farms closest to the coast (11.1 km) to point out that the design of the wind turbines of the same size class is preferred.
    c. avoid the formation of small groups of wind turbines on the outskirts of the wind farm, which appear as separate sets from the main row of wind turbines.
    d. when developing the wind farms of different developers it is recommended to use regular formations, if possible, which would reduce the visual impact of the wind turbines. Also avoid the wheel effect if possible.
    e. it is recommended to emphasize the need to take into account the combined effect of wind farms in the plan.
    f. it is advisable to point out in the plan that the visual impact assessment should be carried out methodologically, in accordance with generally accepted developed guidance material and by an expert in the field. The visualizations should be true and verifiable.
9. Consider treating seabed cultural assets as a single chapter and include both monuments and unprotected wrecks.

10. It is recommended to provide the definitions of *the area with the greatest local impact and range of vision*, 20 and 50 km of the found wind area, respectively.
11. Consider the need to improve conditions for the use of deposits in terms of other potential interests (including threats) (e.g. need for cooperation with the Ministry of Defense on historic explosives, etc).
12. Consider supplementing MSP with the introduction of more location-based land-sea interactions (See figure 4.4.1.9-1).

PROPOSALS FOR THE ACTION PLAN:

1. Developing measures for traditional maritime users (e.g., fishermen) to enter new sectors of the blue economy, taking advantage of established prerequisites (maritime skills, knowledge of the regional sea, etc).
2. Developing rules for combined use of the marine area and national support measures.
3. Include the principle of taking into account the functional hinterland of the port when reviewing the concept of small craft harbors / preparing a new development plan.
4. Analyzing the rescue capacity and assessing needs at the state level, in cooperation with the Police and Border Guard Board and interested parties in the light of the situation in the implementation of the plan.
5. Establishment of a sea litter mitigation plan.
6. Development of a marine renewable energy innovation support program, preferably in cooperation with Latvia and Finland.
7. Further development of land-sea clusters (e.g., in preparation of the new Estonian strategy for regional development).
8. Developing potential local benefit mechanisms to balance the interests of the *developer-current user* and the *developer-local government*.

4.4.2 Impact on property

In the marine area, a direct impact on the property may result from natural conditions (e.g., stranding, impacts of waves or ice banks, storms), ship-facility collisions, incompatibility of marine activities, or poor operational practices (e.g., damage to wrecks by divers). Indirect impacts may include factors such as the restoration of damaged vessels or facilities/infrastructure, loss of revenue due to production stoppages, etc. Due to the environment, the impact on the property may also result in a higher impact/risk to life (risk of drowning, distance to the maritime rescue).

Planning has predominantly reduced the risks to the property by **increasing the safety of** the conditions imposed on various areas of marine use**,** such as setting rules for shipping and highlighting the importance of shipping lanes, working with the Ministry of Defense to identify the locations of historic explosives in the context of planned seabed activities. Proposals for improvements have been made to the different chapters of the Impact Assessment, where necessary for safety reasons.

The marine area favors a variety of combined uses of marine area, but at the same time, combined use also brings with it certain risks to the property: combined use, on the one hand, brings together planned marine area activities which, on the one hand, increase safety and, on the other hand, may increase the magnitude and/or accumulation of impact (for example, a ship getting stuck in shellfish lines or in fish cages in wind farm areas where, under adverse conditions, an uncontrolled ship may collide with wind turbines). Methods to mitigate the impact include developing rules, practices, and practices for combined use and assessing the risks of combined use. **In the light of what is planned in the Maritime Spatial Plan, where new uses are emerging in the marine area, it is necessary to complement national risk assessments and, where appropriate, maritime rescue strategies.**

The impact on assets is also possible due to sectoral developments – e.g., intensification of shipping. Measures to mitigate the impact include improving the coverage and effectiveness of marine rescue, which is also highlighted in the planning.

From the standpoint of land-sea clusters, property owners may feel that certain offshore developments (such as wind turbines) may affect their **income earned from the property or value of the property**. Scientific articles show that planned activities in the marine area can have both positive and negative impacts on tourism revenues, for example. For example, Kuehn (2005)[147] has pointed out that [148] offshore wind farms in Denmark did not reduce the number of tourists or summer rental rates. At the same time, Cook (2004) has[149] compared Denmark with Scotland and pointed out that because of different landscape experiences in different countries, the impact is also different: Denmark is a highly developed and urbanized country with many onshore wind farms already in operation. At the same time, tourists in Scotland are looking for a different experience with wildlife and less cultivated landscapes, so expectations and, therefore, the impact may be different from Denmark. For the UK's Scroby Sands offshore wind farm, the positive impact on tourism in terms of visitors to the wind farm (~ 30,000 people in the first half of the year) has also been highlighted)[150].

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[147] Kuehn, S. (2005). *Sociological investigation of the reception of Horns Rev and Nysted offshore wind farms in the local communities*. ECON Analyse, March.

[148] Horns Rev offshore wind farm in the North Sea, 14-20 km from the coast.

[149] Cook, G. (2004) *Renewable Energy Policy in Denmark - An Introduction; Scottish Parliament Information Centre* (SPICe): Edinburgh, UK.

[150] British Wind Energy Association (2006). *The Impact of Wind Farms on the Tourist Industry in the UK*; London, UK.

Regarding changes in real estate prices, Sunak and Madlener (2016)[151] point out that, according to studies in Germany, offshore wind farms reduced real estate prices by 9 to 14% when there was a significant number of wind turbines in the views from the real estate. When few wind turbines were located in the field of view or their impact was marginal, no decline in property prices was observed. In Denmark, however, Jensen et al., (2018)[152] found that while wind turbines influenced property prices, there was no significant impact on offshore wind turbines, as the wind turbines were at least 9 km from the beach or from a particular plot[153]. There are no known studies conducted in Estonia, which makes it difficult to assess the impact on real estate values. It can be assumed that the real estate price change could be perceived as a threat by the landowners from whose land plot opens a direct view of the sea area where the wind turbines are planned and where the wind turbines are located closest to the coast; according to the Maritime Spatial Plan, these areas would be Tagamõisa peninsula, the western coast of Saaremaa from Vilsandi to Sõrve and Ruhnu. In terms of population density, coastal areas are sparsely populated (see Figure 4.4.2-1), due to which the impact may be rather local depending on the specific nature of the landscape (lack of forests on the coast, etc).

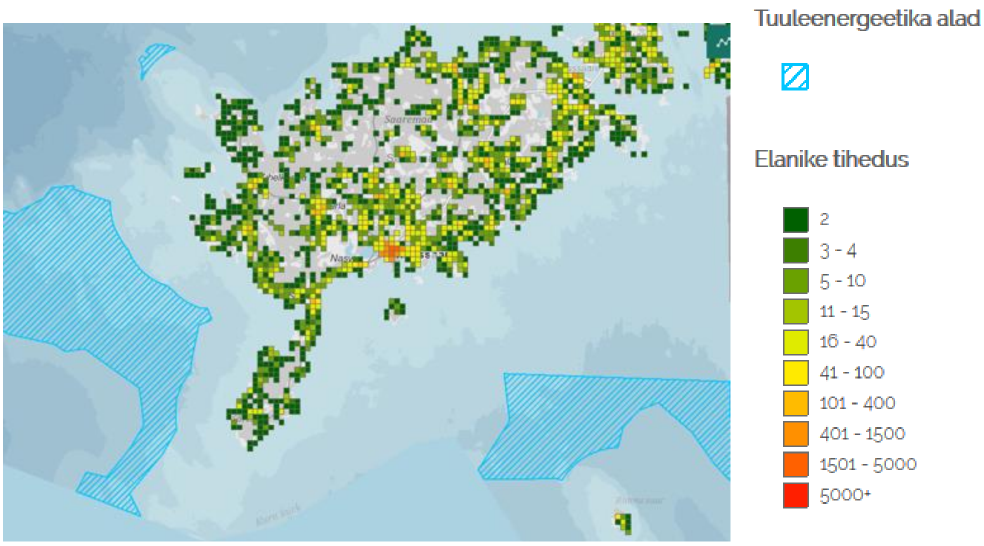

Figure 4.4.2.-1. Population density (people per square kilometer) and planned areas of the wind energy (Extract from the planning map application: mereala.hendrikson.ee)

[151] Sunak, Y., & Madlener, R. (2016). *The impact of wind farm visibility on property values: A spatial difference-in-differences analysis*. Energy Economics

[152] Jensen *et al.*(2018). *The impact of on-shore and off-shore wind turbine farms on property prices*. Energy Policy.

[153] Jensen et al.(2018). The impact of on-shore and off-shore wind turbine farms on property prices. *Energy Policy*.

The implementation of the Maritime Spatial Plan may have indirect effects on people's property through visual impacts.

ENVIRONMENTAL MEASURES:

1. Consider further mitigating the visual impact of wind energy development to prevent potential impacts on landowners whose property may have a direct view of wind turbines. An alternative, but also complementary, measure may be the development of a local benefit mechanism to compensate the landowner, whose dwelling or recreational outbuilding has a direct view of the wind turbine, the potential impact on property prices.

4.5 IMPACT ON HUMAN HEALTH

Marine areas are important for human health and well-being. Many people live in the immediate vicinity of the marine areas, go fishing or consume fish and fish products, spend their leisure time at and by the sea, and the wind blowing at sea gives us energy in the future. All these activities can have both negative and positive impacts on people's health and well-being. The impact can be direct, for example, through accidents at sea or through exposure to various food and airborne contaminants, or indirect, through stress and increased and/or reduced well-being. There are also various recreational activities at sea that improve the health of the population and have a positive impact.

Given the focus of Maritime Spatial Plan, potential health impact, and measures to mitigate and enhance them, in the areas of fisheries, aquaculture, maritime transport, energy production, and marine tourism and recreation will be further analyzed below.

Apart from these, a certain impact may also occur in other areas covered by the Maritime Spatial Plan. For example, some negative impact on public health may occur with the construction of new infrastructures (cables, pipes, etc.), where pollutants are released from bottom sediments back into the water mass, where they pass through fish to the food consumed by people. However, such an impact needs to be assessed on a site-specific basis in the application for a specific project permit and in the EIA (including a prior assessment of contaminant concentrations in sediments, as in the case of the NordStream projects) and, where appropriate, mitigation measures proposed.

It is also important for public health to develop marine rescue and pollution control, which has a positive impact on health and has no direct negative impacts.

Taking into account the marine conservation values addressed in the plan contributes to the creation and maintenance of a clean, species-rich environment, which in turn contributes to human well-being, creates opportunities for movement in the natural environment and acts as a stress reliever.

Marine culture and the appreciation of cultural heritage enhance people's well-being by, among other things, creating opportunities for exercise and engage in sports which have a stress-relieving effect.

National defense activities, such as exercises at sea and seashore, can generate noise that can distract local residents and cause them health and stress-related issues. The potential negative impact of noise can be mitigated through better timing of activities and wider awareness of the population. The plan does not regulate national defense activities.

As Maritime Spatial Plan does not change the current use of the sea area for the extraction of mineral resources, the use of mineral resources and the extraction of mineral resources in the marine area are not associated with any positive or a negative impact on human health. In addition, different regulations must ensure that the material used for dumping is safe for human health and does not contain hazardous substances.

4.5.1 Fisheries

Fish is an important part of the Estonian diet, although we are smaller than average fish consumers compared to many EU countries (EUMOFA, 2018[154]). According to a study commissioned by the Ministry of Rural Affairs, in 2016, the Estonian population consumed 9.6 kg of fish and fishery products per inhabitant (product weight), which included 0.4 kg of self-caught fish or fish obtained free of charge[155]. (Estonian Institute of Economic Research, 2016) In 2015, the consumption of fresh fish was the highest in Western Estonia (6.1 kg per family member) and the lowest in Southern Estonia (2.4 kg per family member), elsewhere 3.8–3.9 kg per family member. Fish consumption is higher than average among fishermen's families.

Impact of the MSP

The Maritime Spatial Plan sees the continuation of fishing as a traditional use throughout the Estonian sea. No significant additional guidelines and conditions will be set for fisheries. In view of the above, the implementation of the Maritime Spatial Plan in the context of fisheries will not have a significant impact on health. The general health impacts of fishing are described below.

Because of the presence of toxic substances such as heavy metals, dioxins, dioxin-like polychlorinated biphenyls (PCBs) in the Baltic Sea, they can end

[154] EUMOFA. 2019. The EU Fish Market – 2018 Edition. *European Market Observatory for Fisheries and Aquaculture Products*.

[155] Institute of Economic Research. 2016. Consumption of fish and fish products. Estonian Institute of Economic Research, Tallinn.

up in fish and hence into the diet of the population. At the same time, the results of different years of assessments of the environmental status of the Estonian marine area are contradictory: high levels of heavy metals have been found at certain points in certain periods, while low levels have been found in other areas. Thus, the environmental status of the Estonian marine area in 2018 does not allow for a coherent assessment of the heavy metals content of fish in the Baltic Sea, and the reliability of the assessment of the status of the high seas has to be considered low due to the lack of monitoring data (Klauson et al., 2018). According to the same overview, it is difficult to estimate the levels of dioxins and dioxin-like PCBs in different fish and other marine organisms. For example, levels above the food safety limits have been found in the Baltic herring and in the Gulf of Finland and the Gulf of Riga and in the flounder in the mouth of the Gulf of Finland, but the levels in the majority of the samples analyzed remain low. This generally indicates that there is a risk, but due to average fish consumption, the risk is low for most people in Estonia. At the same time, there are several risk groups, such as pregnant women and, above all, fishermen's families, whose fish consumption is many times higher, exposure to pollutants is much higher, and there is a real health risk (Roots, 2011[156]).

Fish are generally considered to be healthy foods because they contain omega-fatty acids beneficial to the cardiovascular system, various vitamins (A, E, B1, B6, B12, D) and minerals (potassium, calcium, phosphorus, selenium, and iodine). In addition, fish is a relatively low-fat protein food, and fish protein is easily absorbed. As a result, eating fish has many positive impacts on human health.

The implementation of the Maritime Spatial Plan does not entail any significant health effects that need to be mitigated.

4.5.2 Aquaculture

In addition to fish caught freely in the Baltic Sea, Estonian residents may in the future also consume fish, shellfish and algae cultivated in the Baltic Sea. The pollutants found in the Baltic Sea can also get into them.

Impact of the MSP

The fish feed may be the main source of dioxins and other harmful substances in farmed fish. Because fish in the Baltic Sea may contain various pollutants (see Chapter 4.3.1), prior control of the feed is important. Pollutants in the Baltic Sea (especially heavy metals) can also reach the farmed shellfish and algae. However, since aquaculture takes place primarily in the upper aquifers,

[156] Roots O. 2011. Expert assessment of exposure of coastal fishermen to dioxins and dioxin-like polychlorinated biphenyls. Estonian Environmental Research Centre: Tallinn

where pollutant levels are lower than in the bottom sludge, and because HELCOM (*Helsinki Commission*) has assessed the water quality status as good for pollutants (HELCOM, 2018 [157]), it poses a low risk to human health.

Like fish caught in the Baltic Sea, fish farmed in the Baltic Sea has a positive effect on health. As a rule, fatty fish (e.g., rainbow trout) with higher levels of omega-fatty acids beneficial to the cardiovascular system are reared. Low carbohydrate-containing shells and algae rich in minerals are also beneficial to health. In addition, fish, shellfish, and algae farmed locally in Estonia can be better controlled and regulated than imported goods where only spot checks are carried out.

The implementation of the Maritime Spatial Plan does not entail any significant health effects that need to be mitigated.

4.5.3 Maritime transport

A large number of ships pass through the Estonian marine area, which emits exhaust gases and causes noise. Exhaust gases can be transported by winds from the marine areas to the coast, where they deteriorate air quality. Similarly, people living near ports are affected by air quality and noise. In Estonia, air pollution from ships and harbors has disturbed residents of Muuga and Sillamäe areas, where the number of odor nuisances increases significantly in certain adverse weather conditions (Maasikmets et al., 2014[158]).

Air emissions from maritime transport are governed by Annex VI of MARPOL 73/78, Convention for the Prevention of Pollution from Ships, administered by the International Maritime Organization (IMO), which lays down different emission requirements based on shipbuilding years and engine characteristics (IMO, 2017[159]). In addition, the sulfur content of marine fuels has been regulated and has been significantly reduced in recent years, which has reduced sulfur dioxide (SO_2) emissions from maritime transport (Sofiev et al., 2018[160];

[157] HELCOM. 2018. HELCOM Thematic assessment of hazardous substances 2011-2016. Baltic Marine Environment Protection Commission (HELCOM).

158 Maasikmets M, Teinemaa E, Saare K, Vainumäe K, Arumäe T, Palu M. 2014. Assessment of ambient air quality, odor nuisance and pollutant emissions in Ida-Virumaa, Sillamäe and Vaivara region. Estonian Environmental Research Centre: Tallinn.

159 IMO. 2017. *Amendments to MARPOL Annex VI. International Maritime Organization*. http://www.imo.org/en/OurWork/Environment/PollutionPrevention/AirPollution/Documents/Res_MEPC_ 286%2871%29_Tier%20III%20ECA%20and%20BDN.pdf

160 Sofiev M, Winebrake JJ, Johansson L, Carr EW, Prank M, Soares J, Vira J, Kouznetsov R, Jalkanen JP, Corbett JJ. 2018. *Cleaner fuels for ships provide public health benefits with climate tradeoffs. Nature Communications* 9(1):406.

Campara *et al.*, 2018[161]). In addition, air pollution and noise are caused by the loading of goods (including petroleum products) onboard ships, and the service transport related to maritime transport (including cars carried by ships) (Institute of Marine Systems of Tallinn University of Technology, Alkranel, 2015[162]). In June 2016, HELCOM submitted a proposal to the IMO to change the Baltic Sea into NECA (*Nitrogen Oxides Emission Control Area*) in addition to SECA (*Sulfur Emission Control Area*) by 2021 and to apply even stricter Tier III requirements to ships built after 1 January 2021.

Impact of the MSP

Historically, ships have been the main users of marine areas, and the planning solution has pointed out that changing the location of shipping lanes and imposing significant restrictions on shipping should generally be avoided when planning other uses. Therefore, no significant additional guidelines and conditions are set for maritime transport. In view of the above, the implementation of the Maritime Spatial Plan will not have a significant health impact. The general health impacts of maritime transport are described below.

The impact of shipping on the inhabitants near the Baltic Sea has been assessed in a recent study by Barregard et al., 2019[163]. In their research they modelled the content of ultra-fine particles ($PM_{2.5}$) from ships both in 2014 before the SECA regulations and in 2016 after the SECA regulations came into force in the network in the Baltic Sea region 0.1 ° × 0.1 ° (almost 10 × 10 km). The fine particles in air pollution have been shown to affect both cardiovascular and respiratory morbidity (WHO, 2013[164]). In addition, the fine particles are associated with premature birth and low birth weight (Li et al., 2017[165]), risk of diabetes (Thiering and Heinrich, 2015[166]), rheumatic (Sun et al., 2016[167]) and

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161 Campara L, Hasanspahić N, Srdjan V. 2018. *Overview of MARPOL ANNEX VI regulations for prevention of air pollution from marine diesel engines*. SHS Web of Conferences 58:01004.

162 Strategic Environmental Assessment of the National Development Plan "Estonian Maritime Policy 2012-2020". Institute of Marine Systems, Tallinn University of Technology, OÜ Alkranel: Tartu-Tallinn, 2015

163 Barregard L, Molnàr P, Jonson JE. 2019. Impact on population health of baltic shipping emissions. International Journal of Environmental Research and Public Health 16:1954.

164 WHO. 2013. Review of Evidence on Health Aspects of Air Pollution. REVIHAAP Project Technical Report. World Health Organisation: Copenhagen.

165 Li X, Huang S, Jiao A, Yang X, Yun J, Wang Y, Xue X, Chu Y, Liu F, Liu Y, Ren M, Chen X, Li N, Lu Y, Mao Z, Tian L, Xiang H. 2017. Association between ambient fine particulate matter and preterm birth or term low birth weight: An updated systematic review and meta-analysis. *Environmental Pollution* 227:596-605.

166 Thiering E, Heinrich J. 2015. Epidemiology of air pollution and diabetes. *Trends in Endocrinology & Metabolism* 26:384–394

167 Sun G, Hazlewood G, Bernatsky S, Kaplan GG, Eksteen B, Barnabe C. 2016. Association between air pollution and the development of rheumatic disease: a systematic review. *International Journal of Rheumatology* 2016:5356307

neurodegenerative diseases (Xu et al., 2016[168]), and the International Agency for Research on Cancer (IARC) has identified these as carcinogenic to humans. Figure 4.3.3.-1 shows the population-based content of ultra-fine particles from shipping, taking into account the location of the population and the population density. On this basis, taking into account SECA regulations, air pollution in maritime transport causes 17–38 early deaths in Estonia every year, plus an average of 34 cases of ischemic heart disease and 20 strokes per year (Barregard et al., 2019[12]).

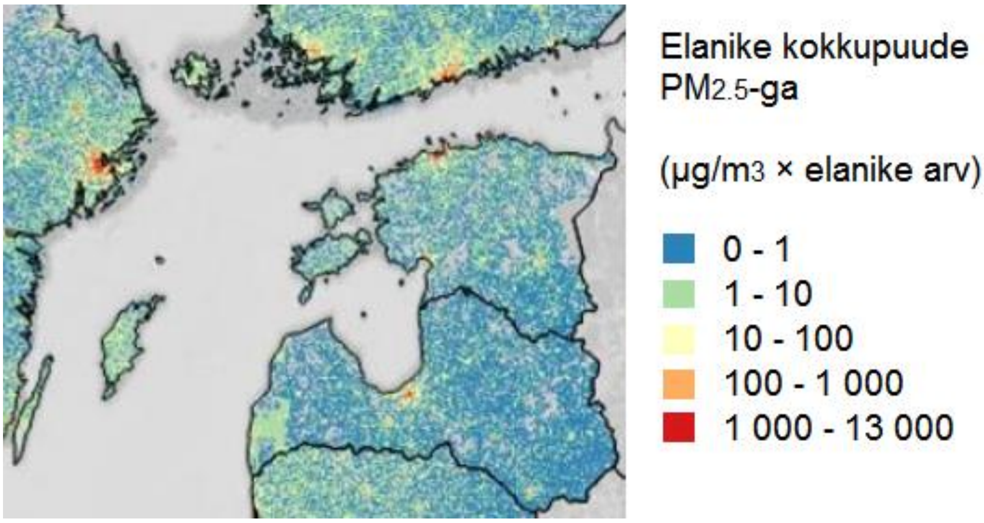

Figure 4.5.3-1. Impact of shipping emissions on the exposure of the Baltic Sea population to ultrafine airborne particles ($PM_{2.5}$) in 2016 (after the SECA regulations came into force) in the 0.1 ° × 0.1 ° network (based on Barregard et al., 2019).

Maritime spatial planning does not envisage changes in maritime transport, so there is no significant impact.

4.5.4 Energy production

With this plan, wind energy development areas located six nautical miles from the coast are planned for the Estonian marine area. In recent years, increasingly more attention has been paid to the health impact of wind turbines, in particular in terms of low-frequency noise, including infrasound (below 20 Hz). However, the research carried out so far has focused on onshore wind farms (van Kamp & van den Berg, 2018[169]), so the results cannot be transferred to offshore wind farms. Although several animal studies have shown minor physiological

[168] Xu X, Ha SU, Basnet R. 2016. A review of epidemiological research on adverse neurological effects of exposure to ambient air pollution. *Frontiers in Public Health* 4:157

[169] van Kamp I, van den Berg. 2018. Health effects related to wind turbine sound, including low-frequency sound and infrasound. *Acoustics Australia* 46(1):31–57.

changes in the outer hair cells of the cochlea following exposure to infrasound, similar human data are lacking, so it is unclear whether such inner ear impacts can causally explain individual symptoms such as tinnitus, dizziness and Meniere's disease (Schmidt & Klokker, 2014[170]). In general, the main complaints about wind turbines are stress, poor quality of sleep, difficulty concentrating, nervousness, exhaustion, headache, dizziness, ringing in the ears (Royy et al., 2014[171]). These symptoms have also been termed "Wind Turbine Syndrome" but have not been recognized as a clinical diagnosis (Pierpon, 2009[172]).

However, wind turbines per se, and seeing them seems to be the most disturbing aspect of wind turbines for people (Freiberg et al., 2019[173]). Wind turbines that can be seen from a home window are often not considered aesthetically pleasing (Pedersen et al., 2007[174]). The picture below shows the Sheringham Shoal offshore wind farm, 17 to 23 km off the coast of England (Photo 4.3.4). Wind turbine distress, in turn, causes stress associated with sleep deprivation, headaches, and difficulty concentrating (Roy et al., 2014[20]). People who live near wind turbines rate their quality of life worse than those who live further away or the average of the population (Shephard et al., 2011[175]). However, people living in the vicinity who benefit directly from wind farms have significantly less feeling of being bored (Pedersen et al., 2009[176]).

[170] Schmidt JJ, Klokker M. 2014. Health effects related to wind turbine noise exposure: a systematic review. *PLoS One* 9(12):e114183

[171] Roy J, Krogh C, Horner B. 2014. Adverse health effects of industrial wind turbines. Canadian journal of rural medicine: the official journal of the Society of Rural Physicians of Canada 19: 21–26.

[172] Pierpon N. 2009. Wind Turbine Syndrome: A Report on a Natural Experiment. K-Selected Books.

[173] Freiberg A, Schefter C, Hegewald J, Seidler A. 2019. The influence of wind turbine visibility on the health of local residents: a systematic review. *International Archives of Occupational and Environmental Health* 92(5):609–628.

[174] Pedersen E, Persson-Waye K. 2007. Wind turbine noise, annoyance and self-reported health and well-being in different living environments. Occupational and Environmental Medicine 64:480–486.

[175] Shepherd D, McBride D, Welch D, Driks KN, Hill EM. 2011. Evaluating the impact of wind turbine noise on health-related quality of life. *Noise & Health* 13(54):333–339.

[176] Pedersen E, Frits van den Berg. 2009. Response to noise from modern wind farms in The Netherlands. *The Journal of the Acoustical Society of America* 126(2):634–643.

Photo 4.5.4-1. Sheringham Shoal Offshore Wind Park (source https://www.flickr.com/photos/windeurope/28687503031)

A third explanation for the health problems of people living near wind farms is the nocebo effect, where people have a negative association in their brain between wind turbines and health impacts (Crichton et al., 2014a[177]). In this case, negative health expectations result in clinical symptoms and do not depend on whether or not the perceived health risk is actually present. The nocebo effect is not only related to the wind turbines but may also occur with other subjects. The low-frequency sound produced by wind turbines must not exceed the legal limits, and the human hearing system has been developed so that we are not disturbed, for example, by the low-frequency sounds produced by our own breathing and heartbeat that are produced beyond the capacity of one wind farm (Crichton et al., 2014b[178]). However, when a person thinks that wind turbines affect their health, they develop health problems because negative associations induce stress-related physiological activity in the autonomic nervous system and brain, and cause irritation, anxiety, fear, and the like. Moreover, with the current knowledge, it cannot be completely excluded that infrasound generated by wind turbines affects human health (Farboud et al., 2013[179]).

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[177] Crichton F, Chapman S, Cundy T, Petrie KJ. 2014a. The link between health complaints and wind turbines: support for the nocebo expectations hypothesis. *Frontiers in Public Health* 2:220.

[178] Crichton F, Dodd G, Schmid G, Gamble G, Cundy T, Petrie KJ. 2014. The power of positive and negative expectations to influence reported symptoms and mood during exposure to wind farm sound. *Health Psychology* 33(12):1588–1592.

[179] Farboud A, Crunkhorn R, Trinidade A. 2013. Wind turbine syndrome': fact or fiction? *The Journal of Laryngology & Otology* 127:222–226.

Impacts of the MSP

This Maritime Spatial Plan solution is designed to minimize the direct human health impact of wind farms. However, in the planning phase, it is not possible to provide specific numerical data (for example, carry out modeling) on how big the noise wind farms noise could become. In the planning phase, the main locations of the wind farms will be determined, but the exact number, height, and technology of the wind turbines are currently unknown. However, for specific project evaluations, modeling of such noise (including low-frequency noise) would certainly be necessary and should take into account other planned wind farms.

As the areas of wind farms are planned to be at least 6 nautical miles (~ 11.1 km) from land and islands, this will greatly reduce the spread of noise, including infrasound, to the coast. However, reaching and hearing infrasound depends on both the wind direction and strength (Keith, 2018[180]). Because wind and waves also produce infrasound themselves (Le Pichon[181] et al., 2004), it can be unrealistic to distinguish it from wind farm noise in most cases. There are currently no studies showing the health impacts of noise coming from offshore wind farms. As mentioned above, the results of surveys of onshore wind farms cannot be transferred to offshore wind farms. In addition, land-based studies have shown that the effect of the noise of a wind turbine located more than 7 km away on sleep disorders (Nissenbaum et al., 2012[182]).

At the same time, offshore wind farms may have some negative impact and reduced well-being due to distraction and nocebo impacts. Following the plan, the areas of the offshore wind turbines will only be visible in certain directions from the nearest land-based points. Because many of these health impacts are related to psychological mechanisms, health impacts are largely independent of exposure - if a person sees a wind farm, they may develop a negative association and health symptoms that are, in many cases, true. It would, therefore, be important to minimize the visibility of wind farms and to create wind-free corridors. Maslov et al. (2018 [183]) have shown that visual impacts can vary significantly across the coast, depending on whether you see wind turbines directly or at an angle and how many you see. According to a study by Sullivan[184] et al., wind turbines can be seen up to 42 km (22.7 nautical miles) away, and they are in visual focus at up to 16 km (8.6 nautical miles) (Sullivan et al., 2013). Therefore, it would be important to reduce visibility in areas

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[180] Keith S. 2018. Wind turbine low frequency and infrasound propagation and sound pressure level calculations at dwellings. *The Journal of the Acoustical Society of America* 144:981.

[181] Le Pichon A, Maurer V, Raymond D, Hyvernaud O. 2004. Infrasound from ocean waves observed in Tahiti. *Geophysical research letters* 31:L19103.

[182] Nissenbaum MA, Aramini JJ, Hanning CD. 2012. Effects of industrial wind turbine noise on sleep and health. *Noise & Health* 14:237–243.

[183] Maslov N, Claramunt C, Wang T, Tang T. 2017. Evaluating the visual impact of an offshore wind farm. *Energy Procedia* 105:3095–3100.

[184] Sullivan RG, Kirchler L, Cothren J, Winters SL. 2013. Offshore wind turbine visibility and visual impact threshold distances. *Environmental Practice* 15(1):33–49

where more people are living or where people are walking by the sea to enjoy the sunset.

In addition, Crichton et al. (2013) have shown that the occurrence of health impacts depends on the information provided to people: by talking more about the positive impacts of wind turbines, the negative impacts can be reduced. Wind energy helps, firstly, to reduce carbon emissions, which mitigates climate change, and climate change has a significant impact on the health of the Estonian population, for example, through the increase in heat waves (Orru et al., 2015[185]). On the other hand, wind energy development would help reduce air pollution from oil shale energy. A study conducted under the Estonian Energy Sector Development Plan 2030 (ENMAK) found that air pollution from oil shale burning causes at least 20 early deaths in Estonia each year (Orru et al., 2014 [186]) and tens of thousands of people in Ida-Viru County have been significantly disturbed by air pollution from the oil shale sector (Orru et al., 2018 [187]). By using more wind energy, these health impacts can be greatly reduced.

ENVIRONMENTAL MEASURES:

1. Performing accurate modeling of wind farm locations at the licensing environmental impact assessment stage to minimize disruption, making them less visually visible on more visited seacoasts.

PROPOSALS FOR THE ACTION PLAN:

1. Developing compensatory measures of tolerating wind farms for the local community.
2. As the potential health effects of offshore wind farms are likely to be psychogenic to some extent, people should be made more aware of the benefits of wind turbines (reduction in mortality due to reduced air pollution and mitigation of climate change).

[185] Orru H, Lanki T, Forsberg B, Saava A, Åström DO, Indermitte E, Orru K, Åström K, Rekker K, Tillmann K, Kangur T. 2015. Health *Report:* Assessing the Impacts of Climate Change and Developing Adaptation Measures on Planning, Land Use, Human Health and Rescue Capacity (KATI), pp. 168-262. Edited by Roose A. University of Tartu: Tartu

[186] Orru, H. 2014. Assessment of changes in health effects expected to be caused by airborne pollution through sectoral scenarios using ultra fine particulate matter content as pollution indicator in the framework of ENMAK 2030+ Development Fund: Tallinn

[187] Orru H, Idavain J, Pindus M, Orru K, Kesanurm K, Lang A, Tomasova J. 2018. Residents' self-reported health effects and annoyance in relation to air pollution exposure in an industrial area in Eastern-Estonia. International Journal of Environmental Research and Public Health 15(2).

4.5.5 Sea tourism and recreation

Maritime tourism and recreation have a significant impact on public health through the promotion and enhancement of active mobility. However, there are several risks associated with the recreational use of marine areas. Thus, 15 people drowned in the sea in 2018, which is 35% of all drownings in Estonia (Oidersalu, 2019[188]). It is also important to note that the number of drownings in the sea has more than doubled compared to 2016 (while the total number of drownings in Estonia has remained at the same level). Another part of the accidents involves fishermen in distress at sea and vessels rescued by the Rescue Board. Therefore, it is extremely important to ensure rescue on larger beaches and at sea.

Water-related accidents also include explosives found on the seabed. As recreational diving is gaining in popularity, the risk of accidents is also increasing. Occupational health hazards arise from both marine rescue, and explosive mine clearance: highly volatile hydrocarbons are toxic when inhaled, and mine clearance entail is a risk of accidents. Safety and accident issues have also been raised in connection with water tourism, which has also increased and is rather more likely to be promoted by the plan. Generally speaking, the creation of various recreational facilities at the seaside and at sea is beneficial to public health as it improves the physical health of the population and reduces stress. Increasing the potential incremental risks, such as the number of skin cancer cases, can be mitigated through awareness-raising and wider use of remedies.

Another part of the water quality risks is related to bathing water. Previous plans have stressed that popular bathing areas (beaches) would be managed as official beaches/bathing areas with accompanying water sample testing, etc. This monitoring is organized by the Health Board, which also gives regular warnings of deteriorated water quality. The main cause of water quality deterioration is water blooms, including cyanobacteria in water. Cyanobacterial toxins are toxic to humans both by the ingestion of water and by inhalation of airborne droplets (aerosols) on the beach. The problem of cyanobacteria occurs only in hot periods and with certain winds when the cyanobacteria are carried to the coast from the high seas. In Estonia, cyanobacteria are regularly monitored, and warnings are given to the population when these levels are high.

188 Oidersalu E. 2019. Fatalities in water accidents, 2018. Estonian Rescue Board: Tallinn.

Impact of the MSP

The plan supports the development of maritime tourism and recreation, which in turn supports the active movement of the population, which has a very important impact on the prevention of chronic diseases. With regard to the adverse impacts associated with the development of the sector, the risk of accidents (drowning, injuries, etc.) may be highlighted. There are also noises in water motorsport activities that can cause disturbance to nearby residents and tourists.

Maritime spatial Planning does not plan activities for marine tourism and recreation, which would have a significant environmental impact.

4.6 ECONOMIC ENVIRONMENT

4.6.1 Fisheries

Fishing is an important sector for the Estonian economy. In 2017, 125 economically active companies[189] engaged in sea fishing[190] as their main activity. The number of companies has increased by 34% compared to 2014. The sales revenue of the companies totaled approximately 42.7 million euros in the same year, 17% more than in 2014. In addition, there are 884 sole proprietors registered in Estonia in 2019, whose main activity is sea fishing, according to the Commercial Register. Companies engaged in sea fishing as their main activity employed around 263 people in 2017, 5% less than in 2014. The number of employees per company has also decreased (from 3.0 to 2.1), which is 3.3 times less than the average for Estonian companies. In addition, there is a large number of sea fishing companies in the coastal areas, whose sea fishing is a secondary activity due to its periodic nature (up to four months per year, according to fishermen, which prevents obtaining a stable income). In 2017, the sales revenue of the companies operating in the field of sea fishing accounted for approximately 0.09% of the total sales revenue of Estonian companies and the number of employees for approximately 0.07% of the total number of employees in Estonian companies.

According to Statistics Estonia and the Ministry of Rural Affairs, Estonian professional fishermen caught 64,477 tons of fish in the Baltic Sea in 2017, of which 17% was coastal fishing, and 83% was offshore trawling. Baltic herring

189 Companies which have indicated sea fishing as the main activity in the Commercial Register (EMTAK 2008 code 03111).

190 An economically active company is a company, which according to the Commercial Register has generated revenue for the financial year.

(55%) and sprat (41%) were the main catches in the Baltic Sea that year. In 2017, Pärnu County coastal fishing accounted for 76% of the total coastal fishery. This was followed by Ida-Viru County (11%), Saare County (7%), and Lääne County (4%). In 2017, the number of fishermen entered in fishing permits in Estonian coastal waters was 1950. The highest numbers of professional fishermen were in Saare County (including Ruhnu) (23%), Pärnu County (including Kihnu and Manija) (21%), Hiiu County (17%) and Harju County (16%).

The Marine Economic Benefit Model [191] shows that the total economic benefits from fishing (both trawling and coastal fishing) are highest in the Gulf of Pärnu, amounting to approximately 100,000 euros per km^2 (**Tõrge! Ei leia viiteallikat.**). In terms of the benefits gained, the next important areas are near Lao beach, reaching 3.500 km^2/year, near Konju beach reaching 2,000 euros km^2/year and near Aseri beach, Kakurahu marine area and Kumari-Papilaiu, reaching in these regions over 1000-euro km ^{2}/year. In other areas, the benefits of fishing are lower.

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[191] Estonian economic model: The Marine Economic Benefit Model is a simulation model commissioned by the Ministry of Finance, developed in 2016 and is still being updated to date (Pihor, K. et al. Basic Study of Maritime Spatial Planning: The Marine Economic Benefit Model. Praxis Center for Policy Studies. 2016; Nõmmela, K., Kotta, J., Piirimäe, K. (2019). Complementing the model of economic benefits from the use of marine resources with ecosystem services. Tartu Ülikool, OÜ Hobikoda and OÜ Roheline Rada, (https://www.rahandusministeerium.ee/et/system/files_force/document_files/mudeli_taiendamine_okosusteemiteenustega_aruanne.pdf).

When interpreting the results of the economic model, it is important to consider that this is a discussion platform rather than a means of reflecting reality. The values of the model parameters are highly uncertain, because in Estonian circumstances there are often no reliable measured indicators, so the results of the model should be indicative.

The Marine Economic Benefit Model was updated for fisheries data. For trawling, data were entered for the period 2014-2017, a four-year period, and annual average catches per species and per square kilometer of sea area were calculated. As regards coastal fishing, only the data for 2017 were taken into account. Both topics were transferred to the time step of one year.

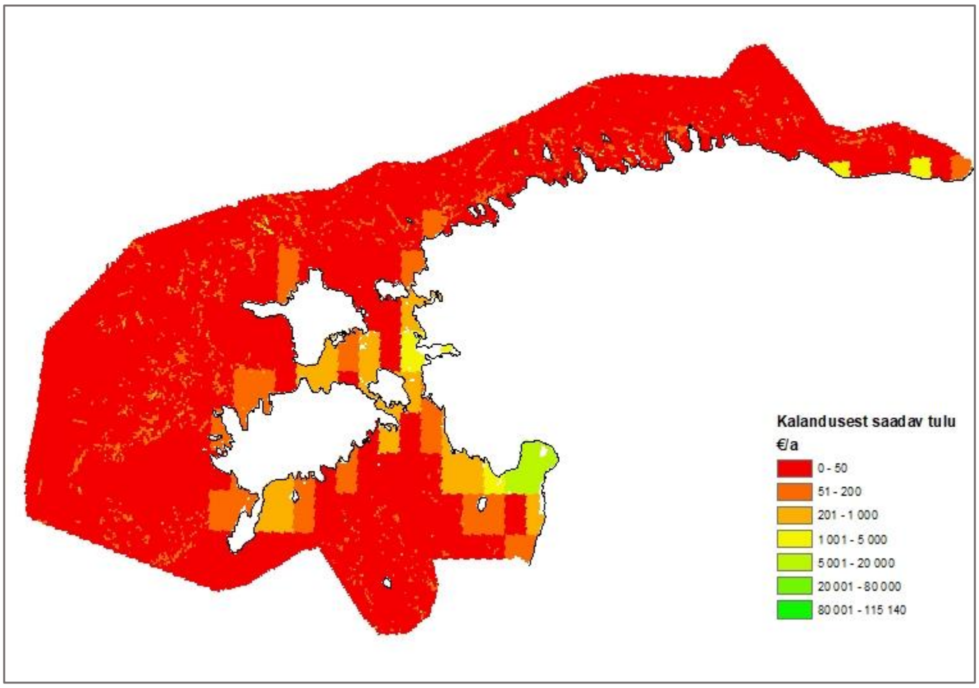

Figure 4.6.1-1. Economic benefits of fisheries in Estonian marine areas, €/km^2/year (Source: The Marine Economic Benefit Model)

The added value of coastal fishing[192] is highest in the Gulf of Pärnu, amounting to over 4,000 euros per km^2/year. The added value is also higher in the Väinameri region, up to 735 euros km^2/year. Near Aseri beach, it is 638 euros km ^{2}/year. Elsewhere, the added value of coastal fishing is less than 1000 euros km^2/year (Figure 4.6.1-2).

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[192] Value added is calculated by multiplying gross income by the value added parameter (60% by default, assuming that the added value of coastal fishing is analogous to trawling in the absence of more accurate data) (Pihor, K. et al. Basic Study of Maritime Spatial Planning: The Marine Economic Benefit Model. Praxis Center for Policy Studies. 2016).

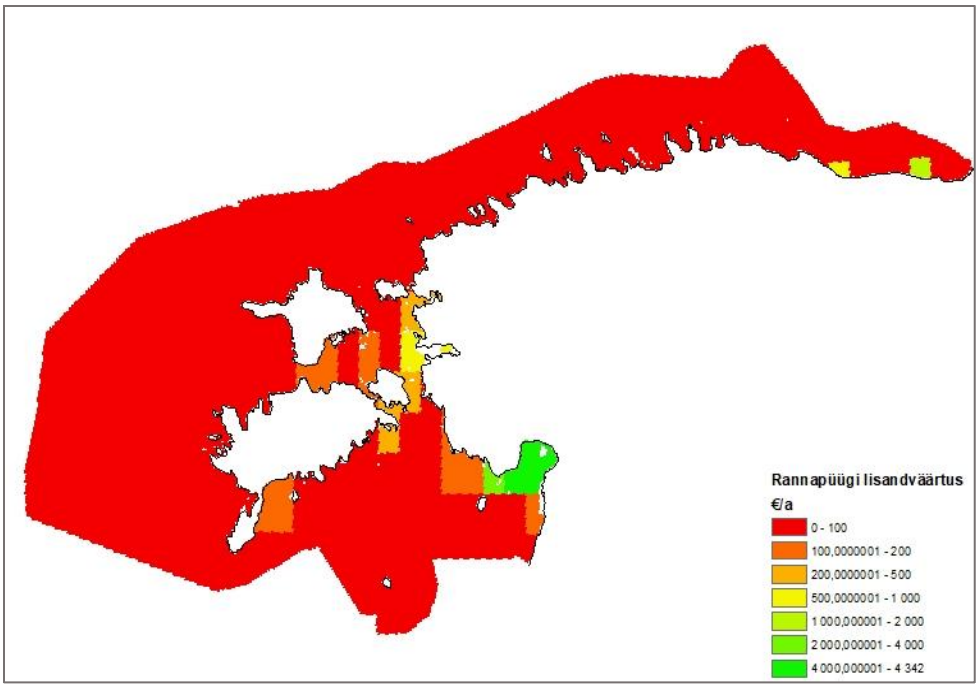

Figure 4.6.1-2. Added value of coastal fishing in Estonian marine areas, €/km^2/year (Source: The Marine Economic Benefit Model)

The added value of trawling in the Estonian marine areas are the largest in the Gulf of Riga, where at times it amounted to 1 500 euros km^2/year. It is also higher in the marine areas near Harju County and in the marine areas near Lääne-Viru County. Elsewhere, the value-added of trawling was less than 1000 euros km^2/year (Figure 4.6.1-3).

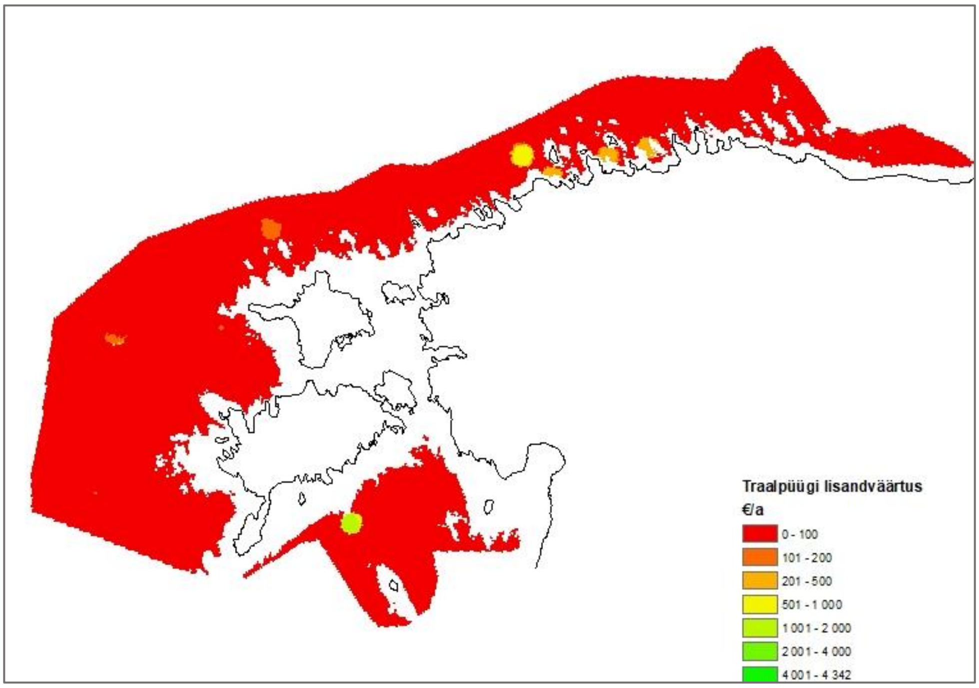

Figure 4.6.1-3. Added value of trawling in Estonian marine areas, €/km^2/year (Source: The Marine Economic Benefit Model)

The state income from coastal fishing in[193] Estonian marine areas was proportional to the added value, being the highest in the Gulf of Pärnu, where it reached up to 700 euros per km^2/year. The state revenue is also significant in the vicinity of Lao Beach, Konju Beach and Aseri Beach, Kakurahu marine area, and Kumari-Papilaiu marine area. In other areas, the state income from fisheries is lower (Figure 4.6.1-4).

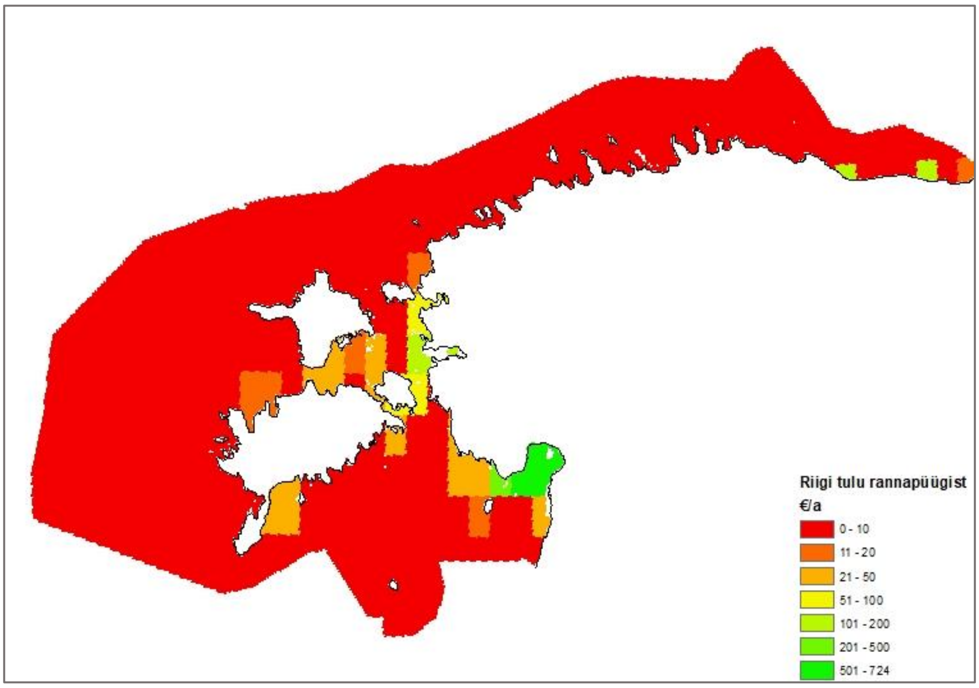

Figure 4.6.1-4. State value from coastal fishing in Estonian marine areas, €/km^2/year (Source: The Marine Economic Benefit Model)

State revenue from trawling in Estonian marine areas is also proportional to the added value of trawling. The state revenue from trawling is highest on the southern coast of Saaremaa, amounting to 760 euros km ^{2}/year. The state revenue from trawling is also significant in the sea areas near Harju County and Lääne-Viru County. In other areas, the national income from trawling is lower (Figure 4.6.1-5).

[193]State income is calculated as a fraction of the gross income (10% by default, assuming these are small businesses, for which coastal fishing is an ancillary activity not subject to VAT), multiplied by the fish catches at primary purchase price of the fish. As a result, the state income is the income tax of the natural person from the dividends paid out. (Pihor, K. et al. Basic Study of Maritime Spatial Planning: The Marine Economic Benefit Model. Praxis Center for Policy Studies. 2016).

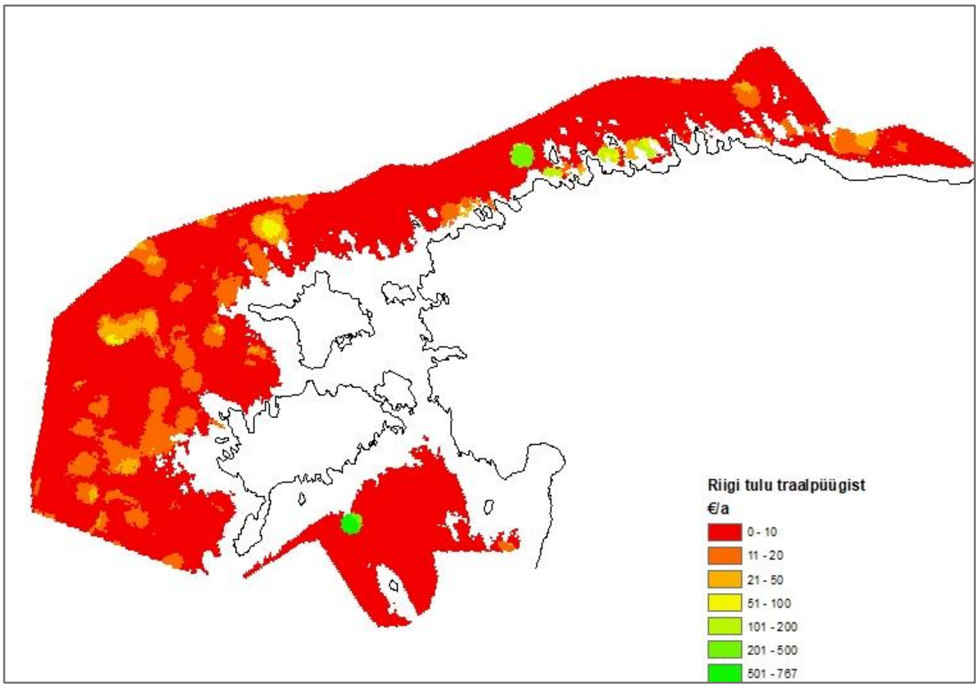

Figure 4.6.1-5. State value from trawling in Estonian marine areas, €/km²/year (Source: The Marine Economic Benefit Model)

Impact of the MSP

The Maritime Spatial Plan does not foresee changes in fisheries-related marine areas, so the plan has no direct economic impact on the sector. Maritime spatial Planning provides a guideline and condition for ensuring the preservation of spawning grounds located in different marine areas that are important for the natural recovery of fish stocks and for ensuring that spawning grounds would not be subject to significant adverse impacts, which are also important from an economic standpoint - ensuring the sustainability of fish stocks is a key factor in the functioning of the fisheries sector. The Maritime Spatial Plan also identifies as a guideline the maintenance or creation of free access to fishing areas, fishing ports, and landing sites, which is also very important from an economic standpoint since free access is a prerequisite for the operation of fishing companies. In addition, the Maritime Spatial Plan sets a minimum depth requirement for trawl fishing, which does not deviate from the current rule and therefore has no economic impact.

Fishing activities require the existence of ports and access to and proper operating condition of the infrastructure there. As of the beginning of 2019, there are 171 seaports in Estonia (data from the Port Register). Fishing at sea does not generally preclude other activities.

Overlap between trawling and wind energy development areas

According to the maritime economic model there are theoretical areas of conflict in the 20-40 m depth range of areas suitable for trawling and wind energy development, where trawling is allowed due to sufficient depth and wind farms are still economically viable due to sufficient shallowness. The largest such area of conflict is in the wind farm area of the Gulf of Riga, which according to the calculations of the generalized economic model (1x1 km grid), almost completely overlaps with the trawling area (Figure 4.6.1-6). In the area to the west of Saaremaa there is a more intense overlap in the south-eastern part of the area.

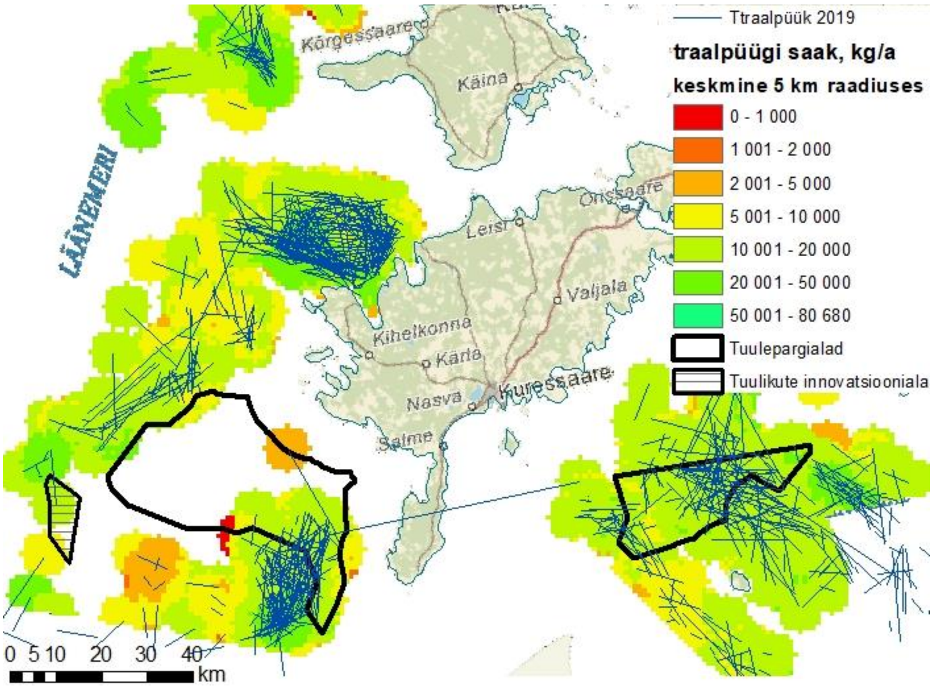

Figure 4.6.1-6. Overlap of trawling and wind energy development areas in Estonian marine areas (Source: Marine Economic Benefit Model)

Trawling has increased in recent years in the wind farm areas set out in the plan. In the wind area of the Gulf of Riga the average share of companies' catches in 2019 was 35% of the total catch in the Gulf of Riga[194]. Considering that the area of the wind farm in the Gulf of Riga has also been established by the plan of Pärnu County, the area added to this plan will further reduce the opportunities for economic activities related to trawling. (Fishermen's Union 19 February 2021).

As to the ports the wind farm area in the Gulf of Riga affects the port of Roomassaare in Saaremaa and the port of Virtsu in Pärnu County the most. In recent years the port of Roomassaare has landed an average of 49% of the total catch from this wind farm area. (Ministry of Rural Affairs, 5 January 2021). If fishing decreases due to wind farms, the income of these ports will also decrease significantly. In the area to the west of Saaremaa there are intensive fishing areas for sprat and herring in the south-eastern part of the area. The decrease in fishing opportunities in this area has the greatest impact on the port of Mõntu in Saaremaa, where 79% of the fish caught in this wind farm area has been landed in recent years. In addition, it should be borne in mind that wind

[194] Letter of the Minister of Rural Affairs to the Ministry of Finance, 5 January 2021

farm areas are not expected to be fully realizable and the extent of their impact on trawling will depend on the latter.

Although the plan allows shipping traffic in the wind farm areas, the shipowners, considering the experience of foreign countries, avoid moving there due to an increase in the risk factor (especially the risk of collisions due to bad weather or engine failure), which insurance companies do not want to compensate. As a result, the cost of fuel and time for shipping, including fishing vessels, is increasing, which is changing the amount of income. It is not possible to assess the exact financial implications of this work due to the lack of detailed information.

Brief overview of the experience of the European countries in the coexistence of offshore wind farms and fishing, in particular trawling

In the United Kingdom the fishing activities are permitted in offshore wind farms. During the construction of the wind farm the safety zone with a radius of 500 m has been established around the main construction vessel, during the operation of the wind farm the safety zones with a radius of 50 m have been established around all fixed equipment, i.e. especially wind turbines. Fishermen are compensated for the loss of income for the areas where fishing is prohibited. At the same time fishermen are responsible for any damage that may occur to wind farm equipment and it is the fishermen's responsibility to compensate them. In order to reduce risks, fishermen generally avoid activities in the wind energy development areas[195,196].

The German maritime spatial plan identifies "priority areas" for various activities, where other activities are generally prohibited. Such areas are also designed for wind energy, which means that fishing activities are not allowed in these areas. However, no such areas have been designated for fishing due to the spatial variability of their activities[197].

The 500m wide safety zone has been established around the Belgian offshore wind farm (the total of 36 wind turbines, 650 to 1000 m apart) and has been closed to shipping since 2006[198].

In the Dutch offshore wind farms all fishing was completely banned until 2015, when it was decided to change the law so that the three areas could coexist

[195] Schupp, M. F., Kafas, A., Buck, B. H., Krause, G., Onyango, V., Stelzenmüller, V., Davies, I., Scott, B. E. (2021). *Fishing within offshore wind farms in the North Sea: Stakeholder perspectives for multi-use from Scotland and Germany. Journal of Environmental Management* 279 (2021) 111762

[196] Arcadis, 2018. *Review on Risk Assessment on Transit and Co-Use of Offshore Wind Farms in Dutch Coastal Water, Commissioned by the Dutch Ministry of Economic Affairs and Climate Policy*, Arcadis Nederland B.V.

[197] (Shupp, at al. 2021)

[198] (Bergman, jt. 2015[198])

under certain conditions[199]. The amendments to the law allowed conditional[200] fishing, but the activities that disturb the seabed, i.e. trawling, remained prohibited[201].

The cable protection zones have been established for the areas of Danish offshore wind farms, covering the entire area of the wind farm and the cables connecting it with a width of 200 m. The law requires fishermen who normally fish in these areas to be compensated for the loss of income. The exact amount of compensation will be agreed with each fisherman individually[202].

The coexistence of offshore wind farms and fisheries is essential for achieving the goals of the European climate policy. The European MSP platform sees the planning of the wind areas to the less intensive fishing areas, allowing fishing in the wind farm areas under certain conditions, planning transit corridors, taking into account the seasonality of fishing when planning the wind farm construction, supporting cross-sectoral cooperation agreements, compensating fishermen, etc. and other opportunities to promote synergies. [203] However, fishermen are sceptical about these solutions, as trawling is prohibited or hampered even under such conditions, compensation usually only compensates for a certain part of the income and other authorized fishing involves risks, as the insurance companies are generally reluctant to insure the movement between the wind turbines.

The implementation of the maritime spatial plan will not have a direct economic impact on fisheries, except for the impact of wind energy development areas on fishing, in particular trawling.

The wind energy development areas proposed in the plan partially overlap with the trawling fishing areas, but as the overlap is small (4.5% of the Estonian trawling fishing areas overlap with the wind energy development areas), this is a significant but local impact. The guidelines and conditions set out in the plan support the functioning of the fishery, but the more detailed analysis of the impact of wind farms requires a more detailed analysis at the level of the authorization procedure and environmental impact assessment.

On 29 April 2021 the Government of the Republic made an interim decision, designating those of the wind energy development areas proposed in the

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[199] European MSP Platform. *Conflict fiche 5: Offshore wind and commercial fisheries*

[200] Additional restrictions were imposed on fishing, such as vessels up to 24 m, fishing during the day, etc.

[201] Arcadis, 2018. *Review on Risk Assessment on Transit and Co-Use of Offshore Wind Farms in Dutch Coastal Water, Commissioned by the Dutch Ministry of Economic Affairs and Climate Policy*, Arcadis Nederland B.V.

[202] Danish Energy Agency (2018). *Offshore Wind and Fisheries in Denmark, Danish Energy Agency, December 2018*. Kättesaadav: https://ens.dk/sites/ens.dk/files/Globalcooperation/offshore_wind_and_fisheries_in_dk.pdf

[203] *European MSP Platform. Conflict fiche 5: Offshore wind and commercial fisheries*

maritime spatial plan as reserve areas which coincide with the areas of historically more intensive trawling.

4.6.2 Maritime transport

Maritime transport has always played an important role in the Estonian economic environment by providing international and national connectivity opportunities and by being an important employer and business developer. In 2017, 60 economically active companies were engaged in shipping[204] in Estonia. The number of companies has increased by 15% compared to 2014. Corporate sales totaled approximately 0.5 billion euros in the same year[205], 5% lower than in 2014. Sales per company have also fallen. The sales revenue of shipping companies accounted for approximately 1% of the total sales revenue of Estonian companies in the same year.

Shipping companies employed around 7,676 people[206] in 2017, up 3% from 2014. However, when comparing the number of employees without one of the largest shipping companies, AS Tallink Grupp, the number of employees has decreased by 45% (from 494 to 270) during the period 2014-2017. The average number of employees per company has also decreased (excluding AS Tallink Grupp from 9.7 to 4.6). Similarly, to the decline in the number of employees in shipping companies, the total number of employees in Estonian companies has decreased over the same period (from 7.6 to 6.9). The number of employees in shipping companies accounted for approximately 2% of the total number of employees in Estonian companies in 2017. There are also ports related to maritime transport[207], which provide a service to shipping companies and which employed around 800 more people in 2017. In addition, Estonian seafarers work in shipping companies of other countries, but there is no reliable information on their numbers.

According to the Port Register, there are 220 ports in Estonia as of 2019, of which 171 are seaports, of which 73% or 125 are small craft ports. According to Statistics Estonia, approximately 7 million passengers traveled on the main international regular services[208] in2017, and approximately 2.5 million passengers on the main domestic regular[209] services. In the same year, 311 cruise ships with 564,280 cruise tourists visited the Port of Tallinn. In total, approximately 6,500 passenger and cruise ships from abroad visited Estonian

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123 Companies which have designated as main activities in the Commercial Register (EMTAK 2008 codes): Sea and coastal freight water transport (50101), Sea and coastal passenger water transport (50101) or Towing of ships (50202).

205 90% of the total sales revenue was generated by AS Tallink Grupp (only the Company's revenue in the field of maritime transport is included).

206 96% of the number of employees was comprised of the employees of AS Tallink Grupp.

207 Companies that have designated port and waterway activities as the main activity in the Commercial Register (EMTAK 2008 code 52221).

208 Tallinn - Helsinki - Tallinn; Tallinn - Stockholm - Tallinn; Paldiski - Kappelskär - Paldiski; Riga-Stockholm-Riga

209 Virtsu - Kuivastu - Virtsu; Rohuküla - Sviby - Rohuküla; Rohuküla - Heltermaa - Rohuküla; Triigi - Sõru - Triigi; Munalaid - Kihnu - Munalaid; Pärnu - Kihnu - Pärnu

ports. The volumes of passenger transport have increased year by year. In passenger transport, international ferry connections are mainly concentrated in the Tallinn area, and domestic ferry connections serve traffic between the mainland and the islands.

In 2017, approximately 34.8 million tons of cargo were transported through Estonian ports, which is 20% less than in 2014. The number of foreign cargo ships visiting Estonian ports and arriving from abroad has also decreased; in 2017, the number of visits of cargo ships was approximately 5,000, which is 4% less than in 2014. The largest cargo ports for cargo transportation are the ports of AS Tallinna Sadam, and the ports of Sillamäe, Pärnu, Paldiski, and Kunda.

According to the Marine Economic Benefit Model, the added value of shipping is up to 0.3 million euros km^2/year. The added value created by the shipping is greatest in the area of international shipping lanes on the high seas, as well as in the vicinity of Tallinn, Muuga, Paldiski, Sillamäe, and Pärnu and on the North-South shipping lane in the Väinameri Sea (Figure 4.6.2-1). The total added value of shipping in the Estonian marine area is approximately 407 million €/year.

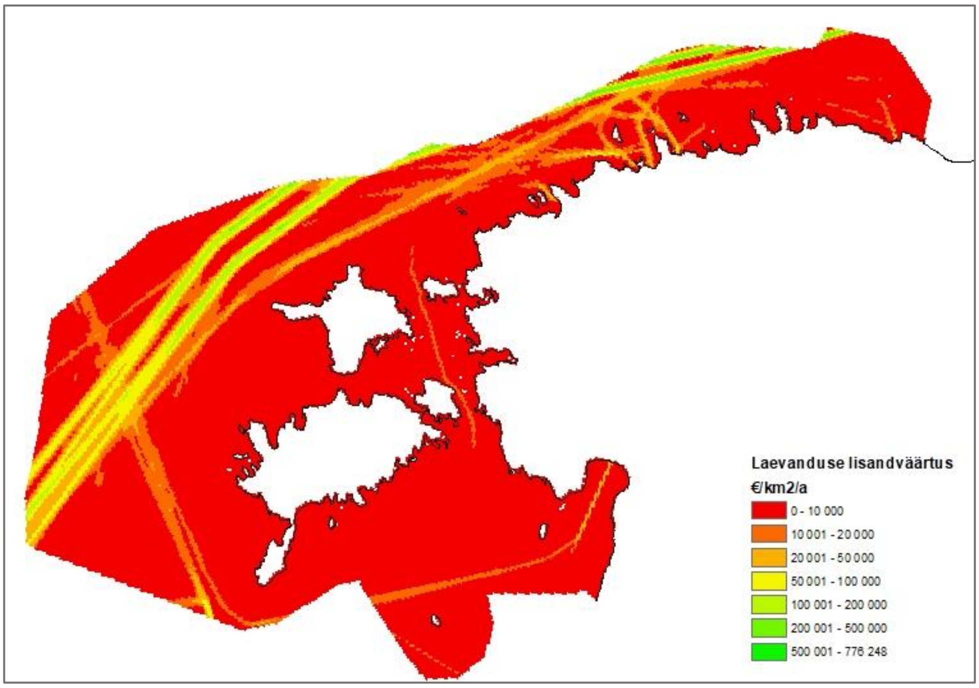

Figure 4.6.2-1 Added value of shipping in Estonian marine areas, €/km^2/year (Source: The Marine Economic Benefit Model)

State revenue from shipping is proportional to the added value of shipping, amounting to 0.1 million euros km^2/year on more active shipping lanes (Figure 4.6.2-2). The largest areas in terms of state revenue are just like in case of added value, international shipping lanes, and the Tallinn, Muuga, Paldiski, Sillamäe, and Pärnu regions and the North-South shipping lane in the Väinameri Sea. The country's total shipping revenue is approximately 200 million euros/year.

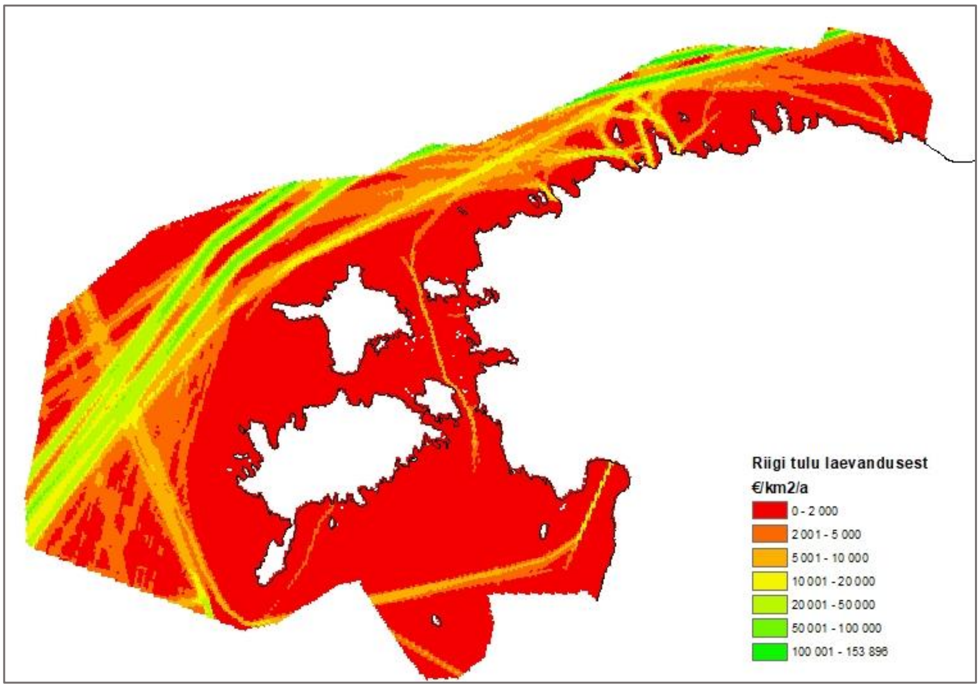

Figure 4.6.2-2. Public revenues from shipping in Estonian marine areas, €/km^2/year (Source: The Marine Economic Benefit Model)

Maritime transport is an international sector whose development is highly dependent on global trends and the competitiveness of the surrounding area. New regulatory developments, technological developments, changes in intergovernmental economic policy relations, etc., may lead to changes in freight and passenger transport, including the opening of new shipping lanes or ports. Also, the volume of sea transport may be significantly affected by the planned tunnel between Tallinn and Helsinki or plans to build bridges between the islands and the mainland, which may change the intensity of use of the sea areas.

Impact of the MSP

The Maritime Spatial Plan does not foresee any changes in the marine areas associated with maritime transport and therefore has no direct economic impact on the sector. As a guideline, Maritime Spatial Plan highlights the potential overlap of waterborne traffic areas with other uses of the sea (including wind energy, aquaculture, etc.), which is a situation where the current functioning of maritime transport is not hindered will have a positive impact on the economic environment. The more economic sectors use the marine areas more multifunctionality, without negative synergies, the greater the positive impact on the economic environment as a whole. As part of the improvement of the planning solution in May-June 2020, the needs of maritime transport in the areas suitable of wind energy development have been taken into account more clearly and better. The surface area of the wind energy development areas was reduced to avoid overlaps with heavy ship traffic areas. The basic passage corridors were also designated for shipping, which must be left free of wind turbines. This avoids possible additional hazard situations and ensures the most optimal routes for maritime transport. Ensuring optimal traffic routes has a clear positive economic impact - additional time and fuel consumption due to lengthening of the voyage is avoided. When bypassing wind energy development areas, the ship's calculated voyage can increase by 10 - 30 km depending on the destination and the time consumption can increase by 0.5 - 1.5 hours. The rate of increase in fuel consumption is difficult to determine, as it depends on the type of vessel, the size of the cargo and many other factors.

In addition, Maritime Spatial Plan sets the guideline, on designing a network of ports, taking into account naturally suitable locations and optimum distances for sailing and motor yachting. From an economic standpoint, this limits the development of potential entrepreneurship in areas where there are capable entrepreneurs and local demand, but naturally unsuitable conditions or the area is outside the optimal range for yachting. From an economic standpoint, the selection criteria for port network design should not be narrowed down to the two factors set out in the Maritime Spatial Plan guidelines, but entrepreneurship should be comprehensively promoted, i.e., all factors should be taken into account when designing new small craft ports or existing port networks.

Shipping requires the availability of ports and access to and the good operating condition of their infrastructure. Shipping may be restricted by nature reserves, where shipping may be subject to additional restrictions and environmental requirements, while Maritime Spatial Plan makes it necessary to consider shipping lanes when creating a new nature site, which is an essential condition for maintaining the positive economic impact of shipping. Shipping may also be obstructed by cables and pipelines located on the seabed and by cultural heritage sites in the vicinity of which anchoring is restricted. For the latter, Maritime Spatial Plan makes it a condition for shipwrecks to be taken into account in cooperation with the National Heritage Board. Contradictions can also occur in the case of overlapping of shipping lanes and aquaculture areas, but to avoid this, Maritime Spatial Plan has made it a condition that the aquaculture development area is not designed for shipping lanes.

Port activities support activities related to shipping, fisheries, aquaculture, marine tourism, recreation, energy generation, marine rescue, border control, pollution control, and national defense, providing access to the sea (including related services). There are no conditions for port activities in Maritime Spatial Plan, and therefore there is no direct economic impact on port activities.

From the economic standpoint of maritime transport, it is important to keep open the shipping routes, especially the shipping lanes, including national and international, and areas suitable for ports, and to avoid the emergence of restrictions in these areas in order to maintain the competitiveness of Estonian maritime transport.

The implementation of the Maritime Spatial Plan does not have a direct economic impact on maritime transport. The conditions set out in the plan will encourage synergies between maritime transport and other economic activities in maritime uses.

4.6.3 Maritime tourism

Maritime tourism and recreation[210] is an important business area for the Estonian economy. In 2017, 441 economically active businesses were engaged in providing maritime tourism and recreational services[211] (including lodging, dining, and drinking, surfing, and sailing clubs) on the coastal areas. The number of companies has increased by 9% compared to 2014. The total sales revenue of the companies in 2017 was approximately 400 million euros, which is 25% more than in 2014. In 2017, hotel revenue accounted for 58% and food and beverage revenue for 36% of the sales revenue. According to the Commercial Register, 75 economically active companies in Estonia were operating in the same year engaged in the construction of pleasure boats and sports boats and in the rental of water transport equipment. The number of companies has increased by 9% compared to 2014. The total sales revenue of these companies in the same year was approximately 35 million euros, which is approximately the same as in 2014.

Companies engaged in the provision of maritime tourism and recreational services employed around 7,875 people in 2017, about 10% more than in 2014. Hotel staff accounted for 60% of the workforce, and employees of food and drink establishments accounted for 35%. The number of employees per company has remained stable between 2014 and 2017 (approximately 18 employees per company). Companies engaged in the construction of pleasure boats and sports boats, and the renting of water transport equipment employed approximately 252 people in 2017, down by 13% compared to 2014. The number of employees per company has also decreased in recent years (from 4.2 to 3.4). In 2017, the number of enterprises actively engaged in the provision of maritime tourism and recreational services, as well as the construction of pleasure and sports boats and the renting of water transport equipment accounted for approximately 0.9% of the total number of enterprises in Estonia. In the same year, the sales revenue of companies accounted for approximately 0.9% of the total sales revenue of Estonian companies and the number of employees for approximately 2.1% of the total number of employees of Estonian companies.

In addition, nature tourism is actively developing (especially bird watching on the west coast of Estonia and the Kihnu region, as well as elsewhere in the Gulf of Riga). Maritime tourism and recreation also have an indirect impact on other

[210] Based on the availability of data, the economic impact of maritime tourism and recreation has been assessed by taking into account he economic performance of companies engaged in providing services in coastal areas (accommodation (including home accommodation/guest apartments, guest houses, hotel; holiday accommodation), eating and drinking places, surfing and sailing clubs) and in the construction of pleasure and sports boats and in the renting of water transport equipment.

[211] The companies involved in providing maritime tourism and recreational services have been selected based on the sites located in the coastal areas mapped in the "Maritime Spatial Planning Baseline: Mapping Social and Cultural Objects" (2016), adding to them the companies that provide related services and their financial performance.

business sectors (adjacent support and ancillary services), whose activities are highly dependent on the competitiveness of maritime tourism and recreation.

To complement the Marine Economic Benefit Model with ecosystem services[212], a methodology for mapping recreational value as a cultural service in Estonian coastal areas was developed. As part of the work, the recreational, economic value of coastal local governments, which consisted of assessing the material benefits of maritime cultural services, was mapped. In terms of economic value, the value of the socio-cultural objects located in Tallinn was highest. Tallinn was followed by the city of Pärnu. Figure 4.6.3-1 shows the distribution of the economic value of the Estonian coastline on a scale of 0-100 in the comparison of local authorities by the sea.

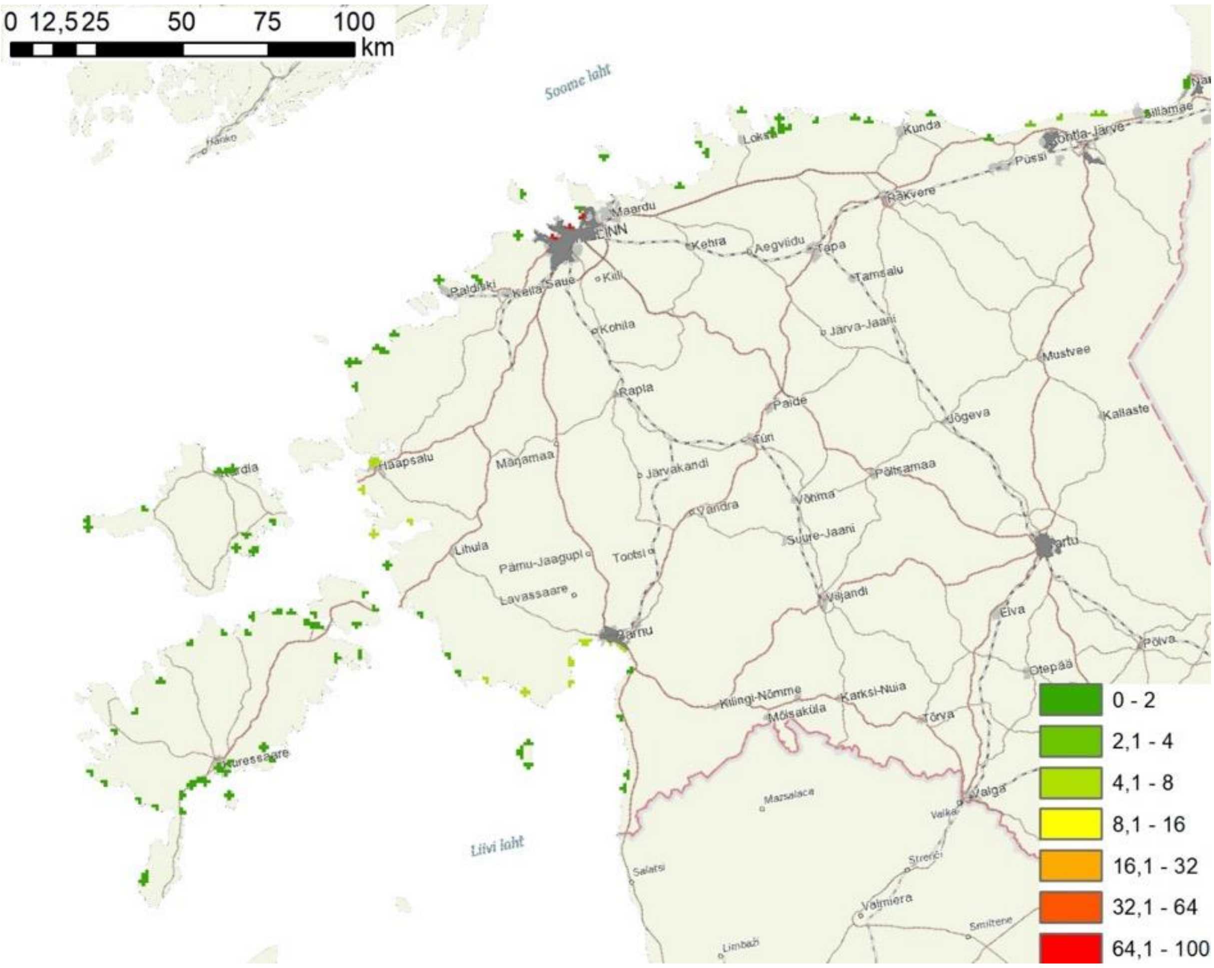

Figure 4.6.3-1. Economic value of socio-cultural objects located in Estonian coastal and marine areas by local governments (scale 0-100)

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[212] The work was commissioned by the Ministry of Finance. Reference: Nõmmela, K., Kotta, J., Piirimäe, K. (2019). Complementing the model of economic benefits from the use of marine resources with ecosystem services. University of Tartu, OÜ Hobikoda and OÜ Roheline-Rada, (https://www.rahandusministeerium.ee/et/system/files_force/document_files/mudeli_taiendamine_okosusteemiteenustega_aruanne.pdf).

The Estonian maritime tourism and recreation sector has great development potential. In recent years, passenger traffic in Estonia's largest port has grown - in 2017, 311 cruise ships with 564,280 tourists visited the Port of Tallinn. At the same time, the number of visits of these ships can be increased in the long term by providing more attractive tourism services in coastal areas and elsewhere in Estonia. It is also possible to open new shipping lines and receive cruise ships in other Estonian ports. Sailing and recreational tourism also have the potential to grow, in particular, through the rearranging of the network of small craft harbors and the development of coastal tourism services.

Impact of the MSP

Maritime Spatial Plan does not foresee any changes in the marine areas associated with maritime tourism and recreation and therefore has no direct economic impact on the sector. Maritime Spatial Plan, as a guideline, promotes the development of international passenger ship traffic and maritime recreational and sporting activities in suitable areas, but does not set criteria for the selection of suitable areas. From an economic standpoint, maritime tourism and recreational activities should be encouraged wherever there is a supply and demand. In addition, the plan provides guidance as to considering the potential tourism value in developing new uses of the sea, which is of great economic importance, while encouraging the development of diversified and mutually supportive business in marine areas.

Maritime tourism-related and recreational areas are generally located in the vicinity of the coast and therefore do not interfere with other marine use activities. When visiting cultural heritage sites or other areas offshore, maritime tourism companies must take into account the activities of other economic sectors at sea. Maritime tourism and recreation are directly linked to port operation areas, as many activities require access to the sea. Maritime tourism and recreational activities are also linked to attractive nature reserves and cultural heritage sites and access thereto. Maritime tourism can also be boosted by new uses such as aquaculture (e.g., diving in aquaculture areas) and wind energy (visits to wind farms).

In the field of maritime tourism and recreation, it is important that marine areas have access to ports and access to nature reserves and cultural heritage sites in order to preserve the sector's competitiveness and development potential.

The implementation of Maritime Spatial Plan does not have a direct economic impact on maritime tourism. The guidelines set out in the plan support the functioning of maritime tourism and encourage its development in the planning of new maritime uses.

4.6.4 Energy production

Offshore energy production is a forward-looking industry considering global developments. According to the Energy Development Plan 2030, the aim is to set up wind turbines with a total installed capacity of up to 500 MW in offshore wind farms, the construction of which would significantly develop the business of the sector. In 2017, there were 14 economically active companies in Estonia, whose main activity was generating electricity from wind energy[213]. Compared to 2014, the number of such companies has increased by 56%, from 9 to 14. In 2017, the total sales revenue of these companies was approximately 15 million euros, doubling revenue per company compared to 2014. However, in 2017, only three companies had created jobs in wind energy companies, a total of 4, which was less than in 2014. As of autumn, 2019, 25 companies have been registered in Estonia, whose main activity is generating electricity from wind energy, but the companies currently registered are engaged in wind energy development from onshore wind farms. Analysis of companies' economic performance reveals that wind energy development does not generate a large number of direct jobs, but indirectly (construction, repair, and maintenance, etc.), job creation can still be significant. In addition, it should be borne in mind that wind energy-related economic activity is largely dependent on more windy months of the year when both business profits and labor demand are higher.

According to the Marine Economic Benefit Model, out of the wind energy development areas in the Maritime Spatial Plan, the area with the largest amount of energy produced (MWh/y) is west of Saaremaa, with 32 to 34 GWh/y/km^2. The amount of energy produced in the Gulf of Riga is around 32 GWh/y/km^2.

[213] According to the Commercial Register, the main activity EMTAK 2008 code 35113 “Electricity generation from wind energy”.

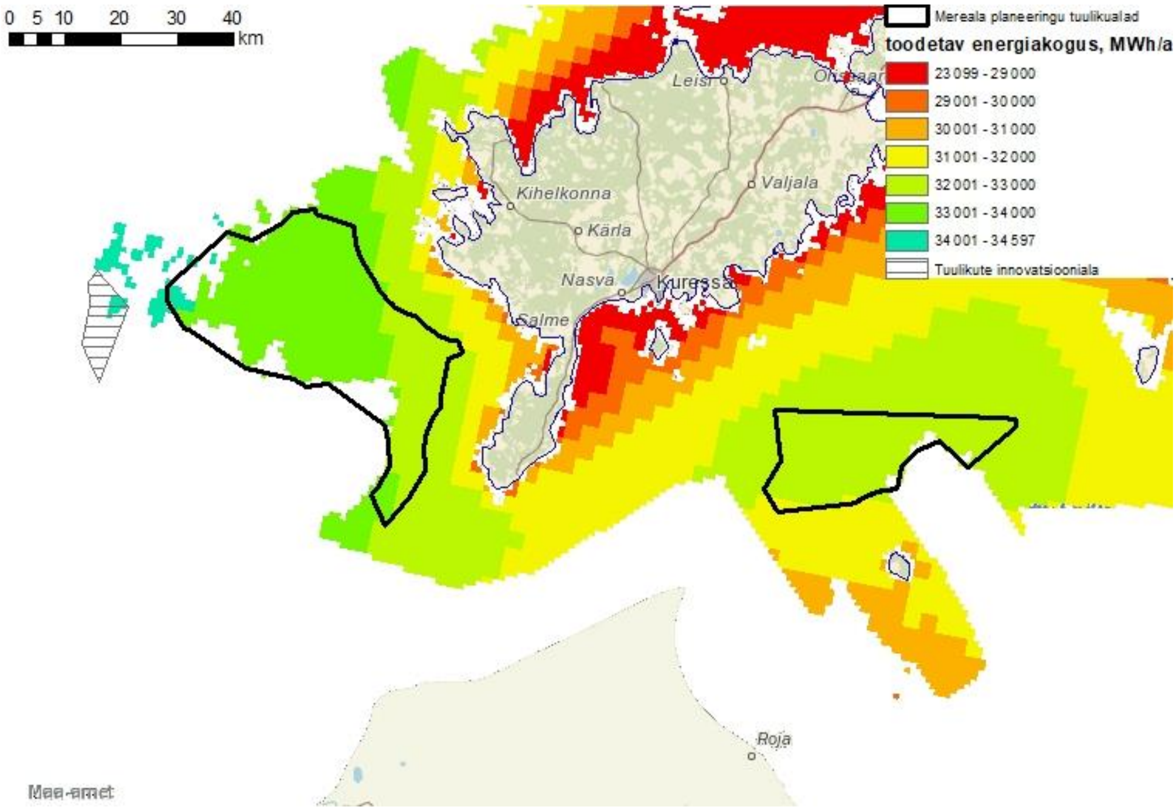

Figure 4.6.4-1. Energy production in planned wind farm areas, MWh/a (The Marine Economic Benefit Model)

According to the Marine Economic Benefit Model, the value-added of the Maritime Spatial Plan wind energy development areas in the Gulf of Riga area is positive throughout most of the area, ranging from -0.04 to 0.23 million €/km2/y. By contrast, the value-added of the wind farm area in the Baltic Sea is negative, almost by half being -0.12. 0.04 million €/km2/y. The area with the highest maximum added value for businesses is the Gulf of Riga. This is followed by Harilaid and then the area west of Saaremaa. The maximum, average, and minimum values of the wind energy development areas are given in the Table . The variation in the potential added value of wind energy development areas is shown in 4.6.4.1. When interpreting the values in the table and the figure, the limitations of the model must be taken into account, including in particular that the model takes into account the network connection to the 330 kV high-voltage line of mainland Estonia, and in case of creation of the connection to the nearby 330 kV high-voltage line in Latvia, the area west of Saaremaa could start providing a significantly higher added value.

Table 4.6.4-1. Value-added of wind energy development areas [214], €/km^2/y (Source: The Marine Economic Benefit Model)

[214] Maximum, minimum and mean values were obtained from the output of The Marine Economic Benefit Model using the Zonal Statistics Tool.

Wind energy development area	Maximum	Mean	Minimum
Area west of Saaremaa (area 2)	36 071	-32 439	-3 625 113
Gulf of Riga (area 1)	227 717	96 671	-20 749

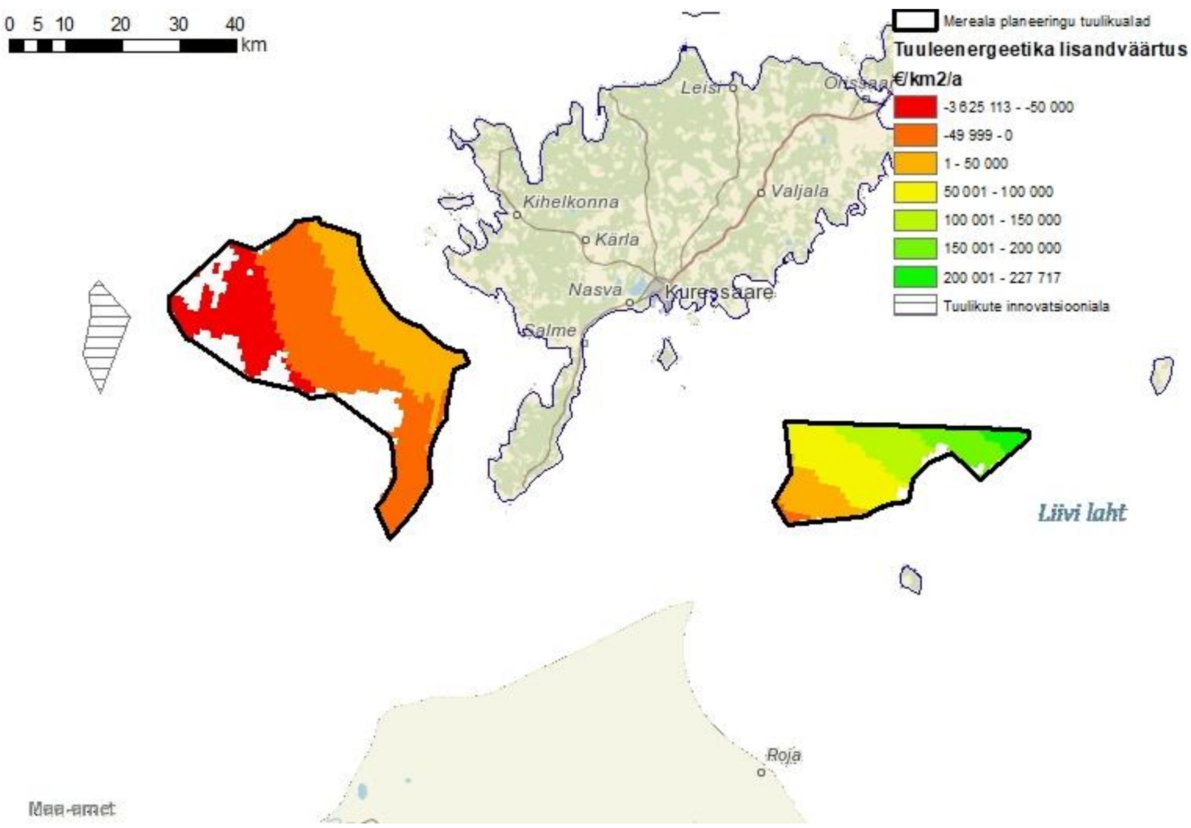

Figure 4.6.4-2. The potential added value of wind energy in planned wind farm areas, €/km^2/y (Source: The Marine Economic Benefit Model)

The wind energy development areas in the Maritime Spatial Plan in terms of potential state income in the Gulf of Riga will be stably at slightly less than 0.3 M €/km ^{2}/y, in the area west of Saaremaa at slightly more than 0.3 M €/km^2/year. The area with the highest maximum state income from wind energy is the area west of Saaremaa, which had the lowest maximum added value for companies [215]. Areas in the Gulf of Riga and close to Harilaid would provide the maximum amount of state revenue in equal amounts (€ per km^2 per year). The maximum, average and minimum state revenues for wind energy development areas are given 4.6.4-2. The variation in potential state revenues for wind energy development areas is shown in 4.6.4-3. The limitations of the model must be taken into account when interpreting the values in the table and the figure.

[215] For a company, higher costs mean less added value, while higher costs mean more taxes for the state.

Table 4.6.4-2. State revenue from wind energy[216] in the planned wind energy development areas, €/km²/y (Source: The Marine Economic Benefit Model)

Wind energy development area	Maximum	Mean	Minimum
Area west of Saaremaa	602 164	310 074	297 377
Gulf or Riga	299 899	292 291	282 004

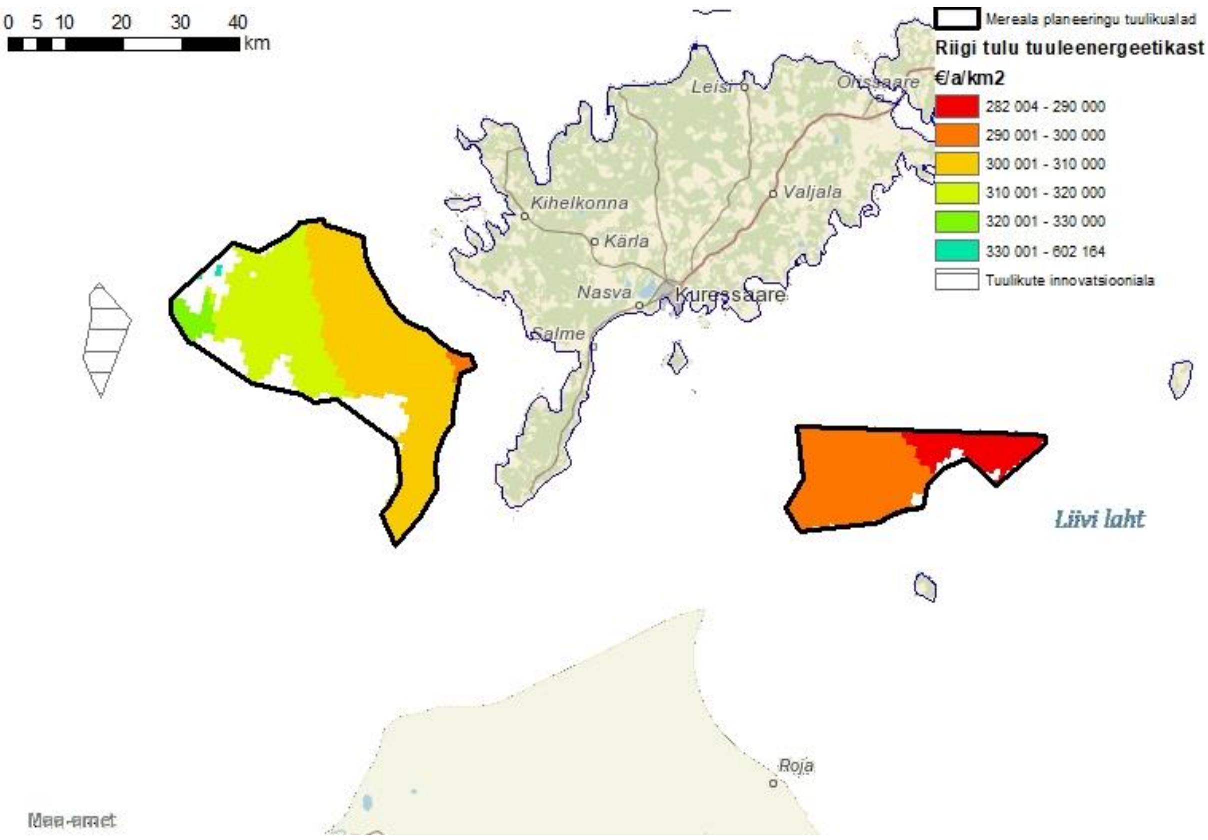

Figure 4.6.4-3. State value from wind energy development in Estonian marine areas, €/km²/year (Source: The Marine Economic Benefit Model)

Impact of the MSP

The introduction of offshore wind energy would increase economic competitiveness and, as a new field of activity, bring added value to various areas (new skills, technological developments, etc.). The 1,000 MW wind farm would mean an investment of more than 2 billion euros to the Estonian economy and create 70 to 100 direct long-term jobs (plus thousands of temporary jobs). The construction of wind farms would have a significant impact on the country's GDP and could become an important export item. The construction and operation of the wind farm will also have an impact on other sectors (during

[216] Maximum, minimum and mean values were obtained from the output of The Marine Economic Benefit Model using the Zonal Statistics Tool.

construction, in particular, the transport of materials, labour, construction work and maintenance and repair work during operation). The operation of the wind farm also has an impact on nearby ports, the service of which is actively consumed, creating additional jobs there. (MKM, 16 February 2021).

The maritime spatial plan has taken into account other areas of marine use, known natural, national defence, social, etc. restrictions and other possible contradictions, which is why offshore wind energy development areas generally do not impose restrictions on planning/developing other economic activities except fishing, especially trawling. The maritime spatial plan sets a guideline not to plan new protected natural objects to the wind energy development areas without assessing the social and economic impacts, which is very important for the economic activity of the sector. In addition, maritime spatial planning makes it a condition to favour aquaculture, in particular shellfish and algae farming, in the wind energy development areas, which is important for strengthening the synergies between economic activities. The plan also defines the area of innovation in wind energy, which is primarily intended for the wind turbines and other innovative solutions on floating foundations. The designation of an innovation area promotes the economic development of the sector.

Maritime spatial planning will determine the marine areas suitable for **wind energy development**, taking into account other areas of the maritime economy and their possible synergies. Of the planned areas, the area with the highest maximum added value for enterprises is located in the Gulf of Riga and the area with the highest maximum state revenue is located west of Saaremaa. The guidelines and conditions set out in the Maritime Spatial Plan will support the economic development of wind energy, subject to other known limitations.

4.7 IMPACT ON CLIMATE CHANGE

Impact of climate change on planned activities

Climate change is primarily attributable to anthropogenic greenhouse gas emissions. Potential consequences of climate change are expected to be an increase in average temperature, rising sea levels, and an increase in extreme weather events (storms, droughts, floods). Reducing the combustion of fossil fuels and the use of renewable energy are considered to be important for climate change management.

The national development plan for adaptation to climate change until 2030[217] has been prepared in Estonia and the report prepared by the Environmental Agency entitled "Climate scenarios for Estonia's future until 2100"[218] has been used as a scientific basis. The climate projections in this report have been prepared for two global climate scenarios: RCP4.5 (recommended baseline scenario; moderate scenario requiring significant national mitigation measures) and RCP8.5 (recommended additional scenario; based on pessimistic, weak transnational cooperation and predominantly carbon economy).

In case of both scenarios the increase in temperature is greatest in the spring and winter months, at about 2.3–2.9 ° C (forecast for 2070). By the end of the 21st century the significant decrease in snow cover is predicted. The scenario modelling indicates that, under the RCP4.5 scenario, the ice cover of the Baltic Sea would have decreased in the typical winter of 2040. The coastal areas of the Gulf of Finland, Väinameri and the Gulf of Riga will be still frozen, but the thickness of the ice has decreased two to three times. According to RCP8.5 scenario the ice cover of the 2040s is slightly lower than in case of RCP4.5, but still quite similar to the more optimistic scenario. Most of the survey sources point to an increase in average wind speeds in winter and partly also in spring. The probable range for growth is 3-18% and this is linked to the increase in the number of cyclones moving from the Atlantic to our areas. Summer average wind speeds increase less or not at all. It has been pointed out that, compared to the period 1970–1999, sea surface temperatures in the coastal waters of Estonia in the period of 2061–2090 are 2.1–2.8 ° C higher in winter and spring, and 1.0–2.0 ° C higher in summer and autumn. The warming is greater in the Gulf of Finland. By the end of the 21st century an increase in the average sea level on the Estonian coast could mean 20–40 cm for the future scenario RCP4.5 and almost 40–60 cm for RCP8.5.

The projected increase in temperature and total precipitation in climatic scenarios, and the increase in storms will lead to different directions. Changes

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217 https://www.envir.ee/sites/default/files/kliimamuutustega_kohanemise_arengukava_aastani_2030_1.pdf

218 https://www.envir.ee/sites/default/files/kliimastsenaariumid_kaur_aruanne_ver190815.pdf

such as the intensification of eutrophication, the growth of southern alien species, and the decline of key cold-water species will have a negative impact on marine biodiversity and the balance of the marine environment. One of the most important environmental problems in the Baltic Sea is the eutrophication of the sea. In addition, climate change will result in regime shifts in food chains and longer vegetation periods, as well as increasing overall secondary and primary production, the impacts of which on the various processes and general functioning of the marine environment are unknown. The decline in salinity in the Baltic Sea, as well as mechanical disturbances in storms, can affect the species composition and diversity of communities.

According to the 2030 Climate Change Adaptation Development Plan the changes in the climate factors forecasted until 2100 will have a relatively small effect on the availability of energy resources, much less on the basis of the projections until 2040. The lifetime of the maritime spatial plan currently being prepared is projected to run until 2030, but as the investments in the maritime sector, especially in the wind farms, are long-term investments in the future, the climate change should be taken into account in the chosen technology.

The impact of the MSP on climate change and the achievement of climate goals

In 2017 the Riigikogu (the parliament of Estonia) adopted the General Principles of Climate Policy until 2050, which aims to reduce greenhouse gas emissions by at least 80% by 2050 and to replace the carbon-intensive energy production mainly with local renewable energy production[219]. As regards the local renewable energy production opportunities, increasing the share of electricity produced in offshore wind farms has the greatest CO2 reduction potential in absolute terms. It is estimated that the total volume of wind energy in Estonia will be 12% of total consumption by 2030[220]..

The general principles of climate policy until 2050 (KPP) and the Energy Sector Development Plan until 2030 (ENMAK) have been prepared and adopted at a time when the ambitions of both Estonia and the EU to curb climate change were considerably lower than at present. While the EU has now committed itself to achieving a carbon-neutral economy by 2050, the goal that has also been confirmed nationally by the Estonian government, the KPP adopted in 2017 is based on the goal of reducing collective emissions by 80% by 2050 compared to 1990 levels. Similarly, both ENMAK and KPP are currently based on an intermediate target of a 40% reduction in emissions in the EU as a whole by 2030, although the European Commission has now proposed raising this target to 55%, which was also supported by the leaders of the EU Member States in December. The current targets in both ENMAK and KPP are not clear and

[219] General Principles of Climate Policy until 2050, Ministry of the Environment 2017

[220] Analysis of the possibilities of raising Estonia's climate ambition, SEIT 219

detailed enough to achieve the goals of the Paris Climate Agreement and do not provide the necessary certainty for renewable energy developers[221].

In its current form KPP does not reflect the role of the energy sector and renewable energy in achieving climate neutrality with more ambitious intermediate and final targets (2030, 2040, 2050), thus KPP should be updated accordingly and a trajectory should be added that clearly shows the specific goals and targets for the development of Estonia's renewable energy economy for 2030, 2040 and 2050[222].

KPP and ENMAK form the main basis for the Estonian national energy and climate plan coordinating the sector which was approved by the government in 2019 until 2030, where the following national energy and climate goals are set for Estonia:

- the share of renewable energy in total final energy consumption in 2030 is 42%, including 50% of final energy consumption,
- the volume of electricity production from renewable sources in 2030 is 40% of the total final electricity consumption,
- the share of renewable sources in the heat economy is 63% of the total final heat consumption,
- the share of renewable sources in the transport sector is 14% of the total final consumption of transport fuels,
- to reduce the greenhouse gas emissions by 13% in the sectors covered by the Shared Commitment Regulation by 2030 compared to 2005,
- the final energy consumption should remain at 32-33 TWh/y up to 2030.

The long-term development strategy “Estonia 2035” (adopted by the Riigikogu on 12 May 2021) sets out the basic principle that by 2050 Estonia will be a competitive, climate-neutral country with a knowledge-based society and economy, where a high quality and species-rich living environment is ensured and readiness and ability to reduce the adverse effects of climate change and make the most of the positive effects is ensured. Estonia does not set precise goals and targets for setting climate neutrality in the action plan of “Estonia 2035” strategy.

According to the Estonian Renewable Energy Chamber, as of the end of 2018, 140 wind turbines with the total capacity of 314 MW have been connected to the grid in Estonia. In 2018, 591 GWh of wind energy was generated for the grid, which is 12% less than a year earlier, when the total production of wind

[221] Application of environmental associations to the Government of the Republic for opening KPP and ENMAK (2 March 2021),https://media.voog.com/0000/0037/1265/files/KPP%26ENMAK%20avamise%20taotlus%20keskkonnauhendustelt.pdf

[222] The same as previous

electricity reached 669 GWh. The wind energy also accounts for about 7% of final electricity consumption[223].

The construction of the wind farms for electricity production means increasing the share of renewable electricity production, which creates the preconditions for reducing greenhouse gas emissions from the combustion of fossil fuels. The construction of offshore wind farms will help to achieve these goals. If we look at the entire life cycle of a wind farm, which includes the manufacture, transport, erection, operation and demolishing (dismantling) of a wind turbine, less than 1% of the CO2 emitted by a fossil fuel power plant is emitted per kwh of electricity production.

During its lifetime the wind farm produces 33 times more energy than spent on its production, maintenance and demolition[224]. In addition, the utilization factor of offshore wind farms in the development of wind farms is considered to be twice as high as on land, approximately 45… 50%. With this maritime spatial plan the wind energy development areas are planned for an area of approx. 1710 km^2. At present, several areas of the offshore wind farm are already in the process of being developed. If the production potential of the existing wind farms is currently 2+ GW, then the potential of the new offshore areas would be about 8.5 GW.

In the global and national context the use of wind energy is generally more environmentally friendly than the use of fossil fuels (such as oil shale, which is predominant in Estonia). For example, about 1.4 kg of oil shale is needed to produce 1 kWh of electricity. If 5% of electricity were produced in Estonia with the help of wind, the need for oil shale would decrease by 0.67 million tons per year, which would save 15 ha of land per year from direct excavation. The impact of the mine / quarry on vegetation, fauna and especially groundwater may be considerably greater. In the production of oil shale electricity, the production of 1 MWh of electricity (with today's technology) emits 1,350 kg of CO2, 1.1–1.5 kg of NOx and 10–18 kg of SO2.

A study of the Vestas V90-3.0 MW wind turbine[225] found that the wind turbine produces the amount of energy it needs in a lifetime within 6.6 months. However, during its lifetime, this wind turbine generates about 158,000 MWh of energy or 36 times more energy than it consumes in its lifetime. In a very good location, this wind turbine generates about 280,000 MWh during its lifetime (over 20 years). Compared to its environmental impact, this wind turbine emits 230,000 tons less carbon dioxide than when burning coal to produce the same amount of energy. In addition, 80% of the wind turbine can be reused at the end of its life.

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[223] Renewable Energy Yearbook 2018, ETEK 2019

[224] http://hiiumeretuulepark.ee/projekt/meretuulepargi-elutsukkel

[225] Life cycle assessment of offshore and onshore sited wind energy plants based on Vestas V90-3,0 MW turbines. Vestas Wind Systems A/S, 2006

With the introduction of the planned wind energy development areas, the total production of renewable energy in Estonia would increase significantly. The implementation of the maritime spatial plan will have a direct positive impact on climate change and it is moved closer to achieving climate goals.

PROPOSALS FOR THE ACTION PLAN:

1. To update and formulate clear climate goals at the national level, which would clearly indicate, among other things, the specific goals and objectives for the development of Estonia's renewable energy economy for 2030, 2040 and 2050

4.8 CUMULATIVE IMPACTS

Cumulative impacts are the combined impacts of one or more activities, which can be manifested by the accumulation of similar impacts of several activities, where there may be many activities, and an important aspect is that the addition of activities results in a change[226]. Cumulative impacts may occur when spatial or temporal overlaps, repeated removal or inflow of resources, or landscape changes occur due to the plan (s) and its intended activities[227].

Impact of the MSP

Cumulative impacts on the natural environment can occur in a marine area where, for example, several large-scale activities are planned close by. One of the biggest threats for birds, as well as for other species and marine habitats and biota, is certainly the simultaneous construction of large wind farms. In particular, an impact may accumulate in the Gulf of Riga, where the current MSP designates wind energy development area No 1 (see Figure 4.8-1). Close to this area, there are also wind energy development areas foreseen in the Maritime Spatial Plan of Pärnu and Latvia, as well as several applications for superficies license for the construction of wind farms that have been initiated by far. Adverse impacts can be most pronounced on birds (see section 4.2.2) and bats (see section 4.2.4), both during the construction phase of wind farms and during their operation.

[226] Peterson, K., Kutsar, R., Metspalu, P., Vahtrus, S. and Kalle, H. 2017. Strategic Environmental Assessment Handbook. Ministry of the Environment, 137 p.

[227] Cooper, L. M. 2004. Guidelines for Cumulative Effects Assessment in SEA of Plans. EPMG Occasional Paper 04/LMC/CEA. imperial College London.

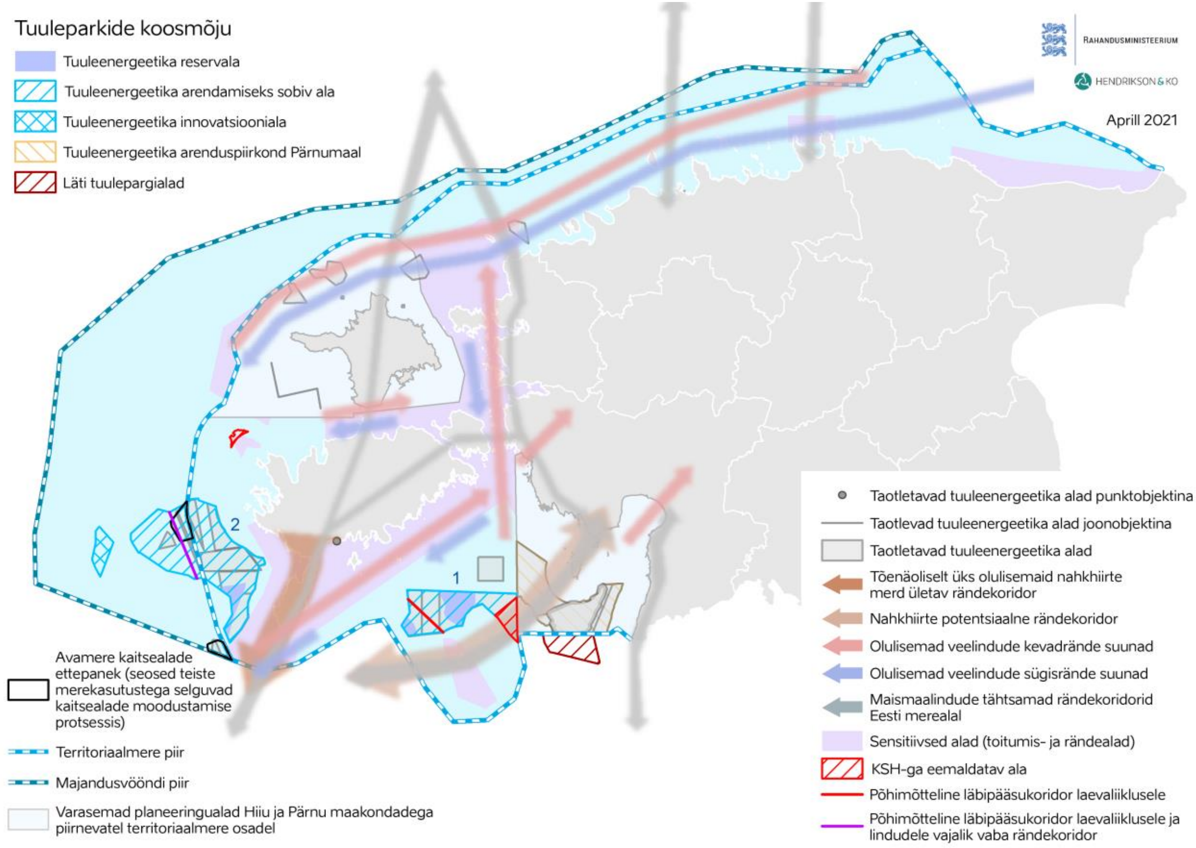

Figure 4.8-1. Wind energy development areas initially planned for the entire marine area and applications for superficies licences initiated for the construction of wind farms together with important nature conservation areas

In the course of the present Maritime Spatial Plan, information on bird migration and staging areas for all Estonian marine areas was compiled and based on this, sensitive areas for marine birds were identified (Chapter 4.2.2). According to the current information, several wind energy development areas previously defined by Pärnu County Planning, as well as several initiated superficies license applications, will be in the sensitive Site of Community Importance (see Figure 4.8-2). If the proposed wind farm areas planned for those areas are realized, it is not known in advance how the birds will adapt to the wind farm and how different bird species will change their behavior patterns. The authorization procedure for each proposed project should be based on the best and most up-to-date environmental information.

The surveys of bats in the marine area in recent years have also shown that one of the most important migration corridors runs across the islands of Kihnu and Ruhnu in the Gulf of Riga (see Chapter 4.2.4 for details).

Cumulative impacts on birds and bats may occur when several wind farms are simultaneously built close to each other. Unexpectedly, large-scale flight obstruction may occur, and adaptation to it will take longer than when just building a single wind farm. Therefore, in order to avoid cumulative impacts, it is important to provide important migratory corridors for birds and bats (Figure 4.8-2) and to further assess synergies with other envisaged plans and projects during each licensing procedure to avoid bottlenecks and/or obstacles to migration in the marine area. The design of the offshore wind farm areas included in this Maritime Spatial Plan takes into account important migratory corridors as well as sensitive areas for species in order to avoid a significant adverse impact.

The proposed wind farms in the Gulf of Riga may also have a combined effect on seals. The exact mechanism of navigation of seals is not known, but telemetry refers to the ability of ringed seals to travel long distances on the high seas, e.g. to the mouth of the Great Strait (see Chapters 4.2.3 and Figure 4.2.3-3) or as to gray seals from Irbe Strait to Allirahu almost in a straight line. The wind farms may affect the trajectories of seals in the "bottleneck" in the Gulf of Riga, as the migration corridor between the wind farms has been significantly compressed in an east-west direction.

The areas suitable for the development of wind energy that overlap with historically more intensive trawl fisheries will be designated as reserve areas (to be operational from 2027), which will help to reduce impediment as movement corridors and allow better knowledge of seal behaviour over time. Other potential spatial effects of wind farms are also indirectly linked to seals, such as the concentration of fishing vessels / offshore fishing in the areas where trawling is difficult in the wind farms in other parts of the gulf and the overlap of fisheries between humans and animals will be significantly higher than today.

The primary objective of the impact assessment was to avoid conflicting uses of the sea in inappropriate areas; thus, the plan excludes new offshore activities such as wind energy and the establishment of fish farming areas in nature protection areas.

Aquaculture areas are not specifically spatially envisaged the current Maritime Spatial Plan, so in case of planned establishment of fish farms close to each other, it is important to always assess synergies with other activities in the area and, in particular, what changes in water quality and how it affects the status of the water body.

While fish farms in natural waters increase the burden on the environment, the cultivation of seaweed and shellfish as nutrient-depleting aquaculture is considered to be environmentally sustainable management. In addition to nutrient removal, this shell farm significantly increases the transparency of water within a radius of about 1 km^2 and reduces the risk of local algal blooms. Consequently, it is prudent to place shellfish farms in the vicinity of fish farms in the coastal sea, as this combination can compensate for the nutrient fluxes from fish farms to the sea and keep the water in the vicinity of the fish farm transparent.

The Maritime Spatial Plan foresees the need to direct and increase developers' knowledge and confidence in implementing cooperative solutions. Synergistic impacts will also occur, for example, in the joint development of a wind farm and shellfish farming. Compact and well-thought-out development has synergistic positive impacts on both the natural and economic environment, and the proposed activities have a multiplicative or exponential impact on each other.

Cumulative impact model

During the course of the Maritime Spatial Plan, PlanWise4Blue[228], a web application for public use was prepared containing a model of the cumulative environmental impact of human activities. Such a model[229] enables access in the Estonian marine area the environmental impact of the proposed activities on the marine area.

The sub-model of environmental impact dynamically links the existing situation (modeled existing environmental data layers), and the impact matrix (i.e., knowledge of how different human uses and intensity of uses potentially affect a particular marine region) to planned human uses. The sub-model of cumulative impacts allows for the calculation of major environmental risks associated with human use and allows for the display of spatial overlaps between natural values and different human uses. In a sub-model of environmental impact, an impact can be combined through summation, compensation, etc. One effect can increase or decrease the other. In synergism, the combined effect of the two impacts is greater than the sum effect of the individual impacts.

This Impact Assessment used the main solution of the Estonian Maritime Spatial Plan as input to the cumulative impacts sub-model to assess the environmental impact of the activities planned by the Maritime Spatial Plan. In addition, other data layers of human activities available in the marine area that are not reflected in the planning solution were used as input (Pärnu County and Hiiu Island (except for its wind energy development areas that have been abolished) Marine Area County Plans, etc.). The PlanWise4Blue model assessed the combined impacts of marine activities - trawling, inland waterway, dumping and deposits - and wind energy development areas foreseen in the Estonian Maritime Spatial Plan on different ecosystem components, as these activities can have a significant impact on the environment.

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[228] Nõmmela, K, University of Tartu CASS; Kotta, J., OÜ Hobikoda; Piirimäe, K., OÜ Roheline Rada “PlanWise4Blue: A Web-Based Model for Estimating the Cumulative Environmental Impact of Human Activities and The Marine Economic Benefit Model”; Commissioned by Ministry of Finance, 2019 (https://www.financingministeerium.ee/en/system/files_force/document_files/planwise4blue_model_description.pdf)

[229] When interpreting the results of PlanWise4Blue application, it is important to consider that it is currently used as a discussion platform rather than a means of reflecting reality, as due to the lack of sufficient measurement results, some parameter values have a high degree of uncertainty. In addition, many new human uses (particularly for interactive effects) still have a high level of uncertainty, and further research is needed to determine more accurately the interactive environmental impacts of human use.

The analysis of the environmental impact of the wind energy developments was based on the following technical solutions. The wind turbines have been built on the concrete foundation with a texture similar to natural material, i.e. the material is suitable for attaching to seaweeds and large invertebrates, then the foundation is filled with natural stone material. The expected diameter of the wind turbine foundation is less than 100 m. The height of the concrete truncated cone is 10 m. The top height of the wind turbine is about 300 m and the diameter of the rotor is in the size class of 250 m. The distance between the wind turbines was calculated to be 4-7 wind turbine diameters, i.e. a minimum of 800 m. The cumulative impact model does not take into account the environmental impacts during construction, but the environmental impact of gravity-based foundations is clearly lower than the other existing solutions.

In the scenario described above, the model analysis showed that the human uses studied do not have a clear negative environmental impact on a large number of ecosystem indicators. Of the human activities studied, the Estonian marine environment is most affected by water traffic areas and trawling. Fish-eating birds are the most disturbed of these activities, and ship traffic also influences the formation of wintering areas for birds. In addition, waterborne traffic and trawling have a negative impact on bladderwrack and agar habitats and, consequently, on Baltic herring spawning grounds. However, in the case of the predictions described above, the natural recovery potential is greater than the rate of anthropogenic degradation. Water traffic areas and trawling do not have a significant negative impact on other natural values, including marine mammals, other key habitats, and Habitats Directive habitats.

Illustratively, the results of the model analysis are shown in Figure 4.8-4 below as combined impacts of marine activities (trawling, waterborne traffic areas, dumping areas, and deposits) with wind energy development areas foreseen in the Estonian Maritime Spatial Plan for Habitats Directive Habitats (1170) reefs.

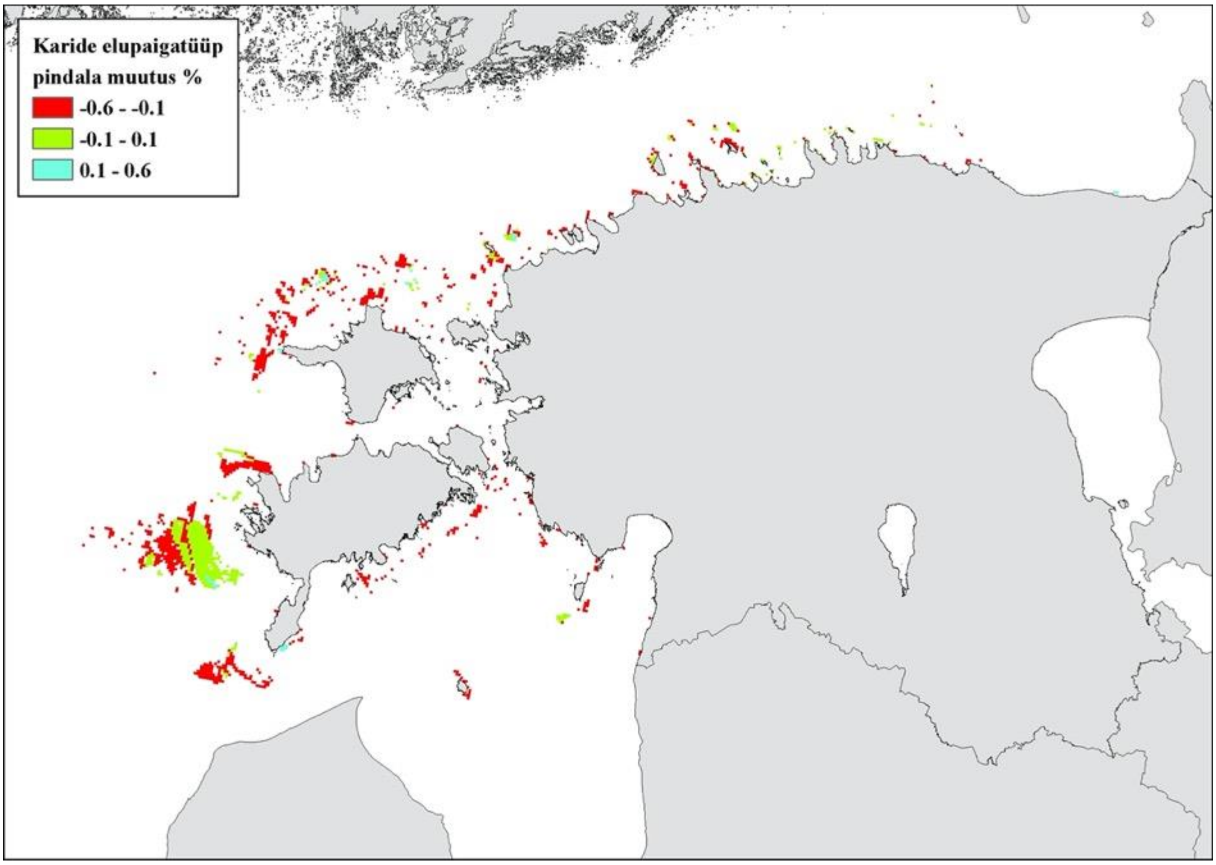

Figure 4.8-2. Using the PlanWise4Blue model the combined impact of the activities in the maritime area - trawling, water traffic areas, dumping areas and deposits - and the wind energy development areas provided for in the Estonian maritime spatial plan on different natural values was assessed. The present figure illustrates the cumulative environmental impacts on the LoD habitat type reefs (1170). The area loss of reefs is shown in red, the addition of reef habitat is shown in blue, and areas where the area of reefs does not change significantly are shown in green. The projected changes are less than 1% everywhere, i.e. the natural recovery potential is many times higher than the rate of human-induced depletion.

According to the predetermined scenario of the model (i.e., wind turbine technical solution – gravity-based foundations, built on concrete foundations with a texture similar to natural material, etc.), the development of wind energy does not lead to significant negative environmental impact. Even in such more open areas of the Baltic Sea, the construction of wind farms can increase the Habitats Directive's Habitat type reef (1170) area by up to 1.7% due to the natural scarcity of stable rocky substrates in the planned wind energy development areas. The growth of this valuable habitat will only be realized if the texture of the concrete foundations of the wind turbines is suitable as an anchorage for seaweed and invertebrates, and there are no other adverse environmental impacts not considered in the model. If a solution other than the one described above is to be used, the parameters of the desired solution for environmental impact assessment must be analyzed with PlanWise4Blue (or a similar approach, i.e., incorporate existing research into the analysis of the impact of wind farms and use the most recent source data map layers on natural values).

The implementation of the maritime spatial plan will not have a significant adverse cumulative effect if the key migratory corridors for birds and bats are secured on the basis of current knowledge at the level of decisions and areas sensitive to wildlife, such as fish spawning grounds, sensitive Site of Community Importance, etc., are taken into account. The planning of wind energy development areas provided for in this Maritime Spatial Plan shall take into account both important areas of the migration corridor and sensitive areas in order to avoid significant adverse effects.

ENVIRONMENTAL MEASURES:

1. In the licensing procedure, synergies with other similar implemented and, if possible, planned plans and projects shall be assessed in order to avoid cumulative impacts in the marine area, including bottlenecks of and/or obstacles to migration.
2. The potential biosecurity risks associated with aquaculture must be assessed in the licensing process, both at the individual project level and in conjunction with the activities of a near vicinity fish farm (e.g., to assess and determine the distance between farms of different companies to avoid biosecurity risks).

4.9 TRANSBOUNDARY IMPACT

The transboundary environmental impact assessment of Estonia will be carried out in accordance with the international agreements, the Convention on Environmental Impact Assessment in a Transboundary Context (Espoo Convention), and the Environmental Impact Assessment and Environmental Management System Act. The process and involvement of the transboundary impact assessment are managed by the Ministry of the Environment.

The Ministry of the Environment has sent notifications of the cross-border SEA process three times according to the table below.

Notification	Replies received
The notification of the intention to develop the initial outlines for the maritime spatial plan and the SEA process (26 November 2018) was sent to Denmark, Finland, Germany, Latvia, Lithuania, Poland, Russia and Sweden.	Denmark, Germany and Poland have indicated that they do not wish to participate in the cross-border process. Feedback was received from Sweden, Finland, Latvia and Lithuania, who indicated their willingness to be involved in the cross-border process. Russia did not respond with regard to the initial notification, so with regard to wider involvement

Notification	Replies received
	in terms of information, notifications will also be sent to Russia.
Notification of the draft maritime spatial plan and the completion of the initial draft plan (with the initial input of the SEA) (20 May 2019) to Finland, Latvia, Lithuania, Russia and Sweden.	The proposals and comments were received from Sweden, Finland and Latvia in the cross-border involvement process. The feedback given by the neighbouring countries to the explanatory memorandum to the plan and the SEA process and their summaries by different proposals are provided in Annex 5.
Notification of completion of the main solution of the maritime spatial plan and SEA report (15 September 2020) to Finland, Latvia, Lithuania, Russia and Sweden.	The proposals and comments were received from Sweden, Finland and Latvia in the cross-border involvement process. The feedback given by the neighbouring countries to the explanatory memorandum to the plan and the SEA process and their summaries by different proposals have been provided in Annex 5. The most important issues highlighted are: 1) the proposed wind energy development areas should not impede international shipping traffic; and 2) the impacts associated with aquaculture areas and the planning conditions affecting them.

Wider involvement and international cooperation with other countries has been addressed in Chapter 5.

There are no direct cross-border effects of the plan. Most of the spatially planned areas are located at a sufficient distance from the border of the Estonian territorial sea. The proposed wind energy development area no. 1 is located approximately 5 km from the Latvian border. The change of views may also take place on the Cape of Kolka, but as the wind turbines are expected to remain visible from only one view (northeast view), this is not a significant impact. The Latvian state has not submitted any proposals or views on this issue in the framework of cross-border co-operation.

In order to transform energy in Europe, including the Baltic Sea region, into an environmentally friendly and climate-neutral one, in addition to wind power generation areas producing electricity from renewable sources, it is necessary to develop high-capacity transnational electricity connections, such as submarine cable connections to Sweden and/or Latvia. The strategic plans and more specific actions for the Baltic Sea Region energy network have not yet been finalized. Potential transboundary impacts need to be specified and assessed during the environmental impact assessment process at each project level.

Indirect impact on marine habitats and biota may include:

- Possible adverse transboundary impact on the lifetime impact of the offshore wind farm on birds;
- Potential transboundary impact on fish and seals during the construction phase of the proposed activities (noise, sediment spreading, etc;
- If the planned wind farm areas are to be connected to a foreign country by a cable (Latvia, Finland, or Sweden) in the future, this activity may lead to a transboundary impact;
- Potential adverse transboundary impacts on the underwater cultural heritage during the construction phase (to be mitigated by the following the conditions set out in the plan)

The objective of both the Maritime Spatial Plan, to be prepared, and the present impact assessment was to develop a planning solution that takes into account the values of the natural environment (including synergies with other marine activities) and excludes potential conflicts at the project level.

There is no direct transboundary impact associated with the MSP.

ENVIRONMENTAL MEASURES:

1. Potential transboundary impacts need to be specified and assessed during the EIA process at the project level.

5 OVERVIEW OF THE ORGANIZATION AND INVOLVEMENT OF THE IMPACT ASSESSMENT

5.1 ORGANIZATION OF IMPACT ASSESSMENT

The organizer of the planning and impact assessment is the Planning Department of the Ministry of Finance and OÜ Hendrikson & Ko, a consultant for the preparation of the planning and impact assessment, together with a broad-based Task Group.

Hendrikson & Ko's broad-based expert group on Maritime Spatial Plan and impact assessment included:

Name	Role	Authority
Pille Metspalu	Project manager, planner	Hendrikson & Ko OÜ
Riin Kutsar	SEA Leading Expert	Hendrikson & Ko OÜ
Marika Pärn	Planner, additional specialist	Hendrikson & Ko OÜ
Ann Ideon	Specialist in Social Impact Assessment	Hendrikson & Ko OÜ
Jaanus Padrik, Kairit Kase	Geoinformatics specialist	Hendrikson & Ko OÜ
Kaile Eschbaum	Environmental specialist, additional specialist	Hendrikson & Ko OÜ
Georg Martin	Marine Environment Specialist	Maritime Institute of the University of Tartu
Redik Echbaum	Fisheries specialist	Maritime Institute of the University of Tartu
Jonne Kotta	Marine Environment Specialist (Cartography, Geographic Information Systems, Modeling)	Maritime Institute of the University of Tartu
Kaidi Nõmmela	Specialist in Economic Impact Assessment	Center for Applied Social Sciences, University of Tartu
Kristjan Piirimäe	Geoinformatics consultant	OÜ Roheline Rada
Helen Sooväli-Sepping	Specialist in Cultural Impact Assessment	Tallinn University
Ain Kull	Energy Specialist	University of Tartu
Hans Orru	Specialist in Health Impact Assessment	University of Tartu
Liina Härm	Marine Transport Specialist	Hiiu Sailing Ship Society

The planning process and the impact assessment were carried out simultaneously, taking into account as far as possible the environmental impact associated with the implementation of the plan, including socio-economic, cultural, and health impact, of the implementation of the plan, in order to ensure sustainable and balanced spatial development. The overall timeline for the planning and impact assessment is illustrated in Figure 5.1-1. Annex 4 provides an overview of the cooperation with authorities, stakeholders, and the public in the framework of the planning and impact assessment, together with a more detailed timetable.

Figure 5.1-1. Schedule for the planning and impact assessment

5.2 COOPERATION AND INCLUSION

In accordance with the Planning Act, persons were included whose rights may be affected by the planning, persons who have expressed a wish to be included in the preparation thereof, as well as authorities who may have a legitimate interest in the relevant social, cultural, economic, natural environmental impact or spatial development trends in the planning area, including environmental non-governmental organizations through an organization unifying them, and non-profit organizations and foundations representing the inhabitants of the planned area. Stakeholders are brought together in a separate planning document - the plan for inclusion, see the planning portal mereala.hendrikson.ee[230].

Co-operation with stakeholders, authorities, and interested parties started in the initial phase of planning. In addition to the activities required by the Planning Act, regional discussions were conducted at the SP and DP stages as well as at the draft planning stage. The aim of the regional discussions was to map the values of the marine space and to discuss the regional specificities of maritime use and the resulting principles. Annex 4 provides an overview of the

230 ESTONIAN MARITIME SPATIAL PLANNING COOPERATION AND INCLUSION PLAN, http://mereala.hendrikson.ee/dokumendid/L%C3%A4hteseisukohad/MSP_kaasamiskava_oktoober_2018.pdf

cooperation with authorities, stakeholders, and the public in the framework of the planning and impact assessment.

The EU Maritime Spatial Planning Directive states that as part of the planning and management process, the Member States bordering marine waters shall cooperate with the aim of ensuring that maritime spatial plans are coherent and coordinated across the marine region concerned (Article 11 (1)). Furthermore, the Directive states that where possible, to cooperate with third countries on their actions with regard to maritime spatial planning in the relevant marine regions and in accordance with international law and conventions (Article 12).

Estonia has cooperated with all BRS countries, especially Finland, Sweden, Latvia, and Russia, in the maritime spatial planning process. Different international forums, such as the European Commission and the HELCOM-VASAB Maritime Spatial Planning Working Group, or international cooperation projects such as Baltic SCOPE, Pan Baltic Scope, Plan4Blue, BalticLines, etc., have been used to organize this cooperation.

Within the framework of the Baltic SCOPE project, Estonia has worked closely with the authorities responsible for maritime spatial planning in Sweden and Latvia. The project has streamlined approaches to cross-border maritime spatial planning and set goals and recommendations for further cooperation. The Plan4Blue project was a co-operation project between Estonia and Finland aimed at creating blue economy scenarios for the Gulf of Finland region.

5.3 DIFFICULTIES WHICH AROSE WHILE CONDUCTING THE SEA REPORT

The strategic environmental assessment was somewhat complicated by the delay in preparing the planning solution beyond the initially planned schedule. This was largely due to the situation caused by the spread of the COVID-19 pandemic and the related operational problems.

The content and generalization level of the strategic planning document have been taken into account in compiling the impact assessment report, but the Supreme Court decisions that have entered into force in recent years have created ambiguity and uncertainty about the correct and sufficient accuracy of general strategic level impact assessments, including the thoroughness of the studies and analyses performed. Based on the decisions of the Supreme Court, there are no more specific guidelines regarding the content of the impact assessment set by the relevant institutions and there are conflicting views regarding the interpretations of the decisions.

The task of the Estonian Maritime Spatial Plan as a national strategic development document is to guide the use of the Estonian maritime space in the long term, setting out the basic principles and rules for the spatial development of various maritime uses. The aim of the plan is to create a comprehensive picture of the interaction of different marine uses and to agree on the spatial principles of the use of the Estonian marine area for the next 15 years in order to contribute to achieving and maintaining the good state of the marine environment and promoting the maritime economy. In order to achieve the long-term directions and an overall picture at the national level, maritime spatial planning is based on international trends, national interests and national development documents. As the goal is a balanced spatial approach to the entire Estonian maritime area at the national level, the degree of generalization is high - the focus is on setting general principles and the activities are not planned in detail (which, however, are necessary for the preparation of the impact assessment and for the assurance in this respect). The guidelines and conditions set by the plan will be the basis for future decisions concerning the maritime area, including the issue of authorizations.

The recent decisions of the Supreme Court regarding the maritime spatial plan bordering Hiiu County and the Rail Baltic region County-wide spatial plan have emphasized that the impact assessment should be based on the data reasonably available at the time of the assessment, including the data collected through new surveys. It has also been pointed out that at the general planning level it is necessary to form a conviction that the selected areas of wind energy development are in principle suitable, i.e. at least under certain conditions, for the production of wind energy. Although the decision of the Supreme Court referred to was made at a time when the maritime spatial plan was already being prepared, the bottlenecks identified in the decision have been taken into account when conducting the impact assessment.

Some of the parties involved have had the expectation that the detailed field studies of various natural values in the marine area will be carried out and that detailed conditions for the construction of wind farms will be established on the basis of this. This expectation is not in line with the strategic nature of the plan. Namely, the plan answers the question of whether, where and under what conditions it is possible to build offshore wind farms by selecting suitable areas for wind energy production, by setting specific conditions and guidelines at the authorization level, including a comprehensive framework for research and other important follow-up activities. As a result of the research of the next stage, it will become clear, taking into account the particularities of the specific location and technological solutions, how many wind turbines and with which parameters can be installed to the selected areas and what will be the exact location. The strategic nature of the plan and the activities of the authorization stage have been explained to the parties.

As part of the impact assessment of the maritime spatial plan, it is known that for the first time in Estonia the visual impacts of the implementation of the strategic development document were thoroughly discussed. It was concluded within the framework of the visual impact assessment that the wind turbines located in the areas suitable for the production of wind energy selected in the Estonian maritime spatial plan will inevitably be visible from the coast, ie there will be a visual change in the sea views. It is not possible to build offshore wind farms in such a way that they are not visible from the shore at all, for the latter purpose the wind farms should be designed at a distance of 50 km from the coast. However, the sea in Estonia is becoming deep fast and it is not possible to plan the wind farms so far from the coast with the current technologies and capabilities. The possibilities for reducing the visibility of each specific wind farm and/or the needs to tolerate disturbances (the need of compensation) should be identified in the authorization procedure of the wind farm. The maritime spatial plan sets out the conditions and guidelines for the latter purpose.

6 SUMMARY AND CONCLUSION

The comprehensive impact assessment of the Maritime Spatial Plan has analyzed the planning solution in the context of the relevant impact on the natural, economic, cultural, and social environment. In other words, the significant and common impacts of the implementation of the plan, which for some reason needed to be assessed when the plan was being prepared, were assessed. Proposals to prevent and reduce significant environmental impact and recommendations for the consideration of environmental measures for further development and implementation of the planning solution have been made by various environmental sectors.

The preparation of the Maritime Spatial Plan and the Impact Assessment was based on existing marine studies and expert analyses (during the planning process, a number of marine space analyzes were carried out to map sensitive areas). This Impact Assessment has already proposed, at a strategic level, the avoidance of more important wildlife sensitive areas on the basis of the principle of prevention and the precautionary principle. The impact assessment has been carried out, taking into account the degree of accuracy of the planning document and the extent of its content. In cases where marine wildlife mapping needs to be refined, and the impact of the proposed activity depends on technical solutions, it was proposed to include in terms of the planning decision that relevant studies need to be specified or further conducted in the licensing stage to ensure significant marine ecosystems and good condition of the marine environment.

6.1 SUMMARY OF IMPACTS

The role of the planning solution and its assessment, due to the degree of accuracy of the Strategic Planning Document, was to review the existing activities and planned activities in synergy and to promote the diversified use of the marine area. Due to the focus of the planning solution, the cumulative impacts will occur, particularly in areas where new uses for the sea are being planned. The most important points of cumulative impacts are:

1. Wind energy development area No 1 in the Gulf of Riga

Although nature values have also been used as a basis for the designation of wind energy development areas, a further study of bird migration corridors and staging points showed a significant impact in the eastern part of wind area 1. In the areas of the Gulf of Riga and Pärnu Bay, wind energy development areas have also been planned with the Pärnu Maritime Spatial Plan and the Latvian Maritime Spatial Plan. The maximum realization of these areas would be a large-scale wind energy production area, which requires very good wind resources. As a result, it was decided to reduce the wind energy development area No 1 by removing the southeast edge of the area, which accounts for 13%

of the total area. Reducing the wind energy development area will have a negative economic impact as well as slightly worsen the chances of meeting the climate targets. In this case, however, the need to mitigate the impacts on birds must be given priority. As it is a large wind energy development area concentrated in one area, the reduction of the area can also be considered as not a significant negative impact in terms of economic impact as it helps to avoid over-consumption of wind resources. This will also free up additional trawl fishing grounds, which would, however, be expected to operate also in conjunction with wind energy.

2. Water traffic areas and principles of port network development

In order to ensure the optimal functioning of maritime transport, it was decided to designate, in addition to water traffic areas, the basic passage corridors for shipping, which must remain free of wind turbines. The surface area of wind energy development areas was also further reduced to ensure safety in specific heavy ship traffic areas. The economic impact assessment states that, from an economic standpoint, the selection criteria for port network design should not be limited to the factors (natural compatibility and distance) provided as guidelines in Maritime Spatial Plan. At the same time, it must be borne in mind that the creation of new ports is an activity that has a significant impact on the natural environment, and the necessity of this must be carefully considered. During the planning process, it has become clear that in the near future, the existing port network needs attention in particular in order to avoid the poor return on investments already made. The purpose of the planning is to better target the port network, and therefore, some restrictions must be considered indispensable.

Proposals must be taken into account in a balanced way in the further development of the planning solution.

The impact assessment focused on identifying the impact of marine activities in order to avoid conflicts. The MSP excluded new marine activities such as offshore wind farms and the establishment of fish farming areas in nature conservation areas

6.2 CONCLUSION

The level of detail in the preparation of Maritime Spatial Plan does not foresee any adverse impacts from the implementation of the spatial plan, taking into account the conditions and guidelines set out in the spatial plan and the environmental measures[231] provided in this Impact Assessment for the spatial planning and future licensing levels.

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[231] A broad-based approach is meant here, the environmental measures can be targeted at the natural, cultural, social and / or economic environment.

7 ANNEXES

Annex 1. Impact assessment VTK

Annex 2. Socio-cultural values of maritime counties

Annex 3. Summary table of visual impact assessments (presented as a separate .xls file)

Annex 4. Overview of the cooperation with authorities, stakeholders and the public in the framework of planning and impact assessment

Annex 5. Proposals received and responses submitted in the course of cross-border involvement (presented as a separate file directory)