ENVIRONMENTAL IMPACT ASSESSMENT PROGRAMME FOR THE OFFSHORE WIND FARM PROPOSED FOR THE LIIVI 1 AND 2 MARINE AREAS

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ABBREVIATIONS

AC – Authorities Concerned
AEWA – The African-Eurasian Migratory Waterbird Agreement
CPTRA – Estonian Consumer Protection and Technical Regulatory Authority (decision-maker)
DCP – Doppler current profiler
Developer – Estonia Offshore Wind DevCo OÜ
EANS – The Estonian Air Navigation Services
EELIS – Estonian Nature Information System
EEZ – Exclusive economic zone
EhSRS – An Act to Implement the Building Code and the Planning Act
EIA– Environmental Impact Assessment
ENMAK – Estonian Energy Policy Development Plan
EST/EE – Republic of Estonia
ESTER – Operational radio network service
GOR /LL– Gulf of Riga
HDD – horisontal directional drilling
HELCOM – Helsinki Commission (Baltic Marine Environment Protection Commission)
IALA – International Association of Marine Aids to Navigation and Lighthouse Authorities
ICES – International Council for the Exploration of the Sea
KeHJS – Environmental Impact Assessment and Environmental Management System Act
KESE – Environmental monitoring information system
LCA – life-cycle analysis
Liivi 0102 – Liivi 1 and 2 off-shore areas
LKS – Nature Conservation Act
MBES – multibeam echo-sounder
MSFD – Marine Strategy Framework Directive
MSP – Marine Spatial Plan
OnS – on-shore substation
OSS – off-shore substation
OWF -off-shore windfarm
PAM – passive acoustic monitoring
PIANC – The World Association for Waterborne Transport Infrastructure
PPA – Police and Border Guard Board
REKK – National Energy and Climate Plan
SAR – search and rescue
SBP –Chirp type sub-bottom profiler
SSS – side-scan sonar
TJB – transition joint bay
UHRS – Spraker-type ultrahigh-resolution seismic
UNESCO – Nations Educational, Scientific and Cultural Organization

UXO – unexploded ordnance
WTG – wind turbine generator
ZTV – Zone of Theorethical Visibility

1. PURPOSE AND NEED FOR THE PROPOSED ACTIVITY AND JUSTIFICATION FOR THE SELECTION OF THE AREA

The offshore wind farm proposed for the Liivi 1 and 2 areas and the offshore infrastructure necessary for its operation is developed jointly by the leading renewable energy company in the Baltics, UAB Ignitis Renewables, and Copenhagen Infrastructure Partners, which has global experience in building offshore wind farms. The applications for superficies licence for the Liivi 1 and Liivi 2 marine areas were submitted by UAB Ignitis renewables projektai 6 on behalf of the developers. UAB Ignitis Renewables and Copenhagen Infrastructure Partners established a joint venture in Estonia specifically for the project, Estonia Offshore Wind DevCo OÜ (16827546), which is the legal successor of UAB Ignitis renewables projektai 6 (hereinafter Developer)

On 25 August 2023, UAB Ignitis renewables projektai 6 (Lithuanian registration code 306280455) submitted a competing application for a superficies licence and for the initiation of the environmental impact assessment (EIA) procedure, with the aim of developing the Liivi 1 and 2 marine areas with an offshore wind farm. The Consumer Protection and Technical Regulatory Authority (CPTRA) evaluated the competing applications and announced a competition among the applicants. On 13 December 2023, by decision No. 1-7/23-413, the Estonian Consumer Protection and Technical Regulatory Authority declared UAB Ignitis renewables projektai 6 the winner of the Liivi 2 marine area auction with the highest bid of €1,723,500. On 17 January 2024, by decision No. 1-7/24-023, the Estonian Consumer Protection and Technical Regulatory Authority also declared UAB Ignitis renewables projektai 6 the winner of the Liivi 1 marine area auction with the sole bid of €1,165,500.

On 6 March 2024, by directive No. 1-7/24-074, the CPTRA initiated the superficies licence procedure and environmental impact assessment (hereinafter EIA) for Liivi 2, and on 9 April 2024, by directive No. 1-7/24-114, initiated the EIA for Liivi 1. By the decision to initiate the EIA proceedings for the Liivi 1 marine area, the Estonian Consumer Protection and Technical Regulatory Authority merged the EIA proceedings for the Liivi 1 and Liivi 2 marine areas. In addition hereof, the Developer submitted an application for the Superficies Licence to CPTRA on (20 May 2025, No. (16-7/25-06990-001)) for the combined export cable corridor, combining the export cable corridor between Liivi 1 and Liivi 2 sites (Interlink Cable Corridor) and the export cable corridor from Liivi 2 site to landfall, to allow connection to the national grid in the Paatsalu region of mainland Estonia, approximately 70 km away from the Liivi 1 and Liivi 2 sites.

Taking into account the opinions and approvals of the authorities concerned, both directives were established on the basis of the decisions confirming the winners of the electronic auctions for the Liivi 1 and Liivi 2 marine areas, subsection 1 and subsection 3 of § 113^4, subsections 10 and 12 of § 113^{10}, and clause 7 of subsection 2 of § 113^{11} of the Building Code; clause 1 of subsection 1 of § 3, clause 5 of subsection 1 of § 6, clause 2 of § 7, subsection 1 of § 9, subsections 3, 7, 8 and 11 of § 11, subsection 1 of § 12, and subsection 7 of § 18 of the Environmental Impact Assessment and Environmental Management System Act (hereinafter KeHJS); and subsections 1 and 6 of § 25^1 of the Act to Implement the Building Code and the Planning Act (hereinafter EhSRS).

It is expected that the proposed activity may have a transboundary environmental impact. Therefore, when assessing environmental impacts, the potential transboundary environmental impacts of the construction and operation of the wind farm must be evaluated.

Pursuant to §11 subsection 11 of KeHJS, the superficies licence proceedings are suspended until a decision has been made to declare the EIA report as compliant with the requirements.

According to the Estonian Maritime Spatial Plan (MSP) established by Government of the Republic Order No. 146 of 12 May 2022, the Liivi 1 and 2 marine areas, located northwest of Ruhnu Island in the Gulf of Riga, are designated as suitable areas for wind energy development. According to the superficies licence application, the marine area to be encumbered by the proposed offshore wind farm is 192.6 km^2 and additionally encumbered area of Liivi0102 offshore export cable (incl. Interlink Cable Corridor) is approximately 86 km^2. Water depth in the Liivi0102 area ranges from 18 to 40 meters.

The aim of the EIA is to assess the potential environmental impacts of the proposed activity and its alternatives. Environmental impact is a direct or indirect impact expected to result from the proposed activity to the environment, human health, cultural heritage or assets. In this case, the EIA is mandatory, as the construction of the proposed offshore wind farm is expected to have a significant environmental impact, pursuant to clause 5 of subsection 1 of § 6 of KeHJS. Environmental impact is significant where it is likely to exceed the environmental capacity of the impact area, cause irreversible changes to the environment, endanger human health and well-being, the environment, cultural heritage or property (§ 2^2 of KeHJS). After EIA programme will be declared compliant with requirements, the EIA report will be prepared in accordance with the EIA programme and will propose mitigation measures to mitigate significant environmental impacts. If additional significant impact factors emerge during the preparation of the EIA report, they will also be analysed.

The EIA programme is being prepared by OÜ Inseneribüroo STEIGER in cooperation with appointed experts (see Chapter 8), based on the superficies licence applications and information provided by the Developer, Estonia Offshore Wind DevCo OÜ. The leading expert of the EIA is Aadu Niidas (EIA license no. KMH0145).

2. BRIEF DESCRIPTION OF THE PROPOSED ACTIVITY AND REASONABLE ALTERNATIVES THEREFOR;

2.1. Purpose and need for the proposed activity

On 9 April 2024, by directive No. 1-7/24-114, and on 6 March 2024, by directive No. 1-7/24-074, the CPTRA initiated the superficies licence proceedings and EIA for the Liivi 1 and Liivi 2 marine areas, respectively. The EIA proceedings were consolidated by the directive initiating the EIA for Liivi 1, resulting in the formation of the Liivi0102 marine area. The initiation decisions also included a list of studies required within the EIA process, which have been taken into account in the preparation of the EIA and are presented in Table 5.2.1.

This chapter describes the realistic technical parameters of the offshore wind farm proposed in the Liivi 1 and Liivi 2 marine areas and offshore electrical cable. Considering that the project is in its early stages, the optimal technical parameters are not yet known, as the site and seabed conditions and the related risks, future technological developments, technological constraints, as well as commercial and regulatory risks, are still unknown.

The description presents information received from the Developer regarding the technical parameters of the proposed offshore wind farm and the off-shore infrastructure necessary for its functioning. This information enables the initiation of the EIA and provides the relevant authorities, stakeholders, and the general public with preliminary information about the proposed offshore wind farm and its components. The specific parameters of the offshore wind farm will be determined in the course of further development planning.

The purpose of the superficies licence and EIA proceedings initiated in the Liivi 1 and 2 marine areas is to develop an offshore wind farm for the production of renewable energy, with a nominal capacity of up to 2,300 MW[1] and up to 145 wind turbines. A functioning offshore wind farm also requires infrastructure – a transmission network of

[1] Depending on the environmental impact assessment's results, construction conditions, site optimisation as well as other factors, the capacity of the offshore wind farm could be around 1–1.5 GW .

offshore substations and cables that connect the offshore wind turbines to the onshore transmission network. The main components of the project are shown in Figure 2.1.1.

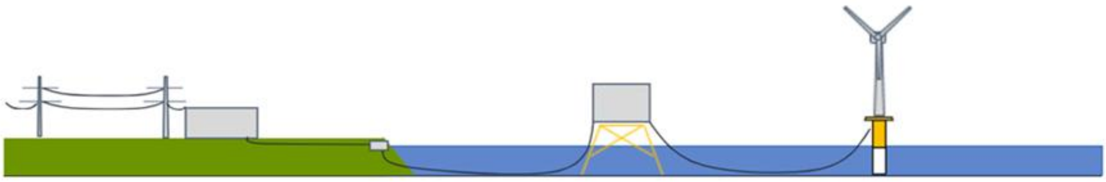


Figure 2.1.1. The necessary components of the offshore wind farm include but not limited to: wind turbines, turbine foundations, inter-array cables, offshore substations, export cables, onshore substation.

The expected maximum tip height of a single wind turbine is up to 400 m, and its maximum capacity is up to 25 MW. Considering the rapid advancement of turbine technology, the EIA programme does not specify the exact turbine model, and environmental impacts are assessed based on the turbines' maximum possible parameters to allow technological flexibility and development until the exact model is selected as part of the procurement phase of the project.

The final maximum possible capacity, layout, and technical details of the wind farm will depend on the outcomes of the EIA and technical design process, including environmental, socio-economic and cultural impacts, the geological structure of the seabed, as well as technical and commercial feasibility.

The typical proposed lifespan of wind turbines is expected to be between 30 and 40 years (the exact time depends on environmental conditions and technical design). The remaining 10–20 years of the superficies licence can be used for development, construction, and eventually decommissioning of the wind farm in accordance with the decommissioning plan developed at the end of the operational lifetime. Therefore, the superficies licences for the wind park and the offshore cables have been applied for a period of 50 years. The wind farm is to be connected to the electricity network around 2035.

The offshore wind farm will reduce the environmental impact of Estonia's energy sector caused by the use of fossil fuels, strengthen energy security, and increase the competitiveness of the economy.

2.2. Location of the proposed activity

According to the superficies licence application, the offshore wind farm is planned in the central part of the Gulf of Riga, within the Liivi 1 (77.7 km²) and Liivi 2 (114.9 km²) marine areas (Liivi0102), which are designated as suitable areas for wind energy development in the Estonian Maritime Spatial Plan (MSP) (Figures 2.2.1 and 2.2.2). In the MSP, these areas are designated to support the country's transition to renewable energy sources and to enhance energy security. For installation of export cable of Liivi0102 OWF additional superficies licence application has been submitted for about 86 km^2 off-shore area. The off-shore cable is located between Liivi 1 and 2 areas and extends from Liivi 2 site to Paatsalu area in Lääneranna municipality.

The Liivi 1 and 2 areas are bordered to the east and west by wind energy reserve areas, which are also designated in the Estonian Maritime Spatial Plan. These are areas with potential for future offshore wind farm development. The reserve areas overlap with historically more intensive trawling grounds and may be made available for use from 2027 onwards according to the governmental decision, provided that, the procedures and studies concerning other areas suitable for offshore wind development renders it impossible to develop offshore wind farms to a sufficient extent (70% of all areas suitable for wind energy development, including reserve areas).

There are several offshore wind farm projects proposed and being developed around the Liivi 0102 area:

- The superficies licence application for the Utilitas Wind Saare-Liivi 4 offshore wind farm, submitted by Utilitas Wind OÜ on 29 April 2020 (16-7/20-06527) and Utilitas Wind Saare-Liivi 5 application (16-7/21-02502);
- Tuuletraal OÜ (superficies licence application 16-7/19-3332);
- Liivi Offshore OÜ (superficies licence application for the Gulf of Riga offshore wind farm No. 16-7/19-3404 and a separate application for the adjacent sub-area No. 16-7/21-00173).

The national spatial plan and strategic environmental assessment for the fourth permanent Estonian-Latvian interconnection is also being prepared. Its 7 alternatives are located near the proposed landfall site of the Liivi0102 offshore export cable (see Chapter 3.17), which is taken into account during this EIA.

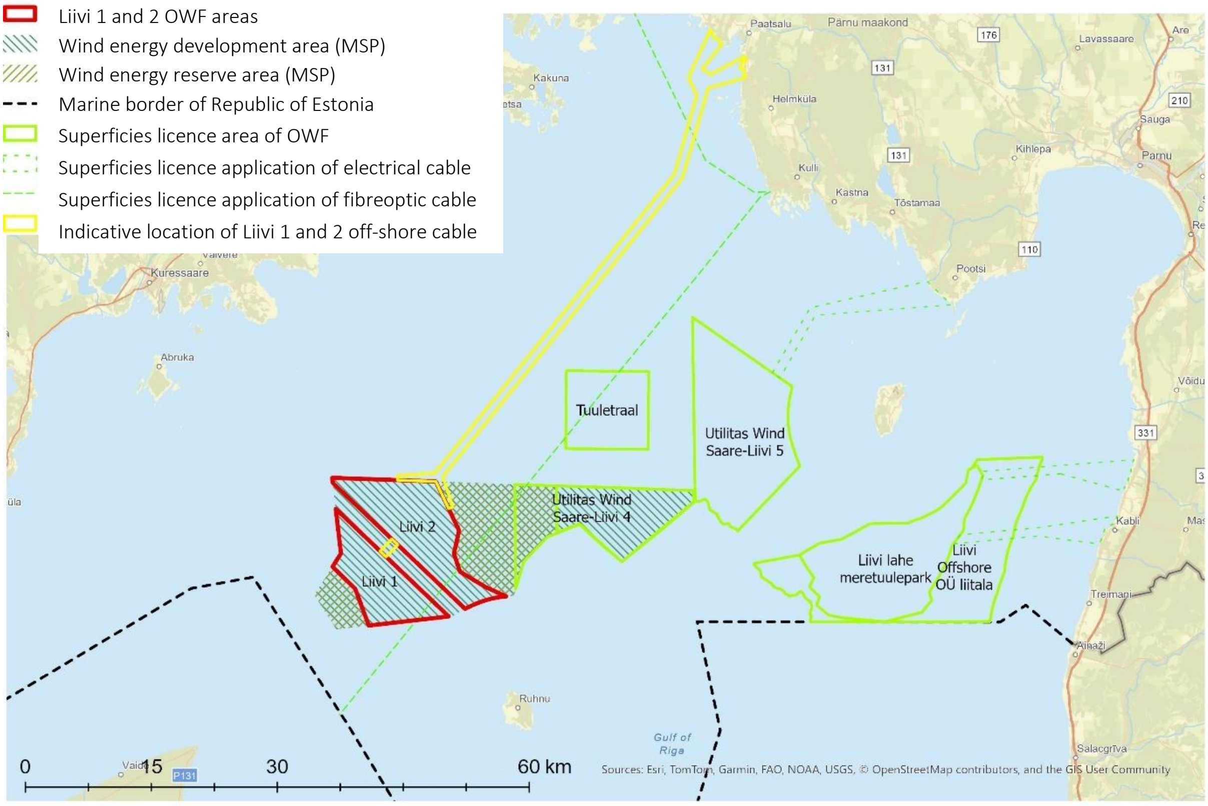


Figure 2.1. Location of the offshore wind farm and export cables in relation to the wind energy development and reserve areas of the Republic of Estonia's maritime spatial plan, other marine areas covered by offshore wind farm superficies licence applications (status of May, 2025), and the national border of the Republic of Estonia.

The proposed activity area is also crossed by a proposed fibre-optic communications cable (Kakumäe–EEZ [Estonian territorial sea boundary]), for which Eastern Light AB submitted a superficies licence application (No. 16-7/18-1251) on 24 April 2018. On 4 March 2025, the Consumer Protection and Technical Regulatory Authority sent the company a draft decision refusing the grant of the superficies licence (Ref. No. 16-7/18-1251-042), to which the company has not yet responded.

To mitigate the potential impact of the wake effect, the EIA for the Liivi 1 and 2 areas will take into account, among other things, the condition set in the Estonian Maritime Spatial Plan that a minimum distance must be maintained between wind farms — approximately eight rotor diameters of the turbines in the subsequently constructed wind farm, and no less than 2 km. This requirement shall be applied to the offshore wind farm which is built last.

The offshore wind farm will be connected to the national onshore electricity network via export cable(s). The number of export cables depends on the number of offshore substations and the final total capacity of the offshore wind farm. The export cable will be routed in a designated corridor, regulated in the Superficies License application submitted to CPTRA on 20th May, 2025 (no [16-7/25-06990-001]) for the combined export cable corridor, combining the export cable corridor between Liivi 1 and Liivi 2 and the export cable corridor from Liivi 2 site to landfall, to allow connection to the national grid in the Paatsalu region of mainland Estonia, approximately 70 km away from the Liivi 1 and Liivi 2 sites.

The offshore export cables are connected to onshore cables, through which the electricity is transmitted to the national electricity network via one of the nearest 330 kV onshore substations. AS Elering operates the existing 330 kV Lihula substation, to which, according to the Estonian Maritime Spatial Plan, an offshore wind farm can probably be connected. The Hanila, Muriste and Paatsalu substations are alternative locations proposed by AS Elering in the course of the national designated spatial plan and strategic environmental impact assessment of the 4th Estonia-Latvia electricity interconnection.

The Developer is working with authorities, local governments, and network operators to enable the seamless connection of the offshore wind farm to the existing electricity network.

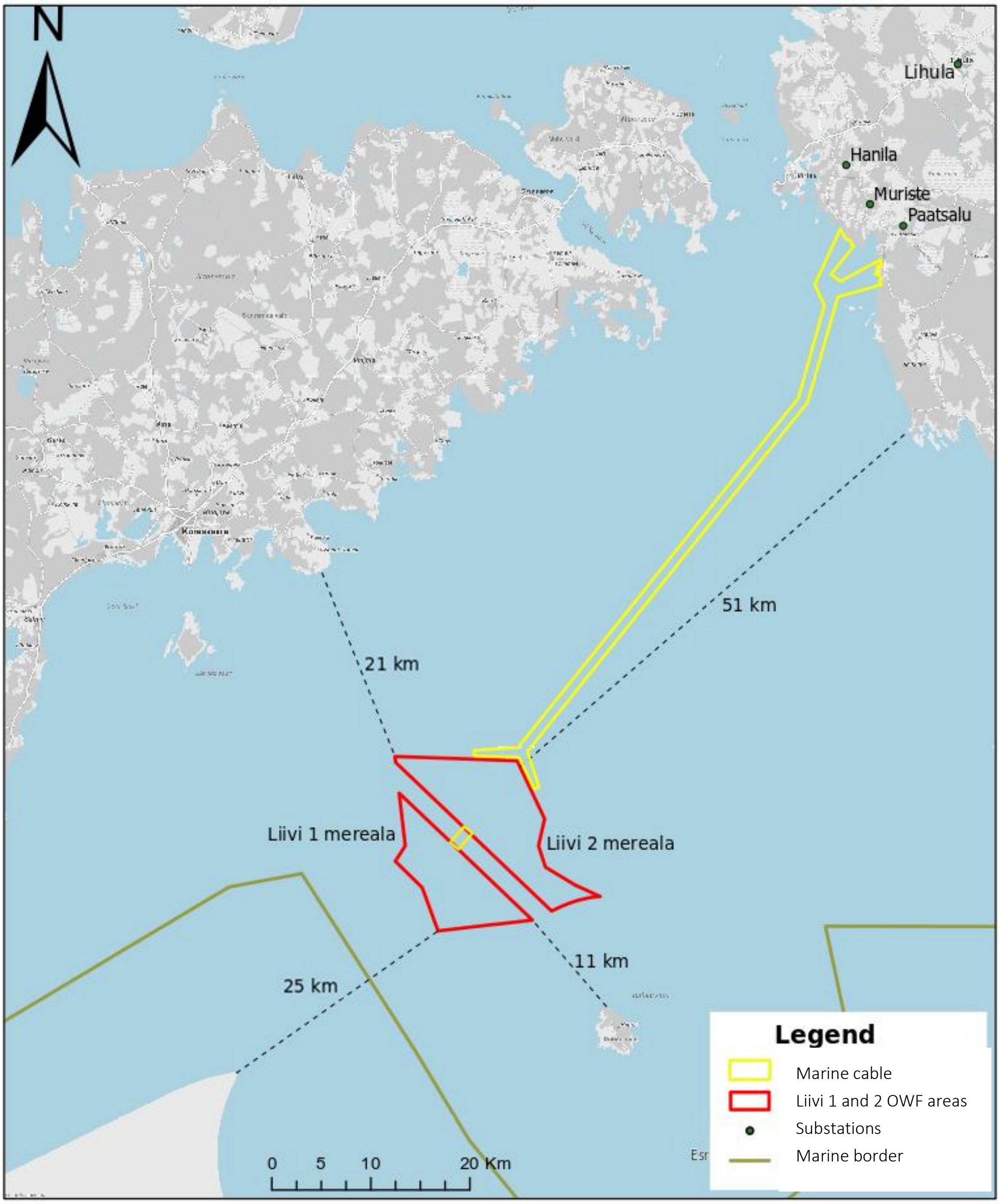


Figure 2.2. The location of the proposed activity, the potential substations suitable for connecting the wind farm to the electricity network onshore (Hanila, Muriste, and Paatsalu are alternatives for a new substation planned by AS Elering as of 12 April 2025, while Lihula is an existing substation), and the distances of the wind farm in relation to these locations.

2.3. Proposed activity and its alternatives

The proposed activity includes the construction, operation and decommissioning of the Liivi 1 and 2 offshore wind farms located in the central part of the Gulf of Riga, in the designated development area under the Estonian Maritime Spatial Plan. The maximum nominal capacity submitted in the superficies licence applications for the proposed offshore wind farm is up to 2,300 MW. Depending on the environmental impact assessment's results, construction conditions, site optimisation as well as other factors, the capacity of the offshore wind farm could be around 1,000–1,500 MW . Based on the superficies licence applications, the total area of the Liivi 1 and 2 marine areas to be encumbered by the proposed offshore wind farm is 192.6 km² (Table 2.3.1), and additionally the export cable corridor area is 86 km^2, and the maximum number of wind turbines is up to 145.

An offshore wind farm includes the infrastructure necessary for its operation, including cables within the offshore wind farm, offshore substations, and an electrical connection from the offshore wind farm to an onshore substation. The EIA for the superficies licence of the offshore wind farm proposed in the Liivi 1 and 2 areas assesses the impacts associated with the offshore wind farm up to the landfall of the offshore export cable on the coast, while also taking into account the impact area of the proposed activity and the need to assess impacts in terms of sea–land interactions (Figure 2.3). This means that impacts originating from the sea and affecting the land will also be assessed.

Table 2.3.1. Basic information on the superficies licence application for the Liivi 1 and 2 marine areas. Detailed information about the offshore export cable is provided in chapter 2.3.4.3.

	Liivi 1 marine area	Liivi 2 marine area	Liivi0102
Maximum number of turbines	57	88	145
Maximum total capacity of the offshore wind farm (MW)	900	1,400	2,300
Maximum number of offshore substations	2	3	5
Proposed maximum capacity of the turbine (MW)	25		
Maximum tip height of the wind turbine from mean sea level (m)	400		
Total area to be encumbered (km²)	77.7	114.9 (incl. 0.24 km² buffer zone in the southeastern corner)	192.6
Maximum proposed construction area (km^2)	0,552825	0,864400	1,417225
Superficies licence period (years)	50		
Application in the Consumer Protection and Technical Regulatory Authority register	16-7/23-11920	16-7/23-11921	-

When selecting the location for the offshore export cable outside the wind farm area, the constructing onshore cables and an onshore substation is also taken into account, meaning that existing and known conditions that may affect the proposed activity are considered. Up to six 220/275 kV cables will be placed in the offshore cable corridor outside the wind farm, with a cable diameter up to 300 mm. Inter-array (66/132 kV) cables with a smaller diameter are used for cabling within the wind farm.

Offshore Export cables are expected to be approximately 70 km in length. The cable corridor survey area is about 86 km^2 and minimal width is 1 km, consisting of an export cable corridor between Liivi 1 and Liivi 2 project area of 2 km^2 and the export cable corridor from Liivi 2 sites to the landfall of 84 km^2.

Distance between circuits is expected to be up 50m between two immediately adjacent cables and 150m between pairs of cables, plus additional external buffer of 150 m. Cables can be laid on the seabed, then buried or buried directly.

Cables are typically buried up to 3 m depth in the seabed or are laid on seabed. The cable burial depth might be increased due to specific ground conditions and risks for cable exposure. For the export cable corridor between Liivi 1 and Liivi 2 a separate risk assessment must be completed to determine the appropriate cable laying and cable protection approach due to the crossing of the shipping lane located between the two sites during technical design of the project. Cables could be protected using the following methods

- Rock berms (most common)
- Mattresses
- Gabion rock bags
- Half-shells
- Or similar

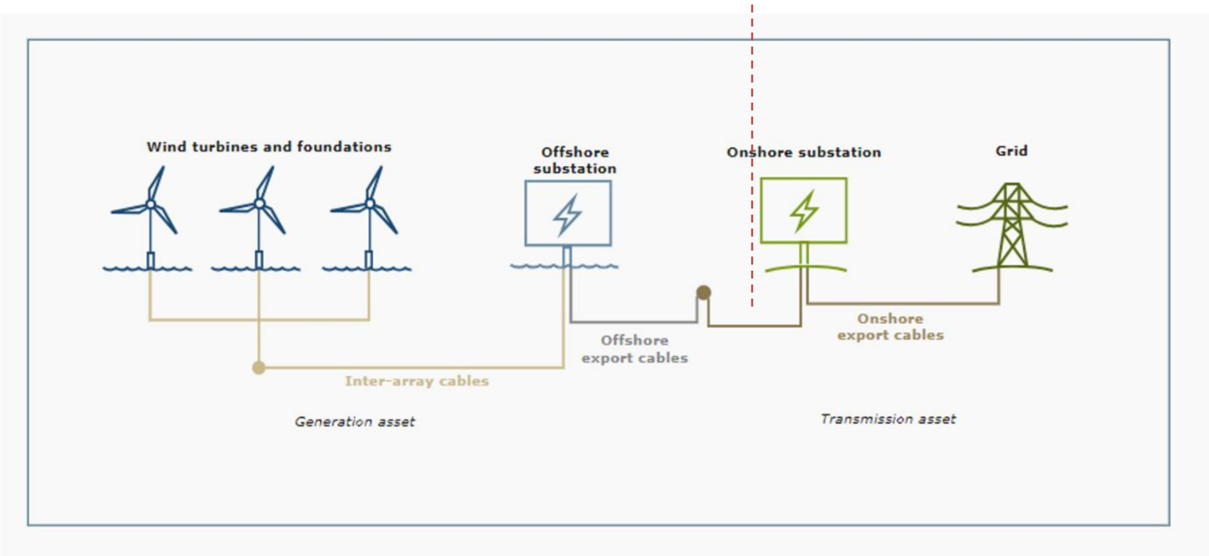


Figure 2.3. A schematic diagram of an offshore wind farm and its connection to the transmission network. The part of the proposed offshore wind farm covered by the EIA is highlighted in colour, while the construction of the cable and substation on land is not included within the scope of this assessment and is shown in grey tones.

The alternatives to the proposed activity must be realistic, meaning they must comply with legal requirements, be technically and economically feasible, allow the objective of the activity to be achieved within a reasonable timeframe and with reasonable resources, and the developer must be prepared to implement all proposed alternatives.

The environmental impact assessment report compares the realistic alternatives of the proposed activity with the current situation, i.e. the zero alternative (the proposed activity is not implemented). At the time of preparing the EIA programme, the realistic alternative to the proposed activity is the wind farm described in the superficies licence applications (Alternative 1; Table 2.1). Considering the rapid development of wind turbine technologies and the information provided in the superficies licence applications, the impact is assessed for larger turbines than those currently in serial production (models currently in serial production are for example Siemens Gamesa 14.7 MW, Vestas 15 MW, and General Electric 13 MW). At the same time, the EIA must also address the possibility that turbine parameters remain largely unchanged in the future, and therefore a greater number of lower-capacity turbines (such as the models currently in serial production) may need to be installed in the offshore wind farm.

The realistic alternatives to the proposed activity are:

- Main alternative (wind farm with offshore export cable corridor as described in the Liivi 1 and 2 superficies licence application and EIA initiation letter):
- up to 145 wind turbines at most;
- maximum total capacity of the wind farm up to 2300 MW;

- The offshore export cable reaches the mainland in the Paatsalu area of Lääneranna municipality to establish an electricity connection to the existing substation in Lihula;
- up to 5 offshore substations
- **Zero alternative (the proposed activity is not implemented).** In this alternative, the offshore wind farm is not developed. The zero alternative serves as the baseline scenario, illustrating the environmental, economic and social assessments in the event that the proposed activity is not implemented.

In the EIA report, the proposed activity (main alternative) is compared with the zero alternative, i.e. the situation in which the developer is not issued a superficies licence for the Liivi 1 and 2 marine areas. If new aspects emerge during the preparation of the EIA report, any resulting realistic alternatives will also be assessed in the report.

The following possible solutions are considered as so-called technical sub-alternatives of the main alternative of the proposed activity:

- different number, sizes and locations of wind turbines and offshore sub-stations;
- different foundation types (e.g. monopile foundations, gravity foundations, jacket foundations, suction bucket foundations) depending on seabed conditions;
- different routes and landfall points for the offshore export cable, depending on environmental restrictions and electricity network connections;
- timing strategies for the installation of wind turbines and their connection to the electricity network.

Such sub-alternatives allow for flexible planning of the offshore wind farm and will be refined based on the results of environmental studies, technological assessments, and stakeholder consultations and other activities conducted during the EIA.

2.3.1. Layout of the offshore wind farm and number of wind turbines

A combination of technical, environmental, economic, and regulatory criteria is applied in preparing the layout scheme for the offshore wind farm infrastructure (turbines, cables and offshore sub-stations). The optimal layout of the offshore wind farm takes into account the following key aspects:

- Wind resource and energy generation: wind turbines are positioned to maximise wind energy output. The distance between turbines take into account the effects of wake and turbulence.
- The orientation and placement of wind turbines allowing for full flexibility in their positioning, taking into account navigational safety, the complexity of future maintenance, and associated costs.
- Seabed and soil conditions, selecting the foundation and determining the feasibility of installation. Certain areas with unsuitable soil conditions may be avoided, thereby reducing the area of the offshore wind farm to be developed.
- Electrical infrastructure, such as offshore substations, inter-array cables, and offshore export cable routes, will be positioned to reduce cable route lengths and energy losses. Where possible, the placement of electrical infrastructure avoids crossing existing infrastructure, as well as areas with unsuitable soil conditions and soil-related hazards and values.
- Maritime, navigational and aviation safety will be taken into account in accordance with national navigation regulations and by allowing for adequate safety zones around offshore wind farm facilities.
- Defence restrictions (including military training areas, radars, radio and communication links) will be taken into account in the location of offshore wind farm facilities.
- Environmental factors (including ecological aspects) will be taken into account to avoid sensitive areas (e.g. reefs, fish spawning grounds, major migration routes for birds and bats) and to reduce the impacts of construction on the marine environment.
- Regulatory and permit-related restrictions, such as exclusive economic zones (EEZs) resulting from national and international maritime borders, are also taken into account when planning the offshore wind farm siting scheme. Visual impacts are also taken into account.
- Economic aspects balance maximising energy productivity and reducing costs.

Due to some of these restrictions, the number of wind turbines, offshore substations, developable area, and offshore wind farm capacity may decrease. The initial offshore wind farm scheme is presented in Figure 2.3.1.

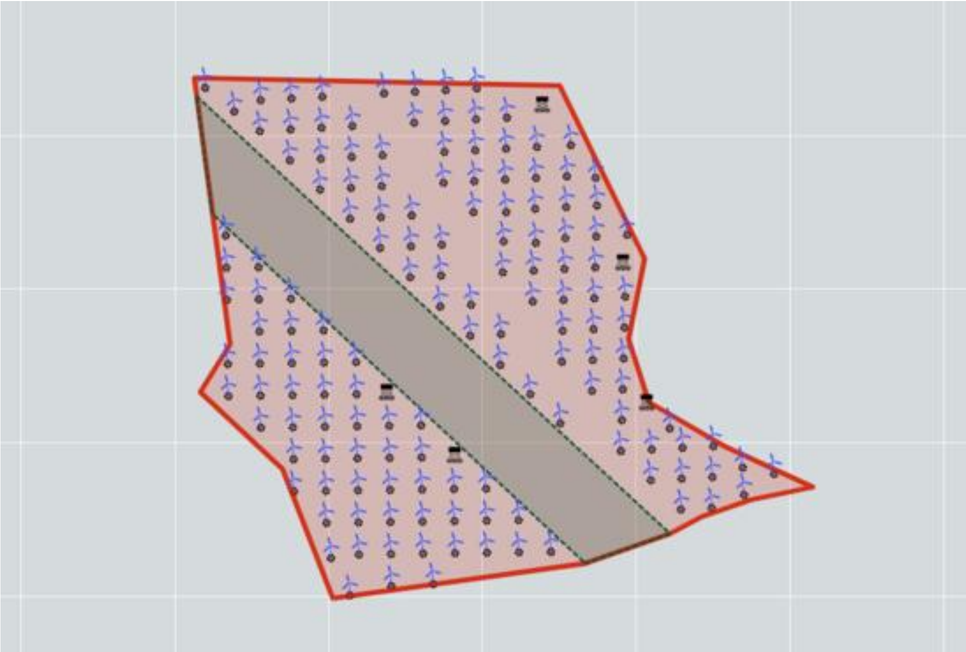


Figure 2.3.1. According to the main alternative, the maximum number of wind turbines and offshore substations can be located in an offshore wind farm, where the existing marine area is used to the maximum.

2.3.2. Wind turbines

The Developer plans to build an offshore wind farm with a maximum of 145 turbines, divided between the Liivi 1 and 2 marine areas. When preparing an EIA, numerous studies are conducted that may identify environmental, technological and socioeconomic or cultural constraints, which may result in a reduction in the number of wind turbines. Models for the serial production of offshore wind turbines have developed significantly over the past thirty years since the first offshore wind turbines were installed. The Developer has not yet selected the exact wind turbine model, but considering the start time of the project construction, the following wind turbine parameters is assumed (Figure 2.3.2):

- Maximum rotor diameter 320 m;
- Maximum top height of the wind turbine above sea level is 400 m;
- Minimum tip clearance is 25 m;
- Maximum hub height is 240 m above sea level (subject to change depending on the specific model and other parameters).

Therefore, the EIA takes into account the hypothetical wind turbines with the largest possible dimensions described in the superficies licence applications, which could have entered production by the time the proposed offshore wind farm is constructed.

However, circumstances may emerge during the EIA that require, for example, height restrictions for wind turbines.

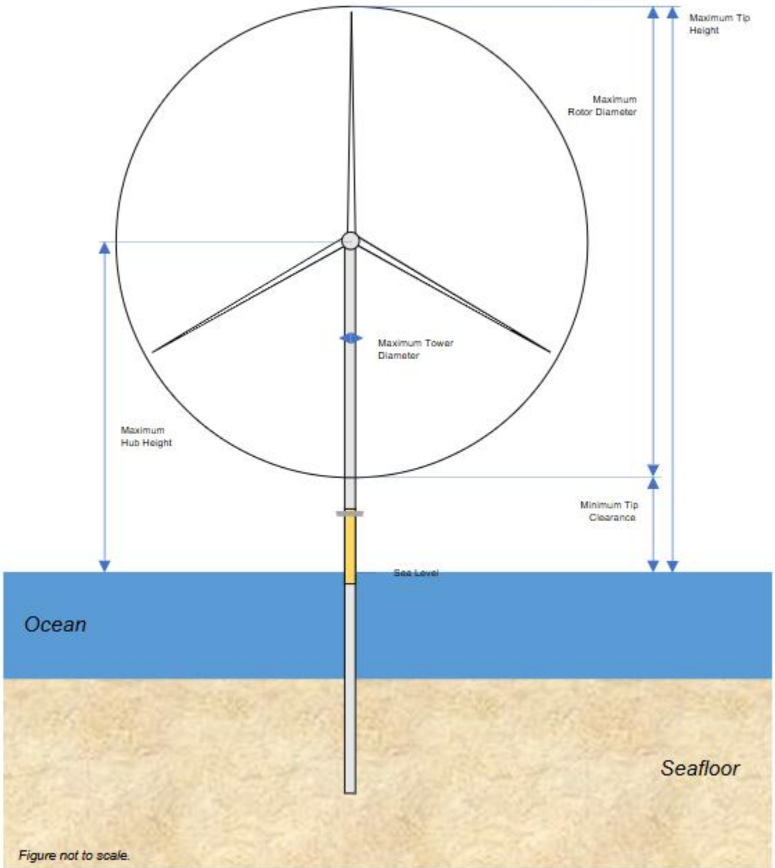


Figure 2.3.2 Main parameters of the offshore wind turbine (figure not to scale).

2.3.3. Type of foundation

The types of foundation to be used in the project has not yet been selected, several foundation types are under consideration (Figure 2.3.3.1):

- Monopile foundations, installed either by large-diameter drilling or pile driving into the seabed.
- Gravity based foundations, which are installed on the seabed.
- Jacket foundations, using suction buckets or piles.

Monopile foundations are one of the most widely used and cost-effective foundations, and they are fairly easy to install. However, there are limitations when installing monopile foundations due to water depth and seabed conditions. In discussions of

Estonian offshore wind farms, gravity based foundations have traditionally been preferred over monopile foundations, because monopile foundation drilling involves noise and gravity based foundations could better withstand moving sea ice. Gravity based foundations are considered cost-effective and can be manufactured in the Baltic countries. Compared to monopile foundations, gravity based foundations are less dependent on sub-soil conditions, but require a stable seabed. Jacket foundations are best suited for deep water and complex seabed conditions. They are more expensive, but they are needed in locations where other foundation types are not usable.

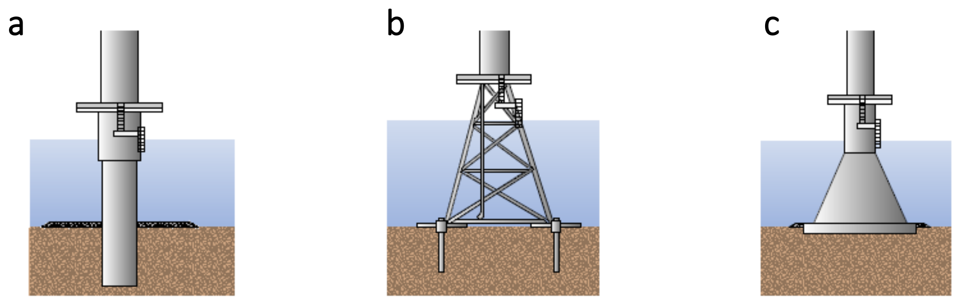


Figure 2.3.3.1. The most common types of foundations used in offshore wind farms are monopile foundation (with transition – piece (TP))(a), jacket foundation (b) and gravity based foundation (c). The choice of foundation type depends on seabed sediments and geological composition.

Various aspects play a role in the selection of foundation types (Figure 2.3.3.2) for the Liivi 0102 project, and the final selection will be made once foundation design is completed after the geophysical and geotechnical surveys of the Liivi 1 and 2 marine areas are complete. For EIA, one of the most important initial data for foundation types is their diameter at the seabed (how large an area of seabed the foundation covers), which is mainly influenced by:

- water depth, seabed conditions and weather conditions (including icing);
- soil conditions and construction geological hazards;
- production, installation and maintenance costs;
- size of the offshore wind turbine.

Another important factor is the noise during the construction, which differs also between the foundation types and installation methods.

The seabed diameter of a conventional monopile foundation (without erosion protection) is up to 16 m, for a jacket foundation up to 50 m , and for a gravity based foundation up to 60 m. Therefore, the construction area given in Table 2.3.1 depends on the type of foundation chosen.

Figure 2.3.3.2. Possible foundation types in the Liivi 0102 project (a – TP-less monopile foundation (Thor Offshore Wind Farm (1000MW), Denmark, developed by RWE. Source: Dajin Heavy Industry, delivering monopiles to project); b – gravity-based foundation (Fécamp Offshore Wind Farm (500 MW), France, developed by EDF Renewables, Skyborn and EIH S.á.r.l. Source: Saimpem, delivering gravity-based foundations (GBF) to project); c - jacket foundation (Changfang and Xidao (CFXD) Offshore Wind Project (589MW), Taiwan, developed by Copenhagen Infrastructure Partners (CIP)).

For almost all foundation types, the seabed must be prepared prior to installation – boulders and other objects must be removed, and the foundation base must be protected against erosion. Installation depths also vary between foundation types: for monopile foundations, the expected depth is up to 45 m, while for driven jacket foundations it may range from 70 to 100 m. The depth of a gravity foundation depends on the strength of the seabed soil.

2.3.4. Transmission system for electricity produced in an offshore wind farm, including off-shore export cable

To transmit the electricity generated in the Liivi 0102 offshore wind farm to the national electricity network, a transmission system must be constructed, consisting of the components described below (Figure 2.3.4.1). The EIA focuses on the offshore components of the wind farm up to the connection point between the offshore export and onshore export cables at a landfall site. Thus, the EIA analyses the impacts of the construction, operation and removal of offshore facilities. The most feasible and realistic solution must be chosen for the construction of an offshore wind farm. If necessary, mandatory technical requirements and restrictions may be set in the EIA report. The EIA report may recommend mitigation measures and monitoring.

The offshore wind farm will be connected to the national electricity network based on the technical conditions , which will be issued by AS Elering to the Developer.

The EIA includes the following offshore wind farm components:

- inter-array cables of the offshore wind farm;
- the offshore export cable(s) up to the landfall point in Paatsalu area (exact location will be decided once environmental and technical studies, including core drilling, have been completed).
- The offshore export cable(s) will be connected at the transition joint bay (TJB), which in turn will be connected to the onshore substation.
- Offshore substations;

The following components are required to connect the offshore wind farm to the national electricity network, but are not addressed in the EIA:

- Onshore export cable;
- Onshore substation;
- Reactive Compensation station (may be required and will most likely be located in the onshore substation)
- HVDC/HVAC converter station (in case HVDC technology is used for the offshore export cable)

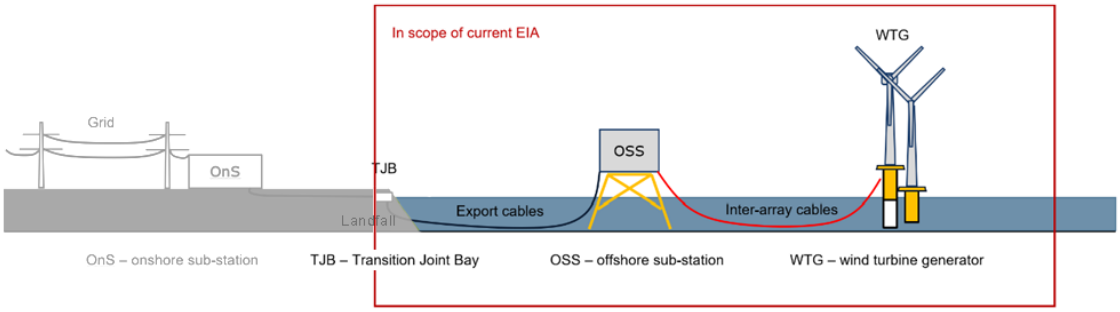


Figure 2.3.4.1.Wind farm components in scope of current EIA (in red lined box) and out of scope of current EIA.

2.3.4.1. Inter-array cables of the offshore wind farm

Within the offshore wind farm, electrical cables connect the wind turbines to each other, forming turbine strings that transmit electrical power to the offshore substation. These cables transmit the electricity generated by each wind turbine to central offshore substations, where the voltage is stepped up to high voltage before being exported to the mainland via export cables.

Within the offshore wind farm, the inter-array cabling is typically 66 kV or 132 kV and is designed with strong insulation and protective layers to guard against mechanical damage, corrosion, and seabed conditions, ensuring durability in harsh marine conditions. According to the Developer, 4 to 12 wind turbines will be connected in a single string, and the diameter of the inter-array cable will be up to 225 mm. The cable core is typically made of copper or aluminium, protected by an insulating material, a waterproof layer, and an outer protective metal armouring. The expected total length of cabling in the Liivi0102 offshore wind farm is up to 300 km, and the cables will be buried up to a depth of 3 m, however the cable burial depth might be increased due to specific ground conditions and risks for cable exposure. The cables will be installed using ploughing, trenching, or jetting methods, with 100 m spacing between cable pairs and an additional 50 m buffer zone.

2.3.4.2. Offshore substations

Offshore substations (Figure 2.3.4.2) collect electricity from wind turbines via cables within the offshore wind farm, step up voltage, and transmit the high-voltage electricity to land via export cables. Depending on the number of wind turbines and their capacity, it may be necessary to build up to 5 offshore substations in the Liivi0102 marine area. The maximum capacity of one offshore substation is up to 1,400 MW. The transmission capacity is expected to be either 220 kV or 275 kV high-voltage alternating current, or alternatively high-voltage direct current. The height of the offshore substations is up to 100 m and their area of coverage is approximately 95,000 m^2. In addition, connections between offshore substations are needed, the number of which is anticipated to be equal to the number of offshore substations.

Like offshore wind turbines, offshore substations also have different foundation types. These may or may not be the same as the turbines in the offshore wind farm. Similar to the selection of foundations for offshore wind turbines, additional geotechnical studies are required to select the foundation type for offshore substations. Possible foundation types for offshore substations are monopile foundations, gravity based foundations, jacket foundations (with piles or suction buckets), or multi-leg jacket foundations.

Figure 2.3.4.2. Offshore substation (Veja Mate (402 MW), Germany, developed by Copenhagen Infrastructure Partners (CIP))

2.3.4.3. Offshore export cables

2.2.4.4 Offshore export cables

The offshore export cables are high-voltage cables that transmit the electricity generated in the offshore wind farm—to the onshore electricity network. These cables run along the seabed (either laid on or buried in it) from the offshore substations to the landfall site.

The MSP scheme in section 5.6.6.1 shows the conceptual locations of the electrical transmission systems (offshore export cables) for wind energy development areas. In section 5.6.6 "Cable corridors from wind energy development areas to land," it is stipulated that *during the development of wind farms at the building permit stage, an alternative location for cable installation may be found if it does not entail a significant environmental impact. The avoidance of significant environmental impacts on habitats and marine life, including important habitats for protected species and the impact on Natura 2000 sites, must be ensured.*

Considering that, due to its length, the generally planned location for the export cable is not a realistic alternative for economic reasons. Additionally, due to the distance from potential onshore substations, the route of the MSP offshore export cable would cause overhead line construction in sensitive bird areas. Therefore, the MSP location for the offshore export cable is not considered as an alternative in the EIA.

In order to determine the preliminary possible location and cable corridor survey area for the proposed offshore wind farm (Figure 2.1), a spatial analysis and a preliminary technical feasibility analysis (Blue Power Partners, 2025) were carried out on the basis of the available data. The spatial analysis compared, several possible electricity offshore export cable landing sites and cable corridor alternatives, assessing the suitability of each on the basis of the following factors:

- Protected areas and environmental constraints: the corridor was selected minimising the expected impact on sensitive natural environments such as protected areas, Natura 2000 sites and marine fauna (including seals, fish). The location was chosen to minimise overlap between the bird and nature areas of the Väinamere, excluding potential negative impacts on protected species and habitat types. Adverse impacts on the Varbla nature area were also ruled out, as moving the corridor southwards will increase the distance between the Lihula substation and potential new substations. This, in turn, may require the construction of overhead power lines, which could have a negative impact on the area's birdlife.

- Geological conditions: the appropriate corridor will take into account the geological conditions of the seabed and, based on the available information, will ensure that the installation of the cable is technically feasible and safe
- Depth of the sea: as the technique of laying the cable may depend on the depth of the sea, a corridor was selected where the depth of the sea ensures safe operation of the cable-laying vessels and the cable laying is technically feasible and safe.
- Effects on shipping and fisheries: the corridor was chosen to minimise the impact on shipping and fisheries by avoiding areas with heavy shipping traffic.
- Socio-economic aspects: it is important to take into account the interests of the local community and landowners in order to avoid potential conflicts of interest and to ensure the smooth implementation of the project. Therefore, the corridor where the shortest route for the offshore wind farm electricity export cable to the onshore substation was chosen. In this way, the land area occupied by the onshore export cable link was minimised, as well as visual impacts, conflicts with private property and excessive deforestation. In the selection of the site, Paatsalu Bay was excluded in order to avoid small harbours, surf areas and more densely populated recreational areas.
- Economic considerations: the chosen corridor must be cost-effective, minimising the costs of installation and subsequent maintenance. A cable corridor was chosen that is economically viable (shortest possible route) but also takes into account environmental considerations.
- Technical constraints: the location was chosen avoiding crossings with existing cables and sufficiently wide to allow for the expected crossing with the planned fourth submarine cable between Estonia and Latvia. The location of the export cable overlaps with the planning area of the Estonian-Latvian 4th electricity interconnection specific plan and partly also with the alternative submarine cable locations (Figure 3.2). The choice of location was based on the MSP guidelines to use the same cable corridors to the maximum extent possible. At the same time, potential hazards (e.g. jetties, wrecks, other pipelines and cables, UXOs) are avoided. The cable corridor was chosen wide enough to allow for shifting of cables within the corridor where possible.
- For export cable connecting Liivi 1 and 2 sites, the already conducted geophysical survey results were taken into account.

The exact location of the offshore export cables will be determined based on the evaluation of various aspects (geophysics, geotechnics, environmental conditions, wrecks, unexploded ordnance (UXOs)) in order to:

- identify and assess potential hazards (e.g. boulders, wrecks, other pipelines and cables, UXOs);
- determine geological, biological and environmental conditions;

– support cable design, route selection, burial depth and method.

Once these studies are completed and the data analysed, it will be possible to determine the final location of the offshore export cable.

Export cable voltage level is expected to be 220 or 275kv (probably alternating current, but direct current is also possible), the diameter of cable is expected to be up to 300 mm. The cable core is typically made of aluminium or copper, which is adapted to have strong insulation, a waterproof layer, and a metal protective layer (Figure 2.3.4.3).

Export cables will be installed within the dedicated export cable corridor, in accordance with the application for the Superficies Licence submitted to CPTRA on [20 May 2025, No. [16-7/25-06990-001]], for the combined export cable corridor between Liivi 1 and Liivi 2 sites (Interlink Cable Corridor) and the export cable corridor from Liivi 2 site to landfall, to allow connection to the national grid in the Paatsalu region of mainland Estonia, approximately 70 km away from the Liivi 1 and Liivi 2 sites.

The cable corridor survey area is about 86 km^2 with a minimal width of 1 km, consisting of an export cable corridor between Liivi 1 and Liivi 2 project area of 2 km^2 and the export cable corridor from Liivi 2 sites to the landfall of 84 km^2.

Distance between circuits is expected to be up 50m between two immediately adjacent cables and 150m between pairs of cables, plus additional external buffer of 150m. Cables can be laid on the seabed, then buried or buried directly.

Cables are typically buried up to 3 m depth in the seabed or are laid on seabed. The cable burial depth might be increased due to specific ground conditions and risks for cable exposure.

The Liivi0102 offshore wind farm has up to 6 export cables, depending on the number of offshore substations and the final capacity of the offshore wind farm.

Figure 2.3.4.3. High voltage cable offshore cable up to 420 kV, (1) Conductor (Al or Cu), (2) Inner semi-conducting layer, (3) XLPE insulation, (4) Outer semi-conducting layer, (5) Swellable tape, (6) Lead sheath, (7) PE oversheath, (8) Fibre optic cable, (9) Filler profiles, (10) Bedding (PP), (11) Armouring, (12) Outer serving (PP). Source: NKT, (A)2X(F)K2YRAA

The offshore export cables reach the shore at the so-called landfall site. Depending on the conditions of the landfall site, environmental restrictions, and distance from existing infrastructure and public areas, different installation methods can be used there:

- horizontal directional drilling (HDD);
- open trench excavation;
- microtunnelling / pipe jacking;
- direct pull-in.

The cables in the landfall area will likely be installed using horizontal directional drilling, but the final method will be selected once environmental and technical studies (including core drilling) have been completed.

The onshore export cable will be connected at the transition joint bay (TJB; figure 2.3.4.4), which in turn will be connected to the onshore substation.

Figure 2.3.4.4. Transition Joint Bay (TJB) located close to landfall where offshore and onshore cables are connected. Source: SSE Renewables, Seagreen Offshore Wind Farm (1.1 GW), Scotland

2.3.4.4. Power connection options

According to the Developer's current plans, the offshore export cables will be connected to an onshore cable line, which will transmit electricity to the national electricity network via one of the nearest onshore substations. Lihula substation is an existing substation of AS Elering (the Estonian national transmission network operator), to which offshore wind farms can be connected according to the Estonian Maritime Spatial Plan. If, as a result of the national designated spatial plan and strategic environmental assessment for the Estonia–Latvia 4th electricity interconnection, AS Elering establishes a new substation in the Paatsalu area, the wind farm developer will be able to analyse, in addition to the main alternative (the existing substation in Lihula), the connection of the proposed wind farm to the nearest substation on the coast in the Paatsalu area (in both cases, the offshore export cable is located within the area covered by this EIA).

AS Elering also plans to build new high-voltage substations in Saaremaa. However, considering the numerous competing offshore wind farm projects that are proposed to be built west of Saaremaa, it is currently not anticipated to connect the export cable of the Liivi 1 and 2 offshore wind farms to Saaremaa. If there will be available connection capacity at the substation to be built on Saaremaa, the developer may consider this as one of the connection options. If an electrical connection is desired to a substation located on Saaremaa, additional studies must be conducted at the location of the offshore export cable and the impacts assessed. However, based on current knowledge and limiting conditions, it is not anticipated to connect the Liivi0102 offshore wind farm to the national grid via Saaremaa. Therefore, the current EIA and the studies conducted in the process do not address the environmental impacts that would accompany the construction of an export cable to Saaremaa.

The EIA therefore assesses the impacts of the offshore export cable corridor and transmission network leading to the Paatsalu area, taking into account the offshore export cable segments at sea and the environmental impacts associated with them.

The EIA report compares the proposed activity and its sub-alternatives with the zero alternative, i.e. the situation where the developer is not issued a superficies licence to build the offshore wind farm in the Liivi 1 and 2 marine areas. If new aspects emerge during the environmental impact assessment, the report will also address other realistic alternative options arising from them.

The best possible realistic solution must be chosen for the development of the offshore wind farm. If necessary, the EIA report can provide mandatory requirements for designing the wind farm and the facilities necessary for its operation. The requirements ensure that no significant environmental impact occurs. These must be taken into account when designing, and mitigation measures and monitoring recommendations must be implemented. The permit issuer must take these requirements into account (including in the case of a permit for the special use of water) and set the requirements both in the permit and as additional conditions to the permit.

3. CONNECTION BETWEEN THE PROPOSED ACTIVITY AND STRATEGIC PLANNING DOCUMENTS

The proposed activity is related to several strategic planning documents at different levels, which are described in more detail below.

3.1. The European Green Deal.

According to the European Green Deal of 11 December 2019 by the European Commission, Europe will be the first climate-neutral continent by 2050. The main objective of the strategy is to achieve a resource-efficient and competitive European economy that reaches climate neutrality by 2050, uses resources sustainably, and ensures adequate economic growth. In line with the European Green Deal, the proposed offshore wind farm supports the transition to a clean energy system and creates the conditions for an environmentally sustainable industrial revolution. To reduce greenhouse gas emissions, it is necessary to increase the share of renewable energy.

3.2. European Union Biodiversity Strategy 2030

On 20 May 2020, the European Commission adopted the EU Biodiversity Strategy for 2030 (COM(2020) 380), aiming to set Europe’s biodiversity on the path to recovery by 2030. To achieve this, the strategy provides a comprehensive plan of commitments and actions to combat the main causes of biodiversity loss in a way that benefits nature, people and the climate.

In the context of the proposed EIA, the most relevant topics are found in Chapter 2.2 of the strategy, *The EU nature restoration plan: restoring ecosystems on land and at sea*.

- Win-win solutions for energy generation. The sub-chapter highlights the need to reduce carbon emissions from the energy system to combat climate change and biodiversity loss. Offshore wind farms are highlighted separately, which can be built provided there is no adverse effect on fish stocks.

- Restoring the good environmental status of marine ecosystems. The sub-chapter emphasises the importance of the benefits provided by healthy marine ecosystems for both human health and well-being and the economy. It is therefore important to achieve good environmental status of marine ecosystems, including by creating strictly protected areas and restoring areas in poor condition. In this regard, the implementation of the EU's Common Fisheries Policy, the Marine Strategy Framework Directive and the Birds and Habitats Directives is essential.

According to the principles of the EU Biodiversity Strategy, the proposed activity is in line with the strategy; the EIA report will specify the potential impacts of the proposed activity on marine ecosystems, including fisheries and marine habitat types.

3.3. National strategy Sustainable Estonia 21

On 14 September 2005, the Riigikogu adopted the national strategy Sustainable Estonia 21 (RT I 27.09.2005, 50, 396), which sets out the principles of sustainable development and the objectives for the development of the Estonian state and society up to 2030. The strategy integrates the development of the economic, social, and environmental sectors and links them to the long-term development frameworks of the world (Agenda 21) and the European Union. The objective of the strategy is to combine the preservation of the principles of sustainable development and Estonia's traditional values with the conditions necessary to remain competitive in the world. The long-term development objectives set out in Sustainable Estonia 21 are:

- the vitality of Estonia's cultural space;
- the growth of human well-being;
- a socially cohesive society;
- ecological balance.

The long-term objectives of the strategy must be taken into account by other sectors when preparing their shorter-term strategic documents, and the fulfilment of these objectives must be monitored. According to the strategy, long-term energy planning must be based on environmental sustainability, and the necessary actions must be planned to transition to a post-oil shale energy system. The proposed activity supports the achievement of the goals of Sustainable Estonia 21.

3.4. National Strategy Estonia 2035

On 12 May 2021, the Riigikogu approved the national development strategy Estonia 2035, which sets the strategic goals for the Estonian state and people and defines the changes needed to achieve them. The strategy states that the use of Estonia's marine area for new purposes – such as renewable energy and more diverse traditional maritime activities – will gradually intensify, increasing the pressure of human activity on the marine environment. Marine resources must be used sustainably, taking into account the sustainability of the marine ecosystem, in order to achieve good environmental status of the sea.

In order to reduce greenhouse gas emissions and ensure energy supply security and safety, the strategy outlines a transition to climate-neutral energy production, including support for offshore wind energy. At the same time, it is considered important to find solutions for increasing the share of renewable energy that take into account security, environmental protection, and the interests of the residents.

The proposed activity supports the achievement of the goals of the country's long-term development strategy Estonia 2035.

3.5. National spatial plan Estonian 2030+

By directive of 30 August 2012, the Government of the Republic established the national spatial plan Estonia 2030+, which provides guidance for achieving a greater share of renewable energy in energy supply. According to the plan, the western coastal sea of Estonia is suitable for the construction of offshore wind farms (Figure 3.1), where the marine areas of Liivi 1 and 2 are also located.

The proposed activity is in line with the national plan Estonia 2030+.

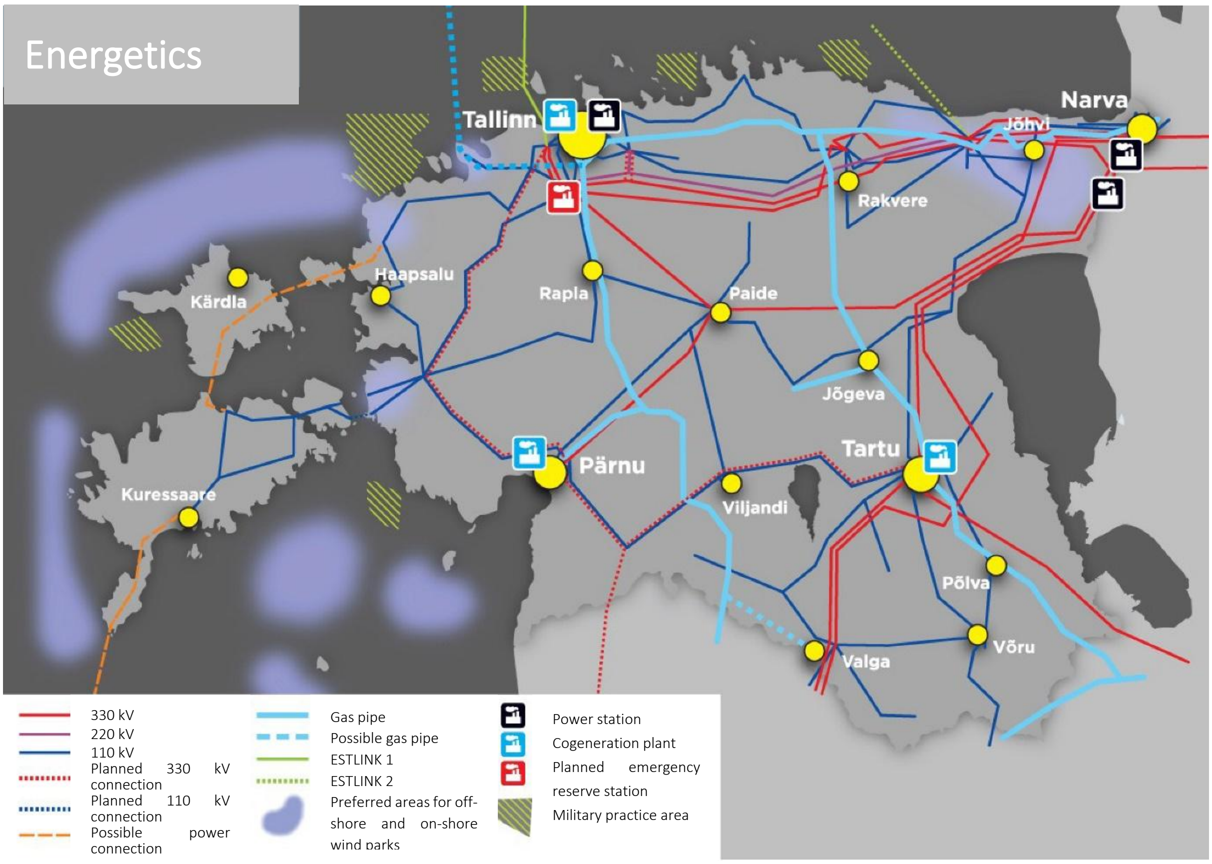


Figure 3.1. The energy thematic map of the national spatial plan Estonia 2030+, which also highlights preferred areas for the development of offshore and onshore wind farms.

3.6. Estonian Maritime Spatial Plan

By directive No. 146 of 12 May 2022, the Government of the Republic established the Estonian Maritime Spatial Plan (MSP). Maritime spatial planning is a tool for planning long-term use of the marine area. The Estonian Maritime Spatial Plan has been drawn up on the basis of Directive 2014/89/EU of the European Parliament and of the Council. The core principle of the plan is the multi-use of the marine area. The aim is to use the sea as a shared and sustainable resource and to enhance the positive synergies between different uses.

The MSP also designates areas within Estonia's marine territory that are suitable for wind energy development. The proposed Liivi 1 and Liivi 2 offshore wind farm areas overlap with wind energy development area No. 1 of the Estonian Maritime Spatial Plan (Figure 2.1). The Estonian Maritime Spatial Plan also sets out the mandatory conditions and recommended guidelines for the subsequent development stages of the offshore wind farm, including the offshore export cable (chapters 5.6.5 and 5.6.6 of the plan). The EIA process for the proposed activity will follow the conditions set out in the MSP and, where possible, will also be guided by its recommendations. The conditions and guidelines of the Maritime Spatial Plan have also been taken into account in the planning of the studies to be carried out for the EIA (as set out in Chapter 5.2 of the EIA programme).

3.7. Estonian Environmental Strategy 2030

By decision of 14 February 2007, the Riigikogu approved the Environmental Strategy until 2030, the objective of which is to define long-term development directions for maintaining a good state of the natural environment. In doing so, the interconnections between the environmental, economic, and social sectors have been taken into account, as well as their impacts on the surrounding natural environment and on people. The environmental strategy's objective regarding climate change and air quality is as follows: to produce electricity in volumes that meet Estonia's consumption needs and to develop diverse, low-environmental-impact sustainable production technologies based on various energy sources that also allow for electricity production for export. The proposed activities are in line with the Estonian Environment Strategy 2030.

3.8. Energy Sector Development Plan until 2030

On 20 October 2017, the Government of the Republic approved the Energy Sector Development Plan 2030 (ENMAK 2030), which brings together future actions related to the electricity, heat and fuel sectors, energy use in the transport sector, and housing. ENMAK declares the vision for the development of Estonia's electricity sector up to 2050 as one in which the electricity sector contributes to the competitiveness of the Estonian economy through ensured security of supply, market-based electricity prices for end users, and the use of environmentally sustainable solutions, while also supporting resource efficiency and the increased share of renewable energy sources.

According to the development plan, wind energy could cover a third of the country's electricity consumption needs by 2050. As a general trend in electricity production, it can be projected that, depending on the decreasing cost of technologies and the rising CO_2 price, the share of generation capacity based on renewable energy sources such as wind and biomass will increase in the future. According to the development plan, the most common renewable energy sources in Estonian electricity production are biomass and wind. One of the key activities under Measure 1.1 Development of electricity generation of the development plan is the construction of new wind farms.

The proposed activity is in line with the Energy Sector Development Plan 2030.

On 18 November 2021, the Government of the Republic initiated the preparation of the Energy Sector Development Plan until 2035 (ENMAK 2035). According to the current schedule, the Government of the Republic should approve the new development plan by the end of 2025. The compliance of the proposed activity with ENMAK 2035 can be assessed when preparing the EIA report.

3.9. Fundamentals of Estonian Climate Policy until 2050

On 5 April 2017, the Riigikogu adopted the Fundamentals of Estonian Climate Policy until 2050 (RT III, 07.04.2017, 1), which set out the vision for climate policy and the national objective. The directions and goals set in the document must be implemented through sectoral development plans. The ultimate goal is a competitive and low-carbon economy. Moving towards such a goal means that the economic and energy system must be gradually and purposefully transformed to be more resource-efficient, productive and environmentally friendly. By 2050, Estonia aims to reduce greenhouse gas emissions by approximately 80% compared to 1990 levels. The proposed activity is in line with the Fundamentals of Estonian Climate Policy until 2050 objectives.

3.10. Climate Change Adaptation Development Plan until 2030.

On 2 March 2017, the Government of the Republic approved the Climate Change Adaptation Development Plan until 2030, the aim of which is to enhance the preparedness and capacity of both the Estonian state and local levels to adapt to the projected impacts of climate change. In the course of preparing the development plan, scientists identified the impact of climate change on Estonia in eight key areas: spatial planning and land use, human health and emergency preparedness, natural environment, bioeconomy, infrastructure and buildings, energy and energy supply, economy, society, awareness and cooperation. In the context of the proposed activity, it is appropriate to address primarily energy and energy supply, but to a greater or lesser extent it is also related to other subtopics.

The sub-goal for energy and energy supply is to ensure that energy independence, security, security of supply and the availability of renewable energy resources do not decrease due to climate change, and that the volume of final primary energy consumption does not increase. The guiding principle of energy independence is to reduce reliance on imported energy carriers and to base energy production on domestic fuels, primarily renewable ones. It is also important to use renewable energy sources and diversify the energy production portfolio. Security of energy supply is best ensured when there are sufficient and quickly responsive production capacities and distributed energy production. In long-term planning of energy sector development, it is important to consider not only the availability of resources, technologies, energy costs, and other factors influencing the sector's development, but also changing climate conditions and how they affect energy production and electricity delivery to consumers.

The proposed activity is in line with the objectives of the Climate Change Adaptation Development Plan until 2030, supporting the goal of reducing the volume of primary energy end-use consumption.

3.11. National Energy and Climate Plan of Estonia 2030

On 19 December 2019, the Government of the Republic approved the Estonian National Energy and Climate Plan until 2030 (NECP 2030), which sets out Estonia's energy and climate policy objectives and the 71 measures developed to achieve them. In the context of the proposed activity, the following NECP 2030 objectives are particularly relevant:

- Reduction of Estonian greenhouse gas emissions by 80% by 2050 (including 70% by 2030)
- The share of renewable energy in the total final energy consumption must be at least 42% in 2030: in 2030, renewable energy makes up 16 TWh, ie 50% of the final energy consumption, including renewable electricity 4.3 TWh (2018 = 1.8 TWh), renewable heat 11 TWh (2018 = 9.5 TWh), transport 0.7 TWh (2018 = 0.3 TWh).
- Ensuring energy security by keeping dependence on imported energy as low as possible: making maximum use of domestic fuels (including increasing the use of non-fuel energy sources) and harnessing the potential of biomethane production and use.

On 10 August 2023, the Government of the Republic approved the draft update of the Estonian National Energy and Climate Plan until 2030, which sets a more ambitious interim target for electricity generation from renewable sources: by 2030, the share of renewable energy in total final energy consumption must be at least 65%, including 100% of electricity consumption – i.e. 9.4 TWh – to be covered by renewable electricity (compared to 2.1 TWh in 2018 and 2.6 TWh in 2022).

The proposed activity contributes to the achievement of the above-mentioned purposes by supporting the increase in the share of electricity generated from renewable energy sources.

3.12. Estonian Marine Strategy

Like other European Union countries, Estonia bases its approach to the protection and use of the marine area on the Marine Strategy Framework Directive. The main objective of the directive is to maintain the marine environment in good condition or to achieve it by 2020 at the latest. Each European Union country must develop and implement a marine strategy for its marine area to promote the sustainable use of the sea and to preserve marine ecosystems.

The Ministry of Climate (formerly the Ministry of the Environment) has initiated the preparation of the Estonian Marine Strategy and its programme of measures to achieve and maintain good environmental status in Estonia's marine area. The Estonian Marine Strategy is being prepared by the ministry in three stages:

- To assess the initial environmental status of the Estonian marine area, conduct a socio-economic analysis, define the good environmental status of the marine area, and set targets for 2020 on how to achieve good environmental status of the marine area. These assessments were updated in 2024 and approved by the Minister of Climate on 18 July 2024 by directive No. 1-2/24/304.
- To develop a monitoring programme to collect periodic data on the environmental status of Estonia's marine area, including to achieve the environmental targets set under the Marine Strategy Framework Directive and to assess the effectiveness of the programme of measures to be established. The objectives is to collect data on human activities that directly or indirectly affect the marine environment, including the use of wind energy. The monitoring programme for the years 2021–2026 was approved by the Minister of the Environment on 12 October 2020 by directive No. 1-2/20/387.

– To develop a programme of measures, the first version of which was approved by the Government of the Republic in 2017 and updated in 2023 (approved by the Minister of the Environment on 22 February 2023 by directive No. 16-7/23/5). Of the measures set out in the programme of measures, the following are particularly relevant to the planning and development of offshore wind farms:
– To develop compensation measures for the disturbance or destruction of seabed integrity (BALEE-M032), which help to offset the impact on disturbed seabed and destroyed habitats in cases where this has occurred as a result of developments or other activities. One of the objectives of the measures is to ensure minimal disturbance to the seabed and to restore it to its previous condition after use.
– To implement the HELCOM underwater noise roadmap and the necessary regulations in Estonia (BALEE-M055), including the organisation and coordination of the implementation of the HELCOM noise roadmap at the national level.

The proposed activity is in line with the Estonian Maritime Strategy.

3.13. Saare county-wide spatial plan 2030+

On 27 April 2018, the Minister of Public Administration established the Saare county-wide Spatial Plan 2030+ by directive No. 1.1-4/94, with Annex 11 being the thematic plan on “Wind Energy.” According to the Saare county-wide spatial plan 2030+, one of the most important global trends for Estonia is to transition to the widespread use of renewable energy. The county-wide spatial plan highlights one trend: Saare County will increasingly use renewable energy in the future, and biofuels will be preferred for local energy solutions. There is likely to be growing interest in placing wind farms on the mainland or in the coastal sea of Saare County, which presupposes a decision to reconstruct the transmission network. The county-wide spatial plan and the county-wide spatial plan's wind energy thematic plan do not address the marine area.

3.14. Saare County Development Strategy 2019–2030

By Regulation No. 66 of 20 December 2018, the Saaremaa Rural Municipality Council approved the Saare County Development Strategy 2019–2030, which was jointly prepared by the three local governments of Saare County. Saaremaa, Muhu and Ruhnu rural municipalities. The development strategy sets out the county's development vision, presents the strategic objectives and indicators for moving towards that vision, and describes the courses of action to achieve the objectives. To support economic development through a favourable business and living environment, the implementation of the county-wide spatial plan is guided, among other things, by the principle that technical infrastructure – roads, ports, electricity supply, broadband connections, etc. – must be developed primarily based on the needs of entrepreneurs. At the same time, the use of existing industrial areas is being improved.

More detailed activities and necessary resources are provided in the development strategy action plan. The development of Saare County is planned across three areas of activity: economic environment (including living environment and human development), energy, and connectivity. The proposed project/activity supports the Ruhnu region mainly through the economic compensation measure indicated in the Saare County Development Strategy. The energy sector covers several areas of energy management, including heating. The proposed activity does not conflict with the Saare County Development Strategy.

3.15. Pärnu county-wide spatial plan.

On 29 March 2018, the Minister of Public Administration established the Pärnu County-wide Spatial Plan by directive No. 1.1-4/74, the aim of which is to define the principles and directions of the county's spatial development up to and beyond 2030. According to the plan, in the field of renewable energy, it is considered promising to further develop energy production based on local resources, including wood, biomass, wind, and solar energy. Although the Pärnu county-wide spatial plan and the wind energy thematic plan of the county-wide spatial plan do not address the marine area, the document is related to the proposed activity due to potential line connections, substations and other electricity facilities reaching land in Pärnu County.

3.16. Lääneranna rural municipality comprehensive spatial plan

On 23 August 2018, by Decision No. 90, the Lääneranna Rural Municipality Council initiated the Lääneranna Municipality comprehensive spatial plan and the strategic environmental assessment. The purpose of the comprehensive spatial plan is to determine the principles and trends of spatial development of the entire territory of the municipality. The public display of the draft comprehensive spatial plan and SEA report took place from 17 June to 29 July 2024, but as of March 2025, they have not yet been adopted. Until the new comprehensive spatial plan enters into force, the area – including the surroundings of Paatsalu Bay – is governed by the former Varbla Rural Municipality comprehensive spatial plan (established by Varbla Rural Municipality Council Regulation No. 1 of 11 November 1999). Depending on the location of the substation used, the cable route may also pass through the former Hanila and Lihula rural municipalities, which, during the administrative reform, merged with Varbla and Koonga rural municipalities to form Lääneranna rural municipality. Also, the main alternative to the onshore substation for the proposed activity is the existing Lihula substation, to which the offshore wind farm can be connected. As in Varbla, the previous comprehensive spatial plans also remain in force in Hanila (the Hanila Rural Municipality comprehensive spatial plan was established by Hanila Rural Municipality Council Regulation No. 32 of 17 December 2003) and in Lihula (the Lihula Rural Municipality comprehensive spatial plan was established by Lihula Rural Municipality Council Regulation No. 22 of 25 September 2003), until the comprehensive spatial plan of Lääneranna Municipality is adopted.

According to the draft SEA report of the Lääneranna rural municipality comprehensive spatial plan, the comprehensive spatial plan supports renewable energy solutions that take into account environmental protection conditions, local economic needs, and the social interests of the community. When planning wind, solar, or other energy production structures in close proximity, their potential mutual impacts and risks must be taken into account – for example, the effects of shadow flicker and icing from wind turbines on the performance of solar panels, and other such interactions. Lääneranna rural municipality is also preparing a designated spatial plan for wind farms covering the entire territory of the rural municipality, but this primarily concerns wind turbines located in the territory of Lääneranna rural municipality.

According to the Varbla rural municipality plan, the Paatsalu Bay area, where the proposed cable route will reach the mainland, will contain lands for various purposes, including reserve land for recreational facilities, protected forests, reserve land for residential construction, and valuable arable land. With the new plan to be established, the main land use purposes will remain the same.

3.17. National designated spatial plan for the Estonia–Latvia 4th electricity interconnection

On 15 February 2024, by directive No. 39, the Government of the Republic initiated the national designated spatial plan and strategic environmental assessment for the fourth Estonia–Latvia electricity interconnection (including 110 kV and higher voltage overhead lines, underground cables, offshore cables, 110 kV and higher voltage transformer substations, and other related facilities, as well as the necessary land use and building conditions). The area located in Estonia under the national designated spatial plan is proposed from the town of Paide towards Lihula and via the Suur Väin to the southwest coast of Saaremaa. This interconnection will increase the amount of renewable energy that can be received into the western Estonian electricity network and will support electricity supply security.

The plan is related to the proposed activity due to the potential location of the submarine cable and substation (alternative sites: Hanila, Muriste, Paatsalu) in the Paatsalu area. The Paatsalu area overlaps with the planning area of the national designated spatial plan and partly with the alternative locations of the offshore export cable (Figure 3.2). When specifying the location of the offshore export cable, the final route of the Estonia–Latvia fourth interconnection offshore cable and any constraints arising from a potential crossing must also be taken into account. The national designated spatial plan for the Estonia–Latvia 4th electricity interconnection is scheduled to be adopted in 2026.

Figure 3.2. The proposed landfall site of the Liivi 1 and 2 offshore wind farm offshore export cable, and the alternative locations of the Estonia–Latvia 4th electricity interconnection submarine cable and the substation to be built in the Paatsalu area (according to the Estonia–Latvia 4th electricity interconnection map application data).

3.18. West Estonian Archipelago Biosphere Reserve

The Estonian Biosphere Reserve (Figure 3.3) is defined in the Sustainable Development Act. (1) a biosphere programme area is an area included in the UNESCO MAB (Man and Biosphere) Programme in order to organise education, monitoring and research activities and to integrate the protection and the sustainable use of natural resources. (2) In the biosphere reserve, the foundations for balanced relationships between people and their living environment are developed, and local development is guided through planning and development activities in accordance with the objectives of UNESCO's Man and the Biosphere (MAB) Programme.

At present, the West Estonian Archipelago Biosphere Reserve is the only one of its kind in Estonia, established by Regulation No. 426 of the Government of the Estonian Soviet Republic (ESSR) on 27 December 1989. The total area of the biosphere reserve is 1,560,078 hectares, and it is located across three counties – Hiiu, Lääne, and Saare. The main functions of the area are: (1) protect biodiversity, (2) ensure sustainable management and human development, and (3) support environmental education, research, and monitoring. The proposed cable corridor of the Liivi 1 and 2 offshore wind farm overlaps with the transition area of the biosphere reserve, where diverse and sustainable use of natural resources is practiced and with which the proposed activity does not conflict. Biosphere reserves are reflected in planning documents at all levels, guided by the documents West Estonian Archipelago Biosphere Reserve Programme and Action Directions until 2030 and Sustainable Development Programme for the West Estonian Archipelago Biosphere Reserve 2014–2020 (Keskpaik, Kiiker & Aksiim, 2014).

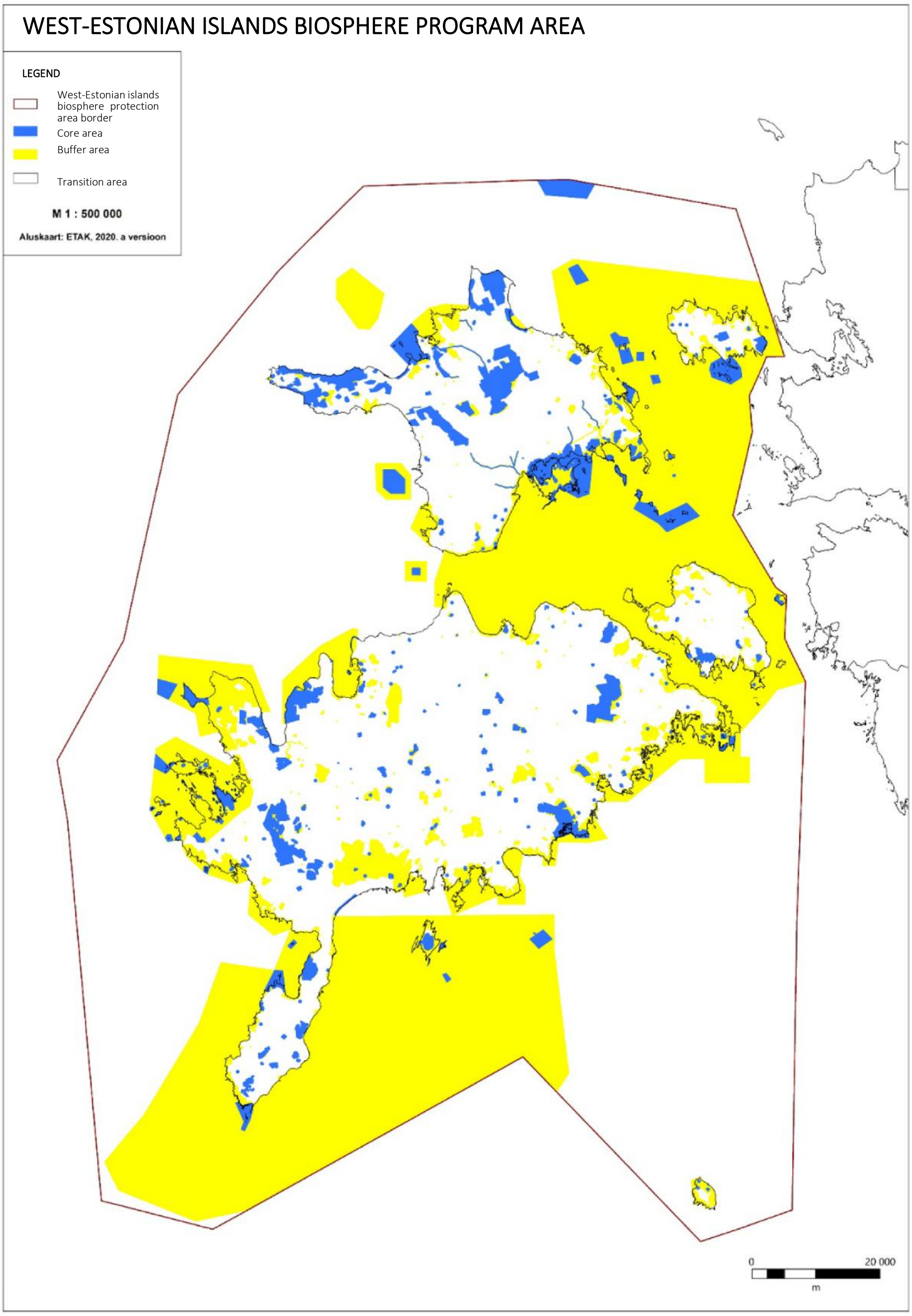


Figure 3.3. West Estonian Archipelago Biosphere Reserve (Hiiumaa Development Centre, 2023).

4. DESCRIPTION OF THE ENVIRONMENT LIKELY TO BE AFFECTED AND THE ENVIRONMENTAL STATUS

4.1. Natural environment

The functioning of the marine ecosystem is influenced by the physical and chemical properties of the sea: seabed topography and depth, salinity, temperature, ice conditions, overall climate, water transparency, oxygen content, currents, wave action, light availability at depth, and water level (Martin et al, 2024). Estonia's marine area is divided by various landmasses, which means that its different parts vary in terms of the above-mentioned characteristics as well as the pressure from human activities. Below is an overview of the natural conditions in the Gulf of Riga, where the Liivi 1 and Liivi 2 marine areas are located.

4.1.1. Geological conditions

The marine areas of Liivi0102are located in the central part of the Gulf of Riga, approximately 11 km northwest of Ruhnu Island. The depth of seawater in the area of the proposed activity varies between 18 and 40 m. The seabed of the Gulf of Riga consists of Palaeozoic carbonate and terrigenous bedrock, overlain by glacial, post-glacial, and marine Quaternary sediments (Quaternary cover). The Quaternary sediments in the Liivi0102areas consist mainly of till, clay, silty clay, sand, and marine mud (Figure 4.1.1.1; Juskevics et al, 1997). Iron-manganese concretions (Stiebrinš and Väling, 1996) and sediments with high concentrations of heavy metals (Baraškovs et al, 1997) are present in the upper layer of bottom sediments. The thickness of the Quaternary sediment complex is uneven – it is usually greater in bedrock depressions and often wedges out on elevations. According to the Quaternary sediment map of the Gulf of Riga, the thickness of sediments in the Liivi0102 areas varies between 1 and 25 m (Juskevics et al, 1997).

The cable corridor area crosses the northern part of the Gulf of Riga in a north-easterly direction (Figure 4.1.1.1). In the corridor area, the upper seabed sediments consist of marine mud and clay on the side of the corridor adjacent to the wind farm area, and silty clay, till, and sand on the side adjacent to the mainland.

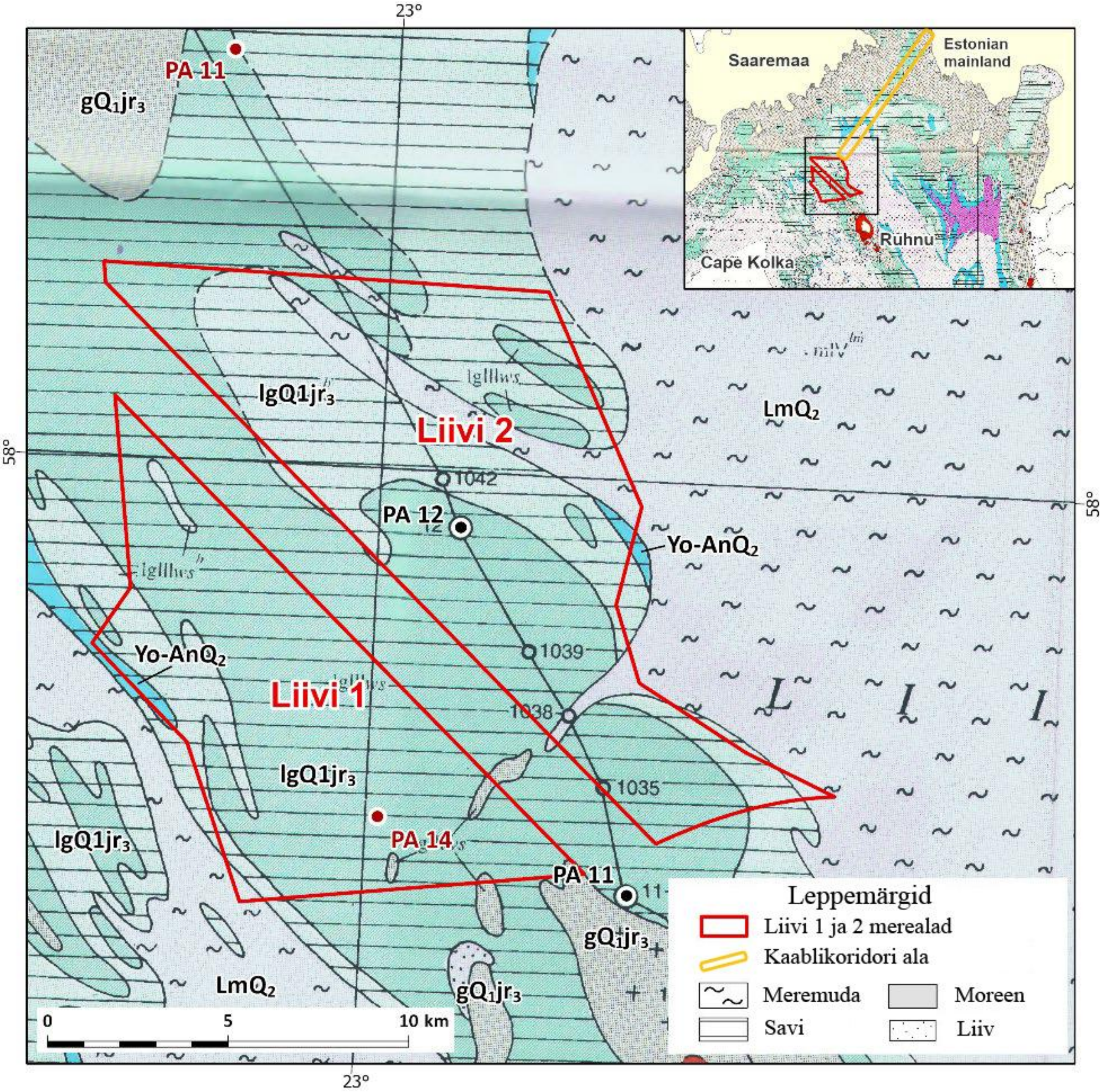


Figure 4.1.1.1. Excerpt from the Quaternary sediment map of the Gulf of Riga (Juskevics et al, 1996) at the location of the Liivi 1 and 2 marine areas. Stratigraphic indices: gQ1jr$_3$ – Upper Pleistocene Järva Member (till), lgQ1jr$_3$ – Upper Pleistocene Järva Member (varved clays of the Baltic Ice Lake), Yo-AnQ$_2$ – sediments of the Yoldia Sea and Ancylus Lake (clays), LmQ$_2$ – Holocene Limnea Sea (mud) sediments. (Based on Tuuling et al, 2024).

According to the geological map of the Gulf of Riga bedrock (Zaicevs et al, 1997), the bedrock of the Liivi 1 and 2 marine areas consists of marls, limestones, and dolomites of the Silurian system (S$_2$oh and S$_2$kg – Figure 4.1.1.2), as well as clays, siltstones, sandstones, and marls of the Devonian system (D1km, D$_{1-2}$pr, and D$_2$nr – Figure 4.1.1.2). The bedrock layers lie subhorizontally with a general dip of a few degrees towards the south-southeast. The surface of the bedrock is uneven. The surface relief is characterised by extensive depressions and elevations, further complicated by smaller valley-like and ridge-like formations, which are often traces of former glacial movement (Tsyrulnikov et al, 2013). According to the borewell on Ruhnu Island, located near the Liivi0102 area (borehole PRK0003338, VEKA database), approximately 15 km southeast of the Liivi 1 and 2 marine areas, the thickness of the bedrock complex reaches 784 m. The bedrock map shows a few additional faults in the Liivi 1 and 2 marine areas, as well as a buried valley along the western boundary of Liivi 1 (Figure 4.1.1.2).

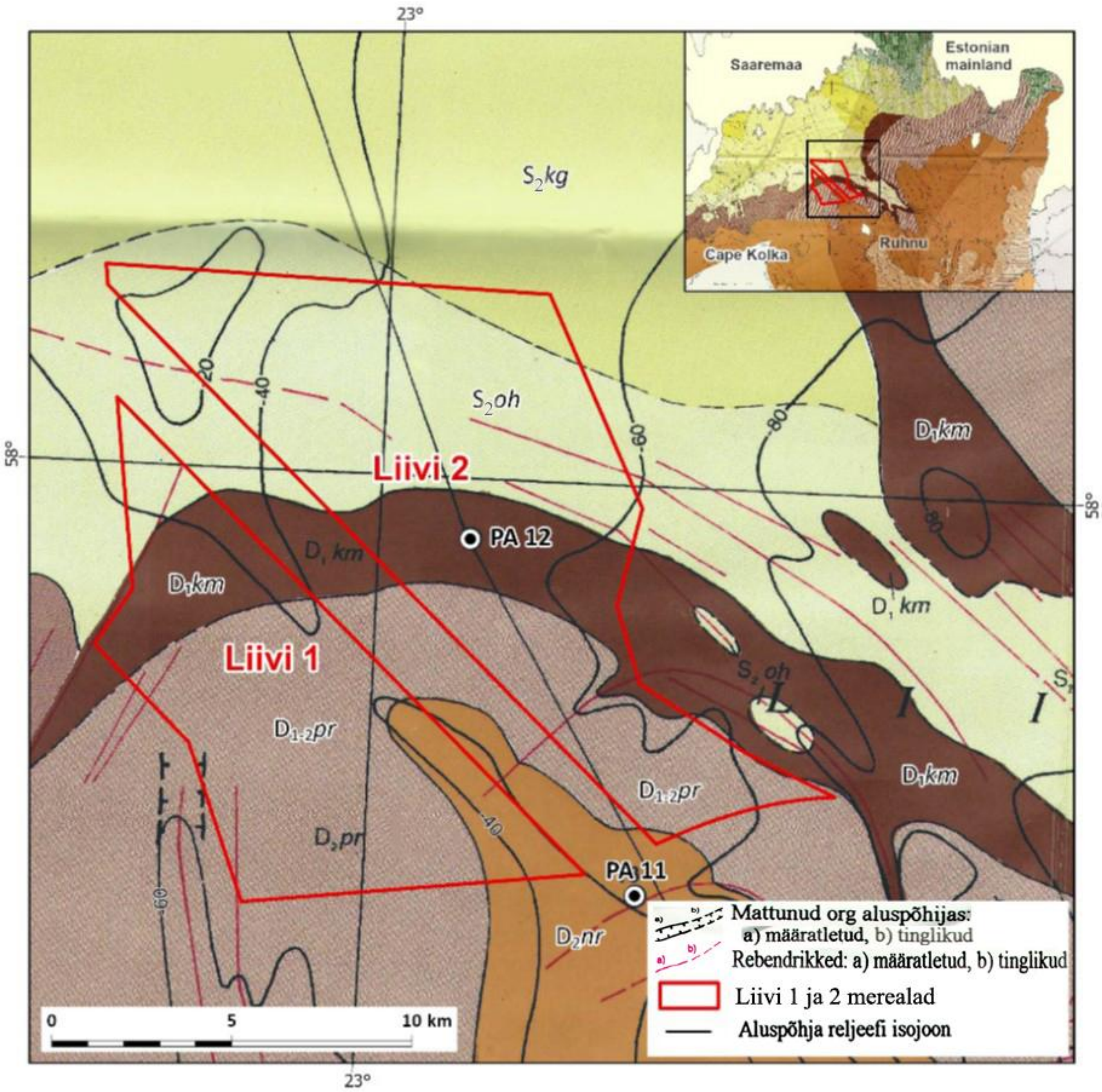


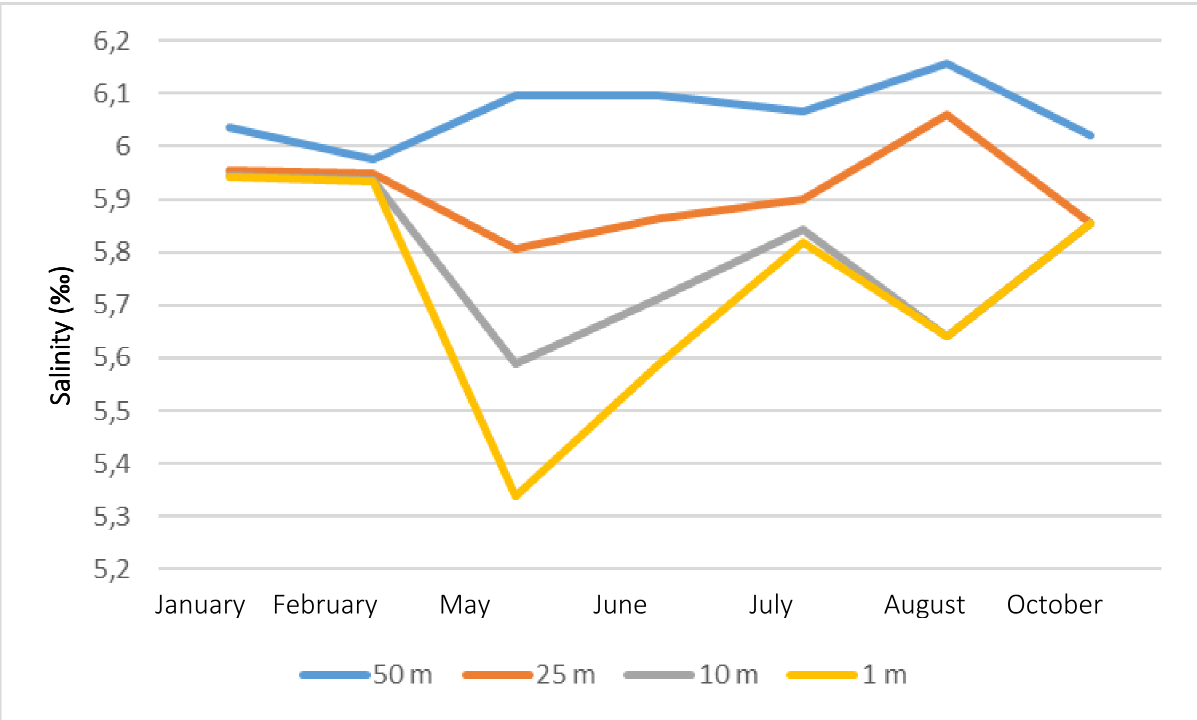
Figure 4.1.1.2. Excerpt from the Gulf of Riga bedrock map (Zaicevs *et al.*, 1997) at the location of the Liivi 1 and 2 marine areas. Stratigraphic indices indicate Silurian (S) and Devonian (D) stages: S_2kg – Kaugatuma, S_2oh – Ohessaare, D_1km – Kemeri, D_1pr – Pärnu, D_1nr – Narva. (Based on Tuuling et al, 2024).

To specify the geological and soil conditions, as well as the water depths in the Liivi 1 and 2 marine areas, a sonar survey is required along the cable corridor (multibeam sonar, side-scan sonar). The developer has conducted a geophysical survey in the Liivi 1 and 2 marine areas with the aim of determining the bathymetry (depth data), sediment and seabed characteristics (mineral composition and stratification of sediments), bedrock properties and geological hazards, as well as seabed environmental conditions. This data is also used in the preparation of the EIA report. As the installation of structures in the Liivi 1 and 2 marine areas, as well as the laying of the offshore export cable, involves the relocation of sediments (including dumping) and the release of resuspended substances into the water column, it is important to collect sediment samples from the surface layer of the seabed and determine the levels of potential pollutants, nutrients, and heavy metals (see details in Table 5.2.1). The need for geological surveys is also stated as one of the conditions of the MSP. Later, separate from the environmental impact assessment, more detailed structural geotechnical surveys will be carried out, which are necessary for the technical design to install the offshore wind farm and cables.

4.1.2. Hydrometeorological conditions

Salinity. The variability of temperature and salinity in the Baltic Sea (Figure 4.1.2) is very high both temporally and spatially, significantly affecting the marine biota (Maritime Spatial Plan impact assessment, 2021). Stratification of salinity and water temperature at different depths is strongest during the summer period (February–October), when water with lower salinity and higher temperature is found in the surface layer, while throughout the year the bottom layers of the sea contain water with higher salinity and lower temperature. The variability of salinity and temperature regimes in both the horizontal and vertical layers is primarily shaped by topographical features and seasonal weather patterns. Water exchange in the Baltic Sea through the Danish Straits is very slow, and the more saline and denser water entering from there does not mix easily with the less saline water of the Baltic Sea, but rather sinks into the deeper basins. While the average salinity of the world's oceans is 35‰, in the Baltic Sea it is generally less than 10‰. The average salinity at the marine monitoring points closest to the Liivi 1 and 2 marine areas in 2023–2024 was 6.0‰ (KESE, 2025).

Unlike the open parts of the Baltic Sea, where the influence of river inflows from land is almost negligible, the Gulf of Riga (including the Liivi0102 and offshore export cable areas) receives an average of 30.7 km³ of river water per year, in addition to 10.3 km³ of water from precipitation. Therefore, the salinity of the Gulf of Riga (3.5–6.5‰) is generally lower than that of the open Baltic Sea (Luhaveer et al, 1996; Martin et al, 2024). According to the 2020 national offshore monitoring data (KESE, 2025), the average salinity of the water above the Ruhnu Deep is 5.9‰ (Figure 4.1.2). As a result of inflow from the Daugava River and water exchange through the Irbe Strait with the open Baltic Sea, a southeast–northwest salinity gradient forms in the Gulf of Riga (Soosaar et al, 2010). As a result, the water column is strongly stratified during summer; however, from December to March, thermal stratification is absent in the gulf (Maljutenko, 2019; Taltech, 2024). Tides are very limited in range and have no significant influence on the composition of seawater (Haritonova, 2016). The Gulf of Riga is hydrodynamically active, and the parameters of the water column are influenced by water movement caused by winds, currents, and seasonal changes (Maljutenko, 2019). This is also confirmed by more recent location-specific studies in the Gulf of Riga (Taltech, 2024). Sea water salinity is also indicated by electrical conductivity, which will be measured in the Liivi 1 and 2 marine areas during sea water quality monitoring (Table 5.2.1).



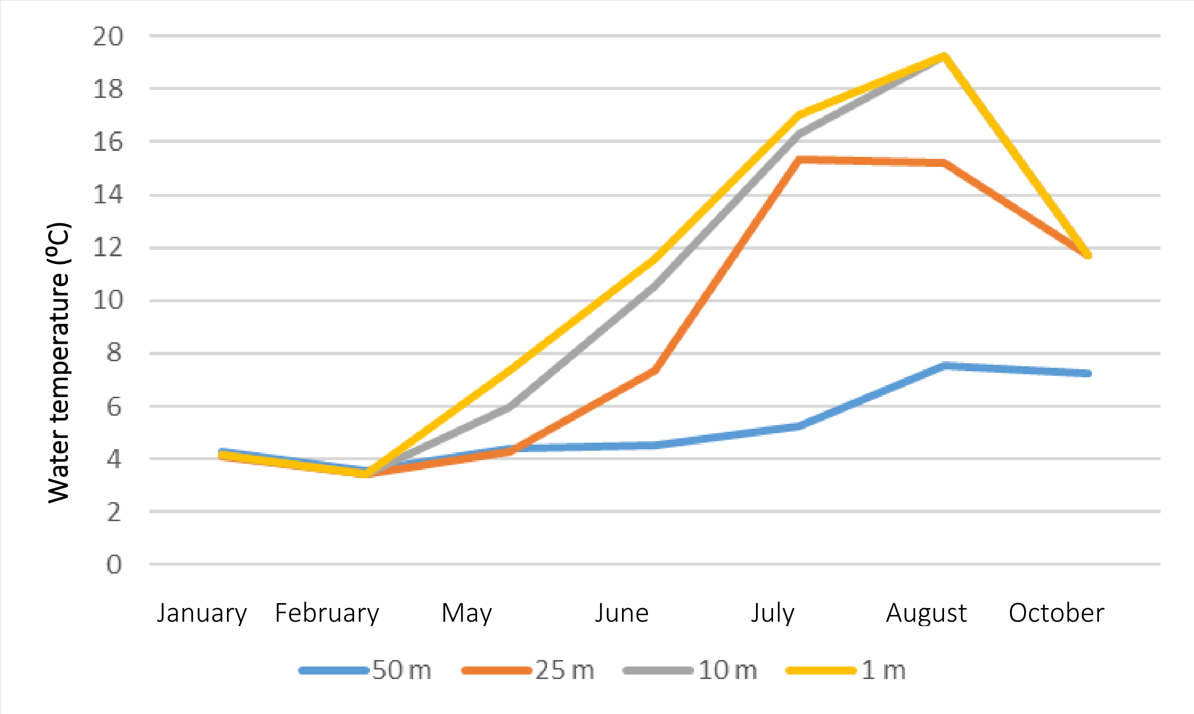


Figure 4.1.2. Seasonal variation of salinity (above) and water temperature (below) in 2020 at depths of 50 m, 25 m, 10 m, and 1 m in the Ruhnu Deep (KESE, 2025).

Water temperature can vary significantly by layer in the Baltic Sea (figure 4.1.2), influenced by both the amount of solar radiation and wind, which mixes the water layers. Thus, in shallower parts of the sea, the surface water temperature can rise above 20 °C at the end of summer during calm weather conditions (with an average summer surface temperature of 15–17 °C), but may quickly drop when winds strengthen and mixing with water from the open sea occurs. In autumn, air cools more rapidly than sea water, thereby cooling the sea as well, but this is counterbalanced by currents bringing warmer water into the area. In the coldest month of the year, sea water temperature in the Gulf of Riga is generally between 0 and +5 °C, and a stable period of sub-zero temperatures may lead to the formation of an ice cover. (KESE, 2025). Seawater temperatures at different depths in the Liivi 1 and 2 marine areas are measured during seawater quality measurements (Table 5.2.1).

Air temperature and precipitation. The climate of the Liivi 1 and 2 marine areas is milder and more maritime compared to mainland Estonia. The most suitable source for describing the climatic conditions of the area is the Ruhnu coastal station of the Estonian Environment Agency's weather service observation network, where both meteorological and marine observations are conducted. The average annual (2014–2024) air temperature at the weather station is 8.4 °C and the annual precipitation is 615 mm, the average humidity is 82.0%, the average 10-minute wind speed is 4.4 m/s and the air pressure at sea level is 1013.7 hPa. Air temperature and precipitation are not expected to significantly affect the functioning of transmission networks. However, at the nearest weather station to the cable route landfall site – Virtsu – the average air temperature for the same period was 7.9 °C, the annual precipitation total was 582 mm, the average relative humidity was 81.0%, the average 10-minute wind speed was 3.3 m/s, and the mean sea-level air pressure was 1013.1 hPa.

Wind. Estonia's wind climate is determined by the frequent alternation of low-pressure systems and high-pressure systems typical of the northern part of the temperate zone – cyclonic activity that causes windy weather. The average wind speed at the Ruhnu coastal station is 4.4 m/s (at a height of 10 m), but the wind speed is higher offshore. In the open central part of the Gulf of Riga, the average annual wind speed is 8–8.5 m/s, with gusts as high as 26–28 m/s. Considering that Estonia's wind speed record of 48 m/s was measured at the Ruhnu coastal station in the autumn of 1969, future maximum gusts over open sea may exceed this value (Ilmateenistus, 2025). The long-term average wind energy (power density, W/m²) in the central part of the Gulf of Riga at 150 m height is 700–780 W/m² (Eesti mereala..., 2021). The prevailing winds in the area are from the southwest and west. (Ilmateenistus, 2025; Kotta et al., 2020). More detailed descriptions of wind conditions based on available data will be provided in the EIA report.

Wave conditions and currents are strongly influenced by the wind climate, which causes them to move predominantly eastward or northeastward (Kotta et al, 2020). However, Taltech's (2024) Gulf of Riga measurement data showed that currents mostly did not follow the wind direction, but followed the wind speed. The average current speed in the surface layer of Estonia's marine area is 10–20 cm/s. The highest current speeds have been measured in straits and along the coast, where they exceed 1 m/s (Kotta et al, 2020). During the 2022–2023 measurement period in the Gulf of Riga, currents measured in the winter and spring seasons exceeded 10 cm/s on only 30% of the measurement days, indicating generally slow speeds (7.4 cm/s in the surface layer and 5.7 cm/s in the bottom layer). During the summer and autumn periods, the surface layer had a similar current speed (7.4 cm/s), and at a depth of 10 m, the current speed was 6.8 cm/s. (Taltech, 2024). Intense currents with speeds of 40–50 cm/s may also occur in the deeper layers of the sea, including near the seabed (Kotta et al, 2020). Wave height is usually 1–2 m, but during storms it can reach 3–4 m in the Gulf of Riga (Kotta et al, 2020). The average significant wave height at the Gulf of Riga measurement point was 0.94 m (October 2022 – January 2023), although no very strong winds occurred during the measurement period (Taltech, 2024). As part of the EIA process, currents are planned to be measured in the Liivi 1 and 2 marine areas during the winter. This provides baseline data (waves, ice conditions) on which to assess other indicators presented in the EIA report. The assessment of the impact on waves and currents is described in more detail in Table 5.2.1.

Ice conditions in the Gulf of Riga can vary considerably depending on the winter temperature regime: while ice cover in the Liivi 1 and 2 marine areas is forecast to last approximately two months in an average winter, in a mild winter it may be limited to 10 days and in a severe winter it may last approximately 100 days (Uibouppin & Pärn, 2021). The probability of ice occurrence in the central part of the Gulf of Riga is lower than in the Gulf of Pärnu (Taltech, 2024). As the sea is deeper in the open part of the Gulf of Riga – and the coastline does not allow the ice cover to remain stable, unlike in the Väinameri between the islands and the mainland or in the enclosed Pärnu Bay – drift ice occurs there, which can significantly damage stationary offshore structures and hinder ship navigation. Since drift ice masses can be approximately 200 km² in size (comparable to the size of Muhu Island) and move at an average speed of 15–20 km per day, their instantaneous speeds can be significantly higher, and upon collision with a marine structure, they may exert considerable force. Theoretical estimates of the maximum force exerted by ice depend on the ice thickness, movement speed, and the surface area of the ice field. Under real conditions, drift ice would affect a structure over an extended period of time, and therefore the cumulative impact of ice drift should be taken into account (Uibouppin & Pärn, 2021). In recent years, both the duration of the ice period and the thickness of the ice have decreased in the Gulf of Riga (Taltech, 2024). According to the ice chart of the Estonian Environment Agency (2025), during the winters of 2020–2025, ice has formed in the Liivi 1 and Liivi 2 marine areas only for a couple of weeks at most, and it has been sparse or very sparse. As the freezing periods have been short, they have occurred in different seasons, from late autumn to early spring. However, there is an area that freezes every year where the cable corridor reaches land and where the ice is periodically thick and permanent.

According to the Estonian Maritime Spatial Plan (MSP), submarine cables proposed for shallow coastal areas must be protected in such a way that they are not damaged by ice. Structures must take into account the risk posed by ice conditions and be designed to withstand them. According to the MSP, it is also necessary to assess how the construction and operation of the proposed offshore wind farm, as well as any potential icebreaking activities, may affect changes in ice cover and the movement of sea ice. The risk to the durability of structures arising from ice conditions must also be taken into account. Therefore, sea ice formation is assessed based on remote sensing data and the impact of the proposed activity on sea ice is analysed based on simulation (Table 5.2.1).

4.1.3. Sea water quality

Water quality in Estonia's coastal sea is assessed on the basis of indicators developed for the implementation of the Water Framework Directive and the established assessment criteria (Regulation No. 59 of the Minister of the Environment of 12 November 2010 and its Annex 6). In the five-tier classification of status, both biological and physico-chemical quality indicator values are taken into account. According to the spatial division of Estonia's marine area, the Liivi 1 and Liivi 2 marine areas belong to the coastal water body of the central Gulf of Riga (EE_19) and the open part of the Gulf of Riga (GOR), while the cable corridor also falls within the EE_17 and EE_18 water bodies (Figure 4.1.3). EE_17, EE_18, and EE_19 are coastal water bodies for which common water quality threshold values have been established. In the marine area outside the coastal waters (including the majority of the Liivi 1 marine area), there are no official criteria in Estonia to assess water quality.

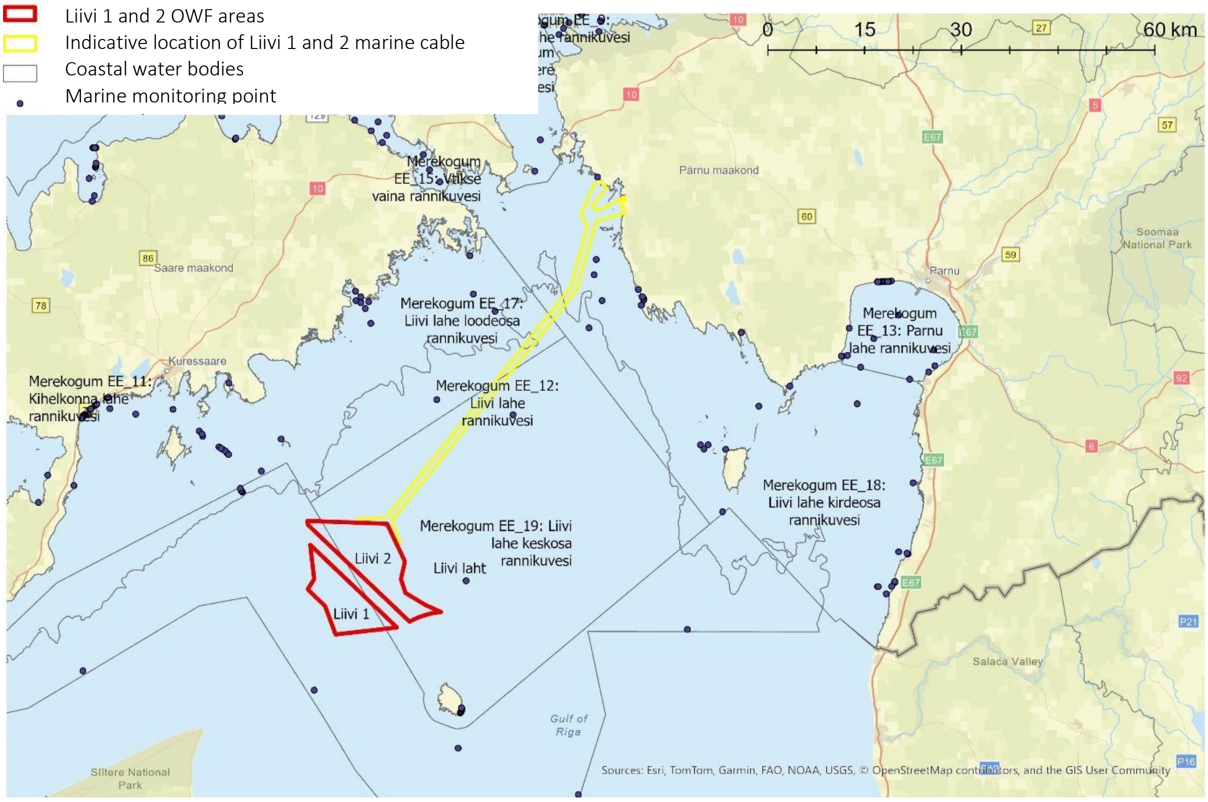


Figure 4.1.3. Coastal water bodies of the Gulf of Riga and locations of marine monitoring stations (coastal water bodies according to Estonian Environment Agency, 2025 data).

In Estonia, the environmental status of coastal water bodies is assessed through an overall status, which consists of ecological status and chemical status, with the overall status being determined based on the lower of the two. Ecological status reflects the condition of the biota, hydromorphology, physico-chemical elements, and basin-specific pollutants in the water body. The environmental status, however, reflects the concentration of hazardous substances in surface water, sediment and/or biota.

According to the overall status information for water bodies, the coastal water bodies of the Gulf of Riga were assessed as having poor overall status in 2023 (due to high mercury content in fish; previously also due to total nitrogen, chlorophyll-a, transparency, zoobenthos community index 2, physico-chemical indicators, phytoplankton, and macroinvertebrate benthic fauna), and this status has not changed in recent years (Keskkonnaportaal, 2024). According to subsection 1 of § 32 of the Water Act, the objective of surface water protection is at least good status of bodies of surface water. Assessments of the status of Estonia's marine area are discussed in more detail in the summary report Environmental Status of Estonia's Marine Area 2024 (Martin et al, 2024a) and its sub-reports.

Water quality has not been previously measured in the proposed wind farm area and its surrounding area. There are no regular national monitoring stations in the area of the proposed activity. The nearest national offshore monitoring station No. 111 is located 8 km south of the proposed offshore wind farm site. Based on the 2023 analysis results (Table 4.1.3), sea water quality is poor in terms of chlorophyll-a concentration, moderate in terms of total nitrogen and transparency, and good in terms of total phosphorus.

Table 4.1.3. Average indicators reflecting the chemical status of sea water from June to September 2023 in the surface layer (1 m) at sampling point 111 near the Liivi 1 marine area (KESE, 2025).

	Value	Unit
Water temperature	10.8	°C
Electrical conductivity	8,204	µS/cm
pH	8.6	
Chlorophyll-a fluorescence	6.4	mg/m^3
Dissolved oxygen	10.4	mg/l
Transparency	3	m
Sum of nitrite nitrogen and nitrate nitrogen	0.18	µmolN/l
Ammonium nitrogen (NH_4N)	0.42	µmolN/l
Total nitrogen (TN)	26.9	µmolN/l
Total phosphorus (TP)	0.42	µmolP/l
Phosphate phosphorus (PO_4-P)	0.19	µmolP/l
Silicate (SiO_4)	6.05	µmolSi/l
Salinity	5.26	psu

As a condition of the MSP, the dispersion of suspended solids in the offshore wind farm area during construction must be assessed, as its spread may affect marine habitats, aquatic vegetation, and fish spawning grounds. In the Liivi 0102 area, sea water quality measurements will be carried out during the EIA, during which water transparency, nutrient content, oxygen concentration, pH, and concentrations of nutrients and chlorophyll-a will be measured repeatedly during the summer period. During the preparation of the EIA report, the dispersion of suspended solids and the potential spread of pollution in the event of an accident will also be modelled (see details in Table 5.2.1). The potential spread of non-native species in the area of the proposed activity (including the offshore export cable survey area) will be identified and assessed through marine biota studies carried out for this purpose (see Chapter 4.1.4 and Table 5.2.1). Underwater noise will also be modelled during the preparation of the EIA report (see details in Table 5.2.1).

4.1.4. Habitats and biota

To describe the distribution of natural values in Estonia's marine area, two different habitat classification systems are used: the habitat types of Annex I to the Habitats Directive and HELCOM Underwater Biotopes (abbreviated as HELCOM HUB). According to the habitat type classification of the Habitats Directive (Paal, 2007), the Liivi 1 and Liivi 2 marine areas could potentially include sandbanks which are slightly covered by sea water all the time (1110) and reefs (1170). However, based on the habitat mapping layer in the EELIS database, no Habitats Directive habitat types are present in the open part of the Gulf of Riga. In contrast, several Habitats Directive habitat types are present in the nearshore area where the cable corridor approaches the mainland (Figure 4.1.4.1): 1110, 1160, 1170, 1220, 1620, 1630*, 5130, 6210*, 6430, 7210* and 7230. The habitat types with the largest coverage in coastal waters are sandbanks which are slightly covered by sea water all the time (1110) and large shallow inlets and bays (1160). Several habitat types of the Habitats Directive are also found in the area where the proposed cable corridor reaches land.

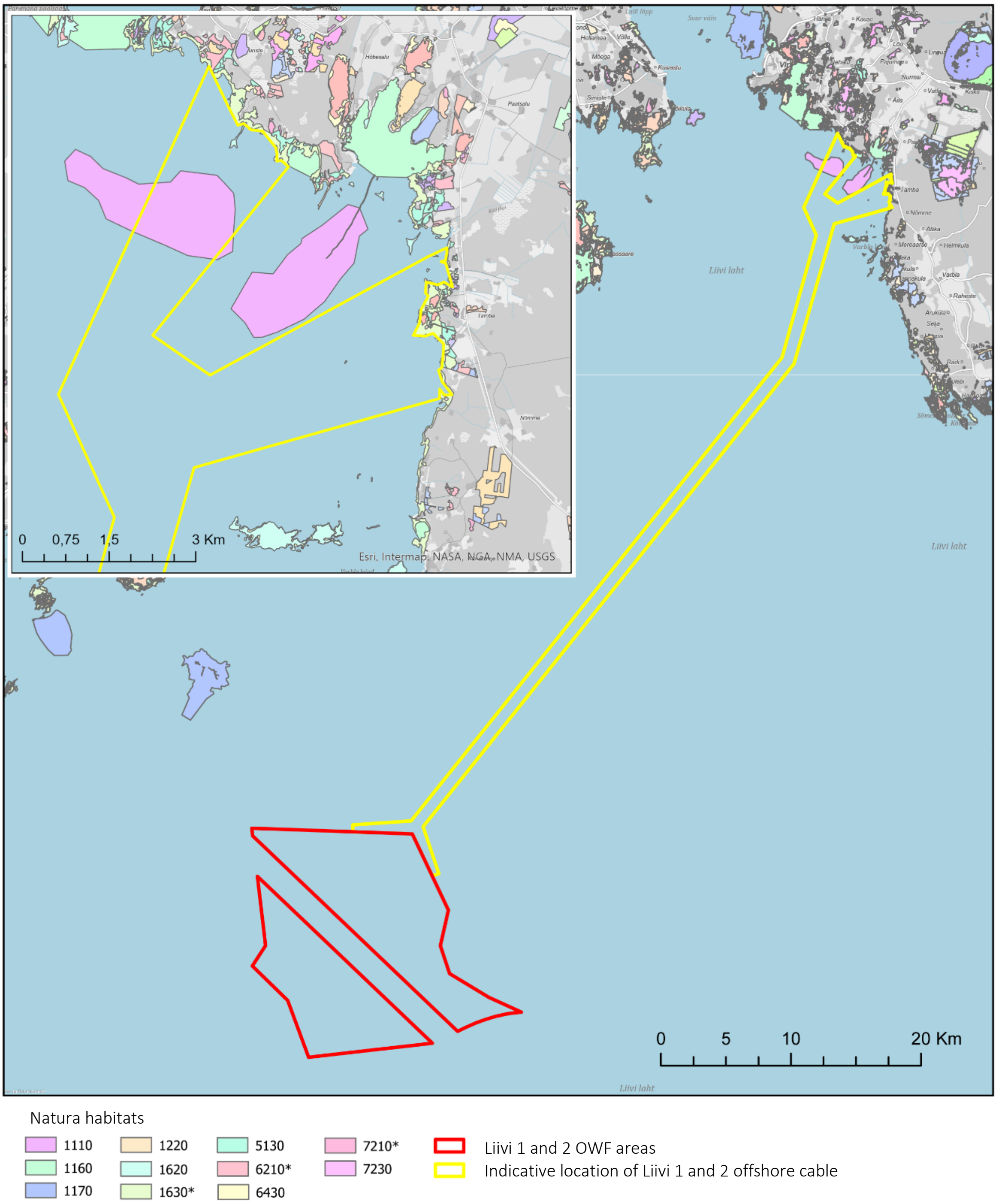


Figure 4.1.4.1. Location of habitat types in Annex I of the Habitats Directive in relation to the Liivi 1 and Liivi 2 marine areas and the cable corridor (EELIS, 2025). 1110 – sandbanks which are slightly covered by sea water all the time; 1160 – large shallow inlets and bays; 1170 – reefs; 1220 – perennial vegetation of stony banks; 1620 Boreal Baltic islets and small islands; 1630* – Boreal Baltic coastal meadows; 5130 – *Juniperus communis* formations on heaths or calcareous grasslands; 6210* – semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia); 6430 – hydrophilous tall herb fringe communities of plains and of the montane to alpine levels; 7210* – calcareous fens with *Cladium mariscus*; and 7230 – alkaline fens.

The HELCOM HUB habitat classification has been developed to systematise all habitats of the Baltic Sea water column and seabed, including offshore benthic habitats. The benthic biota and habitats of the marine area of Liivi 1 and Liivi 2, as well as the proposed offshore wind farm cable corridor, have not been previously surveyed. Table 4.1.4.1 presents the modelled area of habitat types in the EE_19 and GOR water bodies (within and around the offshore wind farm area) and in the EE_17 and EE_18 water bodies (around the cable corridor). Based on this, the proposed Liivi 1 and Liivi 2 marine areas are located almost entirely on the primary habitat type AB.H – mud in the aphotic zone, with a very small area also falling within AB.M – mixed substrate in the aphotic zone.

Table 4.1.4..1. Modelled area (km²) of HELCOM HUB habitat types in EE_19 and GOR (within and around the offshore wind farm area), EE_17 and EE_18 water bodies (around the cable corridor), and in total across the entire Estonian marine area (EST) (Torn et al, 2020).

Code	Habitat type	EE_19	GOR	EE_17	EE_18	EST
AA.A	Baltic photic rock and boulders / Infralittoral rock and biogenic reef	46	18	98	58	1172
AA.H	Baltic photic muddy sediment / Infralittoral mud	-	2	35	35	671
AA.I	Coarse sediment in the photic zone / infralittoral coarse sediment	-	2	0.3	1	11
AA.J	Sand in the photic zone / infralittoral sandy bottom	5	18	241	246	2448
AA.M	Baltic photic mixed substrate / infralittoral mixed sediment	19	134	484	360	3492
AB.A	Rock and boulders in the aphotic zone / circalittoral rocky bottom and biogenic reefs	10	3	3	16	629
AB.H	Baltic aphotic muddy sediment / circalittoral mud	1527	1496	104	46	19682
AB.I	Baltic aphotic coarse sediment / circalittoral coarse sediment	5	1	-	3	35
AB.J	Baltic aphotic sand / circalittoral sand	202	250	134	832	3934
AB.M	Baltic aphotic mixed substrate / circalittoral mixed sediment	145	520	558	311	4374

The distribution of modelled marine habitat types shown in Figure 4.1.4.2 is presented in accordance with the Marine Strategy Framework Directive, and the Liivi 0102 marine area lies entirely within the offshore circalittoral mud habitat type. According to estimates (Martin et al, 2024a), the entire offshore circalittoral mud habitat type in Estonia is in poor condition. The proposed offshore export cable corridor passes through various habitat types (circalittoral mixed sediment, circalittoral mud, circalittoral sand, circalittoral coarse sediment, infralittoral sand).

The MSP guidelines recommend that, when selecting turbine locations within wind energy development areas, the distribution of habitat types should be taken into account. If possible, wind turbines should be avoided in areas where there are habitats of high conservation value. Cooperation with the Environmental Board is necessary. As technology advances, the construction of wind farms should prioritise foundation structures with a smaller “footprint” – both in terms of seabed area and ecological impact. In the case of more sensitive habitats, a monolithic foundation structure should be preferred, as its impact on benthic biota is limited to a single installation event. Where possible, the foundation material should closely resemble natural substrate (e.g. surface roughness, neutral chemical reaction), and consideration should be given to enriching the outer surface of the foundation with natural rock material. This allows marine organisms to create an attachment substrate that is as similar to natural as possible. Marine habitats must also be taken into account when selecting the location of offshore export cable to avoid significant adverse impacts on protected natural objects.

As only modelled data are currently available on the distribution of marine habitats in the area of the proposed activity, additional studies to be carried out during the EIA (Table 5.2.1) will be used to refine the understanding of habitat distribution within the offshore wind farm and its offshore export cable corridor. To map marine habitats within both the offshore wind farm and the offshore export cable area, multibeam sonar surveys will be conducted during geophysical investigations, supplemented by point observations (video camera surveys, diving, and benthic biota sampling). Based on the data obtained, seabed habitats will be modelled and mapped in greater detail.

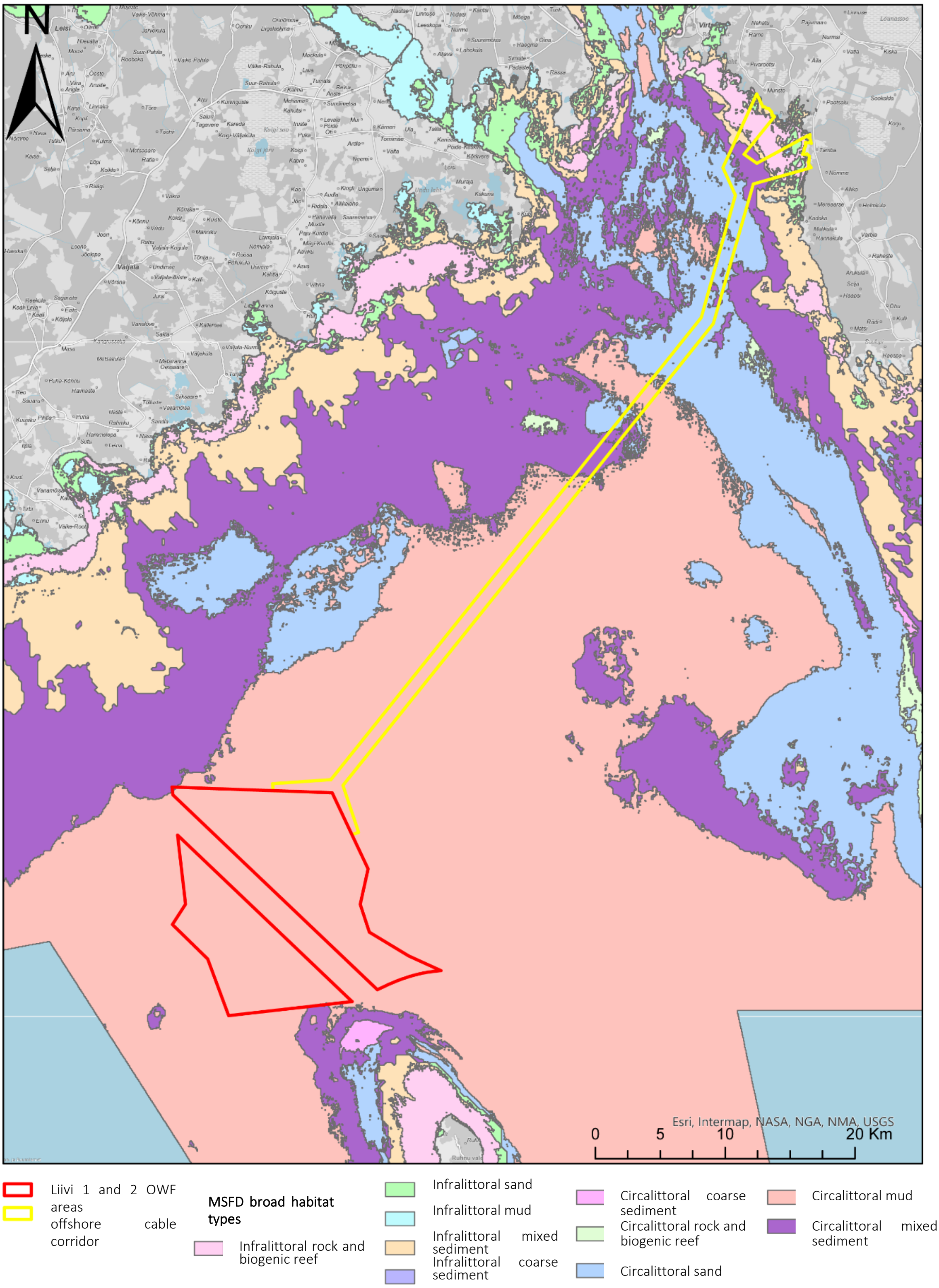


Figure 4.1.4-2. Modelled distribution of seabed habitat types in the Gulf of Riga area according to the Marine Strategy Framework Directive (MSFD) (EELIS, 2025).

Marine life

The marine biota of the Baltic Sea, and more specifically the Gulf of Riga, is relatively low in species richness and consists of phytoplankton, zooplankton, zoobenthos, macroalgae, fish, and marine mammals (Trei, 1991; Martin et al, 2023). In addition, the marine environment is associated with seabirds and, in the coastal zone, also with flowering plants, while *Chiroptera* (bats) may cross the sea during migration.

In the Baltic Sea **phytoplankton** species list (Hällfors, 2004), the species present in the phytoplankton of the Gulf of Riga are listed separately. The most important among these are diatoms, cyanobacteria, and flagellates (Trei et al, 2011). The national environmental monitoring programme also includes annual monitoring of the open sea area, including the Gulf of Riga region (Figure 4.1.3). As part of this, the species composition and biomass of phytoplankton are determined, and chlorophyll-*a* concentration is measured. At open sea monitoring stations, physico-chemical parameters are monitored at least six times a year (including phytoplankton monitoring five times), with samples collected from depths of 1, 5, and 10 m and from the near-bottom layer, and nutrient concentrations are determined separately for each depth horizon (Environment Agency, 2019). In both the Liivi 1 and 2 marine areas and the proposed cable corridor region, the phytoplankton includes, for example, various species of dinoflagellates, euglenophytes, green algae, centric diatoms, and diatoms (KESE, 2025). In 2023, the average chlorophyll-a concentration in the surface water layer (0–10 m) of the northeastern coastal water body of the Gulf of Riga (EE_18; the landfall side of the offshore export cable) was approximately 9.8 mg/m³, and in the open part of the Gulf of Riga (EE_19), where the Liivi 0102 marine area and part of the cable corridor are located, it was 6.0 mg/m³ (KESE, 2025). During the EIA, chlorophyll-a concentration will also be measured in the Liivi 1 and 2 marine areas using the measurement methodology applied at national offshore monitoring stations.

According to the 2018 assessment (Torn, 2018), 12 species of vascular plants, 10 species of green algae, 7 species of charophytes, 14 species of brown algae, and 11 species of red algae have been identified among the **macrophytes** of the Gulf of Riga. The most common macrophyte species in Estonia’s marine area are *Vertebrata fucoides*, *Cladophora glomerata* and *Ceramium tenuicorne*. The greatest number of species/taxons in the Estonian marine area are in the brown algae phylum. Bryophytes and cryptophytes are not identified to species level in Estonia; one genus is represented in each group. The differences between HELCOM sub-basins are relatively small, with the Gulf of Riga being the most species-rich sub-basin in Estonia’s marine area in terms of macrophytes (Torn et al, 2018). In the Gulf of Riga, the maximum photic depth suitable for phytobenthos growth is considered to be 10 m (Martin et al, 2024b). Such shallow areas are not present within the Liivi 1 and 2 marine areas; they occur only in the cable landfall area, where no previous survey results are available.

Offshore zooplankton is monitored at least twice a year – in May or June and in July or August – with species composition (including potential non-native species), abundance, and biomass determined (Environment Agency, 2019). In the Gulf of Riga (both in the Liivi 0102 marine area and along the offshore export cable route), zooplankton has been found to include various gastropods, bivalves, *Amphibalanus improvisus*, Harris mud crab (non-native species), rockpool shrimp (non-native species), polychaetes, rotifers, and copepods (KESE, 2025).

Benthic fauna, or zoobenthos, is monitored at least once a year between May and June (prior to the summer cyanobacterial bloom), with species composition (including potential non-native species), abundance, and biomass determined (Environment Agency, 2016). The species composition and spatial distribution of benthic communities in the Gulf of Riga are influenced by both sea water parameters (such as salinity, temperature regime, and others) and the characteristics of the bottom substrate. Due to the large inflow of freshwater rich in nutrients from rivers, the marine area has become eutrophicated (Hendrikson&Ko, 2016). Based on data from 1992–2018 (Torn, 2018), a total of 92 zoobenthos taxa were recorded in Estonia's marine area, including 73 identified species and 19 taxa not determined to species level. Among the most frequently found invertebrates in Estonian marine waters are *Mytilus trossulus*, *Limecola balthica*, and the substrate-attached *Amphibalanus improvisus*. Of all zoobenthos taxa recorded, 59% belong to the phylum Arthropoda. Permanent zoobenthos monitoring transects are located in the area west of Saaremaa and north of the Pakri Islands. Therefore, data on zoobenthos in the Gulf of Riga have only been collected through macroinvertebrate monitoring (KESE, 2025).

Compared to other parts of the Baltic Sea, species diversity is highest in the Gulf of Riga sub-basin (Torn, 2018). From the Liivi 1 and 2 marine area, the following species were found in the 2023–2024 marine monitoring results for macroinvertebrates: *Pontoporeia femorata*, *Oligochaeta*, *Monoporeia affinis*, *Marenzelleria neglecta*, *Macoma balthica*, *Halicryptus spinulosus*, *Saduria entomon*, *Cordylophora caspia* (KESE, 2025). These species also inhabit the area of the proposed offshore export cable, where, for example, *Mya arenaria*, *Cerastoderma glaucum*, *Peringia ulvae*, *Chironomidae*, *Bathyporeia pilosa*, and *Gammarus spp*. are also found (KESE, 2025).

According to the MSP conditions, the placement of both the offshore wind farm and its cables must, among other things, avoid significant adverse impacts on marine biota. Observations are being made and seabed samples are being collected in the marine areas of Liivi 0102 and the offshore export cable corridor area. Based on the results, zoobenthos will be assessed, and if macrophytes are present, their coverage and biomass will also be evaluated (Table 5.2.1). Subsequently, it will be possible to describe the benthic communities in the area in more detail and assess the impact of the proposed activity on them.

The impact on seabed biota primarily lies in the installation of foundations and cables in the offshore wind farm area. According to the MSP, in the case of more sensitive habitats, a monolithic foundation structure should be preferred, as this results in a one-time impact on the benthic biota. Where possible, the foundation material should resemble natural substrate as closely as possible (e.g. surface roughness, neutral chemical composition), and consideration should be given to enriching the outer surface of the foundation with natural rock material. This makes it possible to create an attachment substrate for marine organisms that closely resembles natural conditions.

The **fish community** in the Gulf of Riga is species-poor but abundant in individuals, which is why a significant share of the Baltic Sea fish catch comes from this area. The fish community of the Gulf of Riga has been studied since the mid-19th century. The most comprehensive overview of fish in the Gulf of Riga was published in English in 1995 (Ojaveer & Gaumiga, 1995). Data on individual species are included in the monograph on Estonian fishes (Ojaveer et al, 2003). The Liivi 1 and 2 offshore wind farm area is located in ICES sub-division 28-1 and within small fishing squares 234, 248, 249, 262, and 263. The proposed offshore export cable area falls within small fishing squares 172, 173, 174, 176, 216, 232, 233, 248, and 262 (KESE, 2025; Figure 4.1.4-3).

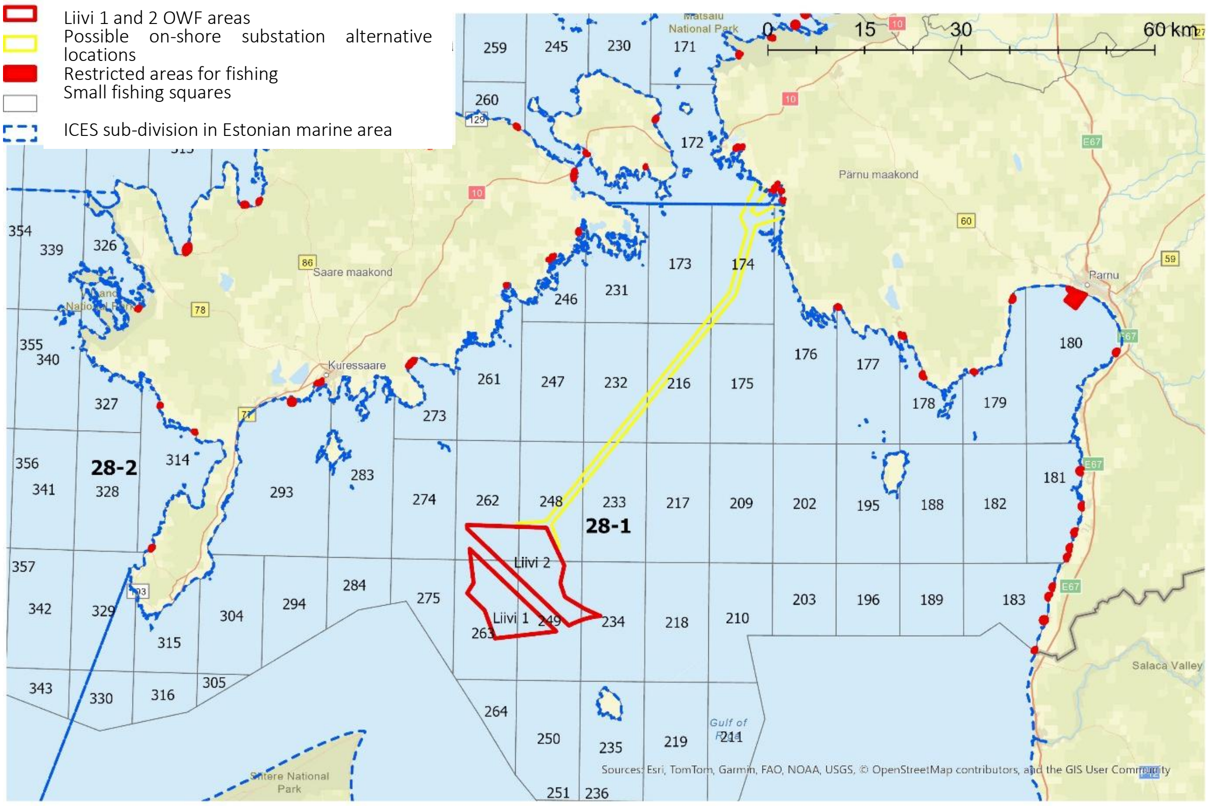


Figure 4.1.4-3. ICES sub-divisions, small fishing squares, and fishing restriction areas in the Liivi 1 and 2 marine areas and the offshore export cable corridor area (according to data from the Environment Agency, 2025).

Fish have different preferences for habitats and spawning grounds. Some species require the deepest areas of the Baltic Sea for spawning, relying on the oxygen and salinity conditions present there. Other species depend on unobstructed access to freshwater spawning grounds or spawn at various depths in coastal areas, preferring different temperatures, salinity levels, substrates, etc. Due to the water depth (at least 18 m) in the Liivi 0102 marine area and most of the cable corridor, these areas do not constitute fish spawning grounds. Marine areas shallower than 15 m are of greater importance for fish. Most fish species spawn in coastal sea areas at depths of up to 5 m, which also serve as nursery grounds for juvenile fish. Areas deeper than 5 m serve as spawning grounds for Baltic herring and flounder. Such areas are found only on the landfall side of the proposed offshore export cable and are also crossed by freshwater fish during their migrations.

Based on catch volumes, the most important commercial fish species in the Gulf of Riga is Baltic herring, with catches reaching 8,220 tonnes in 2024 (Agriculture and Food Board, 2025). The second most important commercial fish species – European sprat – has had significantly lower catches – an order of magnitude smaller (113 tonnes in 2024) – largely depending on the size of the cod population that preys on it. In 2024, trawl fishing in the Gulf of Riga primarily yielded Baltic herring, sprat, viviparous eelpout, European smelt, black goby, and sticklebacks. The species caught in coastal fishing were predominantly perch, European smelt, Baltic herring, roach, round goby, vimba bream, white bream, garfish, pike-perch, flounder, ide, ruffe, bream, bullhead, with smaller quantities of Baltic whitefish, rainbow trout, sea trout, bleak, cod, asp, rudd, sea whitefish, Atlantic salmon, burbot, tench, sprat, common carp, river lamprey, and common dab (Agriculture and Food Board, 2025). The quantities of fish caught in the Gulf of Riga by trawl and coastal fishing in 2024 are presented in Table 4.2.3. Over the past fifty years, the species composition in the Gulf of Riga has changed, as reflected in catches: while catches of eel, viviparous eelpout, smelt, whitefish, perch, and pike-perch have declined, the catch of some cyprinid species has increased significantly since the 2000s (Saat and Ojaveer, 2005). The abundance and catches of the non-native round goby have also increased significantly.

Detailed data on the fish community in the proposed activity area, including both the Liivi 0102 area and the offshore export cable region, are not available. Therefore, it is important to carry out location-specific studies in the area, including experimental gillnet fishing and a hydroacoustic survey for Baltic herring (Table 5.2.1). Fish community studies and impact assessments on fish are also required under the Estonian Maritime Spatial Plan. According to the MSP, the impact on fish habitats – including spawning grounds and migration – as well as on benthic communities must be assessed. In accordance with the precautionary principle, detailed studies of the wind farm area and its impact zone must be carried out at the development consent stage when planning wind farms (e.g. studies describing how operational noise from turbines affects fish migration, including the large-scale migration of economically important fish to key spawning grounds). To mitigate construction-phase impacts, a condition must be set that noise-intensive activities (e.g. installing or dismantling turbine foundations) are not carried out during fish spawning periods and in spawning areas, when large numbers of fish are concentrated in a small area. The studies to be carried out in the EIA report will comply with the MSP conditions; the propagation of noise generated by the proposed activity will be modelled and assessed, and the fish community will be studied, including an assessment of impacts on fish, particularly potential spawning grounds. The dispersion of suspended solids will also be modelled. The detailed research methodologies are described in tabel 5.2.1.

Seals. Four marine mammal species inhabit the Baltic Sea: the grey seal (*Halichoerus grypus*), the ringed seal (*Phoca (Pusa) hispida*), the harbour seal (*Phoca vitulina*), and the harbour porpoise (*Phocoena phocoena*). The Gulf of Riga is known to be inhabited by both *Halichoerus grypus* and *Phoca hispida* – the former is classified as game, while the latter is a Category II protected species. Both seal species give birth on ice, although grey seal is also capable of giving birth on land. However, for ringed seals, the sea ice in the Gulf of Riga is the main breeding area. The haul-out sites of grey seals are located in the coastal areas of Saaremaa in the Liivi 1 and Liivi 2 marine areas, but the Gulf of Riga is an important habitat for ringed seals. The use of the marine area for pupping depends on whether ice forms in the offshore wind farm area in a given year (NGO Pro Mare, 2024). According to telemetry data (Figure 4.1.4.4), both species use these areas for movement and as habitat. Harbour seals and porpoises are very rarely encountered in the Gulf of Riga. (Jüssi, 2019). According to more recent data, the islets in the southern part of Saaremaa are of greater importance to seals, while the Kihnu islets seal area has lost its significance (MTÜ Pro Mare, 2024).

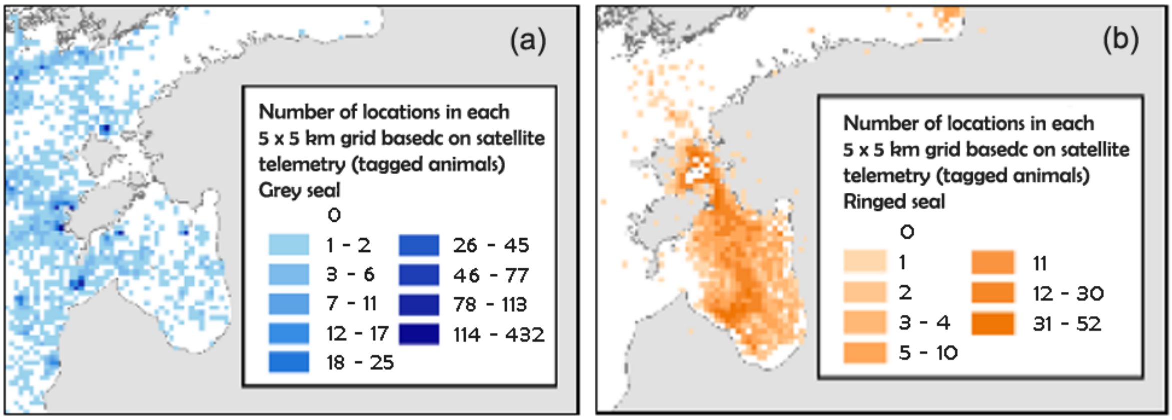


Figure 4.1.4..4. Telemetry data for *Halichoerus grypus* (a) and *Phoca hispida* (b) in the Baltic Sea, shown in a 5 × 5 km grid (HELCOM, 2016).

The conservation action plan for the ringed seal (*Phoca hispida*) (Jüssi & Jüssi, 2015) identifies the main threats to this protected species as bycatch in fishing gear, ice traffic, environmental pollution (oil and other toxins), predators, epidemics, and climate change. Although seals living in the Baltic Sea are sound-sensitive animals that use vocal communication both in air and underwater – which is important for orientation and detecting predators and prey (Klauson et al, 2018) – continuous noise and light pollution are considered low-level threats. The impact of offshore wind farms on them is not assessed in the action plan and is marked as "unknown." Of greater concern is impulsive noise during construction, which may pose a danger to seals (NGO Pro Mare, 2024). This will be assessed in the EIA and mitigation measures will be proposed if necessary. According to the action plan, in the case of an offshore wind farm, the combined effect of multiple disturbances may still be significant, as the ringed seal in the Baltic Sea is an extremely shy animal, and lights or continuous noise sources along migration routes may have unpredictable effects. Therefore, the development of wind farms should be considered a risk factor with uncertain status, and their impacts must be assessed, including the preparation of dedicated studies on marine mammals.

The EIA will examine the abundance and distribution of marine mammals (grey seal and ringed seal) in the Gulf of Riga region, focusing primarily on the main grey seal pupping sites in the southern part of Saaremaa. However, since the potential pupping of ringed seals in the Liivi 0102 marine area and the cable corridor region depends on the presence of sea ice, it will not be possible to study the distribution of ringed seals if ice is absent. In the Gulf of Riga region, sufficient telemetry data are available for ringed seals, but to collect additional telemetry data on grey seals, 10 more grey seals from the Gulf of Riga will be tagged during the EIA. The MSP states that the impact on seal habitat must be assessed. When designing waterways for wind turbine maintenance, consideration must be given to minimising disturbance to ringed seals.

Avifauna. Birds use marine areas as a habitat, feeding ground, and for migration. The Estonian coastal sea is located on the East Atlantic migratory route, which is important for bird life, and extends from the Arctic breeding grounds of Eurasia to wintering areas in Central and Southern Europe and Africa. Some Arctic waterbirds also use the Estonian coastal seas as wintering areas, but the Estonian shallows serve primarily as stopover sites and feeding grounds for waterbirds during migration. The sea is also associated with a number of bird species that live on the coast and in coastal waters, as well as some terrestrial species. For example, during the EIA for the Saare-Liivi offshore wind farm, located east of the Liivi 0102 marine area (Skepast & Puhkim OÜ, 2025), an aerial survey identified 35 bird species. The most frequent benthic feeders were *Clangula hyemalis*, *Melanitta fusca*, and *Melanitta nigra*; the most common pelagic feeders were *Gavia sp.* and *Phalacrocorax carbo*; and surface feeders included *Larus argentatus*, *Larus canus*, *Chroicocephalus ridibundus*, *Hydrocoloeus minutus*, *Sterna hirundo*, and *Sterna paradisaea*. In the environmental impact assessment report for the Gulf of Riga offshore wind farm (Skepast & Puhkim OÜ, 2024), *Clangula hyemalis*, *Gavia stellata*, *Melanitta fusca*, and *Phalacrocorax carbo* are identified as the bird species most sensitive to the development of an offshore wind farm in the Gulf of Riga.

For the Estonian Maritime Spatial Plan, the Estonian Ornithological Society prepared two in-depth analyses: one on the migration corridors of birds in the marine area and the impact of wind farms on feeding grounds (Kalamees et al, 2016), and another on bird stopover sites (2019). Based on species-specific bird movement and location data collected for analysis, areas that are more suitable for wind farm development and marine areas where development may negatively impact bird life were distinguished. Potential impacts on birds will primarily occur within the proposed offshore wind farm area, and not in the offshore export cable corridor—particularly if underground, rather than overhead, lines are used in the onshore section of the cable corridor.

According to current knowledge, birds migrate and move over the sea mostly over a very wide area. However, migratory birds are geographically unevenly distributed and are concentrated in coastal areas, up to 5 km from the coastline. Bottleneck areas – that is, areas where birds concentrate in a very narrow space – mainly occur in narrow straits and at the tips of peninsulas and headlands intersecting with migration routes, as well as on islands (Figure 4.1.4.5). The analysis of bird migration corridors (Kalamees et al, 2016) divides Estonia's marine area into three priority classes based on the intensity of bird migration: areas of critical importance, high importance, and moderate importance. According to this, the Liivi 1 and Liivi 2 marine areas fall predominantly into the second priority class, meaning they are areas of high importance. Liivi 2 is also partly located in the third priority class, meaning this part is an important area (Kalamees et al., 2016). The offshore export cable area is located in both priority classes (II and III).

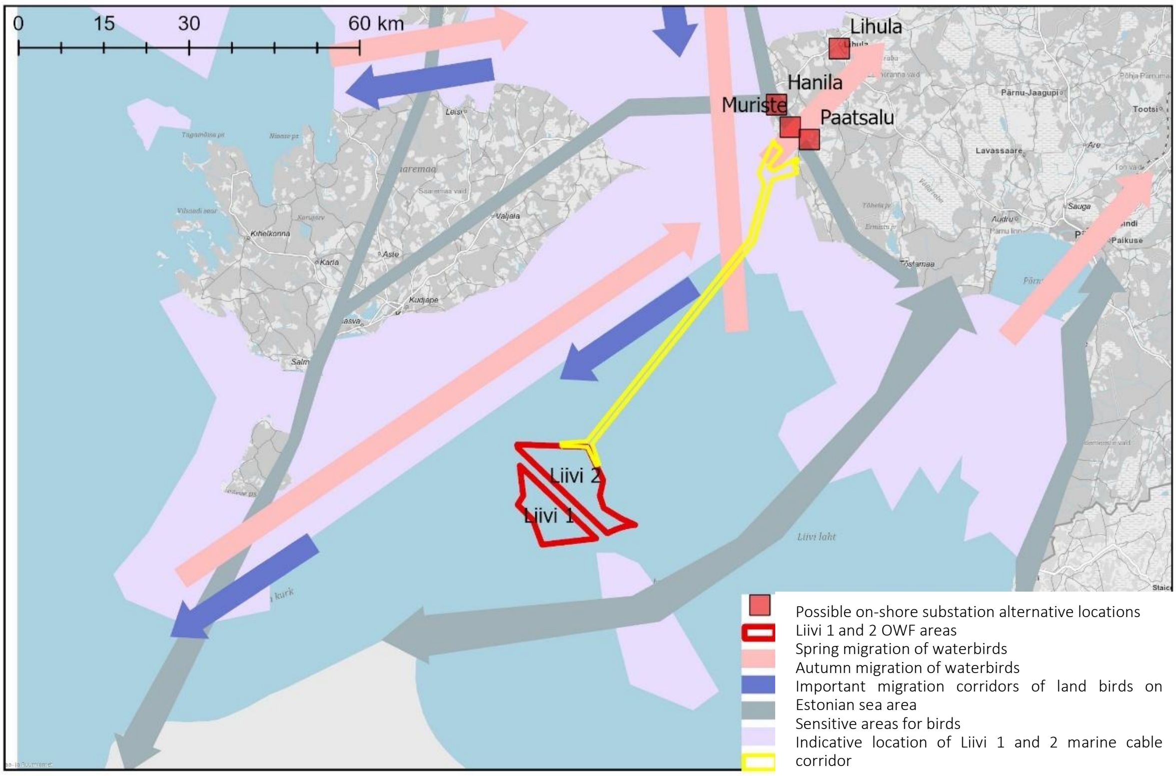


Figure 4.1.4.5. Distribution of spring and autumn waterbird migration in western Estonia (based on the 2022 map layers of the maritime spatial plan).

Based on constructed migration routes (Kuresoo, Leito & Luigujõe, 2011; Estonian Maritime Spatial Plan, 2022), migratory birds pass through the Liivi 1 and Liivi 2 marine areas from the south and southwest in spring, and from the northeast and east in autumn (Figure 4.1.4.5). The sea in the Liivi 1 and Liivi 2 marine areas is relatively deep, and the islets and shoals suitable for bird nesting are located at least 15–20 km northeast and northwest of the proposed wind farm (with the exception of Ruhnu Island, located about 11 km to the southeast); additionally, Cape Kolka in Latvia lies approximately 25 km to the southwest of these marine areas. Therefore, it is unlikely that the proposed activity would occupy nesting sites. The main concern is the collision risk between migrating birds and wind turbines.

The MSP sets out guidelines on how to reduce the collision risk between waterbirds and wind turbines. To reduce the risk of waterfowl collisions, the minimum permitted height of a wind turbine blade must be at least 25 m above the mean sea level. The minimum permitted height can be adjusted, if necessary increased to 30 or 35 m, based on the study carried out during the permitting process. In cooperation with an ornithological expert, the impacts on birds should be further specified in light of the scale, exact location, and technical design of the proposed activity. The marine areas of Liivi 1 and 2 are located in area no. 1 designated as suitable for wind energy development in the MSP. The eastern part of wind energy development area No. 1 in the Gulf of Riga (Liivi 2 marine area) is located near a significant over-sea migration corridor for terrestrial birds, including birds of prey. Therefore, in the eastern part of the development area, near the Kihnu–Ruhnu axis, the actual width of the terrestrial bird migration flow must be determined, and additional necessary information gathered to assess the collision risk (such as flight intensity and flight altitudes of species). For this purpose, a bird radar study covering at least two migration seasons must be carried out, supplemented by visual observations. During the EIA, a bird migration study will be conducted in the Liivi 0102 marine area using radar over a two-year period, in parallel with visual observations, along with aerial surveys of seabirds. Thus, the studies will be carried out in accordance with the MSP conditions. The detailed methodology of the studies is provided in Table 5.2.1.

Bats. Bats use the marine area primarily for overflight during migration and do not interact with the aquatic environment. Therefore, according to the Estonian Maritime Spatial Plan (2022), the only activity potentially affecting bats is wind energy development, which may cause bat mortality and disturb flight corridors and migration routes (Figure 4.1.4-5). Twelve bat species have so far been confirmed in Estonia, but some sources suggest the possible presence of two additional species: *Nyctalus leisleri* and *Barbastella barbastellus* (Masing, 2015). Eight bat species have also been recorded in winter and can be considered resident species in Estonia. These include five species from the genus *Myotis*, as well as *Eptesicus nilssonii*, *Plecotus auritus*, and *Vespertilio murinus*. Resident bats typically move within a radius of up to 100 km from their birthplace, although some individuals may undertake longer regional migrations. Among the species found in Estonia, long-distance migrants include *Pipistrellus nathusii*, *Pipistrellus pygmaeu*s, *Nyctalus noctula*, *Nyctalus leisler*i, and *Vespertilio murinus*

(Hutterer, 2005). These species regularly migrate to and from their wintering grounds, covering a round-trip distance of 3,000–4,000 km (Hutterer et al, 2005).

The bat species observed so far in Estonian offshore areas are *Eptesicus nilssonii*, *Pipistrellus nathusii*, *Nyctalus noctula*, *Myotis brandtii* or *Myotis mystacinus, Myotis dasycneme,* and *Vespertilio murinus* (Lutsar, 2022; Kalda & Kalda, 2024). According to current data, the most frequent migrant among these species is *Pipistrellus nathusii*.

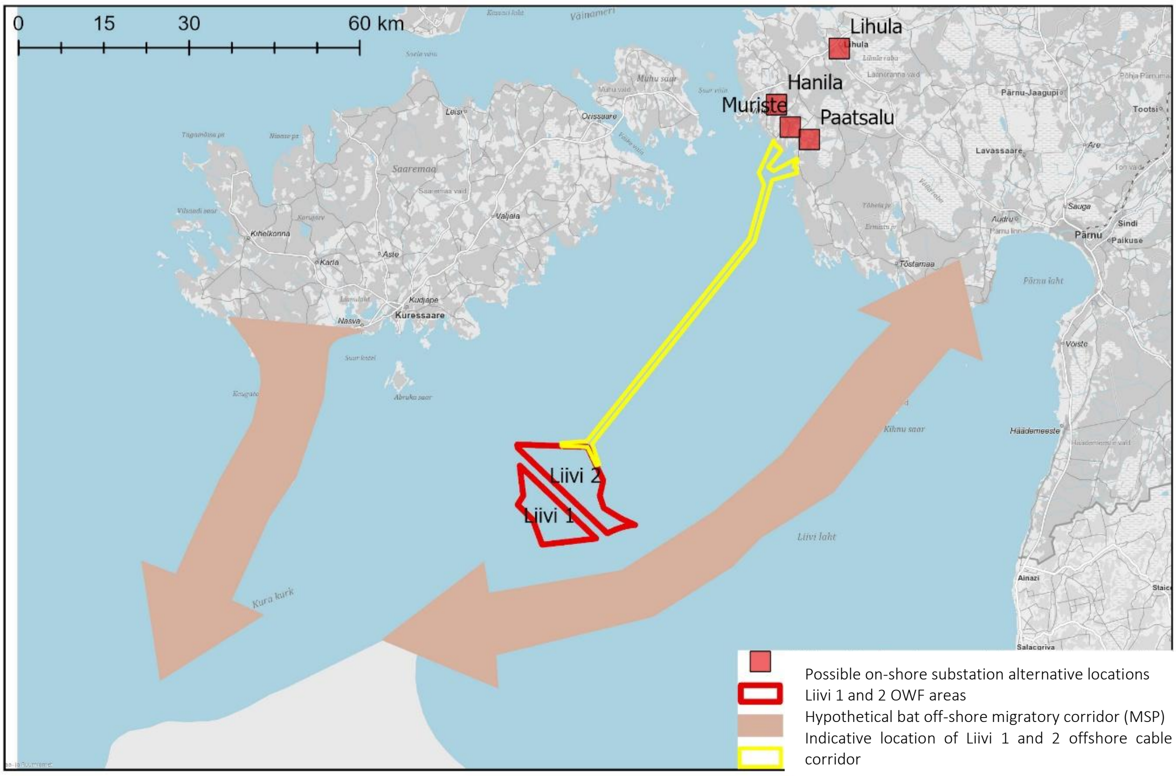


Figure 4.1.4.5. Hypothetical bat migration routes across the Gulf of Riga as presented in the Maritime Spatial Plan, based on the 2022 map layers of the maritime spatial plan.

According to the Nature Conservation Act and Government Regulation No. 135 (RT I, 18.06.2014, 20), 12 bat species are currently protected in Estonia, all classified under protected category II. *Nyctalus leisleri* and *Barbastella barbastellus* have not yet been granted legal protection in Estonia. However, according to the Habitats Directive (Council Directive 92/43/EEC), all small bats (*Microchiroptera*) – that is, all bat species that occur naturally in Estonia – are species requiring strict protection. Estonia joined the Agreement on the Conservation of Populations of European Bats (EUROBATS) in 2004 (RT Annex 2004, 133, 2054). The countries that have joined EUROBATS have undertaken various commitments and set objectives for the protection of bats. Particular attention must be paid to cases where human activity negatively affects bats along their flight corridors and migration routes – these are areas in the landscape where bats concentrate while moving from one region to another. Such concentration areas are also possible at sea (Lutsar, 2022; Rodrigues et al, 2015).

There are no bat mortality estimates for offshore wind turbines (Williams et al., 2024). Over the sea, bats may fly while migrating, hunting for prey, or combining both activities. Bats are more likely to feed at sea in areas where the abundance of flying insects or surface-dwelling crustaceans is high (Ahlén et al, 2009). Little is known about the flight altitude of bats at sea. Observations conducted along the Swedish coast (Ahlén et al, 2009) showed that most bats flew at low altitudes, up to 40 m, although some individuals ascended to higher altitudes near the bases of wind turbines. A bat study conducted around Saaremaa (Lutsar, 2022) also showed that when flying over the sea, bats typically fly at altitudes of up to 10 m above sea level. A recent study (Lagerveld et al, 2024) showed, however, that bats may choose their flight altitude when crossing the sea based on weather conditions and are likely capable of migrating at several hundred metres above sea level. Migration is possible only during relatively calm weather and favourable wind direction. According to the study conducted around Saaremaa (Lutsar, 2022), bats flew over the sea at wind speeds of 1–9 m/s, with most flights occurring at wind speeds of 2–5 m/s. A study conducted in the Gulf of Riga (OÜ Elustik, 2023) also confirms that bats predominantly fly over the sea at lower wind speeds (below 3 m/s).

Since not all flight-capable individuals survive the winter, bat spring migrations are less numerous compared to autumn migrations. This is also supported by bat studies of other offshore wind farms proposed in the Gulf of Riga (OÜ Elustik 2023 and 2024). However, there is very little bat migration data in Estonia and its vicinity, and current estimates of the location of migration routes are very hypothetical. Further research is needed to clarify them. Based on current data, the peak of spring migration is on average at the end of May, and the peak of autumn migration is in mid- to late August.

The MSP includes a condition that, in cooperation with a bat expert, the impacts on bats must be specified in light of the volume of the proposed activity, its exact location, and the technical solution. To this end, bat surveys must be conducted in the marine area being developed before the construction of the wind farm. Bat monitoring must continue during construction and wind farm operations. When preparing the EIA report, bat detectors will be used to survey the marine areas of Liivi 0102 for 2 years to collect baseline data on the extent to which bats use the marine areas of Liivi 0102. The detailed methodology of the study is presented in Table 5.2.1.

4.1.5. Protected natural objects, including Natura 2000 sites

According to the Nature Conservation Act (LKS § 4), protected natural objects include protected areas, limited-conservation areas, protected species and fossils, species' protection sites; individual protected natural objects, natural objects protected at the local government level. Potential adverse impacts on areas within the Natura 2000 network have been assessed in Chapter 6. As part of the Natura 2000 assessment, only potential negative impacts on species and habitat types that are the conservation objectives of special protection areas and special areas of conservation within the Natura 2000 network are assessed. No protected natural objects that meet the criteria of the Nature Conservation Act have been registered within the Liivi 1 and Liivi 2 marine areas. The proposed landfall area of the cable corridor partially overlaps with the Väinameri special protection area and special area of conservation, and with growth sites of Category II (*Angelica palustris*; KLO9324592 and KLO9324594) and Category III (*Dactylorhiza incarnata*; KLO9324589, *Tetragonolobus maritimus;* KLO9324588) protected plant species. In addition, the area contains habitats of Category III protected bird species: (*Motacilla flava*; KLO9109656, KLO9125233), (*Tringa totanus*; KLO9109675; KLO9126083; KLO9109754; KLO9125251, KLO9109791), (*Tadorna tadorna*; KLO9126024), (*Charadrius hiaticula*; KLO9125868; KLO9125869; KLO9110542; KLO9109794), (*Sterna paradisaea*; KLO9126082; KLO9109753, KLO9110568), (*Sternula albifrons*; KLO9122828; KLO9110566) and (*Sterna hirundo*; KLO9122827; KLO9124963) and the habitat of the Category II protected bird species (*Cygnus columbianus bewickii*; KLO9129175). In addition, there are limited-conservation areas and nature reserves around both the offshore wind farm and its cable corridor (Table 4.1.5.1) that could potentially be affected by the proposed activity. In many cases, these overlap with special protection areas and special areas of conservation within the Natura 2000 network, including their conservation objectives. A more detailed overview of the Natura 2000 sites and their conservation objectives is provided in Table 6.2. Some of them are in the territory of the Republic of Estonia and some in the territory of the Republic of Latvia (Figure 6.1). The conservation objective of protected areas in both countries is to protect habitat types listed in Annex I and species listed in Annex II of Council Directive 92/43/EEC, as well as the habitats of bird species listed in Annex I of Council Directive 79/409/EEC and the habitats of migratory bird species not listed in that annex (EELIS, 2025).

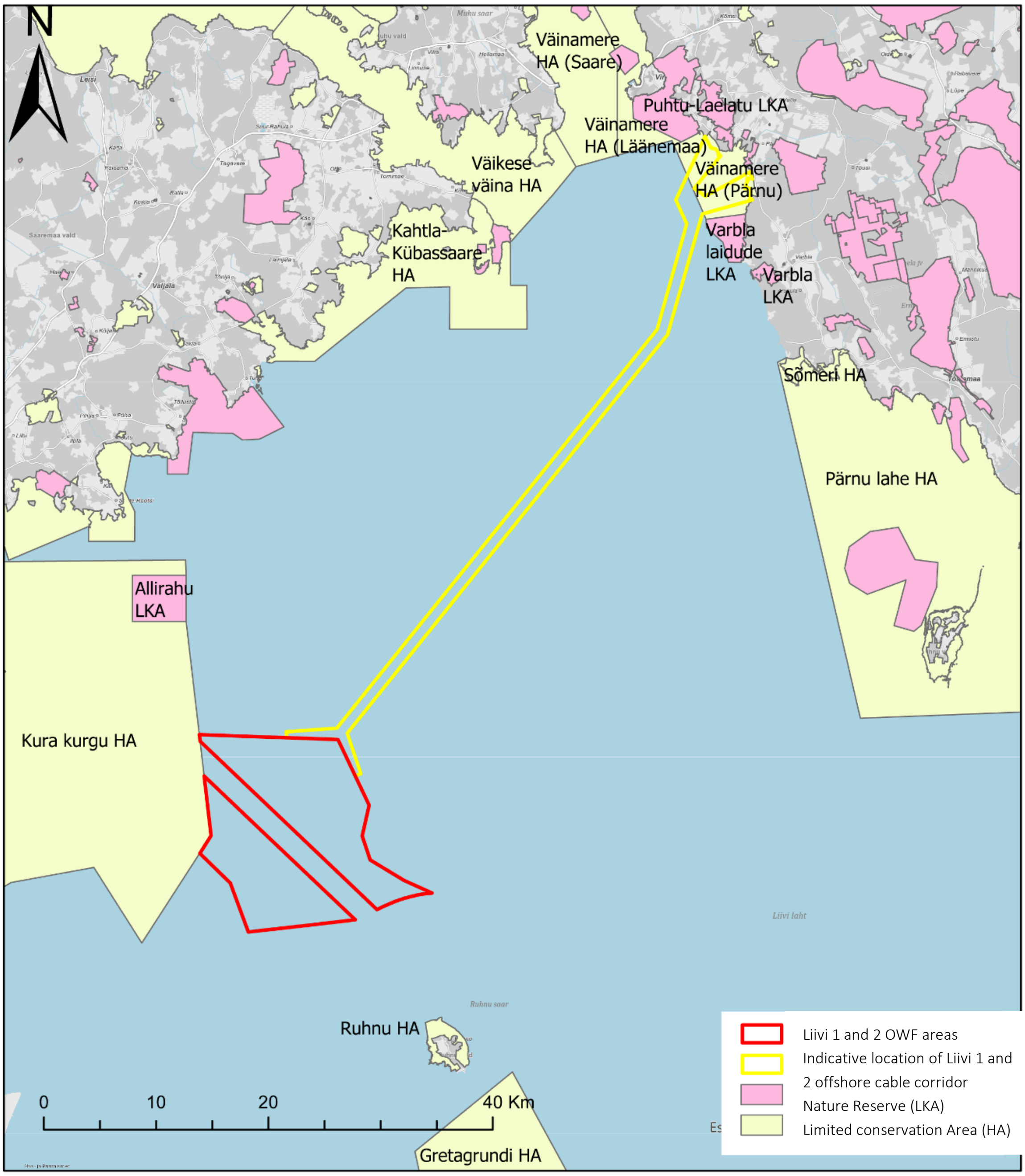


Figure No. 4.1.5.1. There are protected areas located near the proposed offshore wind farm and its cable corridor, outside the Natura 2000 network, that could potentially be affected by the proposed activity (EELIS, 2025).

According to the Estonian Maritime Spatial Plan, significant adverse impacts on protected natural objects and Natura 2000 sites must be excluded when laying offshore cables. Cooperation with the Environmental Board is necessary. The impacts of the construction, operation and decommissioning of the Liivi0102 offshore wind farm on protected natural objects are also being assessed.

Table No. 4.1.5.1. Protected areas located near the proposed offshore wind farm and its cable corridor, outside the Natura network, that could potentially be affected by the proposed activity; their distances from the Liivi 1 and 2 marine area and its cable corridor, and their conservation values (EELIS, 2025).

Site	Distance from the wind farm	Distance from the cable corridor	Conservation objectives
Kura Kurgu limited-conservation area (KLO2000316)	0 km	7.8 km	**Habitat types**: reefs (1170), annual vegetation of drift lines (1210), Boreal Baltic coastal meadows (*1630), Boreal Baltic islets and small islands (1620), Baltic sandy beaches with perennial vegetation (1640), fixed coastal dunes with herbaceous vegetation (*2130), Molinia meadows on calcareous, peaty or clayey-silt-laden soils (6410). **Mammal**: grey seal (*Halichoerus grypus*). **Bird species**: *Gavia stellata, Gavia arctica, Phalacrocorax carbo, Cygnus olor, Cygnus columbianus bewickii, Anser anser, Branta leucopsis, Branta bernicla, Anas penelope, Anas crecca, Anas platyrhynchos, Anas acuta, Anas clypeata, Anas strepera, Aythya marila, Somateria mollissima, Clangula hyemalis, Melanitta fusca, Bucephala clangula, Mergus albellus, Mergus serrator, Mergus merganser, Recurvirostra avosetta, Charadrius hiaticula, Pluvialis squatarola, Calidris canutus, Calidris minuta, Calidris alpina, Limosa lapponica, Tringa erythropus, Arenaria interpres, Alca torda, Cepphus grylle.*
Gretagrund Limited-Conservation Area (KLO2000344)	17.5 km	30,0 km	**Habitat types:** sandbanks which are slightly covered by sea water all the time (1110) and reefs (1170). **Bird species:** *Gavia arctica, Larus minutus, Gavia stellata, Clangula hyemalis, Melanitta fusca, Alca torda.*
Allirahu Nature Reserve (KLO1000146)	10.1 km	13.3 km	**Habitat types:** reefs (1170), Boreal Baltic islets and small islands (1620). **Bird species:** *Arenaria interpres, Larus fuscus, Sterna sandvicensis, Sterna caspia, Alca torda.*
Kahtla-Kübassaare limited-conservation area (KLO2000309)	33.5 km	9.1 km	**Habitat types:** sandbanks which are slightly covered by sea water all the time (1110), mudflats and sandflats not covered by seawater at low tide (1140), coastal lagoons (*1150), large shallow inlets and bays (1160), reefs (1170), annual vegetation of drift lines (1210), perennial vegetation of stony banks (1220), Boreal Baltic islets and small islands (1620), Boreal Baltic coastal meadows (*1630), Juniperus communis formations on heaths or calcareous grasslands (5130), semi-natural dry grasslands and scrubland facies on calcareous substrates (*6210), alvar grasslands (*6280), Molinia meadows on calcareous, peaty or clayey-silt-laden soils (6410), wooded meadows (*6530), calcareous fens with Cladium mariscus and species of the Caricion davallianae (*7210), alkaline fens (7230), Western Taïga (*9010), old broad-leaved forests (*9020), Fennoscandian deciduous swamp woods (*9080). **Bird species:** *Podiceps cristatus, Podiceps grisegena, Podiceps auritus, Phalacrocorax carbo, Cygnus olor, Cygnus columbianus bewickii, Anser anser, Branta leucopsis, Anas penelope, Anas strepera, Anas platyrhynchos, Anas acuta, Anas querquedula, Anas clypeata, Aythya ferina, Aythya fuligula, Somateria mollissima,*

			Clangula hyemalis, Melanitta fusca, Bucephala clangula, Mergus albellus, Mergus serrator, Mergus merganser, Circus aeruginosus, Fulica atra, Grus grus, Recurvirostra avosetta, Charadrius hiaticula, Vanellus vanellus, Calidris alpina schinzii, Limosa limosa, Tringa totanus, Larus minutus, Larus ridibundus, Larus canus, Larus fuscus, Sterna caspia, Sterna sandvicensis, Sterna hirundo, Sterna paradisaea, Sterna albifrons, Lullula arborea, Sylvia nisoria, Lanius collurio.
Väike Strait limited-conservation area (KLO2000341)	47.2 km	9.4 km	**Habitat types:** coastal lagoons (*1150), large shallow inlets and bays (1160), annual vegetation of drift lines (1210), vegetated sea cliffs of the Atlantic and Baltic coasts (1230), Boreal Baltic islets and small islands (1620), Boreal Baltic coastal meadows (*1630), Juniperus communis formations on heaths or calcareous grasslands (5130), semi-natural dry grasslands and scrubland facies on calcareous substrates (*6210), species-rich Nardus grasslands on siliceous substrates (*6270), alvar grasslands (*6280), wooded meadows (*6530), calcareous fens with Cladium mariscus and species of the Caricion davallianae (*7210), alkaline fens (7230), Western Taïga (*9010), old broad-leaved forests (*9020), Fennoscandian wooded pastures (9070). **Plant species:** *Angelica palustris, Cypripedium calceolus, and Sisymbrium supinum.* **Bird species:** *Botaurus stellaris, Cygnus olor, Cygnus columbianus bewickii, Cygnus cygnus, Anser anser, Branta leucopsis, Anas penelope, Anas strepera, Anas acuta, Anas clypeata, Aythya ferina, Aythya fuligula, Somateria mollissima, Bucephala clangula, Mergus serrator, Clangula hyemalis, Circus aeruginosus, Charadrius hiaticula, Vanellus vanellus, Calidris alpina schinzii, Limosa limosa, Numenius arquata, Tringa totanus, Arenaria interpres, Larus minutus, Larus ridibundus, Larus canus, Sterna sandvicensis, Sterna hirundo, Sterna paradisaea, Sterna albifrons, Sylvia nisoria, Lanius collurio.*
Väinameri Limited-Conservation Area (Lääne County) (KLO2000241)	57.9 km	1.7 km	**Habitat types:** sandbanks which are slightly covered by sea water all the time (1110), mudflats and sandflats not covered by seawater at low tide (1140), coastal lagoons (*1150), large shallow inlets and bays (1160), reefs (1170), annual vegetation of drift lines (1210), perennial vegetation of stony banks (1220), Salicornia and other annuals colonising mud and sand (1310), Boreal Baltic islets and small islands (1620), Boreal Baltic coastal meadows (*1630), Baltic sandy beaches with perennial vegetation (1640), European dry heaths (4030), Juniperus communis formations on heaths or calcareous grasslands (5130), semi-natural dry grasslands and scrubland facies on calcareous substrates (*6210), species-rich Nardus grasslands on siliceous substrates (*6270), alvar grasslands (*6280), Molinia meadows on calcareous, peaty or clayey-silt-laden soils (6410), hydrophilous tall herb fringe communities of plains and of the montane to alpine levels (6430), wooded meadows (*6530), petrifying springs with tufa formation (7160), alkaline fens (7230), Fennoscandian wooded pastures (9070), Fennoscandian deciduous swamp woods (*9080). **Plant species:** *Cypripedium calceolus, Sisymbrium supinum*. **Animal species, including birds:** *Halichoerus grypus, Lutra lutra, Phoca hispida bottnica, Cottus gobio, Euphydryas aurinia,*

			Euphydryas maturna, Accipiter nisus, Acrocephalus arundinaceus, Alcedo atthis, Anas acuta, Anas clypeata, Anas crecca, Anas penelope, Anas platyrhynchos, Anas querquedula, Anas strepera, Anser albifrons, Anser anser, Anser erythropus, Anser fabalis, Ardea cinerea, Arenaria interpres, Asio flammeus, Aythya ferina, Aythya fuligula, Aythya marila, Botaurus stellaris, Branta bernicla, Branta leucopsis, Bucephala clangula, Buteo buteo, Buteo lagopus, Calidris alpina schinzii, Calidris canutus, Calidris ferruginea, Calidris minuta, Calidris temminckii, Charadrius dubius, Charadrius hiaticula, Chlidonias niger, Ciconia ciconia, Circus aeruginosus, Circus cyaneus, Circus pygargus, Clangula hyemalis, Crex crex, Cygnus columbianus bewickii, Cygnus cygnus, Cygnus olor, Dendrocopos leucotos, Dendrocopos minor, Emberiza hortulana, Falco tinnunculus, Fulica atra, Gallinago media, Gavia arctica, Gavia stellata, Grus grus, Haliaeetus albicilla, Jynx torquilla, Lanius collurio, Lanius excubitor, Larus canus, Larus fuscus, Larus minutus, Larus ridibundus, Limicola falcinellus, Limosa lapponica, Limosa limosa, Lullula arborea, Lymnocryptes minimus, Melanitta fusca, Melanitta nigra, Mergus albellus, Mergus merganser, Mergus serrator, Numenius arquata, Pandion haliaetus, Perdix perdix, Phalacrocorax carbo, Phalaropus lobatus, Philomachus pugnax, Picus canus, Pluvialis apricaria, Pluvialis squatarola, Podiceps auritus, Podiceps cristatus, Podiceps grisegena, Porzana parva, Porzana porzana, Rallus aquaticus, Recurvirostra avosetta, Riparia riparia, Somateria mollissima, Sterna albifrons, Sterna caspia, Sterna hirundo, Sterna paradisaea, Sterna sandvicensis, Sylvia nisoria, Tetrao tetrix, Tringa erythropus, Tringa glareola, Tringa nebularia, Tringa totanus, Vanellus vanellus.
Väinameri limited-conservation area (Pärnu) (KLO2000300)	57.0 km	Overlaps in the northern part of the cable corridor	Bird species: *Anas acuta, Anas clypeata, Anas crecca, Anas penelope, Anas platyrhynchos, Anas querquedula, Anas strepera, Anser albifrons, Anser anser, Anser erythropus, Anser fabalis, Ardea cinerea, Arenaria interpres, Asio flammeus, Aythya ferina, Aythya fuligula, Aythya marila, Botaurus stellaris, Branta bernicla, Branta leucopsis, Bubo bubo, Bucephala clangula, Calidris alpina schinzii, Calidris canutus, Charadrius dubius, Charadrius hiaticula, Chlidonias niger, Circus aeruginosus, Circus cyaneus, Clangula hyemalis, Crex crex, Cygnus columbianus bewickii, Cygnus cygnus, Cygnus olor, Emberiza hortulana, Fulica atra, Gallinago media, Glaucidium passerinum, Grus grus, Haliaeetus albicilla, Lanius collurio, Larus canus, Larus fuscus, Larus ridibundus, Limicola falcinellus, Limosa lapponica, Limosa limosa, Melanitta fusca, Melanitta nigra, Mergus albellus, Mergus merganser, Mergus serrator, Numenius arquata, Phalacrocorax carbo, Philomachus pugnax, Pluvialis squatarola, Podiceps cristatus, Porzana parva, Porzana porzana, Recurvirostra avosetta, Somateria mollissima, Sterna albifrons, Sterna caspia, Sterna hirundo, Sterna paradisaea, Sterna sandvicensis, Sylvia nisoria, Tringa erythropus, Tringa glareola, Tringa nebularia, Tringa totanus, Vanellus vanellus.*
Puhtu-Laelatu Nature Reserve (KLO1000176)	61.3 km	0.7 km	Habitat types: mudflats and sandflats not covered by seawater at low tide (1140), coastal lagoons (*1150), large shallow inlets and bays (1160), reefs (1170), annual vegetation of drift lines (1210), perennial vegetation of stony banks (1220), Boreal Baltic islets and small islands (1620), Boreal Baltic coastal meadows (*1630), water

			courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation (3260), Juniperus communis formations on heaths or calcareous grasslands (5130), semi-natural dry grasslands and scrubland facies on calcareous substrates (*6210), species-rich Nardus grasslands on siliceous substrates (*6270), alvar grasslands (*6280), hydrophilous tall herb fringe communities of plains and of the montane to alpine levels (6430), lowland hay meadows with Alopecurus pratensis and Sanguisorba officinalis (6510), wooded meadows (*6530), petrifying springs with tufa formation (Cratoneurion) (7160), calcareous fens with Cladium mariscus and species of the Caricion davallianae (*7210), alkaline fens (7230), old broad-leaved forests (*9020), Fennoscandian wooded pastures (9070), and Fennoscandian deciduous swamp woods (*9080). **Plant species:** *Angelica palustris, Cypripedium calceolus, Liparis loeselii, Carex extensa, Cephalanthera longifolia, Cephalanthera rubra, Coeloglossum viride, Dactylorhiza ruthei, Herminium monorchis, Najas marina subsp. intermedia, Ophrys insectifera, Orchis ustulata, Samolus valerandii, and Viola elatior*. **Bird species:** *Aythya marila* (breeding population), *Calidris alpina schinzii, Charadrius hiaticula, Columba oenas, Dendrocopos minor, Jynx torquilla, Limosa limosa, Melanitta fusca, Motacilla flava, Numenius arquata, Rallus aquaticus, Strix aluco, Tadorna tadorna, Tringa totanus, Botaurus stellaris, Branta leucopsis, Circus aeruginosus, Circus cyaneus, Circus pygargus, Cygnus columbianus, Cygnus cygnus, Dendrocopos leucotos, Ficedula parva, Grus grus, Haliaeetus albicilla, Lanius collurio, Lullula arborea, Luscinia svecica cyanecula, Mergus albellus, Philomachus pugnax, Porzana porzana, Sterna albifrons, Sterna hirundo, Sterna sandvicensis, Sterna paradisaea, Strix uralensis, Sylvia nisoria, Aythya marila* **Gastropod species:** *Vertigo angustior, Vertigo genesii, and Vertigo geyeri*. **Amphibian species:** *Rana arvalis.* **Bat species**: *Eptesicus nilssonii, Myotis dasycneme, Myotis daubentonii, Pipistrellus nathusii*, and *Plecotus auritus.*
Varbla Islets Nature Reserve (KLO1000647)	54.8 km	0.5 km	. **Habitat types:** sandbanks which are slightly covered by sea water all the time (1110), reefs (1170), Boreal Baltic islets and small islands (1620), semi-natural dry grasslands and scrubland facies on calcareous substrates (*important orchid sites – *6210), and Boreal Baltic coastal meadows (*1630). **Bird species:** *Limosa limosa, Melanitta fusca, Sterna albifrons, Charadrius hiaticula, Lanius collurio, Numenius arquata, Sterna hirundo, Sterna paradisaea, Tringa totanus, Anas clypeata, Anas strepera, Anser anser, Aythya fuligula, Cygnus olor, Larus canus, Mergus merganser, Somateria mollissima, Vanellus vanellus*
Varbla Nature Reserve (KLO1000667)	55.3 km	5.6 km	**Habitat types:** perennial vegetation of stony banks (1220), fixed coastal dunes with herbaceous vegetation (*2130), semi-natural dry grasslands and scrubland facies on calcareous substrates (6210), alkaline fens (7230), Western Taïga (*9010), old broad-leaved forests (*9020), and Fennoscandian deciduous swamp

			woods (*9080). **Bird species:** white-tailed eagle (*Haliaeetus albicilla*) and its habitat.
Sõmeri limited-conservation area (KLO2000299)	51.6 km	10.5 km	**Habitat types:** Boreal Baltic coastal meadows (*1630), Juniperus communis formations on heaths or calcareous grasslands (5130), alvar grasslands (*6280), and lowland hay meadows (6450). **Plant species:** *Angelica palustris*
Nehatu Nature Reserve (KLO1000175)	63.5 km	0.6 km	**Habitat types:** coastal lagoons (*1150), large shallow inlets and bays (1160), Boreal Baltic coastal meadows (*1630), Juniperus communis formations on heaths or calcareous grasslands (5130), semi-natural dry grasslands and scrubland facies on calcareous substrates (*important orchid sites – *6210), species-rich Nardus grasslands on siliceous substrates (*6270), alvar grasslands (*6280), hydrophilous tall herb fringe communities of plains and of the montane to alpine levels (6430), lowland hay meadows with Alopecurus pratensis and Sanguisorba officinalis (6510), wooded meadows (*6530), calcareous fens with Cladium mariscus and species of the Caricion davallianae (*7210), alkaline fens (7230), Western Taïga (*9010), old broad-leaved forests (*9020), Fennoscandian wooded pastures (9070), Fennoscandian deciduous swamp woods (*9080), and alluvial forests with Alnus glutinosa and Fraxinus excelsior (*91E0). **Bird species:** *Haliaeetus albicilla, Botaurus stellaris, Cygnus cygnus, Luscinia svecica cyanecula, Circus aeruginosus, Circus cyaneus, Circus pygargus, Crex crex, Grus grus, Lanius collurio, Numenius arquata, Sylvia nisoria, Tringa totanus, Limosa limosa, Rallus aquaticus, Podiceps grisegena.* **Bat species:** *Myotis dasycneme, Eptesicus nilssonii, and Pipistrellus nathusii.* **Plant species:** *Cypripedium calceolus and Angelica palustris; Najas marina subsp. intermedia, Cladium mariscus, Cephalanthera longifolia, and Ophrys insectifera.* **Other conservation values:** staging and moulting areas of greylag geese (*Anser anser*); junipers of Porsiku and protected natural objects located within the protected area.

4.2. Social and economic environment

4.2.1. Settlement and employment

The proposed activity covered by the environmental impact assessment – the offshore wind farm along with the infrastructure necessary for its operation (including the offshore export cable to shore) – is located at marine area and does not include land areas, except for the cable landfall point in Lääneranna municipality Paatsalu area.

The nearest human settlement is approximately 11 km southeast of the offshore wind farm, on Ruhnu Island. As of 2024, according to Ruhnu rural municipality, 166 people live on the island (Ruhnu rural municipality, 2025), according to the population register, 90 people: 40 men and 50 women. Approximately 21 km from the Liivi 1 and Liivi 2 marine areas lies Saaremaa Municipality, which had a total population of 30,304 in 2024, including 13,185 residents in the town of Kuressaare. The landfall site of the offshore wind farm cable corridor and the expected substations are located in Lääneranna Municipality, which had a population of 5,086 as of 31 December 2024 (Lääneranna Municipality Government, 2025). Over the past few decades, the population has decreased in Saaremaa and Lääneranna rural municipalities, while it has increased in Ruhnu rural municipality (Figure 4.2.1). The working-age population was 70% in Ruhnu rural municipality, 57% in Lääneranna rural municipality, and 59% in Saaremaa rural municipality.

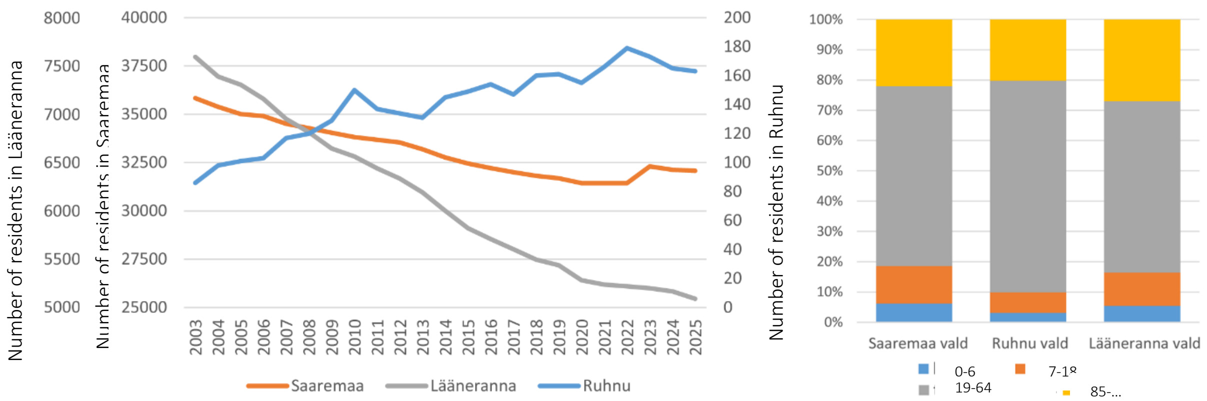


Figure 4.2.1. Population dynamics in Saaremaa, Lääneranna, and Ruhnu municipalities from 2022 to 2025 (left), and the age structure of the population at the beginning of 2025 (right) (based on data from the Association of Estonian Cities and Municipalities, 2025).

According to the Estonian Tax and Customs Board, as of December 2024, 18 legal entities were registered in Ruhnu Municipality (Table 4.2.1), with the main areas of activity being agriculture, forestry, and fishing (4 entities), as well as arts, entertainment, and recreation (4 entities). There were 6,079 legal entities in Saaremaa rural municipality and 895 in Lääneranna rural municipality. The average monthly gross salary in 2024 was 1,595 euros in Pärnu County and 1,517 euros in Saare County, while the average in Estonia was 1,981 euros (Statistics Estonia database, 2025).

The share of tourism in Estonia's economy was approximately 3.6–4.7% in 2023, and with indirect effects (i.e. spillover effects), it may reach 5.3–7%. The share of tourism is highest in Saaremaa, reaching 8.5% with indirect effects, followed by Harju County at 8.2% and Pärnu County at 6.6% (2024 Regional Impact Analysis of Estonian Tourism).

Table 4.2.1. Distribution of legal entities (LE), with entities and gross salary paid in Saaremaa, Ruhnu and Lääneranna rural municipality by field of activity in December 2024 (Tax and Customs Board, 2025).

	Saaremaa rural municipality		Ruhnu rural municipality		Lääneranna rural municipality	
Field of activity	salary (€)	LE (with employees)	salary (€)	LE (with employees)	salary (€)	LE (with employees)
Agriculture, forestry and fishing	1635	736 (129)	1450	4(1)	1463	170 (51)
Mining and quarrying	3077	7 (3)				
Manufacturing	1765	430 (164)		1	1215	44 (15)
Electricity, gas, steam and air conditioning supply	3300	69 (8)			1073	4 (1)
Water supply; sewerage, waste management and remediation activities	1870	13 (3)				
Construction	1417	590 (248)			1162	92 (21)
Wholesale and retail trade, repair of motor vehicles and motorcycles	1553	546 (181)			1134	67 (8)
Transportation and storage	1488	180 (68)			1277	30 (13)
Accommodation and food service activities	1218	327 (73)			1154	49 (15)

Information and communication	3513	255 (59)				
Financial and insurance activities	2012	87 (5)				
Real estate activities	1718	443 (52)		2	1640	45 (1)
Professional, scientific and technical activities	1864	722 (153)			1,950	86 (22)
Administrative and support service activities	1120	323 (323)			929	46 (9)
Public administration and national defence; compulsory social security	2406	18 (0)	1436	2	2286	7 (0)
Electronic communications services, programming, consulting, data processing infrastructure, and other information-related activities					1886	22 (3)
Education	2360	178 (16)		2	1679	22 (4)
Human health and social work activities	3350	87 (24)			1754	16 (4)
Arts, entertainment and recreation	1751	456 (29)		4	1118	73 (7)
Publishing, broadcasting, and content production and distribution					1378	12 (2)
Other service activities	1419	605 (75)		3	1074	107 (17)
Field of activity unspecified		7 (0)				3 (0)

The Estonian Maritime Spatial Plan provides relevant guidelines for the development of wind energy. In wind energy development areas, the development of aquaculture (fish farms, algae and shellfish cultivation) is encouraged in order to achieve positive synergies. Broader cluster solutions based on sea–land linkages (e.g. shared workforce, infrastructure, and vessels, etc.) are also encouraged. It is important to involve fishers and other marine users in wind farm maintenance activities to help mitigate the seasonality of employment in marine-related sectors. The EIA also assesses the socio-economic impact (Table 5.2.1).

The population and, for example, the tourism sector may also be affected by visual impacts related to the proposed activities in the Liivi 0102 marine area. According to the MSP, south of Ruhnu Island (including the Liivi 0102 marine area), opportunities should be sought at the permitting/EIA stage to leave turbine-free zones. The MSP also includes the following guidelines and conditions to reduce visual impact:

- If possible, place the wind turbines in a regular pattern to reduce the visual impact of the windmills. Regular turbine formations should, where possible, be coordinated across adjacent developments or wind farms. If possible, the cumulative visual alignment of turbines should be avoided.
- It is recommended to design wind turbines of the same height (+/-10% of the total height) for wind farms closest to the coast. If possible, avoid visually disruptive layouts where the seabed topography and turbine placement create an uneven view, with towers of different heights “jumping” against the sky and forming a “broken skyline.” Visual similarity in both the placement and parameters of the wind turbines helps reduce visual disturbance;
- Possibilities to have a wind turbine free area when looking from the northern tip of Ruhnu island. To optimise wind turbine placement, actual visibility range must be taken into account, and the methodological assessment of visual impact should begin at an early stage of wind farm planning.
- Wind farm visualisations must provide a representation that is as realistic and distortion-free as possible to the human eye, and the execution of the visualisations must be verifiable.
- Turbines should be clustered into groups as compact as possible, taking into account the technical requirements of turbine design (e.g. ensuring sufficient spacing to maximise energy production and extend operational lifespan).
- At the edges of the wind farm, avoid forming small groups of turbines or isolated individual turbines that appear as detached clusters from the main turbine row.

The visual impact of the offshore wind farm will be assessed in the EIA report with cooperation with Ruhnu municipality, and visualisations will be prepared in accordance with the specifications set out in Table 5.2.1.

4.2.2. Local benefits

According to the Environmental Charges Act (RT I, 11.06.2024, 9), a charge for production of electricity from wind energy is payable upon the construction of a wind farm, which is allocated to the local authority located within the impact area of the offshore wind farm. The impact area of the offshore wind farm is defined as the area within a 20 km radius from the centre point of a wind turbine located at sea. In the case of the Liivi 1 and Liivi 2 wind farms, the only such municipality is Ruhnu rural municipality (Figure 4.2.2.1).

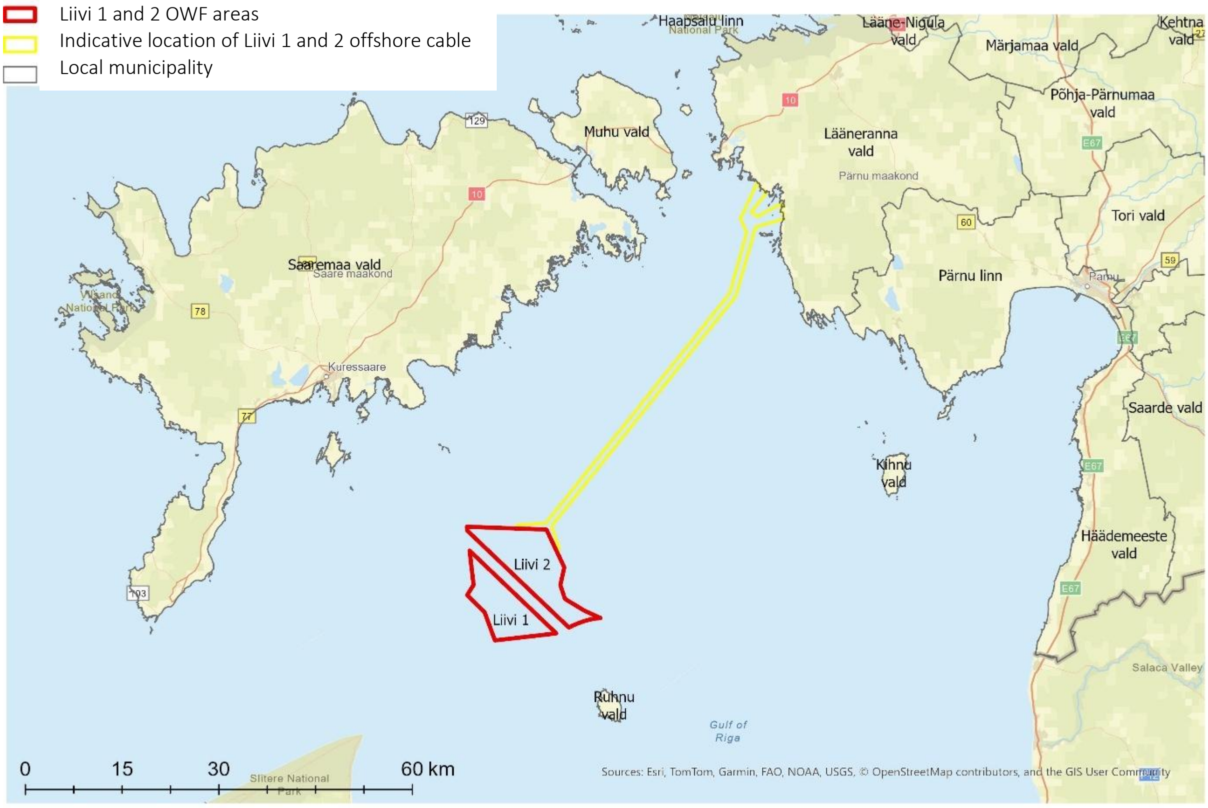


Figure 4.2.2.1. Location of the Liivi 1 and 2 marine areas in relation to local governments

The owner of the wind farm pays a charge amounting to 0.5% of the multiple of the following figures:

- the amount of electricity produced by the wind power plant per quarter in megawatt-hours, but not less than 70 per cent of the rated capacity of the wind power plant multiplied by 1,000;
- the arithmetic mean power exchange price of the day-ahead market in the Estonian price area for the corresponding quarter.

For an offshore wind power plant, the charge for production of electricity from wind energy is distributed with 90% allocated to the local government and 10% to the state fund (Figure 4.2.2-2) upon fulfilment of the conditions set forth in the Environmental Charges Act. A separate compensation is paid to fishery undertakings (holders of a commercial fishing authorisation and fishers listed on the fishing authorisation) to reimburse them, if necessary, according to the Environmental Charges Act § 55[4] for any reduction in fish catches caused by the wind farm. In addition to the charge for production of electricity from wind energy, the offshore wind farm operator as a superficies license holder is required to pay an annual superficies charge into the state budget pursuant to § 113[21] and § 113[22] of the Building Code.

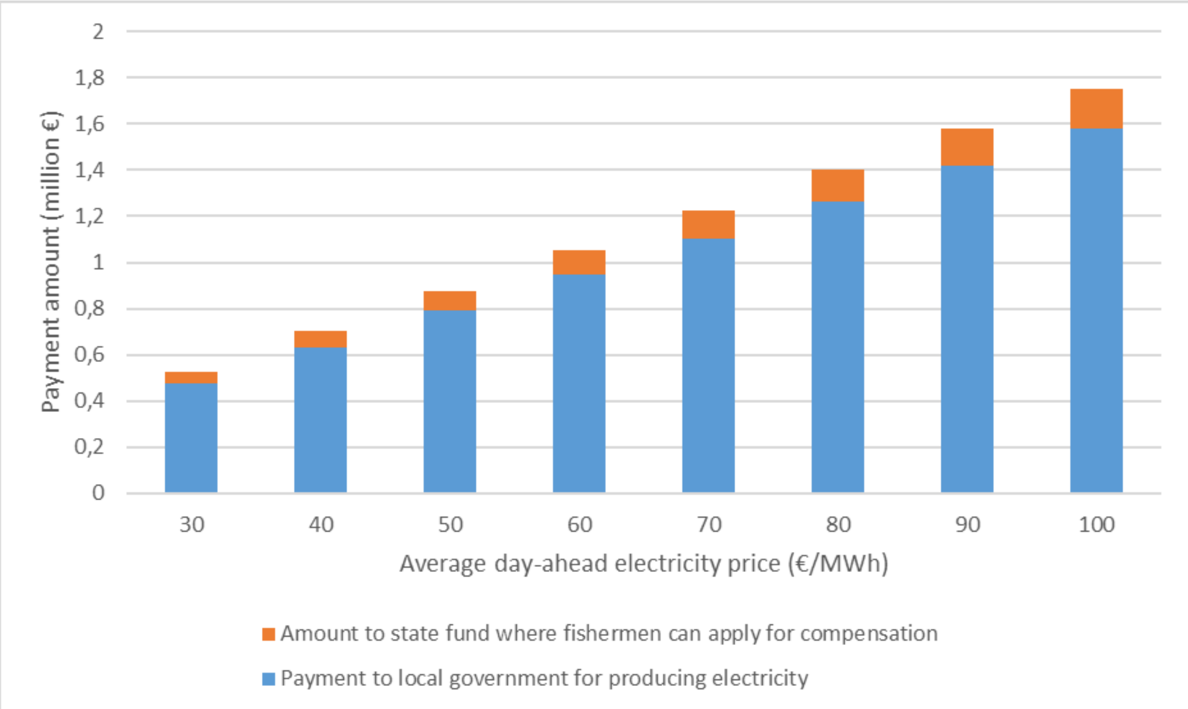


Figure 4.2.2-2. Charge for production of electricity from wind energy for a 1000 MW offshore wind farm and potential compensation for fishery undertakings under various day-ahead electricity price scenarios.

4.2.3. Fishery

The Gulf of Riga is a very important fishing area in Estonia, where fishing is divided into coastal and trawl fishing. Based on the size of the catch, the most important fish caught in both coastal and trawl fisheries is Baltic herring (Table 4.2.3). Coastal fishing at sea generally takes place within 12 nautical miles or up to a 20 m isobath. According to the

Republic of Estonia Government Regulation No. 65 Fishing Rules of 16.06.2016, trawling is only permitted in marine areas that are deeper than 20 metres.

According to the marine chart of the Land and Spatial Agency (2025), water depths in the Liivi 1 and Liivi 2 marine areas exceed 18 m, and no coastal fishing takes place there. Unlike coastal fishing, trawl fishing in the Gulf of Riga is regulated not by the number of fishing permits but by total allowable catches, that is, quotas allocated to individual undertakings. Trawl fishing in the Gulf of Riga primarily targets Baltic herring, as sprat is not present in significant quantities in this area. The use of large and powerful trawlers is prohibited in the Gulf of Riga by agreement with Latvia (Regulation No. 65, Fishing Rules, 2016).

According to the Fisheries Information Centre, in 2023 a total of 2,282 individuals were issued a fisherman's fishing authorisation in Estonia. It is estimated that the proportion of fishermen who receive their main income from fishing is only 10% of all fishermen registered on Estonian fishing authorisations. According to 2024 statistics from the Agriculture and Food Board, fishers in Ruhnu caught 339 kg of fish, while fishers in Saare County caught a total of 937,585 kg, with the Gulf of Riga accounting for only a small share of Saare County's total catch.

Table 4.2.3. Professional trawl and coastal fishing (t) in the Gulf of Riga in 2024. (Agriculture and Food Board, 2025)

Fish species	Professional trawling (t)	Professional coastal fishing (t)
European eelpout	16,028	0.005
European sprat	112,752	0.047
European smelt	28,388	-
Baltic herring	7269,510	8220,288
Cod (Atlantic cod)	0,000	0,036
Fourhorn sculpin	53,863	0.061
Three-spined stickleback	11,526	-
Perch	-	296,120
Eel	-	1,770
Common dab	-	0.057
Pike	-	21,708.
Prussian carp	-	32,940
European river lamprey	-	1,155
Common carp	-	0,286
Ruffe	-	4,475

Crucian carp	-	4,196
Zander	-	20,119
Bream	-	3,954
Flounder	-	13,915
Tench	-	1,350
Burbot	-	0.082
Salmon	-	0,433
Sea trout	-	1,539
Whitefish	-	2,292
European smelt	-	760,938
Blicca	-	7,234
Rudd	-	1,465
Ide	-	12,347
Common roach	-	66,029
Common dace	-	0,002
Garfish	-	13,235
Common bleak	-	0,089
Rainbow trout	-	0,104
Vimba bream	-	60,413
Twait shad	-	0,561
Round goby	-	420,885

Automatic Identification System (AIS) data suggest possible trawling activity in the Liivi 2 marine area, particularly in its central part, but not to a significant extent in the Liivi 1 marine area (Figure 4.2.3). Trawling also takes place in the area of the proposed cable corridor. According to the Estonian Maritime Spatial Plan, in higher-risk areas (e.g. heavy vessel traffic – intersections with shipping lanes, overlap with trawling areas, within the wind farm where service vessels operate, or ice movement in shallow areas), the cable must be protected, if necessary, against potential hazards, either by covering it (e.g. with concrete slabs) or by burying it in the seabed. In areas overlapping with trawling zones, the placement of turbines should be coordinated with the Ministry of Regional Affairs and Agriculture, the economic impacts of trawling on the fisheries sector should be analysed, and multi-use of overlapping areas should be encouraged, including, where necessary, the implementation of compensation measures. As part of the EIA, a fish community study will be carried out and the impact on fisheries will be assessed (Table 5.2.1).

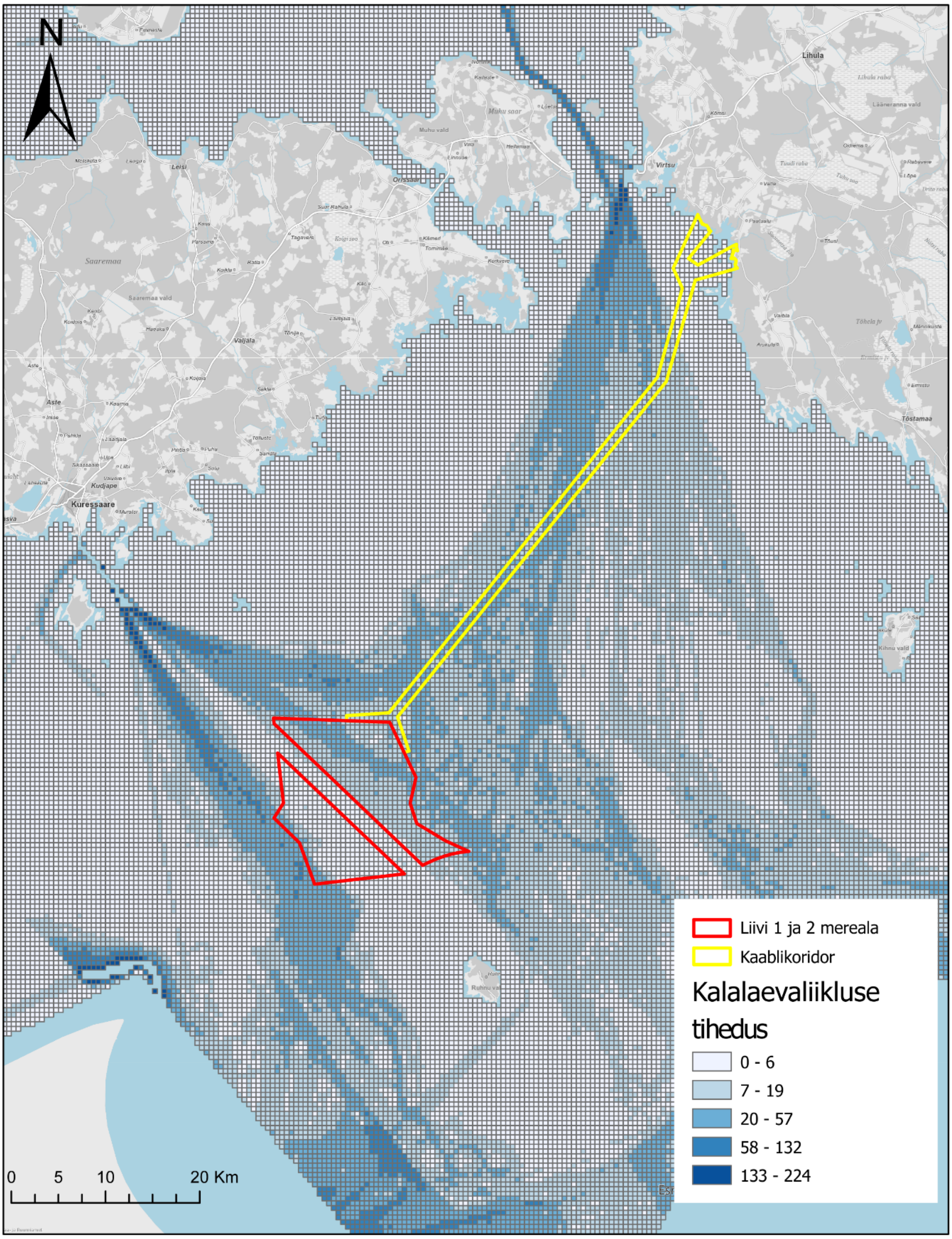


Figure 4.2.3. Fishing vessel density in 2022 based on AIS data (number of fishing vessels passing through a 0.5 × 0.5 km grid cell during the year) (Transport Administration, 2023)

4.2.4. Air and vessel traffic

Air traffic. Ruhnu Airport is of strategic importance, ensuring a transport connection between Saaremaa and mainland Estonia during the autumn and winter months. An 8-seat aircraft serves passengers and cargo on the Pärnu-Ruhnu-Kuressaare route from October 1 to April 30. At other times, Ruhnu Airport mainly serves private and charter flights. Currently, Diamond Sky Aviation Group serves Ruhnu Island with a Britten-Norman Islander BN2B aircraft, the maximum flight altitude of which exceeds 5 km, but the actual flight altitude is lower and also depends on specific conditions. This small aircraft operates under visual flight rules, and Ruhnu airfield lacks both lighting and radio beacons. The proposed offshore wind farm will be located on the flight path between Ruhnu and Kuressaare. International flight routes operate at altitudes far above the maximum height of wind turbines (Airport City, 2025). In the case of Ruhnu Island, air and vessel traffic are essential for residents and for rescue and medical transport from the sea (rescue helicopter and boats).

According to the EMSP, cooperation must be established with the Transport Administration to clarify potential air traffic corridors and avoid interference with navigation systems. In the EIA report, the impact on air traffic will also be assessed (Table 5.2.1).

Vessel traffic. The Gulf of Riga is used as a shipping route by cargo ships, fishing vessels, passenger ships, tankers, recreational boats, and various smaller craft. The spatial distribution of all vessel traffic in 2022, based on Automatic Identification System (AIS) data, is presented in Figure 4.2.3. The main fairways passing through the Gulf of Riga connect the ports of Pärnu and Riga with the open Baltic Sea. The proposed offshore wind farm area and its vicinity are traversed by the most frequently used fairways, including the Ruhnu–Roomassaare route and the routes connecting Pärnu with the open Baltic Sea (Estonian Transport Administration, 2023)

Among the scheduled vessels, the high-speed catamaran Runö connects Ruhnu Harbour with the ports of Pärnu, Munalaid, and Roomassaare from 1 May to 31 October (Ruhnu Municipality, 2025).

According to the MSP, when developing wind energy, it is recommended to prioritise areas located outside of navigation zones. Cooperation with the Transport Administration is necessary to ensure the use of up-to-date vessel traffic data. To ensure maritime safety, turbines will not be placed within fairways, including international shipping lanes and anchorage areas. In wind energy development areas, clear passage corridors for vessel traffic must be maintained between turbines to ensure smooth international freight transport and to minimise route length and the need for course adjustments. Detailed solutions will be developed at the superficies licence stage in cooperation with the Estonian Transport Administration and authorities concerned in neighbouring countries. Under the MSP conditions, the following must be ensured:

- In cooperation with the Transport Administration, the placement of turbines and the functioning of vessel traffic must be clarified in cases where turbines overlap with navigation areas. This must be based on up-to-date data and include an assessment of the impact on vessel traffic (including the economic impact of longer routes, the increased risk level due to restricted or intensified traffic, and the needs of neighbouring countries). A joint decision with the Transport Administration must be made on whether cross-border maritime transport coordination is necessary.
- Based on up-to-date data and in cooperation with the Transport Administration, the width of the buffer zone required for maritime safety must be specified when the wind farm borders a navigation area.

In the case of the offshore export cable, in higher-risk areas (e.g. heavy vessel traffic – intersections with fairways, overlap with trawling areas, within the wind farm where service vessels operate, or ice movement in shallow areas), the cable must, if necessary, be protected against potential hazards, for example by covering it with concrete slabs or burying it in the seabed. Near the offshore export cable landfall site, part of a fairway intersects with the Suur Strait (Figure 4.2.3). Once the cables have been laid, it is prohibited to anchor in the cable corridor.

During the EIA report, navigation risks are analysed using a simulator. The impact on maritime communications, AIS communication systems and marine vessel radars will also be assessed. More detailed methodologies for assessing the impacts of vessel traffic are described in Table 5.2.1.

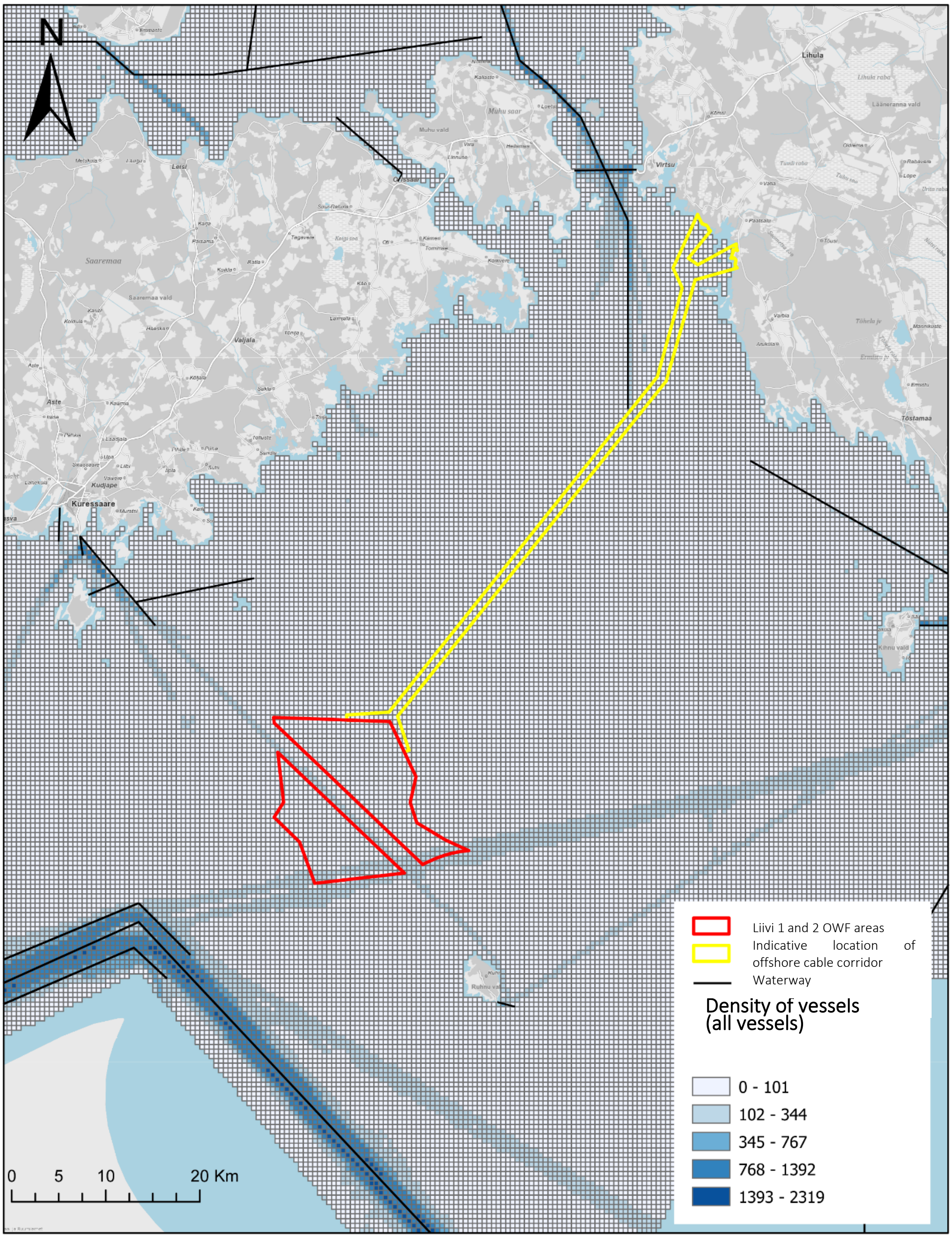


Figure 4.2.3. Total vessel traffic density in 2022 according to AIS data (Transport Administration, 2023).

4.2.5. Hazardous objects located at sea

Every year, mines and other explosives from World War I and II are found in Estonian waters during mine clearance operations. Explosives can also be found on, around, and inside the wrecks of many warships. Unexploded ordnance poses a threat primarily to fishers, but also to constructors of hydraulic structures (including offshore wind farms), and, when washed ashore, to the general public (Treffner, 2019). The risks posed by unexploded ordnance can be divided into three categories: the risk to human life from accidental explosions, the health risk from direct contact with hazardous chemicals, and the chronic pollution of the marine environment and aquatic organisms by toxic explosives leaching from corroded ordnance, which can enter the food chain of marine life and humans (Strehse et al, 2017).

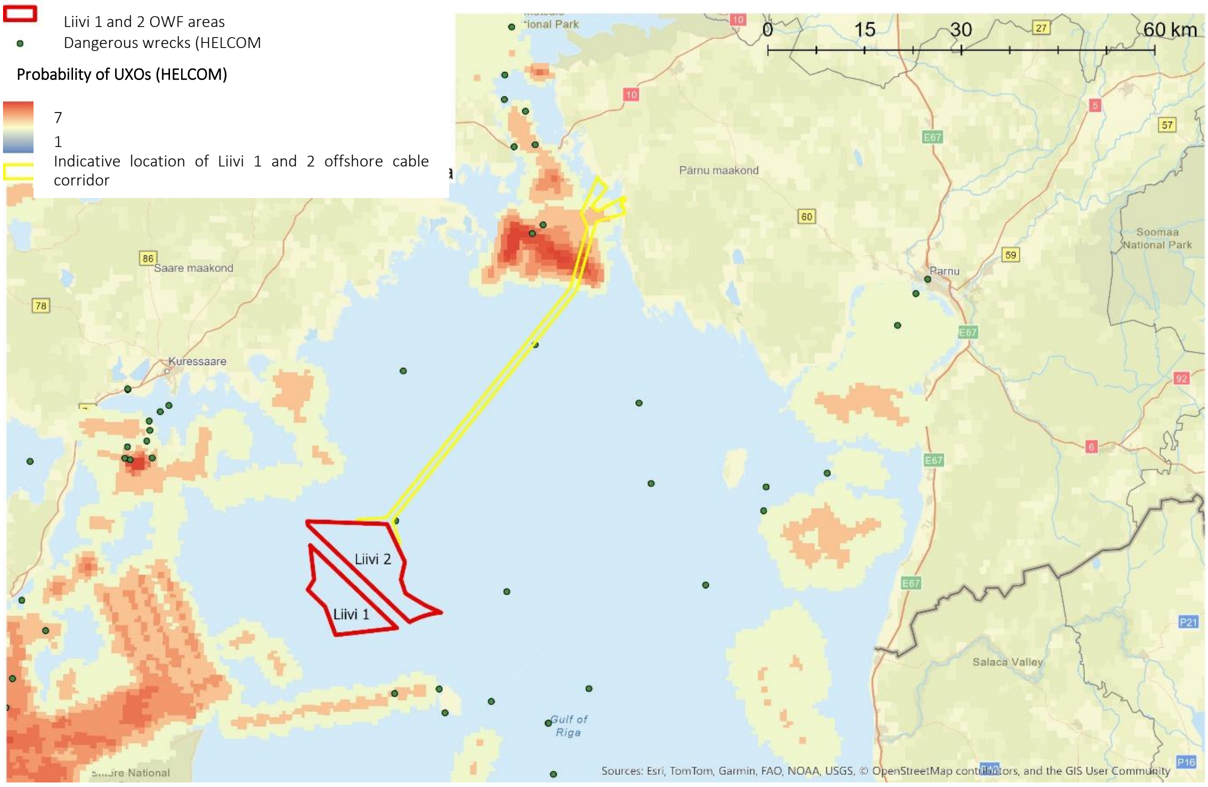


Figure 4.3.2. The probability of encountering explosives and munitions, and hazardous shipwrecks (HELCOM map application data).

Unlike the southern part of the Baltic Sea, no large-scale deliberate disposal of explosives or chemicals at sea is known to have occurred in Estonian waters ((HELCOM map application), but numerous unexploded ordnance and mines are still present, having entered Estonian waters during wartime. The highest risk group is probably divers, as explosives can be activated by touch, static electricity, magnetic fields, or even light and acoustics. Also fishers, who may pull out explosives with trawls or set them off. In Estonia, the matter is handled by the Estonian Navy, which conducts regular exercises and operations, advises relevant organisations (e.g. port developers, fish farm operators, etc.), and is also involved to some extent in prevention. According to the MSP, when planning an offshore wind farm and laying cables, the probability of encountering historical explosives and other hazardous objects must be determined in cooperation with the Ministry of Defence. This is also done during the EIA (Table 5.2.1)

4.3. Cultural assets, including underwater cultural heritage

There are several wrecks in Estonian marine area, some of which are registered as cultural monuments and some are not. Currently, the most comprehensive public database of shipwrecks in Estonia is the Hydrographic Information System (HIS) of the Transport Administration, which records a wooden shipwreck named Nimetu-619 at a depth of 30.2 m in the Liivi 1 marine area (dimensions 26 × 7.3 m) (Figure 4.3.1). In addition, the Liivi 2 marine area contains an as-yet unnamed wooden shipwreck at a depth of 29 m, covering an area of 16 × 10 m. According to the HIS, there are two additional wrecks in the Liivi 2 marine area, but no detailed information is available about them, and their existence needs to be verified (Estonian Maritime Museum Wreck 1 and 2). The shipwreck STB-7268 (sunk on 16 December 1979) is located adjacent to the proposed cable corridor. The remaining wrecks are located further away from the Liivi 1 and Liivi 2 marine areas and the proposed cable corridor. The remaining wrecks are located further away from the Liivi 1 and Liivi 2 marine areas and the proposed offshore export cable corridor.

According to the conditions of the MSP, wind turbines may not be designed on cultural monuments (including wrecks). The impact on cultural heritage must be assessed, which will be determined through an underwater archaeological survey. When planning to install offshore export cables, cooperation with the National Heritage Board must take place during the superficies licence application process to avoid damaging underwater cultural heritage. To determine the exact locations of wrecks in the Liivi 0102 marine area and at the offshore export cable site, an underwater archaeological survey will be conducted as part of the EIA. The survey will be used to verify potential man-made findings in the proposed activity area using side-scan sonar and/or diving, based on multibeam sonar data (Table 5.2.1).

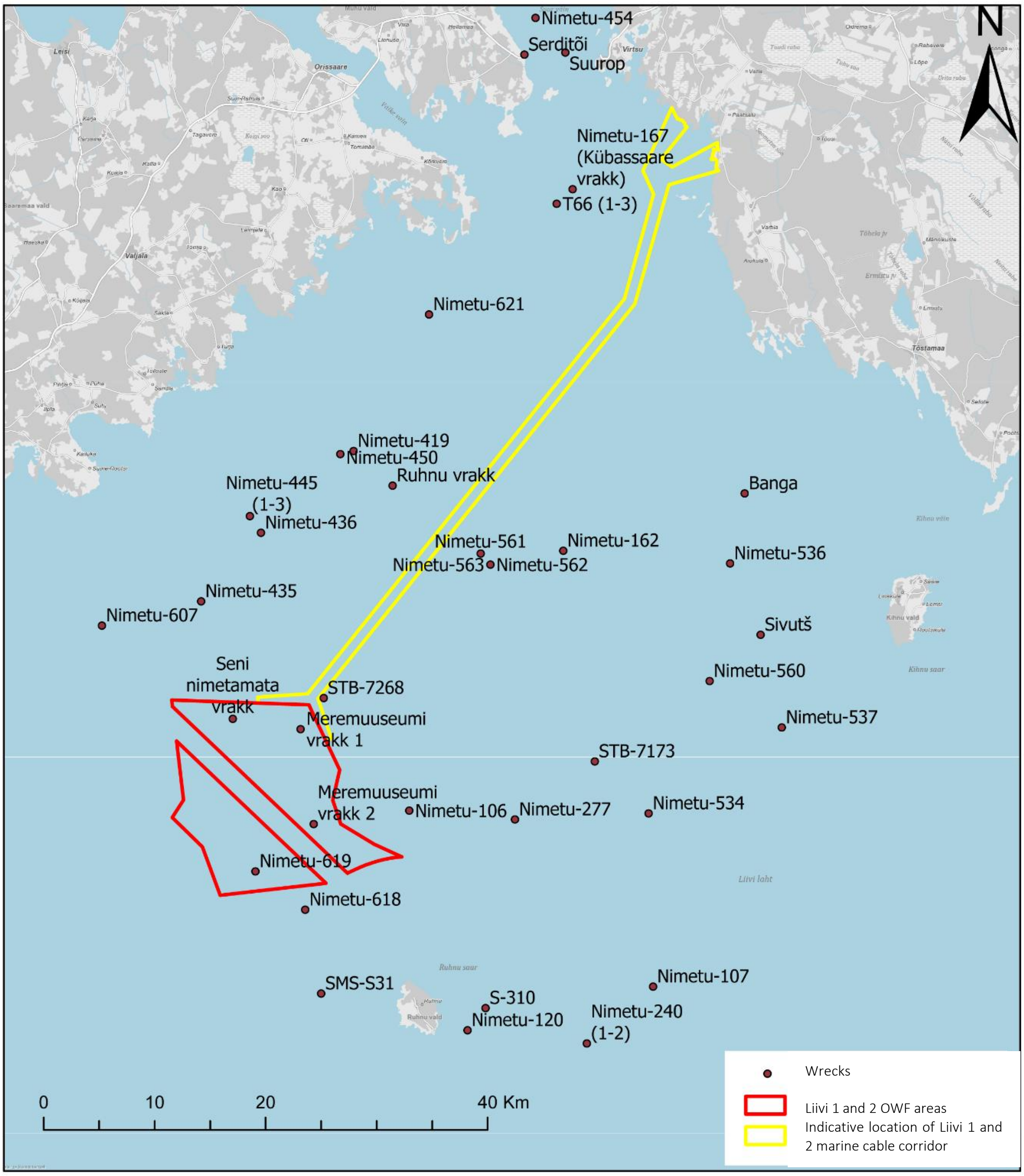


Figure 4.3.1. Shipwrecks located in the Liivi 1 and Liivi 2 marine areas and their immediate surroundings (Transport Administration, 2025).

5. ESTIMATED IMPACT OF THE PROPOSED ACTIVITY

5.1. Assessment methodology

In the environmental impact assessment, the environmental impact of the proposed activity will be assessed in accordance with environmental legislation (the Environmental Impact Assessment and Environmental Management System Act and its implementing acts) and good practice in environmental impact assessment. For the preparation of the EIA report, previously conducted studies, specialist literature, and public databases and information sources will be used. The missing information will be collected through the studies carried out during the EIA, as described in Chapter 5.2.

The environmental impact assessment process consists of two stages: Preparation of the EIA programme and environmental impact assessment, including the preparation of the report. The EIA programme, prepared first, describes the proposed activity, possible alternatives, and its location, and identifies the areas that are likely to be significantly impacted by the proposed activity. The EIA programme is submitted to the expert group who will carry out the assessment and includes a schedule for conducting studies and preparing the evaluation. The EIA programme also compiles a list of stakeholders to be involved in the impact assessment. The EIA programme is processed in accordance with the Environmental Impact Assessment and Environmental Management System Act, and all necessary procedural steps are carried out, including publication, to allow stakeholders and communities to express their views, and consultations are held with the authorities concerned. The EIA programme approved by the decision-maker serves as the terms of reference for the environmental impact assessment, the studies to be carried out, and the preparation of the report.

The preparation of the EIA programme is followed by the environmental impact assessment, the results of which are compiled into a single report. The EIA report contains the results of the studies and assessment process. The studies conducted within the framework of the EIA will be included in the EIA report. Similar to the programme, the EIA report is also processed in accordance with the Environmental Impact Assessment and Environmental Management System Act, and all necessary procedural steps are carried out, including publication and consultation with the authorities concerned. During the publication process, stakeholders, authorities, and the community have the opportunity to submit reasoned proposals and express their opinions.

The environmental impact assessment is based on the principles set out in the Environmental Impact Assessment and Environmental Management System Act, according to which the purpose of the assessment is to evaluate and describe the likely significant environmental impact of the proposed activity, to analyse possibilities for avoiding and/or mitigating this impact, and to make a proposal for selecting the most appropriate solution (including site size, scale, and technological aspects). Environmental impact, within the meaning of the above Act, is a direct or indirect impact expected to result from the proposed activity, to the environment, human health, cultural heritage or assets.

Table 5.2.1 presents the affected environmental elements, the potentially significant impacts associated with the proposed activity, and the methodologies required to assess those impacts. Various assessment methods are used in environmental impact assessment: map analysis (using map layers compiled by the Estonian Nature Information System, the Land Board, and other authorities), observation of the site and its surroundings, studies, expert assessments, and consultations with the relevant authorities. Explanations and conclusions regarding environmental impact, mitigation measures, and recommendations for further monitoring are presented based on the professional expertise of the specialists in the expert group, the results of field observations and studies, and the cooperation between various authorities and stakeholders.

The environmental impact assessment assesses the significant environmental impact resulting from the implementation of the proposed activity — that is, it assesses the alternative described in the superficies licence application (see chapter 2.3 Proposed activities and their alternatives). This approach makes it possible to assess the impacts based on maximum design parameters (as presented in chapter 2.3), as the assessment is based on larger wind turbines than the models currently in serial production. In such a case, the assessment covers the expected maximum possible impact on each affected environmental element. The estimated impact and its significance are assessed for each affected environmental element (see Table 5.2.1).

If the impact assessment reveals that, for any affected environmental element, the impacts associated with the sources exceed the threshold of significance, the parameters of the proposed activity (e.g. size and location of wind turbines, type of foundation, location and landfall sites of the offshore export cable route, timing aspects) will be adjusted and additional environmental measures will be implemented to avoid, reduce, or offset the extent of the impact. The impact assessment for the environmental element will then be repeated until it is ensured that the impact has been reduced to a level that is not considered significant from the perspective of environmental impact assessment.

In the environmental impact assessment for each environmental element, the primary basis is the limit values and indicators established in legislation, as well as the significance of the impact as defined in Table 5.1.2.

If the impact of the proposed activity on an environmental element is minor or moderate throughout several assessment stages, mitigation measures will be proposed where necessary, and their effectiveness will be assessed. Where necessary, the need for monitoring is also indicated in the assessment of each environmental element. If the impact of the proposed activity is significant and cannot be reduced by mitigation measures, it will be specifically highlighted in the summary of the EIA report and must be taken into account when issuing the superficies licence.

Table 5.1.2 Significance of impact

Significance of impact	Definition
Insignificant	The impact is absent or remains below the perceived level and the threshold value.
Minor	The impact is minor and can be effectively mitigated by an environmental measure.
Moderate	The impact is moderate but can be reduced through the implementation of environmental measures; subsequent monitoring is required to ensure the effectiveness of the mitigation measure.
Major	The impact is major and cannot be mitigated by environmental measures.
Significant	Direct adverse international or national impact.

The final result of the environmental impact assessment is formulated as a consolidated result of the assessments of all affected environmental elements, outlining the mitigation measures, monitoring conditions, technical parameters of the wind farm, and spatial extent in such a way that all environmental impacts are minimised to a level where they no longer have a significant effect on the environment.

As part of the EIA, a Natura assessment will be carried out, based on the guidance document "Guidelines for carrying out *Natura assessment upon implementation of Article 6 (3) of the Habitats Directive in Estonia*." Chapter 6 describes in more detail the process of Natura assessment and the methodology used.

Within the framework of the EIA, a transboundary environmental impact will be carried out, with the methodology and involved parties described in chapter 10.

5.2. Sources of impact, magnitude of impacts, affected environmental elements and necessary studies

The affected environmental elements, the significant impacts associated with the proposed activity, the estimated extent of the impact, and the assessment methodologies are presented in Table 5.2.1. The table also describes the studies being conducted. Studies on fish, marine mammals, bats, and birds will be conducted over a two-year period to capture interannual variations in species distribution and abundance within the area of the proposed offshore wind farm and offshore export cable. The conditions and guidelines set in the Estonian Maritime Spatial Plan are discussed in the subchapters of chapter 4.

Table 5.2.1. The potential significant environmental impact, estimated sources of impact, size of the impact area, affected environmental elements, the assessment methodologies used for forecasting significant impacts, and a brief description of the studies to be carried out in the framework of the EIA. The descriptions of the anticipated sources of impact, potentially significant impacts, and possible impact areas are based on the experts' previous experience, the guidelines of the Maritime Spatial Plan, and the assessments provided in previously prepared programmes for the Gulf of Riga region (Skepast & Puhkim OÜ, 2021; Roheplaan OÜ, 2022).

Environmental element to be affected	Potential significant impacts (including impact area, sources of impact)	Assessment methodology, studies to be prepared
1. Seabed sediments and geology	Sources of impact: the main impact on sediments occurs during the construction phase of the wind farm and offshore export cable, when sediments are relocated; this impact is short-term and limited in spatial extent. The approximate need for seabed dredging (including dumping, i.e. placement of solid material into the sea) depends on the dimensions,	**Geophysical seabed surveys** are being carried out in the wind farm area (fieldwork began in autumn 2024) with the aim of determining the bathymetry (depth data) of Liivi 1 and 2, the characteristics of the sediments and seabed of the marine area (mineral composition and stratification of sediments), bedrock properties and geological hazards, as well as the environmental conditions of the seabed. For this purpose, various sonar and instruments are

	type, location, and installation technology of the turbines and other components of the wind farm (offshore substations, offshore export cables, and connection cables to the mainland). Potential significant environmental impact: seabed geology is an important factor in the placement of wind turbines and the selection of foundation types. An offshore wind farm can also affect the seabed and its sediments through wave and current dynamics and sediment movement. Considering the water depth of the Liivi 1 and 2 marine areas, the natural movement of sediments, and the fact that the seabed topography will not be significantly raised or lowered over a wide area, the impact on seabed sediments is not estimated to be significant. Earthworks should be avoided during strong winds to prevent the dispersion of suspended solids over a wider area. The potential impact area is limited to the immediate vicinity of the offshore wind farm and cable.	used, including multibeam sonar (MBES), side-scan sonar (SSS), magnetometer, seismic-acoustic sub-bottom profilers of the Chirp type (SBP) and Sparker type (UHRS), as well as passive acoustic monitoring (PAM). A multibeam sonar (MBES) survey will be carried out in the cable corridor area. Geophysical surveys provide essential baseline data for selecting between possible foundation types and wind turbine models in different parts of the marine area, as well as input data for assessing the impacts associated with their construction, operation, and decommissioning. These studies also provide baseline data for assessing other impacts (e.g. benthic fauna, underwater archaeology, etc.). Surface sediment samples from the seabed in the wind farm and cable corridor areas will also be collected using a grab sampler. These samples will be analysed for texture, concentrations of petroleum products, nutrients (total nitrogen, total phosphorus), and ecologically significant heavy metals (Pb, Cd, Ni, Cu, Cr, Zn, Hg). If it is necessary to dump dredged soil during the construction of a wind farm, a suitable dumping site must be found during the EIA. In selecting a dumping site and assessing its impacts, the HELCOM Guidelines for Dredging and Dumping will be followed. The EIA report will compile an expert

		assessment based on the results of previous studies, the geophysical survey carried out during the EIA process, other relevant studies, and scientific literature.
2. Coastal and marine processes	Sources of impact the impact on marine processes primarily involves the redistribution of sediments (dredging and dumping) during the construction of the offshore wind farm and offshore export cable, as well as the installation of artificial structures extending through the water column (offshore substations, offshore wind turbines). At the same time, natural marine processes such as wave action and storms are of greater intensity than the short-term, one-off impact caused by cable installation. At the same time, offshore structures may promote the formation of sea ice in open waters, which can reduce the impact of winter storms on the coastline. Estimated significant environmental impact: if the wind farm is built more than 11 km from the Ruhnu shoreline, it is not expected to significantly affect coastal processes, their nature, or intensity. An impact on coastal processes may mainly occur if a landfall connection cable is installed in shallower marine areas.	The studies listed in this table (studies No. 1 and 3) include geophysical surveys of the Liivi 1 and 2 marine areas, determination of the composition of seabed sediments, modelling of currents and waves, and an assessment of the impact of the proposed activity on sea ice, which will be evaluated according to the conditions of the Maritime Spatial Plan (MSP). Hydrodynamic modelling is also performed. All of this provides baseline data for assessing the impact on coastal and marine processes. **Fieldwork will be carried out** in the cable landfall area to **determine nearshore sediments and water depth**, as well as the composition of sediments in the cable landing zone. Historical data will also be used to examine how conditions have changed over time.

	However, sea ice forming offshore reduces the impact of winter storms on beaches. According to the conditions of the Maritime Spatial Plan (MSP), offshore export cables planned for shallow coastal areas must be protected in such a way that they are not damaged by ice. Potential impact area: the main impacts occur in the offshore export cable installation area, primarily during the short-term dredging phase, with long-term effects mitigated by natural processes.	
3. Hydrodynamics (wind, wave action, currents, and sea ice)	Sources of impact: offshore structures (wind turbines) promote the formation of sea ice and may affect local wind, current, and wave regimes. Ice formation affects both shipping and marine mammals. Estimated significant environmental impact: during operation, the wind farm may affect the local wind, current, and wave regimes, but the impact is expected to be minor and localised. The installation, presence, and later decommissioning of turbines may increase water flow velocity around the turbines and alter wave direction. Potential impact area: limited to the area of the offshore wind farm.	Wind data for the Liivi 1 and 2 marine areas will be analysed based on existing measurements and modelled data, and extreme values will be calculated for 20-, 50-, and 100-year periods. Wave characteristics under ice-free conditions will be modelled over a 30-year period. Wave height, period, and direction will be assessed, as well as near-bottom wave-induced current velocity. In the Liivi 1 and 2 marine area, currents will be measured during the winter period for at least 2 months using a Doppler current profiler (DCP) buoy. Sea ice formation will be assessed using remote sensing data, and the impact of the proposed activity on sea ice will be analysed through simulation. The impact of the proposed activity on sea ice will be assessed in accordance with the

		conditions of the Maritime Spatial Plan (MSP).
4. Seawater quality, suspended solids and pollution spread	Sources of impact: water quality may be affected primarily during construction by the release of seabed sediments and suspended solids into the water column. The amount of suspended solids depends mainly on the composition of the sediments (including the content of hazardous substances and nutrients), the number and type of foundations, and the installation technology, as well as the installation technology of the offshore export cables. An impact sea water quality may also result from the spread of pollution in the event of an accident. Estimated significant environmental impact: the impact on sea water quality occurs primarily through the release of seabed sediments and suspended solids into the water column during construction, and through pollution in the event of an accident. During the operation of the offshore wind farm, pollution may occur only in the event of an accident, which will be prevented through the implementation of preventive and mitigation measures (such as properly maintained service vessels, wind	Sea water quality will be assessed in accordance with the methodology of the National Environmental Monitoring Programme, with six measurement events over one year at three locations within the **Liivi 1 and 2 marine areas.** From the **seawater samples taken in the Liivi 1 and 2 marine areas**, the following parameters will be analysed: total nitrogen (N_{tot}), total phosphorus (P_{tot}), nitrate nitrogen (NO_3-N), nitrite nitrogen (NO_2-N), phosphate (PO_4), oxygen (O_2), pH, CTD profile (conductivity, temperature, pH, dissolved oxygen), chlorophyll-a, and water transparency. This makes it possible to assess whether the proposed activity may affect water quality and the status of water bodies, and thereby the achievement of the objectives of the Marine Strategy Framework Directive (2008/56/EC) and the Western Estonia River Basin Management Plan 2022–2027. In item 3 of the table, **the dispersion of suspended solids associated with the construction of the proposed offshore wind farm, as well as the potential spread of pollution in the Liivi 1 and 2 areas, will be assessed through modelling.** When preparing the EIA report, six pollution dispersion simulations will be carried out using the OpenDrift model (under three weather conditions and with two pollutants). The dispersion of suspended solids is modelled using Delft3D or a similar model. The impact of vertical water movement

	turbines, and other relevant equipment). However, environmental accidents cannot be completely avoided. During the operation of the offshore wind farm, no suspended solids are generated, as bottom sediments are not disturbed. Pollution may also occur during the decommissioning of the wind farm. The impact is expected to be most significant during the construction of the offshore wind farm and the offshore export cable, and later during decommissioning. Impact area: the impact on seawater quality, suspended solids and the spread of potential pollution will mainly occur in the offshore wind farm area and its immediate surroundings.	on water quality (including cumulative impact with other wind farms) will also be assessed.
5. Seabed habitats and biota	Sources of impact: the impact of the proposed activity on benthic biota and habitats will primarily result from the foundations of offshore wind farm structures (turbines, offshore substations) and offshore export cables. They cover parts of the seabed, and their installation results in the removal of existing habitats and biota. At the same time, the foundations of offshore wind farm structures provide a different type of habitat (so-called artificial reefs), which may	A study of seabed biota and habitats will be performed in the area of the proposed wind farm and cable corridor. The study will map the seabed habitats and the plant and animal species present on the seabed in the proposed activity area. The impact within the wind farm and cable corridor area will be assessed based on multibeam echosounder (MBES) depth and backscatter data. Point observations will also be carried out (using underwater video systems or diving) to assess habitat types and biota coverage (at least 600 points), and benthic samples will be collected to quantitatively assess

	affect the species composition and abundance of marine biota. Potential significant environmental impact: construction directly affects seabed habitats and communities where they are lost at the construction site, and indirectly in the surrounding areas through changes caused by suspended solids and reduced water transparency. Thus, the direct impact depends on the scale of the proposed activity (the number and size of the structures). The impact can be mitigated by selecting locations for the proposed structures that favour less valuable habitats and communities. The impact can also be mitigated by, where possible, preferring foundation types with a smaller seabed footprint and using cable installation methods that cause less disturbance to the seabed (e.g. directional drilling beneath the seabed in more sensitive areas). If the cables are buried in the seabed, the disturbance is temporary, and the seabed biota will later recolonise the cable installation areas. By constructing tall artificial structures on the seabed, conditions are created for the	biomass (at least 200 samples). The point data collected from the area will be linked to multibeam sonar data for comprehensive mapping of marine habitat types. The survey methodology, including the laboratory analysis of biomass samples, complies with HELCOM recommendations (HELCOM, 2015). As a result of the survey, seabed substrates and species, as well as species groups, will be mapped based on their distribution and abundance, along with Annex I habitat types of the Habitats Directive, broad habitat types of the Marine Strategy Framework Directive (MSFD), level 5 and 6 biotopes of HELCOM HUB, and HELCOM Red List biotopes. The impact on marine habitats will be assessed in cooperation with the Environmental Board. Additional damage to benthic biotopes resulting from the removal of foundations during turbine decommissioning will also be assessed in accordance with the conditions of the Maritime Spatial Plan (MSP), along with the cumulative impact in relation to other projects.

	development of various communities of sessile species, which will colonise the available artificial substrate. This process depends on many environmental factors. The formation of a local "reef effect" is significant, and the spread of non-native species may also be facilitated. The impact of turbine decommissioning is similar to that of construction, affecting seabed biota by removing the communities that have developed on turbine foundations, while also allowing seabed biota to recover. The potential impact area is limited to the immediate vicinity of the offshore wind farm and offshore export cable.	
6. Fisheries and fish stocks	Sources of impact: the offshore wind farm affects the fish community within the proposed activity area during its construction, operation, and decommissioning. During the construction and decommissioning of the offshore wind farm and offshore export cable, vessel traffic in the area will increase, and additional structures will be introduced into the aquatic environment. During construction and decommissioning, noise emissions, vibrations, and the	The species composition and abundance of fish in the Liivi 1 and 2 offshore wind farm area are not precisely known, nor is there sufficient knowledge of the area's importance as a migration, spawning, or feeding ground for fish. Therefore, within the framework of the environmental impact assessment, fish community studies will be conducted in the offshore wind farm and cable corridor areas – including a fish inventory (migration, spawning, and feeding grounds) across different seasons, as well as studies on spring-spawning herring. The impact of connection cables (electromagnetic field and thermal energy) on fish will

	release of seabed sediments into the water column (creating suspended solids) will occur. offshore export cables (both inter-array and offshore export cables) also generate some electromagnetic fields and thermal energy. Estimated significant environmental impact: the construction of the offshore wind farm and offshore export cable will increase vessel traffic in the area, and foundations and offshore export cables will be installed within the area of proposed activity. Depending on the technological solutions used for the structures, all of this generates noise and vibration, as well as the spread of suspended solids Such impacts can be mitigated, if necessary, by adjusting construction timing in sensitive areas to avoid fish spawning periods and by applying noise reduction measures. During the operation of the offshore wind farm, the foundations of the facilities will form artificial reefs in the area, the richer biota of which will provide a food base for fish. Based on previous studies, the noise level associated with operating wind turbines does not have a significant impact on fish. In the case of buried	be assessed through expert assessment. During the fish inventory, the seasonal occurrence and abundance of fish species will be determined over a two-year period within the offshore wind farm area, and over a one-year period within the cable corridor area. The inventory (including sampling and analysis) will be carried out during the spring and summer periods using gillnet series, in accordance with the international coastal fish monitoring standard (HELCOM, 2019), and the fish monitoring methodology is accredited by the Estonian Accreditation Centre (registration code L179). The spring-spawning herring migration study will be conducted using hydroacoustic methods, with the survey area being covered multiple times during the spring period. The study will follow the international ICES IBAS methodology (ICES 2017). In the framework of the fish stock study, the impact of the proposed activity on fisheries over the lifecycle of the wind farm will be assessed by analysing historical fishing activity within the project area. The socio-economic impact of the proposed activity on fisheries will be assessed, and mitigation measures will be proposed if necessary. Both cumulative and transboundary environmental impacts related to fisheries will be assessed. In areas where trawl fishing takes place, cooperation will be carried out with

	cables, there is no impact on fish from electromagnetic and thermal emissions during operation. When decommissioning the offshore wind farm, maritime traffic will increase again and temporary disturbances (noise and suspended solids) related to construction activities will occur. If necessary, the significance of the construction and decommissioning impacts of the offshore wind farm can be reduced by avoiding such works during the spawning period. Impact area: it is assumed that the entire impact of the offshore wind farm on the fish population can be limited to the area of the offshore wind farm and the offshore export cable.	the Ministry of Regional Affairs and Agriculture.
7. Marine mammals	Sources of impact: the main impact on marine mammals occurs during noisy construction activities associated with the installation of the wind farm, as well as due to increased vessel traffic, both of which can cause disturbance to the animals. Noise and the spread of suspended solids also indirectly affect seals by influencing the abundance and distribution of fish that form their food base in the area.	To assess the impacts of the Liivi 1 and 2 offshore wind farms on marine mammals, it is necessary to further study the baseline data on the seal population in the Gulf of Riga. Seal studies will be conducted using two methods: point counts of grey seals at key haul-out sites in the northern part of the Gulf of Riga near Saaremaa (Vesitükimaa, Kerju Islet, Allirahu, and Tompamaa). Additionally, at Kerju, Allirahu, and Tompamaa, cameras are used during the grey seal pupping period. In all of the above-mentioned haul-out sites, drone imagery is used to estimate seal abundance. Ringed seal counts are carried out either from sea ice

	Estimated significant environmental impact: the impact on marine mammals during the construction of offshore wind farms is mainly manifested through noise, which is greatest during the construction of the wind farm and the laying of the offshore export cable. Disturbance during construction will also be increased by temporary changes in seawater quality and the spread of suspended solids caused by the movement of marine sediments. During the operational phase of the offshore wind farm, disturbances are mainly related to vessel traffic related to maintenance work, but these disturbances are few and limited in area. The decommissioning of the offshore wind farm facilities will once again result in temporarily higher noise levels, the spread of suspended solids, and more frequent vessel traffic. Potential impact area: mainly limited to the offshore wind farm area and its immediate surroundings, and during cable installation, also to the offshore export cable area and its vicinity.	during the pupping period (if sea ice is present) or from islets during the moulting period. These data complement national monitoring data. In addition to seal counts, a telemetry study of grey seals will be carried out. The goal within the framework of the EIA is to capture and tag an additional 10 grey seals with telemetry devices in 2025. In the Gulf of Riga area, the number of telemetrically tagged ringed seals is sufficient to assess the impact. Based on seal distribution and the use of the Liivi 1 and 2 marine areas, the EIA report will assess the impact of the proposed activity on seals. The cumulative impact must also be assessed.
8. Avifauna	Sources of impact: The construction and removal of the offshore wind farm and its connection cable will cause temporary and	The bird survey in the wind farm area will be conducted in two parts – seabird monitoring from aircraft and migratory bird monitoring using a bird radar.

	localised noise and visual disturbance to birds, and physical structures will be installed that may pose a collision risk. The offshore wind farm may also indirectly affect bird populations through impacts on fish and other marine biota that form their food base. Estimated significant environmental impact: Birds use the offshore wind farm area both for stopping over (waterfowl) and for migration. The main impacts of an offshore wind farm on birds will occur during its operation phase: the current resting areas of birds may become unsuitable for them, birds may die in collisions with wind turbines, and wind turbines may create a barrier to feeding areas for birds. The impact of the proposed activity on birdlife can be mitigated through appropriate mitigation measures (e.g., turbine layout and height, temporal restrictions during the phases of construction and decommissioning, and during the operation, if necessary, by shutting down turbines). The potential impact area is limited to the offshore wind farm and its immediate vicinity.	Seabird monitoring will follow the methodological guidelines of STuK4 and HELCOM 2021, and during aerial transect surveys, all swimming and flying birds will be counted along the transects (in the Liivi 1 and 2 marine areas and their surroundings). A total of 20 aerial surveys will be conducted over a two-calendar-year period. Observations of migratory birds will be carried out at two different points within the proposed offshore wind farm area from a vessel at anchor. Migratory bird observations will be conducted in spring (spring migration to breeding grounds), summer (migration of Arctic seabirds and passerines), and autumn (migration to wintering grounds). Monitoring during migration is carried out through radar and visual observations, and at night also through audio recordings. Migratory bird monitoring is carried out for a total of 60 observation days over two calendar years. During radar and visual monitoring of migratory birds, birds of prey using the marine area for migration will also be recorded. This also fulfils the MSP condition regarding the clarification of the migration corridor of terrestrial birds, including birds of prey. Based on these studies and existing scientific literature, the impact of the proposed activity on birds will be assessed, taking into account flight altitudes and the risk of fatalities, and appropriate mitigation measures will be proposed if necessary. The cumulative impact must also be assessed.

9. Bats	Sources of impact: The impact on bats is mainly related to fatalities caused by collisions with wind turbines, which act as physical obstacles along their migration routes. Wind turbines may also cause barotrauma in bats during operation — tissue damage resulting from sudden changes in air pressure. Estimated significant environmental impact: will mainly occur during the operation of the offshore wind farm (collision risk). Potential impact area: the impact on bats will occur within the offshore wind farm area.	To determine the extent to which bats use the Liivi 1 and 2 marine areas as migration and feeding grounds, a *Chiroptera* study will be carried out. As part of the *Chiroptera* study, eight automatic bat detectors will be attached to temporary buoys in the marine area to record bat activity from spring to autumn over a two-year period. In addition, data will be collected in parallel using two land-based automatic bat detectors (in Kabli, Pärnumaa and Mõntu, Saaremaa island) at locations on the mainland where bats may congregate for migration. Potential cumulative impact will also be assessed.
10. Impact of noise (including low-frequency) and underwater noise and vibration	Sources of impact: During the operation of the wind farm, both audible airborne and underwater noise, vibration (especially during the construction phase), as well as infrasound (frequencies below 20 Hz) and low-frequency noise (10–200 Hz) are generated. In addition to the wind turbines, increased vessel traffic during the construction and decommissioning of the wind farm also generates noise. Estimated significant environmental impact: The distance between the offshore wind farm's turbines and Ruhnu Island is over 11 km, so **ambient noise** and vibration levels exceeding the	To assess noise during construction, operation and demolishing of the turbines, modelling will be performed and a noise map will be compiled on the basis of the Minister of the Environment regulation No 71 "Normative noise levels transmitted in ambient air and methods for measurement, determination and assessment of noise level" of 16.12.2016. Both airborne and underwater noise, as well as vibration, will be assessed through modelling. Infrasound and low-frequency noise are described based on scientific literature. Airborne noise will be modelled using the DataKustik CadnaA software in combination with the WindPRO software suite. Underwater noise will be modelled using the QUONOPS software. The software includes databases describing sound sources

	limit values are not expected to spread to the nearest residents. However, **underwater noise** related to the construction, operation and decommissioning of an offshore wind farm may affect wildlife in the offshore wind farm area. Underwater noise is relevant during the construction and decommissioning phases, and could affect fish and marine mammals in the area. Impact area: within and around the offshore wind farm area during its construction, operation, and decommissioning, and within and around the offshore export cable area during cable installation and decommissioning.	(wind turbines and vessels), which will be used as the basis for noise modelling. Noise modelling will also take into account sound reflections from the ground and water surfaces, sound propagation in the external environment, the sound power levels of noise sources, the height of noise sources above the water surface, etc. Potential cumulative impact will also be assessed.
11. Impact on protected natural objects	Sources of impact: protected natural objects may be affected by impacts arising from the construction, operation, and decommissioning of the offshore wind farm and offshore export cable. This includes taking into account that several protected species (particularly bats, birds, and seals) may migrate through the offshore wind farm area. Estimated significant environmental impact: There are no protected natural objects in the proposed offshore wind farm area. A number of protected areas fall under the impact area of	The impact on protected natural objects will be assessed through spatial layer analysis, and the EIA report will present an expert assessment based on previous studies, the Estonian Nature Information System (EELIS), conducted inventories (including results from surveys carried out within this EIA), species protection action plans, and scientific literature. In assessing the impact on protected natural objects, the sensitivity of the respective features (species) to different impact factors will also be taken into account. In addition to assessing the impact within and around the offshore wind farm area, the impact on protected natural objects located near the shoreline on land will also be

	the proposed wind farm, so the conservation objectives of the protected areas may be affected. Impact area: the impacts are related to the wind farm area and the location of the offshore export cable and their immediate surroundings.	assessed in connection with the installation of the offshore export cable. The cumulative impact on protected natural objects will also be assessed in relation to other developments located in the Gulf of Riga area.
12. Impact on areas within the Natura 2000 network (Natura appropriate assessment)	Sources of impact: Impacts on areas belonging to the Natura 2000 network and their conservation objectives may arise from the construction, operation, and decommissioning of the offshore wind farm and offshore export cable. This includes taking into account that several conservation objectives of Natura 2000 sites (bats, birds, seals) may migrate through the offshore wind farm area. Estimated significant environmental impact: The majority of protected objects in the marine area of the Gulf of Riga and its surroundings are also part of the international Natura 2000 network. They may be affected by sediment transport associated with the proposed activity (suspended solids, coastal processes), icing, habitat alteration, underwater and airborne noise, changes in marine processes and water quality, as well as through food chains (marine organisms,	For the Natura 2000 appropriate assessment, data and map layers from the Estonian Nature Information System (EELIS) will be used, along with completed inventories (including studies conducted as part of this EIA), management plans for nature reserves, and species conservation action plans. A preliminary Natura estimate has been carried out in Chapter 6 of the EIA programme. If, during the preparation of the EIA report, it becomes clear that the impact areas related to the proposed activity are larger than initially estimated and that additional areas may be potentially affected, a Natura appropriate assessment must also be carried out for those areas. Potential cumulative impact will also be assessed.

	fish, birds, bats, and marine mammals). The conservation objectives of Natura 2000 sites (bats, birds, seals) may migrate through the offshore wind farm area and may be at risk due to collision or avoidance of the area. The impact on areas belonging to the Natura 2000 network will be assessed in a separate chapter of the EIA report as part of the Natura appropriate assessment. The results of the Natura preliminary estimate are presented in Chapter 6 of the EIA programme. Impact area: As a result of the Natura preliminary estimate, it was determined that an appropriate assessment must be carried out for the following areas within the Natura 2000 network: Irbe Strait special protection area, Allirahu special area of conservation, Kihnu special area of conservation, Väinameri special area of conservation, Väikes Strait special area of conservation, Irbes šaurums special protection area and special area of conservation, and Rigas lica rietumu piekaste special protection area and special area of conservation, as the impact on these areas cannot be ruled out.	
13. Impact on national defence facilities, maritime	Sources of impact: tall offshore structures (wind turbines and offshore	The impact on national defence facilities will be assessed in cooperation with the Ministry of

surveillance, and ESTER data transmission.	substations) may have a shadowing effect on radars and communication systems, creating a shadow zone behind the turbines. Expected significant environmental impact: the impact on national defence facilities primarily arises during the operational phase of the offshore wind farm, as it may interfere with the functioning of both defence and maritime surveillance radars, as well as ESTER data transmission. According to the MSP, wind turbines must not reduce the operational capability of national air surveillance and maritime monitoring systems; if necessary, compensation mechanisms must be developed and implemented. To prevent situations where structures could pose a security risk, the competent authority and the developer must comply with the coordination requirements set out in the Building Code. Impact area: within and around the offshore wind farm, affecting radar performance at its location onshore.	Defence and the Police and Border Guard Board, taking into account the location of relevant facilities and using line-of-sight analysis. Mitigation measures will be proposed if necessary. According to the MSP, cooperation with the Police and Border Guard Board is required to ensure the operational capability of maritime surveillance radar and maritime radio communication systems, as well as for the protection of the state border. If necessary, a study must be carried out to specify the impact on surveillance radars and to determine appropriate compensation measures. To ensure the operational capability of national air surveillance, cooperation with the Ministry of Defence is required. In the impact assessment process, cooperation will be carried out with the relevant authorities (the Police and Border Guard Board and the Ministry of Defence).
14. Impact on aviation (including helicopters)	Sources of impact: tall offshore structures (wind turbines and offshore substations) may have an impact on air traffic.	The impact of the proposed activity on air traffic, air traffic systems, and nearby airports will be assessed, including consideration of potential flight corridor width, possible weather conditions, aircraft types, and flight speeds. Cooperation will

	Estimated significant environmental impact: The impact on aviation (including potential helicopter traffic such as search and rescue (SAR) and emergency flights, as well as regular flights to Ruhnu) occurs within the offshore wind farm area (not in the cable corridor) and during the operational phase of the wind farm. Impact area: limited to the area of the offshore wind farm.	be carried out with Lennuliiklusteeninduse AS (EANS) and the Latvian Air Traffic Control Centre (LGS). Cumulative impacts in relation to other projects in the area will also be assessed.
15. Impact on vessel traffic and maritime safety	Sources of impact: the above-water structures of the wind farm may interfere with the operation of maritime surveillance radars and create shadow zones behind and between the turbines. Wind turbines also create obstacles, and the offshore export cable imposes anchoring restrictions. Estimated significant environmental impact: Impacts on vessel traffic and maritime safety may occur in all phases of an offshore wind farm (construction, operation, decommissioning). According to the MSP, in the case of overlap with navigation areas, the location of wind turbines and the functioning of maritime traffic must be clarified in cooperation with the Transport Administration,	For the navigation risk analysis, the methodology will be coordinated with the Transport Administration and will be based on IALA regulations (primarily IALA Guideline 1018 on risk management and IALA Recommendation O-139 on the marking of man-made offshore structures. A simulator will be used to identify potentially hazardous situations, and the probability of collisions will be assessed. In addition, the risks associated with denser vessel traffic due to the presence of the offshore wind farm will be assessed separately for both the summer and winter navigation periods, and mitigation measures will be proposed. In addition, the impact of the offshore wind farm on the operation of maritime communication systems and navigation equipment will be assessed. The impact assessment will be carried out in cooperation with the Transport Administration, as required by the MSP.

	based on up-to-date data and by assessing the impact on vessel traffic (including the economic impact of longer routes, increased risk levels due to restricted or intensified traffic, and taking into account the needs of neighbouring countries). To ensure navigational safety, wind turbines will not be placed in fairways, including international fairways and anchorage areas. Anchoring is prohibited in the cable corridor after the installation of the cables, including offshore export cables. Impact area: the impact occurs within and around the offshore wind farm area, and to a lesser extent also within the offshore export cable corridor.	In case of overlap with a navigation area, the width of the buffer zone required to ensure navigational safety must be specified in cooperation with the Transport Administration, based on up-to-date data.
16. Presence of historical unexploded ordnance (UXO)	Sources of impact: Historical unexploded ordnance (UXO) may be present in the offshore wind farm and cable areas, posing a potential hazard during the construction, operation, and decommissioning phases of the wind farm when contact with the seabed occurs. Estimated significant environmental impact: historical unexploded ordnance may be triggered during works in the offshore wind farm area, posing a risk	Using existing data sources, including in cooperation with the Ministry of Defence, the probability of the presence of historical unexploded ordnance (UXO) and other hazardous objects in the offshore wind farm and offshore export cable areas will be assessed. The assessment methodology complies with the requirements of the Maritime Spatial Plan (MSP).

	primarily to human health and property in the vicinity. Impact area: If explosives are present in the offshore wind farm and cable areas, their locations must be identified before construction and they must be rendered harmless.	
17. Possible environmental accidents	Sources of impact: accidents may occur during the construction, operation, and decommissioning of the offshore wind farm, as well as during the installation of the offshore export cable. These may involve offshore wind farm components (wind turbines, offshore substations) and vessels used for the installation, maintenance, and removal of the offshore wind farm and offshore export cable. Estimated significant environmental impact: environmental accidents are expected to primarily affect sea water quality, and their prevention requires the use of properly maintained equipment and adherence to safety regulations. Impact area: the offshore wind farm and offshore export cable area and their immediate surroundings.	During the preparation of the EIA report, oil spill dispersion modelling will be carried out in accordance with the methodology outlined in point 4 of this table.
18. Underwater archaeology	Sources of impact: during the construction phase of the offshore wind farm and offshore export cable, there may be direct physical impacts on cultural heritage objects if their locations are	To detect previously unknown wrecks in the offshore wind farm and cable areas, a full-coverage multibeam sonar survey will be conducted (see items 1 and 2 in this table), based on which man-made objects of at least 1 × 1 m in size will

	not precisely known and offshore wind farm structures or the offshore export cable are planned in those areas. Impact may also occur during construction activities if sediments are dispersed to surrounding areas where cultural heritage objects are located. In addition, access to these sites may be hindered. Estimated significant environmental impact: Historical wrecks may be present in the offshore wind farm and cable area, and their locations must be identified through surveys carried out as part of the EIA. The presence of additional wrecks is also possible. Heritage protection restrictions apply to objects under cultural heritage protection. If cultural heritage is discovered, its preservation and public access must be ensured. Impact area: the offshore wind farm and offshore export cable area (areas related to specific structures).	be identified. If necessary, additional investigations of the identified objects will be carried out using side-scan sonar or diving. The underwater archaeological investigation may be carried out by a company which employs a person with competency certificates in the respective area and who has submitted a notice of economic activity regarding operating in the heritage conservation field (pursuant to Sections 68-69 of the Heritage Conservation Act). Before carrying out the study, the competent person must submit to the National Heritage Board a research plan and notice, and after carrying out the research, a research report (sections 46-48 of the Heritage Conservation Act). Based on the study, an appropriate assessment will be carried out to identify the direct and indirect significant environmental impacts on underwater cultural heritage associated with the construction of the proposed offshore wind farm and its offshore export cable. The impact assessment will be carried out in cooperation with the National Heritage Board.
19. Visual impact	Sources of impact: tall offshore structures (wind turbines and offshore substations) cannot be constructed without being visible. Estimated significant environmental impact: The visual impact will mainly occur during the operational	To assess visual impact, a visualisation and a zone of theoretical visibility (ZTV) analysis of the offshore wind farm will be carried out from the nearest land-based points on Ruhnu, Saaremaa (Vätta Peninsula), and Latvia (Kolka village). For the assessment of visual impacts, the guideline and methodology

	phase of the offshore wind farm and will affect the sea view. The visual impact is influenced by the main parameters of the wind farm (the size and location of the wind turbines, as well as the colour), which can be varied to somewhat mitigate the effects. Impact area: extends to the nearest coastal areas on Ruhnu, the southern coast of Saaremaa, and Cape Kolka in Latvia.	developed during the Estonian Maritime Spatial Plan, titled "Methodological Guidance on the Assessment of Visual Impact to Support the Development of Offshore Wind Farms", will be used. The EIA report will present static 2D visualisations (in accordance with the guideline) from various viewpoints, along with an assessment of the changes to the views. The impact assessment takes into account the guidelines and conditions of the Maritime Spatial Plan (MSP).
20. Socio-economic impact assessment and impact on human health, property, and well-being	Sources of impact: Human health, well-being, and property may primarily be affected by potential noise and visual disturbance (as described in Table points 10 and 19). The impact on the socio-economic environment primarily occurs through the impact on fish stocks (as described in Table point 6), which may in turn affect fishermen and the fishing industry. Tourism, local municipality (through fees) and need for workforce may also be affected. Estimated significant environmental impact: The socio-economic impact of the proposed activity will affect the economy and employment, fisheries (item 6 of the table), and tourism. The impact of the proposed activity on air traffic (regular	To assess the socio-economic impact, various databases (Statistics Estonia, Commercial Register, Tax and Customs Board), relevant previous literature and studies conducted in Estonia, as well as studies carried out within the framework of this EIA, will be used. An expert assessment is prepared, within the framework of which Relevant focus group interviews will be conducted. The cumulative impact must also be assessed.

	Ruhnu–mainland flights and rescue flights; item 14) and maritime connections (point 15) will also be taken into account. Positive impact occurs through fees related to the off-shore wind park (mainly to local municipality), and through additional need for workforce. The impact on human health and well-being will primarily arise from potential noise (item 10 in the table) and visual disturbance (item 17 in the table). The construction of the connection point between the offshore export cable and the subsea–land cable (TJB) may also have impacts, primarily due to noise generated during construction activities. Impact area: estimated to be limited to the rural municipalities of Ruhnu, Saaremaa, and Lääneranna.	
21. Impacts on the climate	Sources of impact: the impact may occur during the construction of the offshore wind farm (climate impact related to component manufacturing), during its operation (local climate effects and contribution to national climate targets), and during decommissioning (disposal of components). Estimated significant environmental impact:	This EIA does not analyse fundamental issues of climate change. The official position of the European Union and therefore also of the Republic of Estonia will used as the basis in the matter of the existence of climate change, the need to mitigate changes and adapt to changes. The impact on climate (including local climate) will be assessed through expert evaluation based on previous studies, scientific literature, and expert assessment.

	Wind farms affect the climate at different levels. Globally and nationally, wind farms provide carbon-free energy, which is estimated to result in a reduction in greenhouse gas emissions. It is possible that wind farms will have a small impact on the local climate during their operational period. Impact area: offshore wind farm area and national level.	Potential cumulative impact will also be assessed.
22. Impact on waste generation	Sources of impact: Waste is estimated to be generated mainly during the construction and decommissioning phases of the offshore wind farm. Estimated significant environmental impact: Waste is generated throughout the life cycle of an offshore wind farm, with the largest amount of waste generated during the construction and decommissioning phases of the offshore wind farm. To reduce environmental impact, waste generation must be minimised and waste should be reused wherever possible. The majority of waste in the offshore wind farm will be generated during the decommissioning phase, when the structures (including turbines) must be disposed of. As a large share of turbine components are reusable or recyclable, waste from the structures must be	The EIA report will include a life cycle analysis (LCA) of the wind turbine and an assessment of potential emissions of microplastics and bisphenol A.

	collected separately by type during decommissioning. If waste management is properly organised, it is not estimated to have a significant environmental impact. Several possibilities of decommissioning are possible for foundations (removal from several heights), depending on certain conditions and possible environmental impact of decommissioning. This will be determined during the preparation of the decommissioning plan. Impact area: primarily waste management sites.	

The conditions and guidelines set in the Maritime Spatial Plan are discussed in the subchapters of chapter 4.

5.3. Cumulative impact

In addition to the offshore wind farm development in the Liivi 1 and 2 marine areas and its related infrastructure, several other offshore wind farms are planned in the Gulf of Riga (Saare-Liivi 4 and 5 offshore wind farms, as well as Tuuletraal wind farm, the Gulf of Riga offshore wind farm, and an adjacent area by Liivi Offshore OÜ), which may result in cumulative impacts.(Figure 2.1). As of May 2025, the EIA reports for Utilitas Wind OÜ's Saare-Liivi offshore wind farm and Liivi Offshore OÜ's Gulf of Riga offshore wind farm have been made public, and sufficient baseline data are available for assessing the cumulative impact on the Liivi 0102 marine area and offshore export cable. Cumulative impact may also arise from the offshore export cable required to connect the proposed offshore wind farm and the submarine cable proposed for the Estonia–Latvia 4th electricity interconnection in the Paatsalu area. (Figure 3.2). If, by the time this EIA report is prepared, any other planned development in the Gulf of Riga area (including any of the developments mentioned below) reaches the stage of EIA report publication, these will also be taken into account in the cumulative impact assessment.

By the time of preparing this EIA programme (May 2025), the following two applications for superficies licences initiated in the Gulf of Riga area had not yet reached the EIA report preparation stage. These include the planned fibre-optic communication cable for the area of the proposed activity (Kakumäe–EEZ (Estonian territorial sea boundary)), for which Eastern Light AB submitted an application for a superficies licence on 24 April 2018 under reference No 16-7/18-1251. On 4 March 2025, the Consumer Protection and Technical Regulatory Authority sent the company a draft decision to refuse the granting of the superficies licence by letter 16-7/18-1251-042. The EIA for the Tuuletraal offshore wind farm has also been initiated, but the EIA programme has not yet been approved as being in compliance with the requirements.

According to the Estonian Maritime Spatial Plan, the cumulative impact must be taken into account in the development of offshore wind farms and offshore export cables as follows:

- When multiple wind farms are planned simultaneously, their cumulative visual impact must be assessed. Where possible, cumulative impact is also assessed in relation to other wind farms prposed in the same area.
- To assess noise-related impacts (during construction, operation, and decommissioning), focusing primarily on underwater noise, but also addressing airborne noise. To carry out noise modelling and, where possible, take into account other existing and proposed wind farms in the area.
- To assess the potential significant adverse impacts of emitted thermal energy, possible magnetic fields, and vibrations related to the structures. If necessary, carry out modelling and, in doing so, take into account other existing and, where possible, proposed wind farms and infrastructure in the area.
- In the planning of wind farms, the cumulative impact of turbines and cables (both internal and external to the wind farm) on the marine area must be assessed.
- At the superficies licence stage, the significant adverse environmental impacts of the proposed activity, including cumulative environmental impacts in relation to nearby structures and installations, must be assessed when planning the installation of wind farm cables.

The EIA report outlines the potential cumulative impact of the proposed Liivi 1 and 2 offshore wind farms and their offshore export cable, arising from their construction, operation and decommissioning, in view of the scale of the associated environmental impacts. The assessment considers possible cumulative impacts with other offshore wind farms and marine cables in the surrounding area, including impacts related to noise, birds, bats, underwater noise and vibration (including impacts on fish), as well as other factors likely to result in significant cumulative impacts. If modelling is indicated as the basis for assessment in Table 5.2.1, it will also be applied in the assessment of cumulative impacts.

All offshore wind farm and cable projects falling within the impact area of the Liivi 1 and 2 offshore wind farm and related infrastructure will be assessed cumulatively, as well as other proposed projects with similar overlapping impacts, provided they have reached at least the same stage of assessment by the time the EIA report is prepared – meaning that data from studies conducted and published for the other project can be taken into account. The list of such projects known at the time of preparing the EIA programme is provided at the beginning of this sub-chapter. The exact list of projects will be determined during the impact assessment process in the course of the EIA report.

6. NATURA 2000 PRE-ASSESSMENT

Natura 2000 is a pan-European network of nature reserves, the objectives and principles of which are set out in the European Union's Habitats Directive adopted in 1992 (92/43/EEC). The same directive established that special protection areas, designated under the Birds Directive, which entered into force in 1979 (2009/147/EC), are also part of the Natura 2000 network. The aim of the network is to protect rare and endangered animal and plant species and their habitats, and, where necessary, to restore the favourable conservation status of threatened species and habitats across Europe (Ministry of Climate, 2025).

During the EIA, a Natura 2000 appropriate assessment will be prepared on the basis of Article 6(3) and (4) of the Habitats Directive 92/43/EEC. According to the Environmental Impact Assessment and Environmental Management System Act (KeHJS) and the Nature Conservation Act (LKS), Natura 2000 appropriate assessment in Estonia is carried out as part of the EIA. In this EIA programme, a Natura 2000 pre-assessment will first be carried out, based on existing information (Natura Standard Data Form, EELIS, national environmental monitoring data, etc.). If the pre-assessment indicates that the proposed activity, either alone or in combination with other activities, is likely to have adverse impact on the conservation objectives of a Natura 2000 site, a Natura 2000 appropriate assessment will also be prepared as part of the EIA report. The likelihood of adverse impacts will be assessed based on the conservation objectives of the site. The impact of the proposed activity is considered adverse if it leads to a deterioration in the condition of the conservation objectives of Natura 2000 sites or if those objectives cannot be achieved as a result of the proposed activity (Ministry of Climate, 2025).

The Natura 2000 assessment procedure is based on the European Commission guidance document "Assessment of plans and projects significantly affecting Natura 2000 sites. Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC, as well as the guideline "Instructions for conducting Natura assessments under Article 6(3) of the Habitats Directive in Estonia" (Kutsar et al, 2019), and the European Commission guidance "Guidance document on wind energy developments and EU nature legislation" (2020). A Natura 2000 pre-assessment is necessary to determine whether the project may affect areas belonging to the Natura 2000 network and to assess whether the project (including in combination with other plans and projects) is likely to have an adverse impact on the conservation objectives of a Natura 2000 site.

If an adverse impact on a Natura 2000 site from the proposed activity cannot be ruled out, a Natura 2000 appropriate assessment must be included in the EIA report

6.1. Information about the proposed activity

The proposed activity involves the construction of an offshore wind farm in the Liivi 1 and Liivi 2 marine areas, along with the infrastructure necessary for its operation and an offshore export cable from the Liivi 1 and 2 areas to the Paatsalu area. The offshore wind farm will consist of up to 145 turbines with a total nominal capacity of up to 2,300 MW and a maximum tip height of 400 m above sea level. The minimum wind turbine blade clearance from mean high sea level must be at least 25 m. In addition to the turbines, the wind farm will include offshore substations, inter-array cables within the farm, offshore export cables leading toward the Paatsalu area, and onshore connection cables and a substation. It may also be necessary to build a reactive compensation station on land. The EIA covers the marine area of the proposed activity up to the landfall point of the connection cable. The superficies licence is to be applied for a period of 50 years The turbines have an estimated lifespan of 20–30 years, and the developer wants to connect the wind farm to the electricity network by 2035. The objective, location (including a location map), and a detailed description of the proposed activity are provided in Chapters 1 and 2 of the EIA programme.

The proposed activity is not connected with or necessary for achieving the protection goals of Natura 2000 sites.

1.1. Description of other projects that may significantly affect Natura 2000 network sites

In addition to the proposed activity – the construction of an offshore wind farm in the Liivi 1 and Liivi 2 marine areas and connecting it with Estonian main land with offshore export cable – three other offshore wind farms and one nearshore wind farm are planned in the Gulf of Riga (Table 6.1). The Estonia–Latvia 4th electricity interconnection is also planned in the Paatsalu area under a national designated spatial plan, as described in Chapter 3.17 of the EIA programme.

Table 6.1. Offshore wind farms planned in the Gulf of Riga for which the superficies licence procedure has been initiated or the auction has been won (Estonian Wind Power Association, 2025; Consumer Protection and Technical Regulatory Authority's superficies licence applications, 2025).

Company	Site	Capacity	Project start
Liivi Offshore OÜ	Liivi lahe offshore wind farm	1,000 MW	2010
Liivi Offshore OÜ	Liivi Offshore OÜ liitala	2,010 MW	2021
Five Wind Energy OÜ	Nasva (coastal)	4 MW	2011
Tuuletraal OÜ	Tuuletraal	380 MW	2013
Utilitas Wind OÜ	Utilitas Wind Saare-Liivi 4	1,200 MW	2020
Utilitas Wind OÜ	Utilitas Wind Saare-Liivi 5	1,200 MW	2021
AS Elering	Estonia–Latvia 4th electricity interconnection	-	2024

6.2. Natura 2000 areas within the impact area of the proposed activity

The following Natura 2000 network sites are within the potential impact area of the proposed offshore wind farm and cable corridor: Kura kurgu special protection area, Ruhnu special area of conservation, Gretagrund special area of conservation, Allirahu special area of conservation, Kihnu special area of conservation, Väinameri special area of conservation, Väinameri special protection area, Kahtla-Kübassaare special protection area and special area of conservation, Pärnu Bay special protection area, Väike Väin special area of conservation, Varbla special area of conservation, Rīgas līča rietumu piekraste special protection and conservation area (western coast of the Gulf of Riga), and Irbes šaurums special protection and conservation area (Irbe Strait) (Figure 6.1).

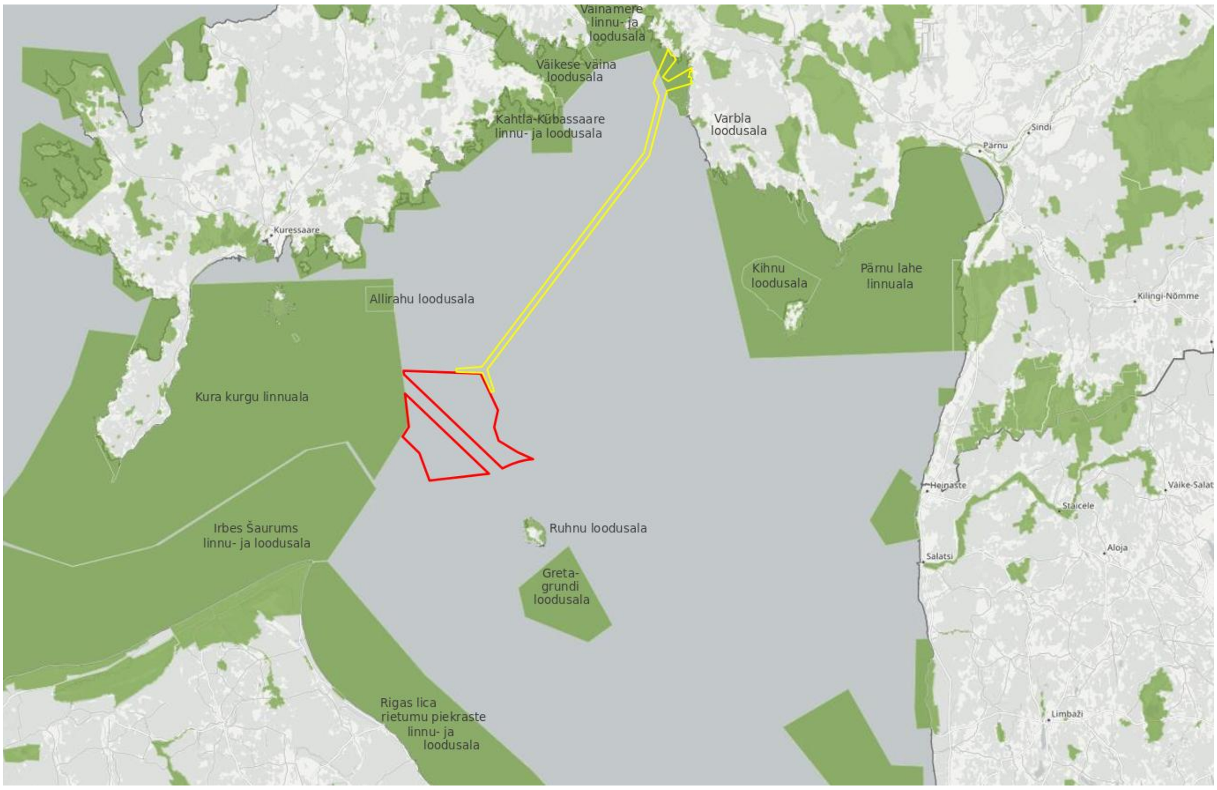


Figure 6.1. Protected Natura 2000 special protection areas and special areas of conversation within the impact area of the proposed wind farm and its offshore export cable (Natura Standard Data Form, 2023).

The conservation objectives of the above-mentioned areas, along with the forecast of potential impacts on them, are presented in Table 6.2.

Table 6.2. Natura 2000 sites located in the area and the anticipated impact of the proposed activity on their conservation objectives.

Site	Conservation objectives	Impact forecast	Results of the Natura 2000 preliminary estimate
Kura kurgu special protection area (EE0040434)	Bird species: *Alca torda, Anas acuta, Anas clypeata, Anas crecca, Anas penelope, Anas platyrhynchos, Anas strepera, Anser anser, Ardea cinerea, Arenaria interpres, Aythya marila, Branta bernicla, Branta leucopsis, Bucephala clangula, Calidris alpina schinzii, Calidris canutus, Calidris minuta, Cepphus grylle, Charadrius hiaticula, Clangula hyemalis, Cygnus columbianus bewickii, Cygnus olor, Gavia stellata, Haliaeetus albicilla, Larus fuscus, Limosa lapponica, Melanitta fusca, Mergus albellus, Mergus merganser, Mergus serrator, Phalacrocorax carbo, Pluvialis squatarola, Podiceps auritus, Podiceps*	The Kura kurgu special protection area is not located within the proposed offshore wind farm area, but directly borders it to the northwest along a stretch of approximately 9 km. Therefore, it is likely that the proposed activity will affect the special protection area through both construction-phase disturbances (noise, ground vibrations, dispersion of suspended	A Natura 2000 appropriate assessment must be carried out during the preparation of the EIA report.

	cristatus, Recurvirostra avosetta, Somateria mollissima, Sterna caspia, Tringa erythropus.	solids) and operational-phase activities (e.g. collision risk). Therefore, the proposed activity may significantly impact the bird species that are the conservation objectives of the Kura kurgu special protection area.	
Ruhnu special area of conservation (EE0040462)	**Habitat types:** large shallow inlets and bays (1160), vegetated sea cliffs of the Atlantic and Baltic coasts (1230), Boreal Baltic islets and small islands (1620), Boreal Baltic coastal meadows (*1630), Baltic sandy beaches with perennial vegetation (1640), embryonic shifting dunes (2110), shifting dunes along the shoreline with Ammophila arenaria (white dunes – 2120), fixed coastal dunes with herbaceous vegetation (*grey dunes – *2130), wooded dunes of the Atlantic, Continental and Boreal region (2180), Juniperus communis formations on heaths or calcareous grasslands (5130), semi-natural dry grasslands and scrubland facies on calcareous substrates (*important orchid sites – *6210), western broad-leaved forests (*9020), Fennoscandian herb-rich spruce forests (9050), Fennoscandian deciduous swamp woods (*9080), and transition mires and quaking bogs (*91D0).	The terrestrial communities of the special area of conservation will not be affected by the construction and operation of the proposed offshore wind farm, as it is located at least 11 km away. Impacts on coastal habitats and coastal processes are also unlikely. Construction-phase impacts may reach the marine habitats of the special area of conservation to a limited extent (e.g. dispersion of suspended solids, ground vibrations), but due to the considerable distance from the proposed activity, adverse impacts are ruled out. This is also supported by modelling results from previous EIAs conducted in the Gulf of Riga (Skepast & Puhkim OÜ, 2024; Roheplaan OÜ, 2025).	The special area of conservation is not located within the impact area of the proposed activity. Adverse impact is excluded.
Gretagrund special area of conservation (EE0040500)	**Habitat types:** sandbanks which are slightly covered by sea water all the time (1110) and reefs (1170).	The Gretagrund special area of conservation does not overlap with the wind farm area or the cable corridor. They are also not located in the immediate vicinity of the Getagrund special area of conservation (minimum distance of	The special area of conservation is not located within the impact area of the proposed activity. Adverse impact is excluded.

		17.4 km and 32.7 km, respectively).	
Allirahu special area of conservation (EE0040402)	**Habitat types**: reefs (1170), Boreal Baltic islets and small islands (1620). **Mammal species:** Grey seal (*Halichoerus grypus*).	The Allirahu special area of conservation does not overlap with the wind farm area or the cable corridor. They are also not located in the immediate vicinity of the special area of conservation (minimum distance of 10 km and 17 km, respectively). One of the conservation objectives of the Allirahu special area of conservation is the protection of the grey seal and its habitats. Underwater noise will be temporary during the construction period, near the construction site. The noise from vessel traffic associated with construction does not differ from that of other ships in the area; the main source of noise is pile driving, which generates impulsive noise. Given the wide-ranging movements and noise sensitivity of the grey seal, the proposed activity may have an adverse impact on the species.	A Natura 2000 appropriate assessment must be carried out during the preparation of the EIA report.
Kihnu special area of conservation (EE0040313)	**Habitat types**: sandbanks (1110), coastal lagoons (*1150), annual vegetation of drift lines (1210), Boreal baltic islets and small islands (1620), boreal baltic coastal meadows (*1630), boreal baltic sandy beaches with perennial vegetation (1640), Shifting dunes along the shoreline with Ammophila arenaria (white dunes) – 2120), fixed coastal dunes with herbaceous vegetation (grey dunes) – *2130), Wooded dunes of the Atlantic, Continental and Boreal region – (2180), Juniperus communis formations on	The Kihnu special area of conservation does not overlap with the area of the proposed activity. The special area of conservation is located 28 km and 46.7 km from the proposed offshore wind farm and its cable corridor, respectively. Due to the long distance and terrestrial location, adverse impacts on the plant species listed as	A Natura 2000 appropriate assessment must be carried out during the preparation of the EIA report.

	heaths or calcareous grasslands (5130), semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) – 6210), Fennoscandian lowland species-rich dry to mesic grasslands (*6270), Nordic alvar and precambrian calcareous flatrocks – *6280), Molinia meadows on calcareous, peaty or clayey-silt- laden soils (Molinion caeruleae) (6410), hydrophilous tall herb fringe communities of plains and of the montane to alpine levels (6430), Fennoscandian wooded meadows (*6530), alkaline fens (7230), Western taiga(*9010), Fennoscandian wooded pastures (9070) and Fennoscandian deciduous swamp woods (*9080). **Mammal species:** grey seal (*Halichoerus grypus*), ringed seal (*Phoca hispida bottnica*). **Plant species**: *Angelica palustris* and *Liparis loeselii*.	conservation objectives are also ruled out. One of the conservation objectives of the Kihnu special area of conservation is the protection of grey seals and ringed seals and their habitats. Underwater noise will be temporary during construction and near the construction site. The noise from vessel traffic associated with construction does not differ from that of other ships in the area; the main source of noise is pile driving, which generates impulsive noise. Given the wide-ranging movements and noise sensitivity of seals, the proposed activity may have an adverse impact on the species.	
Väinameri special area of conservation (EE0040002)	**Habitat types**: sandbanks which are slightly covered by sea water all the time (1110), estuaries (1130), mudflats and sandflats not covered by seawater at low tide (1140), coastal lagoons (*1150), large shallow inlets and bays (1160), reefs (1170), annual vegetation of drift lines (1210), perennial vegetation of stony banks (1220), vegetated sea cliffs of the Atlantic and Baltic coasts (1230), Salicornia and other annuals colonising mud and sand (1310), Boreal Baltic islets and small islands (1620), Boreal Baltic coastal meadows (*1630), Baltic sandy beaches with perennial vegetation (1640), water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation (3260), European dry heaths (4030), Juniperus communis formations on heaths or calcareous grasslands (5130), semi-natural dry grasslands and scrubland facies on calcareous substrates (*important orchid sites – *6210), species-rich Nardus grasslands	The proposed offshore wind farm is located at least 57 km from the special area of conservation, which eliminates direct physical impacts on the area's conservation objectives. However, the proposed offshore wind farm cable corridor passes through at least a 3.6 km section of the southeastern part of the Väinameri special area of conservation before reaching land, where several habitat types listed as conservation objectives are present (mainly 1110 and 1160). The habitats of the plant species listed as conservation objectives – *Angelica palustris* and	A Natura 2000 appropriate assessment must be carried out during the preparation of the EIA report.

	on siliceous substrates in mountain areas (*6270), alvar grasslands (*6280), Molinia meadows on calcareous, peaty or clayey-silt-laden soils (6410), hydrophilous tall herb fringe communities of plains and of the montane to alpine levels (6430), lowland hay meadows (6450), lowland meadows with Alopecurus pratensis and Sanguisorba officinalis (6510), wooded meadows (*6530), raised bogs (*7110), petrifying springs with tufa formation (Cratoneurion) (7160), calcareous fens with Cladium mariscus and species of the Caricion davallianae (*7210), petrifying springs with tufa formation (*7220), alkaline fens (7230), calcareous rocky slopes with chasmophytic vegetation (8210), Western Taïga (*9010), old broad-leaved forests (*9020), Fennoscandian herb-rich spruce forests (9050), Fennoscandian wooded pastures (9070), Fennoscandian deciduous swamp woods (*9080), Tilio-Acerion forests of slopes, screes and ravines (*9180), transition mires and quaking bogs (*91D0), and alluvial forests with Alnus glutinosa and Fraxinus excelsior (*91E0). Animal species: *Halichoerus grypus, Lutra lutra, Myotis dasycneme, Phoca hispida bottnica, Cobitis taenia, Cottus gobio, Lampetra fluviatilis, Misgurnus fossilis, Euphydryas aurinia, Hypodryas maturna, Unio crassus, Vertigo angustior, Vertigo genesii, Vertigo geyeri.* Plant species: *Angelica palustris, Cypripedium calceolus, Dianthus arenarius subsp. arenarius, Dicranum viride, Encalypta mutica, Liparis loeselii, Sisymbrium supinum, Thesium ebracteatum, Tortella rigens.*	*Cypripedium calceolus* – are also located in the cable corridor landfall area, along with several other protected plant species. One of the conservation objectives of the Väinameri special area of conservation is the protection of grey seals and ringed seals and their habitats. Underwater noise will be temporary during construction and near the construction site. The noise from vessel traffic associated with construction does not differ from that of other ships in the area; the main source of noise is pile driving, which generates impulsive noise. Given the wide-ranging movements and noise sensitivity of seals, the proposed activity may have an adverse impact on the species. As the construction phase of the proposed activity may cause various disturbances (direct impact on underwater habitats, dispersion of sediments and suspended solids, ground vibrations, etc.), an adverse impact on fish species listed as conservation objectives is also possible.	
Väinameri special protection area (EE0040001)	Bird species: *Anas acuta, Anas clypeata, Anas crecca, Anas penelope, Anas platyrhynchos, Anas querquedula, Anas strepera, Anser albifrons, Anser anser, Anser erythropus, Anser fabalis, Ardea cinerea, Arenaria interpres, Asio flammeus, Aythya ferina, Aythya fuligula, Aythya marila, Botaurus*	The proposed offshore wind farm is located at least 57 km from the special protection area, but its cable corridor passes through a section of at least 3.6 km in the southeastern part of the	The special protection area is not located within the impact area of the proposed activity. Adverse impact is excluded.

	stellaris, Branta bernicla, Branta leucopsis, Bubo bubo, Bucephala clangula, Calidris alpina schinzii, Calidris canutus, Charadrius dubius, Charadrius hiaticula, Chlidonias niger, Ciconia ciconia, Circus aeruginosus, Circus cyaneus, Clangula hyemalis, Crex crex, Cygnus columbianus bewickii, Cygnus cygnus, Cygnus olor, Dendrocopos leucotos, Emberiza hortulana, Fulica atra, Gallinago media, Glaucidium passerinum, Grus grus, Haliaeetus albicilla, Lanius collurio, Larus canus, Larus fuscus, Larus ridibundus, Limicola falcinellus, Limosa lapponica, Limosa limosa, Melanitta fusca, Melanitta nigra, Mergus albellus, Mergus merganser, Mergus serrator, Numenius arquata, Phalacrocorax carbo, Philomachus pugnax, Picus canus, Pluvialis squatarola, Podiceps cristatus, Porzana parva, Porzana porzana, Recurvirostra avosetta, Somateria mollissima, Sterna albifrons, Sterna caspia, Sterna hirundo, Sterna paradisaea, Sterna sandvicensis, Sylvia nisoria, Tetrao tetrix, Tringa erythropus, Tringa glareola, Tringa nebularia, Tringa totanus, Vanellus vanellus.	Väinameri special protection area before reaching land, where habitats and feeding grounds of several bird species listed as conservation objectives are located. When assessing the potential adverse impact of the offshore wind farm during construction and operation on the site's conservation objectives, the high mobility of birds must be taken into account. However, there is a sufficient distance (over 50 km) between the proposed activity and the special protection area. The offshore export cable corridor of the proposed activity passes closer, but its impacts on birds will only occur during the cable installation phase (airborne noise), which is comparable to regular vessel traffic and is temporary. Adverse disturbances from the Liivi 1 and 2 marine areas do not reach the special protection area.	
Kahtla-Kübassaare special protection area and special area of conservation (EE0040412)	**Habitat types:** sandbanks which are slightly covered by sea water all the time (1110), mudflats and sandflats not covered by seawater at low tide (1140), coastal lagoons (*1150), large shallow inlets and bays (1160), reefs (1170), annual vegetation of drift lines (1210), perennial vegetation of stony banks (1220), vegetated sea cliffs of the Atlantic and Baltic coasts (1230), Boreal Baltic islets and small islands (1620), Boreal Baltic coastal meadows (*1630), Juniperus communis formations on heaths or calcareous grasslands (5130), semi-natural dry grasslands and scrubland facies on calcareous substrates (*important orchid sites – *6210), alvar grasslands (*6280), Molinia meadows on calcareous, peaty	The proposed offshore wind farm is located at least 33.5 km from the special protection area and special area of conservation, but its cable corridor lies as close as 5.5 km from the site at its nearest point (mainly involving habitat types 1160 and 1170). Therefore, significant adverse impacts on habitat types that are the conservation objective are excluded. When assessing the potential adverse impact of the offshore wind	The special protection area and special area of conservation are not located within the impact area of the proposed activity. Adverse impact is excluded.

	or clayey-silt-laden soils (6410), wooded meadows (*6530), calcareous fens with Cladium mariscus and species of the Caricion davallianae (*7210), alkaline fens (7230), Western Taïga (*9010), old broad-leaved forests (*9020), and Fennoscandian deciduous swamp woods (*9080). **Bird species:** *Podiceps cristatus, Podiceps grisegena, Podiceps auritus, Phalacrocorax carbo, Cygnus olor, Cygnus columbianus bewickii, Anser anser, Branta leucopsis, Anas penelope, Anas strepera, Anas platyrhynchos, Anas acuta, Anas querquedula, Anas clypeata, Aythya ferina, Aythya fuligula, Somateria mollissima, Clangula hyemalis, Melanitta fusca, Bucephala clangula, Mergus albellus, Mergus serrator, Mergus merganser, Circus aeruginosus, Fulica atra, Grus grus, Recurvirostra avosetta, Charadrius hiaticula, Vanellus vanellus, Calidris alpina schinzii, Limosa limosa, Tringa totanus, Larus minutus, Larus ridibundus, Larus canus, Larus fuscus, Sterna caspia, Sterna sandvicensis, Sterna hirundo, Sterna paradisaea, Sterna albifrons, Lullula arborea, Sylvia nisoria, Lanius collurio.*	farm during construction and operation on the site's conservation objectives, the high mobility of birds must be taken into account. However, there is a sufficient distance (over 30 km) between the proposed activity and the special protection area. The offshore export cable corridor of the proposed activity passes closer, but its impacts on birds will only occur during the cable installation phase (airborne noise), which is comparable to regular vessel traffic and is temporary. Adverse disturbances from the Liivi 1 and 2 marine areas do not reach the special protection area and special area of conservation.	
Pärnu Bay special protection area (EE0040346)	Bird species: *Acrocephalus arundinaceus, Anas acuta, Anas clypeata, Anas crecca, Anas penelope, Anas platyrhynchos, Anas querquedula, Anas strepera, Anser albifrons, Anser anser, Anser fabalis, Arenaria interpres, Asio flammeus, Aythya fuligula, Aythya marila, Branta leucopsis, Bucephala clangula, Calidris alpina schinzii, Charadrius hiaticula, Circus aeruginosus, Clangula hyemalis, Cygnus columbianus bewickii, Cygnus cygnus, Cygnus olor, Larus canus, Larus fuscus, Larus ridibundus, Limosa limosa, Melanitta fusca, Melanitta nigra, Mergus merganser, Mergus serrator, Phalacrocorax carbo, Philomachus pugnax, Podiceps cristatus, Somateria mollissima, Sterna albifrons, Sterna hirundo, Sterna paradisaea, Sterna sandvicensis, Tringa erythropus, Tringa totanus, Vanellus vanellus.*	The Pärnu Bay special protection area is located at a minimum distance of 41.2 km from the proposed wind farm and 12.9 km from its cable corridor. There are thus no direct physical impacts to the area's conservation objectives. When assessing the potential adverse impact of the offshore wind farm during construction and operation on the site's conservation objectives, the mobile nature of birds must be taken into account; however, the distance involved (over 40 km) is sufficient. The offshore export cable corridor of the proposed activity passes closer to the area, but potential	The special protection area is not located within the impact area of the proposed activity. Adverse impact is excluded.

		impacts on birds are limited to the cable installation phase (airborne noise), which does not differ from regular vessel traffic and is temporary; moreover, there is a minimum distance of 10 km between the nearest point of the cable and the special protection area. Adverse disturbances from the Liivi 1 and 2 marine areas do not reach the special protection area.	
Varbla special area of conservation (EE0040352)	**Habitat types**: perennial vegetation of stony banks (1220), Boreal Baltic coastal meadows (*1630), Juniperus communis formations on heaths or calcareous grasslands (5130), Old broad-leaved forests (*9020), Fennoscandian deciduous swamp woods (*9080).	The Varbla special area of conservation is located at a minimum distance of 55.3 km from the proposed offshore wind farm and at a minimum distance of 5.7 km from the cable corridor. Due to the large distance, the impact of the offshore wind farm on conservation objectives is excluded. The impact of the construction of the cable corridor on terrestrial habitat types has also been ruled out.	The special area of conservation is not located within the impact area of the proposed activity. Adverse impacts are excluded and no appropriate assessment of Natura 2000 will be carried out.
Väike Strait's special area of conservation (EE0040486)	**Habitat types:** sandbanks which are slightly covered by sea water all the time (1110), coastal lagoons (*1150), large shallow inlets and bays (1160), annual vegetation of drift lines (1210), vegetated sea cliffs of the Atlantic and Baltic coasts (1230), Salicornia and other annuals colonising mud and sand (1310), Boreal Baltic islets and small islands (1620), Boreal Baltic coastal meadows (*1630), Juniperus communis formations on heaths or calcareous grasslands (5130), semi-natural dry grasslands and scrubland facies on calcareous substrates (*important orchid sites – *6210), species-rich Nardus grasslands on siliceous substrates in mountain areas (*6270), alvar grasslands (*6280), wooded meadows (*6530), calcareous fens with Cladium mariscus and species of the	The proposed offshore wind farm is located at least 47 km from the special area of conservation and 9.7 km from its cable corridor, which rules out any direct physical impacts on the site's conservation objectives. Due to the distance from the proposed activity, indirect impacts on habitat types that are the conservation objective are also ruled out. The plant species listed as conservation	As part of the EIA report, an appropriate Natura assessment must be conducted.

	Caricion davallianae (*7210), alkaline fens (7230), Western Taïga (*9010), old broad-leaved forests (*9020), and Fennoscandian wooded pastures (9070). **Plant species:** *Angelica palustris*, *Cypripedium calceolus*, *Sisymbrium supinum*. **Mammal species:** ringed seal (*Phoca hispida bottnica*).	objectives are located at least 10 km inland from the cable corridor, which excludes any adverse impacts from the proposed activity on their habitats. One of the conservation objectives of the Väinameri special area of conservation is the protection of the ringed seal and its habitats. Underwater noise will be temporary during construction and near the construction site. The noise from vessel traffic associated with construction does not differ from that of other ships in the area; the main source of noise is pile driving, which generates impulsive noise. Given the wide-ranging movements and noise sensitivity of seals, the proposed activity may adversely impact them, as construction may cause various disturbances (sediment and suspended solids dispersion, ground vibrations, underwater noise, etc.).	
Rigas lica rietumu piekrate special protection area and special area of conservation (LV0900400)	**Habitat type:** sandbanks which are slightly covered by sea water all the time (1110) and reefs (1170). **Bird species:** *Alca torda, Anas crecca, Anas penelope, Aythya ferina, Aythya fuligula, Aythya marila, Bucephala clangula, Chlidonias niger, Clangula hyemalis, Cygnus cygnus, Cygnus olor, Fulica atra, Gavia arctica, Gavia stellata, Haliaeetus albicilla, Larus minutus, Larus ridibundus, Melanitta fusca, Melanitta nigra, Mergellus albellus, Mergus merganser, Mergus serrator, Phalacrocorax carbo, Podiceps cristatus, Podiceps grisegena, Sterna*	The proposed offshore wind farm is located at least 21 km from the Rigas lica rietumu piekaste special protection area and special area of conservation, which is estimated to rule out direct impacts on the special protection area and its conservation objectives during construction. The impact during service-life (collision risk) may also	A Natura 2000 appropriate assessment must be carried out during the preparation of the EIA report.

	caspia, Sterna hirundo, Sterna sandvicensis, Tadorna tadorna.	have adverse impact on the species that are the conservation objective of the Vilsandi special protection area.	
Irbes šaurums special protection area and special area of conservation (LV0900300)	**Habitat type:** Reefs (1170). **Bird species:** *Alca torda, Aythya fuligula, Aythya marila, Bucephala clangula, Cepphus grylle, Clangula hyemalis, Cygnus cygnus, Cygnus olor, Gavia arctica, Gavia stellata, Haliaeetus albicilla, Larus minutus, Larus ridibundus, Melanitta fusca, Melanitta nigra, Mergellus albellus, Mergus merganser, Mergus serrator, Phalacrocorax carbo, Podiceps cristatus, Sterna caspia, Sterna hirundo, Sterna sandvicensis, Tadorna tadorn*a.	The proposed offshore wind farm is located at least 9.5 km from the Irbes šaurums special protection area and special area of conservation, conceptually serving as a continuation of the Irbe Strait special protection area on the territory of the Republic of Latvia. Therefore, disturbances during construction (e.g. noise, dispersion of suspended solids) as well as effects during service-life (risk of collision) that may impact the species that are the conservation objective of the special protection area may occur.	A Natura 2000 appropriate assessment must be carried out during the preparation of the EIA report.

6.3. Summary of the Natura 2000 pre-assessment

The Natura 2000 pre-assessment identified special protection areas and special areas of conservation within the Natura 2000 network that could potentially be adversely impacted by the proposed activity. A pre-assessment was also made of the construction, operation and decommissioning impacts of the proposed offshore wind farm and its cable corridor on the conservation objectives of Natura 2000 special protection areas and special area of conservations. The pre-assessment identified the areas for which a Natura 2000 appropriate assessment must be carried out in the EIA report. These are Kura Kurgu special protection area, Allirahu special area of conservation, Kihnu special area of conservation, Väinameri special area of conservation, Väikes Strait special area of conservation, Irbes šaurums special protection area and special area of conservation, and Rigas lica rietumu piekaste special protection area and special area of conservation. If, during the preparation of the EIA report, it becomes clear that the impact area of the proposed activity is wider, it may be necessary to prepare more Natura 2000 appropriate assessments in the EIA report. In most cases, the need for a Natura 2000 appropriate assessment arises from potential adverse impacts on bird and seal species listed as conservation objectives. Due to the high mobility of these (species)/Birds and seals, the area of potential negative impacts is much wider than for defined habitat types and plant species, although these are also conservation objectives of the sites.

7. THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS AND SCHEDULE

The EIA schedule depends on many factors, and therefore cannot be precisely fixed in the EIA programme. Table 7.1 describes the EIA process and provides an approximate schedule for the procedural stages. The schedule will be specified according to how the procedural steps are completed. The exact information on public involvement and the exact time and place of public consultations will be determined in accordance with the procedure provided for in the law (KeHJS).

Table 7.1. Proposed activities under the EIA and their expected schedule. The stages of the transboundary environmental impact assessment are in italics.

NO.		ACTIVITY	IMPLEMENTER	DATE/TIME
1		Decision to initiate the EIA, *notification of potentially affected countries in the case of transboundary EIA*	Decision-maker, *Ministry of Climate*	6.3.2024 (Liivi 2) and 9.4.2024 (Liivi 1)
2	PROGRAMME	Preparation and submission of the EIA programme to the decision-maker	Expert and developer	12.2024–5.2025.
3		Verification of the EIA programme's compliance with requirements	Decision-maker	Within 10 days after receiving the programme (KeHJS subsection 1 of § 16 of KeHJS)
4		Notification of public display and public consultation of the EIA programme	Decision-maker	Within 14 days after the compliance check (subsections 2 and 3 of § 16 of KeHJS)
		Agreement on the consultation procedure with the affected state and transmission of the draft EIA programme to the affected state	*Ministry of Climate*	At the latest, upon the initiation of the publication of the EIA programme, the affected country has 30 days to respond (subsections 5 and 6 of § 30 of KeHJS).
5		Public display of the EIA programme	Decision-maker	At least 21 days (subsection 1 of § 16 of KeHJS) (expected July-August, 2025)
6		Public consultation on the EIA programme	Expert and developer in collaboration with the decision-maker	Will take place after the public display of the programme, (expected August 2025)
		Latvian stakeholders will be introduced to the EIA programme at a web meeting to make the programme public	*Ministry of Climate*	*Expected 22.7.2025*
7		Reviewing and presenting a position on the proposals, objections and questions received regarding the EIA programme, as well as the positions of the authorities concerned	Decision-maker	Within 14 days after the public consultation (subsection 1 of § 17 of KeHJS)
8		Responding to letters received at the public display and to questions left unanswered at the public consultation. If necessary, improve and supplement the EIA programme and submit it to the decision-maker	Expert and developer	Responding to letters received within 21 days after the public consultation (subsection 3 of § 17 of KeHJS). Submit the programme to the decision-maker no later than 8.10.2025
9		Verification of the EIA programme's compliance with requirements	Decision-maker	Within 30 days after receiving the programme (subsection 2 of § 18 of KeHJS)

10		Notification of the decision to declare the EIA programme compliant with requirements	Decision-maker	Within 14 days after the decision is made subsection 4 of § 18 of KeHJS)
11	REPORT	Preparation of the EIA report based on the EIA programme that meets the requirements and submission to the decision-maker	Expert and developer	2 years
12		Verification of the EIA report’s compliance with requirements	Decision-maker	Within 14 days after receiving the report (subsection 2 of § 21 of KeHJS)
13		Notification of public display and public consultation of the EIA programme	Decision-maker	Within 14 days after the compliance check (subsection 1 of § 21, subsections 2 and 3 of § 16 of KeHJS)
		Agreeing on a consultation procedure with the affected state and forwarding the draft EIA report to the affected state	*Ministry of Climate*	At the latest, upon the initiation of the publication of the EIA report, the affected country has 30 days to respond (subsections 5 and 6 of § 30 of KeHJS).
14		Public display of the EIA report	Decision-maker	At least 30 days (subsection 3 of § 21 of KeHJS)
15		Public consultation on the EIA report	Expert and developer in collaboration with the decision-maker	Takes place after the report is publicly displayed
16		Reviewing and presenting a position on the proposals, objections and questions received regarding the EIA report, as well as the positions of the authorities concerned	Decision-maker	Within 21 days after the public consultation (subsection 4 of § 21 of KeHJS)
17		Responding to letters received at the public display and to questions left unanswered at the public consultation	Expert and developer	Within 30 days after the public consultation (subsection 5 of § 21 of KeHJS)
18		Submission of the EIA report for verifying conformity to the requirements	Expert and developer	Within 6 months after the public consultation of the report (subsection 1 of § 22 of KeHJS)
19		Verification of the EIA report’s compliance with requirements	Decision-maker	Within 30 days after receiving approvals from the authorities concerned (subsection 5 of § 22 of KeHJS)
20		Notification of the decision to declare the EIA report compliant with requirements	Decision-maker	Within 14 days after the decision is made (subsection 7 of § 22 of KeHJS)

* If the developer has not, within 18 months from the initiation of the EIA, submitted to the decision-maker the EIA programme for the purpose of verifying compliance with the requirements, the decision-maker does not review the development consent application serving as the basis for the initiation of the environmental impact assessment and returns it to the developer (subsection 7 of § 18 of KeHJS).

** If the decision-maker finds that the EIA programme does not comply with the requirements verified in accordance with subsection 2 of § 18 of KeHJS, the developer must submit to the decision-maker a modified programme for the purpose of verifying compliance with the requirements (subsection 6 of § 18 of KeHJS).

*** If the developer fails to submit the EIA report to the decision-maker for public display within two years after the making of the decision to declare the EIA programme compliant, the programme expires and a new programme must be prepared in order to assess the environmental impact (subsection 8 of § 18 of KeHJS).

** If the decision-maker determines that the EIA report does not meet the requirements subject to verification under subsection 5 of § 22 of the Environmental Impact Assessment and Environmental Management System Act, the developer must submit a revised report to the decision-maker for compliance verification (subsection 9 of § 22 of KeHJS).

8. DEVELOPER, DECISION-MAKER, LEADING EXPERT, AND EXPERT GROUP COMPOSITION

Developer:

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Decision-maker:

Consumer Protection and Technical Regulatory Authority
Endla 10a, Tallinn 10122
Registry code: 70003218
Contact person: Hanna-Liis
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Expert:

OÜ Inseneribüroo STEIGER
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11216 Tallinn
Registry code: 11206437
Contact person: Aadu Niidas
Environmental Expert
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Email: aadu@steiger.ee

Composition of the expert group:

Aadu Niidas (Bachelor's degree in Natural Sciences with a specialisation in science education (environmental specialist) and a Master's degree in Geoecology from Tallinn University) works as an environmental expert (licence KMH 0145, valid until 26 October 2029) and has served as leading expert in environmental impact assessments since 2012. In the present **EIA procedure, he leads the expert team** and prepares the **Natura appropriate assessment**.

Priit Kallaste (Bachelor's and Master's degrees in Engineering Sciences, specialising in Chemical and Environmental Protection Technology) has been assessing environmental impacts as an environmental specialist since 2016 and as a leading expert since 2023. He conducts ambient air modelling (noise levels, pollutants) and prepares blasting safety calculations in the course of various impact assessments and expert evaluations. As part of the environmental impact assessment, he **assesses** the compliance of **ambient noise** generated by the proposed activity with applicable standards.

Anna-Helena Purre (PhD in Ecology, and Bachelor's and Master's degrees in Geoecology from Tallinn University) has been assessing environmental impacts as an environmental specialist since 2018 and as a leading expert since 2023. In her doctoral thesis, she studied vegetation development and carbon dioxide fluxes on drained, mined, and subsequently rehabilitated peatlands. She assesses the **impact on climate** as part of the environmental impact assessment.

Martin Küttim (PhD in Ecology and Bachelor's and Master's degrees in Geoecology from Tallinn University) works as an environmental specialist and has been assessing environmental impacts since 2021. He is also a researcher at the Centre for Ecology at Tallinn University, and his main research areas are related to peatland and forest ecosystems. He assesses the **impact on waste generation** as part of the environmental impact assessment.

Üllar Rammul (Diploma in Biology and Master's degree in Biology–Zoology in the field of Natural Sciences) works as an environmental specialist and has been assessing environmental impacts in his field since 2016. He is also a lecturer at Tallinn University of Technology, where his main responsibilities include teaching courses in zoology (invertebrate and vertebrate animals), environmental protection, and sustainable development. From 2010 to 2015, he worked in the Nature Conservation Department of the Ministry of the Environment and served as Estonia's focal point for the Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA), leading and coordinating the management of protected natural objects (mainly species' protection sites of bird species), including the preparation of draft legislation and strategic documents and the coordination of their implementation. In the environmental impact assessment, he consolidates the impact assessments for fauna, **protected natural objects**, and **cumulative impacts with other activities**.

Hannes Tõnisson (Diploma in science education, a Bachelor's and Master's degree in Geoecology, and a PhD in Ecology (coastal geology). He works as a senior researcher at the Centre for Ecology of Tallinn University. He assesses the i**mpact of the proposed activities on marine processes and the development of surrounding coastal areas (at the cable landfall site).**

Redik Eschbaum (MSc in Ichthyology and Fisheries) is the head of the coastal fisheries working group at the Estonian Marine Institute of the University of Tartu. He has participated in the preparation of several EIAs and SEAs as a fish and fisheries expert and as an organiser of related studies. Projects include the Saaremaa fixed link, the Estonian Maritime Spatial Plan, offshore wind farm impact assessments, dredging and construction of various ports, and marine mineral extraction, among others. In environmental impact assessments, he evaluates the **impact on fisheries, fish, and their habitats**, taking into account potential spawning areas and access to them.

Aleksander Klauson (Candidate of Physical and Mathematical Sciences, 1981) is Professor of Structural Mechanics at the Department of Civil Engineering and Architecture of Tallinn University of Technology. He assesses the **impact of underwater noise and vibration** associated with the proposed activity.

Rain Männikus (Chartered Port Construction Engineer, PhD in Environmental and Coastal Engineering, 2021, Tallinn University of Technology) is a senior researcher at the Wave Dynamics Laboratory of Tallinn University of Technology and a consultant at OÜ Lainemudel. He worked as a designer at OÜ Estkonsult from 2013 to 2021 and as a port development consultant at AS Saarte Liinid from 2021 to 2024. **He assesses wind conditions and models wave dynamics and the dispersion of suspended solids** at the Liivi 1 and 2 sites.

Rafal Siuchno (MSc in Biology, specialising in Environmental Biology, 2018; ornithology expert) leads the documentation and environmental analysis of radar- and aircraft-based bird studies in the Baltic Sea region. He has conducted and analysed ornithological studies for offshore wind farms, prepared environmental documentation, and assessed environmental impacts since 2017. He assesses the **impact on birdlife.**

Krzysztof Gajko (MSc in Engineering Sciences (Environmental Protection(, 2000; expert in bird data modelling). He has experience in coordinating and conducting environmental studies, modelling bird–turbine collision risk, modelling seabird density, and preparing environmental documentation. Since 2017, he has coordinated bird studies in environmental impact assessments for offshore wind farm projects. He assesses the **impact on birdlife.**

Rauno Kalda (MSc in Zoology and Hydrobiology) has studied the distribution and ecology of bats and has conducted bat surveys and impact assessments in several environmental impact assessments for wind farms, including offshore wind farms. He assesses the impact on bats.

Mart Jüssi (PhD in Animal Ecology) has research experience related to seals and serves as a member and expert on several relevant committees, including HELCOM, ICES, and NAMMCO. He has experience conducting marine mammal studies and impact assessments in several offshore wind farm environmental impact assessments. He assesses the **impact on marine mammals**.

Georg Martin (PhD in Botany and Ecology) has studied phytobenthic communities in the Gulf of Riga and has research experience in seabed biota and sea water quality. He is also a member and expert of several relevant committees, including HELCOM and ICES. He has experience in conducting studies and impact assessments related to the seabed, its biota, and sea water quality in several offshore wind farm environmental impact assessments. He assesses the **impact on phytobenthos, zoobenthos, and sea water quality** (including the effects of suspended solids, nutrients, and pollutants on water quality).

Inga Zaitseva-Pärnaste (PhD in Civil and Environmental Engineering) has studied the wave climate of the Baltic Sea and has prepared navigation risk analyses for offshore wind farms. She is a member of the PIANC Maritime Navigation Commission. She assesses the **impact of the wind farm on vessel traffic, maritime communication and surveillance systems, AIS equipment, and ship radars**.

Kaja Paat (Bachelor's degree in Applied Architecture from Tallinn University of Applied Sciences; five years of engineering studies at the Faculty of Chemistry, Tallinn University of Technology) works as a drafter. She creates visualisations of the **offshore wind farm and assesses its visual impact**.

Ivar Treffner (Master's degree in Archaeology, competency certificate as a responsible specialist issued by the National Heritage Board, No. 1101/2022) has over 20 years of experience in marine archaeology in both Estonia and abroad. He is a marine archaeology researcher at the Estonian Maritime Museum. **He assesses the impact on heritage objects (underwater archaeology).**

Arkadiy Tsyrulnikov (PhD in Natural and Technological Sciences in Geology from the University of Tartu; Diploma in Engineering Geology in Geology from Moscow State University of Geological Prospecting (MGRI)) works as a marine geology expert. He has assessed the geological and geophysical quality of the seabed for the Liivi Offshore OÜ offshore wind farm in the Gulf of Riga and has advised numerous offshore wind farm developers on marine geology and geophysics. His doctoral research focused on the geological structure and development of the seabed in the Gulf of Riga. He assesses the **impact on seabed sediments** as part of the environmental impact assessment.

Valdur Lahtvee (Forest Management Engineer, with a degree recognised as equivalent to a Master's in Natural Sciences) is a registered environmental auditor and has been involved in strategic planning, policy development, and impact assessment in the fields of environment, sustainable development, climate, and energy for over 30 years. He is a founder and member of the Estonian Association for Environmental Impact Assessment. As a licensed environmental impact assessor, he has prepared environmental impact assessments and strategic environmental assessments for several industrial facilities and national development plans. He assesses the **socio-economic impact, and the impact on human health, well-being, and property** associated with the proposed activity as part of the environmental impact assessment.

Anti Purre has extensive experience in aviation and the military sector (communications, radars, munitions). Having worked for an extended period with Thales on air and maritime surveillance radars, as well as with EANS and Thales Air Traffic Management on WAM and DME systems, he assesses the **impact on communication and surveillance systems, as well as on air traffic**. He also coordinates the impact assessment in cooperation with the relevant authorities. In addition to assessing the impact of offshore wind farms on the use of PPA SAR helicopters, he is also responsible for assessing the **impact of historical underwater UXO** (unexploded ordnance).

Siim Pärt (PhD in Oceanography and Meteorology from TalTech; Master's degree in Aquatic Ecology from the University of Tartu) works as an engineer at the Department of Marine Systems of Tallinn University of Technology. He is specialised in oil pollution. He models and assesses the **potential spread of pollution** associated with the construction of the offshore wind farm.

If necessary, other experts will be involved in the work.

9. PUBLIC PARTICIPATION AND OVERVIEW OF THE PUBLICATION OF THE EIA PROGRAMME

The decision-maker has the competence and duty to publicise the environmental impact assessment and to inform the parties involved in the procedure (§ 16 of KehJS). Together with the developer, the expert group has compiled a list of stakeholders (Table 9.1) who, based on the EIA initiation decisions, are either connected to the proposed activity or potentially interested in it. Based on this, the decision-maker decides which parties to notify.

Table 9.1. List of potentially interested authorities and individuals (AC – authority concerned).

Party	Role	Justification
Ruhnu Municipality Government	AC	Local government located within the impact area of the wind farm
Saaremaa Municipality Government	AC	Local government located within the impact area of the wind farm
Lääneranna Municipality Government		Local government at the landfall point of the wind farm's offshore export cable
Ministry of Economic Affairs and Communications	AC	Spatial planning
Ministry of Climate	AC	Transboundary environmental impact, energy, nature conservation, maritime affairs, aviation
Environmental Board	AC	Nature conservation
Estonian Environment Agency	AC	National environmental monitoring, climate
Geological Survey of Estonia	AC	Mineral resources, marine geology
Estonian Transport Administration	AC	Maritime affairs, aviation
Ministry of Regional Affairs and Agriculture	AC	Fishery
Agriculture and Food Board	AC	Commercial fishing
Ministry of Defence	AC	Operational capacity of national defence structures
Defence Forces	AC	Marine pollution, UXOs
Ministry of the Interior	AC	Internal security
The IT and Development Centre of the Ministry of the Interior	AC	ESTER radio communication system
Police and Border Guard Board	AC	Maritime search and rescue, marine pollution
Estonian Rescue Board	AC	Rescue and explosive ordnance disposal operations
Estonian Health Board	AC	Healthcare
National Heritage Board	AC	Cultural assets, including underwater cultural heritage
ELERING AS	AC	Electrical system operator
Estonian Council of Environmental NGOs	Public	Association of NGOs Promoting Environmental Protection
MTÜ Eesti Kalurite Liit	Public	Association representing the interests of fishers
MTÜ Liivi Lahe Kalanduskogu	Public	Association representing the interests of fishers
MTÜ Saarte Kalandus	Public	Association representing the interests of fishers
MTÜ Saare Rannarahva Selts	Public	Association representing local interests

MTÜ Koovi Külaselts	Public	Association representing local interests
MTÜ Elurikkuse Kaitse	Public	Association representing local interests
MTÜ Karala-Pilguse Hoiuala Selts	Public	Association representing local interests
Residents of the region (including residents of Ruhnu Island)	Public	Interests of local residents
Authorities of other countries (transboundary EIA)	AC	Potentially affected state
Companies (OÜ Utilitas Wind, Liivi Offshore OÜ, Tuuletraal OÜ, Eastern Light AB)	Public	Business interests

10. TRANSBOUNDARY ENVIRONMENTAL IMPACT ASSESSMENT

Considering the size and location of the proposed wind farm, approximately 8 km from the maritime border of the Republic of Latvia, it may be an activity with potential transboundary impacts and therefore requires a transboundary environmental impact assessment.

Transboundary environmental impact may occur as follows:

- Possible adverse transboundary environmental impact on birdlife and fish during the construction and operation of the offshore wind farm may arise from migration barriers as well as the loss of feeding and stopover sites.
- Possible adverse transboundary environmental impacts on fish and seals during the construction phase of the proposed activities (noise, etc).
- Possible adverse visual impact. The proposed offshore wind farm will be located *at the nearest point* at a distance of 8 km from the border of the Latvia territorial waters and 25 km from Latvia land area. This is not expected to be a significant impact.
- Potential adverse impacts on transport routes and radars.

A more detailed assessment of the transboundary environmental impact will be carried out in the EIA report, also taking into account the feedback received from the countries involved (Table 10.1).

The environmental impact assessment in a transboundary context is organised in accordance with procedure set forth in 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 of environmental impact assessment in a transboundary context and the involvement are managed by the Ministry of Climate; all relevant notification and feedback documents are provided in the annex of this document.

Following the initiation of the superficies licence by the Consumer Protection and Technical Regulatory Authority and the EIA process, the Ministry of Climate sent a notification on 30 April 2024 by letter No 6-3/24/1948-2 to neighbouring countries (the Republic of Latvia, the Republic of Lithuania, the Kingdom of Sweden, and the Republic of Finland) in accordance with the Convention on Environmental Impact Assessment in a Transboundary Context (Espoo Convention), concerning the proposed Liivi 1 and Liivi 2 offshore wind farm project. A summary of the feedback provided by the neighbouring countries in response to the EIA initiation notice is presented in Table 10.1.

Replies were received from the Republic of Latvia, the Republic of Lithuania (18 June 2024, letter No 6-3/24/1948-3) and the Republic of Finland (19 June 2024, letter No 6-3/24/1948-4). The Republic of Latvia wishes to participate in the present EIA procedure (letter of 26 June 2024, No 5-05/833/2024). The Republic of Finland would like to receive further information before a final decision on participation is made, and they will also receive an EIA programme. The Republic of Lithuania stated that they do not wish to participate in the transboundary involvement process, but would like feedback on the final decision of the EIA process. The Kingdom of Sweden did not respond to the notification letter but had received the information letter. As a result of the engagement between the Espoo Convention contact points, it has been decided to hold a public consultation (online) on the EIA programme with the Latvian parties in addition to the public display of the EIA programme in July 2025. In addition, the developer has held informal online meetings with various Latvian authorities to present the project and collect feedback and materials from the Latvian side.

Table 10.1. Feedback from neighbouring countries on the assessment of potential transboundary environmental impacts following the initiation of the EIA programme

Topic in need of attention	EIA response
REPUBLIC OF LATVIA Letter of 26 June 2024, No 5-05/833/2024	
The Environment State Bureau of Latvia notified by letter No 5-05/833/2024 of 26 June 2024 that Latvia wishes to participate in the EIA and transboundary consultations as an affected state	The proposal will be taken into account.
The Ministry of Environmental Protection and Regional Development	
During the two-year project *LIFE19 NAT/LV/000973 REEF "Research of marine protected habitats in the EEZ and determination of the necessary conservation status in Latvia"*, led by the Nature Conservation Agency of the Republic of Latvia, bird surveys were carried out in the Baltic Sea over the Latvian Exclusive Economic Zone. It is recommended that the results of the project be taken into account in the preparation of the EIA.	The proposal will be taken into account. In order to assess the impact of the proposed activity on bird populations at the population level, inventories and studies conducted in the vicinity of the proposed offshore wind farm, including the results of the aforementioned project, will be taken into account.
The Ministry of Transport of the Republic of Latvia	
Take into account the areas reserved for shipping defined in the Latvian maritime spatial plan	The proposal will be taken into account.
The Ministry of Agriculture of the Republic of Latvia	
The project may affect the interests of Latvian fishermen, as they also fish in the waters of the exclusive economic zone of the Republic of Estonian and exploit the same fish stocks. During the EIA process, it would be necessary to assess the impact of the establishment of offshore wind farms on marine habitats, fish migration and spawning grounds.	Within the framework of the EIA, appropriate surveys and studies are carried out by recognised Estonian experts, including a survey of fish population and spawning grounds and a survey of marine habitats.
The Ministry of Health of the Republic of Latvia	
The proposed activity will not have an impact on human health.	The opinion will be taken into account.

The State Environmental Service	
It is also necessary to assess the impact of the project in the context of the Latvian maritime spatial plan.	The proposal will be taken into account.
The Irbes šaurums special protection area and special area of conservation, which forms part of the Natura 2000 network, is located near the proposed offshore wind farm and is important for the protection of birds, bats, fish, marine mammals, and their habitats.	Relevant surveys of biota and habitats will be carried out during the EIA, and the impact of the proposed activity on them will be assessed. As part of the EIA, an appropriate assessment under the Natura 2000 framework will also be carried out to assess the impacts of the proposed activity on the conservation objectives of the Irbes šaurums Special Protection Area and Special Area of Conservation.
Cape Kolka is a scenically beautiful area located 20–35 km from the wind farm. The wind turbines may be visible from there, including flicker effects caused by the rotation of the blades.	As part of the EIA, views of the wind farm from the Latvian side will also be modelled and the visual impact assessed.
Assess current practice in preventing pollution risks (eg with petroleum products) during the construction and operation of wind farms	The proposal will be taken into account.
Assess the risks associated with the proposed infrastructure and their consequences, for example in the event of malicious damage.	Risks related to the infrastructure are prevented during technical planning (e.g. by using technical solutions to avoid fires and structural collapse, covering the offshore export cable with sediments, etc).
The Kurzeme Planning Region	
The proposed wind farm could have a significant impact on navigation safety, vessel traffic areas in the Baltic Sea, access to Latvian ports and potential risks of marine pollution associated with accidents or collisions between ships, which may have an impact on the Baltic Sea and its habitats.	The EIA addresses the impact on navigation systems, maritime communication systems, vessel traffic, and air and maritime safety. An appropriately detailed risk assessment is part of the EIA.
The Nature Conservation Agency of the Republic of Latvia	
The conservation objectives of the special protection areas and special areas of conservation “Rīgas līča rietumu piekraste” (LV0900400) and “Irbes šaurums” (LV0900300) may potentially be impacted by the proposed activity, and the impact of the wind farm on them – particularly on birds – must be assessed.	Relevant surveys of biota and habitats will be carried out during the EIA, and the impact of the proposed activity on them will be assessed. As part of the EIA, an appropriate assessment under the Natura 2000 framework will also be carried out to assess the impacts of the proposed activity on the conservation objectives of the above-mentioned Natura 2000 sites.
According to the DIVER project, “Rīgas līča rietumu piekraste” is an important area for divers (*Gavia sp.*). Published studies have already shown that wind farms have a significant negative impact on the habitats and migratory success of red-throated divers (*Gavia stellata*).	Relevant surveys of biota and habitats will be carried out during the EIA, and the impact of the proposed activity on them, including on bird species, will be assessed. The red-throated diver (Gavia stellata) is one of the conservation objectives of the “Rīgas līča rietumu piekraste” special protection area and special area of conservation (LV0900400), and will therefore be addressed in the Natura 2000 appropriate assessment carried out as part of the EIA.
The Irbes šaurums special protection area and special area of conservation is an internationally important bird	As part of the EIA, an appropriate assessment under the Natura 2000 framework will be carried

habitat, serving as a key wintering area and stopover site during migration, and forming a so-called migration "bottleneck". In assessing the potential impacts of the wind farm, it is essential to consider and evaluate the impacts on migratory and wintering birds. Construction work should be scheduled for the summer period to minimise the impact on wintering birds.	out to evaluate the impacts of the proposed activity on the conservation objectives of the Irbes šaurums special protection area and special area of conservation, including the wintering and migration of birds. The proposal to schedule construction work for the summer period will be taken into account.
Potential cumulative impacts with the ELWIND wind farm must be assessed, particularly from the perspective of wintering and migratory birds.	The assessment of cumulative impacts is part of the EIA process and will be carried out in accordance with the present programme. The studies for the ELWIND wind farm are expected to be completed by the time the cumulative impact assessment is carried out. The cumulative impacts of the Liivi 1 and Liivi 2 offshore wind farms and the ELWIND offshore wind farm will also be taken into account in the EIA cumulative impact assessment of the ELWIND offshore wind farm, in accordance with the approved programme.
REPUBLIC OF LITHUANIA (18 June 2024, Letter No. 6-3/24/1948-3)	
The Ministry of Environment of the Republic of Lithuania notified by letter No 6-3/24/1948-3 of 18 June 2024 that Lithuania does not wish to participate in the EIA and transboundary consultations as an affected state but wishes to be kept informed about the development process of the Liivi 1 and Liivi 2 offshore wind farms.	The proposal will be taken into account.
REPUBLIC OF FINLAND (19 June 2024, Letter No. 6-3/24/1948-4)	
The Finnish Environment Institute notified by letter No 6-3/24/1948-4 of 19 June 2024 that Finland will decide on its participation in the EIA process after the publication of the EIA programme.	The proposal will be taken into account.
KINGDOM OF SWEDEN	
The Kingdom of Sweden was informed of the opportunity to participate in the EIA process; however, no response presenting a position was received from the Kingdom of Sweden following the initiation of the EIA.	Until a position on participation in the EIA process is received from the Kingdom of Sweden, it will be assumed that Sweden is not an affected party in relation to the proposed activity. If a relevant position is received from Sweden, it will be considered, in line with the progress of the EIA process, to what extent the views and proposals of the Kingdom of Sweden can be taken into account.

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