Coastal Research and Planning Institute

Environmental Impact Assessment Programme for the Installation and Operation of the Offshore Wind Farm of up to 700 MW Installed Capacity in Lithuania's Marine Territory

Year of the document:	2021
Organiser (Developer) of the proposed economic activity	**Ministry of Energy of the Republic of Lithuania**
Developer of the Environmental Impact Assessment Programme:	**Public Institution Coastal Research and Planning Institute**

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Proposed economic activity:	**Installation and Operation of the Offshore Wind Farm of up to 700 MW Installed Capacity**
Site for the proposed economic activity:	Resolution of the Government of the Republic of Lithuania No. 697 of 22 June 2020 "On the Identification of the Priority Parts of Lithuania's Territorial Sea and/or the Lithuanian Exclusive Economic Zone in the Baltic Sea Where a Tender (Tenders) for the Development and Operation of Power Plants Using Renewable Energy Sources is (are) Expedient and on the Measurement of the Installed Capacities of Such Power Plants"
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ABBREVIATIONS

EPA	Environmental Protection Agency
RES	Renewable energy sources
MoE	Ministry of the Environment
IHPA	Important Habitat Protection Area
CPTRL	Comprehensive Plan of the Territory of the Republic of Lithuania
EC	European Commission
MSFD	Marine strategy framework directives
LR	Republic of Lithuania
LRS	Seimas of the Republic of Lithuania
LRV	Government of the Republic of Lithuania
MW	Megawatts
IBPA	Important Bird Protection Area
EIA	Environmental Impact Assessment
PHIA	Public Health Impact Assessment
PEA	Proposed economic activity
SEA	Strategic Environmental Assessment
TS	Transformer substation
WT	Wind turbine

INTRODUCTION

The offshore wind park in the Baltic Sea is one of the most important projects envisaged in the National Energy Independence Strategy, which will increase the production of local electricity from renewable energy sources and reduce dependence on electricity imports.[1] Paragraph 25.1.3 of the National Energy Independence Strategy provides for that energy production from wind energy in the Baltic Sea after 2020 is to be conducted, taking into consideration, including but not limited to, the research carried out and other actions taken which are required for the adoption of decisions regarding territories which are appropriate for organisation of tenders and for identification of the installed capacity of power plants. The Government of the Republic of Lithuania, by its Resolution no. 697 of 22 June 2020 "On the Identification of the Priority Parts of Lithuania's Territorial Sea and/or the Lithuanian Exclusive Economic Zone in the Baltic Sea Where a Tender (Tenders) for the Development and Operation of Power Plants Using Renewable Energy Sources is (are) Expedient and on the Measurement of the Installed Capacities of Such Power Plants" (hereinafter – the LRV Resolution) has identified the part of Lithuania's territorial sea where a tender (tenders) for the development and operation of power plants using renewable energy sources is (are) expedient by 2030, as well the type of power plants to be deployed, i.e., wind turbines, and has measured the installed capacity of such power plants, i.e., up to 700 MW.

PEA meets the type of activity specified in Article 3.8.1 of Annex 2 to the Law of the Republic of Lithuania on Environmental Impact Assessment of Proposed Economic Activities no. XIII-529 of 27 June 2017 (hereinafter – the EIA Law): wind power plants where three wind power plants are installed, with the height of at least one of them being 50 metres (measured to the highest point of the structure) or more which is subject to screening for environmental impact assessment in accordance with Article 7 (2) of the EIA Law. Given the nature of the PEA, the environmental sensitivity of a locality, and the necessity of studies, the EIA is conducted in accordance with Article 7 (11) of the EIA Law: The organiser (developer) of the PEA or the drafter of documents may commence the EIA without the procedure of screening for EIA.

Pursuant to the EIA Law, the objectives of environmental impact assessment are as follows:

- To determine, describe, and assess the potential direct and indirect effects of the PEA, i.e., installation and operation of the offshore WT farm of up to 700 MW capacity in the marine territory approved by the LRV Resolution, on the following elements of the environment: soil, land surface and subsurface, air, water, climate, landscape and biodiversity, focusing in particular on species and natural habitats of Community interest, also on other species protected by the Law of the Republic of Lithuania on the Protected Species of Fauna, Flora and Fungi, material assets, immovable cultural valuables and the interrelationship between these elements;
- To identify, describe and assess the potential direct and indirect effects of biological, chemical and physical factors caused by the PEA on public health, also on the interrelationship between elements of the environment and public health;
- To determine the potential impact of the PEA on the elements of the environment and on public health by virtue of the risk of vulnerability of the PEA due to emergency events and/or potential emergencies;
- To determine the measures to be taken in order to prevent envisaged significant adverse impact on the environment and public health, to reduce it or, if possible, to offset it;
- To determine whether the PEA, having assessed its nature, location and/or effect on the environment, meets the requirements of environmental protection, public health, immovable cultural heritage protection, fire and civil protection legislation.

[1] The PEA, approved by Resolution of the Seimas of the Republic of Lithuania no. No. XI-2133 of 26 June 2012 "On Approval of the National Energy Independence Strategy."

Participants of the EIA process are as follows:

- Organiser (Developer) of the PEA;
- Drafter of the EIA documents;
- The public concerned;
- Entities of the EIA. Pursuant to Article 5 of the EIA Law, entities of the EIA are as follows: the executive institution of the municipality in the territory whereof the PEA is to be carried out, the institutions authorised by the Minister of Health, the institutions authorised by the Minister of the Interior responsible for fire and civil protection, the institutions authorised by the Minister of Culture responsible for the protection of cultural properties.

  The PEA territory, approved by the LRV Resolution, is not a part of territories of the coastal municipalities and is located approximately 29.5 km from the costline. Neither does this EIA include construction of electricity transmission lines to the shore (as proposed under other separate projects). The EIA Programme is submitted for approval to the following entities of the EIA responsible for the administration of coastal zone areas closest to the PEA territory:

  - Palanga Municipality Administration;
  - Klaipeda District Municipality Administration;
  - Klaipeda City Municipality Administration;
  - Klaipeda Department of National Public Health Centre under The Ministry of Health;
  - Fire and Rescue Service of Klaipeda County;
  - Klaipeda Branch of the Department of Cultural Heritage under the Ministry of Culture.

  Pursuant to Article 5 (2) of the EIA Law, entities of the EIA may also be other state institutions if, during the examination of documents of environmental impact assessment, the Competent Authority, having regard to the nature, size or location of the PEA, invites them in accordance with the procedure established by the Minister of Environment to participate in the process of environmental impact assessment.
- The Competent Authority is the Environmental Protection Agency (hereinafter – the EPA).

The EIA Programme is drawn up with a view to providing information on the PEA, its location, nature, capacity, likely impact on the environment, and, accordingly, determining the content of the report, the scope of the assessment, and the issues to be examined.

The EIA Programme has been drawn up in accordance with the Procedure for Environmental Impact Assessment of Proposed Economic Activities (hereinafter – the Procedure)[2]

The public shall be informed about the drawn up EIA Programme (and later - throughout the EIA process) in accordance with the Chapter V of the Procedure "Procedure for Provision of Information to the Public and Participation in the Process of Environmental Impact Assessment." During the EIA process of the PEA, the public concerned shall have the right to submit any proposals, comments, information, analysis, opinion on the PEA and its EIA to the drafter of EIA documents, EIA entities, and the Agency in accordance with the procedure laid down in Chapter V of the Procedure.

[2] Approved by Order of the Minister of Environment of the Republic of Lithuania no. D1-885 of 31 October 2017 "On Approval of the Procedure for Environmental Impact Assessment of Proposed Economic Activities."

1. INFORMATION ON THE PROPOSED ECONOMIC ACTIVITY

The proposed economic activity is installation and operation of the offshore WT farm of up to 700 MW installed capacity in the marine territory of the Baltic Sea approved by the LRV Resolution.

The specification for the procurement of document preparation services for the environmental impact assessment procedures for the wind turbines to be deployed in Lithuania's marine territory defines the PEA as the totality of offshore wind turbines, their foundations, and electricity transmission system up to the offshore substation, including the offshore transformer substation.

Electricity will be generated in the WT farm by means of the offshore WTs and by transmitting the energy produced to the electricity network.

1.1. Physical and Technical Characteristics of the Proposed Economic Activity

The primary offshore WTs had a maximum capacity of 1 MW. Today, the market offers offshore WT models of up to 16 MW. WT technology is evolving constantly and quite rapidly, so, much more powerful models may emerge on the market by the date of construction, therefore, WT with a capacity of up to 20 MW or more can be expected during the implementation of this offshore wind farm project.

The height of an offshore wind tower depends on the capacity of the selected model, wind class of the locality, and environmental conditions (sea depth, etc.)

During the technical design phase, on the basis of the Developer's data and the specified wind speed parameters, the most suitable WTs will be selected and physico-technical parameters of the WTs, including their power, will be provided.

A wind power plant consists of three main components: a gondola, with an embedded turbine, a rotor, with spinning blades, and a tower, with its foundation.

A *gondola* is fitted with the WT's main components (generator, gearbox, and control cabinet) which run the generator and transform the rotor's rotation energy into the three-phase variable electric power.

WT blades spin the rotor which transforms the kinetic energy of wind into the rotary energy and transmits it to a gearbox which actuates a generator.

A *tower* is bearing tubular steel structure, the housing of which is equipped with a shaft, designed for gondola service and energy transmission, and a power transformer, which equalises a variable electrical energy and transmits it to the substation.

Wind Turbine Foundation Structures

A specific type of a WT foundation to be chosen depends on a manufacturer's requirements, as well as on geological and hydrodynamic conditions of the proposed location.

Monopile structures are used at depths up to 50 m. Piles are driven up into the seabed until the required insertion depth is reached, which depends on geological and hydrodynamic conditions. Such foundation affects the minimal area of the bottom; however, pile-driving works cause noise. The effect is short-time, however, due to its high intensity and wide-spread occurrence during the installation of the foundation, is quite significant for living organisms that have and use their hearing organs for communication. Because of the type of structure, local bottom depression may occur, while the seabed may become an artificial reef for marine organisms.

Tripods are used in intermediate-depth waters (20–80 m) and consist of three 'legs' connected to the service core which is bearing the WT foundation. Each leg of the tripod is attached to the bottom using a separate pile. Due to a relatively wider structure, pile penetration into the seabed is smaller. The effect on the seabed is combined, i.e., similar to the effect of the mono-pile and gravity-based structures.

Jacket foundations vary – they may have three or four corner piles. The structure itself is permeable, therefore, it fits well for 20 to 50 m depths. It is exposed to lower wave-impact loads. This is a highly reliable structure (though, expensive) which is rather widely used for construction of offshore platforms or offshore transformers substations.

Gravity-based foundation is used in shallow waters (0–30 m) and consists of a big and heavy steel or concrete base which is lowered right onto the seabed. A base of such type of foundation is large-sized and, as a result, affects the largest possible area of the bottom, facilitates the formation of artificial reefs, and may cause much more serious destructions of local benthic communities.

The choice of the type of offshore WT foundation will depend on the depth, geological and hydrodynamic conditions of the seabed to be installed. The type of foundation will be chosen by the developer after detailed research of the seabed during the preparation of the technical design of the WT farm. Only then the developer will choose the most appropriate and effective solution for the specific park and bottom conditions.

A B C D

Fig. 1.1.1. Conventional offshore WT foundations: (A) Monopile (Source: Dillinger Hütte); (B) Tripod, and (C) Frame (Source: Alpha Ventus), (D) Gravity-based base (Source: Luc van Braekel).

The choice of foundation determines what area of natural substrate will be affected during the construction of the foundation and how hydrodynamic conditions of the proposed location will change.

Electricity Transmission Solutions

A chain of medium and high voltage electrical power lines, step-up transformers, and substations is necessary so that to transform and transmit the generated electricity to the grids managed by the electricity transmission system operator LITGRID AB. Connection of the offshore transformer substation to the onshore one is not proposed or considered under the this EIA.

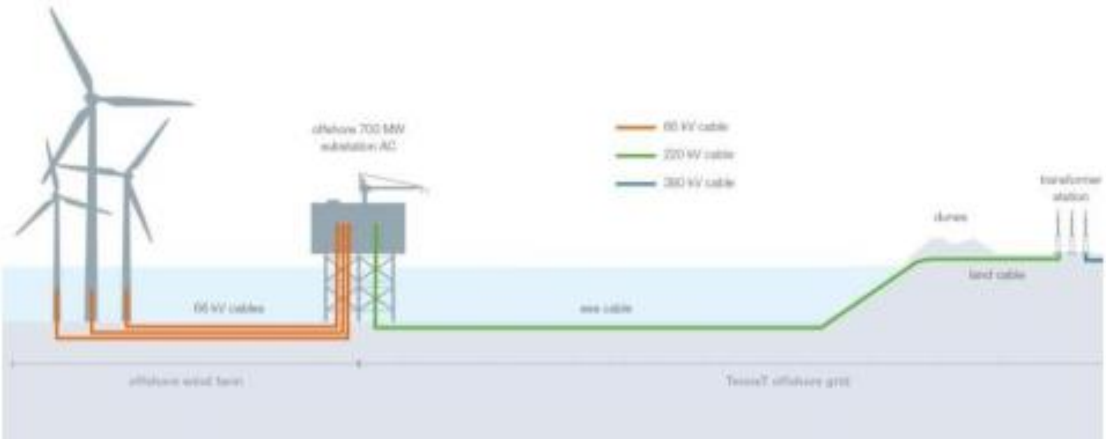

Fig. 1.1.2. Schematic presentation of offshore wind farm-generated electricity transportation to the land-based grids [3].

In seas and oceans, energy is transported and communication is maintained via subsea cables. As the capacity of wind farms and distances between power plants increase, 33 kV submarine cables, which had been used so far, no longer provide adequate throughput power. The 66 kV voltage is planned and offered by the market to use for submarine cables, transformers, and switchgears[4], the use of 132 kV cables may be considered in the future. An exact number of WTs and cable lines in each and the voltage used is to be specified during the technical design.

Cable Line Laying Technology

Cable lines interconnecting the WTs and a WT with a transformer substation are recessed 1-2 m into the seabed. The technical design provides a solution of whether and/or which sections will need additional protection against physical flushing/exposure.

Offshore Transformer Substations

A transformer substation (s) is designed to accumulate the power generated by the entire wind farm, to transform it, and to transmit electricity to the land-based grid.

The size and performance of an offshore substation depends on a cable connection to an onshore substation. An offshore substation might have different equipment subject to the type of connection (HVDC or HVAC).[5] [6]

Fig. 1.1.3. Sheringham Shoal offshore transformer substation[7].

The main components of an offshore power substation are power transformers, switchgear, backup generator, staff rooms, water tanks, power cables, control/surveillance system, etc. Substations weigh 500 to 2,000 tons and are usually constructed on a similar foundation as wind turbines. A platform is erected

[3] https://www.tennet.eu/news/detail/offshore-grid-connection-borssele-beta-ready-to-land-offshore-wind-power/

[4] https://www.tennet.eu/fileadmin/user_upload/Our_Grid/Offshore_Netherlands/Consultatie_proces_net_op_zee/Technical_Topics/4_T1._Enclosure_nr_1b_-_66_kV_systems_for_Offshore_Wind_Farms_by_DNV_GL.pdf

https://search.abb.com/library/Download.aspx?DocumentID=9AKK107046A1094&LanguageCode=en&DocumentPartId=&Action=Launch

[5] HVDC - High Voltage Direct Current

[6] HVAC – High Voltage Alternating Current

[7] Source: The crown estate. Offshore operational report 2020. https://www.thecrownestate.co.uk/media/3792/offshore-wind-operational-report-1.pdf

approximately 25 m above the sea level; its area may reach up to 800 m^2. One standard substation is sufficient to serve a wind farm of up to 700 MW capacity. Yet, to ensure more efficient electricity transmission, more than one substation per wind farm may be installed.

1.2. The Main Proposed Wind Farm Installation Works

During the construction phase, WT components are delivered to the construction site and assembled. The main offshore WT installation works:

- Foundation installation;
- Tower erection;
- Nacelle installation;
- Blade mounting;
- Power cable line laying within the wind farm;
- Connection of WTs to the electricity transmission system.

For the description of the construction phase, information from the similar technical design of construction of the Lillgrund wind farm, which is already in action, has been used. (Jeppsson et al. 2008). This information illustrate the principle of WT farm installation (for the planned WT farm installation, a different technique and technology for installation of foundations, transportation, cable laying, etc. may be selected, corresponding to local conditions and developer's needs)

- Loading of WT foundation structures onto barges and transportation to the WT farm site (Fig. 1.2.1.);

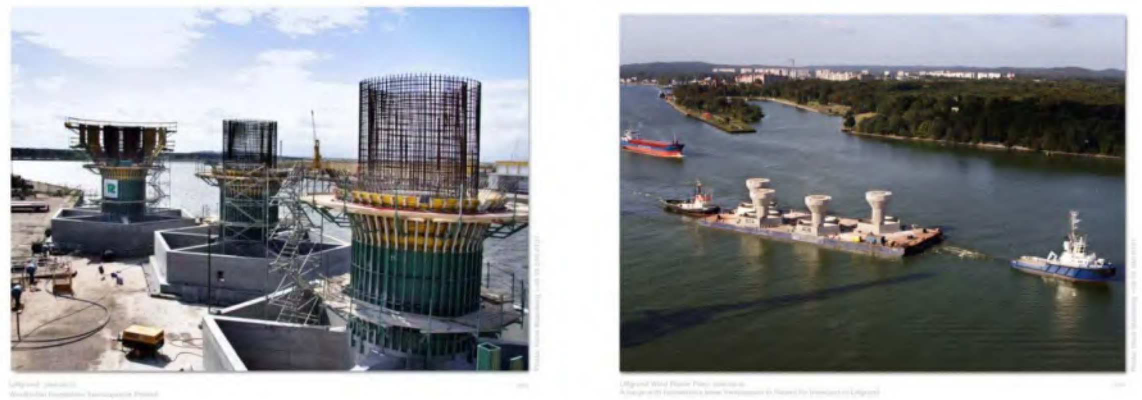

Fig. 1.2.1. Transportation of WT foundation structures (photos by Jeppsson et al. 2008).

- Fitting-out of the foundation installation site: seabed drilling works. Drilling works can be used for both mono-pile and jacket foundations;

- Installation of the delivered foundation structures at the WT site;

Fig. 1.2.2. Installation of WT foundation structures offshore (photos by Jeppsson et al. 2008).

After the foundation has been installed at the bottom of the sea, power transmission cables are connected to it; foundation is reinforced.

The tower is erected on the installed foundation using foundation bolts. Before erecting the wind tower, horizontality of the foundation surface must be ensured.

WTs are connected and electricity is transmitted using special submarine cables. For example, for connecting the offshore power substation of the Lillgrund wind farm to the onshore, a 130 kV cable, i.e., a three-channel copper conductor with an embedded optical cable and a waterproof protective coating, was used. During the installation of Lilgrund WT farm, cable laying trenches was dug in the seabed. A cable was laid in the dug-out trench using a special vessel. The cable was pulled ashore using boats and an excavator.

Fig. 1.2.3. Preparation of the seabed for laying a submarine cable (photo by Jeppsson et al. 2008).

Power transformers, control/surveillance system are usually arranged in the power substation.

Fig. 1.2.4. Installation of power substation in the Lillgrund wind farm (photo by Jeppsson et al. 2008).

Power transmission cables are laid from WTs to the offshore power substation. Lillgrund WTs were connected to the power substation using 33 kV submarine cables.

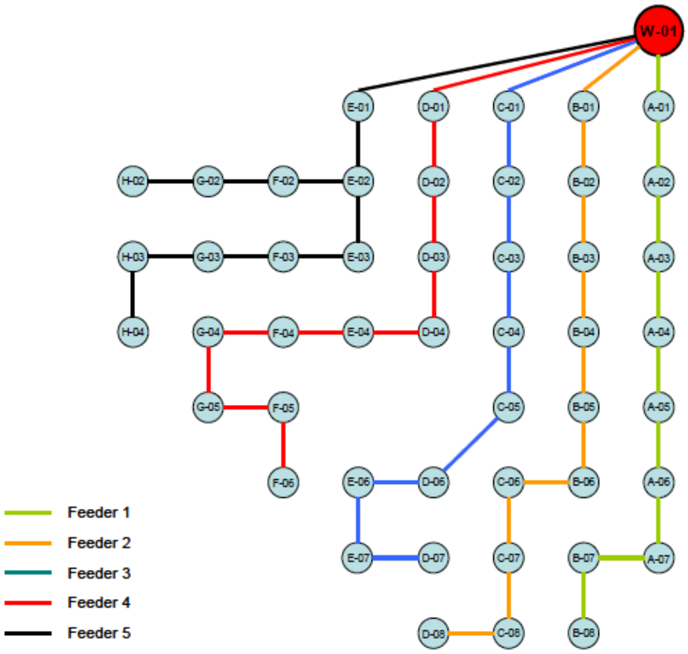

Fig. 1.2.5. Wind farm to the offshore power substation connection layout: Example of Lillgrund wind farm connection (Jeppsson et al. 2008).

The installed WT foundations are connected via the power transmission cables.

The foundation structure is fitted with wind tower components, a rotor is suspended, and a transformer is installed. WTs are furnished with lightning-conductors, a remote surveillance & control system.

Ready-to-install WT components (upper and lower parts of the tower, blades) are loaded onto the ship using a crane and transported to the construction site.

Fig. 1.2.6. The vessel "Sea Power" is shipping wind turbines to the Lillgrund wind farm construction site (photo by Jeppsson et al. 2008).

Provisionally, during the installation of the Lillgrund farm, delivery of three WT components from factories, loading onto the ship (3 wind turbines), shipping to the construction site, installation, and return to a port may took up to 5 days (Flodérus, Arne. Experiences from the Construction and Installation of Lillgrund Wind Farm. Vattenfall Vindkraft AB, May 2008).

During the installation of the Lillgrund WT farm at the site, the vessel was held at a distance of approx. 15 m from the WT foundation structure. Turbine parts were mounted using a crane and interconnected. During the wind farm construction, the on-site installation of three WTs took approx. 2 days of work 24 hrs/day in good weather conditions (by carrying out the installation works using a vessel operated at 1 m wave height and at up to 10 m/s wind speed; for rotor lifting and connection, wind speed is limited to 7 m/s).

For example, construction of the Lillgrund wind farm took place in 2006-2007. The prevailing adverse weather conditions (storms in autumn and winter) caused the delay in the WT farm construction phase of one year (Jeppsson et al. 2008).

1.3. Operation Phase

The operation phase must include the maintenance, repairs, and inspections of WTs. The safety of inspection and repair staff, arriving at the WTs, is crucial at this phase. With this aim in view, a secure outfit and procedure for access to the WTs must be selected.

Maintenance of wind farms may engage small ships which might easily approach and moor next to the WT and the service staff of which might have safe access to the WT service platform.

1.4. Dismantling Phase

The sequence of WT dismantling operations is opposite to the construction one (Pearson, 2001): dismantling of power supply infrastructure; rotor disassembly; gondola and tower disassembly, and (partial) WT foundation demolition (Cape Wind Energy Project, 2004).

The main dismantling works:

- Removal of turbine lubricants and other potentially hazardous substances (Annual Report, 2002);
- WT cut-off from internal power cables;
- Dismantling, extraction, and removal of power cables onshore using barges and special equipment;
- Dismantling and removal of WT components: blades, gondolas, tower;
- Demolition of foundation: dismantling of foundation components, extraction from water, and removal of them onshore. In case of mono-pile foundation, it is cut off below the bottom level after a sand layer is removed (Cape Wind Energy Project, 2004).

All parts of the WTs are shipped onshore and delivered for reuse, recycling, or recovery (Cape Wind Energy Project, 2004).

1.5. Supplies to Be Used

Construction of the WTs in the marine territory will involve certified products that meet the EU requirements. Only the installation of separate equipment will be performed on site; this will require preparatory works and, later, WT operation works.

The PEA does not provide for any use or storage of hazardous substances or mixtures, radioactive agents, hazardous or non-hazardous waste.

The EIA report will provide information on the waste generated during the dismantling of the WT farm and its possible management.

1.6. Scope of Use of Natural Resource (Elements of Organic and Inorganic Nature)

Wind energy will be used to produce electricity. Pursuant to the Law of the Republic of Lithuania on Energy from Renewable Sources, *wind power means air movement energy used for generation of energy*.

2. Information on the Territory of the Proposed Economic Activity

The WTs are proposed to be installed in the marine territory of the Baltic Sea approved by the LRV Resolution where a tender (tenders) for the development and operation of power plants using renewable energy sources is (are) expedient by 2030.

The main characteristics of the territory:

- Area: 137.5 km^2;
- Average depth: 35 m;
- Distance from Klaipeda Seaport: from 38 km;
- Average wind speed: approx. 9 m/s (obtained by mathematical modeling (100 m above sea level)).

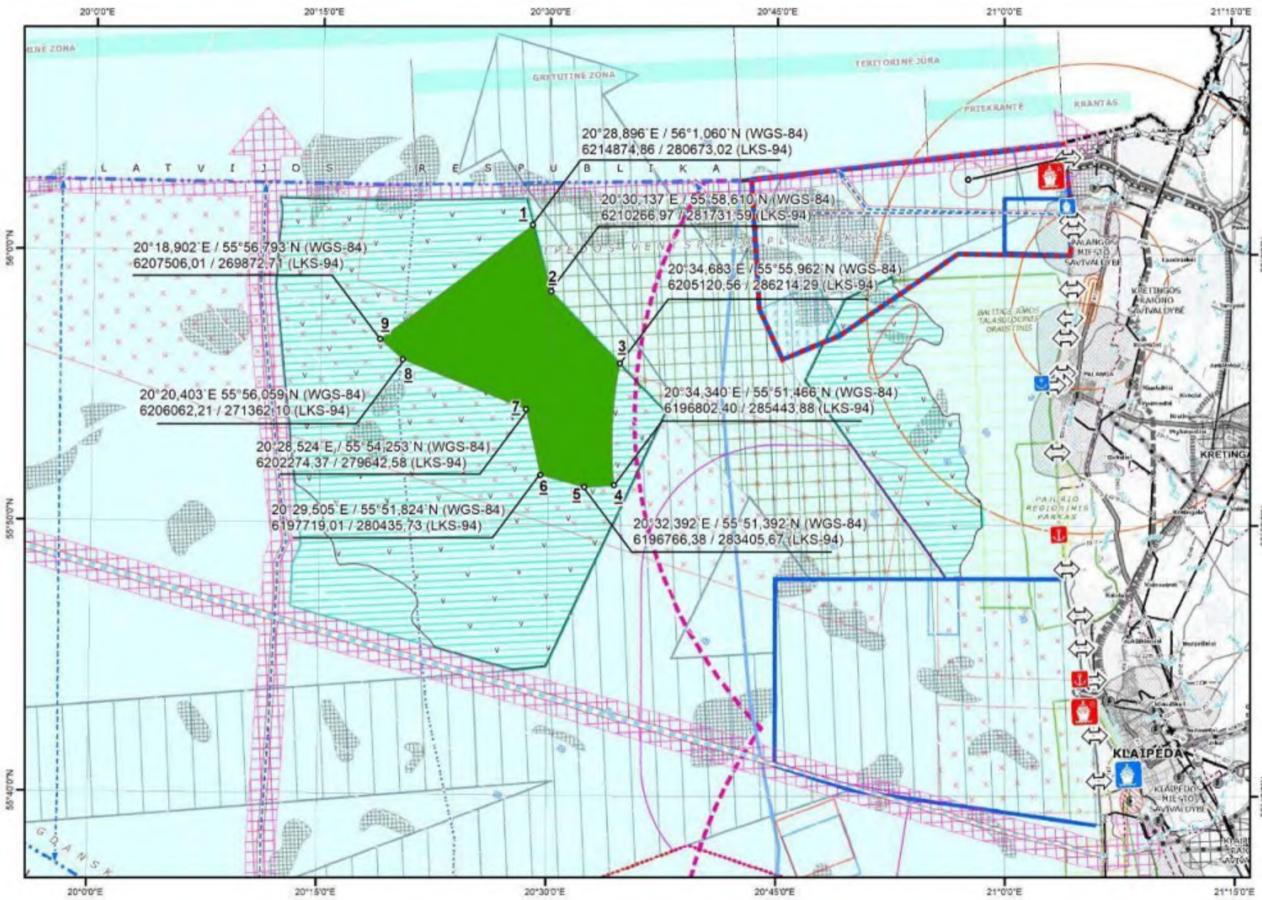

Fig. 2.1. The PEA territory in the Baltic Sea approved by the LRV Resolution.

Table 2.1. Coordinates of the territory approved by the LRV Resolution

Territory point no. (see Fig. 2.1.)	Coordinates	
	according to the World Geodetic System 1984 (WGS–84)	according to the Lithuanian Coordinate System 1994 (LKS–94)
1	20°28,896`E 56°1,060`N	X-6214874,86; Y-280673,02
2	20°30,137`E 55°58,610`N	X-6210266,97; Y-281731,59
3	20°34,683`E 55°55,962`N	X-6205120,56; Y-286214,29
3 to 4 point section	20°34,683`E 55°55,962`N, then, based on the 29,500 m arch, 21°02,476`E 55°52,987`N to 20°34,340`E 55°51,466`N	X-6205120,56; Y-286214,29, then, based on the 29,500 m arch, X-6198268,02; Y-314907,19 to X-6196802,40; Y-285443,88
4	20°34,340`E 55°51,466`N	X-6196802,40; Y-285443,88
5	20°32,392`E 55°51,392`N	X-6196766,38; Y-283405,67
6	20°29,505`E 55°51,824`N	X-6197719,01; Y-280435,73
7	20°28,524`E	X-6202274,37;

Territory point no. (see Fig. 2.1.)	Coordinates	
	according to the World Geodetic System 1984 (WGS–84)	according to the Lithuanian Coordinate System 1994 (LKS–94)
	55°54,253`N	Y-279642,58
8	20°20,403`E 55°56,059`N	X-6206062,21; Y-271362,10
9	20°18,902`E 55°56,793`N	X-6207506,01; Y-269872,71

2.1. Geographical and Administrative Situation on the Territory of the Proposed Economic Activity

The PEA is situated in the Lithuania's Exclusive Economic Zone in the Baltic Sea, at depth of 25 to 45 m isobaths.

The PEA territory is distant from the shoreline and adjacent municipalities of Klaipeda city, Klaipeda district, and Palanga. The shortest distance from the proposed territory to the town of Palanga is about 29.5 km.

The distance from the proposed territory to the Latvian EEZ is about 2.8 km, to the Swedish EEZ – about 77 km, and to the Russian EEZ – about 40 km.

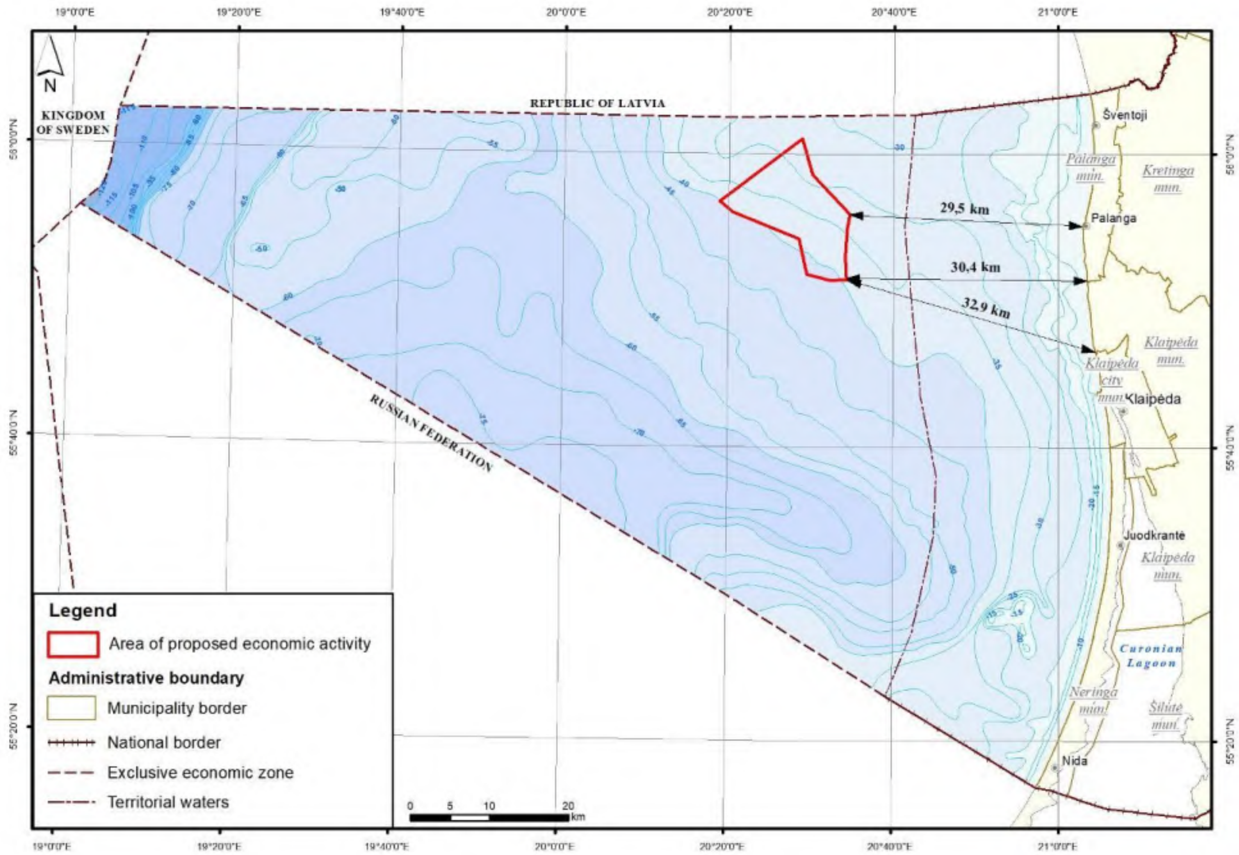

Fig. 2.1.1. Geographical and Administrative Situation on the PEA Territory.

2.2. Current Use of the Territory

Lithuania's Exclusive Economic Zone and marine territory are used for shipping, commercial fishing; there are various engineering communication routes laid out, other economic activities carried out or planned (sand excavation, soil dumping, development of renewable energy, military operations, etc.). The Lithuanian seaside is popular as a recreational area and has a great potential for nautical tourism.

Protected areas and European sites "Natura 2000" under expansion occupy a significant part of marine waters, i.e., the Curonian Spit National Park, the Seaside Regional Park, the Baltic Sea Talasological Reserve.

2.2.1 Shipping

The PEA territory is outside the established international shipping routes, roadsteads, or anchorage sites; neither is it bordering them. A cartographic comparison of the PEA territory with the defined water areas of Klaipeda State Seaport, Sventoji Port, and Butinge Terminal, anchorage sites, and shipping corridors is presented in Figure 2.2.1 below.

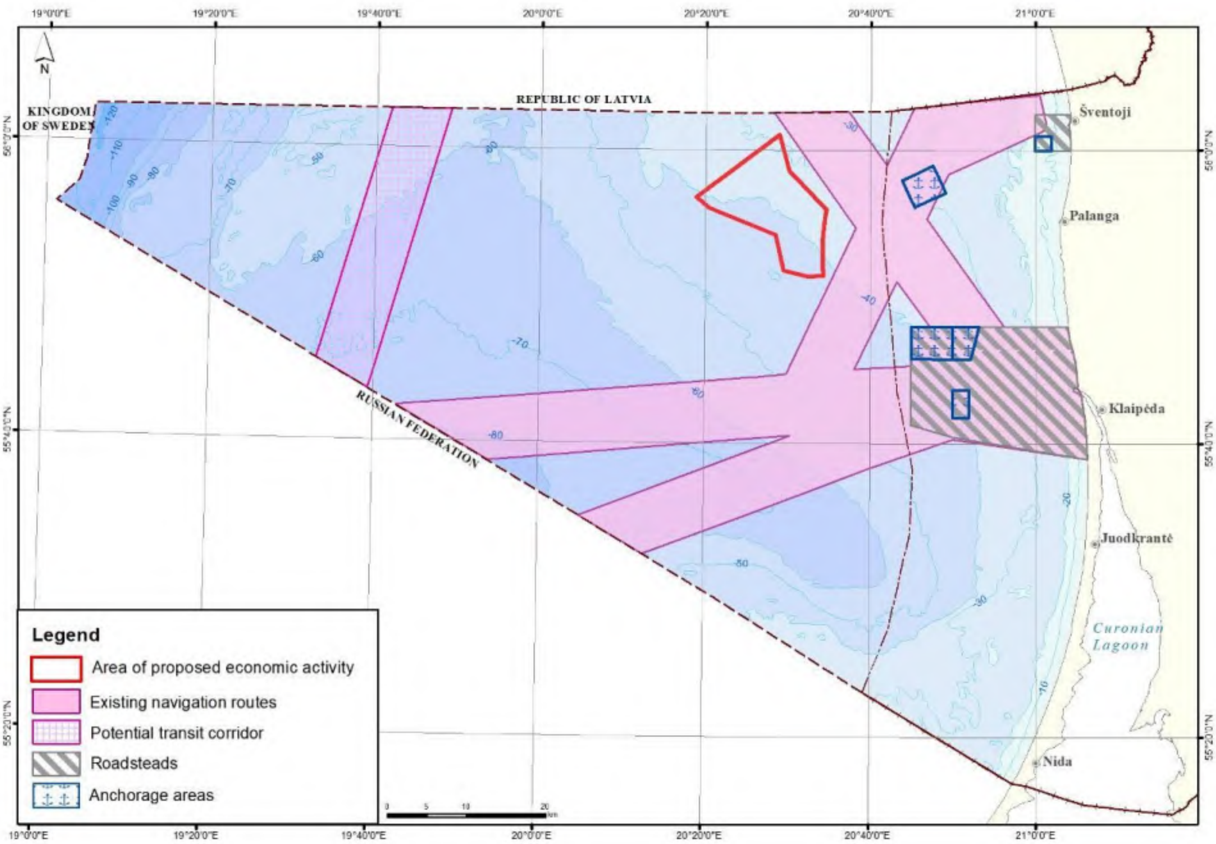

Fig. 2.2.1. Layout of the proposed territory in respect of shipping routes, roadsteads, or anchorage sites.

2.2.2 Fishing

Based on the classification by the International Council for the Exploration of the Sea, Lithuania's marine territory falls within statistical quarters 0H10, 40G9 and 39H10 of subdivision 26 of the fishing area where fish is caught with trawls and trap nets.

The PEA territory falls within statistical quarters 504 and 534 which accommodate trawling areas (Fig. 2.2.2).

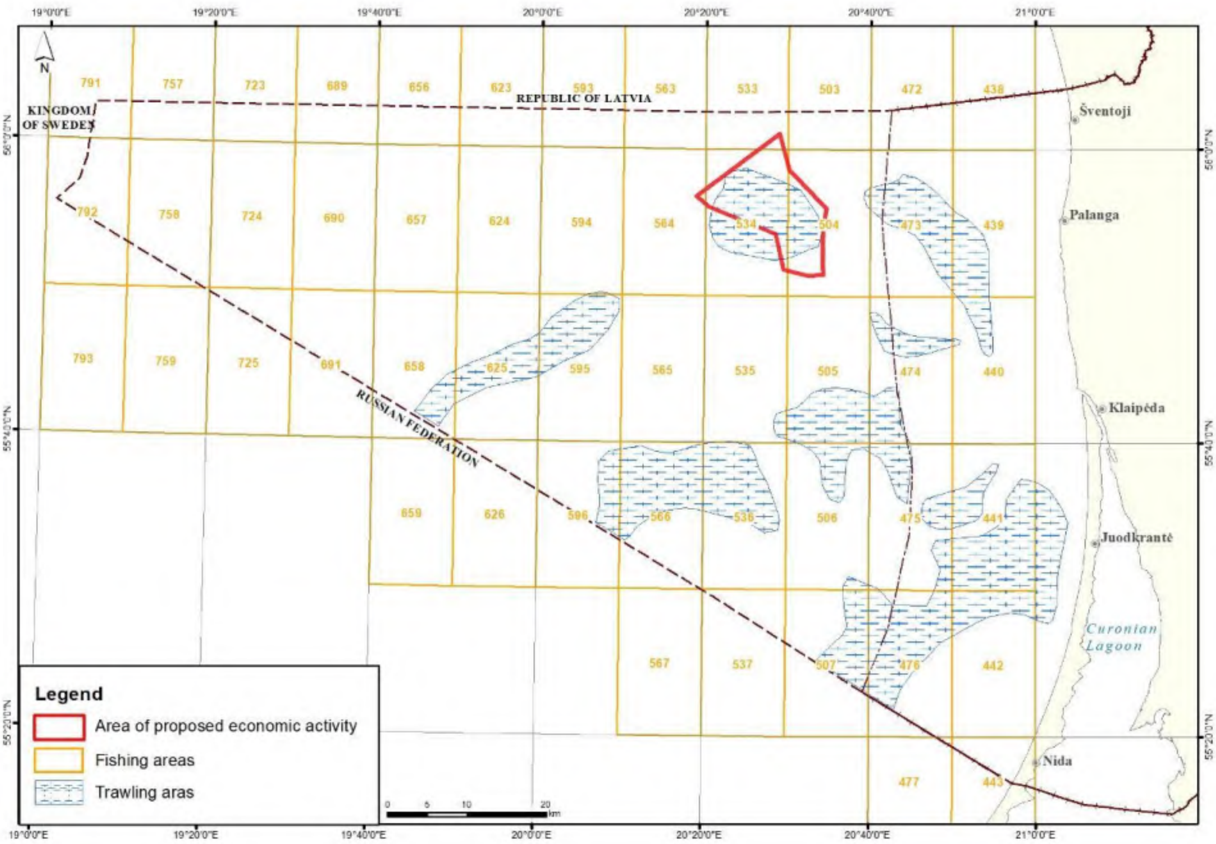

Fig. 2.2.2. Fishing areas.

2.2.3. Soil Dumping at Sea

There are a few offshore dumping sites where the soil, excavated in the Klaipeda port waters, is dumped. A deep-water dumping site, with an area of 4 square nautical miles (i.e., approx. 13.87 km^2), is 11 nautical miles (i.e., approx. 20.37 km) away S-W from the port gate at a depth of 43-48 m. The dumping site was put into operation in 1987. All the types of soil dumped in this area, i.e., sand, silt, moraine, are excavated during dredging.

Another site for dumping of sandy soils (fine sand and silty sand) is 6 nautical miles (i.e., approx. 11.11 km) away N-W from the port gate at a depth of 25-30 m.

A coastline nourishment with sand was started in 2001. For this purpose, a section of the coastline with coordinates 55°47'00'' to 55°45'20'' was chosen. The sand was poured at a depth of approx. 5 m. In total, about 400K m^3 of sand was poured out in this section of the coastline.

The existing offshore soil dumping sites are more than 20 km away from the PEA territory (Fig. 2.2.3).

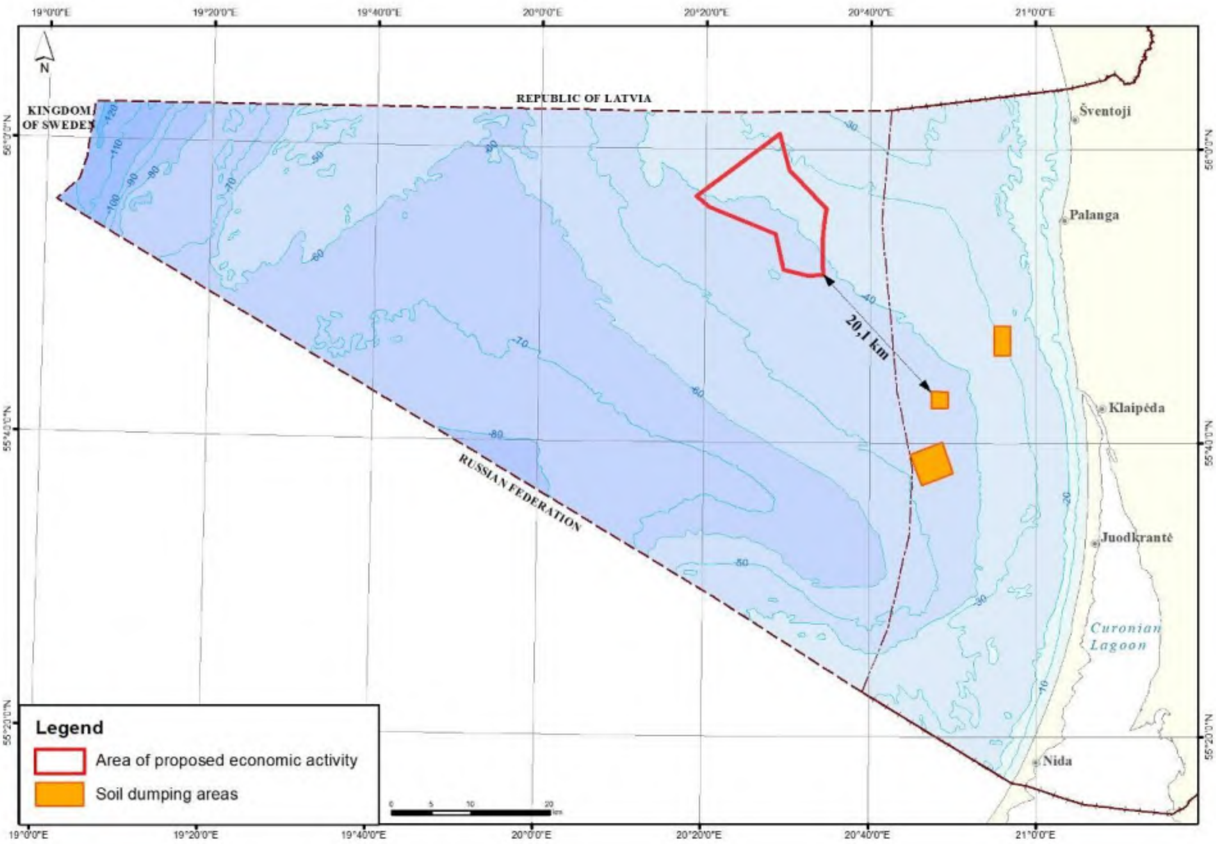

Fig. 1.2.3. Existing offshore soil dumping sites.

2.2.5. Recreational Resources

A sea-shaped formation, i.e., a beach, stretches along the Baltic coastline. Swimming zones at the beaches of Sventoji settlement and Palanga town were legalised by Order of Director of Palanga Municipality Administration no. A1-559 of 22 July 2010 "On Establishment of Swimming Zones at the Palanga Beaches."

Klaipeda beaches by the Baltic Sea were legalised by Order of Director of Klaipeda City Municipality Administration no. AD1-592 of 21 March 2012 "On Legalisation of Klaipeda City Beaches."

The most-visited beaches in Klaipeda district are the ones next to Karkle.

A distance from the PEA territory to the nearest recreational areas and beaches of Palanga Municipality is approx. 29.5 km (Fig. 2.2.5).

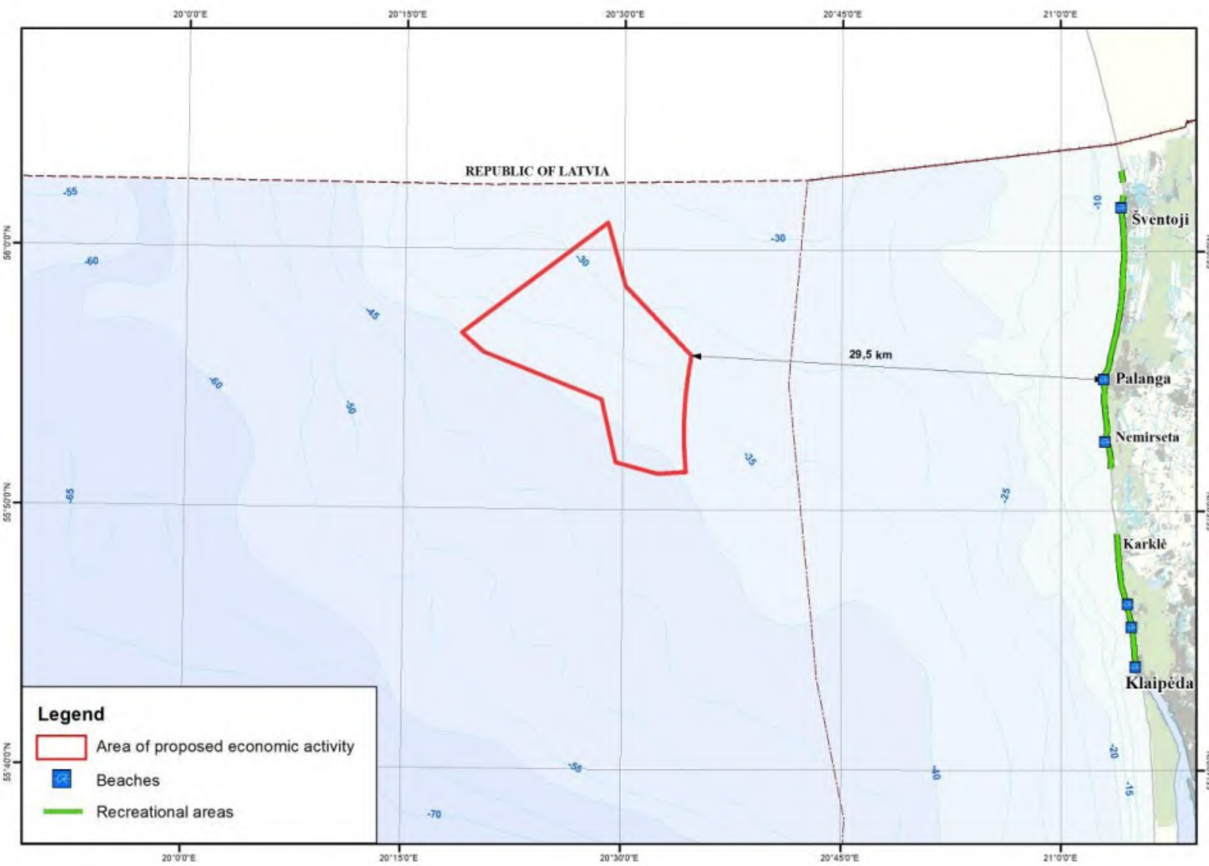

Fig. 2.2.5. Residential and recreational areas in the coastal municipalities.

There are nautical tourism services beginning to emerge at the Lithuanian seaside. Nautical tourism is defined as an individual paid service of travel by sea for tourists which needs special infrastructure, i.e., adapted embankments, roads, pedestrian (bicycle) tracks, a specially designed area for tourists, buildings, parts thereof, facilities, and other objects of similar purpose, intended to meet the needs of inbound, outbound, and local tourism in nautical tourism facilities situated in Lithuania's territorial waters and their surrounding areas. Based on this definition, the following most frequent nautical tourism services are identified in the Lithuanian seaside: cruise shipping, inland tourist shipping, recreational fishing, and sea diving services.

There are several diving clubs in Klaipeda region which offer recreational diving services in the Baltic Sea. The best diving destinations in the Baltic Sea are wreck dives and tours to expressive elevations at the bottom of the sea (moraine ridges). According to the diving club OCTOPUS, diving usually takes place in coastal waters. The most popular diving spots are more than 20 km away from the PEA territory.

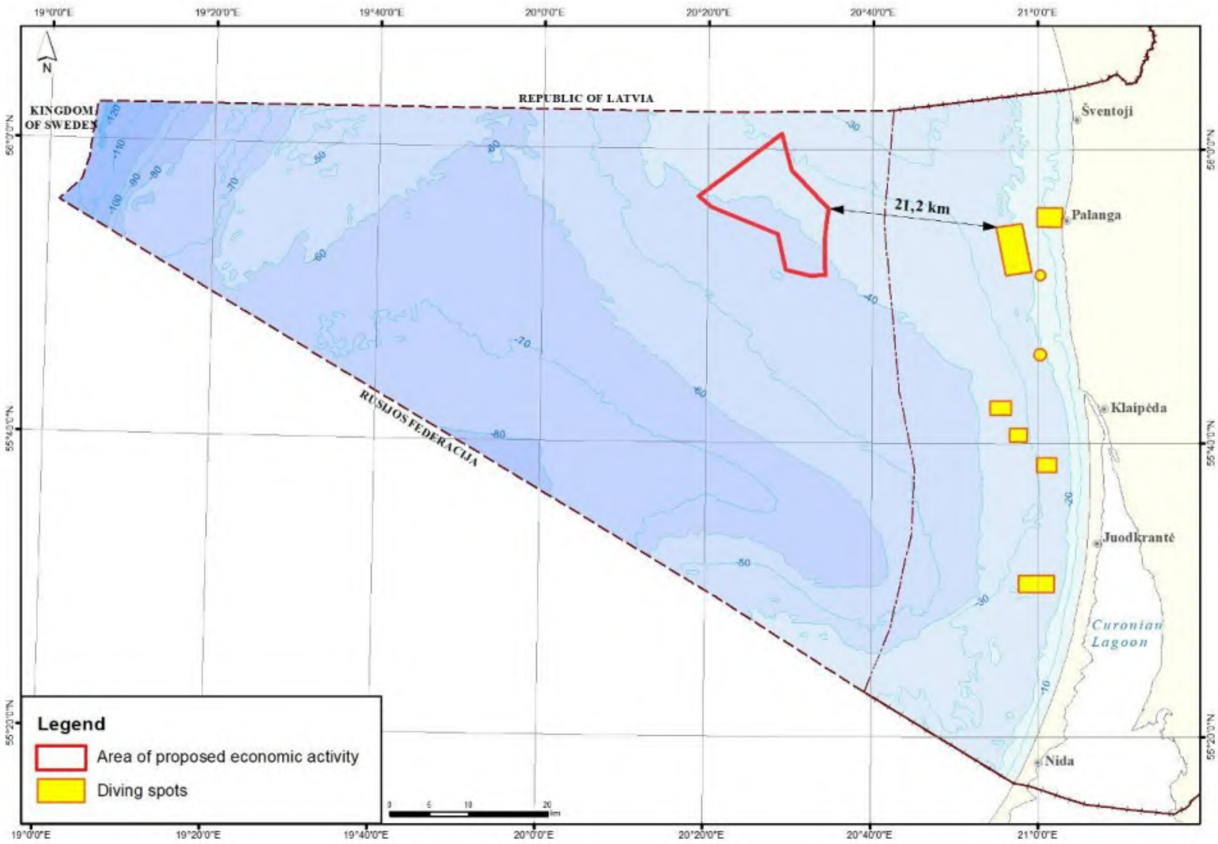

Fig. 2.2.6. The most popular diving spots.

2.2.6. Engineering Infrastructure

In Lithuania's marine territory of the Baltic Sea, there have been two types of engineering infrastructure identified: a pipeline complex, including the Single Point Mooring (SPM) buoy at the Butinge Terminal, and submarine cables.

The 7.3 km long pipeline at the Butinge Oil Terminal connects an underground onshore pipeline with a tanker mooring buoy and is used for oil product handing operations at AB Orlen Lietuva. Coordinates of location and safety area of the Butinge Terminal's oil pipeline and buoy (SPM) are provided in the Butinge Oil Terminal Shipping Rules. The terminal has a water area allocated thereto, within a radius of 1,000 m around the SPM buoy, and a safety area of 300 m on each side of the oil pipeline. [8]

The Exclusive Economic Zone is intersected by the following four submarine cable lines: 2 telecommunications cable routes, with the starting point in Sventoji, Lithuania, owned/operated by AB TeliaSonera (according to: International Cable Protection Committee); that is:

- The 218 km long BCS East-West interlink route (ready for service since 1997) connecting Sventoji with Katthammarsvik, Sweden;
- The 97.8 k long BCS East (ready for service since 1995) connecting Sventoji with Liepaja, Latvia;

An origin of the other four cable routes crossing the Lithuanian EEZ South to North and South-west to North-east, marked on navigation maps, is unknown.

[8] The Shipping Rules have been approved by Order of the Minister of Transport and Communications of the Republic of Lithuania no. 3-248 of 18 September 2000 "On Approval of the Butinge Oil Terminal Shipping Rules."

In the central part of the water area, from Klaipeda, via the Curonian Spit, and further towards the Swedish EEZ, there has been a NORDBALT link constructed, that is, a 450 km long, 700 MW high-voltage DC submarine and underground cable.

On 21 December 2018, CEOs of Lithuanian and Polish transmission system operators LITGRID AB and PSE signed an agreement on commencement of the project of construction of new Polish-Lithuanian submarine HVDC cable – "HARMONY Link." [9] The LRV, by Resolution no. 720 of 1 September 2021, approved the engineering infrastructure development plan for the special state importance energy system synchronisation project "Construction of Harmony Link Connection and 330 kV Darbenai Switchyard." It presents a route for the proposed offshore connection HARMONY Link.

The PEA territory does not fall within the areas of the existing and proposed engineering infrastructure.

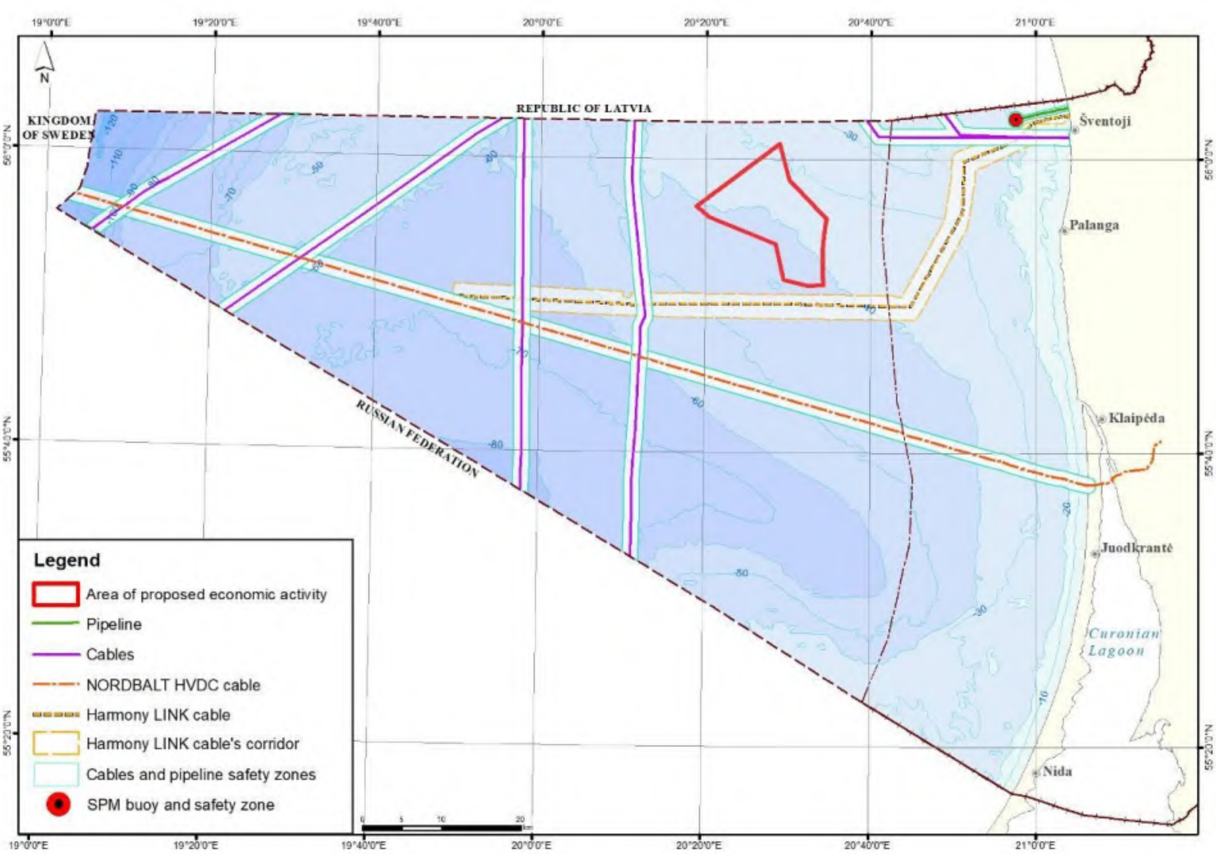

Fig. 2.2.7. Existing and proposed engineering facilities in the marine territory

2.2.7. Restricted-Use Areas and Danger Zones at Sea

Part of the PEA territory is within the danger zone at sea, i.e., former minefields (Fig. 2.2.8).

In Lithuania's territorial sea and the Exclusive Economic Zone, there are several restricted-use, military exercise grounds, a water area with wrecks of World War II munitions, and former minefields of quite a large area. It is possible to carry out economic activities in the said territories, however, a prerequisite is to conduct seabed surveys in search of hazardous objects and, if necessary, to carry out decontamination of hazardous objects before the implementation of technical design solutions.

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[9] Resolution of the Government of the Republic of Lithuania no. 720 of 1 September 2021 "On Approval of the Engineering Infrastructure Development Plan for the Special State Importance Energy System Synchronisation Project "Construction of Harmony Link Connection and 330 kV Darbenai Switchyard." https://www.e-tar.lt/portal/lt/legalAct/876d697011ff11ec9f09e7df20500045

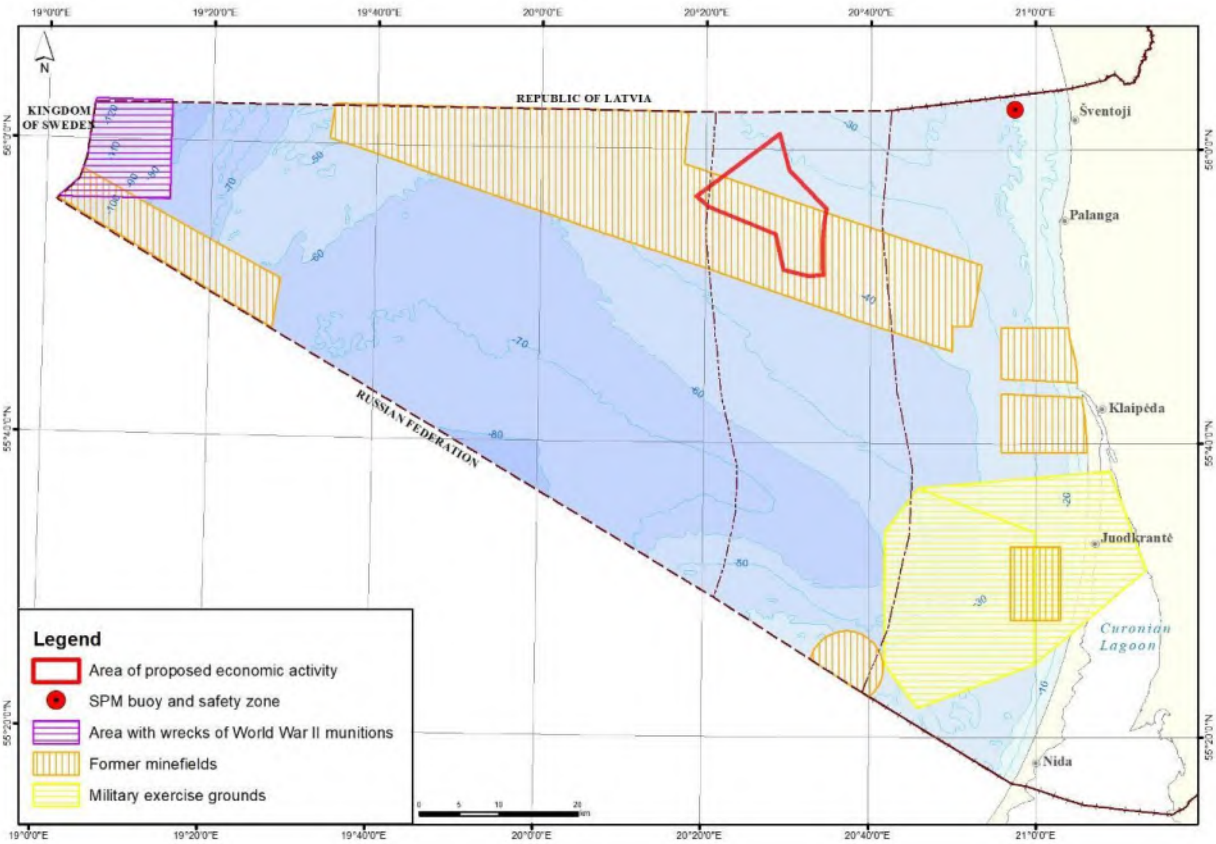

Fig. 2.2.8. Restricted-use areas and danger zones.

2.2.8. Important National Security Areas

[10] [11]Based on the Methodology for mapping of territories of the Republic of Lithuania where design and construction of wind power plants may be subject to restrictions in relation to national security, a map of the territories of the Republic of Lithuania, where wind power plant (high-rise buildings) design and construction works may be subject to restrictions, has been developed and approved.

The PEA territory is a part of the areas where construction sites for wind power plants are subject to coordination provided that a manufacturer of energy from renewable resources signs a contract with the Lithuanian Armed Forces on part of the investment and other costs (Fig. 2.2.9).

Pursuant to Article 49 (8) the Law of the Republic of Lithuania on Energy from Renewable Sources, "Locations for the construction of wind power plants in the areas that are be subject to special land use conditions in relation to national security in accordance with the Law of the Republic of Lithuania on Special Land Use Conditions shall be agreed in advance, in the course of territorial planning, with the Commander of the Lithuanian Armed Forces and other institutions according to a procedure prescribed by law and other legislation. A location for the construction of a wind power plant is not approved if disturbances to be caused by the planned wind power plant cannot be avoided through the use of additional measures. Should it be determined that disturbances to be caused by the planned wind power plant can be avoided through the use of additional measures, the location shall be approved on condition

[10] Approved by Order of the Minister of National Defence of the Republic of Lithuania no. V-921 of 22 August 2012 "On Approval of Methodology for Mapping of Territories of the Republic of Lithuania Where Design and Construction of Wind Power Plants May Be Subject to Restrictions in Relation to National Security."

[11] Approved by Order of the Commander of the Lithuanian Armed Forces no. V-217 of 15 February 2016 "On Approval of Methodology for Mapping Territories of the Republic of Lithuania Where Wind Power Plant (High-Rise Buildings) Design and Construction Works May Be Subject to Restrictions."

that the person planning to construct or install the power plant will submit to the institution specified in the conclusion on the agreement to the issue of the building permit, no later than prior to the issue of the building permit, an approved construction project, will enter into agreement with the said institution on a payment of compensation for part of the investments and other costs incurred in securing the national security functions, and will provide a security of discharge of the said obligation. The size of the compensation shall be determined by multiplying the power plant capacity (kW) stated in the authorisation to develop electricity generating capacities by EUR18 / kW. The procedure for the payment of the compensation shall be established by the Government. The compensations shall be used according to a procedure prescribed by law as other funds of institutions financed from the state budget that have not been received as state budget appropriations."

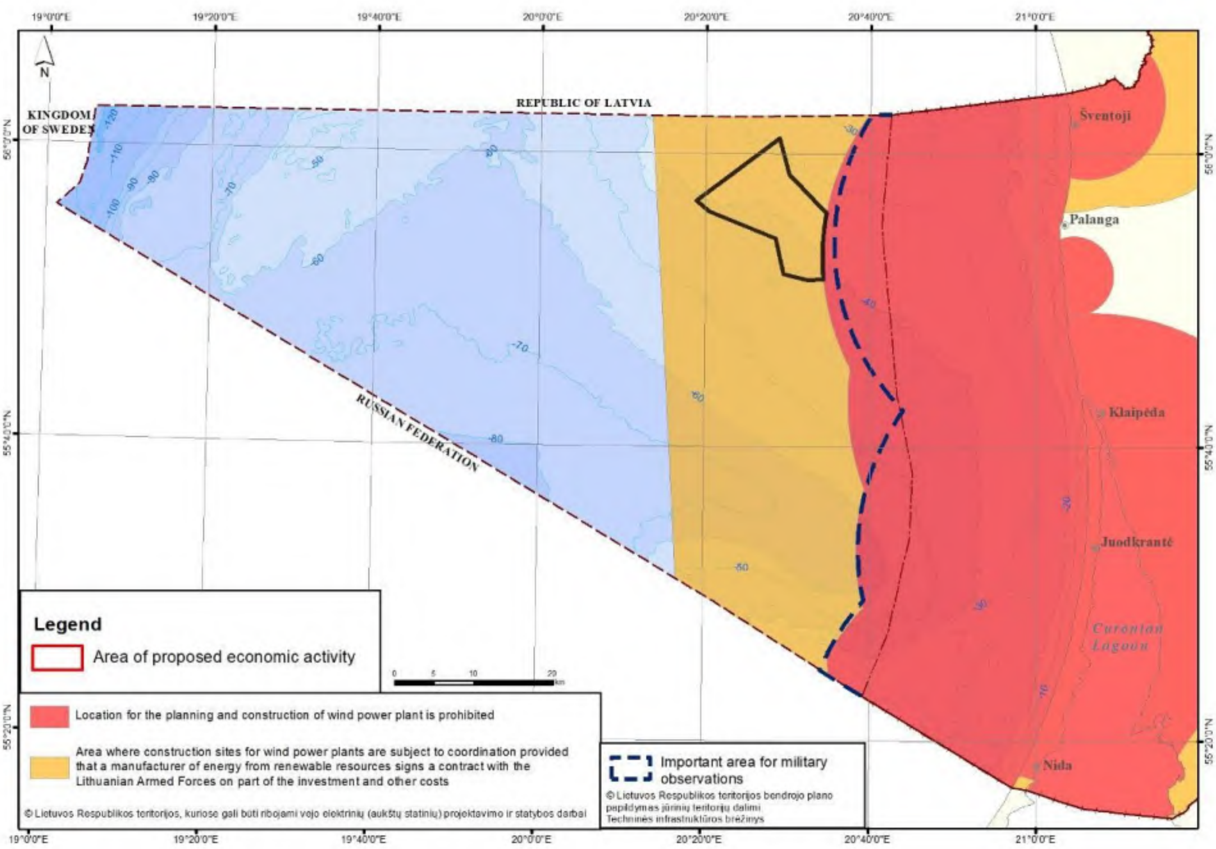

Fig. 2.2.9. Location of the PEA territory in relation to the areas subject to national security requirements (basis: the Map of the territories of the Republic of Lithuania, where wind power plant (high-rise buildings) design and construction works may be subject to restrictions, approved by Order of the Commander of the Lithuanian Armed Forces no. V-217 of 15 February 2016).

2.3. References to Territorial Planning Documents, Strategic Plans and Programmes

Comprehensive Plan of the Territory of the Republic of Lithuania

- Comprehensive Plan of the Territory of the Republic of Lithuania[12];
- Comprehensive Plan of the Territory of the Republic of Lithuania supplemented with the part "Marine Territories";[13]

[12] Approved by Resolution of the Seimas of the Republic of Lithuania no. IX-1154 of 29 October 2002 "On Approval of the Comprehensive Plan of the Territory of the Republic of Lithuania."

[13] Approved by Resolution of the Seimas of the Republic of Lithuania no. XII-1781 of 15 June 2015 "On Approval of the Comprehensive Plan of the Territory of the Republic of Lithuania supplemented with the part "Marine Territories."

- Comprehensive Plan of the Territory of the Republic of Lithuania under development (Lithuania 2030);

The CPTRL supplemented with the part "Marine Territories" provides for that Given the growth rates of the rapidly developing offshore wind energy sector in the Europe and, concurrently, in the Baltic Sea, sites for the installation of offshore wind farms, as well as corridors for linking such farms to onshore grids must be envisaged. It is appropriate to initiate the development of an integral wind farm network in the Baltic Region and, thus, to enable the connection of the proposed power plants in the marine territories of Lithuania and other Baltic states to the EU funded wind farm network of Denmark, Poland, Sweden, and Germany." The graphical part of the Comprehensive Plan supplemented with the marine solutions highlights the potential areas most suitable for the development of offshore renewable energy projects, including wind energy (Fig. 2.3.1).

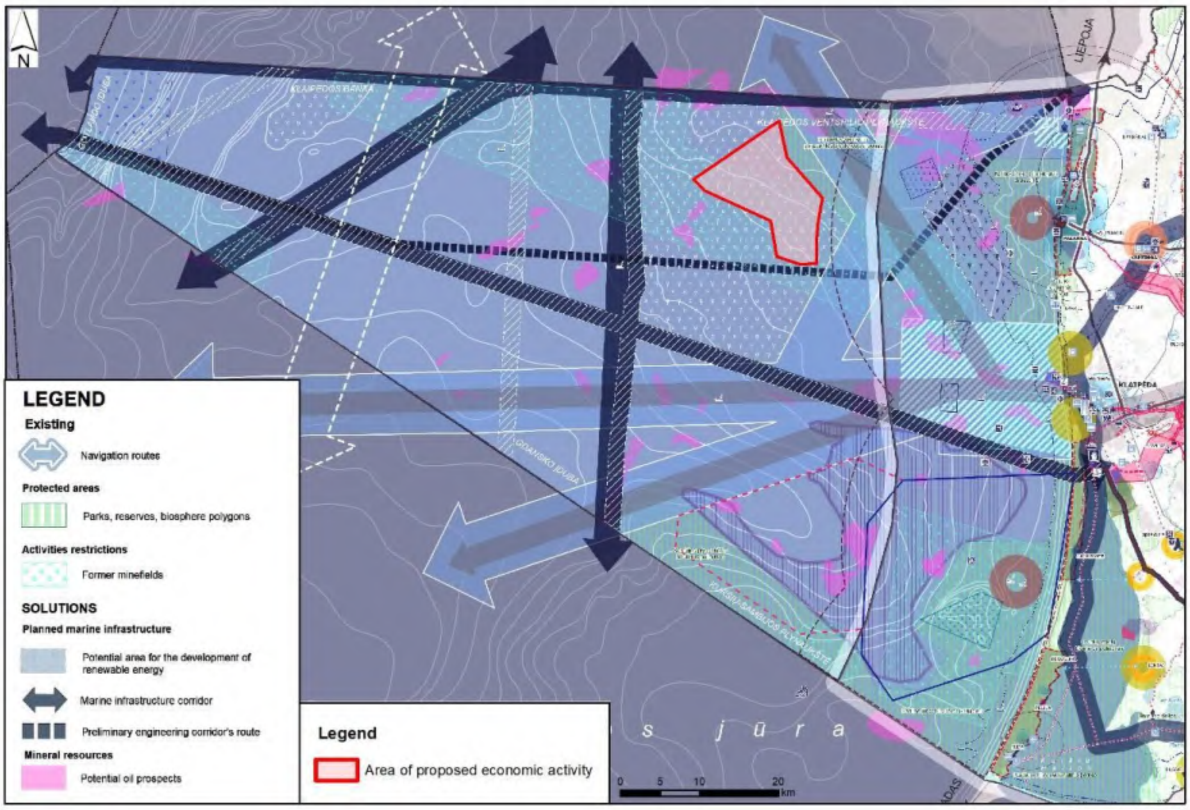

Fig. 2.3.1. Location of the PEA territory in relation to the solutions of the technical infrastructure scheme in the Comprehensive Plan of the Territory of the Republic of Lithuania supplemented with the part "Marine Territories."

The Comprehensive Plan of the Territory of the Republic of Lithuania as well provides for:

– Locations for the construction of WTs in the areas that are be subject to certain restrictions in relation to national security shall be agreed with the Lithuanian Armed Forces and other institutions responsible for national security according to the Procedure for the provision of information of the areas that are be subject to certain WT construction restrictions in relation to national security, approval of locations for the construction of WTs in such areas, and payment of the compensation; [14]

[14] Approved by the Resolution of the Government of the Republic of Lithuania no. 626 of 29 May 2012 "On Approval of the Procedure for the provision of information of the areas that are be subject to certain wind turbine construction restrictions in

– The priority groups of activities in the functional area of renewable energy production are: installation of renewable energy (wind, wave, currents, etc.) farms and their accessories, engineering systems of power supply structures (transformers, etc.) and other engineering equipment; construction, power and telecommunication lines. Other activities may also be developed in the background: commercial fishing, aquaculture and other economic activities that do not interfere with priority activities, and the extraction of minerals.

Engineering Infrastructure Development Plan for Marine Areas of Lithuania's Territorial Sea and/or the Exclusive Economic Zone of the Republic of Lithuania in the Baltic sea, Designed for the Development of Renewable Energy

Pursuant to the Order of the Minister of Energy of the Republic of Lithuania no. 1-253 of 17 August 2020 "On Commencing the Preparation of the Engineering Infrastructure Development Plan for Marine Territories of Lithuania's Territorial Sea and/or the Exclusive Economic Zone of the Republic of Lithuania in the Baltic Sea, Designed for the Development of Renewable Energy, and on the Setting of the Planning Objectives" and in view of the objectives to create conditions for energy production from wind power in the Baltic Sea and, thus, to increase a share of renewable energy sources in Lithuania's domestic energy production and total final energy consumption, in 2021, the preparation of the Engineering Infrastructure Development Plan for Marine Areas of Lithuania's Territorial Sea and/or the Exclusive Economic Zone of the Republic of Lithuania in the Baltic sea, Designed for the Development of Renewable Energy (herein after – the Development Plan) was initiated.

For the purposes of the preparation of the Development Plan, the Programme on the Development Plan Planning Works was approved by Order of the Minister of Energy of the Republic of Lithuania no. 1-306 as of 23 September 2020 "On Approval of the Programme on the Planning of the Engineering Infrastructure Development Plan for Marine Territories of Lithuania's Territorial Sea and/or the Exclusive Economic Zone of the Republic of Lithuania in the Baltic Sea Designed for the Development of Renewable Energy."

The PEA territory is marked in the Development Plan as the area under development in Phase I (Fig. 2.3.1).

relation to national security, approval of locations for the construction of wind turbines in such areas, and payment of the compensation."

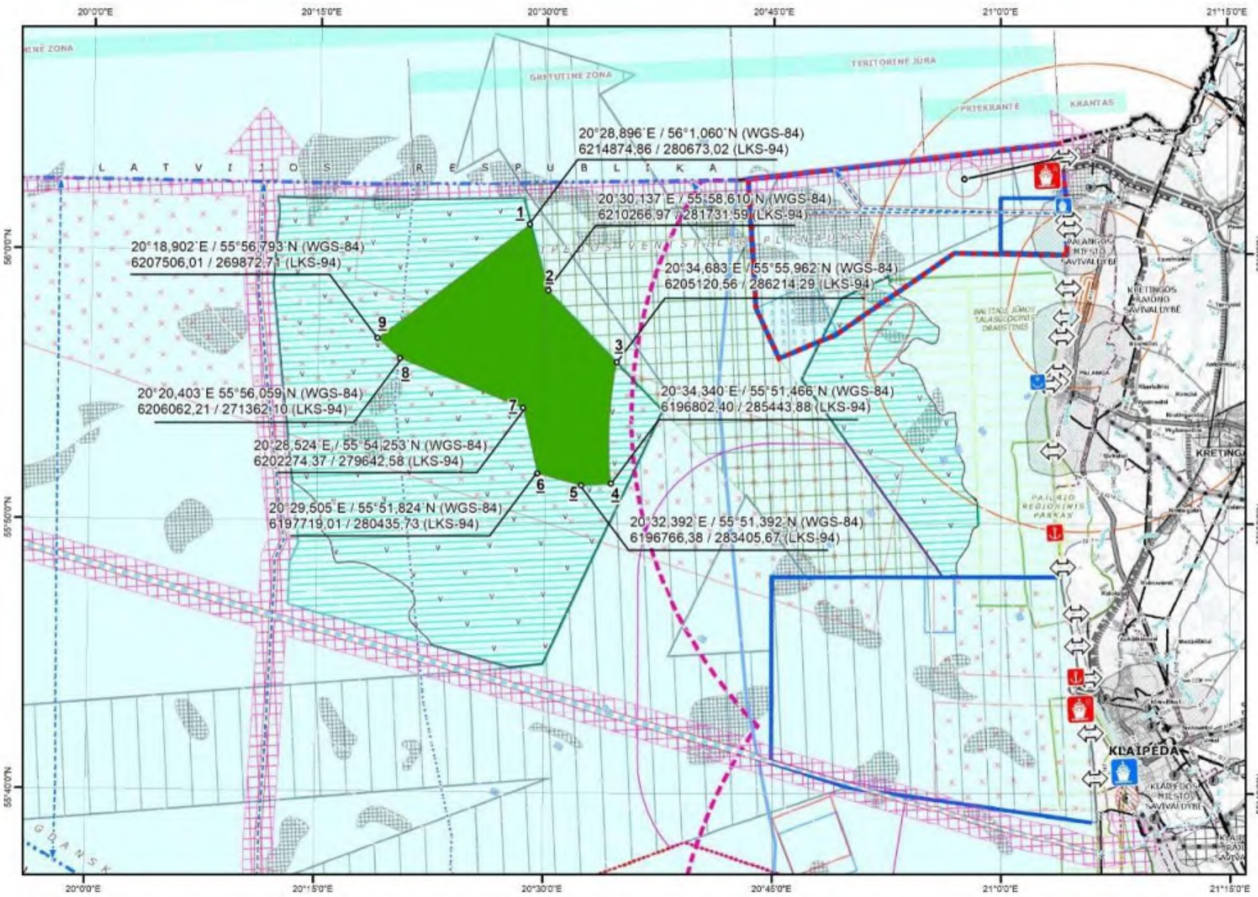

Fig. 2.3.1. The area under development in Phase I

References to Strategic Plans and Programmes

- National Strategy for Sustainable Development[15];
- National Environmental Protection Strategy[16];
- National Energy Independence Strategy[17] (hereinafter – the NEIS);
- National Strategy for Climate Change Management Policy[18];

The National Strategy for Sustainable Development provides for a more effective use of natural resources. One of principles, the Strategy's implementation is based on, is the principle of substitution. Non-hazardous substances and renewable resources must replace hazardous substances and non-renewable resources. The wider use of renewable energy sources (wind, etc.) in energy and transport sector will make it possible to reduce the use of organic fossil fuel and the resulting air pollution, and to cut the amounts of greenhouse gases.

One of the four priority areas of the environmental protection policy under the National Environmental Protection Strategy is sustainable use of natural resources. According to the Lithuanian environmental

[15] Approved by Resolution of the Government of the Republic of Lithuania no. No. 1160 of 11 September 2003 "On Approval and Implementation of the National Strategy for Sustainable Development."

[16] Approved by Resolution of the Seimas of the Republic of Lithuania no. XII-1626 of 16 April 2015 "On Approval of the National Environmental Protection Strategy."

[17] Approved by Resolution of the Seimas of the Republic of Lithuania no. XI-2133 of 26 June 2018 "On Amendment of the Resolution of the Seimas of the Republic of Lithuania no. XI-2133 of 26 June 2012 'On Approval of the National Energy Independence Strategy'."

[18] Approved by Resolution of the Seimas of the Republic of Lithuania no. XI-2375 of 6 November 2012 "On Approval of the National Strategy for Climate Change Management Policy."

vision under the Strategy, in 2050, Lithuania will have energy resources involved in all the sectors (energy, industry, transport, agriculture, etc.) of national economy.

The National Energy Independence Strategy states that in 2016, RES accounted for about 25.5% of final energy consumption in Lithuania.

In pursuit of the strategic RES target, the aim will be to increase the share of renewable energy sources in the total final energy consumption of the country to 30% by 2020, 45% by 2030, and 80% by 2050. RES will become the main source of energy in electricity, heating and cooling, and transport sectors.

The National Strategy for Climate Change Management Policy sets GHG emission reduction targets and implementing measures. The Strategy presents the vision of the climate change management policy until 2050: By 2050, Lithuania will have ensured adaptation of the sectors of the domestic economy to environmental changes caused by climate change and climate change mitigation (reduction of GHG emissions), developed competitive low-carbon economy, implemented eco-innovative technology, achieved energy generation and consumption efficiency and use of renewable energy sources in all sectors of the domestic economy, including energy, industry, transport, agriculture, etc.

3. INFORMATION ON ALTERNATIVES TO BE CONSIDERED

Pursuant to Article 11.2 of the Procedure, the EIA programme shall include information on feasible alternatives to the considered (e.g. location, time, technical and technological solutions, measures to reduce the environmental impact), including a 'zero' alternative, i.e., without carrying out any activities.

The 'zero' alternative, or, inactivity, shows current circumstances and an environmental situation in the event of non-performance. In this case, changes in the environmental situation of Lithuania's marine territory in the Baltic Sea would have no connection with the development of the PEA.

Project alternative: the offshore WT farm of up to 700 MW installed capacity in the territory approved by the LRV Resolution.

Taking into account the development trends of WT high technologies, technical solutions of existing wind farms in the Baltic and North seas, and the economic efficiency aspect related to the implementation of these high technologies, the initial assessment phase will involve negotiations on 8 MW to 16 MW offshore wind turbine models, currently available on the market, for the installation of the proposed WT farm of up to 700 MW installed capacity. During the implementation of this offshore wind farm project, wind farms with a capacity of up to 20 MW or more can be expected. The height of such offshore WT may vary, but not limited to, from 140 m to 300 m; the number of such turbines in the proposed territory may be approximately 87 to 43 pcs (but not limited to), subject to the model capacity. The WT model, layout in the territory, and the number thereof, to be used for the environmental impact assessment, will be specified after the detailed wind strength measurements which are scheduled for 2022.

In that regard, the EIA report will include the assessment of several various alternatives for the offshore wind farm deployment in the proposed territory, the construction, operation, and dismantling of the offshore WTs of different heights and installed capacities to best (most efficiently) meet natural conditions in the selected area.

Based on the selected capacity of the WT, a potential significant effect of the number, physical and technical characteristics, and location of the offshore WTs on various components of the environment and public health in the approved territory will be examined. As part of the analysis of the alternatives, a scale of effect of the installed offshore wind farm on various components of the environment and public health has been assessed; essential measures to reduce the effect of installation, operation, and dismantling have been envisaged.

Principles of Laying out the Power Plants in the Territory of The Proposed Economic Activity

Placement of WTs against each other, in relation to prevailing winds or the proposed territory is very important for the final energy yields. There are a few methods of selecting the optimal placement of WTs: geometrical or one of the *turbulent wake* models, i.e., Jensen model, Ainslie model, or G.C. Larsen model. [19]

The Figure 1.3.1 shows an example of geometrical layout of offshore WTs in the PEA territory based on the diameter of the WT rotor (D), by assuming that GE Haliade-X 12 MW wind turbine model is installed:

- in wind direction 12xD;
- in the direction perpendicular to wind direction 5xD;
- capacity of offshore WT: 12 MW, rotor diameter: 220 m.

[19] https://www.researchgate.net/publication/279154872_Optimized_Placement_of_Wind_Turbines_in_Large-Scale_Offshore_Wind_Farm_Using_Particle_Swarm_Optimization_Algorithm

Different literature sources provide various widths and lengths, therefore, there have been average dimensions of the proposed wind farm selected.[20] WT locations and their number with be specified at the technical design phase on the basis of the methodology provided by the developer or one of the turbulent wake models, with regard to the selected (specified) WT model/s and technical parameters thereof. It is envisaged that the PEA developer will be able to choose the most suitable WT model and its capacity, WT layout, as well as the technical parameters of the substations and their number, the technical parameters of the connection to the land network and their number.

Taking into account solutions under the Engineering Infrastructure Development Plan for Marine Areas of Lithuania's Territorial Sea and/or the Exclusive Economic Zone of the Republic of Lithuania in the Baltic sea, Designed for the Development of Renewable Energy and with a view of using the entire territory most efficiently, peripheral wind turbines are planned to be constructed at the cable protection zone (100 m) from the boundaries of the territory, by planning the entire power plant layout grid, accordingly.[21]

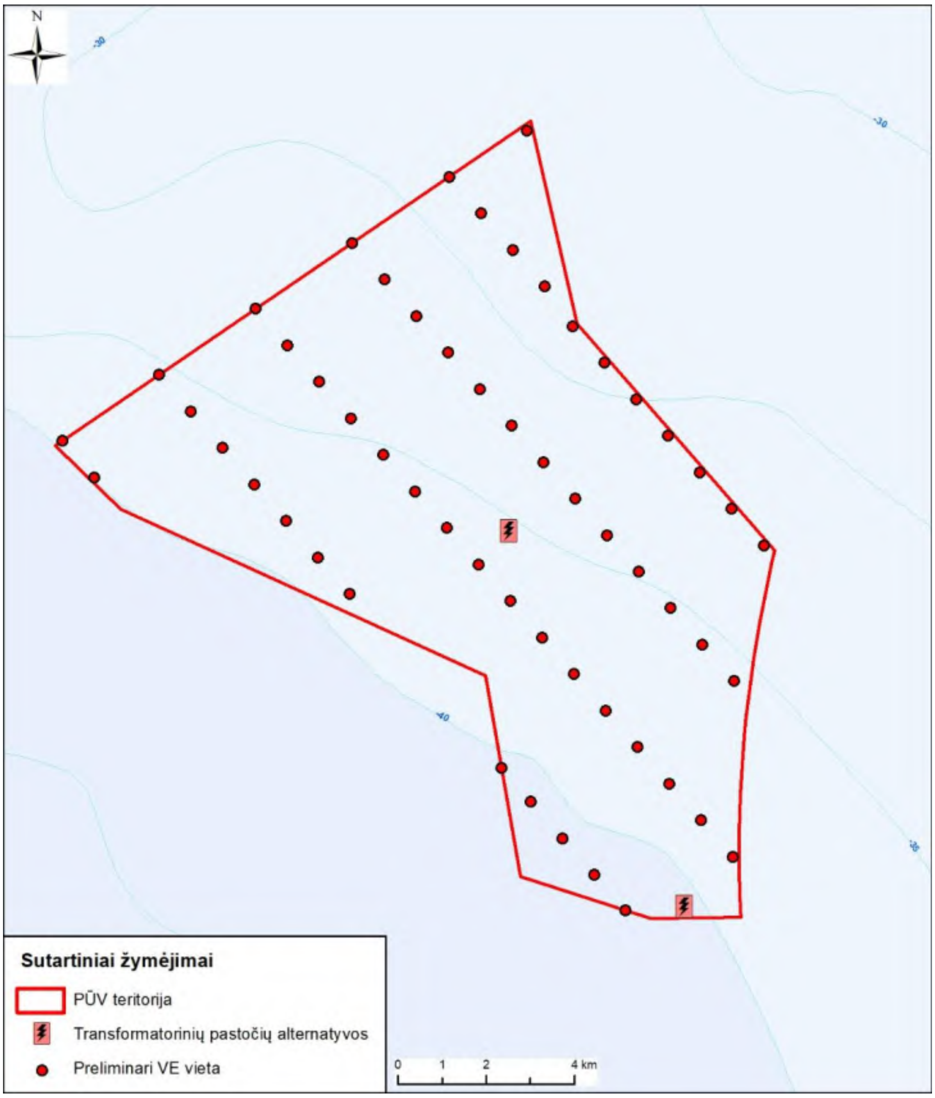

Fig. 3.1.1. Example of wind farm layout in the PEA territory.

Installation Solutions for the Offshore Transformer Substation

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[21] https://e-seimas.lrs.lt/portal/legalAct/lt/TAD/TAIS.416425

A transformer substation (hereinafter – the TS) is designed to accumulate the power generated by the entire wind farm, to transform it, and to transmit electricity to grids. A TS is usually built in the centre of the generated power or in another location suitable for bringing medium and high voltage cable lines. Step-up transformer substations do not occupy much space in the PEA territory:[22] Dimensions of the TS foundation is similar to the one of the WT.

The choice of substation location is influenced by:

- Sea depth: construction is more cost efficient in shallower waters;
- Lengths of medium-voltage cables and energy losses in them: most cost-efficient location for the substation is a centre of generating sources;
- Proposed high-voltage connections with onshore and other wind farms;
- Additional wind turbulence caused by a substation as a structure.

Preliminary optional locations for transformer substations of the proposed offshore wind farm are proposed with regard to the solution alternatives of the Development Plan (Fig. 3.1.2).

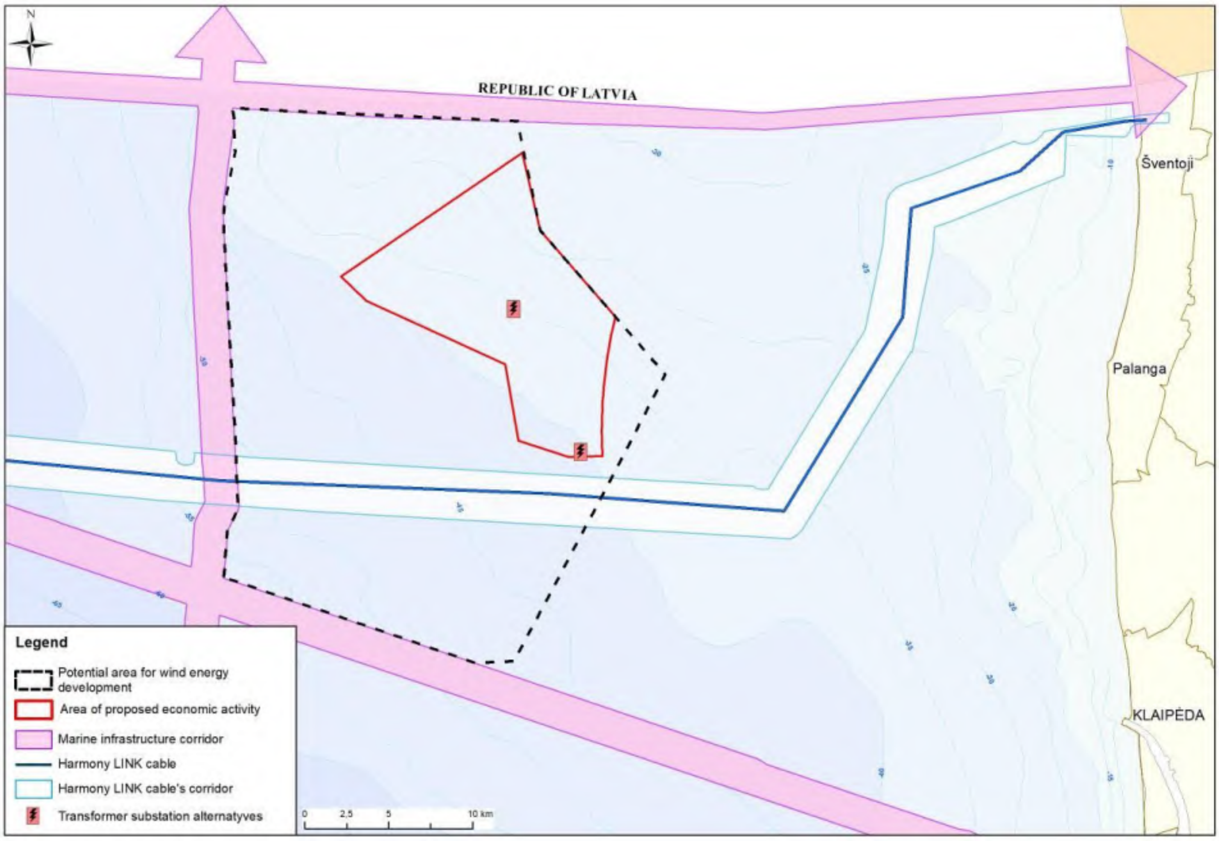

Fig. 3.1.2. Alternative locations of TS of the proposed offshore wind farm according to solutions of the Development Plan.

The technical design will specify the need for step-up (intermediate) transformer substations and the electrical network connection scheme. During the technical design phase, taking the above criteria into consideration, the proposed location of the TS may change.

[22] https://www.nordseeone.com/engineering-construction/offshore-substation.html

4. Expected Significant Impact of the Proposed Economic Activity. Measures to Prevent, Reduce and Compensate for Significant Adverse Effects on the Environment.

4.1. Water

Hydrological and Hydrodynamic Conditions of Lithuania's Baltic Sea

Hydrological and hydrodynamic Conditions of Lithuania's marine area in the Baltic Sea, including the PEA territory, is typical of the common conditions of the Baltic Sea **PR**.

Wave height There are wind waves prevailing in the Baltic Sea, thus, a wave regime is identical to the wind regime. The highest waves are observed in autumn and winter; the lowest ones – in summer. An annual mean wave height is about 0.7 m.

Table 4.1.1. Average wave height in the Baltic Sea (metres) in 1986–2005 (Klaipeda)

Month	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**IX**	**X**	**XI**	**XII**
Av.	1.02	0.78	0.70	0.52	0.47	0.51	0.57	0.63	0.74	0.75	0.76	0.92

Direction of wave motion almost coincides with direction of prevailing winds. In the south-eastern part of the Baltic Sea, waves prevail in the direction SW-W-NW:

0-2 m high waves, caused by 4-9 m/s speed winds in ~70 % of cases;

2-4 m high waves, caused by 10-19 m/s speed winds in ~24 % of cases;

4-7 m high waves, caused by storm winds in ~4 % of cases;

Calm sea is normally observed in summer and spring (~5 %).

Mixed waves, i.e., 1-3 m high waves and sway, are quite frequent in the Baltic Sea. 50% of wave heights on the Lithuanian cost are up to 0.6 m high waves; 90% - up to 2 m high waves. Over 5 m high waves occur on average once in 10 years (Kelpšaitė et al., 2011).

Extreme values of wind waves at the Baltic Sea coast are determined by strong W-S-W and W winds. Wave height is found to decrease at 20-25 m isobath.

Wave parameters have a significant impact on both hydrodynamic and sediment transportation processes at the Baltic Sea coast. There are not much data on observation of the Lithuanian marine area, therefore, when running the LMSFD project, parameters of the Lithuanian Baltic Sea wave propagation in strong winds was simulated.[23]

2D digital modelling system MIKE 21 has been used for simulation of wave propagation. The NSW (Near-shore Spectral Wind-Wave Module) has been a model when simulating the parameters of wind-produced wave propagation at the Baltic Sea coast (MIKE, 2002). The baseline data on the offshore wave model were retrieved from the ECMWF (European Centre for Medium-Range Weather Forecasts, www.ecmwf.int) wave model for the period 2016-2018 (inclusive).

Currents. Lithuania's territorial waters have a basic cyclonic direction of currents in the Baltic Sea (counter-clockwise) (Žaromskis, 1996), which forms prevailing flows of water masses along the coast from south to north.

The interaction between atmospheric processes and inert water mass forms a complex structure of surface and deep currents. Varying seasonal activity of atmospheric processes above the Baltic Sea is reflected in

[23] Preparation of the Documents of Enhancing the Lithuanian Baltic Sea Environmental Management. Interim Report I. Klaipeda University Coastal Research and Planning Institute, 2011.

the annual change of current rates. The lowest current rates are observed in the spring-summer season, the highest – in autumn-winter.

Wind-induced currents are directly formed by wind on water surfaces. Due to unevenness of the wind field and intense variation of wind speeds, wind-induced currents have a complex spatial structure and high variation over time. The speed of wind-induced currents is decreasing in greater depths.

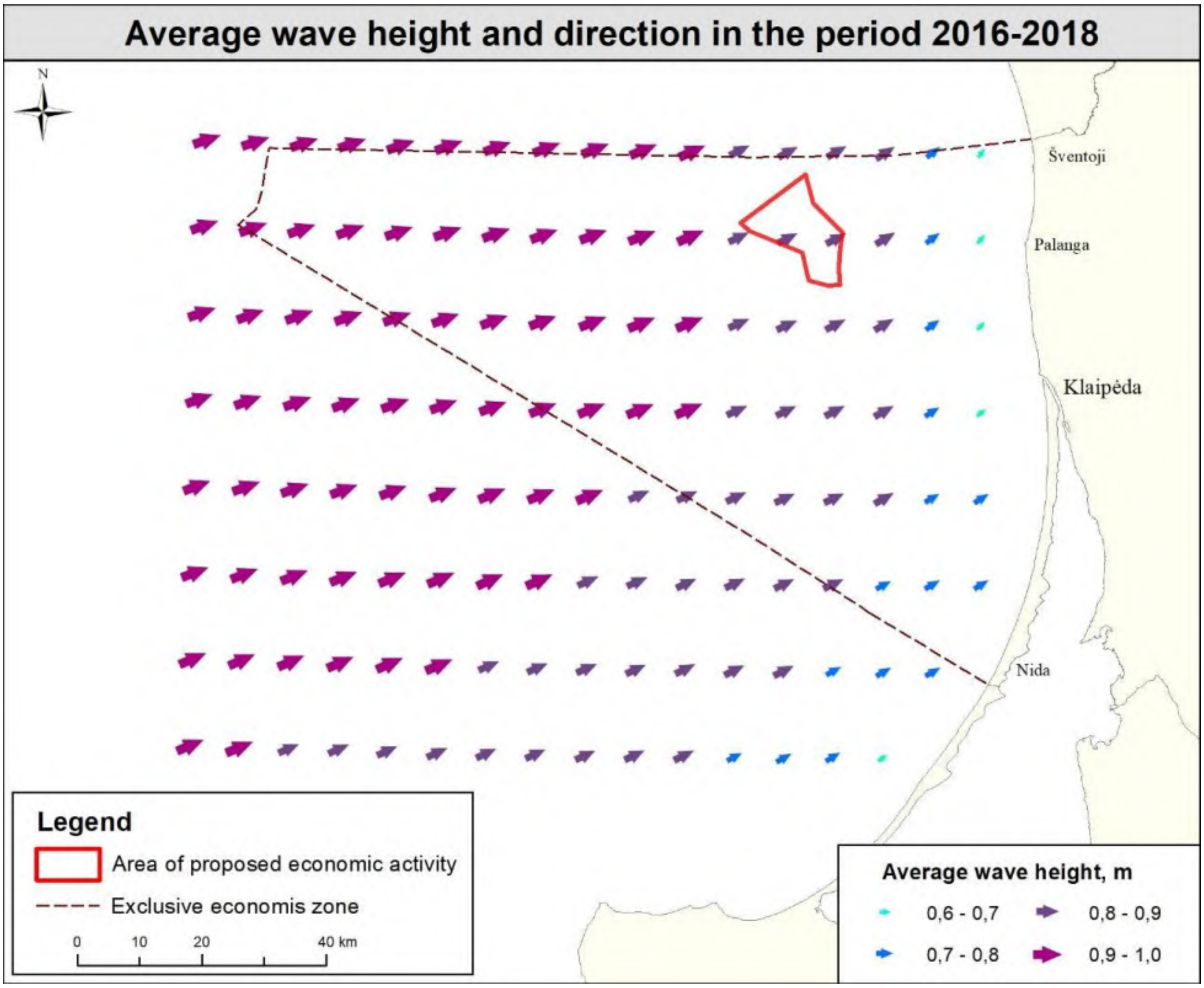

Fig. 4.1.2. Average wave height and direction in Lithuania's territorial waters of the Baltic Sea

By nature of formation, there are several types of currents prevailing on the sea: long forced waves that form in the interaction of the static water mass and the varying pressure above the water surface; periodic currents that are caused by water level fluctuations; currents in relation to internal waves in layers of different densities (Гидрометеорологические условия шельфовой зоны морей СССР, 1983).

At the sea surface, in the 0-10 m thick layer, there are weak and medium currents prevailing, with a speed normally not exceeding 0.20 m/s (Žaromskis, Pupienis, 2003). The marine area between the coast and 35 m isobath has northward currents. Currents are directed toward the south far less often, toward the south-west – least often. The northward direction of the current is determined by the freshwater flowing from Curonian Lagoon. The 35-45 m deep area away from the shore is predominated by south-west, south, and west currents. Even further, i.e., beyond the 45 m isobath, currents are directed toward the east and north-east. In the intermediate water layer (10-30 m), there are various current regimes formed. The water area of up to 25 m depth, like in the surface layer, mostly has northward currents. Less frequently, currents are directed south- and westward. Beyond the 45 m isobath, there are north and north-east currents prevailing. In the intermediate water layer, current speed is 0.11 to 0.14 m/s. Weak, 0.07-0.09 m/s rate currents normally prevail in the bottom layer. The water area to 35 m isobath mostly has north-west and south-east currents, in 35 to 45 m isobath – north-west, west, and south-west currents, and beyond 45 m – north currents (Žaromskis, Pupienis, 2003).

Simulation of average current rates (m/s) and directions (degrees) for different seasons (spring, summer, autumn, winter) (SMHI BALTICSEA_REANALYSIS_PHY_003_011 2012-2016) shows that weak surface and bottom currents prevail in the open sea, with the speed averaging 3-5 cm/s in the surface layer and 1-3 cm/s in the bottom one (Fig. 4.1.3-4.1.4).

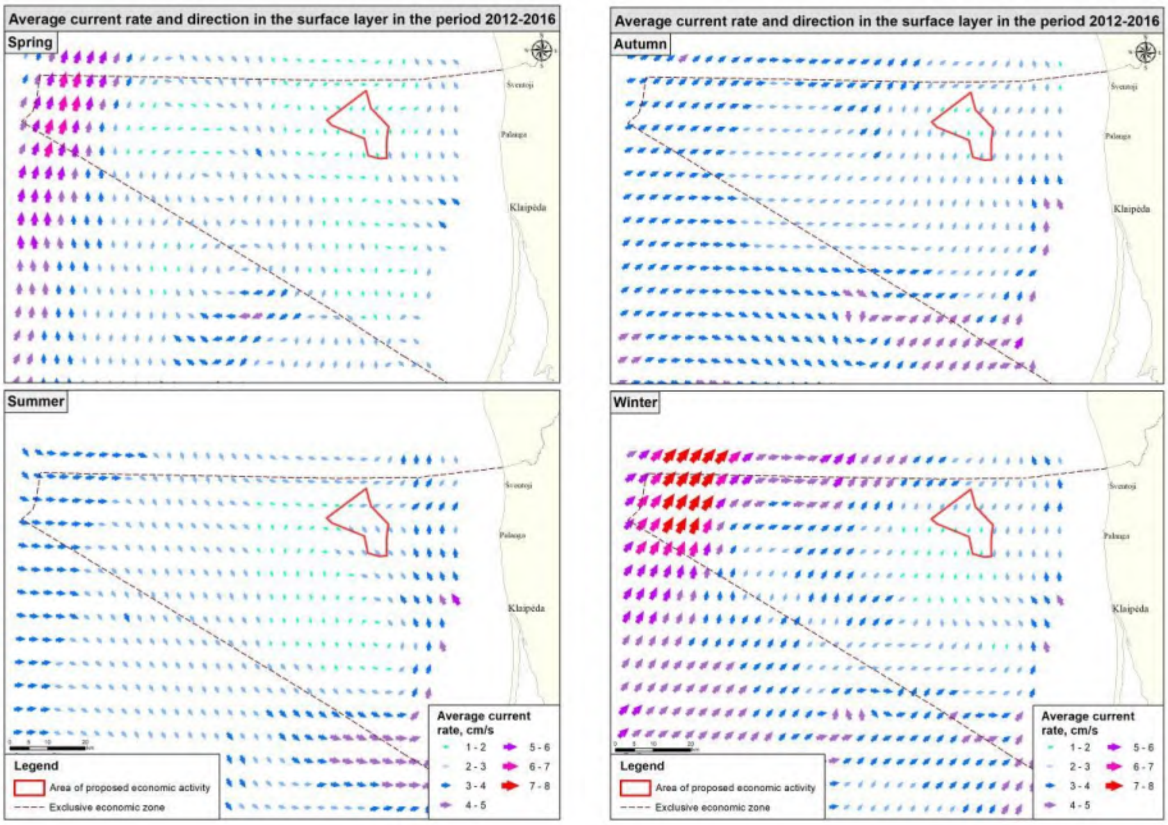

Fig. 4.1.3. Average current rate and direction in the surface layer in the period 2012-2016 (SMHI, Sweden).

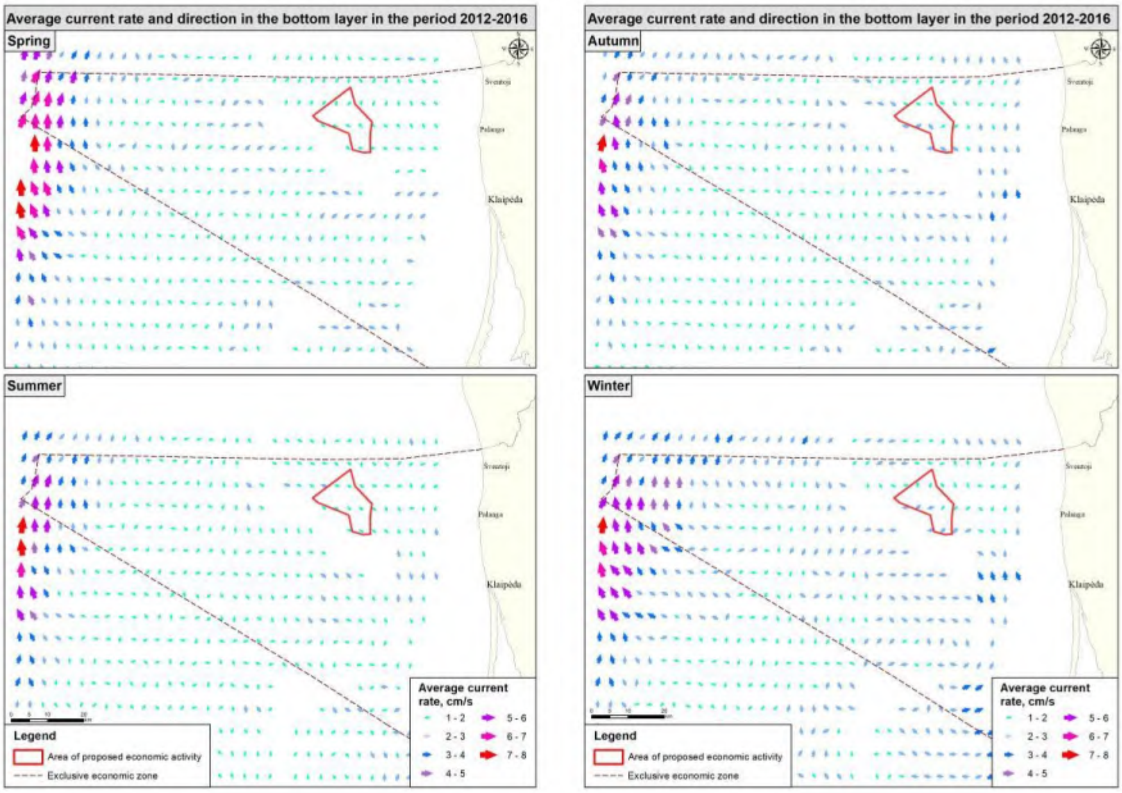

Fig. 4.1.4. Average current rate and direction in the bottom layer in the period 2012-2016 (SMHI, Sweden).

Temperature, Salinity, and Water Clarity Lithuania's marine area in the Baltic Sea is relatively shallow, as a result, thermal regime of the water responds to seasonal fluctuations of climate conditions very quickly (Dailidienė et al., 2011). Minimum water temperatures are reached in February (to -0.5°C), and maximum – in July-August (to 28.2°C).

In any single year, the coastal area, territorial waters of the Baltic Sea, and the open sea have specific horizontal distribution of water temperature and certain vertical stratification of water related to temperature gradients. In all seasons, at the sea surface up to a depth of 10 m, there is a homo-thermal layer of convective and turbulent mixing formed. Seasonal thermocline (a layer of rapid temperature drop) develops in summer at the depth range of 10-40 m; the water temperature gradient in this layer is 0.5 - 1.0 °C/m. The thermocline separates a surface, warm mass of water from the intermediate cold layer. Meanwhile, the difference between water temperature in coastal areas and in deep-water areas may reach 15 or more degrees. In a halocline area and deeper, temperature fluctuations are minor throughout the year.

In autumn, waters of the open sea thermally mixed down to permanent halocline at the depth of 40 m (Vyšniauskas, 2003). At this time, not only intense convective mixing takes place, but stronger winds and higher waves are observed, too. In a halocline area and deeper, temperature fluctuations are minor throughout the year (Dailidienė et al., 2011).

Variations of salinity in the southeastern Baltic Sea, in Lithuania's marine area, depend on the inflow of fresh waters from rivers , as well as on the variations of salinity in the central Baltic Sea. In Lithuania's water area, average water salinity is about 7 ‰. The western part of the Lithuanian EEZ belongs to the central Baltic Sea which has a two-layer structure of water. In the upper layer (at the depth of 0 m to approx. 60 m), salinity is 6–8 ‰. This layer is isolated from the saltier deeper layer by a permanent halocline. In the central Baltic Sea, a halocline borders at a depth of 64-90 m, its centre is at a depth of 74 m; salinity of this layer rapidly jumps from 7.7 to 10.4 ‰ (Matthäus, 1990). At greater depths, isolated with a halocline, oxygen saturation of the water decreases. In the bottom layer, there is oxygen deficiency observed and a hydrogen sulphide zone formed.

In coastal areas and in the shallow open sea, clear and permanent stratifications do not develop due to salinity; a homogeneous well-mixed water mass prevails up to a depth of 55-60 m (Dailidienė et al., 2011).

Two key methods are used to measure water clarity: 1) water clarity measurement (in metres) using a *Secchi* disk, and 2) measurement of the amount of suspended solids (mg/l) in water. The data on measurements of suspended solids in the Lithuanian coastline are fragmented, therefore, further analysis involves *Secchi* disk measurements.

The Baltic Sea monitoring reports by the Department of Marine Studies of the EPA show that the highest water clarity is in the open sea where the *Secchi* depth reaches 4.5 m.

Ice Cover No permanent ice cover is formed in the Lithuanian area of the Baltic Sea. In normal and severe winters, a shore ice belt, from a few metres to a few kilometres wide, is formed in coastal areas. It usually consists of piled ice rocks, brought to the shore by wind and water currents which stays stable only in calm and cold weather.

Ice cover develops up to 1.5 km from the shore. Drifting ice sheets, up to 10 cm thick, cause ice jams at a distance of up to 7 km from the shore. Due to climate change and, thus, milder winters, there are fewer days of ice phenomena in the Baltic Sea observed. The decrease in the number of ice phenomena days reversely proportional to the annual increase in water temperature. In the Lithuanian coastline, an average duration of ice phenomena decreased by approx. 50 percent during the period of 1961-2009 (Dailidienė et al., 2011).

Water Quality

In Lithuania, the ecological and chemical status of the Baltic Sea is constantly controlled through the environmental monitoring of the Curonian Lagoon and the Baltic Sea.

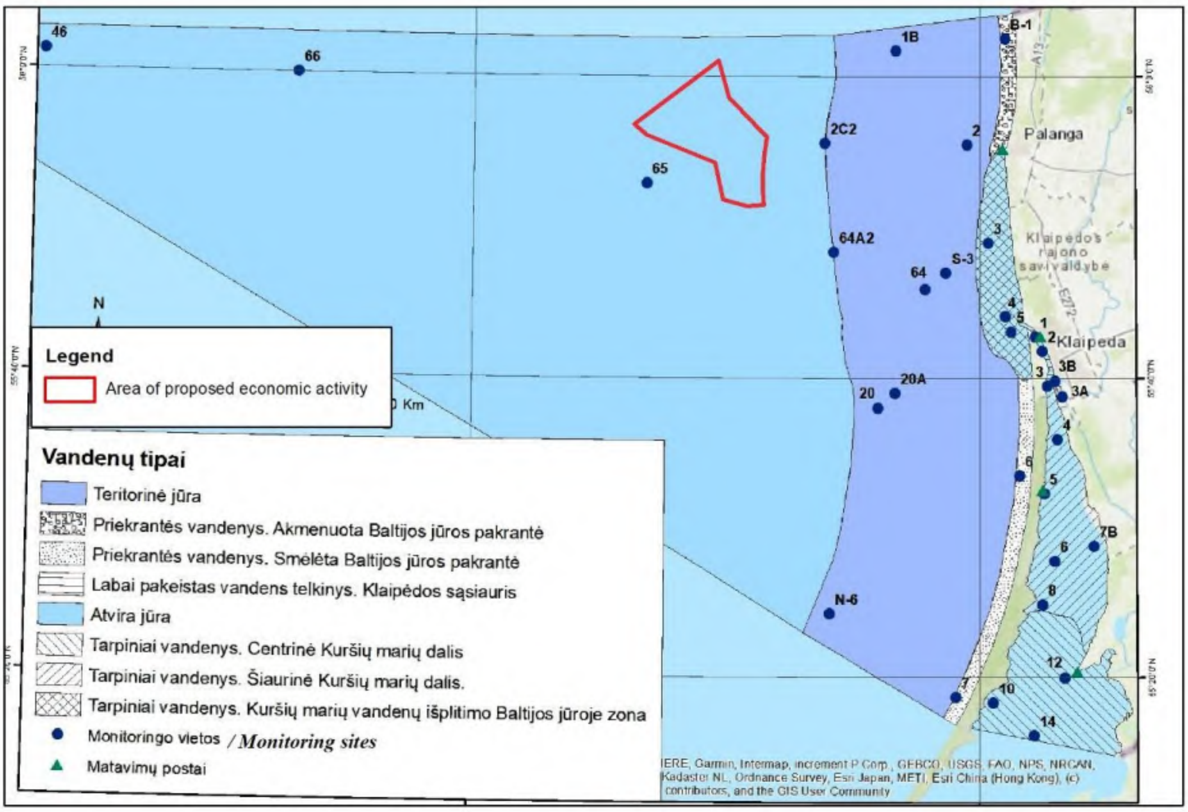

Fig. 4.1.5. Monitoring sites in the Baltic Sea and the Curonian Lagoon.

Ecological status is determined for each of the water bodies of transitional waters and coastal waters, by assigning the status with one of the five quality grades: very bad, bad, average, good, and very good. Transitional waters include the Curonian Lagoon (northern and central ones) and the zone of propagation of the Curonian Lagoon's waters into the Baltic Sea. In accordance with the Rules for the assessment of ecological status of surface water bodies, the ecological status shall be assessed on the basis of the survey of the surface or integrated water layer (at a depth of up to 0.5 m in the Curonian Lagoon, 1 m to 10 m – in the Baltic Sea). Average values of chlorophyll 'a,' total nitrogen and total phosphorus, water clarity, average annual number of specific pollutants, average content of macroinvertebrates in a sample of a warm period (June to September) have been used to assess the ecological status of the Baltic Sea coastline (sandy and stony) and the Curonian Lagoon. Further, the higher phytoplankton abundance index was used to assess coastline waters, seasonal phytoplankton succession index – to assess the northern and central areas of the Curonian Lagoon, and macroinvertebrate community index (MCI) – to measure the quality of sandy coastal waters.[24]

Chemical status is determined for transitional waters, coastal waters, marine area, and exclusive economic zone by assigning the status with one of the two quality grades: good or below good. Good chemical status of a surface water body means that no concentrations of substances listed in Annex 1 and Annex 2, Parts A and B (List B1) of the Wastewater Management Regulation exceed an annual average value of the Environmental Quality Standards (AA-EQS)) and/or a maximum allowable concentration (MAC-EQS). EQS) and/or the biota EQS.[25]. Should the concentration of at least one substance is found to be exceeded, the status of a water body is considered below the good status. Concentration limits for substances in the bottom sediments are determined in accordance with LAND 46A-2002[26].

Annual average values of total nitrogen and total phosphorus in the marine areas of the Baltic Sea and the Exclusive Economic Zone, the chemical status thereof are determined on the basis of characteristics of good environmental status of the Lithuanian marine area and their qualitative descriptors.[27]

<u>Potential Impact of the Proposed Economic Activity on Water</u>

Under normal operating conditions, the offshore wind farm will not have any significant impact on seawater quality. However, temporary changes in water quality are possible during construction, i.e., when installing foundations and laying cables due to a temporary increase in suspended particles (turbidity) in the bottom layers of water column.

Where the proposed economic activity relates to the sea, information on the marine environment and its characteristics shall be provided: geochemical properties of the water of the Baltic Sea, currents, waves, including medium, storm values, their recurrence, seasonal and perennial fluctuations.

Characteristics of good environmental status of the sea have been established by Order of the Minister of Environment of the Republic of Lithuania no. D1-194 of 4 March 2015 "On Approval of the Characteristics of the Good Environmental Status of the Lithuanian Marine Area." The qualitative descriptors for determining good environmental status (according to Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy) have been established in Order of the Minister of Environment of the Republic of Lithuania no. D1-500 of 14 June 2010 "On Approval of the Procedure for Assessment of the Marine Environmental Status, Setting of Characteristics of Good Environmental Status

[24] Order of the Minister of Environment of the Republic of Lithuania no. D1-210 of 12 April 2007 "On Approval of the Procedure for the Assessment of Ecological Status of Surface Water Bodies."

[25] Order of the Minister of Environment of the Republic of Lithuania no. D1-236 of 17 May 2006 "On Approval of the Wastewater Management Regulation."

[26] Order of the Minister of Environment of the Republic of Lithuania no. 77 of 26 February 2002 "On Approval of the Environmental Normative Document LAND 46A-2002 'Rules for Excavation of Soil in the Waters of the Open Sea and Seaports and Disposal of the Excavated Soil."

[27] Order of the Minister of Environment of the Republic of Lithuania no. D1-194 of 4 March 2015 "On Approval of the Requirements for Determining the Characteristics of the Good Environmental Status of the Lithuanian Marine Area."

of the Baltic Sea, Objectives of Protecting the Marine Environment, the Monitoring Programme and Measures," Annex 2.

Operation of the proposed offshore wind farm is not expected to have any significant impact of water; the EIA will rather be aimed to assess peculiarities of hydrological and hydro-chemical conditions of the territory in question. Available data will be measured and new studies on hydrological and hydro-chemical parameters of water will be conducted.

Content of Environmental Impact Assessment

Projected studies and exploratory work	
Type of study	***Projected studies***
Hydrological parameters	Speed and direction of water currents, temperature, salinity
Hydro-chemical parameters	pH, dissolved oxygen, suspended solids, petroleum hydrocarbons, polyaromatic hydrocarbons, heavy metals
Information to be provided in the EIA report	
Aspect to be considered	***Information provided***
Current situation	Description of the hydrological and hydrodynamic regime of the territory and peculiarities thereof Information on hydro-chemical conditions and water quality.
Potential significant impact during the wind farm installation, operation, and dismantling phases	Potential impact of the wind farm on the hydrodynamic situation, water quality, and good environmental status. Potential water pollution with oil products. Changes in water clarity during the WT construction: cabling, foundation installation.
Assessment methods	Hydrological and hydro-chemical surveys on water. Analysis of primary and secondary data, GIS mapping, expert opinion
Mitigation measures	Analysis of mitigation measures

4.2. Ambient Air and Climate

The key meteorological factor of favourable conditions for the development of offshore wind energy projects is wind strength. Based on the aggregate data (Fig. 4.2.1), the wind strength at sea increases as moving further away from the shore and varies from 7 to 10 m/s. Preliminary data (based on mathematical modelling (100 m above the sea level)) suggest that the average wind speed in the PEA territory may reach approx. 9 m/s.

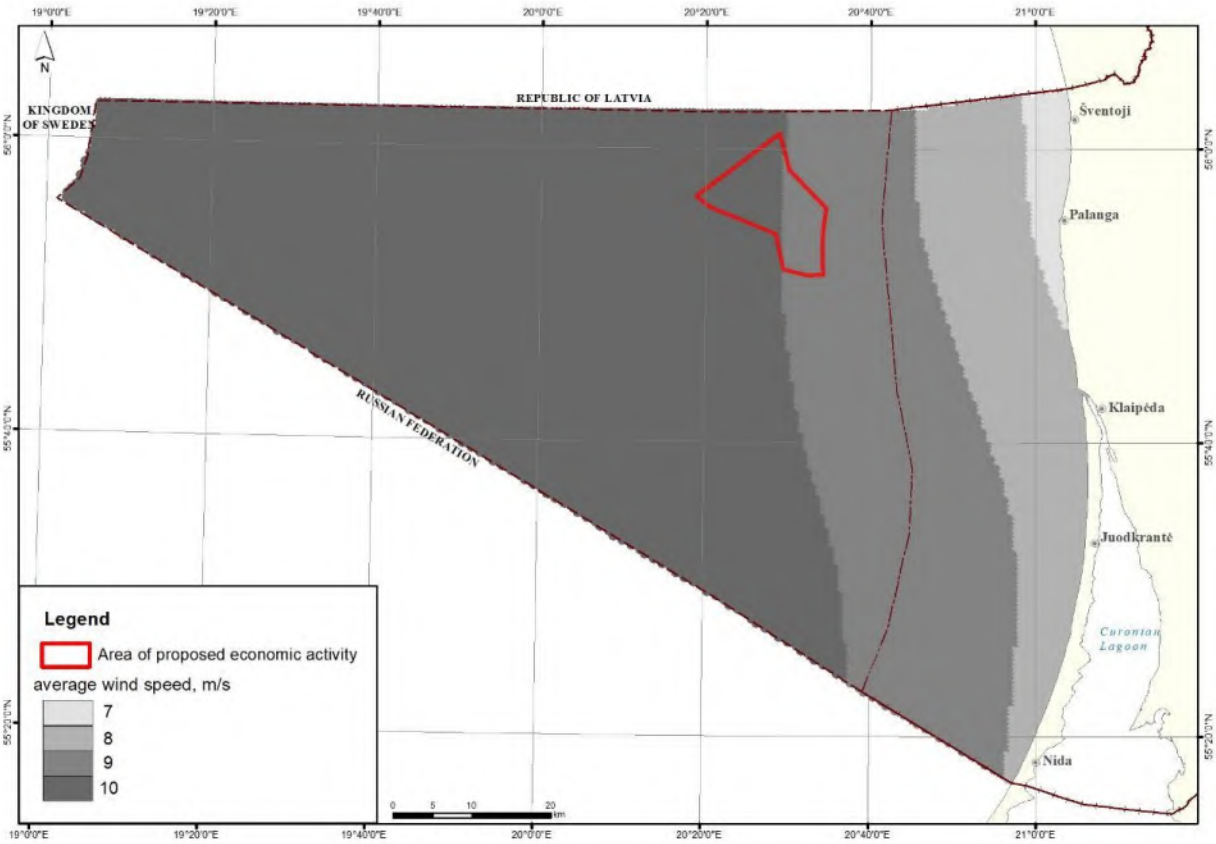

Fig. 4.2.1. Average wind speed at sea.

Air pollution is associated with mechanisms of construction and maintenance of wind farms rather than with the main proposed activity, i.e., electricity production by wind turbines. Main sources of ambient air pollution during the offshore wind farm installation, operation, and dismantling phases are means of transport and operated construction machinery.

Renewable energy sources, as a climate change mitigation measure, are particularly welcome in terms of climate impact. Wind energy is one of the renewable forms of energy, which reduces the use of fossil fuels and, together, emissions of CO2 and other substances into the ambient air. The use of wind energy plays a great role in controlling climate change by reducing greenhouse gas emissions from the energy sector. The PEA implementation is expected to have an indirect positive effect on the climate.

Information to be provided in the EIA report:

Ambient Air and Climate	
Current situation	Climate conditions. Distribution of speed and directions of wind in the territory under study.
Potential significant impact during the wind farm installation, operation, and dismantling phases	Sources of ambient air pollution and emissions. Provisional quantities of ambient air pollutants from mobile sources. Potential impact on the climate.
Assessment methods	Ambient air pollution from mobile sources will be assessed using available pollution calculation methodologies.

Measures to prevent, reduce, or compensate for major adverse effects on the environment	Description of mitigation measures.

4.3. Soil: Seabed and Deep Sea

The seabed of the Lithuanian marine area in the Baltic Sea was caused by glacial activity, by water level changes in different eras of Baltic Sea evolution, and by modern sedimentation processes. There are two favourable topographic forms, i.e., plateaus, and adverse forms, i.e., basins, identified at the bottom of the sea.

The Klaipeda-Ventspils Plateau (Gelumbauskaite, 1986), where potential wind energy development area is located, is most significant in terms of the object under study. The deeper northern slope of the Gdansk Basin, in part, and the complete Nemunas Valley, opening to the basin (Gelumbauskaite, 2010) are beyond the boundaries of the territory under study.

The Klaipeda-Ventspils Plateau in the northern Lithuanian water area starts at the Gulf of Riga, stretches along the shore, and somewhere in the latitude of Liepaja turns south-west, to settle between the Gotland and Gdansk basins. There are also more prominent elevations at this location. One of them is known as the Bank of Klaipeda, located in the north-western part of the Lithuanian Economic Zone. The sea depth in some places of this area reaches 47 m (Gelumbauskaitė et al., 1999). Westwards, this bank descends a steep slope into the Gotland Basin.

One the most fragmented seabed areas is the southern part of the Klaipeda-Ventspils plateau which stretches up to the coastal area at Sventoji-Palanga and adjoining the shore of Giruliai. This territory has a large variety of fragmented seabed patterns. Herein, a relative height of some single forms normally reach 4-5 m, and sometimes 6-8 m.

Based on foundation technologies, the best conditions for the installation of wind farms are seabed areas with a depth of 20 to 40 m (installation of wind farms in coastal areas, up to 20 m is practically infeasible due to the environmental constraints). The PEA territory mainly has 34-40 m depths (Fig. 4.3.1).

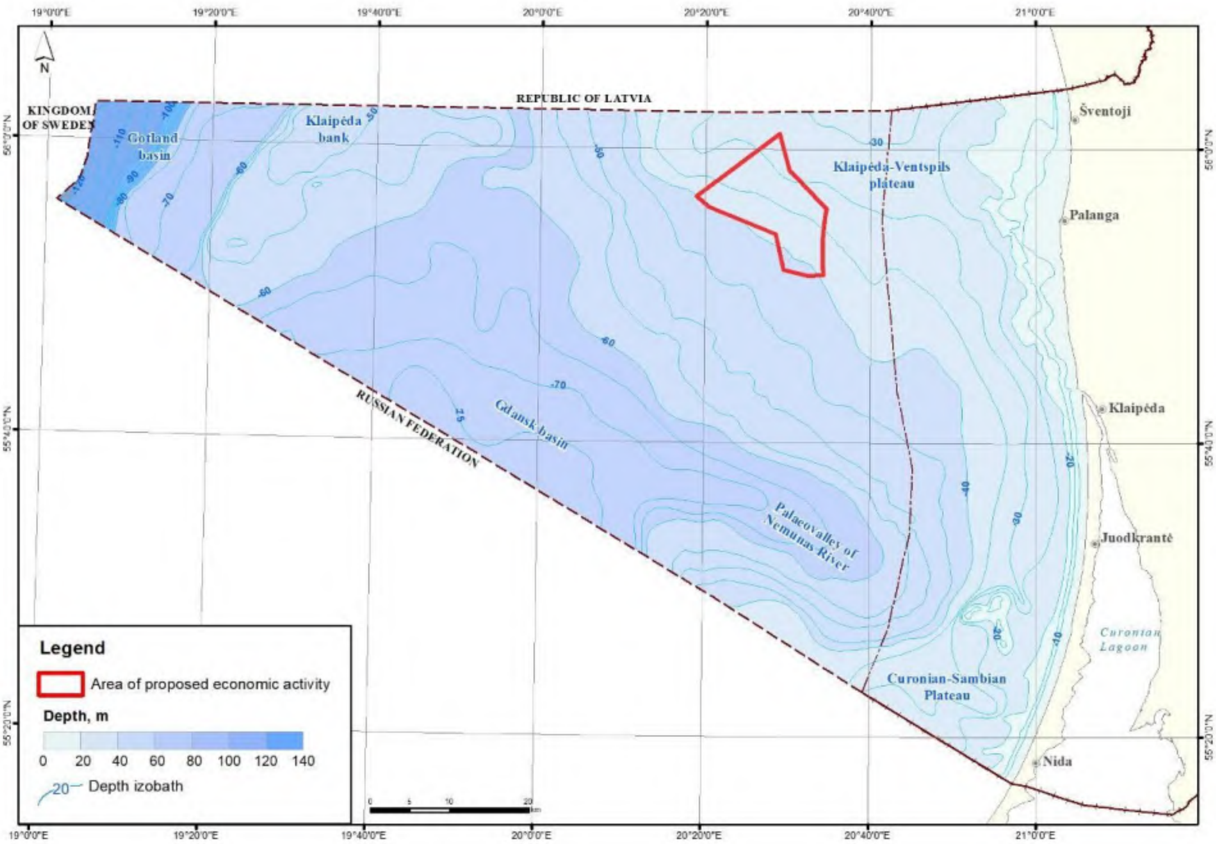

Fig. 4.3.1. Sea depth scheme for the PEA territory.

<u>*Distribution of Bottom Sediments*</u>

The seabed of the Lithuanian water area is covered with recent and relict bottom sediments (Gulbinskas, 1995). Relict sediments are sediments deposited during the Ice Age and Baltic Sea evolution stages. They occur in hydrodynamically active areas of the sea where sedimentation no longer takes place today or, even, where bottom destruction occurs. In many such spots, glacial deposits (moraine) are heavily eroded; their surface is covered with boulders, pebble, shingle, or uneven-grained sand.

Relict deposits and sediments also cover the Klaipeda-Ventspils Plateau, within which the PEA territory is located. Relict sediments consist of moraine of varied composition (sand, loam, boulder clay) and the eroded elements (boulders, pebble, shingle). This boulder rock separates the coastline of Lithuania's mainland from the open sea. Its dispersal range: at Giruliai: 14–18 m, Karklininkai: 16–20 m, the Dutchman's Cap (Lithuanian: *Olando kepurė*): 5–25 m, Nemirseta: 10–22 m, Palanga: 4-23 m, Sventoji: 17–29 m, and Butinge: 21-32 m.

Recent sediments are found in accumulation areas. The main types of sediment are sand, siltstone, and sludge) (Emelyanov et al. 2002). Sand mostly consists of fine-grained sand. There are three areas of dispersal of such sand: one of them is also found at the foot of Klaipeda-Ventspils Plateau; herein the sand deposits at a depth of 26-40 m. Bottom in deeper marine areas (45–65 m) is covered by silty sediments. Sludge sediments consist of fine siltstone and pelitic siltstone. The said types of bottom sediments are widespread at a depth of 50-60 m and cover the bottoms of Gdansk and Gotland basins,

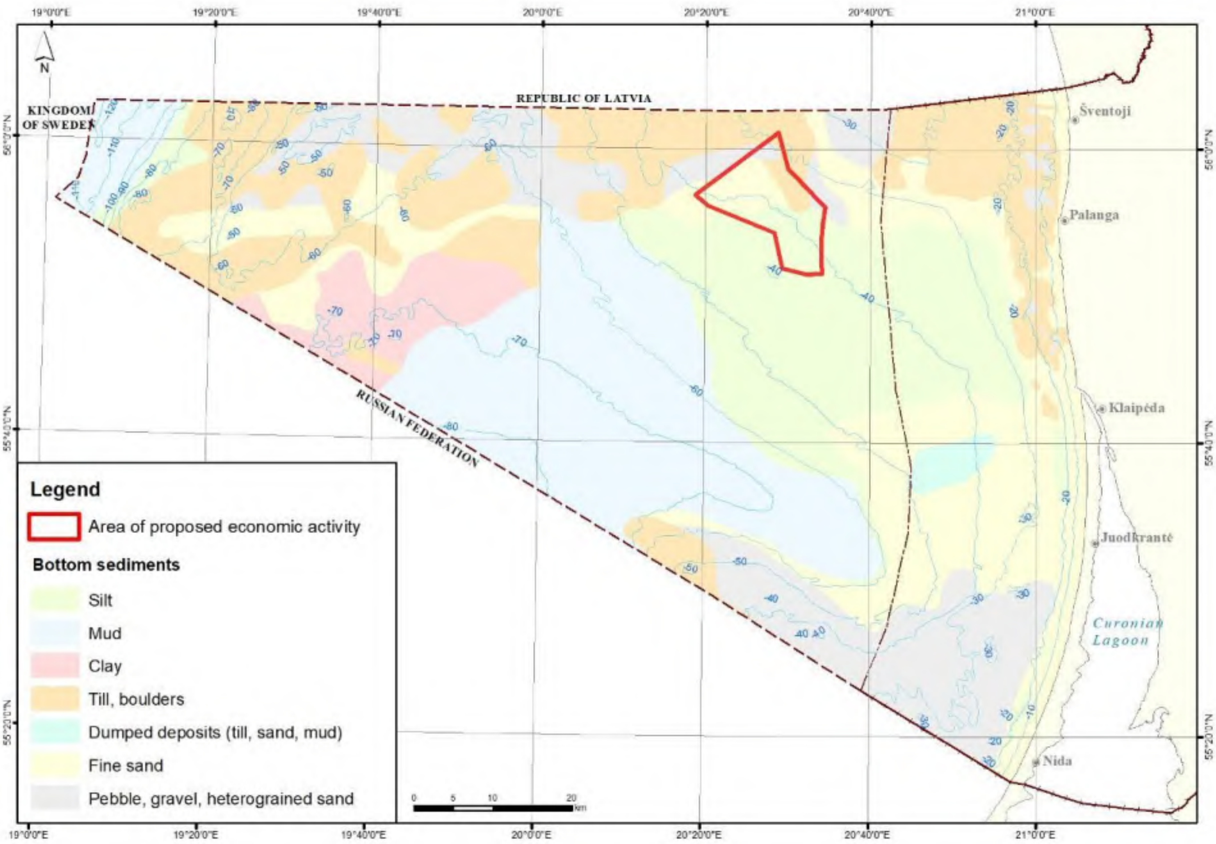

Fig. 4.3.2. Lithological composition of bottom sediments.

In the bottom of the Baltic Sea, there are found sediments of various ages, origins, and compositions. Depending on the intensity of sedimentation, the recent formation of sediments does not occur in some areas of the bottom; instead, deposits and rocks from previous geological periods are uncovered. The layer of sedimentary rocks in the Lithuanian marine areas is about 2 km thick.

The upper part of the geological section consists of quaternary sediments. Thickness of the quaternary sediments greatly varies, i.e., from 5-10 m in plateaus to more than 100 m in paleosections. Under the quaternary sediments, there occur formations of the Middle and Upper Devonian periods (sandstone, siltstone, dolomite), Permian (dolomite limestone), Lower Triassic (clay, clayey siltstone, and marl), Middle and Upper Jurassic (argillite), and Lower and Upper Cretaceous epochs (Terigenic clay, siltstone, glauconitic-quartz sand).

The quaternary column of the Lithuanian waters in the Baltic Sea consists of three key lithostratigraphic complexes: Pleistocene glacial deposits (prevailing moraine loams and sandy loams), sediments (clays, sands) formed during various phases of Baltic Sea evolution (mud of Late Glacial and Holocene periods), as well as recent marine sediments (sand, siltstone, mud). Deposits and sediments from the first two lithostratigraphic complexes are also known as relict deposits and sediments (Gulbinskas, 1995). They occur in hydrodynamically active areas of the sea where sedimentation no longer takes place today or, even, where bottom destruction occurs.

In the PEA territory, quaternary sediments are about 20–30 m thick. Beneath them, there are normally deposits of the Triassic, less often of the Permian period found.

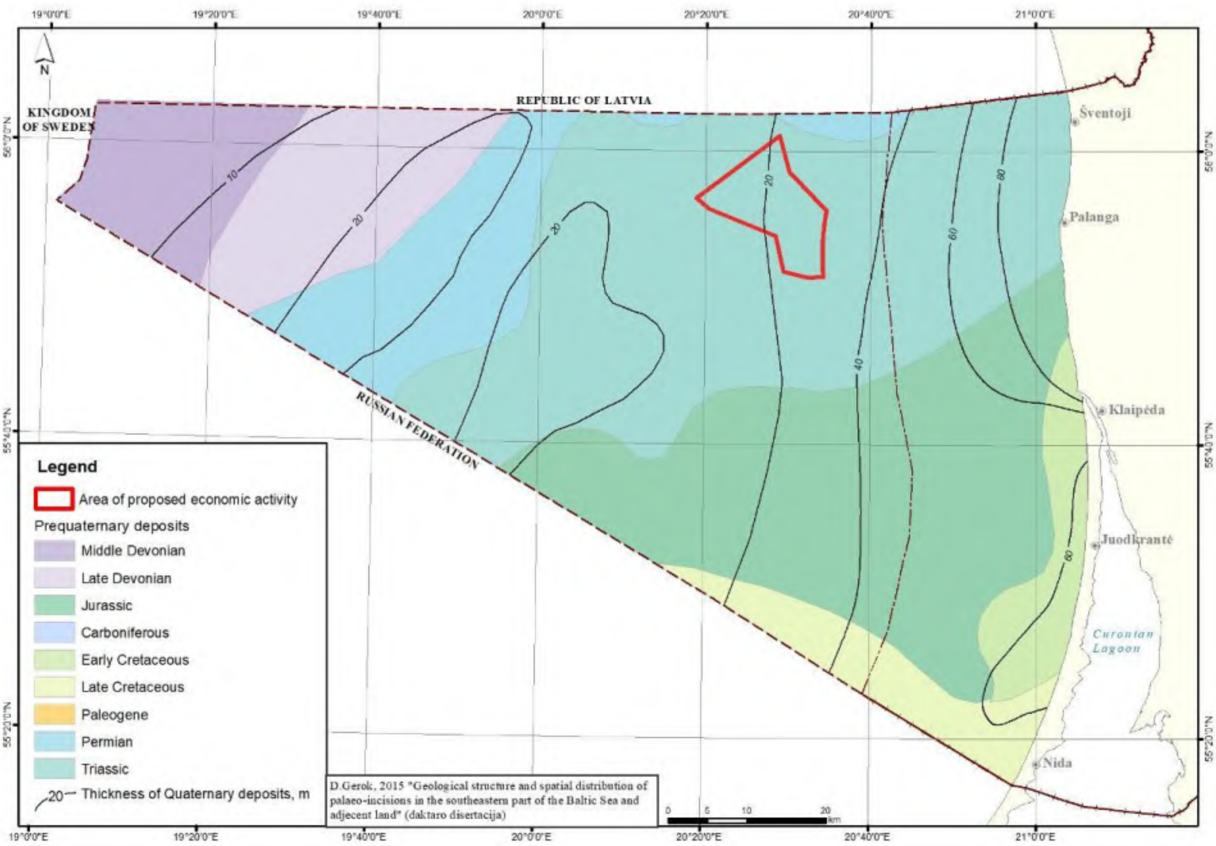

Fig. 4.3.3. Post-quaternary sediment prevalence and quaternary column thickness.

Mineral Resources

Oil According to the Lithuanian Geological Survey on potential oil structures in the Lithuanian marine area, the Lithuanian EEZ is supposed to store about 40–80 million tons of oil.

Chapter 8 of the solutions of the Comprehensive Plan of the Territory of the Republic of Lithuania 2030 (revised according to public and entities' comments) "Preservation and usage of resources, development of bio-production economy," p. 465, states that regulation for the development of oil resources in the maritime part shall be envisaged in coordination with other activities (wind energy, shipping, etc.), internal, inter-sectoral, and international cooperation shall be promoted and enhanced.

The PEA territory does not fall within the known potential oil locations, though, it is possibly adjacent thereto. Therefore, once the additional results of potential oil structure surveys are received, this information will be further assessed.

Sand and Gravel The sand and gravel resources in the Lithuanian EEZ have not been yet explored or included in the state register of mineral resources as a mineral deposit. Nonetheless, there have been found accumulations of these resources during the geological mapping. The most intense sand dispersal is found in the hydrodynamically active area up to 20 m. The sand in this area, however, maintains the dynamic balance of the coastline, nourishes the beaches, and is prohibited from usage due to the environmental and coastal protection constraints.

Another range of sand dispersal is found on the south-eastern slope of the elevation of Liepaja – the Klaipeda-Ventspils Plateau – the Curonian-Sambian Plateau and its north-western slope. In these areas, the occurrence of sand and coarse-grained sediments is associated with the coastal formations of the transgressive and regressive phases of the Baltic Sea. Such ancient sediments are often covered with recently formed sea sands. The thickness of the sands reach 5 meters and more.

In this marine area, there are two locations defined as potential sources of sand for shore management:

- The south-eastern slope of Klaipeda-Ventspils Plateau, 25-30 m deep, coastal formations of the transgressive and regressive phases of the Baltic Sea. Sand dispersal over relatively large areas on the slopes of the plateau. A sand layer thickness reaches 1 metre and more.
- On the surface of the Curonian-Sambian Plateau, there are found relict formations of the Ice Age or the Baltic Sea evolution stages. Sea depth is 20-30 metres. Sand dispersal range is the largest here; a layer thickness is over 3 metres.
- In Preila-Juodkrante district, the most promising elevation area is between 20-27 m isobaths. When implementing the Coastal Strip Management Programmes, the sand from the district of Preila - Juodkrante was used for restoration of beaches of Palanga.

There are no approved sand deposits in the PEA territory.

Amber. The world's largest amber deposits are found on the Sambia Peninsula, the current Kaliningrad region. Here, near the small village of Yantarny, the world's largest amber reserves are extracted in the open-cast mine. Despite the immediate vicinity, there are no large amber deposits in Lithuania. Small deposits of amber are found near Priekule, next to the King Wilhelm Channel, as well as in the districts of Preila, Juodkrante, and Nida, though, of minor commercial significance. There are no known amber deposits in the PEA territory.

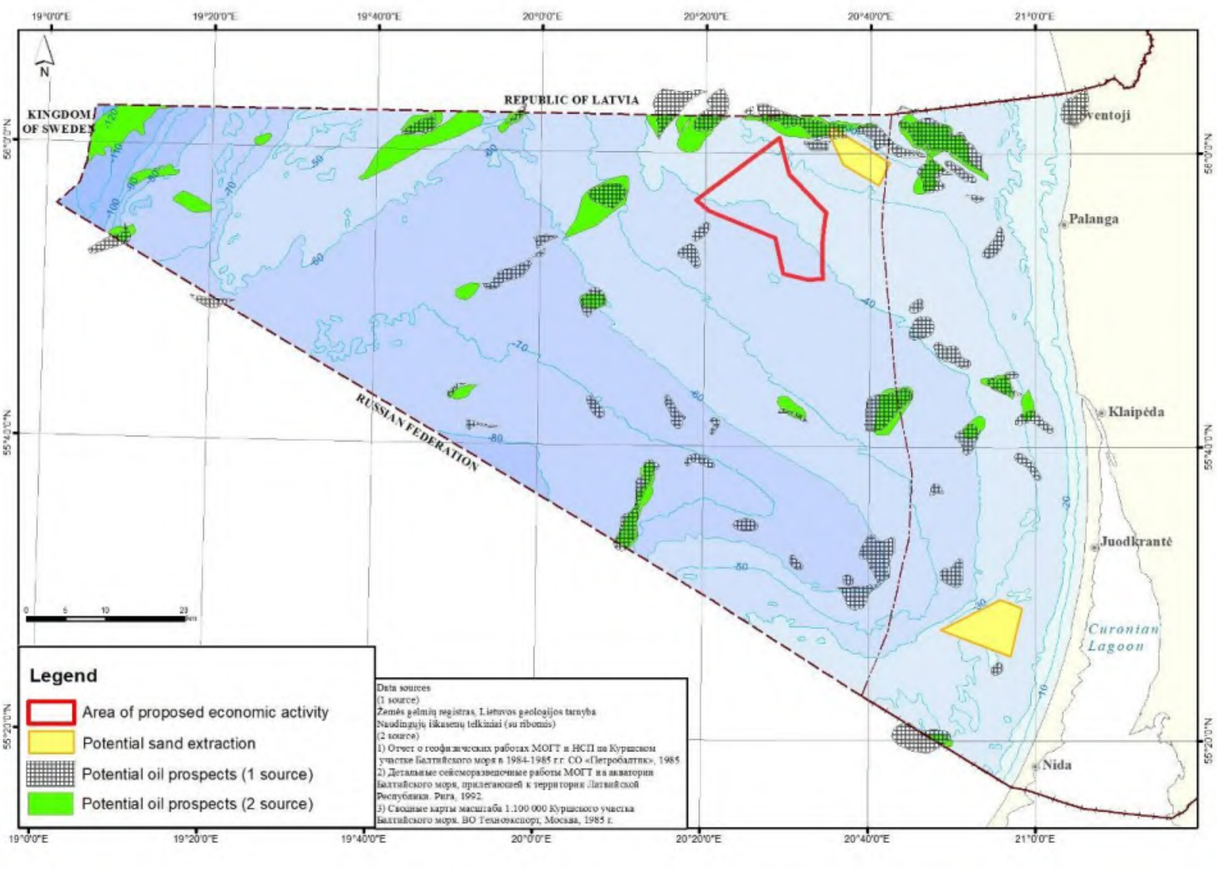

Fig. 4.3.4. Layout of the PEA in respect of mineral deposits.

Content of Environmental Impact Assessment

The geological structure of the area has a greater impact on the processes of installation of the WTs, cabling, and the selection of foundation structures. The EIA will especially focus on assessment of geological conditions of the PEA territory so that to measure a potential impact of the WT installation on the integrity of the seabed.

Research projects	
Type of study	***Projected studies***
Submarine morphology	Seabed surveys.
Geological structure of the bottom surface	Distribution and composition of bottom sediments.
Geochemical surveys	Contamination of bottom sediments.
Information to be provided in the EIA report	
Aspect to be considered	***Information provided***
Current situation	Seabed characteristics, relief, depths. Sedimentation conditions. Geological structure and mineral resources.
Potential significant impact during the wind farm installation, operation, and dismantling phases	Potential impact on the seabed and sediment formation. Assessment of potential contamination of sediments. Break of seabed integrity
Assessment methods	Analysis of primary and secondary data, GIS mapping, expert opinion
Mitigation measures	Measures to reduce the impact on the seabed and sedimentation processes.

4.4. Landscape and Biodiversity

Landscape/Seascape

Based on the morphological zoning of the landscape, there have been defined the Eastern shallow marine section of the Baltic Sea (A) South-East Baltic Sea submarine plateau area (I) Curonian-Western Samogitia coastal submarine plateaus and depressions of the Baltic Sea (1). There is a prevailing seascape of submarine plateaus and depressions.

The PEA territory is located in the open sea, more than 29 km away from the shore, and is beyond the boundaries of the general landscape defined in the National Landscape Management Plan (Fig. 4.4.1). [28]

The EIA will include the assessment of the potential visibility of the offshore wind farm from onshore observation sites.

[28] approved by Order of the Minister of Environment of the Republic of Lithuania no. D1-703 of 2 October 2015 "On Approval of the National Landscape Management Plan."

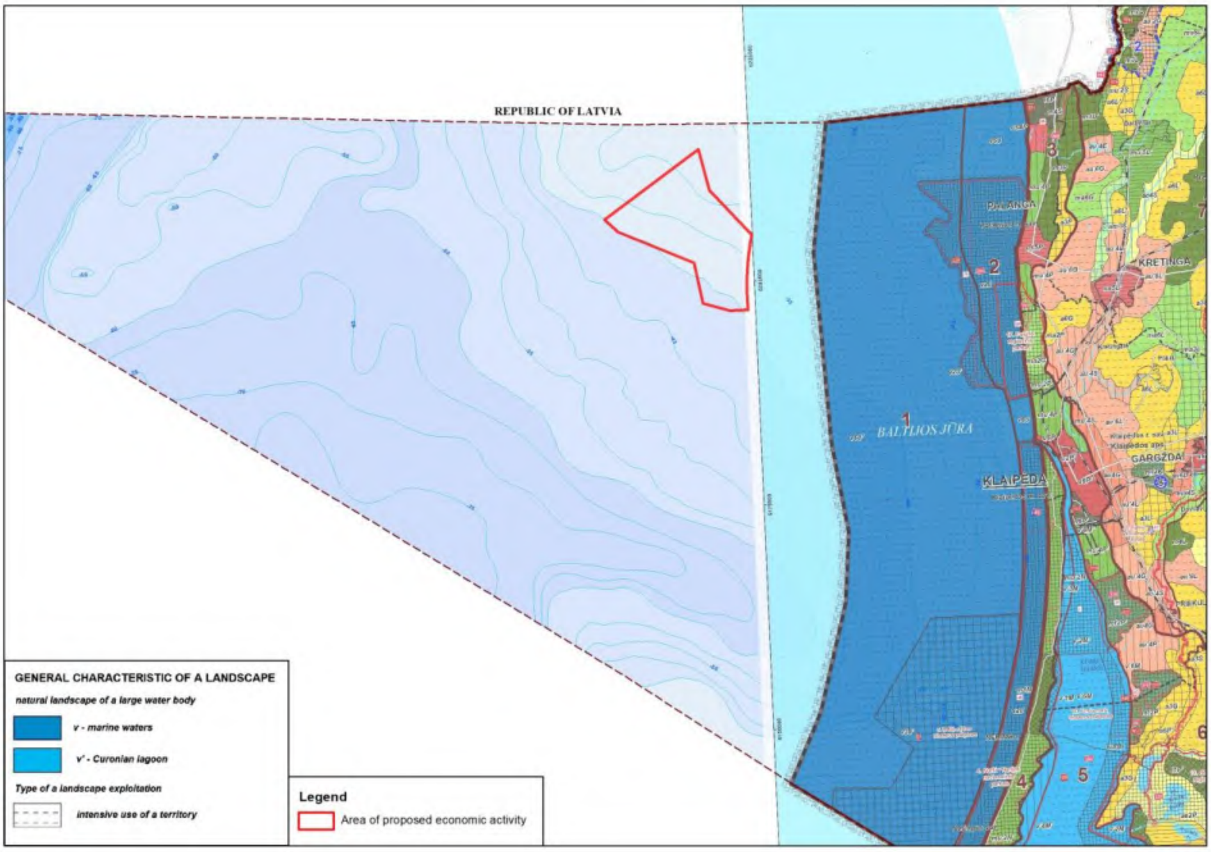

Fig. 4.4.1. Landscape management zones in the PEA territory.

<u>Protected Areas and NATURA 2000 Sites</u>

In the Lithuanian waters of the Baltic Sea, there are protected areas and sites of the European ecological network "Natura 2000" demarcated. The PEA territory borders the biosphere reserve of the Klaipeda-Ventspils Plateau and important habitat and bird protection areas (Fig. 4.4.2). Information on the closest protected areas is provided in Table 4.4.1.

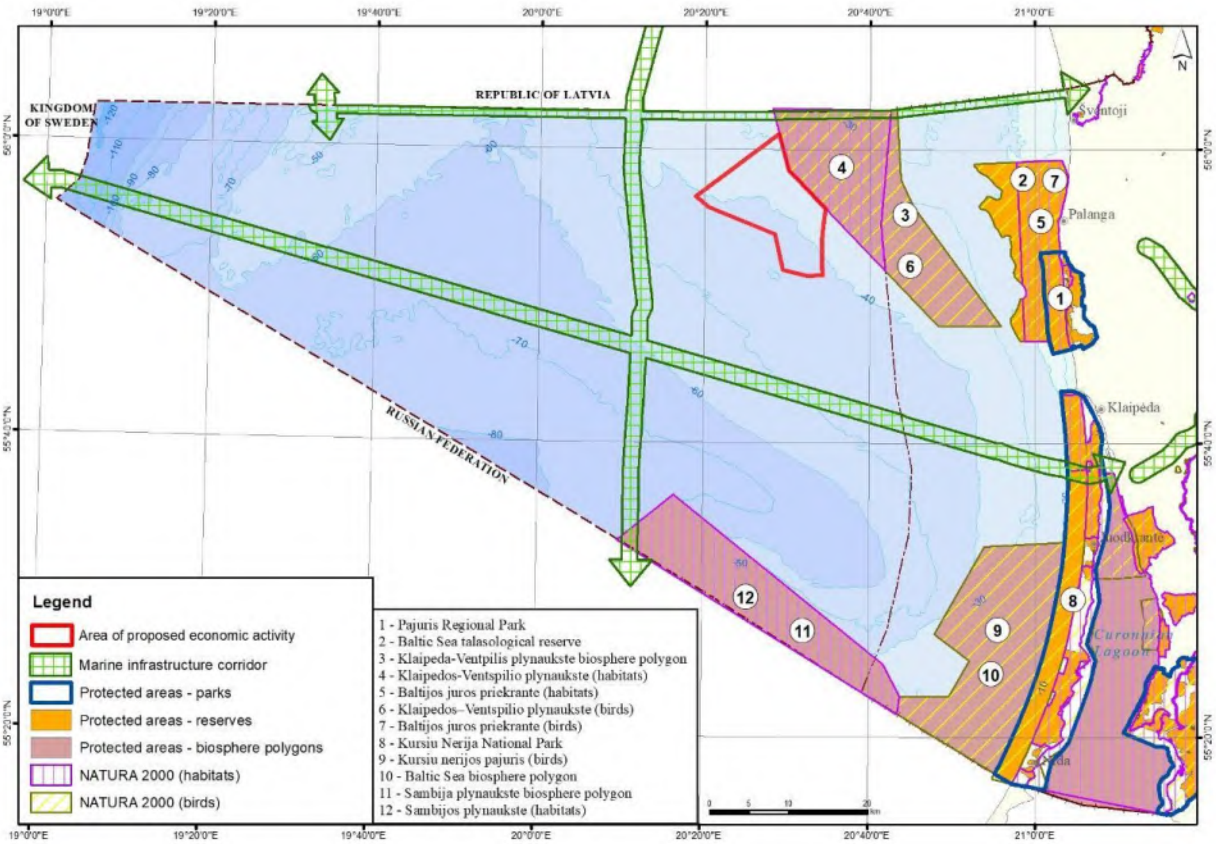

Fig. 4.4.2. Protected areas and NATURA 2000 sites closest to the PEA territory.

Table 4.4.1. Information on the protected areas and NATURA 2000 sites bordering the PEA territory, purposes of establishment thereof, protected natural habitats and species of EU importance (according to the State Cadastre of Protected Areas of the Republic of Lithuania).

Protected area	Area, ha	Purpose of establishment, protected valuables	Distance from the boundary of the proposed territory
Biosphere reserve of the Klaipeda-Ventspils Plateau	31949.309903	To protect a valuable part of ecosystem of the Baltic Sea in the Klaipeda-Ventspils Plateau, in particular, with a view to conserve: Areas of the natural marine habitat of EU importance, i.e., 1,170 reefs, to ensure a favourable conservation status thereof; a place of regular gatherings of wintering water birds of EU importance: velvet scooter (*Melanitta fusca*), to ensure a favourable conservation status thereof; wintering and migrating populations of razorbill (*Alca torda*), long-tailed duck (*Clangula hyemalis*), to ensure a favourable conservation status thereof; to conduct observation (monitoring) of the natural habitat and the protected species referred to in paragraph 3.1 of the Regulation, studies in relation to the protected valuables; to collect information on status thereof; to analyse the impact of human activities on the marine ecosystem; to ensure the sustainable use of natural resources; to promote	borders

Protected area	Area, ha	Purpose of establishment, protected valuables	Distance from the boundary of the proposed territory
		ideas and ways of biodiversity conservation.	
NATURA 2000 IBPA Klaipeda-Ventspils Plateau	31949.309903	to protect gatherings of the wintering velvet scooter (*Melanitta fusca*)	borders
NATURA 2000 IHPA Klaipeda-Ventspils Plateau	17948.498809	1,170 reefs	borders

Seabed Habitats

According to the valuation survey results as of 1993-2007, 7 main habitats are found in the Lithuanian marine area (Table 4.4.2).

Table 4.4.2. List and distribution of habitats in the Lithuanian marine area of the Baltic Sea (* bottom habitats classified as reefs)

Habitat name	Area, ha	Share of the marine area (%)
Open-to-waves moraine bottom, with *Furcellaria lumbricalis*	2,343	1.3
Open-to-waves moraine bottom, with *Balanus improvisus*	10,757	6.1
Open-to-waves moraine bottom, with *Mytilus edulis trossulus* and *Balanus improvisus**	17,494	9.9
Open-to-waves moraine bottom, with *Mytilus edulis trossulus* and *Balanus improvisus**	43	<0.1
Open-to-waves sandy bottom, with *Macoma balthica*	138,497	78.1
Open-to-waves sandy bottom, with *Pygospio elegans* and *Marenzelleria neglecta*	7,879	4.4
Open-to-waves sandy bottom, with boulders and amphipods	377	<0.1

There are two types of habitats common in the PEA territory (Fig. 4.4.3): a sandy bottom of the aphotic zone and a bottom of varied sediments.

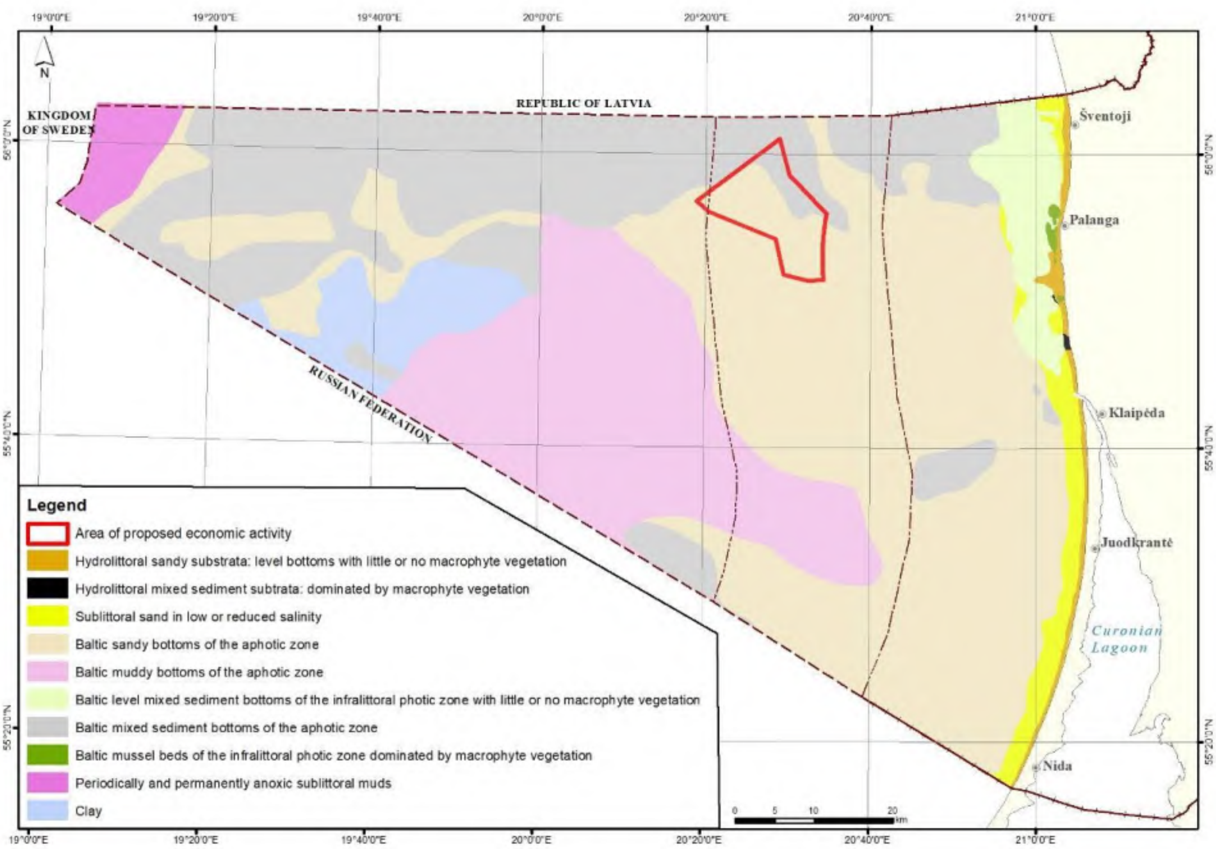

Fig. 4.4.3. Dispersal of benthic habitats in the PEA territory.

There are no benthic habitats in the territory under study that are acknowledged most valuable under the valuation survey, biologically important, or classified as reefs by the habitat types in Annex II of the Habitats Directive. Geo-morphologically, major reefs are moraine ridges, with *Mytilus edulis trossulus* and *Balanus improvisus*, the location of which has been found only in Lithuania's territorial sea near Palanga. They are not common for the territory under study.

<u>Macrozoobenthos communities.</u> In the eastern Baltic Sea, 11 benthic fauna species are known to be dominant communities. Major part of them are adapted to loose-lying sediments; only two species, *Mytilus edulis* and *Balanus improvisus*, prevail in the solid substrate, which is not found in the area under study.

The most expected benthic faunal communities in the area under study are as follows:

The *Marenzelleria viridis* community develops along the coast, in sandy bottom sediments at a depth of 3 to 30 m. There are 12 benthic fauna taxa found, including the most common *B. pilosa* and *H. diversicolor* in the shallows, and *P. elegans* and *Oligochaeta* – in deeper waters.

The *Macoma balthica* community is most common on the sandy and silty bottoms of the central Baltic Sea, where all infauna and mobile species known to the area have been registered. There are four forms of the community identified depending on the depth. However, in all of them, the range of dominance of *M. balthica* is quite large and usually exceeds 70-80%. Since many shallow species such as *M. arenaria* are found in the shallow part of the submarine slope up to a depth of about 30 m, it comprises a greater diversity of benthic fauna in the form of communities. In deeper waters, the community biomass is significantly greater and often exceeds 100 g m^{-2}. There are prevailing large individuals of *M. balthica*, though the species composition of the community is rather scarce and the number of its permanent members such as *H. spinulosus* or *Bylgides sarsi* is small.

Pontoporeia spp. communities develop at a depth of 50 m and deeper, i.e., 80 m. More shallow areas are dominated by *P. affinis*, with an average of 8 species found in the community. In deeper waters, there are prevailing *P. femorata*, with a number of species significantly lower, i.e., 2 to 4 species. The both species are known in the Baltic Sea as dominant in deep muddy waters. The range of distribution of amphipods is not large and normally does not exceed 50% of the total benthic fauna biomass. This proves that a community is not a permanent formation on an submarine slope and usually consists of a random set of species that are able to survive in that environment.

Fish

In total, 65 cyclostomatous and fish species have been registered in Lithuanian waters of the Baltic Sea, including 21 freshwater, 33 marine, and 11 migratory. Approximately 19 cyclostomes and fish species are protected under the Habitats Directive, Bern or CITES conventions (Convention on International Trade in Endangered Species of Wild Fauna and Flora); 5 of them are included in the Red Data Book of Lithuania, and 18 are considered very rare. Among all the species registered in Lithuanian waters of the Baltic Sea, some fish species are very common, while other species (swordfish, anchovy, poacher) have only been recorded once or few times.

Baltic herring (*Clupea harengus membras*), Baltic cod (*Gadus morhua callarias*), and flounder (*Platichthys flesus*) are some of the most abundant fish in the Lithuanian Economic Zone and, therefore, are intensively fished. Baltic herring spawning grounds are observed on the rocky bottom with marine vegetation along the northern coast of Lithuania, as well as in the pier of Klaipeda port at depths of 2-5 m.

In the Klaipeda port area, as well as in the area from it northward to Sventoji and southward to Alksnyne and Juodkrante, there are abundant migratory and freshwater fish. Migratory fish are: smelt, vimba bream, salmon, sea-trout, whitefish, twaite shad, eel, and cyclostomes – sea and river lamprey. Most migratory fish species keep close to shores, usually in a depth of up to 20 m; salmon, however, migrates over very long distances. The salmon that is spawning in Lithuanian rivers can also be found both in the northern part of the sea, near Finland, and in the southern part – in coastal areas of Germany. The sea-trout migrates at shorter distances. In recent years, as pollution in rivers and the Curonian Lagoon is decreasing, there has been a significant increase in abundances of twaite shad and vimba bream.

Freshwater fish, such as bream, zander, silvery bream, ide, roach, bleak, asp, perch, ruff, and three-spined stickleback, are usually caught only along the coastline.

In summer, the sea is dominated by sea and migratory fish species; though, coastal areas (in particular, near Klaipeda) are also rich in freshwater fish coming from the Curonian Lagoon. In autumn, September-October, along the coastline of the Baltic Sea, there are many species of migratory fish that float in the rivers to spawn: vimba bream, salmon, sea trout, whitefish, and smelt. In November, when the water temperature drops, the coastline is dominated with herring, abundant flounder, and some cod.

Birds and Bats

The Lithuanian marine area in the Baltic Sea has been studied inhomogeneously in terms of waterfowl. Most thorough studies were conducted at the sea coastline and part of Lithuania' territorial waters. In this area, there are over 20 species of seabirds regularly found.[29]

The Lithuanian Baltic Sea is of the highest importance for wintering seabirds. In Lithuania, both in the coastal areas and in the open sea, there are found numerous velvet scoter (*Melanitta fusca*), long-tailed duck (*Clangula hyemalis*), razorbill (*Alca torda*), common guillemot (*Uria aalgea*), red-throated loon (*Gavia stelatta*), great crested grebe (*Podiceps cristatus*), and other seabird colonies. Birds feeding on benthic organisms (diving sea duck) are found at depths of 5 to 35 m. Therefore, their abundance is high above the corresponding habitats. Pelagic birds, such as diver, razorbill, dive to a depth of 50-60 m and feed regularly at a depth of about 20-30 m. So, the areas used for feeding are more remote from the coastline.

[29] The concept 'seabirds' herein includes any birds that use the marine environment at various stages of their lives:grebes, divers, sea ducks, terns, gulls and somewader .

The Baltic Sea is an important site for migratory birds that fly to wintering or breeding grounds. Over Lithuania's territorial waters, there are intense migrations of geese, cranes, divers, passerines, and other bird families observed. Depending on species, birds fly either above the water surface or high up to several hundred metres.

In summer, a small number of birds stay in the territorial waters of Lithuania. The coastal waters are most intensively used by the local breeding great cormorant (*Phalacrocorax carbo*), common tern (*Sterna hirundo*), and several members of the gull family: European herring gull (*Larus argentatus*), common gull (*Larus canus*), black-headed gull (*Chroicocephalus ridibundus*), and great black-backed gull (*Larus marinus*).

During the autumn migration, intensive bat passages above the coast and in the western part of Lithuania's mainland up to ~ 70 km over the sea have been established. It is known that Nathusius' pipistrelle, which was ringed in Lithuania, was found wintering in the United Kingdom (hereinafter – the UK). In order to reach the UK, the bats had to overcome the North Sea. Some bats are known to migrate to the UK from the Netherlands, Belgium. So, there is a high probability that bats, under favourable natural conditions, may migrate to wintering grounds above the Lithuanian marine area of the Baltic Sea, near the coastline.

Marine Mammals

There are 3 species of seals living and breeding in the Baltic Sea: grey seal (*Halichoerus grypus macrorhynchus),* Baltic ringed seal (*Phoca hispida botnica*, and harbour seal (*Phoca vitulina vitilina*). Only one species, the grey seal, is in the list of Lithuanian fauna. As well, this species is included in the Red Data Book of Lithuania. The grey seal is assigned the Category 1 (E) (critically endangered species). The other two species are not listed among the Lithuanian fauna, however, their occurrences in Lithuanian territorial waters have been recorded.

The seals are found regularly in the Lithuanian marine area. Specifically, they are recorded during the cold season and come along with the migratory fish. Therefore, an exact number of these animals is not known.

The Baltic Sea is home to two different populations of the harbour porpoise. One of them breeds in the waters of the Belts and the Sound, in Kattegat and Skagerrak. Another population is found along the coasts of Germany, Poland, and eastern Sweden, in the central part thereof. The animals migrate seasonally, i.e., they move southward in winter. They normally dive at a depth of 20-60 m and also are able to dive to a depth of 200 m. They feed mostly at night and choose feeding grounds depending on migrations of their 'catch' (Jussi, 2009; Natkevičiūtė, Kulikov, Grušas, 2013). Lithuanian marine areas do not fall within the areas important to the harbour porpoise feeding (Carlén, 2013). So, the number of harbour porpoise and the probability of locating them in Lithuanian marine areas are low compared to other areas in the Baltic Sea.

Potential Impact of the Proposed Economic Activity on Biodiversity

The installation of the offshore wind farm may have severe implications for biodiversity, both positively and negatively.

The main positive aspects are related to the establishment of invertebrate communities on WT piles and the restriction of fishing. This can make a WT farm a safe place for fish communities, thus, recovering fish populations in the Baltic Sea.

The main negative aspects for birds are:

- Site avoidance and loss of feeding grounds for seabirds;
- Barrier effect for migrating birds;
- Direct collision and death caused by the WT.

Several negative aspects for other marine animals should be mentioned as well:

- Noise during the construction of a wind farm, which may cause adverse physiological effects (including damage to organ tissues), disrupt animal communication, influence behaviour (including eviction from their natural habitats or hunting areas);
- Potential barrier and death effect on migrating bats.

Content of Environmental Impact Assessment

Research projects	
Type of study	***Projected studies***
Seabed habitats	Bottom sampling and benthic habitat surveying using a remotely operated underwater vehicle (ROV). Distribution of benthic habitats, species composition and abundance of benthic fauna.
Birds, bats	Recording of birds, feeding on water, with the vessel for a period of two years, every month, during the spring-autumn seasons (May-October). Recording of birds, feeding on water, with the plane for a period of two years, every month, during the autumn-spring seasons (November-April). Observation of bird migration using visual and radar method during spring and autumn migration seasons. During the monitoring, data on species composition, abundance of migrating and resting birds will be collected. Recording of bat migration and flight intensity using an ultrasonic detector.
Marine Mammals	Recording of marine mammals on the plane or vessel every month for a period of two years.
Information to be provided in the EIA report	
Aspect to be considered	***Information provided***
Current situation	Information on landscape: - landscape characteristics; - the nearest recreational areas. Information on the protected areas and sites of the European ecological network "Natura 2000", respective protected animal species. Information on local fauna: – seabed habitats; – ichthyocenoses; – bird and bat species specific to the area; – intensity of gathering of birds and bats, feeding, rest, wintering grounds and migration thereof; – marine mammals.
Potential significant impact during the wind farm installation, operation, and dismantling phases	Impact on the landscape, recreational areas Impact on the protected areas and on integrity of sites of the European ecological network "Natura 2000"

	Potential impact on benthic habitats, fish, birds, bats and marine mammals. Potential impact of the offshore wind farm on migrations of animals (birds, fish, mammals) through the Lithuanian waters of the Baltic Sea. Impact on biodiversity due to possible factors caused by hydrological regime, electromagnetic fields, underwater noise, and other negative factors caused by the wind farm and cable connections.
Assessment methods	Analysis of reference materials and literature; Assessment of visual pollution of the object and visualisation by modelling: in order to objectively assess the potential significant impact of the PEA on the local landscape, it is planned to performe the assessment of the PEA visual impact at different times of the year, under different meteorological conditions and at different times of the day. Recording of birds, bats, marine mammals in the PEA territory; Expert opinion; GIS mapping for the preparation of graphical material.
Mitigation measures	Measures to prevent, reduce and compensate for the effects on biodiversity during the construction of the wind turbines and operation of the wind farm. Measures to reduce visual impact on the landscape.

4.5. Cultural Heritage

Protection of the underwater heritage is regulated by the UNESCO Convention on the Protection of the Underwater Cultural Heritage. "Lithuania - Convention on the Protection of the Underwater Cultural Heritage" was ratified on 12 June 2006. It defines underwater cultural heritage as underwater heritage of historical and cultural significance, containing clear examples of history of the humankind.

According to the Cultural Heritage Register of Lithuania, there are 9 valuables registered in the maritime territory of Lithuania. The PEA territory contains no registered cultural valuables. The distance to the closest registered marine cultural valuable, i.e., the vessel 38471 "L-14" sunken in the Baltic Sea, is approx. 24 km (Fig. 4.5.1).

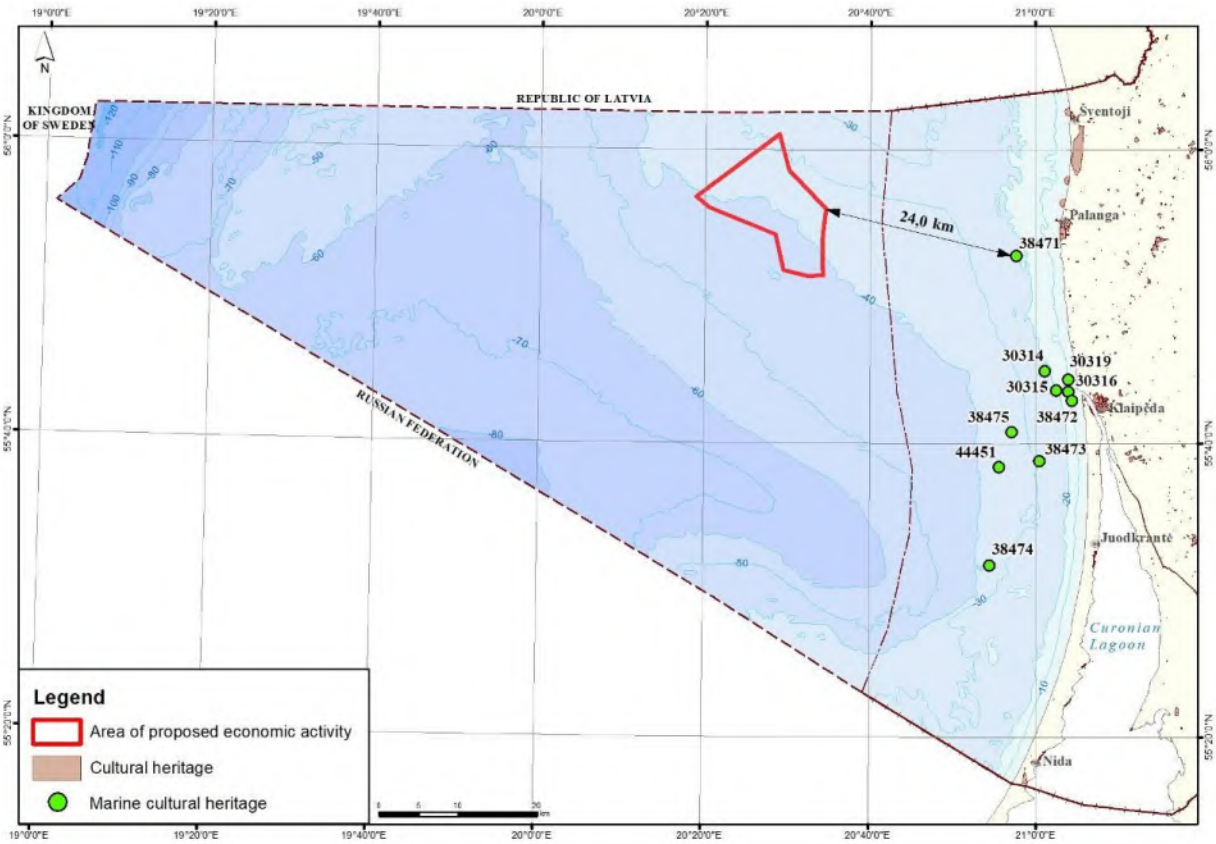

Fig. 4.5.1. Objects of marine cultural heritage.

According to the charts of the Lithuanian Transport Safety Administration, there are several dozen sunken objects marked in the Lithuanian EEZ that are not included in the Cultural Heritage Register.

Most of the sunken objects are industrial ships; though, remains of wooden vessels great scientific value were discovered, too. There were also several valuable habitats of cultural underwater seascape with natural relics and tree remains found.

One discovery site is marked nearby the PEA territory but does not fall within it (Fig. 4.5.2).

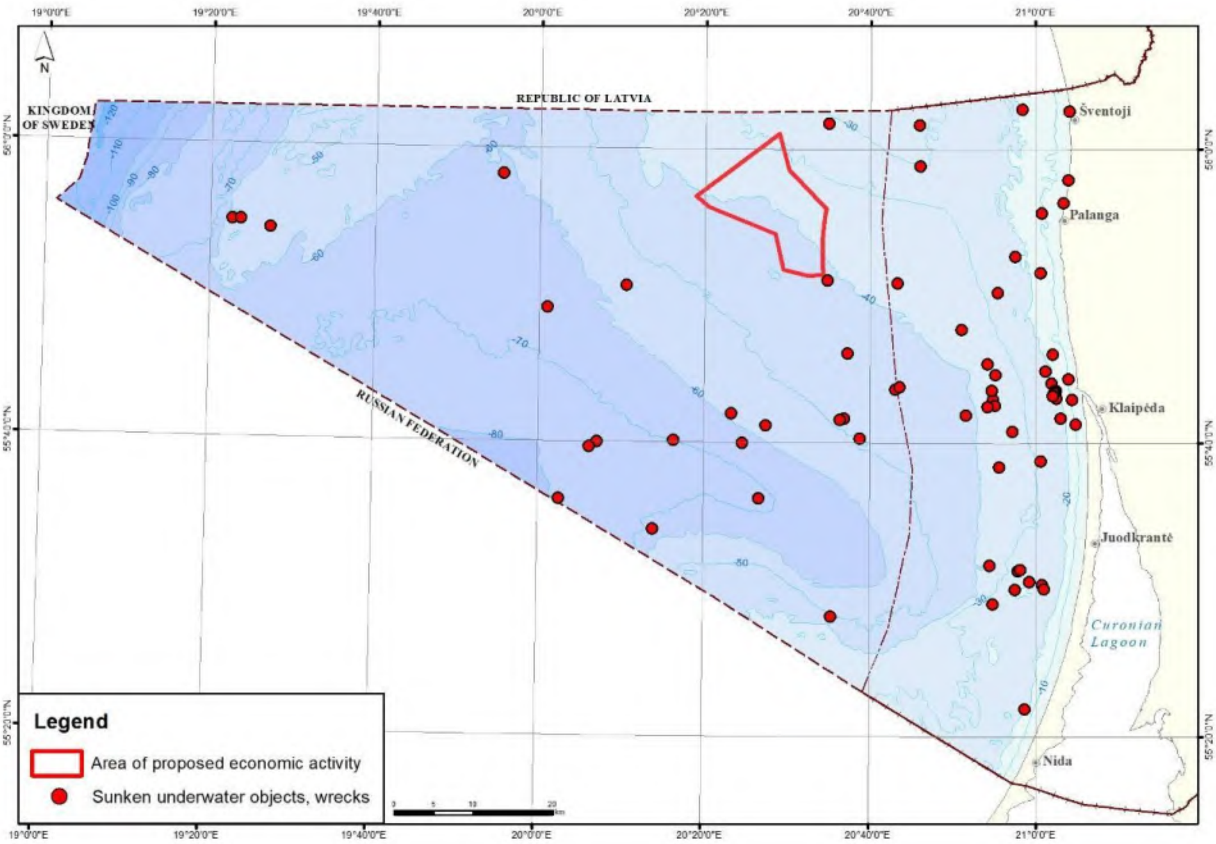

Fig. 4.5.2. Identified locations of sunken underwater objects.

Information to be provided in the EIA report:

Projected studies and exploratory work as part of the EIA	
Type of study	***Projected studies***
Search for sunken objects	Seabed surveys.
Information to be provided in the EIA report	
Aspect to be considered	***Information provided***
Current situation	Information on cultural valuables and sunken objects.
Potential significant impact during the wind farm installation, operation, and dismantling phases	Potential impact on cultural valuables.
Assessment methods	Analysis of reference materials and literature; Expert opinion on seabed surveys; GIS mapping for the preparation of graphical material.
Mitigation measures	Recommended measures to preserve valuable objects.

4.6. Public Health

The key factors determined by onshore wind energy that may affect public health are: noise, flickering, electromagnetic field, and infrasound.

An impact of the WTs is usually studied and may occur for the living environment up to 2 km from the proposed WTs. The effect of flickering can be perceived at up to 1-1.5 km from WT towers. Electromagnetic fields are only generated in the immediate vicinity of a WT rotor or overhead power lines and usually grow weak to the limit values of about 20-30 m from the cables. Infrasound is also typical for the natural environment, in particular, for the marine environment due to wind and wash of waves. Since competent experts have found that modern WTs emit merely slight infrasound, neither WT-induced infrasound nor low-frequency sound are controversial in European countries. Due to the long distance to the nearest living environment, the said factors are not so relevant for offshore wind energy which is normally developed at quite a long distance from the coast.

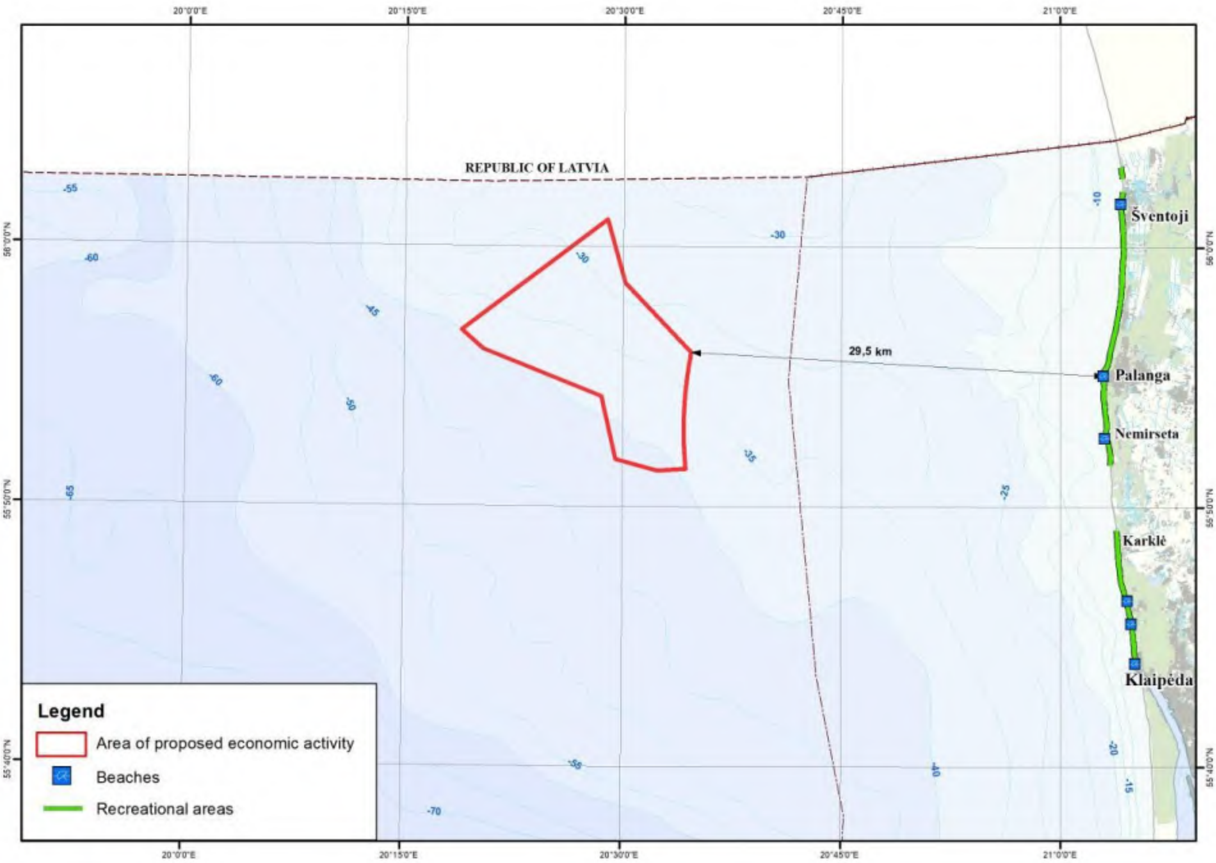

Fig. 4.6.1. Location of the proposed WTs in relation to the nearest onshore recreational and living areas.

The Public Health part of the EIA Report will be drafted and the potential impact on public health will be assessed in accordance with the guidelines provide for in Annex 1 of the Procedure "Recommendations on the Structure and Scope of Environmental Impact Assessment Documents," Chapter II, Section 8 "Public Health."

When preparing the EIA Report, an impact of the PEA on public health shall be assessed by analysing the likely direct and indirect effect of physical factors caused by the PEA on public health. Public health impacts are addressed to the population living in the impact zone of economic activities and to other people, especially, the most vulnerable groups of the population (e.g., children, the elderly and the sick, who are most sensitive to increased pollution).

Information to be provided in the EIA report	
Aspect to be considered	***Information provided***
Description of the current situation	Residential and public environment, recreational territories located in the coastal zone (in the municipalities of Palanga, Klaipeda district and Klaipeda city). Demographic indicators of the local population Analysis of population morbidity indicators. Description of health determinants.
Expected significant impact	Analysis of (physical) factors determining public health. Assessment of pollution caused by the proposed economic activity (noise, flickering, infrasound, and electromagnetic radiation) that may have a significant impact on public health.
Assessment methods	Analysis of reference materials and literature; Mathematical modelling of noise and flickering using specialised software; Expert opinion; GIS mapping for the preparation of graphical material.
Measures to prevent, reduce, or compensate for major adverse effects on the environment	Measures to reduce an impact of the proposed economic activity on public health. Measures to reduce a potential impact on residential, recreational or other areas envisaged in the approved territorial planning documents.
Graphical material	An attached map of the demarcated proposed facility, predicted levels or values of physical pollution, adjacent areas of the planned facility (dwelling houses, public buildings, objects of pollution or other significant facilities), a size of the protection zone .

4.7. Material Valuables

The feasibilities of developing offshore wind energy are directly related to other activities currently carried out in the marine area, i.e., shipping, navigation routes; fishing; mining sites for excavated soil, potential locations for sand excavation to nourish beaches; offshore engineering installations (power and communication lines, pipelines, etc.) and their safety zones; restricted-use areas (military exercise grounds, sunken ships, dangerous objects, cultural heritage values); marine areas for conservation purposes; other potential activities (prospect sites of useful resources).

In order to rationally use marine areas and sea resources, it is important to coordinate basic and projected activities with interests of sea users.

It should be noted that the installation of the offshore wind farms will significantly contribute to the implementation of objectives of the Lithuanian Energy Independence Strategy.

Information to be provided in the EIA report	
Aspect to be considered	***Information provided***
Current situation	Usage of the existing marine area in the territory under study.
Potential significant impact during the wind farm installation,	Potential impact on other industries, on activities carried out at sea

operation, and dismantling phases	and in the coastal zone, on the Klaipeda State Seaport. Potential impact on fisheries and fishing (reduction of fishing grounds, deterioration in fishing conditions, etc.)
Assessment method	Analysis of primary and secondary data Expert opinion GIS mapping for the preparation of graphical material.
Mitigation measures	Recommendations on mitigation of the potential socio-economic impact.

4.8. Risk Analysis and Its Assessment

Construction and operation of WTs may entail accidents and hazard to people and the social environment as regards the spinning blades, including the likelihood of their partial or complete dropping, collapse of a tower, an impact of voltage on service personnel. The risk of collisions is posed to aircraft, ships sailing nearby the power plants or in their farm area.

Emergency-related hazards to the natural environment include minor oil spills from rotors, fuel spills from vessels, collisions, and oil spills from transformer substations. During the preparation of the technical design, measures shall be foreseen to protect the transformer substations from possible direct collisions with ships, thus preventing the oil spills in the transformers from spilling into the water area. Damage to marine fuel tanks is very rare, the tanks are protected from damage in direct collisions.

The EIA report will provide statistical information on the leakage of transformer oil and marine fuels into the water area during such collisions and provide generally accepted measures to prevent such emergencies. According to statistics on such events, measures will be proposed to limit possible dispersion. The measures envisaged will be sufficient to stop the spread of pollutants and prevent them from entering the coastal zone, including Palanga and other beaches.

The EIA report will assess the possibilities of the Lithuanian Armed Forces Marine Rescue Coordination Center to eliminate local pollution incidents in the area of the wind farm.

The operation of cables connecting the wind farm to onshore facilities poses a risk of power leakage into the environment. The likelihood of such leakages is quite limited due to the reliability of the cables used, therefore, it shall not be analysed separately.

Navigation hazards, i.e., the likelihood of collision of ships with WT, are the greatest risk in the operation and construction of offshore wind farms. Table 4.8.1 provides the summary of PEA risks and the most typical hazardous factors, as well as possible external actions and factors that may cause emergency situations.

Table 4.8.1. Hazardous factors

Risks	**Most common hazardous factors**
Wind farm	WT Transformer substations Electricity cables
WT	Spinning rotor blades Power towers Rotor oil Electrical equipment;
Transformer substation	Electrical equipment Transformer oil
Electricity cables	Electrical voltage
External actions and factors	
Passing-by vessels	Transportation of dangerous goods Marine fuel Bilge oils

	Damages to tower structures
Flying-by aircraft	Aircraft fuel Damages to blades
Birds	Bird deaths Rotor failures
Extreme hydro-meteorological conditions	Icing Hurricanes, severe storms

Lithuanian normative documents in force impose an obligation to use highest values in projects and, thus, to hedge against possible deformations of building structures, which may cause accidents and collapses. To ensure safe operation of the WTs, their models are selected with due regard to the local weather conditions.

The EIA report will address a potential impact of accidents and emergencies during the operation of the wind farm, propose solutions to avoid such impact, and provide for measures to prevent and reduce the impact of potential accidents and emergencies.

Information to be provided in the EIA report:	
Aspect to be considered	***Information provided***
Description of the current situation	Information on shipping lanes in the territorial waters and outer roadsteads of Klaipeda port, submarine communications (cables, pipelines) in the vicinity of the wind farm.
Potential significant impact during the wind farm installation, operation, and dismantling phases	Assessment of the potential impact of accidents and emergencies during the construction and operation of the wind farm: • The likelihood that natural or catastrophic meteorological and hydrological phenomena, including geological processes and phenomena, will damage or destroy the PEA structures or facilities and endanger the life and health of the population and biodiversity; • The expected adverse effects on the environment and human health, commercial and recreational shipping due to the risk of exposure of the offshore wind farm to disasters and/or emergencies, including those caused by climate change.
Assessment methods	Qualitative risk assessment using a risk matrix. The PEA risk analysis, forecasting and assessment of possible emergency situations, and planning of preventive measures will be carried out in compliance with: – Recommendations on assessment of risks and emergencies related to the proposed economic activity; [30] – The list of criteria for emergencies, indicators of natural, catastrophic meteorological and hydrological phenomena[31] [32]
Measures to prevent,	Following the assessment of the potential impact of accidents and emergencies

[30] Approved by Order of the Minister of Environment of the Republic of Lithuania no. 367 of 16 July 2002 "On Approval of the Recommendations on Assessment of Risks and Emergencies Related to the Proposed Economic Activity R41-02."

[31] Approved by Resolution of the Government of the Republic of Lithuania no. 1063 of 14 September 2015 "On Approval of the List of Criteria for Emergencies."

[32] Approved by Order of the Minister of Environment of the Republic of Lithuania no. D1-870 of 11 November 2011 "On Approval of the Indicators of Natural, Catastrophic Meteorological and Hydrological Phenomena."

Information to be provided in the EIA report:	
reduce, or compensate for major adverse effects on the environment	during the construction and operation of the wind farm: • Taking the right solutions to prevent emergencies and accidents, to minimize their probability; • Based on the results of the risk analysis, planning and recommendation of prevention and mitigation measures.
Graphical material	Map of the vicinities, including shipping lanes, outer roadstead, and submarine communication routes; Maps of potential threats to the proposed wind farm, if any identified during the risk analysis.

5. MONITORING

The monitoring measures are appropriate for in the implementation of the PEA: installation of the WT farm in Lithuania's marine territory of the Baltic Sea.

The monitoring programme draft will be prepared during the EIA.

The monitoring programme is expected to include monitoring of the impacts of the WT and TS construction and cabling on the seabed, water quality, and wildlife.

While developing the EIA, it is planned to carry out baseline observations of birds and bats, which will allow to judge on the abundance of species using the territory and the susceptibility of the territory to the proposed economic activity.

The EIA report will include an outline of environmental monitoring.

6. INFORMATION OF THE POTENTIAL SIGNIFICANT TRANSBOUNDARY IMPACT

Convention of the United Nations Economic Commission for Europe on Environmental Impact Assessment in a Transboundary Context (hereinafter – the ESPOO Convention) prescribes that a transboundary EIA is to be carried out when the PEA is listed in Appendix I to the ESPOO Convention.

Pursuant to Decision III/7 "Second Amendment to the ESPOO Convention" of 04/06/2004, major installations for the harnessing of wind power for energy production (wind farms) are included in Appendix I to the Convention.

On the basis of the powers granted under the Paragraph 1 of the Resolution of the Government of the Republic of Lithuania no. 900 of 28 July 2000 "On Granting of Powers to the Ministry of Environment and Its Subordinate Institutions," the transboundary EIA process is coordinated by the Ministry of Environment.

The distance from the PEA to the Latvian EEZ is about 2.8 km, to the Swedish EEZ – about 77 km, and to the Russian EEZ – about 40 km.

The expected transboundary impact will be assessed as part of the EIA. Due to its peculiarities, the PEA may have a transboundary impact in the following aspects:

Aspect / Environmental component	**Description of potential impact**
Impact on birds and bats	The WT farm may be a barrier to birds and bats migrating over the Baltic Sea It is known that there are intense migrations of geese, gruiformes, diver, passerine, and other bird families observed over Lithuania's territorial waters. Research data shows that there is a probability that bats, under favourable natural conditions, may migrate to wintering grounds over the Lithuanian marine area of the Baltic Sea, near the coastline.
Shipping	As mentioned above in paragraph 2.2.1, the PEA territory is outside the established international shipping routes, roadsteads, or anchorage sites; neither is it bordering them. Therefore, no significant impact on shipping or international shipping routes is expected.
Visual effect	The PEA territory is located about 30 km from the Latvian coastline. At such a distance, offshore wind farms will be barely visible from onshore observation sites, therefore, significant visual effect is unlikely.

Aspect / Environmental component	**Description of potential impact**
Mineral Resources	The northern part of the PEA territory overlaps with the boundaries of potential oil production structures. The potential oil production locations are also known in the marine area of the Republic of Latvia. A distance from the PEA border to the sea border with Latvia is about 2.8 km, therefore, an impact on oil resources in the Republic of Latvia and prospective mining is unlikely.

PUBLIC INFORMATION AND CONSULTING

The public shall be informed about the ready EIA programme in accordance with the Section 2 of Chapter 5 of the Procedure.

Information on public access to the EIA programme and submission of proposals has been disclosed as follows:

- provided by e-mail to the EPA, by requesting to publish it on the website;
- provided by e-mail to the administrations of municipalities of Palanga, Klaipeda district and Klaipeda city, by requesting to publish it on the websites and bulletin boards of the administrations;
- published on the website of the Ministry of Energy of the Republic of Lithuania;
- published on the website of Public Institution Coastal Research and Planning Institute;
- published in newspapers "Klaipėda," "Banga," "Palangos tiltas."

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