

Authority services

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Swedish Environmental Protection Agency
registrator@naturvardsverket.se

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Finland's response to the notification regarding the planned offshore wind farm project "Bothnia Offshore Sigma"

The Finnish Environment Institute hereby acknowledges that Finland has received the notification, dated 9 November 2023, and the consultation documents from Sweden in accordance with Article 3(1) of the Convention on Environmental Impact Assessment in a Transboundary Context (Espoo Convention) regarding an environmental impact assessment (EIA) procedure of the planned offshore wind farm project "Bothnia Offshore Sigma" in Sweden's exclusive economic zone (EEZ) in the Bothnian Sea. Njordr Offshore Wind AB intends to apply for a permit to construct and operate the project. A maximum of 143 wind turbines are planned with a maximum total height of 370 meters covering an area of approximately 640 square kilometres. The planned project is expected to produce approximately 13,6 TWh. The facility will consist of offshore wind turbines on fixed foundations, offshore transformer stations on fixed foundations, measurement masts and cables laid in water within the group station and transmission cables to land.

Consultation in Finland

According to the Act on Environmental Impact Assessment Procedure (252/2017), the Finnish Environment Institute is the competent authority and responsible for consultation tasks related to the Espoo Convention. The Swedish Environmental Protection Agency requested an indication whether Finland intends to participate in the EIA procedure and to provide comments on the scope of for the assessment of the environmental impacts of the project on Finland, and to submit any comments that might be received from the public in Finland. The public and authorities were given the opportunity to comment on the consultation documents from 16 November to 22 December 2023. The consultation documents were available, and statements were asked on the website of Finland's environmental administration and on the website of electronic public consultation. The Finnish Environment Institute received eleven statements.



Participation in the EIA procedure and remarks during the consultation

Based on the received statements and deliberating its own views, the Finnish Environment Institute states in accordance with Article 3(3) of the Espoo Convention that Finland intends to participate in the EIA procedure. Finland wishes to note that planning of offshore wind farms has increased in the Baltic Sea region which has raised concerns, among other things, about the need for an overall assessment. All contributing factors should be known, and their impacts assessed to ensure that the decision on the implementation of the project is based on firm knowledge of its impacts and on the best possible solution. As cumulative impacts of several wind farms can potentially be ecologically significant, it is important to examine and assess cumulative impacts as widely as possible. In addition, the EIA documentation should clearly address transboundary impacts from Finland's perspective and take into account the remarks in the statements in further planning. The original statements, which are enclosed to this letter, include important and detailed remarks which need be taken fully into account in the EIA. The Finnish Environment Institute has prepared a summary of the original statements.

According to a statement by the **Ministry of Transport and Communications**, considering the location of the project area and other offshore wind farm projects planned in the vicinity, the projects may have an impact on maritime traffic to and from Finland, especially in icy conditions. The possible combined effects of offshore wind farms on shipping in the entire area should be comprehensively investigated during further planning. The construction of numerous offshore wind farms may have a significant impact on the safety and smooth traffic flow of shipping. The impacts may concern, for example, changes to traffic routes, fuel consumption, meteorological instrumentation, radar reflection effects, and winter navigation. The wind farms' impact on the ice conditions in the area also requires further examination, as spillover effects on maritime transport may extend significantly beyond the project area. When building offshore wind farms, the impact on maritime transport infrastructure must be considered.

Smooth and safe shipping both on regular waterways and outside them throughout the year is important, as most of the transport of goods in Finland's foreign trade takes place by sea. It is important to pay attention to shipping in order to safeguard the operating conditions of Finnish commercial shipping and to ensure safe and smooth navigation. The unobstructed use of waterways must be considered in the planning of offshore wind farms. Offshore wind farms can cause changes to traffic areas and routes, extend travel times, and increase emissions from vessels as fuel consumption increases. When determining the areas for the planned offshore wind farm projects, it is important to consider the routes used by shipping also outside the established routes and route-sharing systems in a manner that ensures that the operating prerequisites and safety concerns of shipping are considered in the planning. In addition, special consideration must be given to the routes used for winter traffic. Furthermore, wind turbines have an impact on the field strength and signal quality of mobile networks. The functioning of radio links operating in the sea area also requires a completely clear area between the transmitter and receiver. Coastal and offshore electronic communication services are dependent on radio systems, and it is therefore important to ensure that mobile communications services as well as radar and radio links function free of interference also in offshore areas. Even small changes in the location of wind turbines can play a crucial role in the operation of radio systems in the area.



In its statement, the **Finnish Transport and Communications Agency Traficom** emphasises that, if realised, these extensive offshore wind farms, especially when located in close proximity to each other, may have a significant impact on maritime traffic in the Gulf of Bothnia, from the perspective of both safety and traffic flows. When determining the areas for the planned offshore wind farm projects, it is important to consider the routes used by shipping also outside the established routes and route-sharing systems in a manner that ensures that the operating prerequisites and safety concerns of shipping are considered in the planning. In addition, special consideration must be given to the routes used for winter traffic, which deviate from the routes used during open water season. These may not be clearly indicated in the traffic flow analyses carried out on the basis of AIS data covering the entire traffic flow in the area.

Other offshore wind farm projects are being planned for the immediate vicinity of the planned wind farm in hand in both the Finnish and the Swedish EEZs, which amplifies the possible impact that offshore wind farms may have on shipping. The consultation document (Figure 16) shows the offshore wind plans in the vicinity of the planned project. Traficom points out in its statement that the consultation document completely omits three large-scale offshore wind plans in the Finnish EEZ adjacent to the planned project. Other individual projects located slightly further away from the Finnish EEZ are also missing from the consultation document. Consideration of surrounding projects is crucial when assessing the overall impact on shipping, for example. The possible combined effects of offshore wind farms on shipping in the entire Bothnian Sea area should be comprehensively investigated during further planning. The wind farms' impact on the ice conditions in the area also requires further clarification. Extensive wind farms in close proximity to each other may cause shipping routes to change and become increasingly concentrated in certain areas, and the hundreds of wind farm structures would break up the area's floating ice fields. This would cause increasing accumulation of ice in the area, which may affect, for example, the organisation of winter shipping, and spillover effects on maritime transport may extend beyond the project area.

In its statement, Traficom notes that the planned project is located in a sea area with icebreaking activity during average icy winters. Traficom reiterates what it has said before about other planned projects in the vicinity of the area; anticipating projects already in the pipeline, in offshore wind projects outside the territorial waters it would be important that both Finnish and Swedish authorities responsible for icebreaking be consulted to ensure that icebreaking cooperation and winter routes deviating from the open water routes can be taken into account already in the planning phase of the projects and that the overall picture of the maritime environment and any changes to it are brought to the attention of the authorities as early as possible. The planning of designated areas for wind farms and the location of individual wind turbines should consider the use of radar as the main navigation and collision prevention device for vessels and its key role in winter navigation and traffic control. Impact assessments should also consider any out-of-the-ordinary use of ship radars in icy conditions. Wind turbines can cause shadow or reflection effects to radars, which at worst make it more difficult to interpret radar signals.

Traficom also notes that wind turbines may affect a vessel's Global Navigation Satellite System (GNSS) in such a way that the signals of the satellites are reflected off the wind turbines, causing incorrect positioning of the vessel using the system. The location planning of the area designated for wind farms – and later the positioning of individual wind turbines – must also consider the potential impact of wind turbines on the radio systems used in shipping and in



coastal areas. The reliable operation of radar and radio systems is essential for general safety and the safety of navigation. The impact of wind turbines on radars, navigational radio equipment and other radio equipment essential for navigation and traffic control should be considered to ensure that no serious disturbances occur in Finnish areas. Furthermore, wind turbines have an impact on the field strength and signal quality of mobile networks. The functioning of radio links operating in the sea area also requires a completely clear area between the transmitter and receiver. Coastal and offshore electronic communication services are dependent on radio systems, and it is therefore important to ensure that mobile communications services as well as radar and radio links function free of interference also in offshore areas. Traficom considers it important that these issues are also considered.

In Traficom's view the projects may also have an impact on shipping to and from Finland, particularly in icy conditions when vessels seek the most easily navigable connections along the Swedish coast in situations where winds have caused ice to accumulate on the Finnish coast. In addition, Traficom wishes to draw attention to the multiple offshore wind farm projects located at the outer borders of the Finnish and Swedish EEZs. In order to ensure controlled land use and shared practices as well as equal treatment of projects, it would be justified to establish a sufficiently high-level cooperation network between Finland and Sweden to reconcile the increasingly rapid planning of offshore wind farms and the coordination of maritime traffic in the EEZs of the Gulf of Bothnia.

In the view of the **Centre for Economic Development, Transport and the Environment (ELY Centre) of Southwest Finland (environment and natural resources division)**, the potential primary cross-border environmental impacts of the planned project could affect Finland through migratory birds or as a result of a possible accident. The ELY Centre of Southwest Finland points out in its statement that the information on the EIA methodology provided in the consultation document is very general. In addition, it believes that the EIA should assess the areas of the electricity transmission networks and cable corridors associated with the project. Impacts should also be assessed over the entire life cycle of the wind farm project. The assessment of cumulative and multiplier effects should also take into account the effects of the planned offshore wind farm projects on the Finnish side, including the effects of new projects planned in the vicinity of the project area, such as Ilmatar Oy's two new wind power projects of which the Bothnia West project directly borders the Bothnia Offshore Sigma project area¹. As the project area is located in the open sea far from the coast, the individual project cannot be considered to have an impact on coastal bird species on the Finnish side of the territory of the ELY Centre of Southwest Finland.

In its statement the ELY Centre of Southwest Finland notes that it is important to be aware that there is a lack of information on offshore migratory species, so it is possible that some birds may also migrate through the project area. The programme has therefore estimated that offshore wind farms may have an impact on birds in terms of combined impacts, as migratory birds tend to avoid wind farms, resulting in increased energy consumption by birds. Considering that there are several offshore wind projects in the vicinity of the project area and in the Baltic Sea, the project, together with other projects, may have an impact on bird migration routes, which may also affect the Finnish bird population. The consultation document has identified the need to identify seabird migration patterns and routes in relation to the location of the wind farm. There

¹ [Ilmatar launches two new offshore project areas - Bothnia & Bothnia West in Finland's EEZ - Ilmatar](#)



is a need to invest in surveys and to consider, for example, species-specific differences in migration timing. The study should also make use of the best available methods. In addition to literature studies, the impact assessment should also make use of other up-to-date information that may be available, such as satellite bird monitoring data, for example. According to the programme, the power plants will only be anchored to the bottom, which means that the dredging required will vary depending on the type of foundation. However, the programme makes no assessment of the need for dredging or where the dredged material will be dumped, even though dredging and dumping also cause seabed loss and disturbance. For dumping in the sea, the location should be chosen so that the dredged material does not move with the currents.

In its statement the ELY Centre of Southwest Finland emphasises that, as part of the EIA, the contaminant concentrations in sediments must also be investigated. Dredging and dumping activities are sources of underwater noise in addition to other activities during construction, such as piling. Although the noise may be short-lived in duration or impulsive, it can reach harmful levels at times. The ELY Centre of Southwest Finland considers that, in addition to impulsive noise, the continuous noise generated during the operation of the power plants should also be evaluated in the EIA. If assessments indicate that noise levels are reaching unacceptably high levels, noise attenuation techniques should be used. The consultation document states that the benthic fauna will suffer from habitat loss and sediment movement during the construction of the wind farm, but this is expected to be restored over time. The ELY Centre for Southwest Finland points out that the seabed under the foundations of wind turbines will be completely destroyed and that the cable corridors and possible dumping areas will be at the very least seriously disturbed. The condition of the seabeds may not be restored, and native species may not return to the area, as habitat conditions may change. Species may become even more depleted or be replaced by species that adapt more quickly and efficiently to the new environment. When an artificial reef is created, the structure of the benthic community is also changed. The ELY Centre for Southwest Finland points out that the change may not always be positive and may also have indirect effects on the structure of food webs in the area.

The ELY Centre of Southwest Finland believes that, as part of the EIA, it would also be a good idea to assess the likelihood of possible accidents during construction and operation and plan how to prevent them and minimise their environmental impact. The materials and methods used in the assessment must enable the assessment of the significance of the potential environmental impacts caused by the project and its various implementation options, and the limitation of the environmental impacts identified as harmful to the extent possible. In addition, a detailed explanation of the forecasting methods and underlying assumptions used, and the relevant environmental data is required, as well as an explanation of the shortcomings and uncertainties identified in the collection of the necessary data.

According to the statement of **BirdLife Finland**, it cannot be ruled out with certainty that the area cannot be an important feeding ground for deep-diving, fish-eating auks at some point during the year. The delineation is north-south, which means that it is largely aligned with the migration route of birds. As a result, it is unlikely to form a large barrier that migratory birds would have to circumnavigate, which would potentially have an impact on their survival. However, it is possible that the autumn migration of some species, such as bean geese and whooper swans from the Kvarken area to the south-west, passes through the site or adjacent



areas to a significant extent. Therefore, the project poses a potential risk of being an object of collision for birds nesting in Finland.

In its statement BirdLife Finland notes that the programme states in section 5.6.1 that it is not considered the shallows of the Bothnian Sea to be important as wintering and feeding areas. However, the study referred to in the paragraph did not cover the open sea of the Bothnian Sea, which should be pointed out in the paragraph. Moreover, the expression is too general – shallow areas can be of regional importance, even if their importance at national level is small. A 500–1,000-m protection distance to the main seabird resting areas, as stated in section 6.8.1, is totally inadequate and contradicts current research findings. A sufficient protection distance depends on the species and can be more than ten kilometres for the most sensitive species, such as auks and red-throated loons. In the same paragraph, the risk of birds colliding with wind turbines is downplayed because night migration is not addressed at all, despite the fact that the majority of birds migrate at night, when they are unable to see the turbines.

BirdLife Finland also points out with regard to the bird surveys highlighted in Section 7.1 of the consultation document, that states "Mapping of the movement patterns and flight paths of local and migratory seabirds in the area.". BirdLife Finland notes that this sounds good in itself but is inadequately specified because the methods are not described. It is not possible to know from the programme whether helicopter censuses of feeding birds are carried out in the area; at what times of year and how often inventories are carried out; and whether bird radar is used to determine flight paths and altitudes. The EIA completely lacks an assessment of the combined effects of the project with other projects, i.e., the assessment of cumulative effects. As shown in Figure 16 of the consultation document, there are six other projects planned in the vicinity of the planned project, as well as a large number of other projects in the rest of the Gulf of Bothnia and the Baltic Sea. The assessment of cumulative impacts is a particularly important part of the overall impact on migratory bird populations.

With regard to marine physics, **the Finnish Meteorological Institute (FMI)** points out that it carries out observation activities in the Bothnian Sea related to the monitoring of the Baltic Sea using both automatic measurement methods and shipboard measurements. The construction of the planned project will make it difficult to use automatic measurement methods in the Bothnian Sea, especially because of their limited manoeuvrability, and will probably also limit the area of the farm to outside of measurements by ships. With regard to the physics of sea and ice, FMI considers that the planned studies are comprehensive. Due to the impacts related to marine observation, FMI believes that Finland should be involved in the EIA to ensure good access to marine observations even during the construction of the farm – for example by adding an observation station to the farm. FMI has no comments on matters related to the weather radar network.

In its statement **Metsähallitus** considers that, because the planned number of wind turbines and size of power plants is increasing in the Gulf of Bothnia, it is important to consider the cumulative effects of all the phases of the life cycle of offshore wind power on marine species at population and habitat levels as well as the impacts on ecosystem services. Metsähallitus considers it important that Finland participate in the EIA procedure to make sure that the combined effects of the projects located on the Finnish side are also included in the assessment.



According to the **ELY Centre of South Ostrobothnia**, there are compatible interests in the area, in which the marine plan must also be considered. It is important to assess the impacts on the use of the sea, the landscape and the natural environment mentioned below. In particular, it is likely that there will be combined effects with offshore wind projects under development on the side of the Finnish EEZ. The closest protected areas within the Finnish EEZ in the area of the ELY Centre of South Ostrobothnia are the archipelagos of Närpiö (SAC/SPA FI0800135) and Kristiinankaupunki (SAC/SPA FI0800134). The activity will have a number of impacts on the natural environment. The project will be located on known bird migration routes and possibly also in foraging areas for local birds. The impacts on birds also extend to species on the Finnish side and need to be fully assessed. Additional mortality due to direct collision risk may be significant for population development, especially for species with long lifespans. Indirect impacts, such as a longer migration route, deterrent effects and impact on nesting areas and feeding areas used during breeding, may also weaken populations. Of the migratory fish in the Baltic Sea, Arctic char and eel are already critically endangered and Baltic salmon vulnerable.

In its statement the ELY Centre of South Ostrobothnia notes that the project must assess the impact of the construction and activity on the life cycle of migratory fish and thus the potential impact on the population. The programme has estimated that the electromagnetic fields may have a particular impact on eels. For grey seals, there is no accurate information on the distribution and movement of the species in the area. The importance of affected areas for grey seals should be investigated. A similar investigation should be extended to include the presence of the Baltic ringed seal in the area, as the spring breeding season on the ice is critical in terms of interference. The project may have an impact on the flight and migration routes of bats, affecting even bats found in Finland. The effects of electrical cables, transformers and power lines may have an impact on several different groups of organisms (e.g., marine mammals) and may also directly or indirectly affect Finnish populations. For example, the dispersion of sediments, noise during construction and operation, changes in thermal layers, changes in seabed topography and quality, physical changes and their impact on biogeochemistry, and the formation of upwelling/downwelling dipoles due to weakened wind conditions may have an impact on the entire marine ecosystem on the Finnish side through complex processes.

The ELY Centre of South Ostrobothnia also notes that the programme does not include an assessment of potential transboundary impacts. The potential impacts on the Finnish EEZ and territorial waters, including impacts on the marine resources management assessment indicators have to be assessed (more information²). A wide range of impacts have been considered in the main. The assessment programme phase has identified the need to assess the impacts on birds, fish, benthic fauna and marine mammals. Impacts on bats will be assessed through a literature review, and the actual impact will be refined as the power plants become operational. The surveys mentioned in the programme must be carried out in sufficient detail and using appropriate methods so that the potential impacts can be reliably assessed. Potentially harmful substances and nutrients in the sediment should be identified and the risk of their spreading and effects, for example due to dredging, should be assessed through modelling. The EIA must also consider the effects on food webs in the area and the project's impact on sea currents and waves and their indirect effects on water quality. Combined effects with other projects must be assessed with sufficient scope and care.

² [Havsmiljöns tillstånd i Finland 2018 \(helsinki.fi\)](https://helsinki.fi/havsmiljons_tillstand_i_finland_2018)



The ELY Centre of Southwest (fisheries authority) points out that Finland has fishing rights in the project area. Furthermore, the fish populations of the Baltic Sea and the Gulf of Bothnia are shared, and regulation of fishing takes place at the EU level. Finland and the regions represented by the ELY Centre of Southwest Finland have significant interests related to commercial fishing throughout the Gulf of Bothnia, which may be affected by this project. The fisheries authority notes that Finnish fishing vessels have fishing rights in the project area. The area contains fish stocks that are significant to Finnish commercial fishing, in particular Baltic herring, sprat and salmon. Construction and continuous activities can have a significant impact on fishing, fishing opportunities, the value and availability of catches, fish migration routes, reproductive success, survival, condition and contaminant concentrations, and thus on the Finnish fishing industry. In addition, the fisheries authority estimates that such an extensive project may have a significant impact on the ecosystem of the marine area to be jointly exploited (the Bothnian Sea) and, consequently, on the shared fish stocks.

The fisheries authority states that the project is one of several projects that may be implemented simultaneously in the Gulf of Bothnia. The impact of such significant projects alone can become amplified, changing the marine environment permanently. Impact assessment must therefore be also carried out in terms of combined impact. The fisheries authority is concerned about the fishing- and especially passage restrictions caused by the project. Fishing by Finnish vessels or vessels landing fishery products in Finland in the production area itself is limited over much of the area due to the shallow nature of the area, but there are trawling areas immediately to the west and east of the production area. In particular, the trawling area to the west of the project area is at times an important auxiliary area, allowing a steady supply of fish to the industry to be maintained when catches in the core trawling areas are poor.

The fisheries authority considers the potential of the fishing areas to the west of the production area to be important for security of supply and the development of fisheries. There may be overlaps with trawling on the periphery of the production area and in cable corridors; especially in fixed bottom trawling corridors and trawl haul-outs. Inside the production area, there may also be a few fixed bottom trawling corridors in the middle stage. Transit access to the project area is a critical factor for the availability of food fish in Finland. The "mindre omväg (minor detour)" mentioned in the consultation document may be techno-economically too much. The fisheries authority considers that trawling must be allowed in technically critical areas and that transit for fishing vessels must be guaranteed in an east-west direction. The fisheries authority stresses that any far-reaching effects of the project must be avoided. Therefore, any impact, including indirect impact, on fish stocks must be carefully investigated. The fisheries authority points out that the project involves potential hydrogen production, although this is not specified more precisely in the document. Offshore hydrogen production can multiply the environmental impact of this project.

In its statements the fisheries authority notes that the consultation document does not identify the importance of fishing in or near the project area. The fish stocks present in the area are poorly identified. Direct impacts on fishing are identified, but a realistic assessment of the impact is lacking. The impact on fishing elsewhere is not mentioned. Impact on fish stocks is mainly identified during construction (noise and turbidity). The magnetic field problem and reef effect are identified but handled only sketchily and narrowly. Risks to the marine ecosystem, impact beyond the project area or the large scale of the project have not yet been sufficiently taken into account. Potential hydrogen production is not considered even though it would significantly alter



the environmental impact of the project. The total amounts of different emissions are not assessed, their possible impact is not considered sufficiently or at all, and no solutions have been proposed to avoid them. The fisheries authority also notes in its statement that the research plan is very incomplete. Cumulative impacts have been considered, but there are no more precise boundaries, so it is impossible to assess whether the planned consideration is sufficient. From the perspective of the fishing industry, the content of the document is deficient at this stage.

The fisheries authority stresses that the document ignores Finnish fisheries. The project area and the surrounding areas are, in the opinion of the fisheries authority, of no importance to the Swedish fisheries, as stated in the document, but the project area and the surrounding areas are of much greater importance to the Finnish fisheries. According to Article 5 of Regulation (EU) 1380/2013 of the European Parliament and of the Council, Finnish vessels have the same fishing rights in Swedish waters as Swedish vessels.

The fisheries authority considers that the following issues need to be thoroughly investigated:

1. Wind farms and their residues are expected to prevent trawling, such as the current state of fisheries and permanent changes in fishing opportunities: Wind farms and their residues will presumably prevent trawling, as stated in the consultation document. The current fishing use of the area for all EU countries and how the project will affect fishing opportunities must be clarified. Potential trawling routes and haul-up points must be identified (using VMS material and interviews). Areas where trawling becomes impossible should be indicated on a map. If necessary, it should be demonstrated how fishing can be made possible (for example, trawling corridors or changes to the project area boundaries). Long-term consequences after possible decommissioning or disaster must also be considered. The possibility of demolishing the turbines and other structures must be assessed. In the view of the fisheries authority, the technical conditions for safe trawling do not exist when the distance between the power plants is less than 3 kilometres.
2. Transit possibilities for fishing vessels: To the west of the project area is one of the most important fishing grounds for food fish and the shipping route from the important fishing port of Kaskinen passes directly through the planned production area. If transit becomes technically impossible, the project will affect the opportunities for and profitability of food fish fishing by Finnish vessels. The impact on the quality, price and availability of food fish may be fatal. Transit possibilities for fishing vessels must therefore be investigated (e.g., the impact of ice throw) and made possible.
3. Combined impacts: At least four wind farms are planned in the vicinity of the project in the Finnish and Swedish EEZs, which would cover a significant part of the central Bothnian Sea. Together with the planned Bothnia-West project (Ilmatar Offshore AB) on the Finnish side, the project would form an uninterrupted production area. In addition, dozens of projects are planned or pending in Sweden and Finland in the Gulf of Bothnia. The combined impacts of the project with these other projects must be investigated in detail. Neighbouring projects must be included, at least initially, in modelling, maps and assessments.
4. The migration routes of wild and planted salmon stocks in the Gulf of Bothnia, the impact of turbines, cables and construction on these routes, and possible technical improvements:



Most of the Baltic salmon population migrates to the northernmost parts of the Bay of Bothnia, perhaps also through the project area. Most of the Baltic Sea quota is fished in the northernmost parts of the Bay of Bothnia and in the Tornionjoki River, in economically vulnerable remote areas. Salmon fishing has a significant socio-economic impact on this region. Changes to migration routes may have a major impact on the local fishing industry and the viability of the stock. At least blasting and clouds of solids caused by the construction as well as the magnetic fields of the cables and changes to the coastal thermocline in the early summer during operation are expected to have an impact on fish migration behaviour. The project and neighbouring projects could also theoretically affect the coastal thermocline by reducing wind speeds.

5. Impact of construction-phase sediment emissions on fish stocks: Dredging, cabling and banking activities cause extensive turbidity and sediment emissions. The scale of the project translates to an emission period of several years within a radius of at least tens of kilometres. Modelling of the movement of the sediment clouds caused by construction works, and assessment of the impact on the chemical-physical conditions of the water, both for construction activities and for the resulting changes in the soil profile. Timing options for expected sediment emissions must also be presented so that disturbances can be placed in context with other upcoming projects. Based on this information, an assessment must be made of any harmful impact on breeding grounds, benthic fauna, and the oxygenation of the hypolimnion. If necessary, proposals must be made on how to avoid excessive strain in sensitive areas (for example technical solutions and construction strategies such as breaks in construction).
6. Thermal emissions from production: In theory, thermal emissions from the equipment and cables may affect the stratification of the water column in the surrounding areas and, consequently, the chemical composition of the epilimnion and hypolimnion. There is also a possible impact on ice cover. The volumes and distribution scenarios of thermal emissions must be presented, and their effects assessed and modelled when necessary. Countermeasure options must be provided when necessary.
7. Changes in flow conditions and stratification: When combined with the neighbouring projects, the project area is so extensive that there is a possible impact on surface currents. This can affect water stratification, temperature as well as nutrient, salt and oxygen concentrations at different depths. In theory, stronger stratification could alter the nutrient concentrations of the surface water, causing changes in fishing production and blue-green algae blooms. The expected changes in flow conditions and their impact on physico-chemical conditions must be modelled and impact on the ecosystem and fish stock assessed.
8. Toxic emissions and their potential accumulation in fish: At least the following must be considered as possible sources: sediments, drilling chemicals, protective paints, lubricants for turbines and moving parts, transformer coolants. Possible emission (worst-case) scenarios for accidents and, for example, sabotage must also be assessed with regard to their impact on fish stocks.
9. Threat potential from easily agitated solid pollutants: In the Bothnian Sea area, tall oil has been identified as a waste causing problems for fishing. After coastal spills, it has settled to



the bottom and is easily agitated. When the oils get into trawls, even small quantities can spoil hundreds of tonnes of haul. The existence of tall oil and similar contaminants in the project area, the potential of their agitation, directions of movement and means of response must be assessed before such an extensive construction project.

10. An assessment based on research data on how wind farm structures and possible artificial reefs affect the structure of the ecosystem and fish stocks: The positive reef effect on fisheries observed in the oceans is highly unlikely in the project area, as the target species (large and/or long-lived demersal fish, crustaceans or molluscs) are virtually absent in the northern Baltic Sea. The fisheries authority sees the reef effect mainly as a change in natural ecosystems, which must be treated primarily on the precautionary principle.
11. Invasive species strategy: The Bothnian Sea is an area isolated by a large salt and temperature gradient with a low number of cold-water species. Due to low traffic volumes, few invasive species have thus far entered the area. Particularly due to eutrophication and climate change, the Bothnian Sea is vulnerable to invasive species that can also have a negative impact on fish stocks. If other wind farm projects are also implemented, the transport of construction and dredging vessels and foundations from outside the Baltic Sea seems likely. Such equipment may be a more hospitable platform for the introduction, survival and naturalisation of different organisms than ordinary commercial vessels. The developer must understand the risks caused by invasive species and a strategy for how to respond to these risks. The steppingstone effect of any artificial structures in the wind farm must also be considered, for example, when selecting different building materials. The thermal and reef effect (local eutrophication) must also be assessed at this stage. Permanent monitoring of species is desirable.

According to the statement of the fisheries authority, offshore wind farms are a new phenomenon, and relatively little research data is available on their impact. This lack of data is emphasised in the Bothnian Sea because many key species and communities present in oceans are missing from the area. This means that research data obtained from elsewhere cannot be applied. For this reason, projects targeted at the region must carry out investigations specifically by means of research and monitoring. The fisheries authority urges developers to commission studies in good time and on a sufficiently broad basis. Cooperation with other projects and the funding of independent research, for example, are desirable and demonstrate the client's sense of responsibility.

According to the **Finnish Transport Infrastructure Agency**, the project may have an impact on shipping to and from Finland, especially considering the project's combined effects with other planned wind farm areas and the ice conditions in the area. Although the project area in question takes good account of the routes used by shipping and the maritime areas of the Swedish maritime spatial plan, it is important to consider the combined impact of wind power projects in the area on shipping. In addition, sea ice occurs in the Bothnian Sea during a normal ice winter. Ice cover changes the routes used by ships compared to open water traffic, and the routes used by icebreakers differ from those used by merchant ships. It is therefore important that the Swedish and Finnish authorities responsible for icebreaking are consulted at an early stage. The wind farm area would have an impact on shipping to Finland during the open water season, as wind farms affect the radar image of ships, satellite positioning, radio traffic between ships and coastal stations, and the field strength and signal quality of mobile communication networks. In



this respect, the Finnish Transport Infrastructure Agency refers to the opinion of Traficom on the matter.

In its statement **the Government of Åland** points out that the distance to Åland waters is so short, that impacts on Åland are possible.

In its statement, the **Finnish Association of Professional Fishermen (SAKL)** points out that it is practically impossible to practise trawl fishing in areas where offshore wind farms are constructed, which is why the association requires that the key trawl fishing areas be reserved exclusively for fishing. Any cables must be ploughed to the bottom of the sea. The impact of the planned offshore wind farm area on fishing in the Bothnian Sea and beyond, must be thoroughly investigated and the information obtained must be critically examined. SAKL points out that the importance of the project area for commercial fishing in the longer term must be assessed. The consultation document does not sufficiently take into account the activities of trawlers flying the Finnish flag. The impact of offshore wind farm construction, including the area in question, on herring stocks (spawning, reproduction, and nursery areas) must be thoroughly investigated. It is particularly important that the combined cumulative effects of the project and the other planned areas are investigated. There are currently several offshore wind farms being planned for the Gulf of Bothnia and particularly the Bothnian Sea without any coordination or overall assessment.

Service development director

Heli Karjalainen

Senior officer,
Point of Contact to the Espoo Convention
and the Protocol on SEA

Laura Aitala-Martesuo

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Appendices Received statements in Finland

For information Ministry for the Foreign Affairs of Finland
Ministry of the Environment
Ministry of Transport and Communications
Finnish Transport and Communications Agency Traficom
ELY Centre of Southwest Finland
BirdLife Finland
Finnish Meteorological Institute
Metsähallitus
ELY Centre of South Ostrobothnia
Finnish Transport Infrastructure Agency
Governmen of Åland
Finnish Association of Professional Fishermen

