

Tamba wind farm

Non-Technical Summary

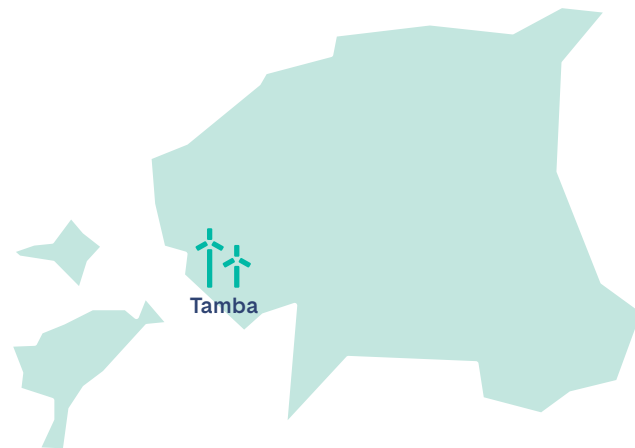


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1. Short description of the project

The Tamba Wind Park project aims to construct a 6 MW wind farm in Varbla municipality, Estonia. The wind park will consist four WTGs, each with a capacity of 1,5 MW, along with necessary infrastructure including wind turbine foundations, road. The total area governed by the spatial plan is approximately 35 hectares.

2. Legal basis and background

The environmental impact assessment (EIA) for the Tamba Wind Farm is primarily governed by the following legislation Law of Property Act, Coastal Protection Act, Energy Act, Act on Protection and Use of Animals, Act on Protected Nature Objects, Public Health Act, Environmental Impact Assessment and Environmental Management System Act, Planning and Building Act.

Special attention is required for compliance with the Beach and Coast Protection Act, which typically mandates a construction prohibition zone of 100 meters from the normal water line on the mainland. However, the planned wind turbines for Tamba are to be located approximately 30-80 meters from the water line.

The general spatial plan of Varbla municipality also enforces a 100-meter construction prohibition zone, though this can be adjusted through detailed planning. Any reduction in this zone may negatively impact the landscape and increase the risk of accidents from ice ridges. To mitigate these risks, the design of the wind turbine foundations must consider these environmental and safety factors.

3. Site location and description

The Tamba Wind Farm is situated on the Tamba peninsula, along the east coast of the Gulf of Riga. This area is open to the sea and features minimal residential land. The nearest residential property is the Viibre I land unit, approximately 450 meters from the area governed by the detailed spatial plan (DP area). Other nearby residential buildings and outbuildings are located on the Laine, Põlde, and Viibre I land units, about 300-400 meters from the DP area.

The wind turbines are arranged in a row along the coastline, within the construction prohibition zone stipulated by the Coastal Protection Act (30 to 80 meters from the normal water line). The detailed spatial plan includes a scheme that provides an overview of the turbine arrangement (see annex 1).

The turbines have a service life of at least 20 years, after which they will be dismantled and likely replaced by more modern units. Access to the site will be via a gravel-covered road connected to the Audru-Tõstamaa-Nurms road. While part of the existing dirt road will be used, a new road will need to be constructed for most of the DP area.

4. Description of the planned activity

The Tamba Wind Farm will cover an area of approximately 35 hectares, with around 1.2 hectares directly occupied by the facilities, including wind turbine foundations and access roads. The Environmental Impact Assessment (EIA) also considers the construction of power lines and a substation to connect the wind turbines to Eesti Energia's distribution network. According to technical conditions from Eesti Energia, the existing 35 kV power line must be upgraded to 110 kV to accommodate the electricity generated by the wind farm.

The project involves installing four SÜDWIND S-70 wind turbines, each with a capacity of 1.5 MW. Each turbine features an 85-meter high white-painted metal conical mast and a 3-bladed rotor with a 35-meter radius (70-meter diameter). The total weight of each turbine is approximately 262 tons, and they will be transported to the site in parts. Each turbine will be anchored by a foundation covering 910 square meters.

The turbines will operate optimally at a wind speed of 11.6 m/s, with the rotor beginning to work at 3 m/s and shutting down at speeds exceeding 25 m/s. The rotor speed varies between 10.5 and 19 revolutions per minute, depending on the wind conditions.

5. Summary of the impacts and mitigation measures

5.1 Landscape and visual

Landscape. The most important elements of the landscape in the area are coastal lakes, and it is crucial to avoid impacting their water systems through construction activities. This includes avoiding drainage and blocking water movement. The area is predominantly a coastal meadow featuring three coastal lakes (approximately 3.1 and 0.3 hectares in size), coastal ridges with juniper bushes, reeds, and salt patches. It borders the Gulf of Riga and is dominated by a moraine coastal zone.

Visual Impact. According to the thematic plan "Valuable landscapes" of the Pärnu county spatial plan, the area covered by the detailed spatial plan is part of the coastal landscape of Paatsalu - Varbla islets. This landscape is valued for its cultural-historical, natural, aesthetic, and recreational significance. A visualization has been created to help the public and decision-makers assess the wind farm's potential visual impact on the aesthetic value of the landscape.

The Tamba wind farm is located on the Tamba peninsula, which is open to the sea on the east coast of the Gulf of Riga. The visual impact of the wind farm is expected to be noticeable from the coastal area between Paatsalu and Varbla islets and potentially from the Audru-Tõstamaa-Nurmsi highway. The extent of the visual impact depends on the openness and exposure of the location.

The WTGs, which have a height of 120 meters including the impeller, are mostly white. However, considering Estonia's foggy and rainy weather, a light grey color might blend better with the surroundings. Some opinions suggest that grey tones can cause oppressive emotions, while multicolored options with smooth transitions or "patchy" designs have also been used globally.

The arrangement and color of the WTGs are designed to fit into the landscape. Simple geometric shapes that follow the landscape's contours are more easily perceived by viewers. In this case, the turbines are placed along the coastline, with the general order slightly disturbed by the eastern turbine on the northern side. For road observers, the visual impact is reduced by the forest and bushes between the sea and the road, which partially hide the turbine towers.

Overall, it is challenging to definitively assess the aesthetic value of the landscape. Visualization of the Tamba wind farm is provided to enable the public and decision-makers to judge whether the proposed wind turbines will disrupt or enhance the existing appearance of the Tamba Peninsula. The goal is to ensure that new elements and land use match the old, preserving the landscape's valuable characteristics without causing disruptive inconsistencies.

Mitigation measures

- To avoid additional visual disturbance, underground cable lines should be preferred when choosing the power lines connecting the wind turbines to the substation; overhead lines would cause excessive visual clutter.
- To mitigate the negative visual impact, it is possible to paint the WTGs with a light grey color to blend better with the surroundings.

5.2 Soil pollution and erosion

In the planned Tamba wind farm area the thickness of the soil is 5-10 m. Accurate geotechnical studies for the choice of wind turbine foundation construction technology have not yet been carried out.

5.3 Hydrology and Hydrogeology

The coastal lakes are the most crucial hydrological elements in the landscape, and it is essential to avoid impacting their water systems

through construction activities. This includes avoiding drainage and blocking water movement. The wind turbines are positioned within the construction prohibition zone (30 to 80 meters from the normal water line) set by the Coastal Protection Act, and there is a possibility that this zone might be reduced.

Coastal lakes are particularly sensitive to changes in the water regime and pollution. Natural processes in the coastal meadow and the entire peninsula rely on these water regimes. Due to natural processes such as uplift, the water level on the coast is constantly lowering, leading to the overgrowth of water bodies. Seasonal fluctuations in water levels can be significant, with smaller lakes potentially drying up during the summer.

The direct impact of the planned Tamba wind farm construction on the landscape involves the modification of the landscape structure through the introduction of artificial objects and the road network. Each wind turbine foundation covers a relatively small surface area approximately of 910 m², with the foundations of four turbines totalling approximately 3,644 m² or 0.4 hectares. The more significant impact comes from road construction, which may fragment some landscape units (land cover and land use types). Indirect impacts include potential drainage to create suitable conditions for construction, which could lower the surface water level and alter the water regime of coastal lakes. To mitigate this, it is crucial to use technology and materials that do not require prior drainage when constructing wind turbine foundations.

It is also vital to avoid disrupting the connection between the largest coastal lake and the sea when building roads, possibly by installing a culvert or bridge.

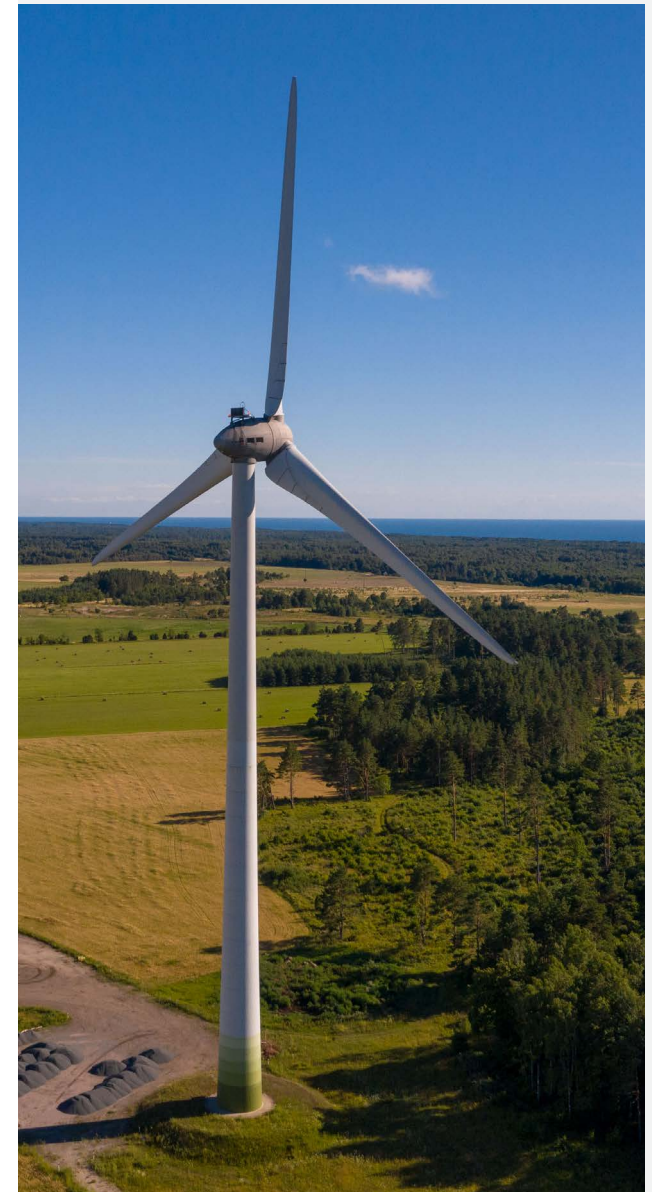
Wind turbines do not pose a direct pollution threat to coastal lakes or the sea, but there is a minimal risk of oil spillage if a wind turbine collapses. Due to fluctuating water levels and ridged ice, cables and transformers for turbines located directly on the coast (from 30 meters from the coast) are at risk. In the event of a failure, this could lead to an extensively wet area becoming electrified.

Mitigation measures

- Drainage and blocking of water movement should be avoided.

5.4 Protected areas and areas of high ecological value

There are no protected individual objects of nature and protected areas in the planned Tamba wind farm territory. The nearest



protected areas are the Nehatu Nature Reserve II fragment on the banks of the Paadrema river (distance from the Tamba peninsula approximately 2400 m) and the protected area of Varbla islets with an unapproved rule of protection (distance from the Tamba peninsula approximately 3200 m).

5.5 Biodiversity

The construction of the Tamba wind farm is expected to have impacts on the local biodiversity, particularly affecting birds and vegetation.

Regarding the impact on birds, there will likely be a change in the species composition of breeding birds in the Tamba meadow, leading to a decrease in species diversity and zoological value. Non-breeding bird populations, especially Barnacle goose, are expected to decline. Additionally, high mortality rates for birds due to collisions with wind turbine components are anticipated. This, however, is not expected to significantly affect overall bird population abundance. The disturbance effect extends up to 500 meters from the nearest turbine, affecting feeding, resting, and wintering birds. Indirect impacts on migration and feeding habits will extend further.

The highest risk area is within 200 meters of the turbines, where habitat use will be significantly reduced. Construction impacts are short-term, whereas post-construction impacts are long-term, affecting species composition and breeding success.

The Tamba meadow is a significant area for Barnacle goose migration. If their habitat use decreases, it will increase pressure on surrounding areas. The arrangement of wind turbines, designed to minimize risk, still poses significant challenges due to the proximity to bird migration routes.

Regarding the impact on vegetation, the Tamba area hosts a medium-value coastal meadow with significant populations of the endangered *Angelica palustris*. Construction must avoid damaging the coastal meadow, and continued management (mowing and grazing) is essential. The vegetation around Tamba has been studied multiple times, revealing a mosaic of coastal ridges, salt patches, marshy patches, and juniper bushes, with diverse plant species including some protected by European regulations.

Direct impacts on vegetation include local destruction of plant communities and potential damage during construction. Roads and turbine locations are selected to minimize damage. Indirect impacts include the potential cessation of meadow management,

leading to overgrowth by reeds and tall fescue.

The negative impacts on biodiversity, particularly birds and coastal meadow vegetation, are significant but can be mitigated with careful planning and management. Continued grazing and mowing are crucial to maintaining the ecological value of the coastal meadow.

Mitigation measures

- Construction work must take place outside the breeding season (April 15-July 15).
- Reduce the size of the project by placing the wind turbines in one row, reducing the number from four to three.
- Conduct pre-construction monitoring to gather background data on breeding and migration periods.
- Decide on the possibility of expanding the project as a result of further monitoring.
- Implement temporary shutdown of wind turbines during periods of intense migration, depending on monitoring results.
- Continue and increase the management of the coastal meadow through mowing and grazing.
- Ensure adequate supervision during construction to prevent damage to the vegetation. It is especially important not to damage the habitat of the endangered species - the *Angelica palustris* - in the immediate vicinity of the most north-eastern wind turbine.
- Carry out both pre- and post-construction monitoring to assess the actual impact on bird populations.

5.6 Cultural heritage and protected areas

There are no objects under heritage protection in the area governed by the spatial plan and no objects and areas of historical importance. The nearest heritage sites are the buildings of Paatsalu manor approximately 3000 m away and about 1 km north of the Tamba Peninsula, on the peninsula across the bay, is the Jungermann family cemetery.

5.7 Socio-economic

The development of a wind farm in the village of Tamba is expected to have a mix of positive and negative socio-economic

impacts on the local community and the broader region. On the positive side, the wind farm could enhance employment opportunities and contribute to the overall development of the area. However, there may be some negative effects on the quality of life for local residents both during construction and the operational phase of the wind farm.

The socio-economic impact of the wind farm is mainly indirect and is most evident at the village and municipality level. According to the 2000 population census, Tamba village has 7 permanent residents, Nõmme village has 9, and Paatsalu village has 64. Varbla municipality, which encompasses these villages, has a total of 1,029 permanent residents. The local economy is characterized by low employment and business activity, with a significant reliance on agriculture. In 2000, Varbla municipality had an unemployment rate of 34.7%, with only 9 entrepreneurs and a large portion of the working population (35.8%) engaged in agriculture. A significant part of the population relies on social assistance, with the highest rate of subsistence allowances in Pärnu county.

The Tamba peninsula, being a seaside area, has recreational value. The municipality's general plan envisions a public bathing beach on the peninsula, but currently, access to the seashore is limited due to a lack of roads, leaving the recreational potential underutilized. The nearest tourist attractions are located in Paatsalu.

The socio-economic impacts of wind energy in Estonia are generally indirect. Direct revenues to the municipality or state from taxes are negligible. The construction and operation of wind farms can influence employment, land use, the real estate market, and the overall economic climate. Wind energy production is a low labor-intensive industry, but during the initial phases, it can provide work for design, planning, construction, transport, and supply companies, including local businesses in Pärnu county. The assembly of wind turbines requires specialists with specific training, so local labor involvement may be minimal. During the operational phase, minimal labor is needed, mostly for regular maintenance activities such as grazing, mowing, and brush removal, which could involve local farmers.

The existing land use for agriculture will not be restricted by the wind farm, and the economic value of the landscape in the detailed spatial plan area is expected to increase. Alongside energy production, grazing can continue. Recreational opportunities might be affected by noise and changes in natural views, but the wind farm will also provide access to the beach area, which was previously inaccessible. Some tourists may find the wind farm

attractive, although it is unlikely to become a major tourist draw on its own.

The impact on the real estate market depends on the nature of transactions. Potential buyers of properties within a 1000-meter radius of the wind farm might be deterred by noise or visual disturbances. However, the Tamba Peninsula's natural conditions are not favorable for residential construction, reducing the likelihood of significant impacts on real estate prices. The value of agricultural or production land is not expected to decrease due to the proximity of wind turbines.

For economically underdeveloped areas like Varbla municipality, wind energy production could provide an impetus for economic improvement and create a positive image. Modern wind farms can symbolize support for green energy and ecological development. However, there can be opposition from local residents who, while supporting renewable energy in principle, may not want wind turbines in their immediate vicinity due to noise and visual concerns, a phenomenon known as the "not in my backyard" (NIMBY) syndrome.

5.8 Public health

No significant adverse impacts on public health are anticipated but however noise affects the quality of life. Disturbance of people can be manifested, for example, if the enjoyment of one's own garden is limited; sleeping, communicating, listening to the radio, reading is disturbed in a living room with open windows; to ensure undisturbed sleep, it is necessary to close the windows. People's perception of noise is different. In addition to sleep disorders, mental health disorders and noise-induced hearing damage may occur in some cases.

5.9 Physical pollution (noise, shading, and electromagnetic waves)

The noise level generated by the proposed four wind turbines at the Tamba wind farm is expected to reach up to 35 dB(A) at a wind speed of 10 m/s, extending to an estimated distance of 600 meters from the nearest turbine. The noise extends farthest northeast of the turbines, up to 690 meters. Although the current land use in the Põlde and Dorbek units as profit-yielding land will not be disturbed by noise, the property of Viibri I, intended for residential use, will experience noise levels reaching 45-50 dB(A). This level exceeds

the critical noise limit of 45 dB(A) for residential areas, suggesting the nearest wind turbine must be at least 310 meters from the building to ensure compliance.

Noise assessment is crucial for wind farms near residential areas as it primarily affects human disturbance. While there are only seven permanent residents in Tamba, with additional summer residents and vacationers, it is essential to determine if and how the noise from the wind turbines will affect their daily lives. The EU noise policy defines environmental noise as sound from human activity that affects people's outdoor living environments. Noise can disturb sleep, communication, and other activities, potentially leading to mental health disorders and hearing damage.

In Estonia, the noise standard is 35 dB(A), which is stricter than in many other European countries. The natural background noise in Tamba, mainly from wind and waves, averages over 30 dB but can reach up to 70 dB due to breaking waves. The noise from the wind turbines will add to this background noise, but natural sounds may mask the turbine noise to some extent.

Shading from the wind turbine rotors can also be visually disturbing, particularly on sunny days. This effect is most noticeable in the morning and evening when shadows are longest. In Tamba, the shading from the most northeastern wind turbine could disturb travelers on the Audru-Tõstamaa-Nurmsi road in the evening. Studies in Denmark suggest that only 20% of the maximum possible shading time is realized, which equates to about 30-40 days a year. Tall landscaping around residential buildings and along roads can help reduce this disturbance.

The electromagnetic impact from wind turbines is minimal. The turbines can cause scattering and reflection of electromagnetic waves, but this primarily affects areas near mobile communication transmitters or where turbines are on the line between transmitters and receivers. There are no such objects within a 1000-meter radius of Tamba village, making electromagnetic interference unlikely.

Mitigation measures

- In order to reduce noise, it is important to preserve and/or establish (high) vegetation near residential buildings.
- Ensure the nearest wind turbine is located at least 310 meters from residential buildings to maintain noise levels within the critical limit of 45 dB(A).
- Reduce disturbance from the movement of shades by

implementing tall landscaping around residential buildings and along roads.

5.10 Waste

Waste in the form of concrete foundation, metal and plastic is generated primarily during the dismantling of wind turbines at the end-life of their use. Wind turbines are easy to dismantle, and their material can be reused or recycled.

Mitigation measures

- It is necessary to record the obligation to dismantle the wind turbines and supporting facilities in an environmentally safe manner in the building permit, activity license and other documents issued on the basis of the detailed spatial plan.

5.11 Air pollution

The production of electricity from wind will not pollute the air, non-renewable natural resources are used only in the production of wind turbines and their parts and in the technical maintenance of wind turbines.

5.12 Traffic and transport

Access to the area governed by the spatial plan is planned from the Audru-Tõstamaa-Nurmsi road. Currently, a dirt road leads to the area governed by the spatial plan; most of the area has no roads.

6. Glossary


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| EIA | Environmental Impact Assessment. |
| Spatial Plan | Detailed plan of the Tamba wind farm. |
| Natura 2000 | A coherent network of special areas of conservation of habitats which is composed of sites hosting the natural habitat types of community interest and habitats of the species of community interest, and which enables the natural habitat types and the species' habitats to be maintained and, where appropriate, restored to a favourable conservation status in their natural range. The Natura 2000 network includes special areas of conservation of birds. |
| Protected area | A land and/or water area which has clearly defined boundaries, an acknowledged scientific, ecological, cultural and other value and for which a special protection and use regime/procedure has been established by legal acts. |
| SEA | Strategic environmental assessment. |
| WTG | Wind turbine generator. |

7. Contacts



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