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Anholt Offshore Wind Farm

Tourism and Recreational Activities

December 2009

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1. Summary

The recreational values are closely connected to the tourism on both Djursland and Anholt. This memo describes the recreational areas and activities - on shore and offshore, in order to estimate the impacts of the wind farm project on recreational values and tourism.

Djursland is known for its many attractions, which are located within short distances of each other. Some of the main attractions are the beaches and the wasteland behind the coastline. Along the coast there are several cliffs which are of geological interest and therefore popular recreational sites as well. The marinas along the coast of Djursland are used by pleasure sailors, anglers and divers. There are several locations along the coast and further from the shore which are popular sites for angling, diving and hunting. This makes the offshore activities around Djursland very diverse.

On Anholt the landscape, beaches and unspoilt seaview are some of the key factors making the island a popular destination. There are only 160 residents but during summer the number of people reaches up to 6000 a day. The island has a harbour serving as an industrial harbour as well a marina.

The impacts during the construction phase are primarily connected to visual impacts, noise and restrictions in access to the project area. The safety zone of 500 metres around the project area may include the entire construction area or a rolling safety zone. This will primarily have an impact on sailors and the route of the ferry. Impacts on divers, anglers and hunters are estimated to be minor. The visual impacts and noise impacts are primarily an issue in Grenaa, due to the possible storage, handling and transportation of elements from the harbour.

During operation the primary impacts are the visual impacts. The wind farm will be visible from the coasts of Djursland and Anholt, which will change the seaview and the experience of the landscape radically. This may also result in impacts on tourism, depending on how the project is perceived. Experiences from other projects show that the tourists and the public often tend to have a positive view on similar projects due to the environmental advantages. However, it is difficult to predict the actual impacts on tourism.

Noise calculations on selected areas on land using WindPro show that the noise generated by the turbines does not affect the coastal lines of neither Djursland nor Anholt. Safety zones will be applied for the wind farm area or parts hereof. This will have an impact on pleasure boating and to some extent diving, angling and hunting.

2. Introduction

2.1 Background

In 1998 the Ministry of Environment and Energy empowered the Danish energy companies to build offshore wind farms of a total capacity of 750 MW as part of fulfilling the national action plan for energy, Energy 21. One aim of the action plan, which was elaborated in the wake of Denmark's commitment to the Kyoto agreement, is to increase the production of energy from wind power to 5.500 MW in the year 2030. Hereof 4.000 MW are to be produced in offshore wind farms.

In the years 2002-2003 the two first wind farms was established at Horns Rev west of Esbjerg and Rødsand south of Lolland, consisting of 80 and 72 wind turbines respectively, producing a total of 325,6 MW. In 2004 it was furthermore decided to construct two new wind farms in proximity of the two existing parks at Horns rev and Rødsand. The two new parks, Horns Rev II and Rødsand II, are going to produce 215 MW each and are expected to be fully operational by the end 2010.

The 400 MW Anholt Offshore Wind Farm constitutes the next step of the fulfilment of aim of the action plan. The wind farm will be constructed in 2012, and the expected production of electricity will cover the yearly consumption of approximately 400.000 households. Energinet.dk on behalf of the Ministry of Climate and Energy is responsible for the construction of the electrical connection to the shore and for the development of the wind farm site, including the organization of the impact assessment which will result in the identification of the best suitable site for constructing the wind farm. Rambøll with DHI and other sub-consultants are undertaking the site development including a full-scale Environmental Impact Assessment for the wind farm.

The present report is a part of a number of technical reports forming the base for the Environmental Impact Assessment for Anholt Offshore Wind Farm.

The Environmental Impact Assessment of the Anholt Offshore Wind Farm is based on the following technical reports:

- Technical Description
- Geotechnical Investigations
- Geophysical Investigations
- Metocean data for design and operational conditions
- Hydrography including sediment spill, water quality, geomorphology and coastal morphology]
- Benthic Fauna
- Birds
- Marine mammals
- Fish
- Substrates and benthic communities
- Benthic habitat
- Maritime archaeology

- Visualization
- Commercial fishery
- Tourism and Recreational Activities
- Risk for ship traffic
- Noise calculations
- Air emissions

2.2 **Content of specific memo**

This memo contains a baseline study of the tourism and recreational activities in the areas near Djursland and Anholt which potentially can be affected by the construction and operation of Anholt Offshore Wind Farm. Potential impacts are assessed and topics like mitigation measures, cumulative effects and decommissioning are also enlightened in the memo. The recreational interests include activities on shore as well as offshore.

The information serves as a basis for the description and impact assessment of the tourism and recreational activities in the final EIA for the Anholt Offshore Wind Farm.

3. **Offshore wind farm**

3.1 **Project description**

This chapter and the later chapters 3.6 and 4 describe the technical aspects of the Anholt Offshore Wind Farm. For a full project description reference is made to /1/.

3.1.1 **Site location**

The designated project area for the Anholt Offshore Wind Farm is located in Kattegat between the headland Djursland of Jutland and the island Anholt - see Figure 3-1. The project area is 144 km², but the planned wind turbines must not cover an area of more than 88 km².

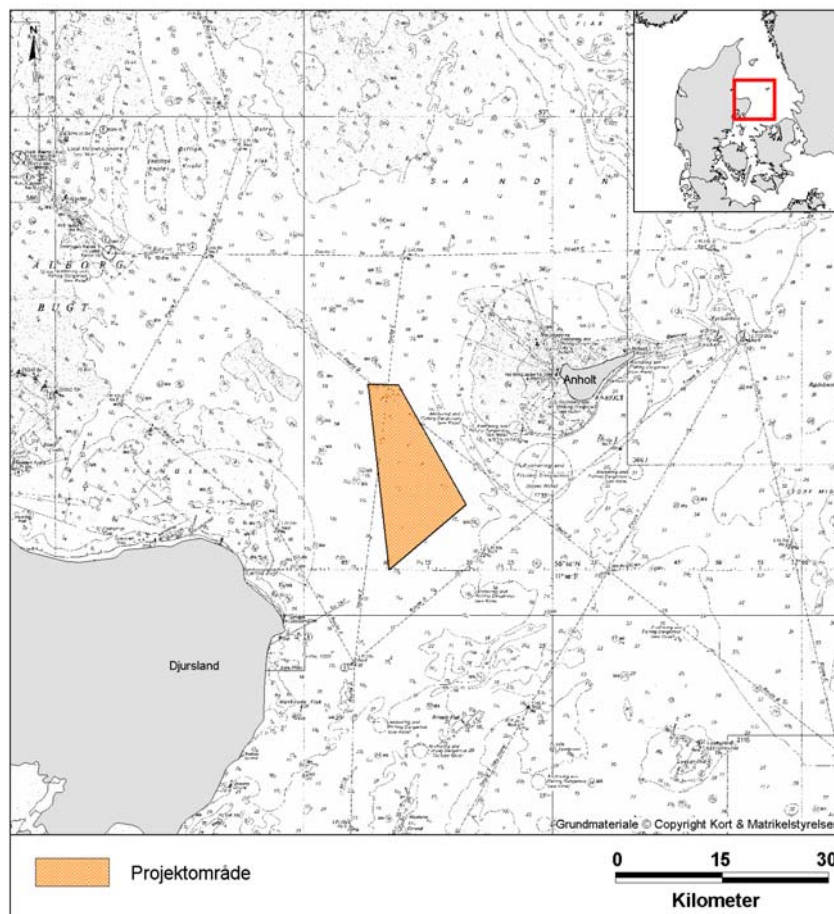


Figure 3-1 Location of the Anholt Offshore Wind Farm project area.

3.1.2 Offshore components

3.1.2.1 Foundations

The wind turbines will be supported on foundations fixed to the seabed. The foundations will be either driven steel monopiles or concrete gravity based structures. Both concepts have successfully been used for operating offshore wind farms in Denmark.

The monopile solution comprises driving a hollow steel pile into the seabed. A steel transition piece is attached to the pile head using grout to make the connection with the wind turbine tower.

The gravity based solution comprises a concrete base that stands on the seabed and thus relies on its mass including ballast to withstand the loads generated by the offshore environment and the wind turbine.

3.1.2.2 **Wind turbines**

The maximum rated capacity of the wind farm is limited to 400 MW by the authorities. The farm will feature from 80 to 174 turbines depending on the rated energy of the selected turbines corresponding to the range of 2.3 to 5.0 MW.

Preliminary dimensions of the turbines are not expected to exceed a maximum tip height of 160 m above mean sea level for the largest turbine size (5.0 MW) and a minimum air gap of approximately 23 m above mean sea level. An operational sound power level is expected in the order of 110 dB(A), but will depend on the selected type of turbine.

The wind turbines will exhibit distinguishing markings visible for vessels and aircrafts in accordance with recommendations by the Danish Maritime Safety Administration and the Danish Civil Aviation Administration. Safety zones will be applied for the wind farm area or parts hereof.

3.1.3 **Installation**

The foundations and the wind turbine components will either be stored at an adjacent port and transported to site by support barge or the installation vessel itself, or transported directly from the manufacturer to the wind farm site by barge or by the installation vessel.

The installation will be performed by jack-up barges or floating crane barges depending on the foundation design. A number of support barges, tugs, safety vessels and personnel transfer vessels will also be required.

Construction activity is expected for 24 hours per day until construction is complete. Following installation and grid connection, the wind turbines are commissioned and are available to generate electricity.

A safety zone of 500 m will be established to protect the project plant and personnel and the safety of third parties during the construction and commissioning phases of the wind farm. The extent of the safety zone at any one time will be dependent on the locations of construction activity. However the safety zone may include the entire construction area or a rolling safety zone may be selected.

3.1.3.1 **Wind turbines**

The installation of the wind turbines will typically require one or more jack-up barges. These vessels stand on the seabed and create a stable lifting platform by lifting themselves out of the water. The area of seabed taken by a vessel's feet is approximately 350 m² (in total) including leg penetrations of up to 2 to 15 m (depending on seabed properties). These holes will be left to in-fill naturally.

3.1.3.2 **Foundations**

The monopile concept is not expected to require any seabed preparation.

The installation of the driven monopiles will take place from either a jack-up platform or an anchored vessel. In addition, a small drilling spread may be adopted if driving difficulties are experienced. Following transportation to the site the pile is transferred from the barge to the jack-up and then lifted into a vertical position. The pile is then driven until target penetration is achieved, the hammer is removed and the transition piece is installed.

For the gravity-based foundations most often the seabed needs to be prepared prior to installation, i.e. the top layer of material is removed and replaced by a stone bed. The material excavated during the seabed preparation work will be loaded onto split-hopper barges for disposal. There is likely to be some discharge to water from the material excavation process. A conservative estimate is 5% material spill, i.e. up to 200 m³ for each base, over a period of 3 days per excavation.

The installation of the concrete gravity base will likely take place using a floating crane barge, with attendant tugs and support craft. The bases will either be floated and towed to site or transported to site on a flat-top barge. The bases will then be lowered from the barge onto the prepared stone bed and filled with ballast.

After the structure is placed on the seabed, the base is filled with a suitable ballast material, usually sand. A steel 'skirt' may be installed around the base to penetrate into the seabed and to constrain the seabed underneath the base.

3.1.4 **Protection systems**

3.1.4.1 **Corrosion**

Corrosion protection on the steel structure will be achieved using a combination of a protective paint coating and installation of sacrificial anodes on the subsea structure. The anodes are standard products for offshore structures and are welded onto the steel structures.

3.1.4.2 **Scour**

If the seabed is erodible and the water flow is sufficiently high a scour hole will form around the structure. The protection system normally adopted for scour consists of rock placement in a ring around the in-situ structure. The rock will be deployed from the host vessel either directly onto the seabed from the barge, via a bucket grab or via a telescopic tube.

For the monopile solution the total diameter of the scour protection is assumed to be 5 times the pile diameter. The total volume of cover stones will be around 850-1,000 m³ per foundation. For the gravity-based solution the quantities are assessed to be 800–1100 m³ per foundation.

3.2 Baseline study

3.2.1 Methods

3.2.1.1 Data

Information about the recreational use in the area is primarily collected from The Danish Nature & Environment Portal which contains information regarding harbours, recreational areas, beaches, paths, sailing etc. /2/.

Furthermore, information regarding sailing, hunting and similar activities is established by searching relevant web sites from the harbours clubs and organisations.

In order to get information about the local interests, additional information is collected from the harbour of Anholt and the local tourist informations on Djursland and Anholt /3/,/22/.

3.2.2 Tourism

Tourism is defined as the economic aspect of visits in the area, rather than the actual activities connected to tourism. Tourism is highly connected to different attractions in the area, the landscape and nature, hotels and other accommodations etc.

Djursland is known for its many attractions, which are located within short distances of each other. The recreational values and some of the main attractions near the coastal line on Djursland are further described in the following chapters regarding recreational values.

It is difficult to quantify the tourism on Djursland, however, Table 3-1 shows an estimated number of visitors.

Table 3-1 Tourism on Djursland.- estimated number of visitors in 2007 and 2008 (overnight stays) /4/

	2007	2008
Pleasure boats	66,000	70,000
Hotels and holiday centres*	99,500	84,600
Camping sites	550,000	590,000
Youth hostel/ Danhostel Mid Jutland	170,000	155,000
Cottages (East Jutland)	1.4 Mio	1.2 Mio

* + 40 beds, only Southern Djursland.

Estimated amount of guests on Djursland (over night stays) is approx. 2 million per year including B&B. The total number of sold tickets to attractions on Djursland was 1.3 mio in 2008 /4/.

On Anholt, the number of visitors can reach up to 6000 people per day during the summer /19/.

The following table shows the economic importance of tourism in the municipalities in the region of Mid-Jutland estimated from year 2006.

Table 3-2 Importance of tourism in the region of Mid Jutland /5/.

	Consumption within tourism				
Region of Mid Jutland all in all	Commercial forms of overnight stays*	Non-commercial forms of over-night stays	All in all	Sum of supply	Share of tourism
Region Midtjylland i alt	6.760	5.359	12.119	789.220	1,5
Favrskov	30	111	141	21.752	0,6
Hedensted	144	137	281	26.233	1,1
Herning	374	372	746	59.930	1,2
Holstebro	318	185	503	41.039	1,2
Horsens	264	357	621	49.793	1,2
Ikast-Brande	141	117	258	30.036	0,9
Lemvig	229	109	338	15.029	2,2
Norddjurs	317	193	511	19.570	2,6
Odder	128	107	236	10.217	2,3
Randers	176	322	498	54.155	0,9
Ringkøbing-Skjern	1.136	266	1.402	52.665	2,7
Samsoe	78	38	116	2.045	5,7
Silkeborg	444	383	827	49.825	1,7
Skanderborg	184	348	532	29.833	1,8
Skive	394	182	575	34.001	1,7
Struer	295	118	413	15.028	2,7
Syddjurs	521	351	871	19.630	4,4
Viborg	292	231	524	65.895	0,8
Århus	1.295	1.432	2.727	192.544	1,4

*Commercial forms of overnight stays: Hotels, camping, hostels, holiday centres, marina, farm holidays, cruises and cottages.

Compared to the rest of the region, the share of tourism is relatively high in the municipalities of southern and northern Djursland; 4.4 and 2.6 % respectively. This indicates that the communities are more sensitive towards changes in the income generated by tourism than an average municipality in the region.

3.2.3 Recreational values and activities

In this case the description of the recreational value covers activities offshore as well as on shore in the areas surrounding the project area and the areas affected by the on shore cable and substation. The description of the existing conditions covers a broad spectre of the recreational values and activities, linked to the year-round use as well as seasonal use.

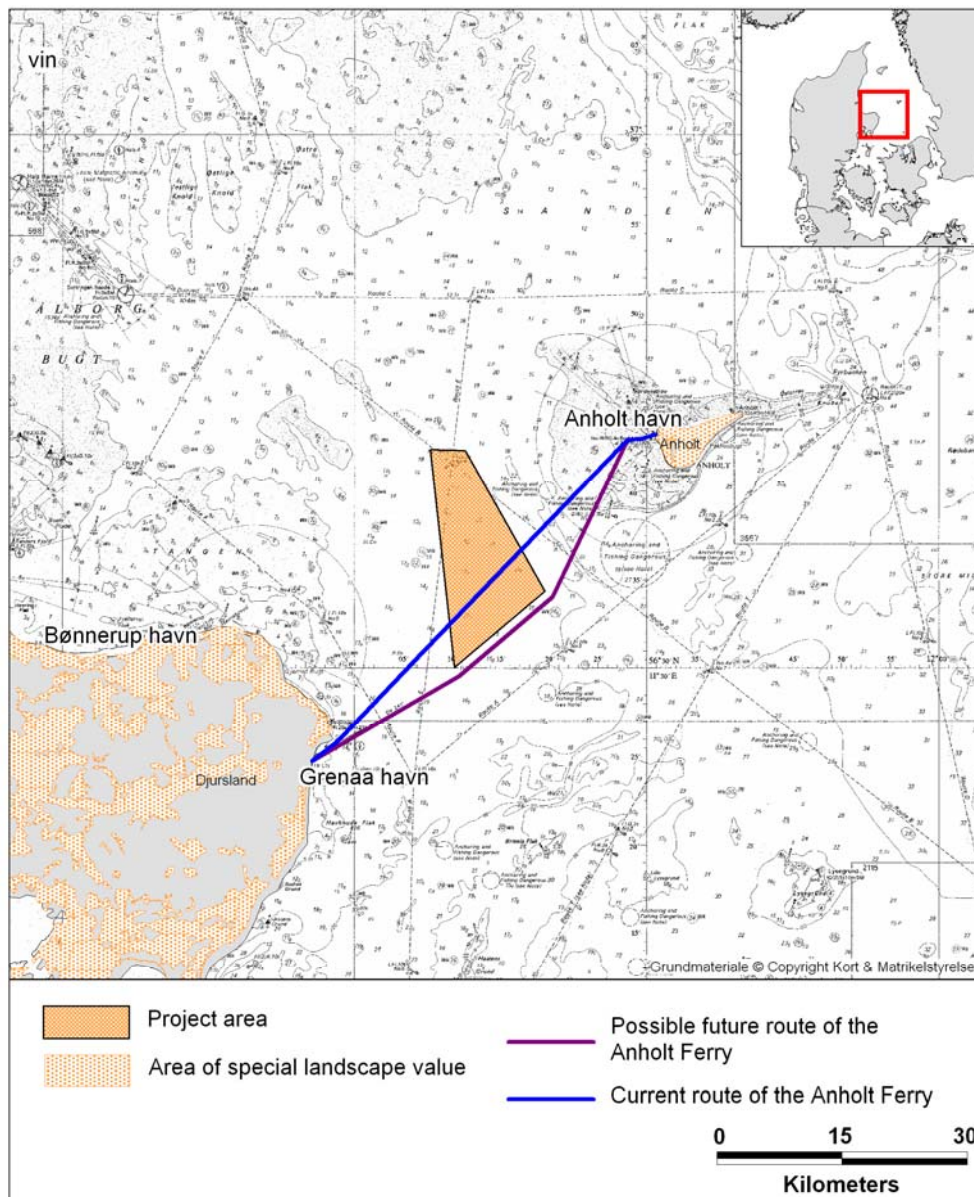


Figure 3-2 Recreational values – valuable landscapes. The possible future route of the Anholt Ferry is also shown.

3.2.3.1 Recreational values and activities offshore

The recreational activities offshore include pleasure boating, angling, diving and hunting. There are a wide range of recreational facilities such as marinas and harbours on Djursland and on Anholt.

Pleasure boating

Kattegat is popular amongst leisure sailors and there are a number of marinas along

the coast of Djursland as well as one on Anholt. In many marinas the facilities are adapted to leisure sailors passing through as well as the sailors who are using the marinas on a year-round basis.

The busiest routes in terms of pleasure boating relevant to this project are located along the coast of Djursland from the south of Jutland and Germany, via Grenaa to Anholt. There is also traffic from the north of Jutland, Norway and Sweden crossing the Kattegat and travelling south following the "Læsø Rende" to Anholt. In addition boats travel to Anholt from Limfjorden, Mariager Fjord, Randers Fjord and Bønnerup /3/.

In the following, the relevant marinas in the area will be presented.

Bønnerup Marina

Bønnerup Marina, situated on the north tip of Djursland, is a combined marina and fishing harbour. The marina is characterized by the surrounding sandy beaches increasing its recreational value further /15/. The marina houses three clubs, "Bønnerup Strand Bådelaug" (*boating*), "Bønnerup Strandjagt & Lystfiskeriforening" (*hunting and angling*) and "Bønnerup Strand Sejlklub" (*boating*) /16 /.

Seven turbines are placed alongside the boundary of the harbour, as shown on Figure 3-3. As a consequence the visual landscape is influenced by large elements in the vicinity of the harbour. However, the view of the sea in a larger scale is still unspoiled.



Figure 3-3 Existing turbines in Bønnerup Lystbådehavn.

Grenaa Marina

The marina in Grenaa was established in 1987 after the municipality of Grenaa decided to build a separate marina south of the industrial harbour (Port of Grenaa). The marina includes various facilities such as toilets, showers and a playground. Furthermore a restaurant and a shop are located on the harbour, /18/.

The boating club "Grenaa Sejlklub" is based in a club house situated on the marina. The club hosts different races, sailing lessons etc. /17/.

Anholt Harbour

The harbour on Anholt is versatile as it serves as harbour for industrial fishery, angling, pleasure boating as well as for the ferry connecting the island to Grenaa. One boating club is based in the marina, "Anholt Sejlklub M/L" /19/. The marina is visited by up to 300 boats per month from May to September (mainly pleasure boats), and 20 boats per month from October to April (mainly fishing boats) /3/.

The ferry has between 4-5 departures from Anholt per week. The ferry departs from Anholt in the morning and returns to the island in the afternoon.

Angling

The angling opportunities along the coast of Djursland and Anholt are excellent. Several angling clubs are connected to some of the marinas along the coast of Djursland and on Anholt.

It is possible to angle either from the coast or from a boat. The conditions are favourable,,which means that it is possible to make a good catch even a few hundred metres from the coast. /6/.

Diving

The diving interests are primarily connected to the old ship wrecks along the coast of Djursland and in particular around Anholt. There are no known diving sites within the project area. However, there are several other popular diving sites closer to the coasts, which are not marked specifically on the map /7/.

Hunting

The Grenaa Hunting Club (Grenaa Jagtforening), a section of the Danish Hunting Society (Danmarks Jægerforbund). covers the northern part of Djursland and Anholt. The club has approx. 335 members¹ and is a merger of originally three hunting clubs, including a beach hunting club. Furthermore, there is a local beach and sea hunting club in Bønnerup (Bønnerup Strand- og Havjagt) /24/. This type of hunting takes place either from the beach, from a barge on shallow water or from a motor-boat at sea /25/.

¹ Number of members on the 15th of June 2009

Beach and sea hunting is prohibited in a 1 km zone of the sea around Bønnerup Marina and on the beach at Bønnerup as well as on the beach of Gjerrild Nordstrand. Furthermore, hunting is prohibited on the beach and near the coast of Grenaa. The restriction zone covers approx. 2.5 km of the coastal line including beaches, a summer cottage area and the harbour /26/.

3.2.3.2 Recreational values and activities on shore

Recreational areas

Djursland

The landscape and nature on Djursland is very diverse despite the relatively small area (approx. 50x50 km). The rich flora, woods and views across the landscape makes it an interesting outing close to Grenaa /14/.

A large area along the coast of Djursland has been pointed out as an area with special valuable landscapes in the regional planning. Furthermore, Djursland contains a number of elements and structures in the landscape which have been pointed out as valuable cultural areas and elements /2/. The presence of these elements adds further value to the experience of the landscape.

Anholt

Although the island is visited by up to 6000 tourists a day during the summer, it still stands in contrast to the more densely populated and visited areas around Grenaa. There are only 160 permanent residents on the island, mainly in Anholt By. The nature, sandy beaches, unspoiled views and tranquillity are some of the characteristics of the island /19/, /20/.

Anholt has been pointed out as an area with special valuable landscapes.

Coastline

In general the beaches on Djursland are of very good quality in terms of clean water and fine amenities. As a result a number of the beaches have been rewarded EU's Blue Flag. The coastal line on the north-eastern part of Djursland is characterized by long sandy beaches in form of Bønnerup Strand and Gjerrild Nordstrand with sand dunes and unspoilt wasteland /12/.

Some sections of the coastal line contain valuable geological sites consisting of cliffs with deposits of sediments from the two last ice ages. The cliffs at Gjerrild are up to 20 metres high and cover nearly 3 km of the coastal line. The cliffs are easily accessed from the parking lot at "Rebækvej" /8/.

The cliffs at Karlby and Spangstrup contain deposits of chalkstone and are also visited due to their geological interests. Karlby Cliff is situated 8 km north of Grenaa and stretches 1 km along the coastal line. The cliffs are up to 12 metres high /9/. Spangstrup Cliffs are up to 17 metres high and cover nearly 3 km of the coastal line /10/.

All these cliffs are pointed out as areas of geological interest in the regional planning of the former Århus Region /2/.

The beaches vary in character. Some are child friendly and excellent for swimming or sun bathing in the sand dunes while others are more suitable for walks along the coast or in the wasteland behind /12/.

The beach on the southern coast of Anholt is a unique area characterized by its white sand, sand dunes and unspoiled view of the sea.

Other recreational values

The Kattegat Center

The marine center, The Kattegat Center, Figure 3-4, in Grenaa just south of the harbour, offers a mixture of experiences and information about marine topics. The center covers approx. 6000 m² and consists of large indoor aquariums and an outdoor basin with seals. The center opened in 1993 and has for the past seasons had up to 200.000 visitors per year. Between 170.000 and 180.000 visitors are expected in 2009 /11/.



Figure 3-4 The Kattegat Center in Grenaa.

Lighthouses

The lighthouse on Djursland, Fornæs Lighthouse, Figure 3-5, situated approx. 4.5 km north of Grenaa harbour, was built in 1892. It has value as a landmark in the area and is an attraction along the coastal path /23/.



Figure 3-5 Fornæs lighthouse on Djursland.

The light house on Anholt also has value as landmark on the north-eastern coast of the island. The lighthouse dates back to the 1780s and is a listed building /19/.

3.3 Environmental impacts

3.3.1 Method for impact assessment

The impacts are assessed on the basis of general knowledge from existing wind farms on shore and offshore, as well as from other projects requiring EIA studies. Furthermore, the impact assessment follows the methods and criteria as described in the Memo regarding EIA methods /13/.

The analysis of the visual impacts is also part of the basis for assessing how the projects will affect the tourism and the recreational use, due to the importance of aesthetics and the experience of the landscape as part of the recreational value. The visual impacts are presented in a separate memo /27/.

The impacts will be summarized in Table 5-1

3.3.2 Impacts during the construction phase

3.3.2.1 General

The impact assessments are based on the following conditions:

- The port of Grenaa will be used as main harbour which means that all material will be stored on this location if necessary
- It has not yet been decided whether the turbines will be stored on the harbour or whether they will be transported directly from the factory – however

a worst case situation will serve as basis for the assessments, meaning that the elements will be stored in the harbour.

During the construction phase there will be impacts on the recreational value in form of noise and visual impacts mainly due to the transport and storage of the turbine elements. The construction period is expected to last three years and runs throughout spring, summer and autumn. In this period the recreational use of the landscape and the seascape is the most sensitive towards impacts, since tourists and the local community use the outdoor facilities the most during especially spring and summer.

3.3.2.2 **Tourism**

Impacts on tourism can be of either positive or negative nature. The immediate impacts in form of noise and visual changes will most likely be perceived as negative impacts. There are risks of noise impacts above water during construction, especially in relation to the process of driving steel piles into the seabed /1/.

On the other hand the construction of this type of project may also have some positive impacts for those tourists who find it interesting and see it as a positive contribution to the improvement of the climate. The majority of the construction work will take place approx. 20 km from the nearest coast. Therefore the primary impacts on tourism during construction are expected to come from the transport and possible storage of materials in the harbour.

The awareness amongst the population regarding climate and energy has grown over the past years. Whether the construction work is seen as a nuisance rather than a positive initiative in the climate debate is difficult to predict since it is a highly subjective matter.

The following Table 3-3 shows the overall significance of the impacts on tourism. The impacts are considered as secondary impacts caused by changes in the physical environment, e.g. visual impacts, which may have an impact on the popularity of an area as a tourist resort.

Table 3-3 Overall significance of impacts on tourism during construction.

Impact	Intensity of effect	Scale/geographical extent of effect	Duration of effect	Overall significance of impact
Visual impact on tourism	Minor	Regional	Short term	Minor
Noise impact in tourism	Minor	Regional	Short term	Minor

3.3.2.3 **Recreational values and activities offshore**

Pleasure boating

A safety zone of 500m will be established to protect the project plant and personnel, and the safety of third parties during the construction and commissioning phases of

the wind farm. The extent of the safety zone at any one time will be dependent on the locations of construction activity. However the safety zone may include the entire construction area or a rolling safety zone may be selected.

It is intended that third parties will be excluded from any safety zone during the construction period, and that the zone(s) will be marked in accordance with the requirements from "Farvandsvæsenet", The Danish Maritime Safety Administration. The temporary markings will include yellow light buoys with an effective reach of at least 2 nautical miles. In addition, all buoys will be equipped with yellow cross sign, radar reflector and reflector strips. Regular Notice to Mariners will be issued as construction progresses.

The construction work and restriction zone will influence a local area, but may nevertheless have an impact on sailors on a regional level in cases where sailors travel longer distances to visit Anholt. The connection between Djursland and Anholt will be affected and the usual travel routes may be temporarily changed. The distances the sailors travel may not change radically but the fact that the sailors need to consider alternative routes may be a nuisance, considering the importance of wind direction in relation to the boat etc. Therefore the intensity of the impact is considered to be moderate. Since the impact is short term the overall significance is considered to be minor.

Angling

The intensity of the impacts are considered as minor, since the impacts are on a local level in a short term period. More importantly the construction site is situated far away from the coastal line, which reduces the amount of anglers.

Diving

Impacts on diving are estimated to be minor during the construction period. Impacts primarily consist of access restriction to the project area. Consequently a couple of ship wrecks in the area can no longer be used as diving spots.

Hunting

Impacts on hunting are expected to be none or minor, since the hunters typically hunt on the beach or near the shoreline. Hunters using motor boats on open sea may be affected by the restriction area, as the case is for sailors.

Table 3-4 Overall significance of impacts on recreational values and activities offshore during construction.

Impact	Intensity of effect	Scale/geographical extent of effect	Duration of effect	Overall significance of impact
Access restriction (impacts on pleasure boating)	Minor	Local	Short term	Minor
Impacts on hunting, diving and angling	Minor	Regional	Short term	Minor

3.3.2.4 Recreational values and activities on shore

Recreational areas

The view from the recreational areas along the coasts of Djursland and Anholt will change during the construction phase due to the actual construction work on the site as well as storage of material on shore. However, the Port of Grenaa is already dominated by other technical elements and activities, buildings etc., which makes the harbour less sensitive towards impacts caused by storage of material and the construction work. Furthermore there may be impacts in the form of noise from the handling and transport of the turbine elements.

The coastlines of Djursland and Anholt will not be affected directly in the form of physical impacts, but the areas may be affected by noise and visual impacts during construction. The duration of the impacts are short term on a regional level and the overall significance is considered as minor regarding noise and moderate in terms of the visual impacts.

Other recreational values

The Kattegat Center may be negatively affected by the transportation of the elements, depending on the final choice of location of sailing routes. Since the center has a number of outdoor activities it may be affected by noise. However the overall impacts are considered to be minor since the center is less sensitive towards impacts due to the location near the city in an area with a high level of human activity, as opposed to a location in an unspoiled site in the countryside.

A stock of turbines and other materials may be established on the harbour, which will effect the visual environment during construction.

From the lighthouses on Djursland and on Anholt the construction site will be visible, which may be perceived as an attraction or as a negative impact on the view of the sea.

Table 3-5 Overall significance of impacts on recreational values and activities on shore during construction.

Impact	Intensity of effect	Scale/geographical extent of effect	Duration of effect	Overall significance of impact
Visual impact on recreational areas and values	Medium	Regional	Short term	Moderate
Noise impact on recreational areas and values	Minor	Regional	Short term	Minor

3.3.3 Impacts during the operation phase

3.3.3.1 General

In general the impacts on tourism and recreational values during the operation phase will primarily depend on:

- The visibility of the turbines
- Restrictions in access
- Generated noise

3.3.3.2 Tourism

The impacts on tourism are the direct impacts caused by the visibility of the wind farm.

Experiences from former offshore wind farm projects show that the general attitude amongst tourists towards wind farms is positive, despite the fact that they often disturb the view of the landscape. The reason is that turbines have a positive image due to their environmental benefits. In fact, some tourists perceive the turbines as an actual attraction, which was the case in eastern Jutland near Horns Rev /21/.

Interviews of citizens, politicians and people engaged in businesses in the areas near Horns Rev and Nysted wind farms showed that the general attitude towards wind farms was negative, before the projects were carried out. One year later the general attitude had changed and become more positive /28/, /29/.

The tourist information in Grenaa is generally positive towards the project, based on the same arguments as presented in experiences from former projects, regarding the positive image of the turbines /22/.

The intensity of the visual impacts is considered to be large and on a regional level /27/. Even though the duration of the impacts is long term, the overall significance for tourism is considered to be moderate rather than significant. The reason for this is that the tourism as a whole is not expected to change significantly due to the visual changes.

Table 3-6 Overall significance of impacts on tourism during operation.

Impact	Intensity of effect	Scale/geographical extent of effect	Duration of effect	Overall significance of impact
Visual impacts during operation affecting tourism	Medium	Regional	Long term	Moderate
Noise during operation affecting recreational values	Minor	Regional	Long term	Minor

3.3.3.3 Recreational values and activities offshore

Pleasure boating

During the operation phase the intensity of impacts on pleasure boating will be none or minor. The restriction area around the project area is expected to be cancelled and it will therefore be possible for pleasure boats to cross the park. This wind farm may still be seen either as a negative impact if it is considered as an obstacle on the sailing route, or it may be seen as an attraction.

Angling

The angling opportunities are expected not to be influenced by the project during operation, due to the location of the wind farm far from the coastal line. Furthermore there may be access to the wind farm or parts hereof during operation depending on the restriction zone.

Diving

The diving activities are expected not to be affected significantly during operation. However, the impacts are determined by the final decisions regarding restriction zones around the turbines.

Hunting

The impacts on hunting are expected to be minor based on potential secondary effects in case some interesting habitats evolve around the turbines benefiting species which can be hunted in the area.

Table 3-7 Overall significance of impacts on recreational values and activities offshore during operation.

Impact	Intensity of effect	Scale/geographical extent of effect	Duration of effect	Overall significance of impact
Access restriction (impacts on pleasure boating)	Minor	Local	Long term	Minor
Impacts on hunting, diving and angling	Minor	Regional	Long term	Minor

3.3.3.4 Recreational values and activities on shore

Recreational areas

The impacts in the operation phase are primarily visual impacts which affect beaches and other recreational areas along the coast. The experience of these recreational areas will change, since the undisturbed view of the sea plays an important role in the characteristics of the areas.

On Anholt the turbines will be visible from a large part of the southern beach, which is indicated on Figure 3-6. This area has been picked out because the view is seen as a particularly important feature in the experience of the landscape.

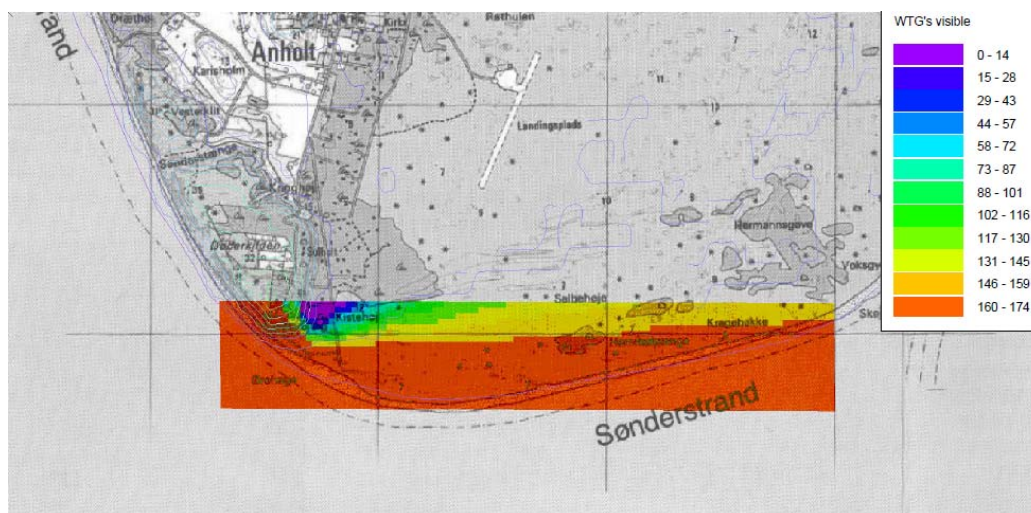
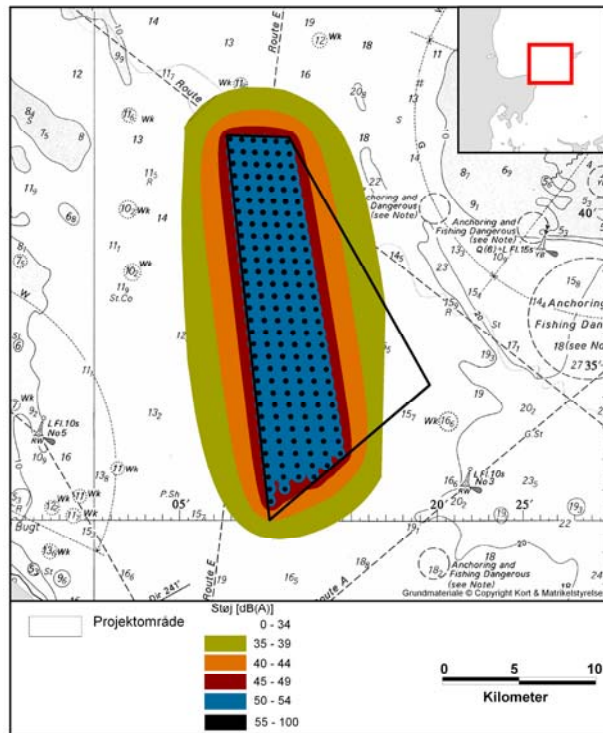


Figure 3-6 Visibility of turbines on the southern part of Anholt. The purple colour in the top of the chart indicates a low visibility (0 – 14 turbines) while the orange colour in the bottom of the chart indicates a high visibility (160 – 174 turbines).

Noise calculations on selected areas on land using WindPro show that the noise generated by the turbines does not affect the coastal lines of either Djursland or Anholt Figure 3-7. Therefore, the overall significance of the noise impacts on recreational areas is considered to be minor, since the only affected recreational values are off-shore activities near the wind farm. Additionally the Anholt Ferry is affected on a short distance of the route between Djursland and Anholt.



Other recreational values

The Kattegat Center will be affected visually by the wind farm. The impacts are considered to be large since the unspoiled view from the center is changed radically. Whether this has an impact on the number of visitors in the future is difficult to predict. Nevertheless, the center is considered to be less sensitive towards visual changes compared to the beaches on Djursland and Anholt, due to its location in the city which is already influenced by human activities.

The lighthouse on Anholt is located on the eastern side of the island, and is therefore not affected by the turbines in the same degree as the lighthouse on Djursland. The lighthouse on Anholt will not be affected by the project. However, the visual impacts seen from the lighthouse on Fornæs are considered to be large. This may change the overall experience of the lighthouse and the surrounding landscape.

Table 3-8 Overall significance of impacts on recreational values and activities on shore during operation.

Impact	Intensity of effect	Scale/geographical extent of effect	Duration of effect	Overall significance of impact
Visual impact on recreational areas and values	Medium	Regional	Long term	Moderate
Noise impact on recreational areas and values	Minor	Regional	Long term	Minor

3.4 Mitigation measures

The following measures can be taken in order to minimize the impacts on the tourism and recreational activities in the area.

Construction phase:

- Early dialogue is an important part of achieving a positive attitude in the local community
- Information regarding the project, duration of the construction work and the final impacts of the project will ensure that residents and tourists are familiar with the changes in the area. Consequently, it is easier to accept any potential impacts and nuisances that the project may cause.

Operation phase:

The visual impacts in the operation phase highly depend on the final choice of layout design and type of turbine.

- As it is the case during the construction phase, information about the project is an important part of the process when operating projects which may potentially affect a large number of people.

3.5 Cumulative effects

Other existing or planned projects, such as the wind farm at "Store Middelgrund", are not expected to have a cumulative impact on the recreational values in the area due to the large distance.

3.6 Decommissioning

The objectives of the decommissioning process are to minimize both the short and long term effects on the environment whilst making the sea safe for others to navigate. These obligations are stipulated in the United Nations Convention of the Law of the Sea (UNCLOS).

There are no specific international regulations or guidelines on the decommissioning of offshore installations. Decommissioning will have to consider individual circumstances, such as comparative decommissioning options, removal or partial removal in a way that causes no significant adverse effects on the environment, the likely deterioration of the material involved, possibilities for re-use or recycling as well as its present and future effect on the marine environment.

Based on current available technology, today's practice for decommissioning would imply to remove the wind turbines completely and to remove all other structures and substructures to the natural seabed level. Infield and export cables would be removed, left safely in-situ, buried to below the natural seabed level or protected by rock placement depending on the hydrodynamic conditions. Scour protection would be left in-situ.

The wind turbines, structures and cables would be dismantled using similar craft and methods as deployed during the construction phase. However the operations would be carried out in reverse order. The recovered materials would be transported to shore for later material reuse, recycle or disposal.

The decommissioning programme will be developed during the operations phase, as regulatory controls and industry practices most likely will have changed in 25 years' time, when the wind farm will be decommissioned. Regardless of the decommissioning method, decommissioning will comply with all applicable legal requirements regarding decommissioning at that time.

3.6.1 **Environmental impact of decommissioning**

In the decommissioning phase the same impacts as described in the construction phase can be expected, such as noise, restrictions regarding the access to the area offshore and possibly temporary storage of waste material on shore, depending on how the material is being deposited.

The technological options and the preferred methods for decommissioning of offshore installations will most likely be different in 25 years' time, when the Anholt Offshore Wind Farm is expected to be decommissioned.

Therefore mitigation methods for decommissioning and closure of the cable connection to land will be conducted according to the situation (legislative requirements, technology available and knowledge of environmental impact) at the time of decommissioning.

3.7 **Technical deficiencies or lack of knowledge**

- Noise impacts during the construction phase have been estimated in terms of the underwater environment but not for the environment above water. Therefore the estimates of noise impacts on the recreational use are based on general estimates regarding noise from similar construction work.

- Estimates of the impacts on tourism are based on the direct impacts in the recreational areas etc. However, it is difficult to estimate the preferences and development within the industry of tourism, since it is affected by a number of other factors apart from this project.

4. Transformer platform and offshore cable

4.1 Project description

An offshore transformer platform will be established to bundle the electricity produced at the wind farm and to convert the voltage from 33 kilovolts to a transmission voltage of 220 kilovolts, so that the electric power generated at the wind farm can be supplied to the Danish national grid.

4.1.1 Transformer platform

Energinet.dk will build and own the transformer platform and the high voltage cable running from the transformer platform to the shore and further on to the existing substation Trige, where it is connected to the existing transmission network via 220/440 kV transformer.

The transformer platform will be placed on a location with a sea depth of 12-14 metres and approximately 25 km from the shore of Djursland. On the platform the equipment is placed inside a building. In the building there will be a cable deck, two decks for technical equipment and facilities for emergency residence.

The substation is a 40x30 metres wide and the top of the platform will be up to 25 metres above sea level. The foundation for the platform will be a floating caisson, concrete gravitation base or a steel jacket.

4.1.2 Subsea Cabling

The wind turbines will be connected by 33 kV submarine cables, so-called inter-array cables. The inter-array cables will connect the wind turbines in groups to the transformer platform. There will be up to 20 cable connections from the platform to the wind turbines and possibly one cable connection to Anholt. From the transformer platform a 220 kV export cable is laid to the shore at Saltbæk north of Grenå. The cables will be PEX insulated or similar with armouring.

The installation of the cables will be carried out by a specialist cable lay vessel that will manoeuvre either by use of a four or eight point moving system or an either fully or assisted DP (Dynamically Positioned) operation.

All the subsea cables will be buried in order to provide protection from fishing activity, dragging of anchors etc. A burial depth of approximately minimum one meter is expected. The final depth of burial will be determined at a later date and will vary depending on more detailed soil condition surveys and the equipment selected.

The cables will be buried either using an underwater cable plough that executes a simultaneous lay and burial technique that mobilises very little sediment; or a Remotely Operated Vehicle (ROV) that utilises high-pressure water jets to fluidise a narrow trench into which the cable is located. The jetted sediments will settle back into the trench.

4.1.3 **Onshore components**

At sea the submarine cable is laid from a vessel with a large turn table. Close to the coast, where the depth is inadequate for the vessel, floaters are mounted onto the cable and the cable end is pulled onto the shore. The submarine cable is connected to the land cable close to the coast line via a cable joint. Afterwards the cables and the cable joint are buried into the soil and the surface is re-established.

On shore the land cable connection runs from the coast to compensation substation 2-3 km from the coast and further on to the substation Trige near Århus. At the substation Trige a new 220/400 kV transformer, compensation coils and associated switchgear will be installed. The on shore work is not part of the scope of the Environmental Statement for the Anholt Offshore Wind Farm. The on shore work will be assessed in a separate study and is therefore not discussed further in this document.

4.2 Environmental impacts

In the following sections the potential impacts on tourism and the recreational values and activities will be described regarding the substation and offshore cable during construction and operation of the Anholt Offshore Wind Farm.

4.2.1 Method

The methods used to identify and assess impacts of the substation and offshore cable are the same as the methods used in the previous chapters describing the impacts of the wind farm.

4.2.2 Impacts during the construction phase

Tourism

The impacts on tourism during construction consists of visual impacts and noise from the construction works as well as transport and possible storage of material. Furthermore the tourism can be affected in terms of impacts on the recreational values in general as described on the following sections.

Recreational values and activities offshore

During the construction phase the duration of the impacts are short term. The impacts are mainly due to restrictions regarding sailing routes for pleasure boating and offshore hunting around the substation and along the cable and the lay barge vessel.

The impacts on diving activities are expected to be minor. There may be impacts in terms of the restriction zone around the cable, but it is not estimated to have an impact on known diving sites.

Recreational values and activities on shore

The construction work may affect some of the coastal areas on Djursland in terms of noise problems as well as visual impacts.

Recreational values on Anholt may be affected by the construction work regarding the positioning of the cable and substation, primarily in terms of visual impacts. However, the impacts are considered to be minor.

Table 4-1 Overall significance of impacts on recreational values and activities during construction.

Impact	Intensity of effect	Scale/geographical extent of effect	Duration of effect	Overall significance of impact
Visual impact on recreational areas and values	Minor	Regional	Short term	Minor
Noise impact on recreational areas and values	Minor	Regional	Short term	Minor
Access restriction (impacts on pleas-	Minor	Local	Short term	No/Minor

ure boating)				
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4.2.3 **Impacts during the operation phase** **Activities offshore**

The substation is a 40x30 metres wide and 25 metres high building, placed near the turbines. The station will be visible from the Anholt ferry on some sections of the route and from pleasure boats travelling between Djursland and Anholt. The platform is visible from some sections of the coasts of Djursland and Anholt but does not appear dominant in the landscape.

Safety zones will be applied for the wind farm area or parts hereof. The specific safety zones will be determined by Søfartsstyrelsen, The Danish Maritime Authority. A 200m safety zone around all cables is to be expected. For the offshore transformer station a prohibited entry zone of minimum 50m radius is foreseen for non-project vessels.

The safety zone around the transformer is not expected to have an impact on the recreational use offshore.

The restriction zone of 200 metres along the cable may have an impact on the diving opportunities, in cases where diving sites are situated close to the cable. The location of known diving sites in the area, are however not in risk of interfering with the safety zone.

Recreational values and activities on shore

The distance of approx. 20 km to the coasts of Djursland and Anholt means that the substation is barely visible from the coasts. The smaller scale of the substation compared to the turbines further reduces the visual impact of the platform seen from the coast /27/.

During the operation phase the impacts caused by the cable on recreational values on shore are minor or none. The cable will not be visible and it does not result in any restrictions regarding the recreational use.

Table 4-2 Overall significance of impacts. on recreational values and activities during operation.

Impact	Intensity of effect	Scale/geographical extent of effect	Duration of effect	Overall significance of impact
Visual impact on recreational areas and values	Minor	Regional	Long term	No/Minor
Noise impact on recreational areas and values	Minor	Regional	Long term	No/Minor
Access restriction (impacts on pleas-	No/minor	Regional	Long term	No/Minor

ure boating)				
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4.3 **Mitigation measures**

Mitigation measures are not estimated necessary regarding the impacts on recreational interests.

4.4 **Cumulative effects**

Other existing or planned projects are not expected to have a cumulative impact on the recreational values in the area due to the distance to other project sites.

4.5 **Decommissioning**

Decommissioning of the substation and the cable is considered to result in minor impacts on the recreational value and can be compared to the impacts in the construction phase.

4.6 **Technical deficiencies or lack of knowledge**

The uncertainties regarding the impact on tourism are the same as described in chapter 3.7.

5. **Conclusion**

The potential impacts of the wind farm project and the overall significance is summarized in the following Table 5-1.

Table 5-1 Summarized effects and significance.

Impact	Overall significance of impact	Quality of available data
OFFSHORE PROJECT		
Impact on tourism and recreation on shore and offshore - during construction		
<i>Visual impact</i>	Moderate	1
<i>Noise impact</i>	Minor	1
<i>Restriction in access</i>	Minor	2
Impact on tourism and recreation on shore and offshore - during operation		
<i>Visual impact</i>	Moderate	2
<i>Noise impact</i>	Minor	2
<i>Restriction in access</i>	Minor	2
TRANSFORMER PLATFORM AND CABLE PROJECT		
Impact on tourism and recreation during construction		
<i>Visual impact</i>	Minor	1
<i>Noise impact</i>	Minor	1
<i>Restriction in access</i>	No/Minor	1
Impact on tourism and recreation during operation		
<i>Visual impact</i>	No/minor	1
<i>Noise impact</i>	No/minor	1
<i>Restriction in access</i>	No/Minor	1

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