
Areas with special ecological values on the Dutch Continental Shelf

Han Lindeboom (Alterra)
Joris Geurts van Kessel (RIKZ)
Lieke Berkenbosch (RIKZ)

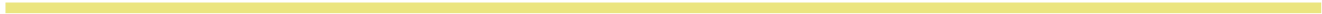
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Foreword

Attention to protecting the marine environment has evidently been increasing in the last few years. Along with it, the discussion about the conservation of areas with special ecological values at sea is an important. Under various international initiatives (e.g. the Convention on Biodiversity, the EU Birds and Habitats Directives and the OSPAR-Convention) proposals have been developed in the last few years for the designation and conservation of areas with special ecological values at sea. Both within the EU and within the scope of the OSPAR-Convention a time schedule has been determined for the implementation of such protected areas.

The Netherlands has already designated two areas as special protection zones in its territorial sea within the scope of the Birds Directive (the Voordelta and the North Sea Coastal Zone north of the Wadden Islands). The same areas, although with slightly different boundaries, have also been put forward as special areas of conservation within the scope of the Habitats Directive. The European Commission has recently agreed with the special areas of conservation that were proposed by The Netherlands throughout the country within the scope of the Habitats Directive, but with it, it is noted that the European Commission is expecting further proposals for Marine Protected Areas.

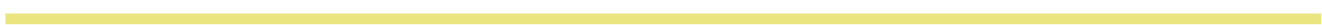
The Dutch cabinet established in May 2004, when the cabinet's decision on the National Spatial Strategy was fixed, that a number of areas in the mean time would already be preliminary protected, anticipating the formal designation based on international agreements. At the same time, the boundaries of the areas that were named earlier in preliminary studies, were mapped indicatively. In addition, the National Spatial Strategy notes that a further determination of the boundaries would take place within the scope of the Integral Management Plan North Sea 2015. To have this further determination of the boundaries being done, the Ministry of Agriculture, Nature Management and Food Quality and the Ministry of Transport, Public Works and Water Management jointly have ordered Alterra and RIKZ to make proposals for the boundaries using the international criteria that were agreed upon within the scope of the EU and OSPAR. This has led to the report at hand. In addition to Alterra and RIKZ, NIOZ and RIVO have contributed to this study.

All relevant ecological knowledge on the Dutch Continental Shelf (DCS) has been considered in this report. The research offers a sound basis to reach decisions on boundaries of the areas to be protected. This decision will be taken in the Integral Management Plan North Sea 2015 that will be published mid-2005.

The results of this research will also be used in the further decision-making process of the designation of areas under the Birds and Habitats Directives within the scope of the EU and in the designation of marine protected areas within the scope of OSPAR.

Ir. J.H. Bakker, repl. director of the Directorate Nature of the Ministry of Agriculture, Nature Management and Food Quality)

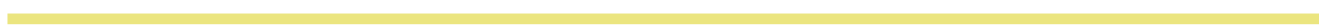
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Abstract

Scope and purpose

In this report we are submitting proposals for the boundaries of areas on the Dutch Continental Shelf (DCS). In the National Spatial Strategy¹ (see references) a conservation regime has been determined for five areas in the North Sea with special ecological values. The areas concerned are shown on PKB-map 10 (North Sea and Wadden Sea with indicative boundaries). PKB is a Dutch instrument: National Spatial Planning key decision. RIKZ and Alterra have formulated this report in cooperation with RIVO and NIOZ, ordered by the Directorate-General of Water Management and the Directorate Nature of the Ministry of Agriculture, Nature Management and Food Quality. The five areas of the National Spatial Strategy are: the Dogger Bank, the Central Oyster Grounds, the Cleaverbank, the Frisian Front and the Coastal Sea. For these areas a specific conservation regime has been determined by the National Spatial Strategy, which implies that:

“New plans, projects or activities within and in the vicinity of these ecologically valuable areas, that may have significant consequences for the characteristics to be conserved and the nature values in these areas are not allowed, unless there are no actual alternatives and reasons of great public importance are involved”.

The National Spatial Strategy states that a further determination of boundaries of areas with special ecological values will take place in the Integral Management Plan North Sea 2015 (IMPN 2015)² In this report we are submitting proposals based on the criteria of the Birds and Habitats Directives (EU) and of the OSPAR instructions. We have examined which areas qualify under the Habitats Directive as sandbanks, reefs or biogenic structures. Furthermore we have examined in which areas populations of species occur that qualify for the Birds and Habitats Directives criteria. Finally, we have examined which areas meet the OSPAR criteria, each time emphasizing the special ecological values with respect to a relatively high biodiversity.

In addition to proposals for the boundaries, this report provides a description of the activities occurring on the DCS and an indication of the impact these functions have on the natural values to be protected in the proposed areas.

The five areas of the National Spatial Strategy

The typical natural values described below have been described from available surveys and we have submitted proposals for boundaries based on these surveys. We have also indicated to what extent these boundaries deviate from the boundaries indicatively given in the National Spatial Strategy.

- The Dogger Bank is remarkable due to its high biodiversity of zoobenthos, but is also important for birds and fish (e.g. thornback ray). Three different options are proposed for this area. At present, an international discussion is taking place as a result of draft proposals for habitat type 1110. The options we have put forward are based on (1) taking the 25 m isobath as a boundary, (2) taking the 30 m isobath as a boundary or (3) taking the 40 m isobath as a boundary and joining up with the German proposals. In the latter two options the Dogger Bank may be designated under the Habitats Directive as one large internationally connected sandbank.
- The Cleaverbank is characterized by its deviating sediment surface (gravel), with representative algal cover, its particular zoobenthos and its special bird values as an area which is unique for the DCS and which meets the criteria of the Habitats Directive. We propose two different options for the Cleaverbank, (1) strictly confined to the two occurrences of gravel, or (2) including the channel in between (Botney Cut). It should be noted that there are large gravel and rock concentrations on the English Continental Shelf as well, the ecological values of which are possibly or probably higher. The United Kingdom as yet does not intend to submit such gravel areas for conservation under the Habitats Directive, as it concentrates on the areas with larger extents of hard substratum such as boulder gravels.
- The silt-rich area of the Central Oyster Grounds stands out in particular due to its high biodiversity of zoobenthos. The area proposed is smaller than indicated in the National Spatial Strategy and is situated further to the west. Based on zoobenthos, the area meets the OSPAR-criteria for designation as a Marine Protected Area (MPA). NB: this area does not qualify based on the current BHD list of habitats/species to be protected.
- The Frisian Front is considerably larger in this proposal than in the National Spatial Strategy. It now contains the total area in which special ecological values have been found. The Frisian Front is a unique area with a high biomass and a high biodiversity of zoobenthos. Birds and fish here occur in high concentrations in certain seasons. The Frisian Front qualifies for designation under the Birds Directive and as MPA in relation to OSPAR, based on the occurrence of over 1% of the world population of the great skua in autumn, and of over 20,000 individuals of guillemots in late summer and autumn.
- The area of the Coastal Sea locally has a high biodiversity of zoobenthos and is of great importance to birds, fish and sea mammals alike. For the area studied in this report we have taken the high water spring tide contour as the landward boundary. The emphasis is on the marine part and not on the intertidal zone. The Wadden Sea coast and the Voordelta have been designated as Special Areas of Conservation as part of the

Habitats Directive. There is no reason to distinguish between the North Holland and South Holland Coast on the one hand and the Wadden and Delta Coast on the other hand qua ecological values. Application of the various criteria, however, leads to several boundary options. The most extended proposal (1) involves the total Coastal Sea to the 20 m isobath, as indicated in the National Spatial Strategy. A more confined option (2) involves only an extension of the existing BHD-areas with part of Bergen and Petten (based on their value to birds in particular) and an extension with the Vlakte van de Raan in the mouth of the Westerschelde.

New areas

In addition, four other areas that are likely to qualify for protection, but are not designated as such in the National Spatial Strategy, emerged from this study. These areas are:

- Zeeuwse Banks - this area borders the Delta Coast and is situated near the Belgian border. It meets the criteria for sandbanks under the Habitats Directive. In the event of designation as an area with special values, incorporation into the Coastal Sea has to be searched for and in proposals of the Development sketch for the Scheldt estuary to designate the Vlakte van de Raan as a Special Area of Conservation under the Habitats Directive. The Vlakte van de Raan is situated in the mouth of the Westerschelde, partly on the Belgian Continental Shelf.
- The Borkumse Stones - this area, bordering the Coastal Sea near Schiermonnikoog, contains special zoobenthos. In addition, the area is important as a haulout and foraging area for seals. It joins at the seaward side with an area that has been submitted by Germany (Federal Authorities) to the European Commission. Further fine-tuning with Germany (federal state Niedersachsen) on this area within the 12-mile zone is desirable.

Further research is needed for two other areas, namely “the Bruine Bank” and “the Gas Seeps”, before a possible designation as an area with special natural values may be issued.

Current use

Generally, the pressure of use increases as the closer the areas are to the coast.

- *The Dogger Bank.* From the research into use and impact it appears that the pressure of use at the Dogger Bank is limited. The pressure of fishing activity by Dutch fishermen is comparatively low and other activities seldom occur (some platforms, cables and pipelines).
- *The Cleaverbank.* At the Cleaverbank the pressure of fishing activity is also comparatively low. Some helicopter routes are across the Cleaverbank and there is a shipping lane at the southern edge, all with a relatively low intensity of use. There are also some platforms, cables and pipelines.
- *Central Oyster Grounds.* Here the pressure of fishing activity is high. Other activities occur mainly at the edges or just outside the area.
- *The Frisian Front.* At the Frisian Front fishing activity is very intensive. Moreover, the area is crossed by deep water shipping lanes, on which the transport of harmful substances takes place. Whilst the intensity of use of this route is not high, many oil discharges are reported relative to its use. The Frisian Front partly overlaps a military practicing area for the air force and the navy. In the southernmost tip of the area a cluster of gas platforms is located and also several cables and pipelines. A helicopter route crosses the area as well.
- *The Coastal Sea.* Large fishing boats (>300 hp) are not allowed to fish within the 12-mile zone. However, the pressure of fishing activity by so-called Eurocutters (<300 hp) is high in the Coastal Sea. In addition, a great deal of shipping activity occurs and many oil discharges are reported, particularly along the Holland coast. There are a few platforms and many cables and pipelines. Off Egmond in the Coastal Sea, the Near Shore Wind Turbine Park will be constructed. Extraction of shells, dredge disposal and sand supplementation (under water and on the beach) occur in the Coastal Sea. Extraction of sand is only allowed beyond the Coastal Sea. From MOD-terrains (Ministry of Defense) along the coast firing takes place in certain practicing areas and/or there are planes practicing low flying. Moreover, the zone along the coast is used for beach recreation, water sports and for angling. In the Coastal Sea off the delta area a license was granted for a small-scale mussel-farm in 2003.

Future use

Large developments or new activities in the areas proposed offshore are not expected. However, it is likely that one or two oil or gas platforms will be constructed in the future.

Furthermore, we expect a small increase in the number of cables. These areas are too far away from the mainland for the other activities. Plans may possibly be developed to eventually extract sand and gravel from the Cleaverbank, though there is little interest in this at the moment.

It is possible that another platform will be added in the Coastal Sea and we foresee an increase in cables and pipelines (e.g. for the landing of wind energy) and associated infrastructure. It is yet not clear whether shellfish-farms at sea will increase. The changes in other uses are expected to be limited. We may expect activities that will occur just beyond the Coastal Sea, such as the construction of wind energy farms and deep mining of sand. An important development having an impact on the Coastal Sea is the expected increase of sand nourishment due to the relative rise of sea level caused by climatic changes.

Impact of use

Of all the different activities, beam trawl fisheries have by far the largest impact on the zoobenthos. The high biodiversity of zoobenthos in particular has been an important selection criterion for the identification of the areas of special ecological values. Mortality of zoobenthos will lead to shifts in the composition of species and in the age composition of populations. Fishing activities are affecting habitat characteristics as well, e.g. reef and gravel areas. In addition, beam trawl fisheries hugely affect the demersal fish fauna (bottom dwelling fish) as well. Besides short-term effects, (removal) this also involves long-term effects (changes in population composition), both varying from species to species and those with a low growth and reproduction rate are particularly vulnerable. The local extent of these long-term effects is mostly unknown due to the mobility of fish.

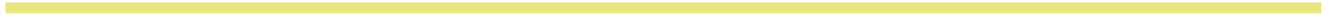
Shipping may have a negative impact in the Coastal Sea and the Frisian Front in particular, especially by (illegal) operational oil discharges and possible accidents. Both areas are

of considerable importance to sea birds that are very susceptible to oil. Disturbance by military activities is thought to be limited, but no specific research into this topic has been carried out. Disturbance to marine mammals by underwater sounds of ships may possibly occur. Furthermore, the impact of sonar use (navy) on marine mammals may be considerable, but this is not part of this study as the use and effects are not restricted to the areas in question.

The environmental effects of oil and gas platforms have been strongly reduced in recent years. Their impact is now considered to be limited to marginal and lights on the platforms may have negative effects on migrating birds due to disorientation. Wind turbines may lead to possible mortality in birds due to collisions, but whether this is affecting population levels is unknown and will be studied at the Near Shore Wind Park. From this it will appear whether actual effects on the birds of the Coastal Sea may be expected in the case of a large increase of the number of wind farms. Both platforms and wind farms may have a positive effect on fish and on zoobenthos (refuge areas), as around the rigs and turbines other uses are prohibited.

Local extinction of zoobenthos may occur due to sand extraction, shell extraction, dredging, dredge disposal and under-water supplementation. Little is known about the long-term ecological effects of sand supplementation. Possible effects occur in particular with the dumping of dredgings, as silt (as opposed to sand) spreads out over a larger area.

The ecological effects on the beach caused by recreation are considerable, but are expected to be limited to marginal at sea. Effects of cables and pipelines occur in particular during construction and/or removal and are marginal. Effects of water pollution have not been investigated in this study, as these are difficult to regulate by area specific policy. Of all these areas, however, the Coastal Sea has the heaviest burden of pollutants partly due to effluent from rivers, canals, drainage reservoirs and discharges.



1 Introduction

1.1 Scope and purpose

In this report proposals are submitted for the boundaries of the areas with special ecological values on the Dutch Continental Shelf (DCS). In the National Spatial Strategy five areas in the North Sea have already been indicatively designated as such. These five areas are: the Dogger Bank, the Central Oyster Grounds, the Cleaverbank, the Frisian Front and the Coastal Sea. The objectives of this report are to provide further detailed boundaries and an underpinning for these indicatively marked areas. RIKZ and Alterra have prepared this report in cooperation with RIVO and NIOZ, ordered by the Directorate-General of Water Management of the Ministry of Transport, Public Works and Water Management and the Directorate Nature of the Ministry of Agriculture, Nature Management and Food Quality.

After determination of the boundaries, these will be incorporated into the Integral Management Plan North Sea (IMP2015)⁴. The regime of conservation in the National Spatial Strategy will become valid for the newly bounded areas: “New plans, projects or activities within and in the vicinity of these ecologically valuable areas, that may have significant consequences for the characteristics to be conserved and the nature values in these areas are not allowed, unless there are no actual alternatives and reasons of great public importance are involved”. This basic principle is similar to the scope of weighing in Articles 6 of the Habitats Directive.

In addition to proposals for boundaries, this report identifies the activities at the DCS and the impact of these activities on the natural values of the areas proposed.

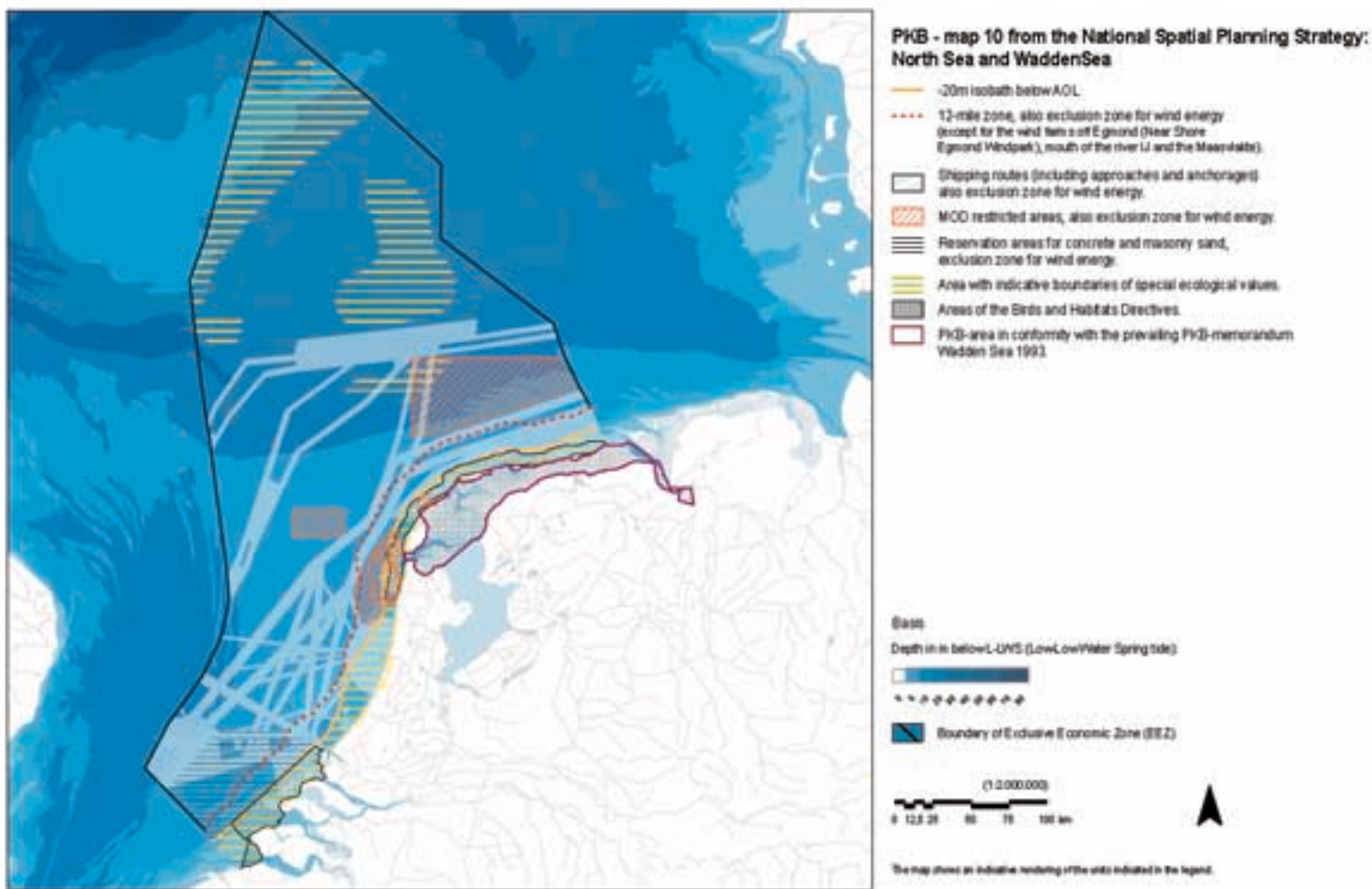


Figure 1.1: PKB-map 10 from the National Spatial Strategy³

1.2 Methods

This report consists of an analysis of the available, most important (recent) references, along with discussions with experts. Results from tables have been tested in workshops and, where necessary, adjusted afterwards.

We used data from RIKZ, Alterra, NIOZ and RIVO for Chapter 3 “Ecological Values”. The ecological values of the various areas are based on the distribution and abundance of zoobenthos, fish, birds and marine mammals. In addition, we examined to what extent the species and habitat types mentioned in the Birds and Habitats Directives and OSPAR, give rise to the indication of particular areas requiring protected status. Consultation with neighbouring countries took place about the proposals for the boundaries of the areas with special ecological values and where it was relevant, the results of the consultation process has been taken into account in the proposals for the boundaries.

We used the North Sea Atlas (2004)⁵ for the section on “use and impact”. Further information on the use and future developments in the areas has been gathered from a literature study and limited consultation of the various departments. Sources for the description of future developments expected in the use of the North Sea are:

- Policy memorandums: National Spatial Strategy (wind energy, various other functions), Second Structural Outline on Military Grounds⁶(MOD), Regional Extraction Plan North Sea 2⁷(sand extraction);
- Further reports: (i) oil and gas extraction: Expected activities in proposed special areas of conservation on the Continental Shelf (to 2015 and 2050) by TNO-NITG, ordered by the Ministry of Economic Affairs⁸. (ii) recreation: Aquatic Outlook (2002) The meaning of water for recreation and tourism in the Netherlands⁹, (iii) Suitability map wind energy (made for IMPN 2015)
- Oral statements from DGTL (Directorate General for Transport and Civil Aviation), Directorate North Sea (sand and shell extraction) and RIKZ (coastal supplements).
- A limited study has been carried out into the impact of use on ecological values. The results have been elaborated by experts’ judgement during several workshops and put into the tables of Appendix 2.

1.3 Remarks to this report

- Considering the short time span, this research has been carried out using only existing information.

- The expected activities for oil and gas extraction have been calculated by TNO-NITG based on the boundaries, as they were known in October 2004.
- In this report we have used the existing sea borders agreed upon with our neighbouring countries. When there is no agreed border however, we have used a line of equidistance, from which we have drawn a straight line to the border of the EEZ. This line has been decided upon for practical reasons.

1.4 Reading Guide

The reading guide indicates the contents of the different chapters. When a particular method has been used, this is described at the beginning of the chapter involved.

In [Chapter 2](#) we begin with a description of the criteria on which the designation and determination of boundaries of an area with special natural values may take place. [Chapter 3](#) contains a description of the ecological values of the five areas mentioned in the National Spatial Strategy and their relation to international aspects. A number of new areas will come up, which, based on the research results, possibly qualify as area with special ecological values.

In [Chapter 4](#) we describe the activities occurring at the Dutch Continental Shelf (DCS).

In [Chapter 5](#) we take a closer look at the areas: in addition, the impact of the various activities on the values to be protected in the areas are discussed. Various options are given (substantiated) for the boundaries of these areas.

The figures show the proposed boundaries (red lines) of the areas with special ecological values.

[Appendix 1](#) consists of a map in which the newly proposed boundaries are projected onto the underlying PKB-map from the National Spatial Strategy. From this it is evident where the new boundaries deviate from those in the National Spatial Strategy.

[Appendix 2](#) consists of tables per area, in which the colours indicate the varying degrees of impact of use on the values. From here it is clear which activities have only a marginal impact and those, which have a greater effect on the natural values of the area under consideration.

[Appendix 3](#) contains the coordinates of the proposed areas with special ecological values..

2 Selection-criteria for the areas

2.1 Application of the Birds and Habitats Directives (BHD) in the EEZ

The European Union aims to protect rare and endangered species and habitats across Europe. As a part of this, the EU member states are legally bound to put forward Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) under the Birds and Habitats Directives (BHD) that meet a number of ecological criteria. By taking protective actions in these areas of conservation, member states contribute to a European network of areas of conservation (Natura 2000).

The European Environmental Council finally decided on 30th of June 2004 that the Natura 2000 areas for the marine environment have to be designated by 2008. The list of areas that have to be submitted to the Atlantic bio-geographical region under the Habitats Directive was determined in December 2004 by the European Commission, but reservations were made for four marine habitat types and four marine species^b. In the Dutch part of the North Sea no areas have yet been designated, except for the coastal zone of the North Sea north off the Wadden Islands and the Voordelta.

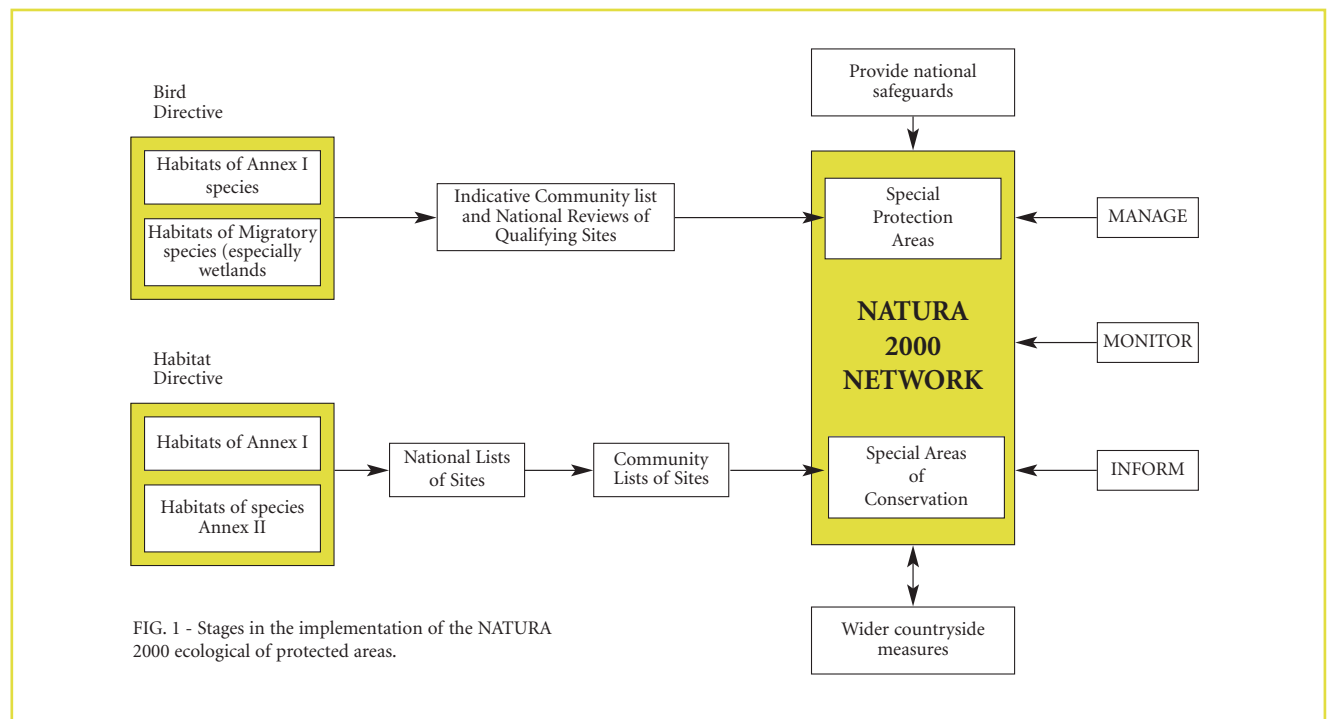


FIG. 1 - Stages in the implementation of the NATURA 2000 ecological of protected areas.

Figure 2.1 Criteria from the Birds and Habitats Directives that may be applied for designation of areas and the way in which national legislation and rules may be implemented on the selected Special Areas of Conservation. From: O'Brien 1998¹⁰.

Since the Birds and the Habitats Directives became effective in 1979 and 1992 respectively, there was uncertainty about whether marine areas would be included under these directives. As a result of from questions in the EP (E-3529/96, OJ C138) in 1997, the EU indicated that these directives also applied to areas outside the territorial waters^a. However, the way in which this has happened has caused uncertainties.

Other countries around the North Sea have recently begun the designation of SACs outside the 12-mile zone. Such designations are based on the selection criteria of the European directives and also on regional conventions, such as OSPAR (applying among other areas to the North Sea) and HELCOM (the Baltic Sea). Under these conventions the EU is a "contracting party".

^a "As far as Member States have competence, it applies to the exclusive economic zones. However, the marine species and habitats concerned generally have their main range inside territorial waters".

^b "As knowledge of presence and distribution of the types of natural habitats of Annex I and the species of Annex II of the directive that occur in the marine territorial waters and in marine waters beyond the territorial waters that come under national jurisdiction is still incomplete, it cannot be concluded whether the network with respect to these types of habitats and species is complete or incomplete." (Publication paper EG L387 van 29.12.2004, p. 1).

2.2 Elaboration of the selection criteria of BHD and OSPAR on the DCS

Five areas have been indicated in the National Spatial Strategy at the DCS that should be protected based on their ecological values: the Coastal Sea, the Frisian Front, the Central Oyster Grounds, the Cleaverbank and the Dogger Bank. These areas correspond to the results of the selection based on the criteria given below.

SACs that are to be designated or submitted are firstly selected on the basis of existing information on biotic and abiotic values. For the designation of areas with habitats that are mentioned in Annex I of the Habitats Directive, we made a selection for the DCS, corresponding to the method as described in the (draft-)memorandum “*Guidelines Natura 2000 network in the marine environment, Application of the Habitat and Birds Directive*”. We refined this selection, again based on the method from the Guidelines-memorandum above, with the analyses described in the report at hand, both for species mentioned in Annex II of the Habitats Directive and in Annex I of the Birds Directive and for other types of migratory birds for which a need for protection exists as meant in Article 4, second paragraph of the Birds Directive. Also taken into account is the discussion that was held on the “Consultation on the Coastal area” under supervision of the Ministry of Agriculture, Nature Management and Food Quality by Alterra and the Expertise Centre ANF and that will eventually result in the assessment by the State of Maintenance and the set-up of national goals and regional goals for above mentioned marine habitats and species in the Netherlands. In contrast with the UK and Germany, no supplementary survey work has been carried out in the Netherlands to be able to designate specific areas.

The following BHD and OSPAR criteria have been used for the selection of areas on the DCS that may qualify for protection:

The Habitats Directive (HD)

The Habitats Directive (HD) describes both habitats and species that are to be protected, based on which Special Areas of Conservation can be designated:

Sandbanks permanently submerged by seawater (Habitat type 1110)

The original definition as formulated in the EU Interpretation Manual, has been interpreted by the JNCC in accordance with their views for the situation in the United Kingdom. “Sand” is defined as sediment with a grain size between 0.0625-2 mm, under which the complete range of very fine to very coarse sand is included. At the same time it

is said that the depth of the area concerned is “predominantly” less than 20 m, but that channels and surrounding areas with a depth of over 20 m may be included in this habitat type. For practical reasons the depth is determined with respect to Chart Datum, a measure that virtually corresponds with Lowest Astronomical Tide. The habitat type includes, according to the British version, both solitary rising banks surrounded by deeper water on all sides, and horizontal and gradually sloping plains. Typical species of this habitat type are considered to be common scoter, black-throated diver, red-throated diver and eelgrass.

Until 2002, Germany used a definition that broadly corresponded with the description in the Interpretation Manual. The German interpretation also includes the whole range of fine sandy to very coarse sandy sediment, but the 20 m isobath is not mentioned. This description mentions transitions between habitat type 1110 and habitat type 1140 “Mud flats and sand flats not covered with water at low-tide” in which the mean low water line is considered to be the boundary between both habitat types (www.bfn.de/03/030301_lebensraumtyp.htm). Eventually, habitat type 1110 was described as rising sand banks with a grain size > 64 µm, on all sides surrounded by slopes of generally > 0.5°, but in some cases > 0.1°, in which again no minimum depth was indicated. It is emphasized that such a sandbank should be recognizable as a structure on its own (‘eigenständige Struktur’) and therefore has to be surrounded by lower lying areas on all sides¹².

In the Marine Expert Group set up by the Habitat Commission, an adequate definition of a sandbank has been discussed intensively during the past couple of years. A final conclusion of these discussions has not yet taken place. The latest version of the draft-definition (of 18th March 2005) of habitat type 1110 reads: “Sandbanks are elevated, elongated, rounded or irregular topographic features, permanently submerged and predominantly surrounded by deeper water. They consist mainly of sandy sediments, but larger grain sizes, including boulders and cobbles, or smaller grain sizes including mud may also be present on a sandbank. Banks where sandy sediments occur in a layer over hard substrata are classed as sandbanks if the associated biota are dependent on the sand rather than on the underlying hard substrata”. In addition, it is mentioned that “Slightly covered by sea water all the time” means that the water depth above a sandbank is seldom over 20 m below Chart Datum. A sandbank that qualifies may occur at greater depth than the mentioned 20 m. Such lower-lying areas often belong to a larger ecological unit, in which a strong coherence between higher and lower areas is present. Sandbanks and the adjacent lower-lying areas may have an international character (like the Dogger Bank).

Characteristics of the ecosystem play an important role in the final description of the type. Habitat type 1110 is described as areas usually with scarce coverage. Typically zoobenthos species include various polychaetes, crustaceans, sea anemones, molluscs that bury in the substratum including clams (*Spisula sp.*), echinoderms (*Echinocyamus pusillus* and *Asterias rubens*) and a few fish species (*Ammodytes spp.*, *Pleuronectus platessa* and *Limanda limanda*).

Reefs (Habitat type 1170)

Reefs are, according to the Interpretation Manual, defined as “submarine, or exposed at low tide, rocky substrates and biogenic concretions, which arise from the sea floor in the sublittoral zone but may extend into the littoral zone where there is an uninterrupted transition of plant and animal communities”. In the definition formulated by the Marine Expert Group, formations of solid rock or limestone, large boulders and smaller boulders (“generally > 64 mm in diameter”) are included in this habitat type as are formations of organisms that are forming “biogenic concretions”. These include *Serpula vermicularis*, *Sabellaria spinulosa* and *Sabellaria aveolata*, *Lophelia pertusa*, *Mytilus edulis* and *Modiolus modiolus*¹³. Germany has a similar approach. In addition to real rock formations, formations of boulders of > 6 cm are included in this habitat type. Often, these boulders have a specific fauna. Biogenic formations as well, such as mussel-banks and *Sabellaria*-formations are also included in habitat type 1170, both when exposed at low tide and when permanently under water.

(www.bfn.de/03/030301_lebensraumtyp.htm).

A further elaboration of the concept of “biogenic concretions” is given in the description of the definition of habitat type 1170 by the Marine Expert Group. Coagulated structures of animal origin and biogenic formations that have formed an encrustation on solid objects are included and also coral-like structures and mussel beds, both existing of dead material and living animals. An important starting point is that these structures offer a substratum for epibiotic species, including various species of Rhodophyceae, Phaeophyceae and Chlorophyceae. A reef is considered to be topographically different from the surrounding sea floor: often the term “arise from the sea floor” is used. Reefs may occur in the sublittoral zone (i.e. permanently covered with water), but may extent from the sublittoral zone into the intertidal area.

Submarine structures formed by leaking gasses (Habitat type 1180)

According to the current criteria they are described as “spectacular” submarine pillars, rising up into the water, consisting of sandstone and carbonate resulting from microbial processes due to leaking of gas from the seabed, generally methane. Non-spectacular leaking holes, only occasionally emitting gas, may also be present in these areas.

Relevant species

Relevant species mentioned for the designation of Special Areas of Conservation: (Annex 2 HD):

Marine mammals: grey seal; common seal; bottlenose dolphin; porpoise.

Fish: river lamprey; sea lamprey; alis shad; twaite shad; sturgeon.

The sturgeon has priority; this means that this species, being no longer present on the DCS, needs special protection.

The Birds Directive (BD)

Under the Birds Directive (BD), areas may be designated based on the presence of species that are in Annex I of the BD and other migratory birds as mentioned in Article 4, second paragraph of the Birds Directive.

The following species from Annex I of the BD are relevant to the North Sea: black-throated diver; red-throated diver; great northern diver; Slavonian grebe; storm petrel; Leach's Petrel; Balearic shearwater; little gull; Sandwich tern; common tern; Arctic tern; little tern; black tern.

In addition, areas may be designated based on the “frequent occurrence” of other species of migratory birds that are present in concentrations of over 1% of their bio-geographical population. Which species are meant, has been studied in a background document to this study, based on data of RIKZ and the European Seabirds At Sea (ESAS) database.¹⁴

Based on the current criteria (as formulated in the Memorandum of Reply to the Birds Directive, part 1¹⁵ and as applied in the Designation Order of the North Sea Coastal Zone north off the Wadden Islands and that of the Voordelta) designation should occur at species level and not at the seabird-community level.

In the Designation Order of the North Sea Coastal Zone north off the Wadden Islands¹⁶ and in that of the Voordelta¹⁷, the lesser black-backed gull and the herring gull are not included as qualifying species. In the analysis carried out by Leopold et al. (2005) this is because in the various coastal areas over 1% of the bio-geographical population of the lesser black-backed gull occurs and also because (in addition to the Dutch summer birds) it concerns partly migratory birds from coastal areas elsewhere in north-western Europe and Iceland. Tens of thousands of herring gulls that lay their eggs in Scandinavia are present in the Dutch coastal waters during winter. Therefore, this species also needs to be considered as a qualifying migratory bird.

OSPAR

Within the scope of OSPAR, Annex A and Annex B outline the rough criteria for designation of a Marine Protected Area. Annex A mentions the ecological criteria and Annex B describes which considerations need to be taken when a priority determination needs to be assessed. Here, different criteria than those that are followed when a SAC is designated within the scope of the Birds and Habitats Directives are used. Thus, the designation of an MPA within the scope of OSPAR may have higher priority when a particular area has the broader support of stakeholders than elsewhere.

The criteria in the OSPAR Annex A are:

1. The occurrence of endangered or decreasing species and habitats/biotopes
2. Important species and habitats/biotopes
3. Ecological importance
 - In the area a large part of a particular habitat type or a bio-geographical population is present
 - Important feeding grounds, breeding grounds, moulting grounds, wintering grounds or resting grounds are involved
 - Important nursing grounds, areas in which young animals in particular are present and spawning grounds are involved
 - The area is characterized by a high productivity of a species or phenomenon
4. High natural biological diversity
5. Representativeness
6. Vulnerability
7. Naturalness

Areas to be designated have to meet several of these criteria, but not necessarily all of them. An ecologically coherent network of well-managed MPAs is the ultimate goal.

2.3. Determination of boundaries of the areas

In determining the boundaries of the areas, we departed from the concept that straight lines, with well-defined vertices are the best approach for future policy and maintenance. That is why all areas have been given straight boundaries. The Coastal Sea is an exception; here, the continuous 20 m isobath is a good boundary in particular for bird values and the diversity in fish species. In determining the boundaries, the location of the abiotic characteristics that qualify for the habitats to be protected, (such as depth and sediment composition) have been taken into account, along with the areas with high natural values as indicated in chapter 3. To determine the definitive boundaries, two expert workshops were held in which all maps showing the specific abiotic characteristics (qualifying habitats) and high natural values (presence of qualifying species, high diversity), were placed on top of each other. This was the basis on

which agreements have been reached in joint consultation. These boundaries are further underpinned and elaborated per selected sea area in Chapter 5.

In this report we have taken the high water spring tide mark as landward boundary of the Coastal Sea. The emphasis in this is on the marine part and not on the intertidal zone.

We have taken into account the existing sea boundaries with the surrounding countries in this report. Where there is no agreed boundary, however, we have used a line of equidistance.

2.4 Joining in with Germany and the United Kingdom

Although the European Commission accepts member states use deviating criteria for the designation of Special Areas of Conservation, it is aiming for the highest possible consistency. In particular, in the case of areas adjacent to the boundary of the DCS, we need to aim to join up with proposals of our neighbouring countries. Germany submitted its areas to the EU in May 2004. In it, all sandbanks were put forward, regardless of the depth of their tops and all reefs are regarded as areas with loose boulders > 6 cm with a specific cover. The coordinates of the German areas at the Dogger Bank and at the Borkumse Stones have also been used for the determination of the boundaries of the areas proposed on the DCS.

Up to now, the UK has not made any proposals for the special conservation of areas with loose boulders.

3 Ecological values

3.1 Introduction

The North Sea supports a great number of natural values in the form of specific habitats and in particular places the occurrence of large numbers of zoobenthos, fish, birds and marine mammals. In this chapter we further analyse and map the areas with special ecological values.

In addition to the habitat types from the Habitats Directive mentioned above, we have also mapped the natural values for the individual species groups. Adequate data exists for zoobenthos, fish and birds to indicate specific areas with a higher biodiversity or higher value. For marine mammals we can only make a rough description at the moment.

In this chapter we have elaborated this further per species group.

The Figures show the outlines of five areas of special interest from the National Spatial Strategy that resulted from this project (Chapter 5): Dogger Bank, Cleaverbank, Oyster Grounds, Frisian Front and Coastal Sea.

3.2 Abiotic habitat characteristics

For sediment characteristics, depth and morphology, we have worked out which areas on the DCS qualify within the scope of the Habitats Directive. For the habitat type shallow sand banks (habitat type 1110) the criteria of the top being no deeper than 20 m and sloping on all sides until the slope is $< 0.1^\circ$ is used. Under these criteria, the Dogger Bank (having a shoal of about 15 m on the English Continental Shelf) and a couple of banks off the Zeeland coast qualify. The actual Coastal Sea is also included under this, but here there is only a slope to one side.

For the habitat type reef (habitat type 1170; stony reef) the criterion of a considerable number of boulders > 6 cm present is valid. With a specific cover for stony areas, the gravel area at the Cleaverbank meets this criterion. Near Texel, there used to be such a stony area (see Figure 3.1), but due to fishing and the movement of sand there are so few boulders left here that it is no longer considered to be qualifying habitat.



Dead man's fingers (photo by G.W.N.M. van Moorsel)

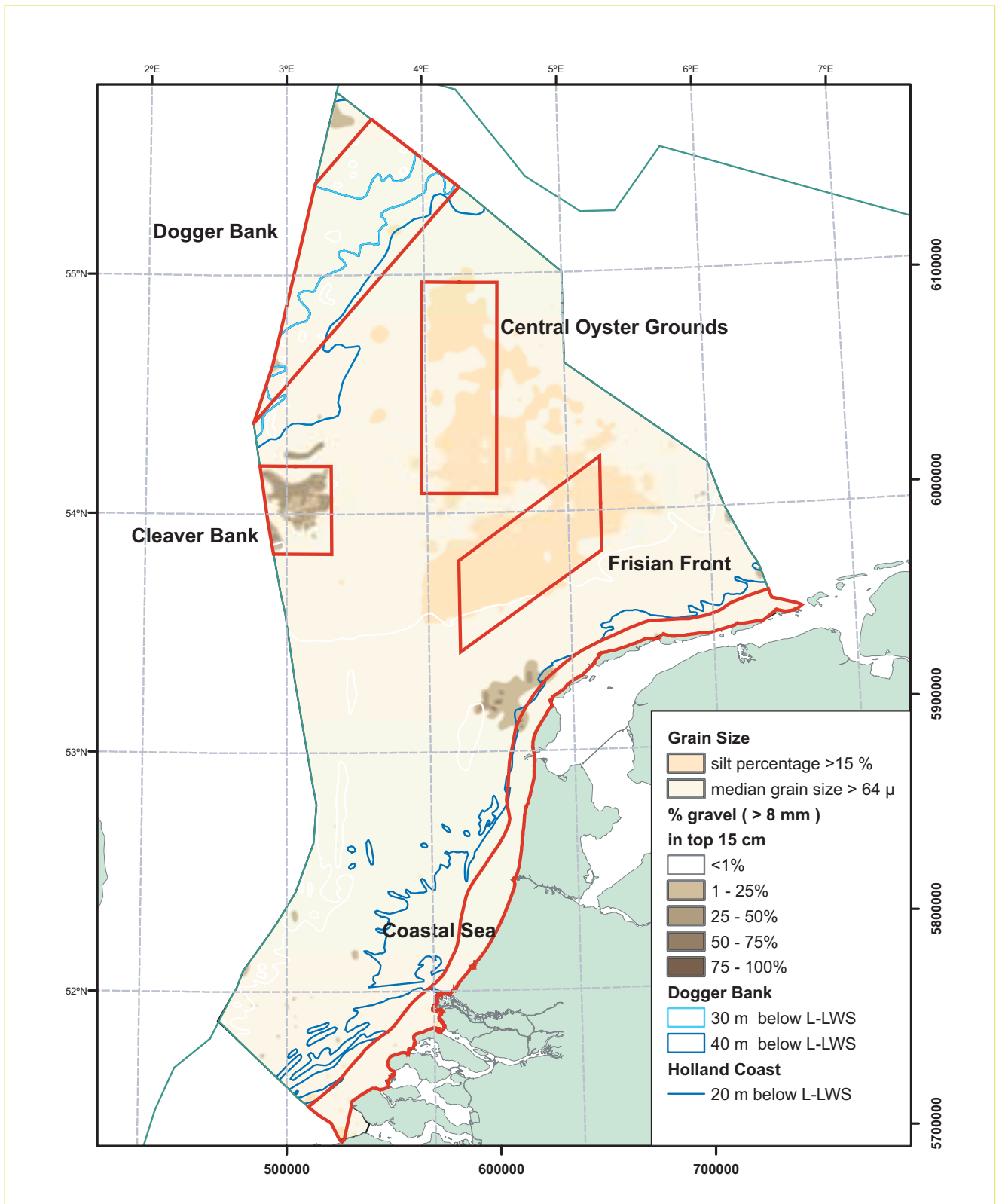


Figure 3.1: Sediment types at the DCS being important as typical of habitat types of the Habitats Directive. The Dogger Bank and Cleaverbank in particular qualify as sandbank and reef respectively. The central area with a high silt content, including the Frisian Front and the Oyster Grounds is also characterized by a high biodiversity of zoobenthos, but as yet those silt areas have not been included in the Habitats Directive. (Data: TNO-NITG, RWS, and Alterra.)

Figure 3.1 shows the different sediment types that are of interest for the selection of habitats. It shows the 20 m isobath as related to the low-low water spring tide datum for the Coastal Sea as well. Figure 3.2 shows a three-dimensional impression of the North Sea in which the sandbanks and the deeper parts can be discerned clearly.

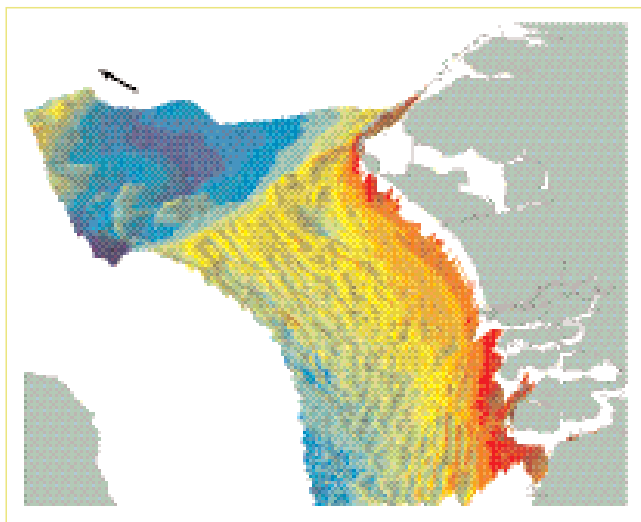


Figure 3.2: Three-dimensional impression with enhanced variations in height of the Dutch North Sea bed. Above left the Dogger Bank, qualifying as shallow sand bank as habitat type 1110. Many sand banks are present off the Holland coast reaching towards the border, but except for a number of banks off Zeeland, their tops are deeper than -20 m and therefore they do not qualify. (Data: TNO-NITG, RWS, and Alterra).

According to the Habitats Directive ‘Submarine structures made by leaking gases’ are included in the directive as habitat type 1180. From research by TNO-NITG (Cees Laban, pers.comm.) it appears that in the north of the DCS at least one pockmark and a large number of gas emissions or gas seeps are present, in particular in the map squares F3, F6 and B13 (see Figure 3.3).

A pockmark is a spot where in the past a large gas emission has left a clear crater in the sediment. In map square A11 such a crater is present with a diameter of over 100 m; in the centre is a smaller crater that still leaks gas.

In a gas emission or gas seep, gas continuously leaks from the sediment. At a large number of places shown on map squares F3 and F6 this is occurring and side scan sonar recordings show that gas plumes with a height of up to 20 m bubble up from the seabed into the water. For further descriptions see Laban (1999)¹⁸. The leaking methane may feed a special micro-flora that in turn may form calcareous sandstone. These formations in particular are named in the Habitats Directive as structures to be conserved.

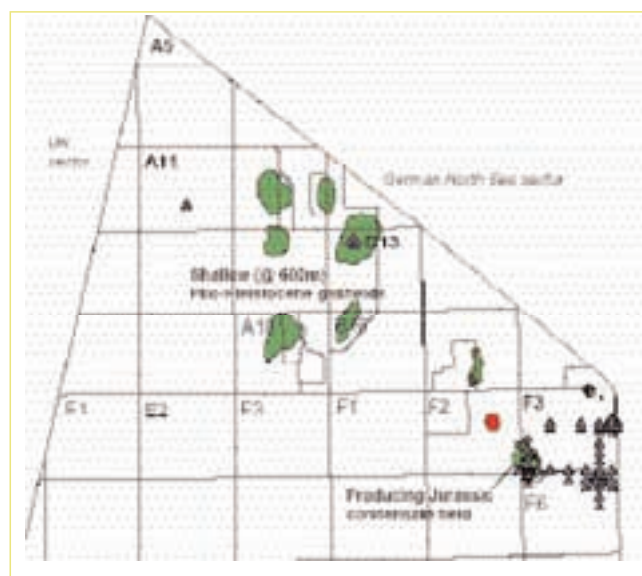


Figure 3.3: The presence of a pockmark and gas emissions or gas seeps, in the northern part of the DCS (Source: C. Laban, TNO-NITG).

Up to now we do not know whether such submarine structures that have been found in the Kattegat, for example, are present on the DCS. Further research will have to show the exact status of the flora and fauna near these emissions and whether this may be a reason for protection under the HD. The Pockmark occurs in the vicinity of the Dogger Bank and part of it could potentially be protected if it appears that structures are present here.

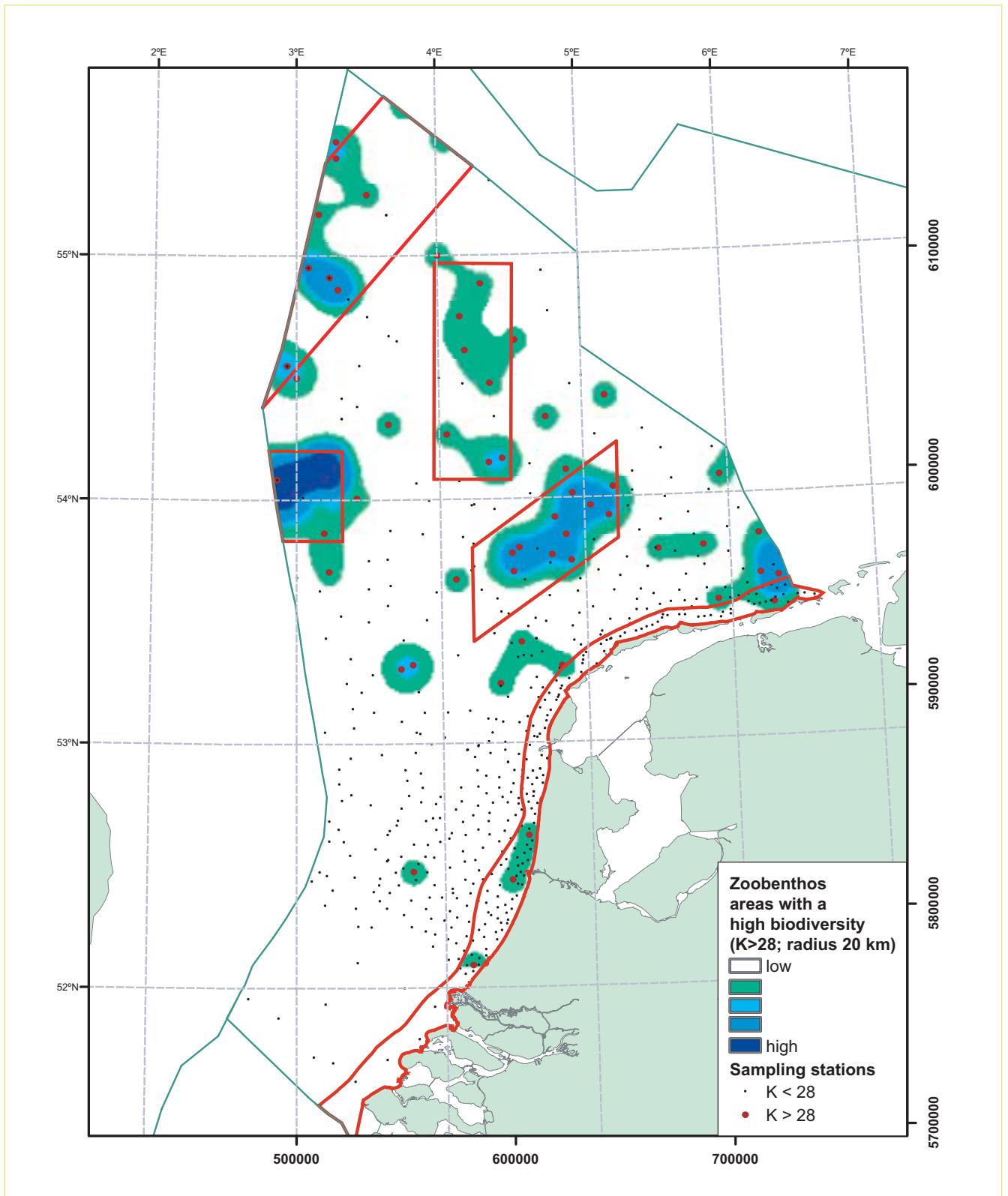


Figure 3.4: Areas at the DCS with a high biodiversity of zoobenthos (source NIOZ, after Lavaleye, 2000)²⁰.

3.3 Zoobenthos

NIOZ has gathered as much data on zoobenthos as possible to indicate and describe areas with characteristic macrobenthos communities on the DCS. This had been instigated in an earlier report within the scope of the project “Ecosystem targets North Sea”¹⁹. Based on this report five areas were mentioned in the National Spatial Strategy, for which a certain protected status – with regard to new human activities – is considered to be advisable, namely the Coastal Sea, the Frisian Front, the Central Oyster Grounds, the Cleaverbank and the Dogger Bank. For this current project both the underpinning of the particular nature of these areas and a more exact geographical delineation have been elaborated further.

In addition to data from 100 stations of the BIOMON project covering the years 1995-2002, another 490 stations from the MILZON project (1987-1993) and an unpublished data set from the Dogger Bank (NIOZ, R. Heyman) were used.

In order to determine the particular nature of the areas the same method was used as formulated in Lavaleye (2000)²⁰. This method calculates a mean of four criteria per station over the sampling years. These criteria are as follows:

1. Hill0 biodiversity index (number of species per unit area)
2. Shannon-Wiener biodiversity index
3. Simpson’s biodiversity index
4. Number of rare species

Subsequently, we divided the values of the four different criteria into ten classes. Each class got a mark ranging from 0 to 11, depending on class height or class rareness. The sum of these marks for all four criteria per station renders an objective number (K-value) for the particular value of its macro-benthos. Next, areas with a total value of over 28 were designated as areas with a high natural value. In this way we were able to select five areas at the DCS that could be considered special with regards to macrobenthos. For the larger part these areas overlap with the areas that are mentioned in the National Spatial Strategy (2004). These are the Dogger Bank, the Central Oyster Grounds, the Frisian Front, the Cleaverbank and the Coastal Sea. The central and eastern parts of the Frisian Front have a higher biodiversity, while the southwestern part is different by its particular composition of the local fauna. The Cleaverbank is designated here partly based on other research²¹, data of which have been used to calculate the biodiversity present. Here we suggest the inclusion in the Cleaverbank of the part of the Botney Cut that dissects the area (the deep channel between the two gravel banks), as higher natural values are also found here (see Figure 3.4). One other important area was found on the DCS, namely the stations near the Borkumer Reef that were also found to

have a high biodiversity score. With regard to Lavaleye (2000) we are able to designate more precisely the extent of the five special areas of macrofauna based on a higher number of stations. Earlier, the Coastal Sea appeared not to qualify as special, based on the four criteria, but due to the much higher number of stations in the coastal zone the contrary is now the case, mainly based on the high density and biomass of the macrofauna (*Spisula* and *Ensis*) off the Holland coast and near Schiermonnikoog (Figure 3.4).

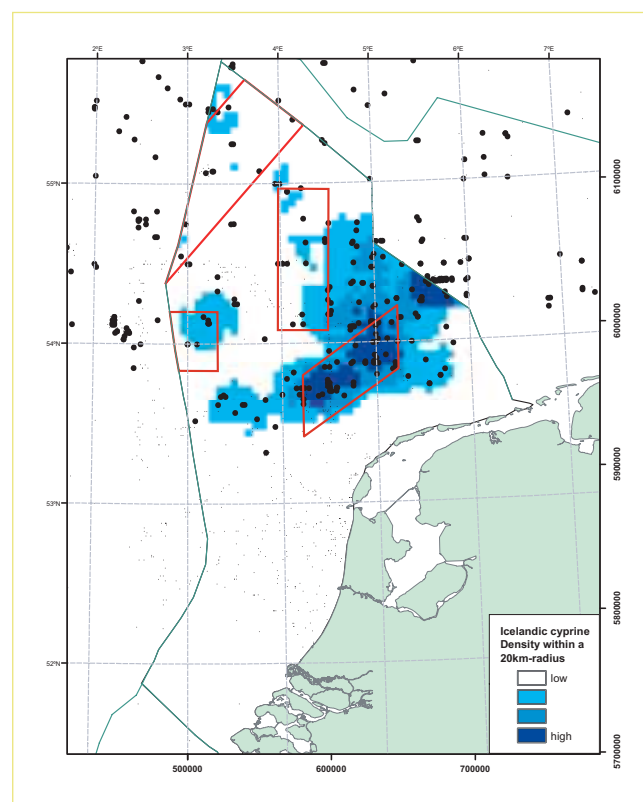


Figure 3.5: Areas at the DCS in which the Quahog (*Arctica islandica*) or Ocean quahog have been found frequently²².

OSPAR documents mention *Arctica islandica* (Ocean quahog) as a species to be protected. Using the data gathered by NIOZ we calculated which areas on the DCS are important to this species (Fig. 3.5). The Frisian Front and the area northeast of it appear to contain relatively high concentrations of *Arctica*. If the Frisian Front, as shown in Figure 3.5, is protected fully as possible against activities that harm the *Arctica*, then this should be an adequate measure to maintain the population of the *Arctica* on the DCS.

3.4 Fish

RIVO has studied to what extent areas of conservation within the DCS may be of ecological value to fish communities. The five areas designated in the National Spatial Strategy: Coastal Sea, Frisian Front, Central Oyster Grounds, Cleaverbank and Dogger Bank have been used as a guideline. Data originates from four routine surveys carried out at the North Sea, namely the International Bottom Trawl Survey (IBTS, since 1965), Beam Trawl Survey (BTS, since 1985), Sole Net Survey (SNS, since 1969) and Demersal Fish Survey (DFS, since 1969). We refer to an extensive discussion of the results to the report of Van ter Hofstede *et al.* (2004)²³. It appeared from cluster analysis that within the DCS no obvious communities of fish exist. This meant that further analyses were required at species level. We have studied whether the distribution of fish species within the DCS could be associated to the five designated protected areas and to specific habitat types based on sediment type and depth. These analyses were twofold:

1. Aimed at target species for conservation policy, while observing the presence/absence of these species from trawls in the Special Areas of Conservation to be designated and in the habitat types concerned. Data was used from all four routine surveys.
2. Aimed at common species (>100 positive trawls per survey) in which the distribution of the mean of the trawls on the DCS was related to the Special Areas of Conservation to be designated and to the habitat types concerned. Data originated from the surveys that covered the whole of the DCS (IBTS and BTS). Other surveys (DFS and SNS) have not been included as they are restricted to the coastal area.

Protection of the five Special Areas of Conservation to be designated is expected to positively affect the populations of a number of fish species at the DCS. This is expected for the target species anchovy, butterfish, sand smelts, viviparous blenny or eelpout, striped sea snail, European smelt, thornback ray and five-bearded rockling, and for the common species flounder, grey gurnard, long rough dab and four-bearded rockling. It mainly involves coastal species.

From the analyses it appears that the Coastal Sea is an area that may protect fish significantly. As yet it is not clear whether the other areas may contribute to the protection of the target species and/or common fish species, as they do not differ significantly with their surrounding areas as far as fish species are concerned (Figure 3.6).

We have found correlations between individual fish species and habitat types, but the reliability of the results are limited by artefacts at species level and also by the fact that the area studied only covers the DCS and the natural distribution boundaries of the fish species has not been taken into account.

The range of the species diversity of fish within the DCS has been considered by GIS-interpolation of the number of fish species observed per trawl and by a geographic image. In this, again, only data from surveys that cover the whole of the DCS have been used (BTS and IBTS). From the BTS data we can see a gradual transition from a high biodiversity to a low one the further away from the coast fishing occurs. This implies that the biodiversity within the DCS is mainly related to the Coastal Sea. However, from the IBTS-data it appears that at the DCS there is a rather homogeneous distribution of biodiversity without significant gradients. Remarkably, in either survey few fish species per trawl were sighted in the north of the DCS at the Dogger Bank. However, we did not statistically examine correlations between biodiversity and protected areas (and habitat types as well). The conclusions with regard to the distribution of biodiversity are based on visual interpretation of the distribution maps.

We conclude that research into the correlation between the distribution of fish and the Special Areas of Conservation to be designated should not be limited to just the DCS, as in this way the cross-border (natural) distribution areas of fish species are not taken into account. In addition, the analyses per individual species must be carried out in detail, while all possible pitfalls in interpretation are carefully considered. The results presented must be carefully interpreted and detailed research is necessary before powerful conclusions can be drawn.

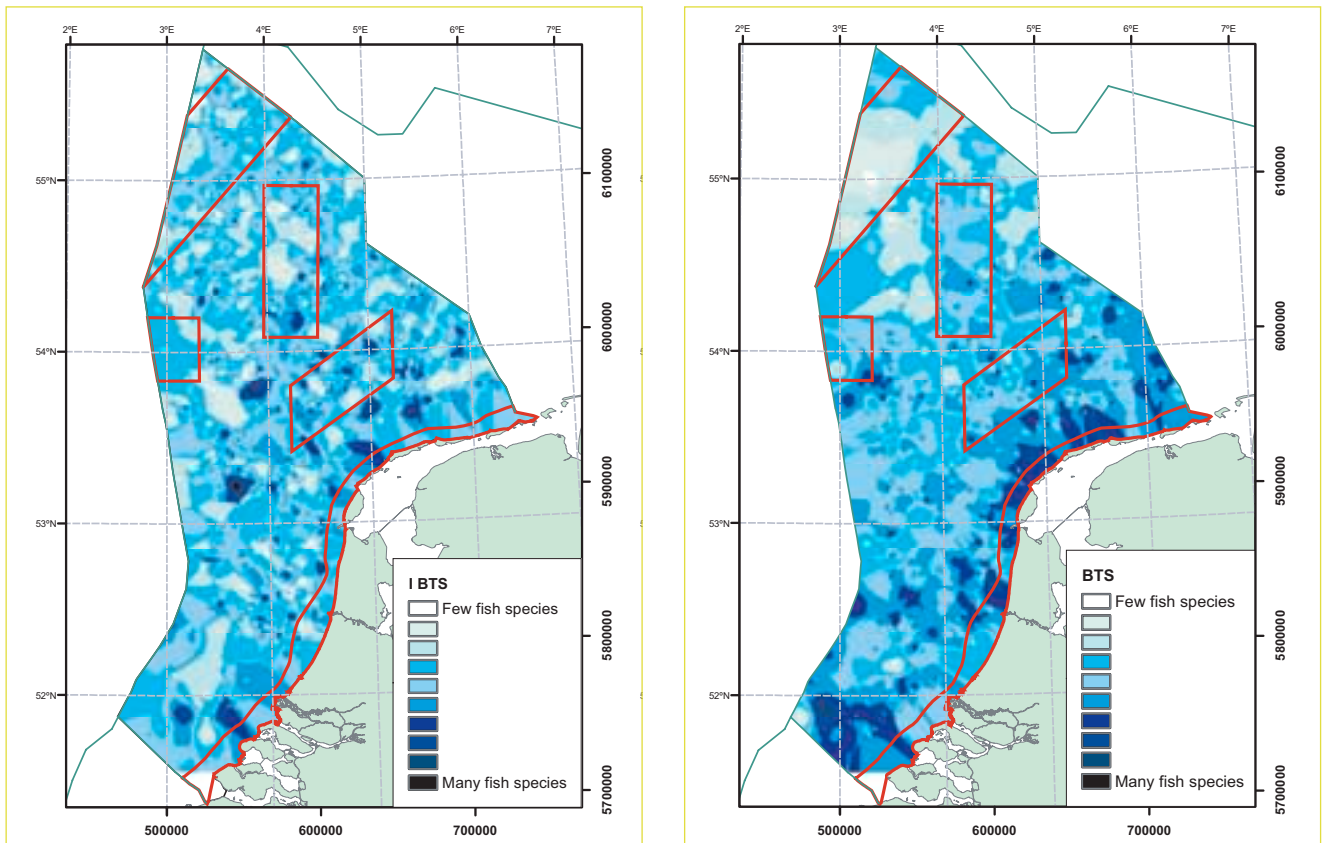


Figure 3.6: Distribution of biodiversity within the DCS based on data from hauls originating from the IBTS-survey (1977-2002) (left) and the BTS-survey (1985-2003) (rights) Source: RIVO.

3.5 Birds

Introduction

Many species of sea birds are present on the DCS in varying numbers and distribution patterns throughout the year.

These birds have been monitored at sea by aeroplane (RIKZ) and by ship (European Seabirds At Sea Database, ESAS for short) over the past ten years. We calculated bird densities per two-month period based on both data sets for map squares of 5x5 km. We used it to study to what extent the areas in question would qualify under the Birds Directive. To this end two different criteria have been used:

1. The standard (Ramsar) criterion for bird concentration areas. For this we have calculated whether over 1% of the total European population of a bird species frequently resides in each area in question, or whether over 20,000 individuals of a bird species frequently occur.
2. At a later stage we considered the total “bird value” per map square of 5x5 km. This parameter depicts the occurrence of all different species together (taking vari-

ous weighing factors into account). This offers the opportunity to see at once which areas are important to sea birds in a more general way.²⁴

The Coastal Sea

The Coastal Sea is very important to sea birds the whole year round. In winter large groups of Common Scoters (up to well over 100.000 birds) and Eiders (up to well over 50.000 in years of scarcity of food at the Wadden Sea) reside here. The most important concentration areas (for the larger part already protected under the Birds Directive) for these ducks are situated north off the Wadden Islands and off the Noord-Holland coast north of Egmond aan Zee (see Figure 3.7). However, concentrations of common scoters are also frequently found in the Voordelta. The star off the Holland coast indicates the spot where a large group of Common Scoters was sighted in the severe winter of 1987. This could be an indication of the fact that this area functions as a refuge area under special circumstances.

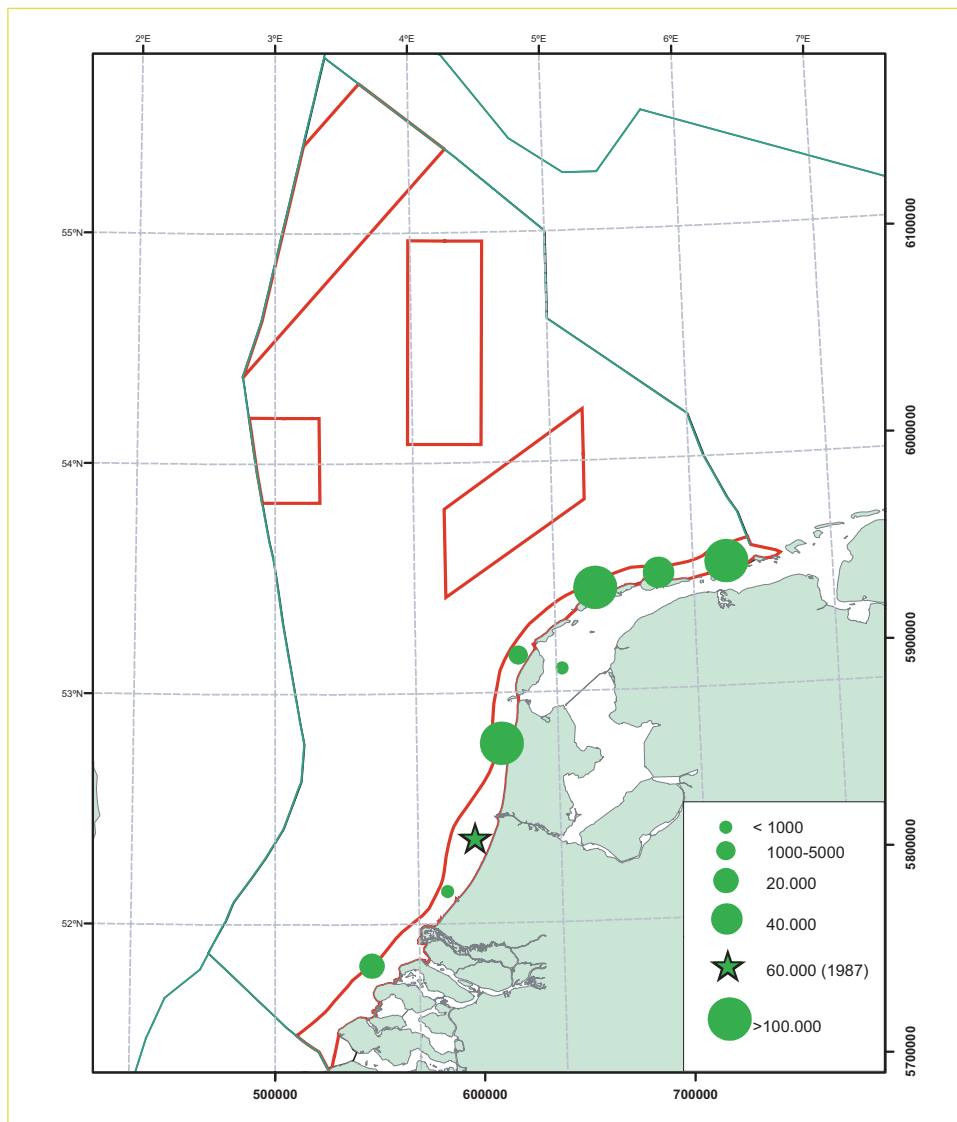


Figure 3.7 Places at the Dutch North Sea where large groups of common scoters were sighted between 1987 and 2003.

In spring and summer (the breeding season) the entire Coastal Sea is very important as a foraging area for lesser black-backed gulls and herring gulls, Sandwich terns and common terns. During the migratory season (autumn and spring) very large numbers of sea birds temporarily stay in the area and can forage there “on their way to elsewhere”. As a consequence over 1% of the entire population of little gulls may stay off the Dutch Coast at certain times and considerable numbers of Arctic skuas and great skuas migrate through this zone. The areas already designated under the Birds Directive are important to red-throated divers (Figure 3.8). In winter and spring up to several thousands of individuals (estimation based on various sources) may occur in the Dutch Coastal Sea. Furthermore, the Coastal Sea acts as

refuge area for large numbers of grebes and other water birds during severe winters.

From the species specifically mentioned in Annex I of the BD, the red-throated diver, black-throated diver, great northern diver, Slavonian grebe, Sandwich tern, common tern, Arctic tern and black tern occur within the DCS (virtually) exclusively in the Coastal Sea, while the storm petrel, Leach’s petrel and Manx shearwater use the Coastal Sea as a migratory route in autumn.

Offshore waters

Within the offshore zone the Frisian Front is one of the

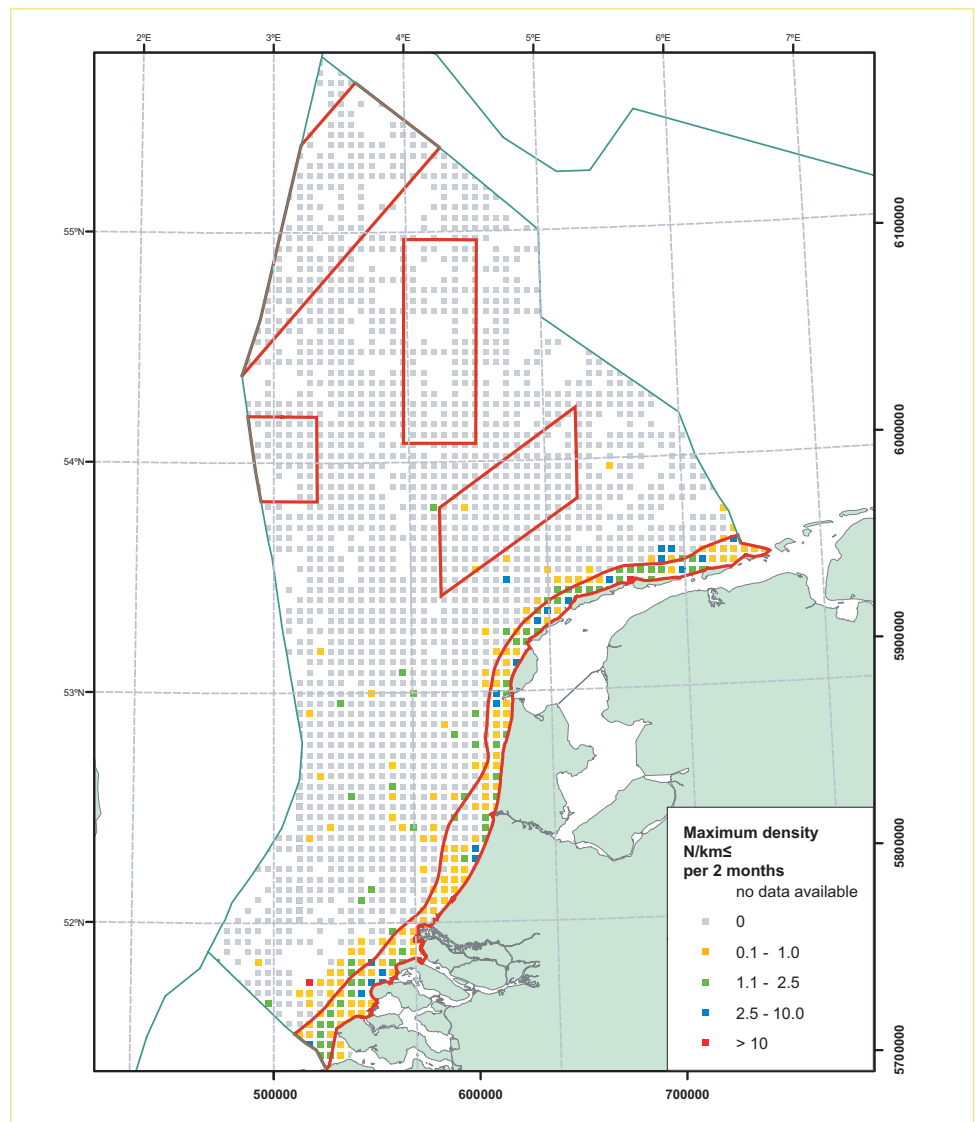


Figure 3.8: Observed densities of red-throated and black-throated divers in the Dutch North Sea region. Maximum densities (N/km^2) that have been sighted in two-monthly periods are indicated (period 1987-1994).

most important areas for birds. In late summer and autumn the area is important for great skua (1% standard) and the guillemot (>20,000 birds). The area is particularly important for certain life stages of guillemots where moulting adults migrate with their not yet fully-fledged young from Great Britain to the Frisian Front. These young birds are extremely vulnerable to risks such as oil slicks and they cannot migrate fast to other areas.

The other areas, the Dogger Bank, Cleaverbank and Central Oyster Grounds, do not meet the 1%-criterion for any species of bird. The Dogger Bank and the Central Oyster Grounds may harbour over 20,000 great skuas at certain times. However, on the scale of the entire North Sea this is an inconspicuous phenomenon and therefore less worth

protecting. Near the Bruine Bank relatively high numbers of greater black-backed gulls, herring gulls, guillemots and razorbills occur (mainly in winter). None of these species, however, appear to exceed the 1%-standard or the number of > 20,000 birds, but new counts are necessary to confirm this view.

From the species specifically mentioned in Annex I of the BD red-throated divers, black-throated divers and Sandwich and Arctic terns occur in the offshore zone of the DCS, almost exclusively in spring (April) and particularly in a zone of 25 km width immediately bordering the Coastal Sea.

Storm petrels and Leach's petrels incidentally occur further

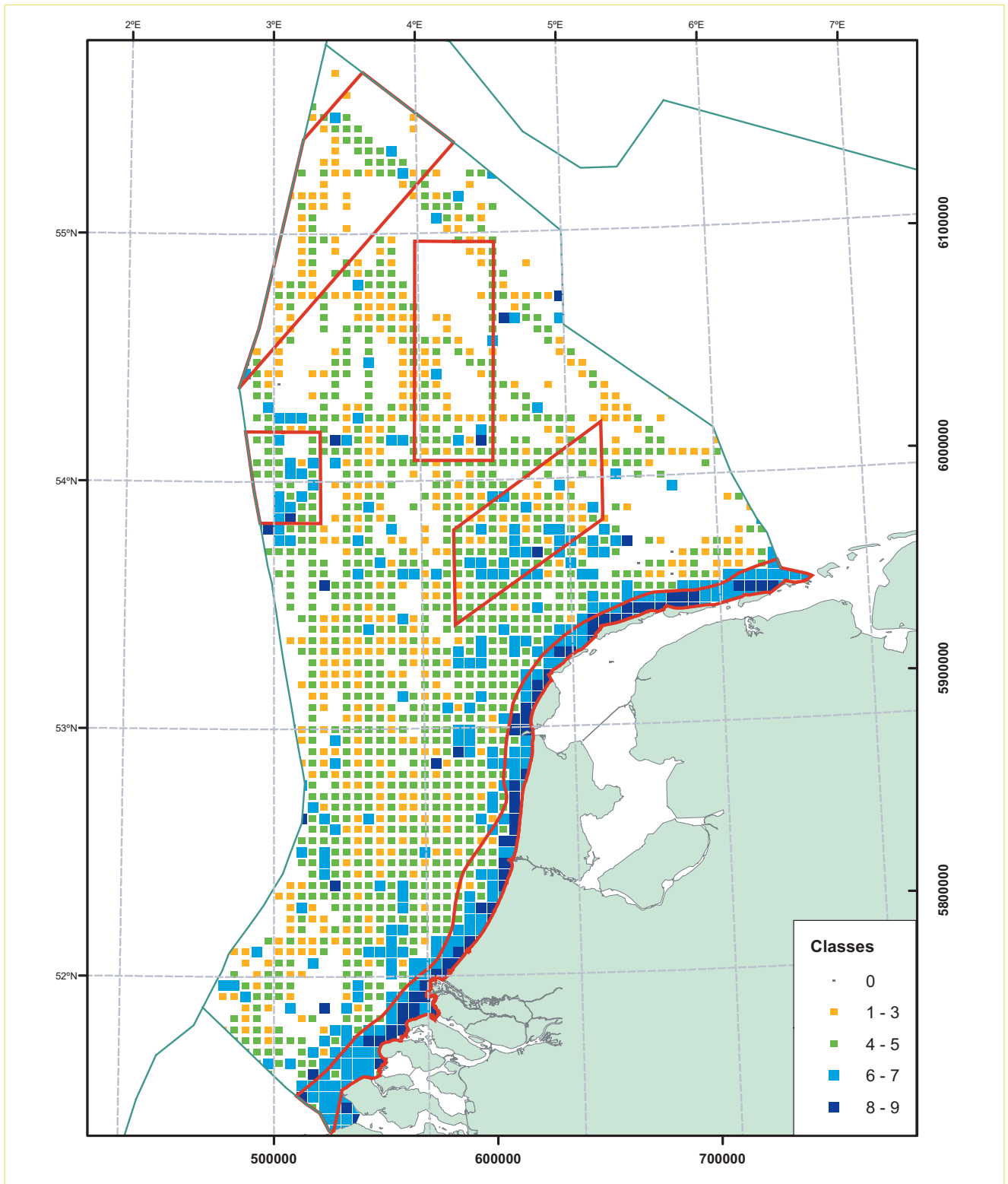


Figure 3.9: Annual mean bird values at the DCS as calculated from a combined RIKZ-ESAS data set in the period 1991 up to and including 2002.

offshore, but not in concentrations requiring consideration under the Birds Directive.

Total bird values

The map of bird values (the sum of occurrence/importance for all species together; Figure 3.9) shows the Coastal Sea to be the most important continuous bird area within the DCS. The area of the Zeeuwse Banks is situated directly seaward of the Voordelta but it does not meet the selection criteria of any individual species. Likewise, we find clusters of relatively high bird values at the Frisian Front and in the area of the Cleaverbank/Botney Cut (that does not qualify for individual species). We have added bird value maps for winter (Feb/Mar) and autumn (Oct/Nov) as an example (Figure 3.10). The left-hand map shows that in winter the northern half of the DCS is virtually “empty”, while the southern half shows high bird values virtually everywhere. The right-hand map shows clearly the relatively high importance of the Frisian Front and the Cleaverbank.

3.6 Marine mammals

Common seal.

Designating areas with a special value for seals is problematic. The common seal can be seen at its resting place (haulout) and in the Netherlands this is in the Wadden Sea and in the Delta-region. The animals are seldom sighted when they are in the water and as a consequence, the protection of the animals has up to now been aimed at these haulout sites. For the time being this is justified as the animals are very dependent on these haulout sites in the sensitive period of nursing and moulting as young animals can only be nursed on land and being on dry ground appears to be important for moulting.

Satellite-transmitters that are small enough to use for research on the common seal have been developed fairly recently. The seals did not appear to be restricted to the immediate vicinity around their haulout sites, and sometimes migrate over 200 km to the open sea and to haulout sites situated over 300 km further away. Since 1997 in the Netherlands 43 animals have been followed with satellite-

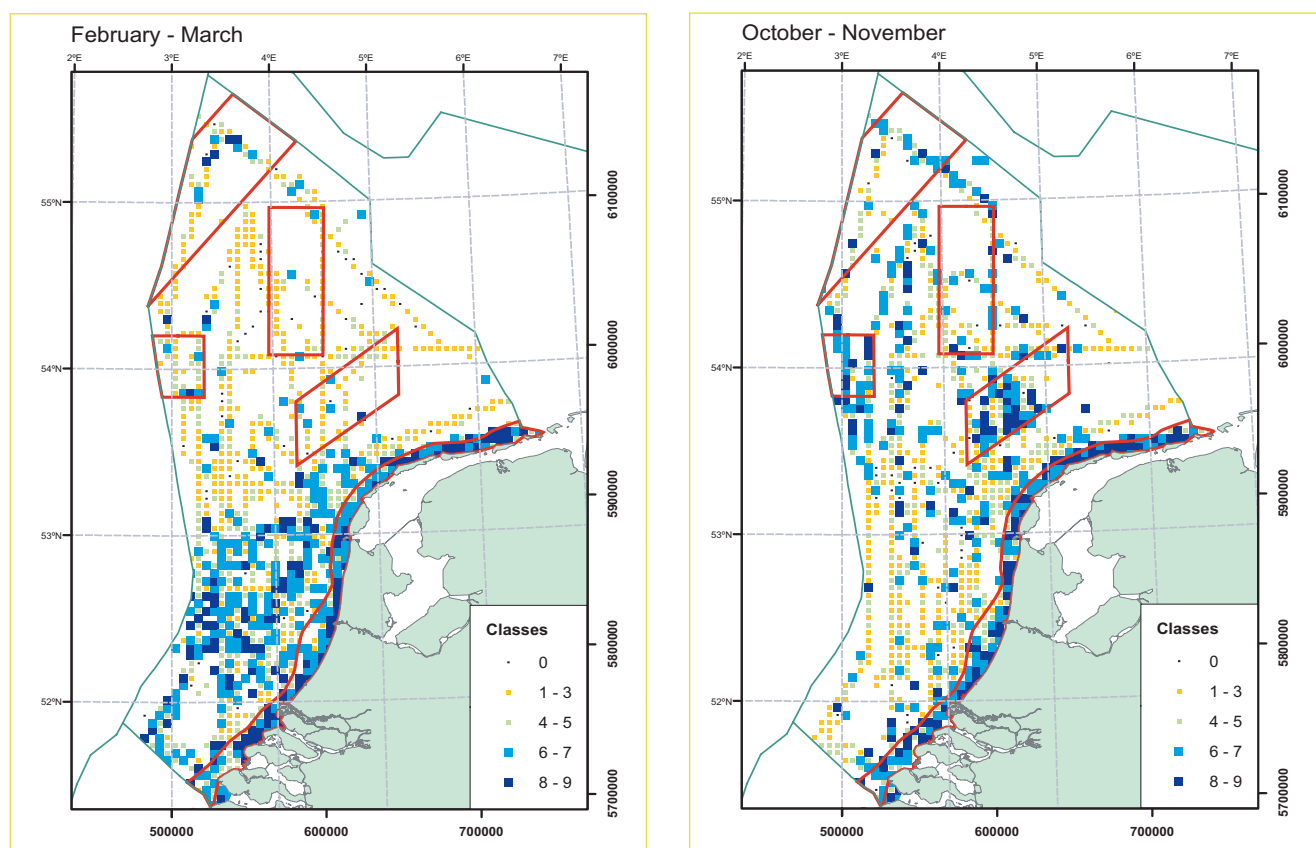


Figure 3.10: Calculated bird values for the months February-March (left) and October-November (right). The values have been calculated from a combination of data from RIKZ and ESAS in the period 1991 up to and including 2002. The distribution in February-March is probably affected by fisheries (discards).

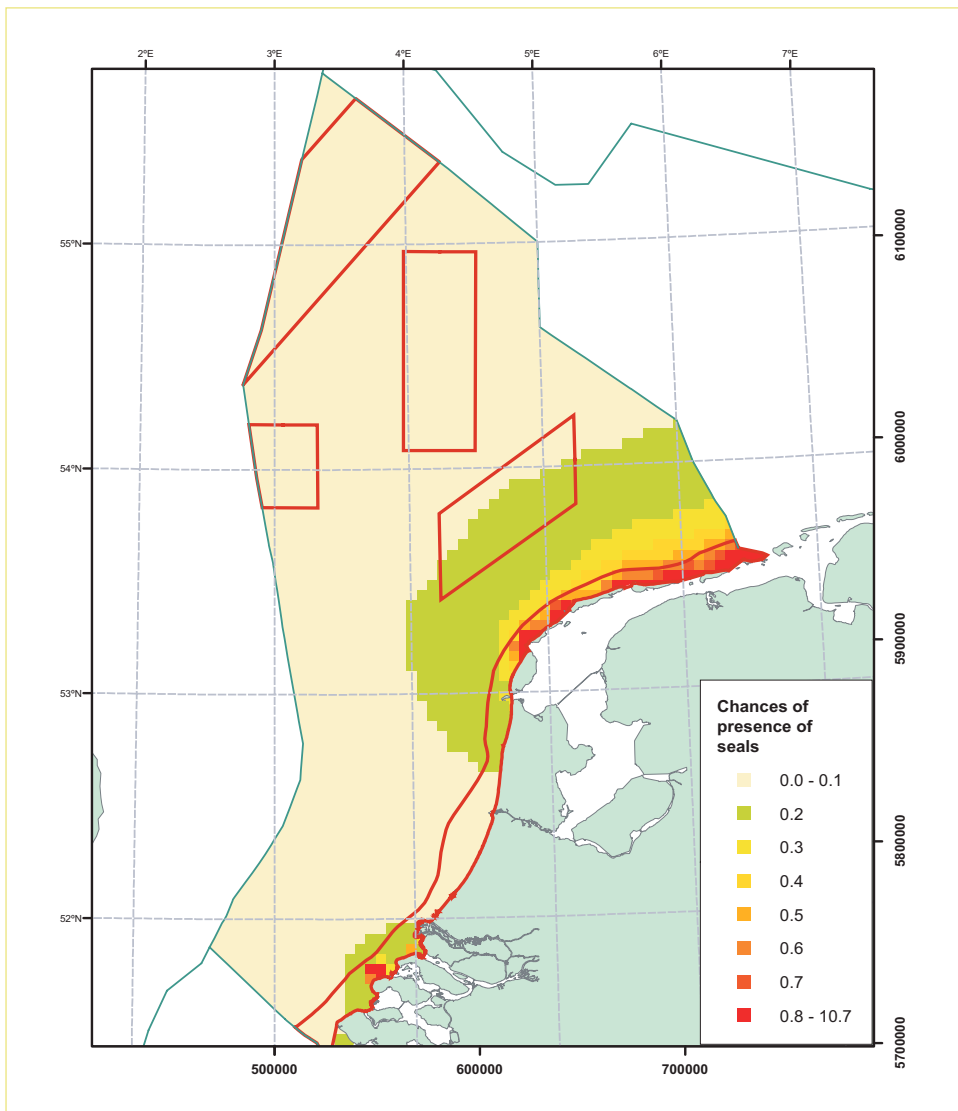


Figure 3.11: Calculated chances of a seal being present per 4 km². Data based on the swimming behaviour of seven seals equipped with satellite-transmitters.

transmitters. With the current technique, which involves the transmitter being glued to the fur, an individual animal can be followed for a maximum of 6 months, after which the transmitter is then shed.

In addition to the wide range of the seal migration, the main conclusion from these studies is that the animals are very individualistic and despite the animals' well-directed migratory behaviour, two seals were never sighted together at sea. Due to the broad individual variation and the lack of adequate data in the most important foraging season (autumn) it is difficult to identify important foraging areas in the North Sea.

An initial distribution model has been made in the mean time (Fig 3.11). It appears that the potential habitat of the

Common Seal covers the entire DCS, but as the animals gather at the shoals of the Wadden Sea and the Delta-region, the potential concentration of seals in the coastal areas is high. This makes the Coastal Sea near the Wadden Islands and the Delta important areas for seals. As the Coastal Sea both near the Wadden Islands and near the Delta have already been designated as areas under the Habitats Directive and this overlaps with the most important area for the presence of seals, extension of the areas of the Habitats Directive in the open sea for seals does not seem necessary for now.

However, it should be noted that further analysis will possibly reject the hypothesis used here that the animals spread completely homogeneous over the rest of the area and possible "hotspots" for seals in the North Sea may occur. We

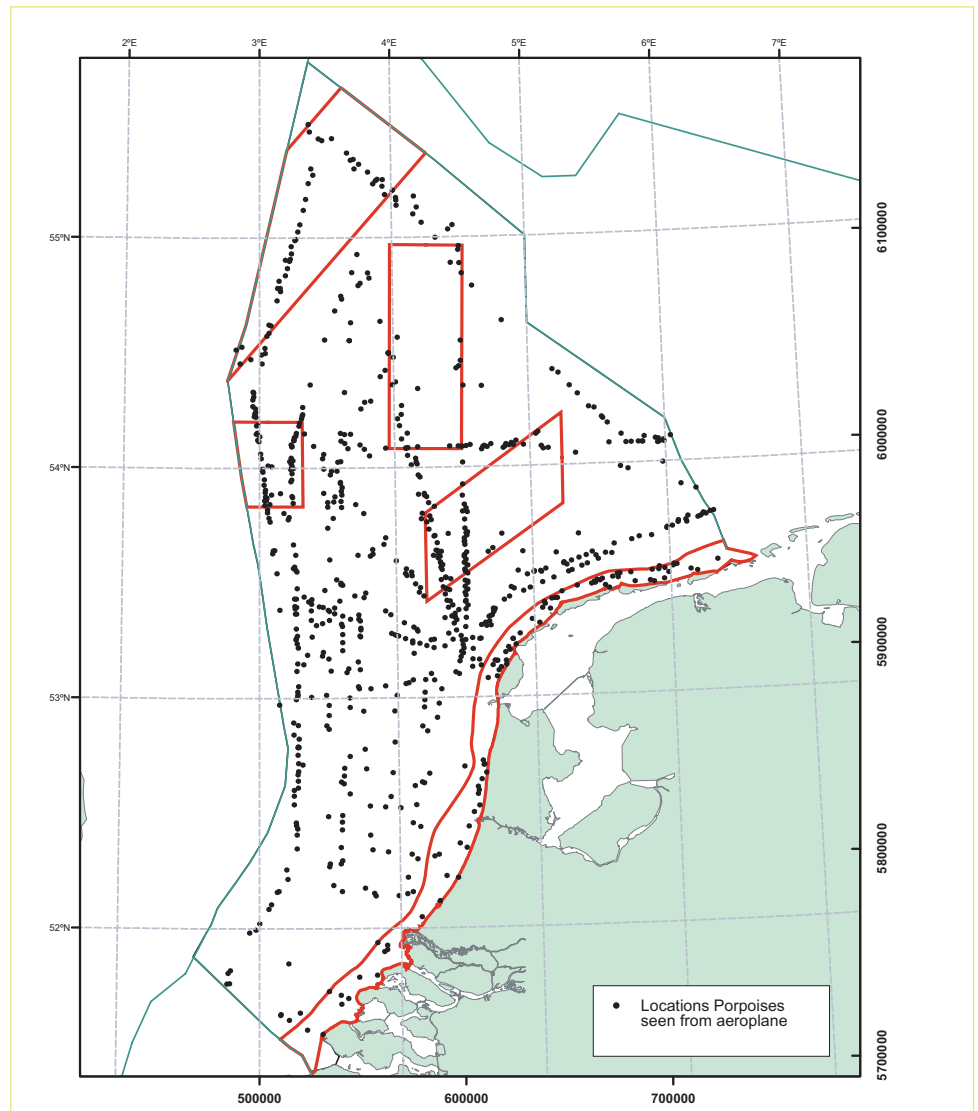


Figure 3.12: Locations where porpoises were sighted from an aeroplane during two-monthly countings of seabirds by RIKZ in the period from 1991 up to and including 2002.

expect that a combination of disturbance, geographical, physical and chemical factors will be identified that will determine the seals' choice for a particular foraging area. In the future, some protective measures will probably be necessary for these "hotspots".

Grey seal

Fairly recently, the grey seal has recolonized Dutch waters. Until the Middle Ages these animals occurred in the Wadden Sea, but they became extinct here probably due to hunting. Since 1980 the grey seal colony that uses haulout sites in the western wad, has grown exponentially and in 2003 1100 individuals were counted. In the Delta-region grey seals are also frequently sighted. No research has been

carried out into the use of habitat by these animals in the Netherlands, but it is plausible that they will overcome even bigger distances to forage than the common seal does (>200km), as with grey seals in Scotland. It will also be important to consider hotspots for grey seals in the North Sea that will need further identification.

Porpoise

Of all cetaceans in the North Sea and DCS, the porpoise is the most abundant. In the first half of the last century this species was a common sight along the coast, but from the 1950s a decline in numbers began, eventually resulting in a virtual absence in the 1970s and 80s. In the 1990s, however, the species made a strong comeback, with numbers still

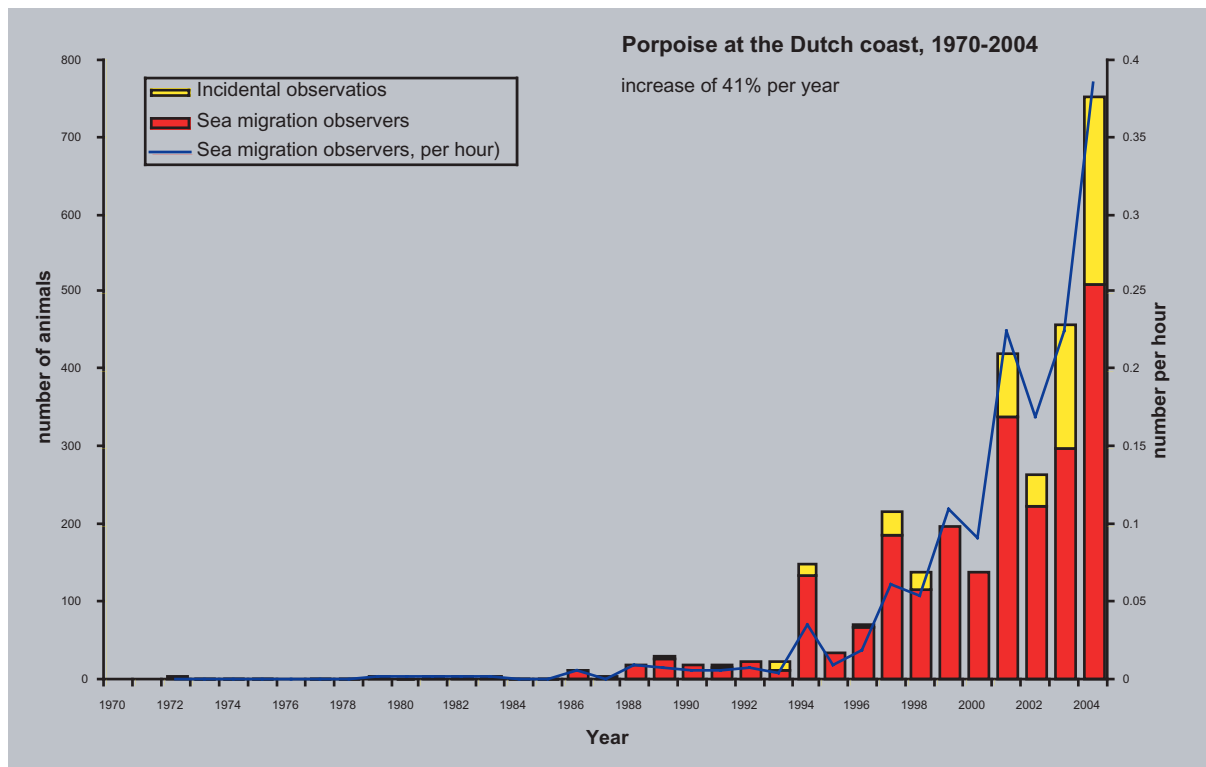


Figure 3.13: Number of sighted porpoises in the Dutch Coastal Sea since 1970, as calculated from incidental sightings (yellow bars) and systematic observations (red bars), and the long-term trend (blue line; numbers per hour)²⁷.

increasing and an ever-growing range.. Porpoises are difficult to count at sea, but they seem to be most abundant in a wide zone that crosses the central part of the DCS (Figure 3.12). Many porpoises have been spotted in the Coastal Sea, with numerous observations from ships. Observations from the coast by the Dutch Seabird group show that the porpoise is not only sighted more frequently (Figure 3.13) but that it is spreading further southward as well. Until recently, the species has been scarce in the Southern Bight but recent counts have revealed high densities off the Noord-Holland coast, particularly in winter and spring. Counts from aeroplane by RIKZ also show the highest presence in winter and spring. It is currently not possible to designate Special Areas of Conservation for the species as the numbers of porpoises are increasing strongly in Dutch waters and it is not yet sufficiently clear whether there are important, fixed areas of concentrations at the DCS.

Other cetaceans

The **white-beaked dolphin** is the most frequently occurring of the other species of cetacean that have been observed in Dutch waters (be it alive or washed ashore dead)²⁸. The major area of the distribution, however, is situated outside the Dutch waters, in particular the northwestern part of the North Sea. Groups are occasionally known to come from this area all the way into Dutch waters, possibly via the Outer Silver Pit, a deep channel lying southwest of the Dogger Bank and ending up in the area of the Cleaverbank / Botney Cut. The occurrence of the species on the DCS is infrequent and there are no special areas to be designated that are considered important for this species in the Netherlands.

The **bottlenose dolphin** was present in the first half of the twentieth century in the Coastal Sea near Den Helder and in the Marsdiep. A group of about 40 animals were present here in the 1930s, disappearing however after the closure of the Zuiderzee. Nowadays only about 130 bottlenoses are present in the North Sea, in northeastern Scottish waters. In France, Wales and Ireland several hundreds animals are also living in the coastal waters. Therefore the sudden appear-

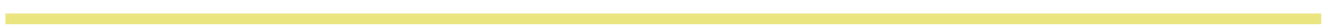
ance of several (possibly up to 100 individuals) of bottlenoses near Den Helder in August and September 2004 was remarkable²⁹. It remains unclear whether this is a coincidence or they are the offspring of the Dutch bottlenoses rediscovering their previous habitat at the western entrance of the Wadden Sea. The area is potentially important, but there is not enough information to designate it as Special Area of Conservation for this HD species.

3.7 Conclusions

This study shows that all areas mentioned in the National Spatial Strategy contain special ecological values. Applying the definitions, the Dogger Bank, the Cleaverbank and the Coastal Sea come under the criteria of the Habitats Directive and the Coastal Sea and the Frisian Front come under the criteria of the Birds Directive. In all areas including the Oyster Grounds, a high biodiversity of zoobenthos was observed, which is one of the criteria under OSPAR. In this the Frisian Front appears to accommodate a high concentration of *Arctica islandica*.

The Coastal Sea has the highest biodiversity of fish, however this decreases further seaward. As far as they occur on the DCS, the fish species that are mentioned in the Habitats Directive are found virtually exclusively in the Coastal Sea. Data on fish distribution do not justify the designation of other Special Areas of Conservation at the moment. Too little is known about the distribution of marine mammals, except about those in the Coastal Sea, to indicate whether there are additional areas that fall under the criterion of the HD valid for these animals. For these species, that are mentioned in the Annex of the Habitats Directive, a generic protection is applicable.

Adequate data exists on particular habitats and on the distribution of zoobenthos and birds to identify the boundaries of the areas with increased ecological values. This has been elaborated further in Chapter 5.



4 Use of the North Sea

4.1 Methods

In this chapter we present the various forms of human use at the North Sea (based on the North Sea atlas, 2004³⁰; (Ministry of Agriculture, Nature Management and Food Quality: Research program 418)³¹, IMPN 2015³²) based on literature sources and policy memorandums were used for information on the future developments in use (2015). Finally, we assessed to what degree the activity affects the

natural values of an area that are to be protected. The latter's objective is not to undertake a comprehensive overview of impacts, but to indicate the areas of likely conflict between nature conservation and the occurrence of activities. This study, therefore, has not been comprehensive.



Wind turbines at Horns Rev (Denmark) (photo Rijkswaterstaat)

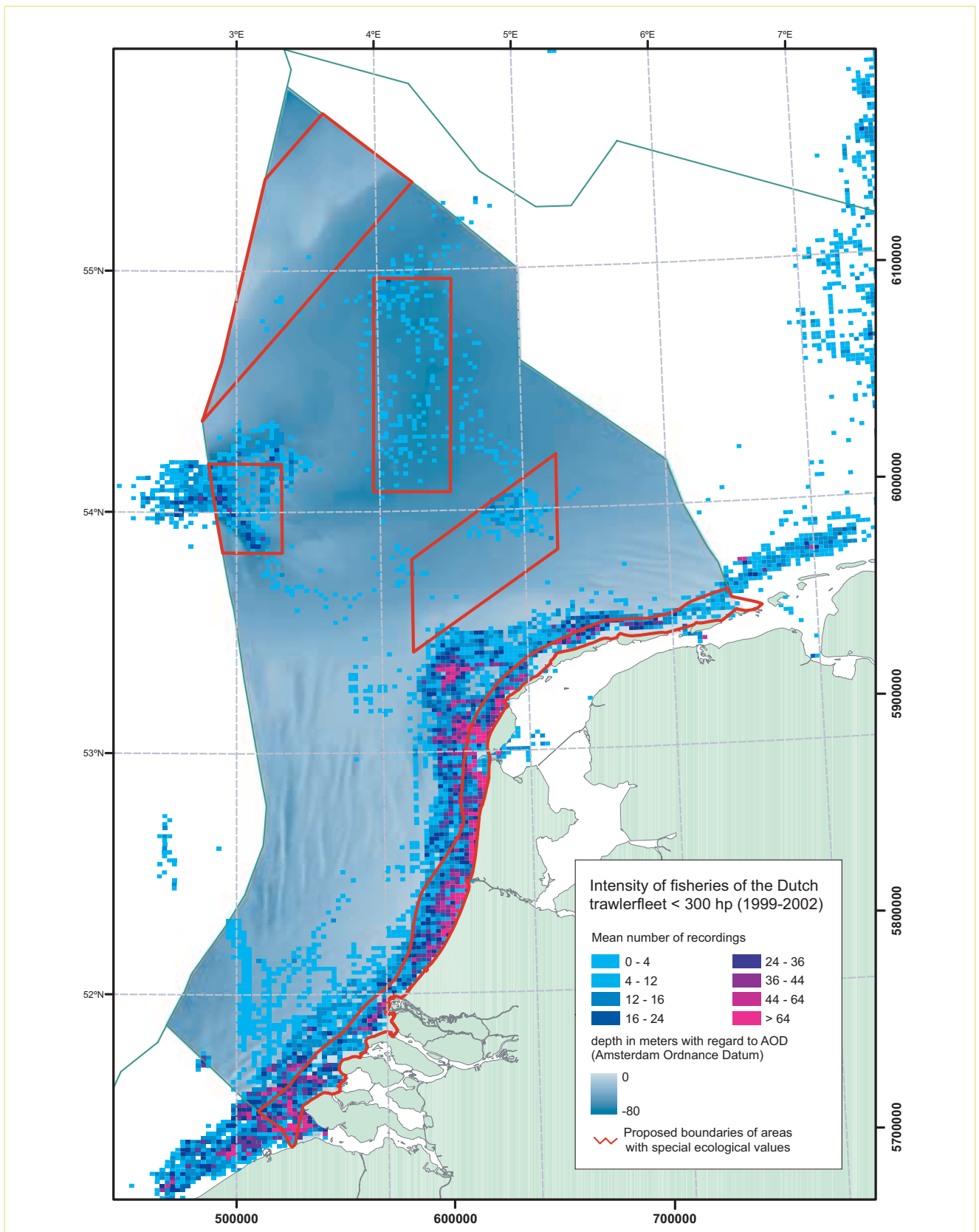


Figure 4.1a: Intensity of fisheries of the Dutch trawlers with an engine power < 300 hp. ³³

4.2 Fisheries

Current use

Trawlers (mainly fishing for flatfish species such as sole and plaice) and freezer trawlers (mainly fishing for pelagic fish species such as herring and mackerel) fish intensively on the DCS. Within the Plaice box^a (north of the Wadden Islands and in the German Bight) only vessels with an engine power of less than 300 hp are allowed to fish.³⁴ These ships (so-called Eurocutters) fish in the coastal zone mainly for sole, plaice and shrimps. In addition, shellfish fishermen fish in particular in the Voordelta for clams such as cut trough shell (*Spisula subtruncata*) and American jack-knife clam (*Ensis directus*)³⁴. The biggest fishing effort by the Dutch fleet is located in the southern part of the DCS, which includes the Coastal Sea, the Frisian Front and the Cleaverbank. At the Oyster Grounds fishing activity occurs but at the Dogger Bank effort is relatively low.

Future developments

Sea-fisheries are mainly regulated by the EU using the Common Fisheries Policy³⁶. The EU is aiming to achieve sustainable fisheries. In principle, future developments will be in line with the decreasing commercial fish stocks. The objective is to achieve this, for example, by assigning quotas and bringing the capacity of the fleet in line with the sustainable use of fish stocks. The EU stimulates innovative research into selective and environment-friendly fishing gear and sustainable aquaculture.^b

Effects of use

The most important effects of the fishing activity are the catching of fish and (for trawlers in particular) the disturbance to the seabed, which causes the smothering of zoobenthos³⁷. Fishing activity has negative effects on the composition of the population of the entire fish community in the North Sea. Fishing is aimed at the larger and commercially interesting fish species, but the amount of so-called discards (undersized and non-marketable fish that are thrown back – dead – into the sea) is considerable. This has caused a strong reduction in spawning stocks and the growth of young animals. Changes in the fish population in the North Sea may affect the entire food chain of the North

Sea ecosystem, but our knowledge is currently inadequate to be more specific about this.

Trawler fishing catches or damages a considerable part of the zoobenthos community. The direct mortality of shellfish in the track of a trawler amounts to between 12 and 84%. The mortality of worms is considerably lower (1 to 14%)³⁸. Frequent fishing of an area leads to a change of species composition of zoobenthos. Over half (55%) of the DCS is fished more than once a year and only 14% less than once every four years³⁹. Another effect of fishing activity (trawler and gillnet in particular) is that of the by-catch of marine mammals.

In addition, the ecosystem is affected by the dumping overboard of discards (which attracts many birds) and by the effects on the sediment balance (turbidity and sedimentation).

^a Since 1989 it is not allowed to fish in the plaice box with trawlers and board-trawlers with an engine power of over 300 hp

^b Edwin Meeuwssen, LNV Directie Visserij (Ministry of Agriculture, Nature Management and Food Quality, Directorate Fisheries, pers. communication)

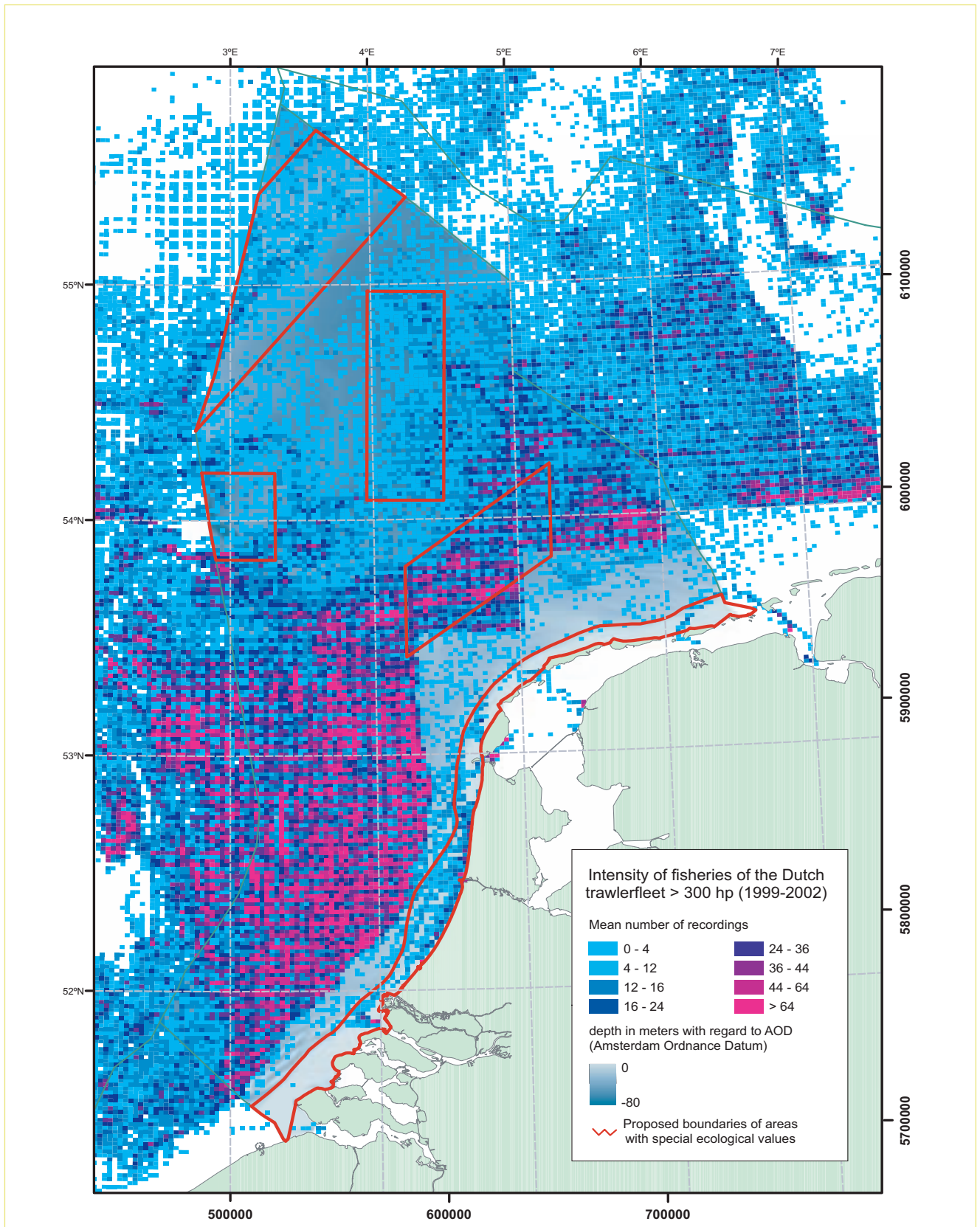


Figure 4.1b: Intensity of fisheries of the Dutch trawler fleet on the DCS. The area within the 12-mile zone and within the so-called 'plaiice box' (protected nursing grounds for plaiice) is closed to trawlers with an engine power > 300 hp



Beam trawler (photo archives RIKZ).

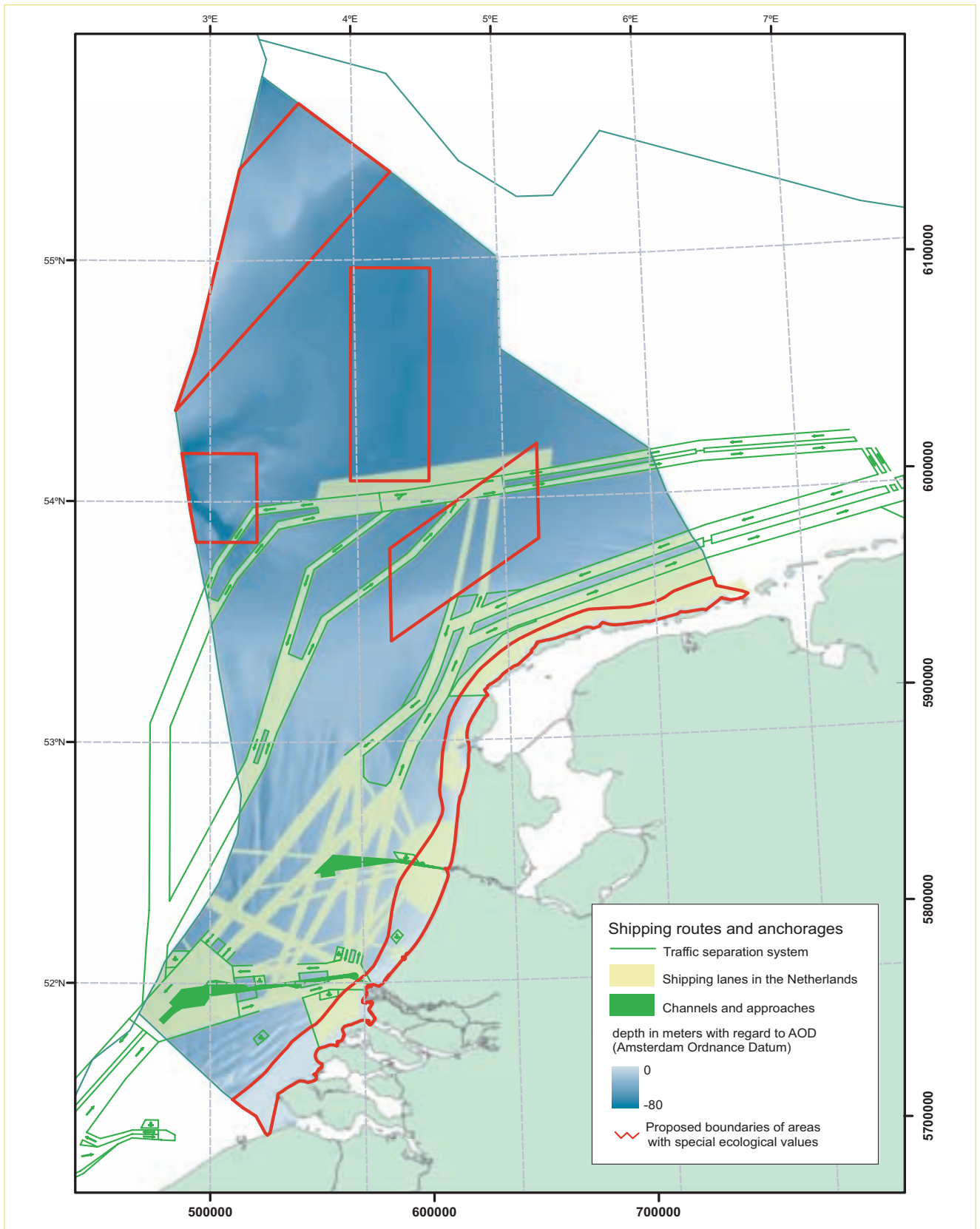


Figure 4.2: Location of shipping lanes on the DCS. About half of the shipping on the DCS is route-bound (After: North Sea-atlas, 2004).

4.3 Shipping

Current use

The North Sea is one of the world's busiest shipping areas. Annually 260,000 shipping movements take place at the DCS⁴⁰. These intensive traffic movements are directed by traffic separation systems in the North Sea. The main lanes are situated close to the 12-mile zone, but further offshore as well, off the Frisian Front. In addition, special entrances (deep water lanes) to the main ports have been fixed, with adjoining anchorages. The total lane system covers an area of about 2400 km² (4% of the DCS)⁴¹.

About 52% of the total shipping is route-bound and 48% non-route-bound. The route-bound shipping consists of 50% cargo trade, 25% tankers, 14% bulk carriers and 10% container ships. The non-route-bound shipping consist of 20% work shipping, 60% fishing boats and 20% recreational shipping.⁴²

Future developments

We are expecting negligible changes in the amount of goods-transport on the DCS. Whilst there will be a tendency towards increasingly larger ships, short sea shipping (as an alternative to transport by road) will be encouraged.

Effects of use

The risk of large-scale accidents increases with the increase in the number of large ships (e.g. oil tankers or chemical tankers). As a result of operational discharges, oil ends up in the marine environment. Ships discharge 5,000 to 13,000 tons of oil per year on the DCS, the larger part of which is a result of illegal discharge. Oil pollution affects, amongst other things, bird populations. The percentage of birds covered in oil on the Dutch coast has been decreasing over the last few decades, but is still high compared to that of the surrounding North Sea countries.

The fuels used contain harmful components and they contribute to air pollution that partly ends up in the water again by atmospheric deposition. TBT (Tributyltin) and copper from anti-fouling paint used on ships have ended up in the marine environment and may cause so-called imposex in molluscs such as dogwhelks and whelks. The EU has banned application of TBT since 2003 and a ban on the presence of TBT on ship's shells will take effect in 2008. Exotic species are introduced in Dutch waters by the discharge of ballast water that was taken in elsewhere. These may consist of toxic or potentially toxic phytoplankton species or of organisms that effect the ecosystem balance. It has been calculated that, on average, once every 4.1 years a

new species is being introduced to Dutch waters via ballast water⁴³.

The noise of ships when sailing, and also the sheer presence of ships, may lead to disturbance of birds and marine mammals. Not much is known about the effects of underwater sounds, but experts think that these are minor.

A considerable amount of waste from ships ends up in the sea. 46% of the amount of litter on beaches originates from the sea (including polystyrene foam, pallets, fish crates, ropes, nets, plastic and metal containers, lamps, industrial gloves and the like⁴⁴). From research it appeared that 96% of the Northern Fulmars have plastic in their stomachs.

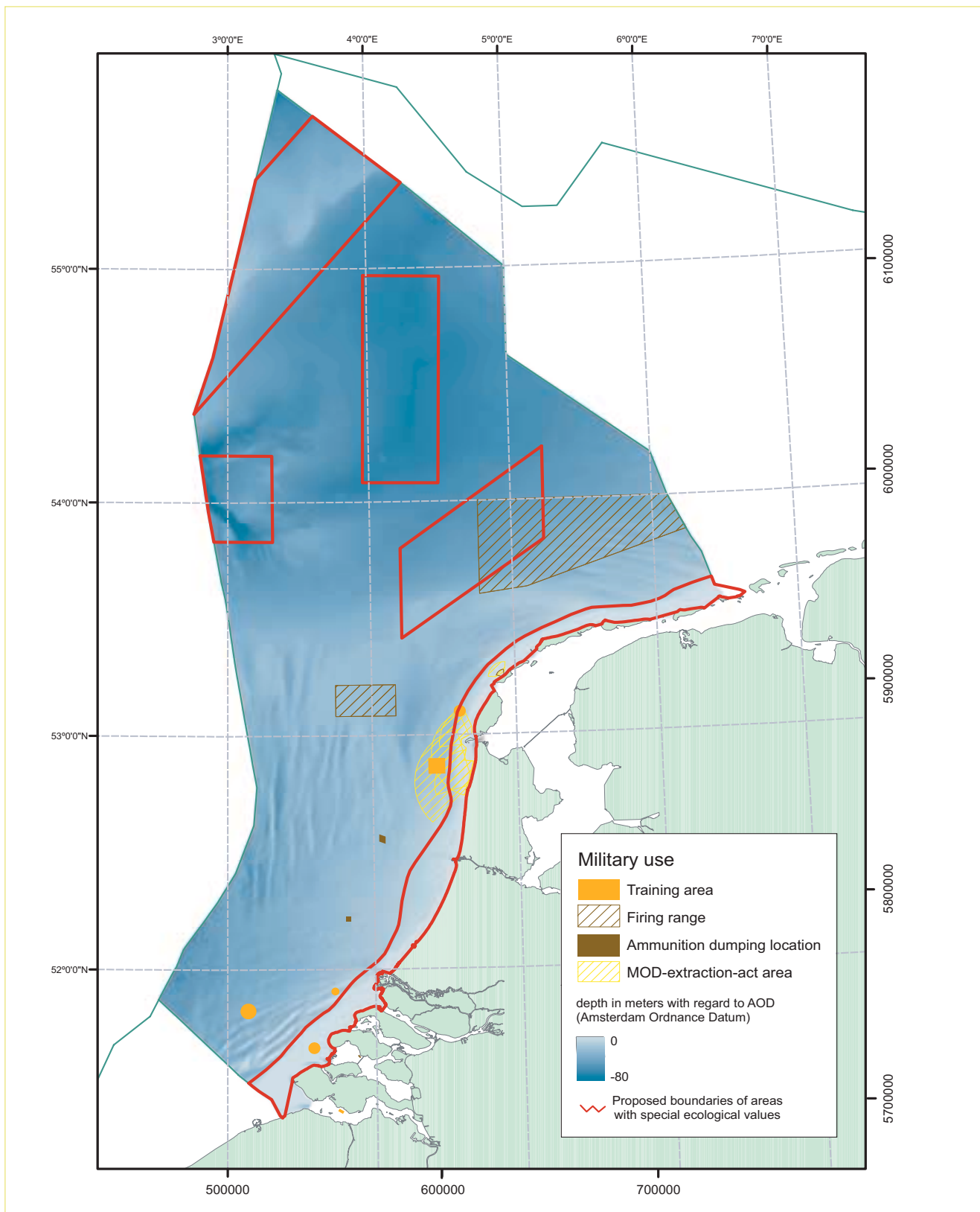


Figure 4.3: Areas in the North Sea designated for military use. The training areas offer practice in the deposition and detection of mines. In the firing ranges there is artillery training with aeroplanes, ships and from land. Redundant stocks of ammunition have been dumped in the ammunition dumping areas. Restrictions on other user forms are valid in so-called MOD-extraction act areas (North Sea Atlas, 2004)

4.4 Military activities

Current use

An area of 4200 km² (well over 7%) of the DCS is used for military purposes. This is divided into areas for artillery training, areas for flying practices, areas for practices with mines and for (former) ammunition dumps. When practices are not taking place, these areas are used by the fishing industry and (non-route-bound) shipping.

The dumping areas have not been used for a considerable amount of time due to the total ban on ammunition dumpings in the North Sea. However, the old stocks still remain⁴⁶.

Future developments

The Ministry of Defense (MOD) will soon close two firing ranges near Den Helder (from where firing at sea occurs). The sea parts that are unsafe will remain about the same size, however, because they overlap with the firing ranges that remain. It is not expected that in the near future many changes will take place in the use of military areas by the MOD on the DCS⁴⁷. With respect to the increasing pressure on space in the North Sea, combinations of training areas with other functions (e.g. sand extraction) will be considered more often.

Effects of use

Ammunition remnants end up in the sea during artillery training. Ammunition consists mainly of (heavy) metals, but the composition differs per type of ammunition. Most frequent materials are copper, lead, aluminium, steel, magnesium, chromium, molybdenum, potassium and vanadium. The total impact, however, is minor and the ammunition remnants usually penetrate the upper layer of the seabed, so that harmful substances are slowly released and the effects are only very local and temporary⁴⁸.

In addition to the chemical loads, artillery trainings may lead to disturbances by noise pollution. Low-flying aeroplanes and helicopters may lead to acoustic disturbances. Low-flying helicopters (flying at a height between 30 – 300m) may disturb foraging birds⁴⁹. Finally, little is known about the degree of sonic underwater disturbance by aeroplanes and helicopters, but it is believed that this effect is minor.

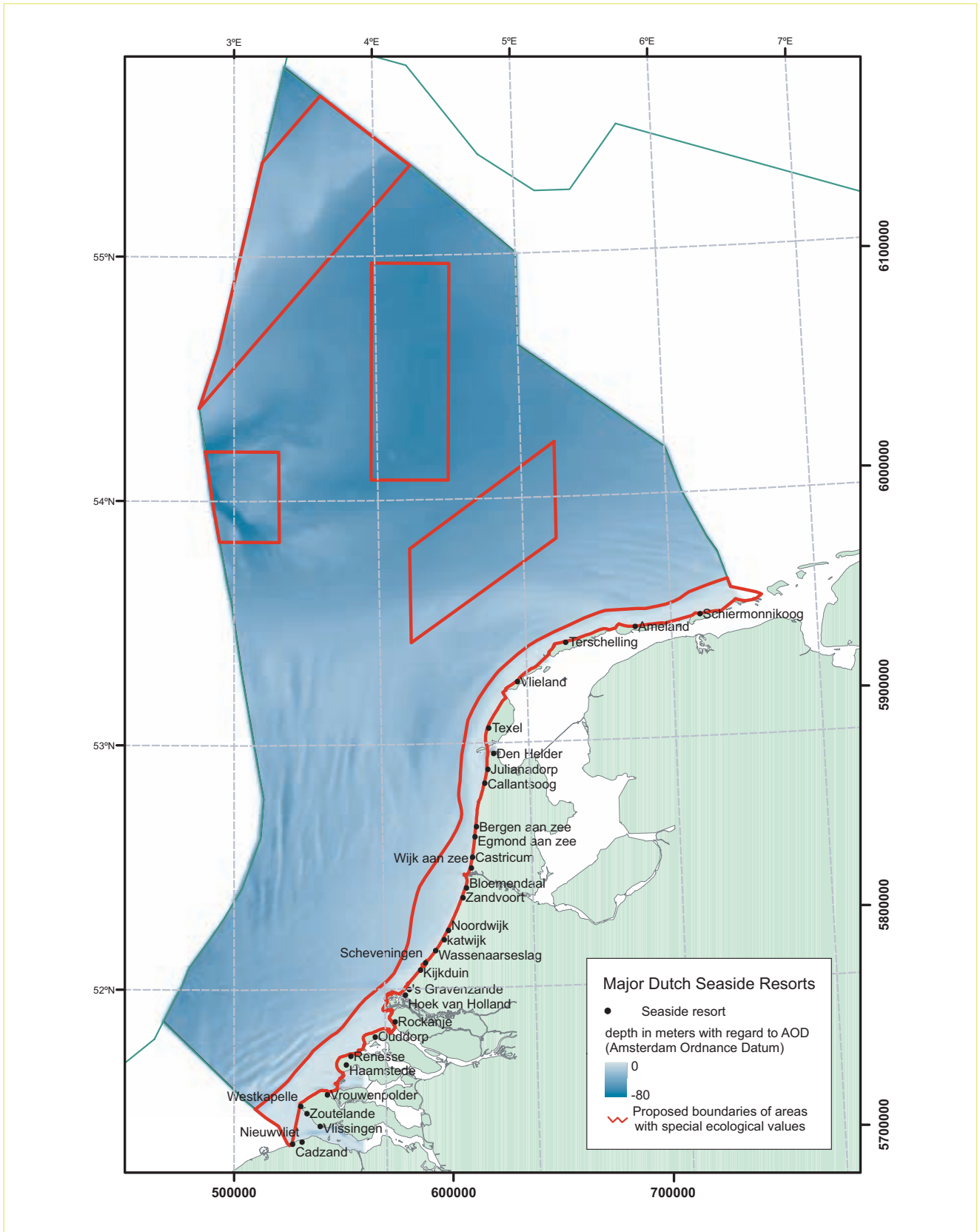


Figure 4.4: Beach recreation takes place at virtually every beach along the entire Dutch coast.

4.5 Recreation and tourism

Current use

The North Sea coast is an attractive area for beach recreation, water sports and angling. Water sports also take place in the North Sea (sailing and cabin cruiser shipping). Tourism and recreation occurs at about 1750 km² of the Dutch coastal zone; this corresponds with 3% of the DCS⁵⁰. Measured in visitor numbers, the North Sea coast is the most important recreational area of the country. The number of day-trippers visiting the Dutch North Sea coast amounts to about 8.3 million a year. In addition to these day-trippers, about 7.5 million nights are spent in the resorts along the North Sea⁵¹. Anglers fish in the North Sea from the shore (beaches and sea-dikes) and from boats. Recreational shipping mainly takes place in the coastal zone, but crossings to England are made as well.

Future developments

No major changes are expected in the use of beaches and in angling⁵².

The water sports sector mentions a growth in recreational shipping along the coast and to England. There is a requirement for an increase in the number of marinas along the Dutch coast (e.g. initiatives in Katwijk, Hoek van Holland and Petten).

Effects of use

Beach recreation can lead to disturbance. The beaches along the mainland of Noord-Holland and Zuid-Holland are no longer suitable for seals and coastal summer birds.

Holidaymakers are producing waste into which animals may become entangled or which they may eat. 15% of the litter that is found on the beaches originates from holidaymakers and 1% is dumped from land. Holidaymakers mainly leave plastic food containers and paper. Mechanical maintenance of the beaches may have some negative effects on the zoobenthos in the long run.

Anglers can take a considerable amount of fish from the coastal zone. Fishing lead and nylon fishing-lines are frequently lost in the water and animals may become entangled in fishing lines.

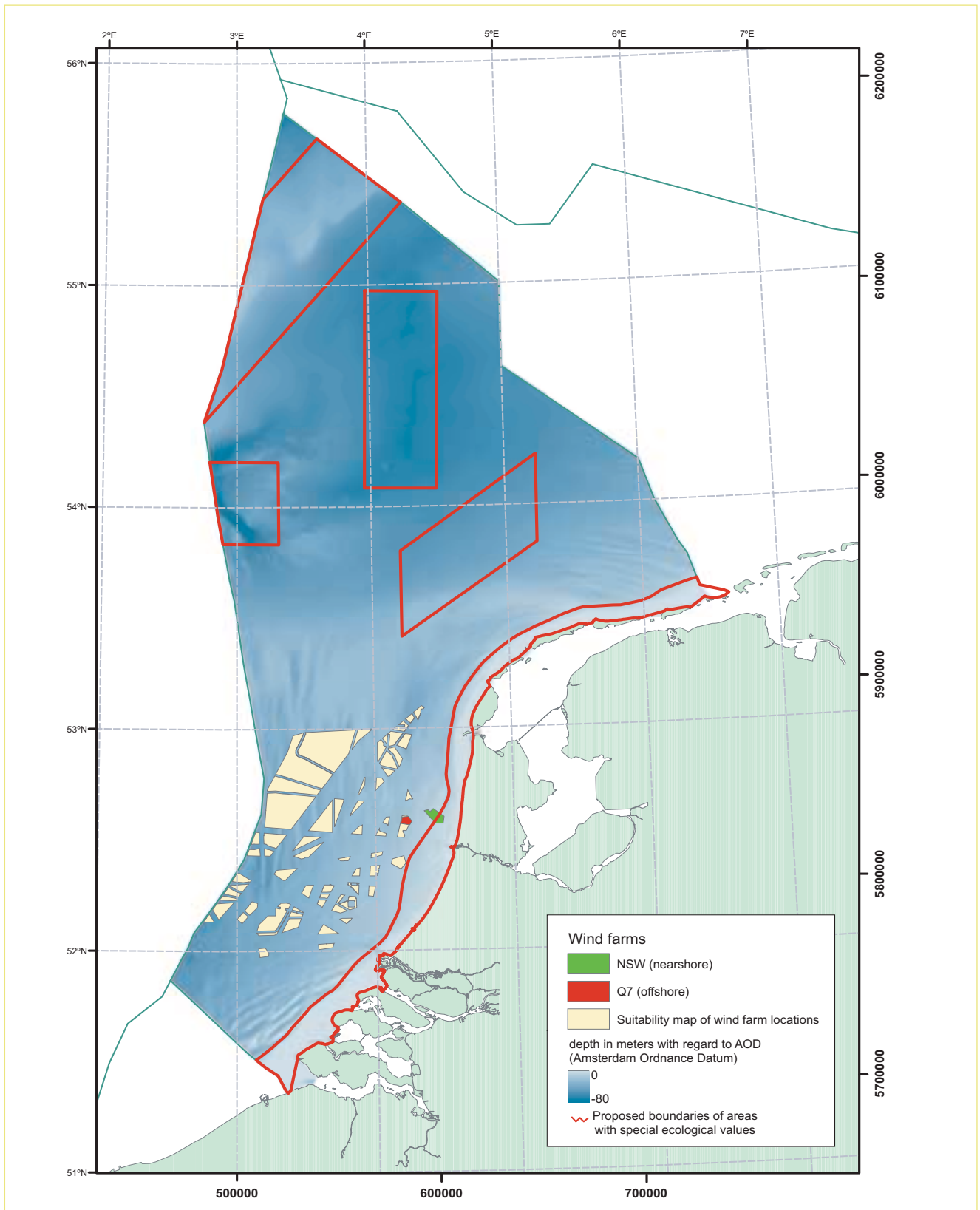


Figure 4.5: Permits have been granted for two wind turbine parks on the DCS: the Near Shore Wind park (NSW) within the 12-mile zone and the offshore park Q7 at 23 km off IJmuiden. The light-coloured areas indicate favourable locations for future wind turbine parks (After: North Sea-atlas 2004 and IMPN 2015)

4.6 Wind energy

Current use

The Netherlands are aiming at an output of 6000 MW by 2020 by means of wind turbine parks in the North Sea within the scope of the Kyoto declarations for renewable energy. Realization of these wind farms up to a total output of 6000 MW in the EEZ is occurring for “compelling reasons of great public importance”⁵³. The required sea area is about 1000 km². The policy is for the wind turbine parks to occur outside the 12-mile-zone, except for the Near Shore Wind Park. Currently there are no large-scale wind farms in the Dutch part of the North Sea ready for use although permits have been granted for two wind farms, the Near Shore Windpark (NSW, 8 miles off the coast of Egmond)⁵⁴ and the Q7-park off the 12-mile zone⁵⁵. It is expected that construction will start in 2006. Together these wind farms, their safety zones included, cover an area of about 50 km².

Future developments

In accordance with the policy to aim for an output of 6000 MW from wind farms by 2020 in the Dutch part of the EEZ, we are expecting an increase in the number of requests from 2005 onwards. In view of the current technology this means that the total space required is about 1000 km². This makes the zone immediately beyond the 12-mile-zone off the Holland mainland coast the most appropriate with respect to depth and vicinity of landing points at Beverwijk and at the Maasvlakte. Establishment of wind turbine parks will be prohibited in existing exclusion zones (incl. safety zones around cables and pipelines, shipping lanes, sand extraction areas and MOD-restricted areas). Whether the growth to 6000 MW by 2020 will be possible will depend on the readiness to invest by the market parties, the degree to which costs will be reduced and the degree to which the parks can be implemented from an ecological point of view.

Effects of use

During the preparation and construction stages of wind farms there may be disturbance as a result of seismic research, the sinking of piles and from transport and working traffic. In addition, stirring up of sediment from the seabed may cause turbidity. These effects on the ecosystem are minor and short-lived⁵⁶.

Turning wind turbines may cause physical damage to birds. Flying birds may bump into the rotor blades or the wind turbine tower and may get hurt or die⁵⁷⁺⁵⁸. Besides this immediate mortality, wind farms may lead to the forming of a barrier (migrating birds may change their flying routes) and disturbance (by presence of (turning) wind turbines)⁵⁹.

The towers, and the rip-rap around them, are a suitable substratum for sessile (permanently attached) plants and animals. In addition, a safety zone of 500 m will be created around a wind turbine park, from which other activities such as shipping and fishing are excluded. This will create a protected habitat within the wind farm that will possibly function as a refuge area for fish and zoobenthos and potentially for birds⁶⁰.

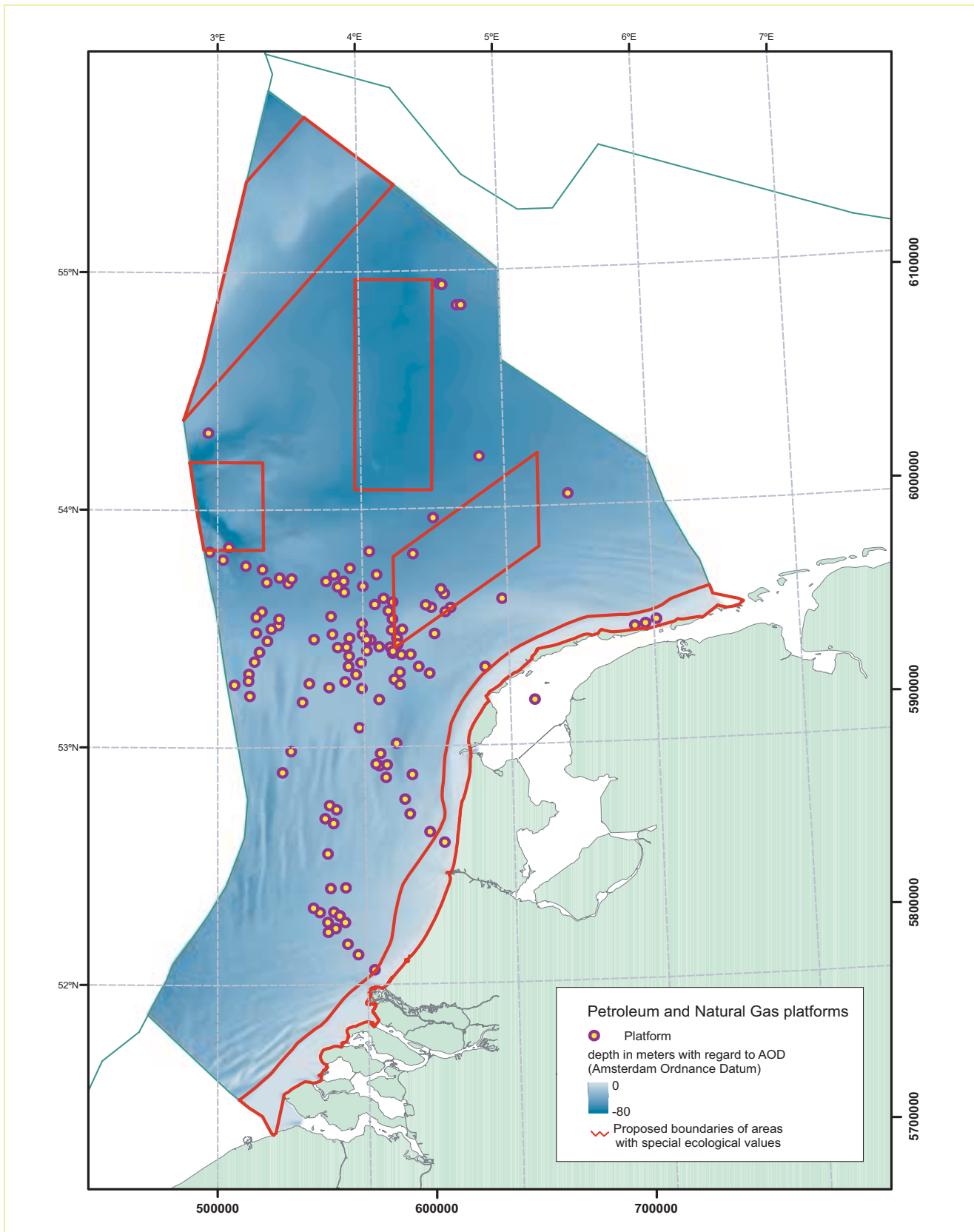


Figure 4.6: Petroleum and Natural gas platforms on the DCS (After: North Sea atlas, 2004).

4.7 Oil and gas

Current use

Currently, there are about 130 production locations at the North Sea. At 10 of these locations only oil is extracted, both oil and gas are extracted at a few and gas only at a number of others. Most platforms are situated in the central part of the DCS. A relatively high concentration is found in the southwestern part of the Frisian Front. A few platforms are located in the Coastal Sea and a few more scattered in other areas.

In 2001 about 29 billion m³ gas were extracted from the DCS (this is about 40% of the total Dutch production) and about 1 million m³ oil (this is 65% of the Dutch production)⁶¹. The produced gas and/or oil are transported via pipelines to land.

Future developments

The Dutch oil and gas reserves are declining. Exploration and exploitation of new (small) reserves depends on the world oil and gas prices. With regard to the areas considered in this report, drillings and new platforms (oil and/or gas) are expected at the Frisian Front (10 drillings and 4 platforms respectively), in the Coastal Sea (11 drillings and 2 platforms) and probably in the Central Oyster Grounds, the Cleaverbank and the Dogger Bank.

Effects of use

A platform causes disturbances in various ways during its life of about 20-30 years. During the preparation stage before construction there are a few weeks of seismologic research. This causes some disturbance by vibrations from explosives. During the drilling stage (2-3 months) noise is produced and dumping of drilling mud and drilling dust occurs. During the production stage there are emissions into the air (CH₄, CO_x, NO_x, SO_x, VOC, soot) and into the water (waste water, production water (during oil extraction in particular), benzene, heavy metals, oil and PAHs).

The impact of the release of substances into the air is local and minor due to the dilution effects of the atmosphere. The impact of substances in the water is minor and local due to the dilution effects of the water column but the latter, however, depends on currents (the formation of plumes may occur). Since 1993 it has been prohibited to dump drilling dust containing oil. During exploitation generators constantly produce noise. Little is known about the effects of underwater noise on fish and marine mammals. In the air noise seems to have little effect on birds.

The impact of permanent lighting on the platforms is significant, in particular on migrating birds that become disoriented⁶²⁺⁶³. Recent research has revealed that adjustment of the colour of the lights may reduce this effect.

Flaring off, for instance in borehole tests, may be hazardous to birds as well if it occurs at night or when visibility is poor.

The number of incidents (blow-outs, crashes, spills, pipeline incidents) is small and their impact is generally local. The industry is paying much attention to implementation of environmental policy by obligations of effort and the realization of the Integral Environmental Terms of Reference for the sector⁶⁴.

Generally, there is a zone of 500 m around the platforms in which other activities are excluded due to safety considerations. A refuge areas may be implemented here in view of the impact of fishing activity in particular. In addition the platform poles create a new hard substratum on which plants and animals may develop. This can be as much as 1500 tonnes of biomass per platform.

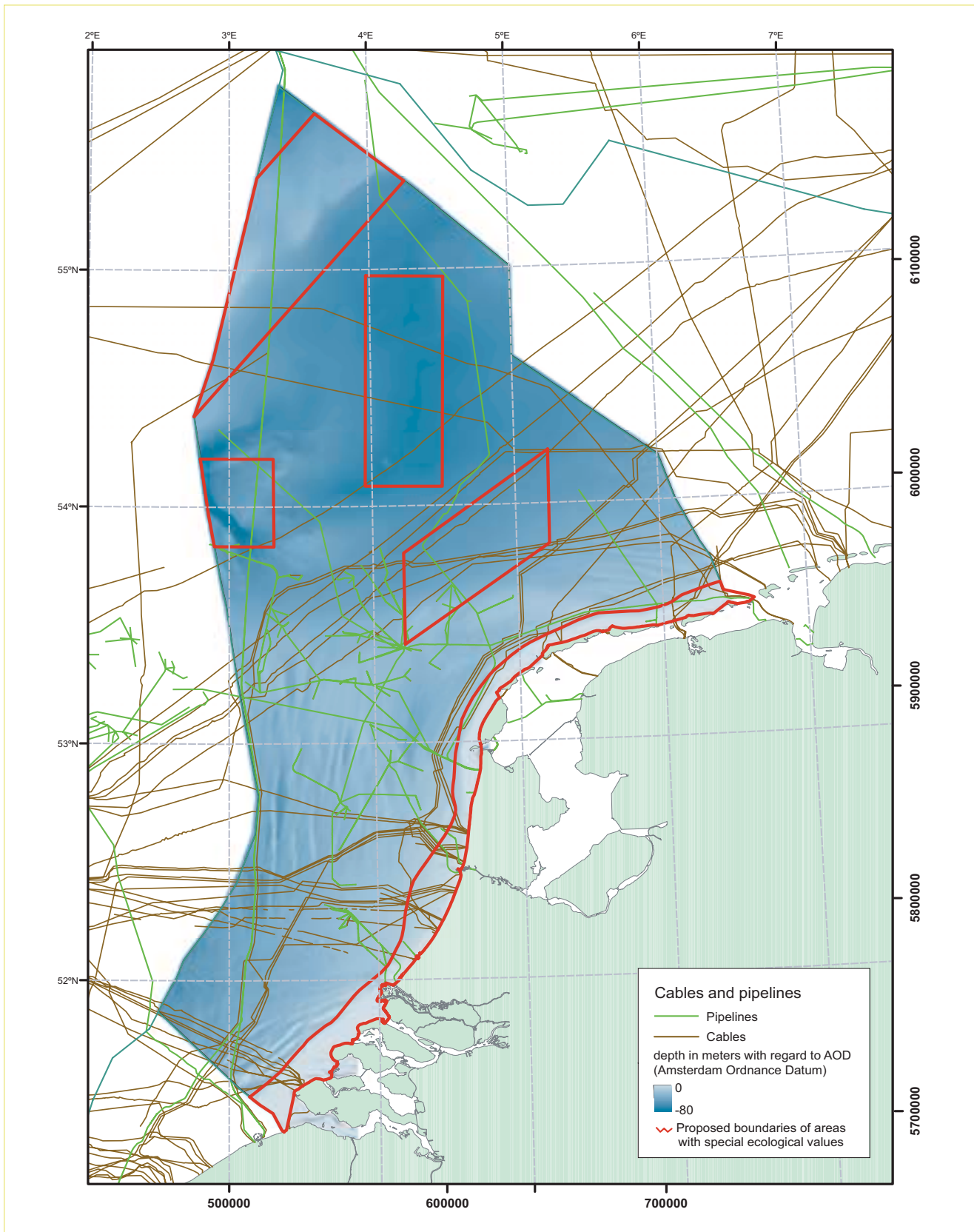


Figure 4.7: Cables (electricity and telecom) and pipelines (oil and gas) on the DCS (After: North Sea Atlas, 2004).

4.8 Cables and pipelines

Current use

On the DCS some 2500 km of pipelines and some 4000 km of cables are present, mainly in the southern part of the area. Within the proposed protected areas, many cables and several oil and gas pipelines are present mainly in the Coastal Sea. These are concentrated around four landing points for cables and around three (partly other) landing points for oil and gas. The other proposed areas are crossed only by an odd cable or pipeline.

Future developments

The development of wind farms at sea also requires cables to transport the produced energy to the mainland. At present, research has been carried out on the most suitable design of this landing (individually or bundled), within the scope of the Connect-2-project of the Ministry of Economic Affairs.

Besides these “wind energy cables” only a limited increase in cables and pipelines is expected. There are currently discussions on plans for an electricity cable to England (BritNed) and a cable between Norway and Callantsog. In addition, there are plans for an ethylene pipeline and for a gas pipeline between Balgzand and Bacton (England).

Effects of use

In general the impact of cables and pipelines is local and marginally negative during construction. The chance of leaking is low and its effects are generally considered to be minor. During the construction stage and any possible breakdown stage, turbidity of the water may occur and the zoobenthos of the cable track affected. During the use of electricity and telecom cables, electrical and magnetic fields are generated but their exact impact remains unclear. Minor amounts of Al and Zn are released due to cathode protection. Due to dilution the impact on the environment is minor.

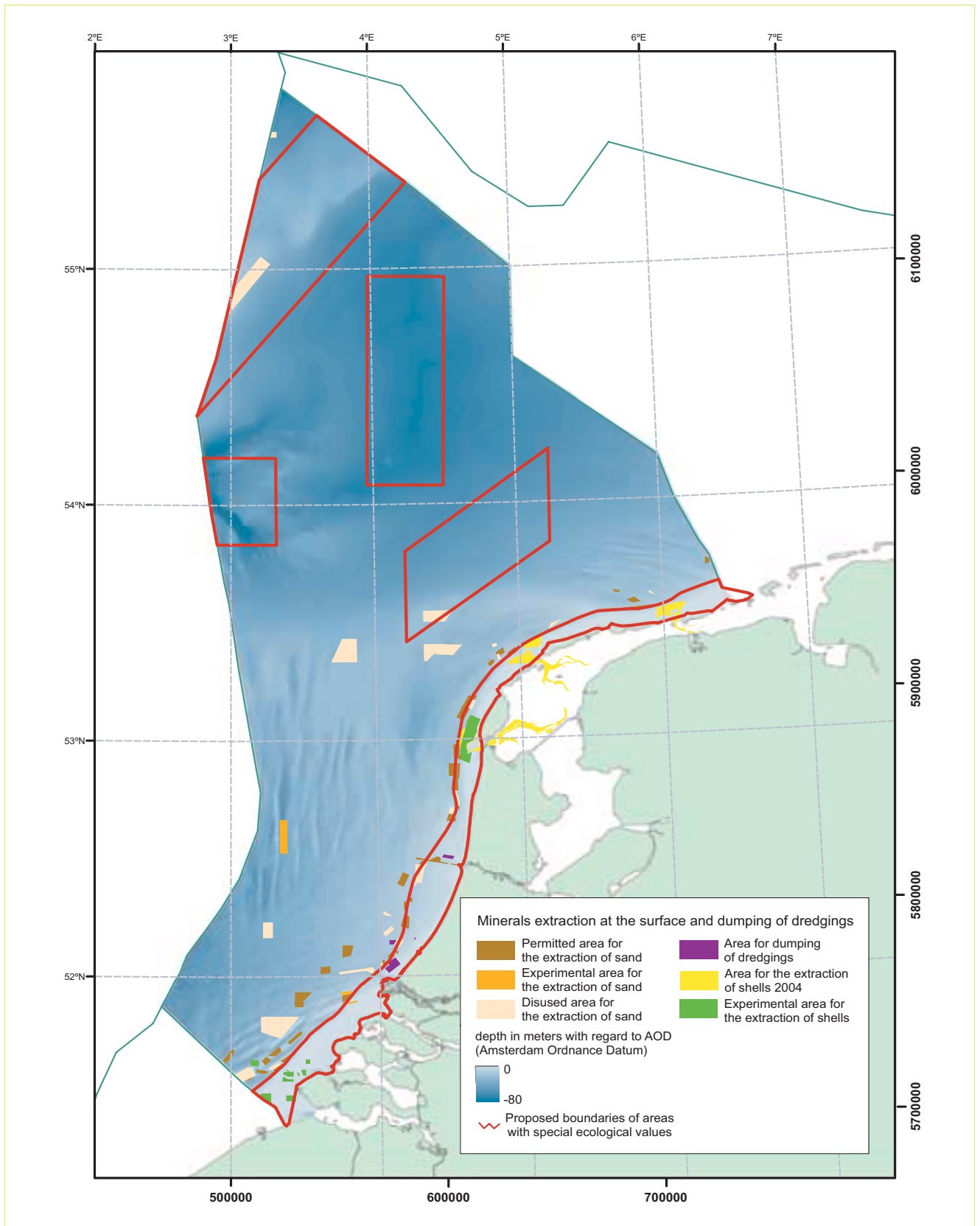


Figure 4.8: Mineral extraction, dredge disposal and sand supplementation on the DCS (After: North Sea Atlas, 2004).

4.9 Mineral extraction at the surface, dredge disposal and sand supplementation

Current use

In the North Sea extraction of minerals from the seabed (sand, gravel and shells) is taking place. In addition sand and silt are being dumped at specially designated areas and in suppletion areas to protect the coast.

Sand extraction is allowed in specially allocated sand extraction areas (these are situated below –20 m with respect to the Dutch Ordinance Level) and in shipping channels (Euro/Maasgeul and IJgeul). In the areas first mentioned, only superficial extraction takes place, which is no deeper than 2 m beneath the original seabed. Annually, about 35 million m³ of sand is extracted on the DCS, 20 million m³ of which is used to elevate areas and over 14 million m³ is used for coast protection (fore shore and beach supplementation). Part of the silt that is dredged from harbour basins and shipping channels is disposed at locations allocated for this purpose. This is only dredge spoil that meets the requirements of the ‘Uniform Content Test’⁶⁵.

At several locations in the North Sea shells (partly fossil) are extracted for use as pavement and isolation material. Shell extraction is only permitted at certain locations, deeper than –5 m below DOL. Each year the maximum amount of shell material that may be extracted from the area of the Wadden Sea and the Zeeland waters is re-established. There is no maximum for extraction in the North Sea off the coastal zone⁶⁶. No gravel is being extracted from the DCS at the moment⁶⁷.

Future developments

Apart from large-scale infrastructure building works (Maasvlakte II) we expect that only in the case of a rising economy will the annual sand demand increase. The construction of the Maasvlakte II may require about 300 million m³ in total starting from 2006⁶⁸. The required sand may be extracted by way of deep extraction (i.e. deeper than 2m beneath the existing sea bed).

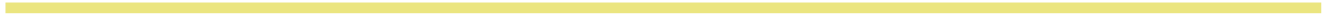
We expect an increase in the required amount of sand as a result of the shift from beach to fore shore supplementation, which will require comparatively more sand.

An equivalent of 10 million tonnes of dry matter in dredgings from the Dutch seaports is disposed of annually in the dredge disposal areas. It is expected that the current disposal locations are large enough to meet this requirement in the coming years.

Effects of use

The effects of mineral extraction occur both on the seabed and in the water column. The pressure on the ecosystem is caused mainly by the removal of substratum including the organisms that live in it or on it, by the change in sediment composition, the turbidity of the water and, in the case of deep extraction, by increased sedimentation and sometimes the formation of oxygen deficiency on the sea bed⁶⁹.

Zoobenthos will largely die off in supplementation and disposal areas due to the effects of smothering and underwater supplementation may affect *Spisula*-beds - the staple food of the common scoter⁷⁰. Beach supplementation may affect sanderlings and both species of birds are qualifying species under the Birds Directive⁷¹. Prolonged and large-scale supplementation may, in the long term, cause an effect by morphological changes of the surf zone and the beach, which may affect the biodiversity of zoobenthos⁷².



5 A closer look at the areas

5.1 Reading Guide

This chapter describes the areas in more detail. We examine the values to be protected for each area, the current use, future developments and the vulnerability of the areas to the use. The method of identifying uses and assessing its impact on the special ecological values is given below.

Where applicable, other options for boundaries are given for an area along with their justification.

Figure 5.6 shows the boundaries of the proposed areas with special ecological values. In Appendix 1 they are projected on PKB-map no 10 of the National Spatial Strategy.

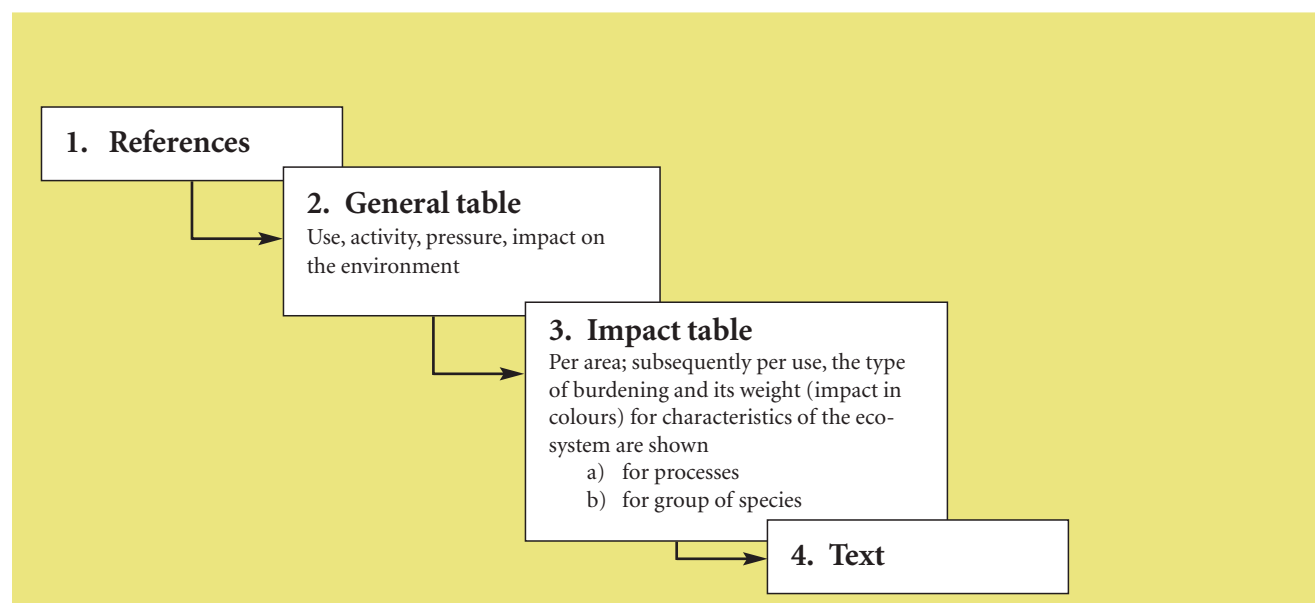
Figure 5.7 shows an overview of the values of each area, the impact of the current use and of new activities that are expected.

construction of platforms, exploitation of platforms, dismantling of platforms), what pressure they cause on the ecosystem (e.g. sound waves, emissions into the air and water, turbidity), their impact on the characteristics of the ecosystem (e.g. change in substratum, change in species composition of zoobenthos), the possible recovery time and which side effect the impact has. We refer to relevant literature. For technical reasons these tables have not been included in this report.

Impact tables

These tables (Appendix 2) have been deduced from the general tables with the help of expert judgement during a number of workshops and based on the following formula:

$$\text{Impact} = \text{pressure} \times \text{extent}$$



5.2 Methods to assess the impact of use

References

A relatively quick analysis has been made using data from existing sources. This analysis has not been exhaustive, but has been carried out in such a way that the most recent and most important references have been used. In addition, we have consulted various experts.

This research is not an exhaustive impact study, but the direction and degree of the impact may be deduced from it.

General Table

With these data general summary tables have been made. They show the type of use (e.g. oil and gas extraction), the activities that are associated with it (e.g. seismic research,

The impact tables have been created for each area (see Appendix 2). The heading of each table briefly describes the extent of the various uses in the area under consideration (e.g. much, little, high or low intensity, seasonal). The impact table indicates per use the kind of pressure to characteristics of the ecosystem and its extent according to the formula above (extent in six classes: four negative, one positive, one neutral). Two types of impact table per area have been set up:

- a) On processes affecting the ecosystem (e.g. pollution of water, turbidity of water, disturbance, extraction)
- b) On species groups in the ecosystem (plankton, zoobenthos, fish etc.)

Text

We have written the text based on the information structured in this way.

Note: Where “relatively or comparatively” is used, it is related to the other areas with natural values, unless stated otherwise.

Storage of knowledge and documentation

All the material, including the mentioned tables, is gathered as reference documents and has been put on CD-Rom as well. This information has been filed at RIKZ and Alterra.

5.3 The Dogger Bank

Short characterization

The Dogger Bank as a whole, i.e. including the English and German part, is a sandbank according to the definition of the Habitats Directive. The top (situated in the English part) is –15 m below low-low water spring tide and therefore less deep than –20 m and the bank slopes down on all

sides with a continuous coverage of sand over the entire bank. The part of the bank on the DCS has, on its western side, a higher diversity of macrobenthos, important natural values at the slopes and with a core between the 30 m and 40 m isobaths. Fronts occur frequently in summer along the southern boundary of the bank, and they may cause higher concentrations of fish and birds.

Justification for boundaries

The definition of the habitat “sandbank” requires that the eventual dimensions of the area to be protected are determined by international agreements on the lower limit of this habitat type. If this coincides with a depth of –20 m, then the part situated on the DCS will not be included. In the case of deeper lower limits a greater area will be included accordingly. Following the German definition of sandbank (see chapter 2.2), the boundary as a sandy area and the perimeter from which the slope exceeds 0.1°, can be clearly indicated. If an area adjacent to the area already submitted by Germany is chosen then it seems logical to take the corners indicated by Germany as the eastern boundary of the area to be conserved. If this is the case we propose to follow the definition of sandbank with a slope of over 0.1°

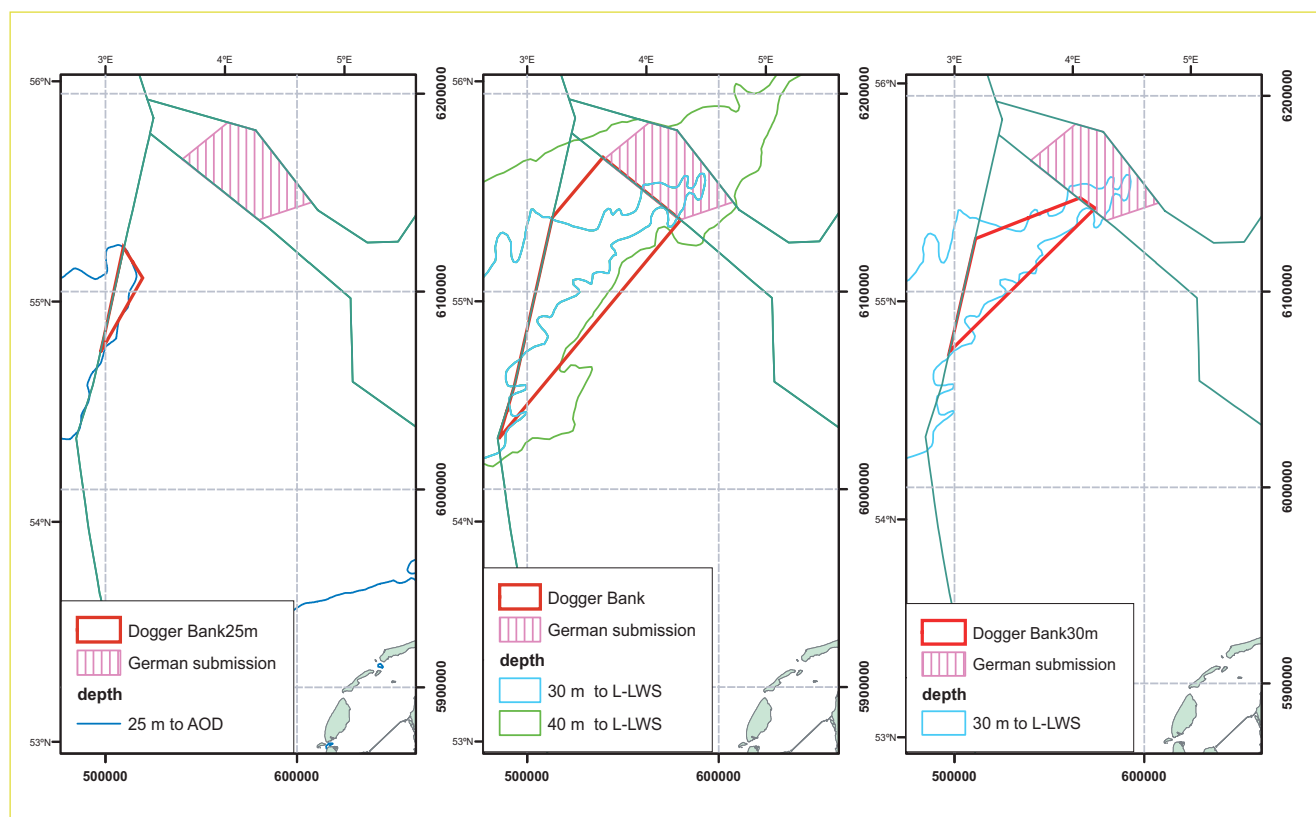


Figure 5.1: Three alternatives for the boundaries of the area to be protected at the Dogger Bank. The map in the centre shows the boundaries following the German definition of sandbank and taking into account the higher natural values between the 30 m and 40 m isobaths. The left-hand map shows the 25 m isobath to be taken into account; the map on the right shows the same for the 30 m isobath.

for the southern boundary, which means in practice that the 40 m isobath defines the boundary. To the north side this boundary is less evident and when we stick to the German definition it lies even beyond the DCS. To provide join up internationally we propose to draw a line from the German 40 m to the 30 m isobath at the boundary with the UK. With these boundaries the area meets the criteria for sandbanks of the Habitats Directive. A new situation arises if an international decision is taken to make the deep boundary less deep, e.g. at the 25 m or the 30 m isobath. This would lead to alternatives at the 25 m or the 30 m isobath respectively. Figure 5.1 shows the alternatives.

An important gas pock mark is present in this area and also a number of gas seeps or gas fountains, of which it is not yet clear whether they contain submarine structures that possibly qualify for extra protection. Research into this matter is required.

By its high biodiversity of benthos, (part of) the Dogger Bank meets the OSPAR criteria for area protection. Currently, 40% of the remaining population of thornback rays on the DCS occurs in this area. The thornback ray, however, is not included in the lists of the HD or OSPAR. As the Dogger Bank extends over the EEZ of several countries, it offers a good chance to create an internationally protected area of a substantial size.

Values to be protected

All characteristics of a sandbank; biodiversity and biomass of the macrobenthos and the thornback ray.

Current use

No offshore platforms are present within the proposed boundaries of the Dogger Bank. There is, however, one platform to the south side. One pipeline and several telecom cables cross the area.

Sand or shells are not being extracted. There is one area, however, where sand used to be extracted.

No shipping lanes are present at the Dogger Bank and the intensity of shipping is low. Only some non-route-bound traffic occurs, such as fishing boats. There are relatively few wrecks and the number of reports of discharges is relatively low.

The Dutch trawler fleet fishes relatively seldom at the Dogger Bank. It is unknown how many ships under foreign flags are actually fishing here. Other forms of fisheries - such as pelagic fisheries - rarely occur at the Dogger Bank.

Developments

It is possible that in the period to 2015 another platform will be constructed in the area of the Dogger Bank and seismic research could potentially be carried out as well. The

construction of a new telecom cable in the area is expected. No new developments are expected for other activities. In view of its distance to the coast, the Dogger Bank is not very attractive to potential developers.

Vulnerability to use

Although fishing intensity is relatively low in relation to other areas, there are negative consequences of the trawler fisheries in particular, due to the destruction of the Dogger Bank's valuable zoobenthos. Generally, long-lived species with a relatively slow reproduction rate have disappeared or have strongly decreased in numbers by fishing and disturbance of the seabed. In addition, fishing activity has effects on the demersal fish (fish dwelling near the sea bed). As most species of fish are very mobile, it is not certain whether this will have local effects and overall effects will be species specific.

Because of the relatively undisturbed nature of the area (no important shipping lanes, oil platforms, etc.), the animals in this area, birds and marine mammals in particular, are not used to disturbance. Therefore, relatively minor disturbances may have more impact than a similar disturbance in an area such as the Coastal Sea. Construction and use of a platform may lead to noise and light disturbance. The discharge of production water may lead to pollution of the water and the seabed. Effects are expected to be limited to marginal. The effects of the construction of a telecom cable are temporary and marginal.

5.4 The Cleaverbank

Short characterization

The Cleaverbank is the only area at the DCS where there are significant amounts of gravel at the surface of the seabed and where, amongst other species, larger boulders with a typical cover of calcareous red algae occur. It is the area with the highest biodiversity of zoobenthos of the DCS. It should be noted that there are large gravel and boulder concentrations at the English Continental Shelf as well, the natural values of which are higher. Conservation of this “Zuid-Limburg (southern ‘un-Dutch’ part of the province of Limburg) of the North Sea” deserves Dutch priority. The area is also potentially important for the reproduction of fish that require hard substratum, such as rays and herring. There are some indications that this used to be the case, but the current situation is unknown. There is also some evidence that birds and porpoises sometimes occur here in large concentrations; whether this is an incident or not is unknown.

Justification for boundaries

The area with boulders and coarse gravel (>6 cm), with a specific cover qualifies as “reef” according to the Habitats Directive. The gravel area and the bordering channel of Botney Cut both have a higher biodiversity of benthos that meets the OSPAR criterion. Around the gravel area, as it is mapped by NITG-TNO and RWS, a boundary has been drawn in straight lines. We propose to include the Botney Cut in the area to be protected as well, with a higher concentration of silt and a high biodiversity of benthos. This leads to two options. The first option in which only the two actual gravel areas are protected, and the second option in which the deeper area in between the gravel areas is also protected. Both options are shown in Figure 5.2.

Values to be protected

All ecological values of the coarse gravel area, in particular the rocks at the surface with their specific algae. The benthos in between has a high natural value as well.

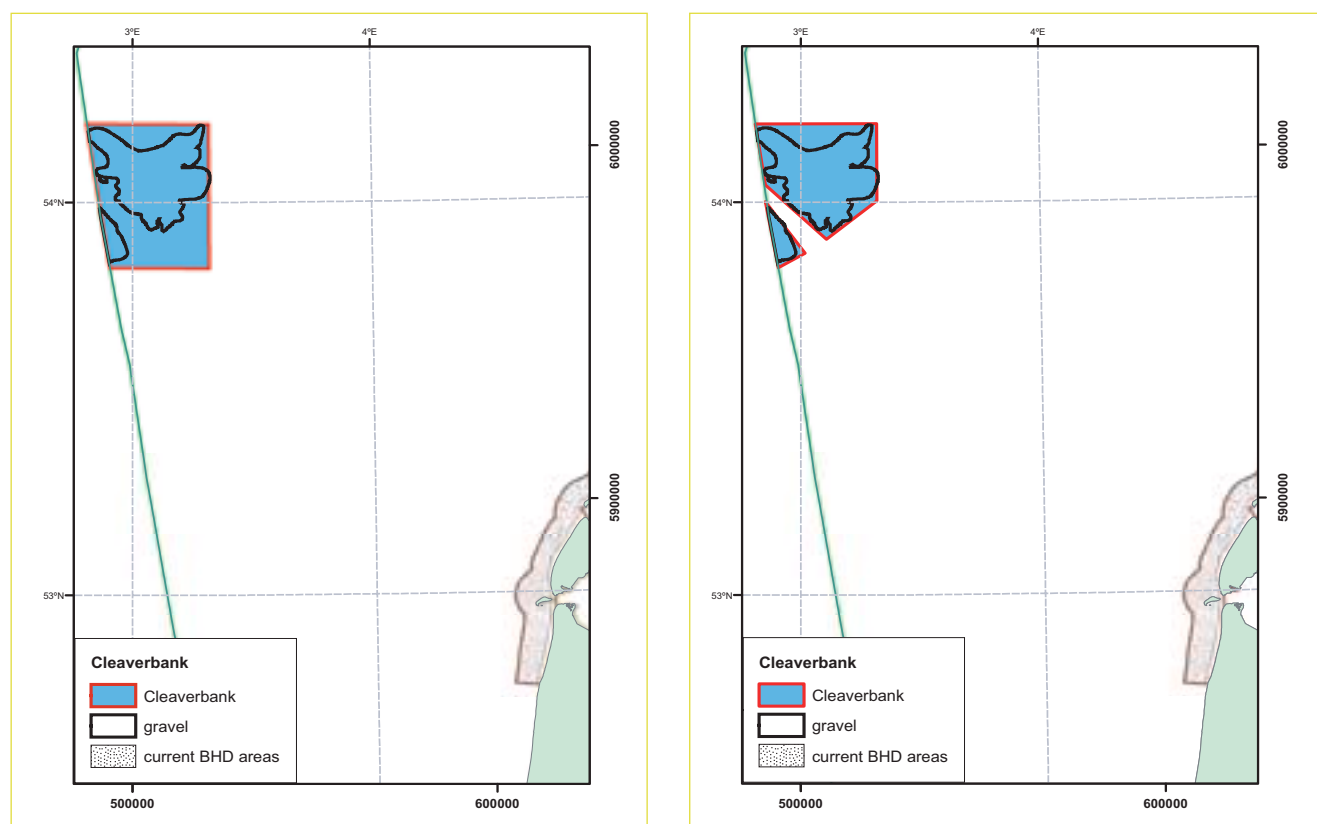


Figure 5.2: Two options for an area to be protected at the Cleaverbank. On the left the gravel area including the Botney Cut, where a high biodiversity of benthos is found. On the right only both gravel areas are protected.

Current use

To the south of the Cleaverbank there are some platforms along with a pipeline and telephone cable that cross the site. The Cleaverbank is crossed at the southern edge by a shipping lane in which the transport of hazardous substances occurs. The frequency of use is relatively low, but as the ships using this route generally carry hazardous substances, the impact of a possible accident would be enormous. The number of reports of discharges is relatively low. Several helicopter routes to and from offshore platforms cross the area, but in general they are flying at a sufficient height that causes minimal disturbance. No shell or sand extractions take place at the Cleaverbank. In the past fifteen years however plans have frequently been developed to extract gravel, or sand for concrete or masonry.

According to the official fisheries registrations relatively little Dutch trawler fishing takes place here. A low density of target species and the practical problems for the fishermen to fish in this area because of the presence of gravel and boulders may be the reason for this. The demersal pair trawlers and otter trawlers mainly fish for cod and whiting.

Developments

There is a small chance that a new platform will be constructed at the Cleaverbank. No extensions to cables and pipelines are known. At the Cleaverbank gravel, concrete and masonry sand is available, but currently the market is showing little interest in extraction. For other new developments this area is also too far off the coast.

Vulnerability to use

The substratum of the Cleaverbank consists mainly of coarse material (boulders and coarse gravel) with a specific and (for the Netherlands unique) epibenthos of mainly long-lived species. Recovery of these species, in particular large shellfish, is generally slow. Sessile animals recover only very slowly or not at all after they are covered with sediment or after the removal of the stones.

Although the intensity of fishing activity is relatively low in relation to the other areas, the consequence of this is considerably negative due to the destruction of zoobenthos that is particularly valuable here. In addition, the fishing has effects on demersal fish (fish dwelling near the sea bed). As most species of fish are very mobile, it is not certain whether this will have local effects and the effects may be

species specific. In general, long-lived species with a relatively low reproduction rate have disappeared or been greatly reduced in number by fishing and disturbance to the seabed. Sand and gravel extraction may also have serious consequences for the unique zoobenthos. Construction and use of platforms may lead to noise and light disturbance. The discharge of production water may lead to pollution of the water and the seabed. Effects are expected to be limited to marginal. The effects of shipping may be marginal due to minor intensity however, the disturbing effects may be larger than for instance in the Coastal Sea, due to the relatively undisturbed nature of the area.

5.5 The Central Oyster Grounds

Short characterization

The Central Oyster Grounds is a silt-rich and deeper area. Old charts show that extensive oyster banks were situated here until the end of the nineteenth century, however no oysters are currently found in this area. Over-fishing, climatic changes and possible disease have extirpated the oysters. Now it is an area of high biodiversity in which the Quahog (*Arctica islandica*), listed as an OSPAR-species, occurs to some extent. As a silt area it is a special area on the DCS. Whether it is of international importance is not known. On the German Continental Shelf there is a similar area for which Germany will not set up any extra protection for the time being.

Justification for boundaries

Based on the current criteria this area does not qualify as an area within the Birds or Habitats Directives but the silt-rich area does have a high biodiversity of benthos that deserves protection according to the OSPAR-criteria. The sampling stations for benthos in the central part are the baseline for the boundaries. This leads to a rather variable and curved boundary. We propose to draw a clear boundary with clear straight lines around it, allowing most sampling stations with a higher biodiversity to be present within the area (Figure 5.3).

Values to be protected

The high biodiversity and biomass of the macro-benthos. The *Arctica islandica* is on the OSPAR-list and deserves extra protection.

Current use

Except for fisheries and a few telecom cables, the activities are situated at the edge or just outside the area. At the eastern edge of the area there are some oil and gas platforms. One pipeline runs just along the boundary of the area. A helicopter route is situated along the eastern edge of the area. It is used to supply oil platforms (and ships) and to bring crewmembers to and from the platforms. Along the southern edge of the Central Oyster Grounds there is a deep-water shipping lane. Although this lane is less crowded than the lane along the coast, the ships on this

lane have potentially hazardous substances on board. The number of reports of (illegal) discharges of oil and chemicals at the edge of this area is relatively high in relation to other areas, and to the number of ship movements. Relatively few shipwrecks are present in the area.

The MOD-practicing grounds for the air force, where low flight training is carried out with F-16 fighter jets are well outside the area. The Central Oyster Grounds have relatively low fishing pressure.

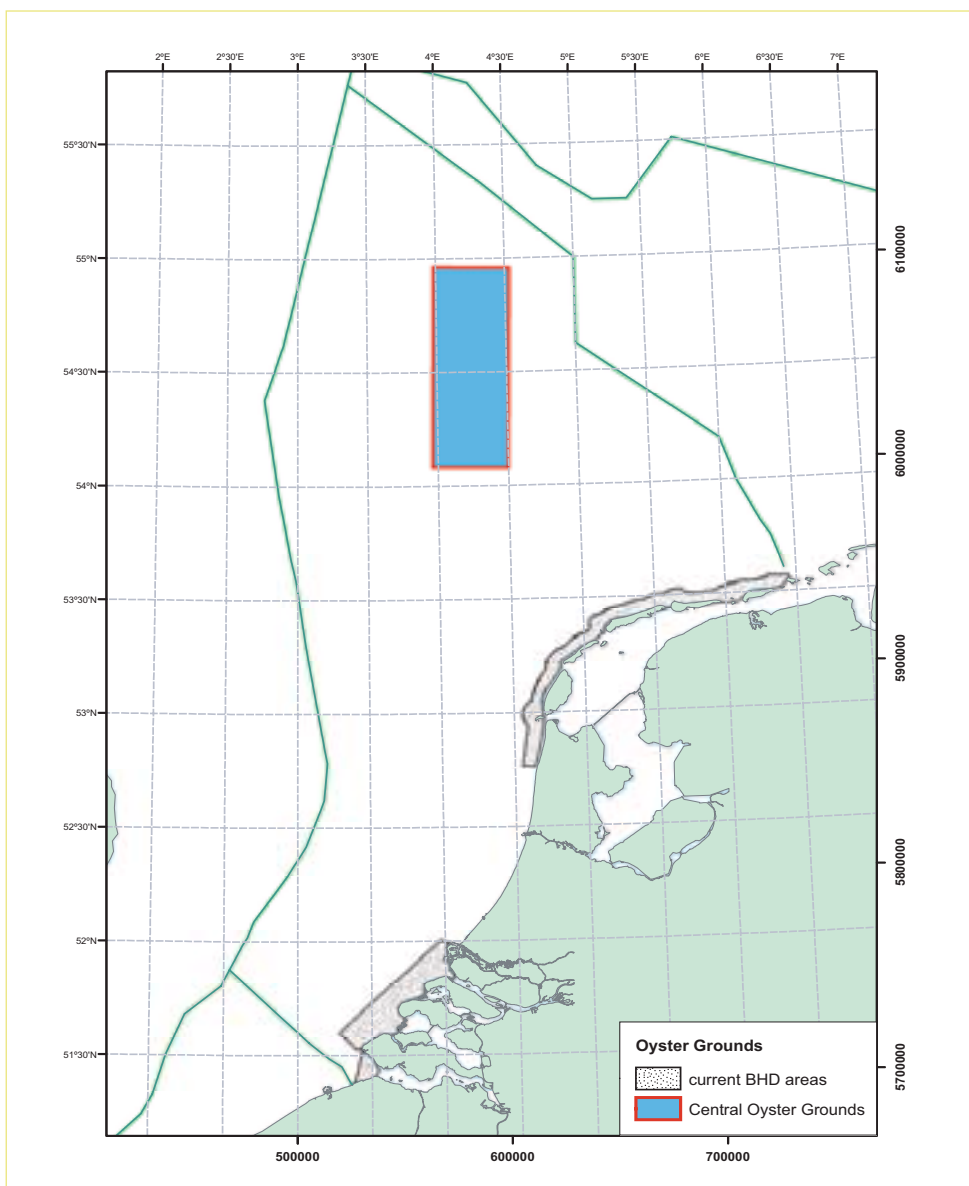


Figure 5.3: The area in the Central Oyster Grounds in which a higher biodiversity for benthos has been found.

Developments

The construction of a new telecom cable is expected in the area. Furthermore there is a considerable chance of constructing one or two platforms in the period up to 2015. It is expected that the extent of shipping traffic will not increase any further, although a shift will take place towards bigger ships. The area is too far away from the coast for new developments.

Vulnerability to use

The intensive trawler fisheries are having a large impact on the zoobenthos, for which this area is valuable, and on the demersal fish populations. As most fish species are very mobile, however, it is not certain whether this will have any effects locally and the effects will be species specific.

In normal situations, the area-bound effects of shipping are limited to disturbance, particularly by underwater noise. Their consequences are not fully understood, but believed, by experts, to be limited. Due to the low density of ships, sea birds in this area are less habituated to disturbance of shipping. Therefore, disturbance by passing ships has possibly more impact. Sea birds are very vulnerable to oil discharges but as the shipping lane is at the southern edge of the area, the effects are marginal seen in the light of the overall area of the Central Oyster Grounds.

Construction and use of platforms causes disturbance by noise and light. Emissions into the air, water and seabed also occur. Effects are expected to be limited to marginal in this case. The effects of the construction of a telecom cable are temporary and marginal.

5.6 The Frisian Front

Short characterization

The Frisian Front is part of the long physical front along the south side of the area in the central part of the North Sea that is stratified in summer. The unique characteristics of this front mean that silt and nutrients are imported from the English coast and the English part of the North Sea potentially resulting in higher primary production. In addition, the Dutch coastal river enters here in deeper, and consequently, slower flowing water into which silt and nutrients can settle. All these factors combined produce a zone with a high biomass of zoobenthos and a high diversity. *Arctica islandica* occurs in high numbers throughout the area. Higher concentrations of fish and birds have been observed in this area as well. Guillemots in particular migrate to this area in large numbers in late summer and in autumn with their young to forage.

Justification for boundaries

The entire proposed area has high bird values and qualifies under the Birds Directive (Great skua meet the 1% criterion). Furthermore, large numbers of guillemots and their young are present from July–November; a phenomenon which is very special in the southern part of the North Sea. The guillemot meets the criterion of numbers of > 20,000 and the western part in particular is an important moulting and foraging area for the guillemot.

The Frisian Front has a high biodiversity of benthos, which meets the OSPAR criteria. The sampling stations with a higher biodiversity of benthos, the presence of *Arcticas* and the high bird value together determine the boundary. We have chosen to make the boundaries straight lines. In the southwestern tip the area is shallow with a distinctive fauna. In the proposed boundaries we have also taken into account the observed shift of the area with a maximum of silt (Figure 5.4). There are no indications, though that the area with higher ecological values is shifting strongly.

Values to be protected

The biomass and biodiversity of benthos and the high numbers of guillemots. An important concentration of the *Arctica islandica*, one of the species of the OSPAR list.

Current use

A cluster of gas platforms is present at the southwestern side of the Frisian Front. The pipelines to the platforms are for the most part outside the boundary of the site. Furthermore, several telecom cables cross the area. The Frisian Front is crossed by several deep water shipping lanes that are used for the transport of hazardous substances. Despite the intensity of the shipping traffic being low, the number of reports of illegal discharges is relatively high. There are few wrecks in the area.

Over the area a helicopter route runs for traffic to and from oil and gas platforms. The Frisian Front partly overlaps with MOD practicing grounds for the air force and navy. There are almost daily flying and artillery practices in this area with (low-flying) F16s and navy-vessels. Beam trawlers intensively fish the area.

Developments

It is likely that another platform will be constructed in the period to 2015. There are no plans known for extension of the number of cables. The amount of shipping traffic is not expected to increase any further, although there will be a shift towards increasingly larger vessels. The use by the MOD is expected to remain about the same in the coming years. Due to its depth and distance to the coast, the Frisian Front is not favoured by other developers.

Vulnerability to use

The intensive trawl fisheries form a threat to the valuable zoobenthos and demersal fish populations in the area. As most fish species are very mobile, it is not certain whether this will cause any local effects. In addition, the shipping is an issue of concern. The area-bound effects are limited in normal situations to disturbance by underwater noise in particular. Their consequences are not fully understood, but believed, by experts, to be limited. However, sea birds, for which this area is very valuable, are very vulnerable to oil spills, that frequently occur in this area.

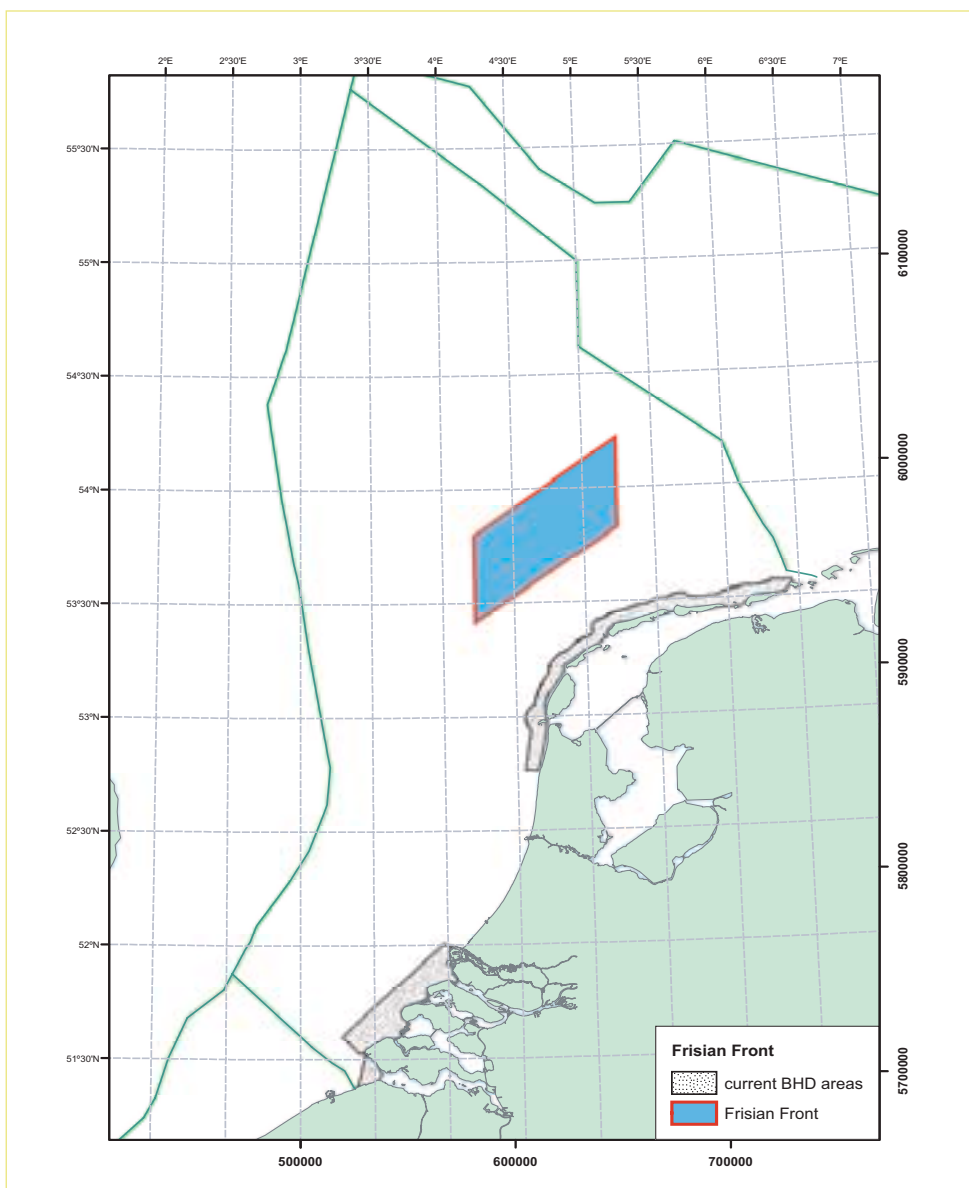


Figure 5.4:

The area of the Frisian Front that qualifies as Birds Directive area and as OSPAR area with a higher diversity of benthos. This is an important area for the *Arctica islandica* as well.

Sea birds do not seem to be particularly vulnerable to disturbance from military use by the MOD. In the case of flight traffic, the more intensive the traffic, the more the birds get used to it. Furthermore, helicopters, for which disturbance due to noise is linked to visual disturbance, have a greater disturbing impact than fighter jets, for which the visual disturbance is preceded by noise disturbance, however, no research has been carried out into the exact effects of low-flying fighter jets on resting and foraging birds in the North Sea.

The most important impacts of platforms are noise and light disturbance. The discharge of production water may lead to pollution of the water and the seabed. Effects are expected to be limited to marginal.

5.7 The Coastal Sea

Short characterization

The Coastal Sea is characterized by high natural and perceptive values. It is an area of high primary production and off the Holland coast and near Schiermonnikoog an increased diversity of benthos is found. The biodiversity of fish throughout the Coastal Sea is high relative to the rest of the DCS. Potentially a number of species of the Habitats Directive such as sturgeon, twait shad, allis shad and sea lamprey occur. Off the entire Holland Coast large numbers of common scoter may be resident (up to 100,000), and large groups of eiders are frequently observed. The most important location in the past decade has been a large complex of *Spisula*-beds between Bergen aan Zee and Callantsoog, but in an earlier winter (Feb 1987) a very large group occurred between Noordwijk and IJmuiden and much earlier still (1929) a sighting was made off the coast of Zuid-Holland. Given the presence of shallow water with scattered (both alternating in place and time) rich occurrences of shellfish (*Spisula* or other species) very large groups of ducks may occur all along the Holland Coastal Sea. The Coastal Sea of the Delta and Wadden Islands is important for the Common and Grey Seal that are both mentioned in the HD.

Justification for boundaries

The areas with increased natural values for birds and fish determine the boundaries of the Coastal Sea. For birds this boundary corresponds clearly with the 20 m isobath to the seaward side. In this report the landward boundary is the high water spring tide contour. Currently the Wadden coast and the Voordelta are subject to the Birds and Habitats Directives but the mouth of the Westerschelde and the Holland Coast are not. Given the distribution and population numbers of the various species of birds and fish, these

parts of the Coastal Sea also qualify under the Birds and Habitats Directives. Judging from the occurrence of *Spisula*-beds in past decades the area north of Bergen, starting at 52° 38' qualifies as a Birds Directive area. This leads to two possible options, protection of the entire coastal area or protection of parts of the area. Figure 5.5 shows the areas that are already designated and the possible new boundary of the northern area near Bergen aan Zee is also shown. An extension of this northern area down to the 20 m isobath fits the calculated bird values in a better way.

In the southern part the sandbanks adjoining the Coastal Sea, of which the highest parts are less than -20 m (with regard to low-low water spring tide), potentially qualify as Habitats Directive areas as well. On the map (Figure 5.6) this area is indicated as the "Zeeuwse Banks". In the event of designation as an area with special values, this will need to be incorporated in proposals of the Development sketch for the Scheldt estuary to designate the Vlakte van de Raan as a Special Area of Conservation under the Habitats Directive. The Vlakte van de Raan is situated in the mouth of the Westerschelde, partly on the Belgian Continental Shelf. North of Schiermonnikoog there is an area with increased biodiversity of macrofauna and this area is important as a residence and foraging area for the large population of seals near Schiermonnikoog and Rottum.

Values to be protected

Concentrations of fish, zoobenthos (including clam-beds), birds and marine mammals.

Current use

Because of its location near the Dutch coast, the Coastal Sea is used for a variety of purposes.

There are five gas platforms in the Coastal Sea itself and two in its direct vicinity. Pipelines (gas and oil) and many cables (telephone) cross the Coastal Sea. Oil and gas pipelines land at four locations: the Rijnmond district, IJmuiden, south of Den Helder and the district of the river Ems mouth

Up to now no wind farms are present in the Dutch Coastal Sea. However, permits have been granted for two wind farms, off the coast of Egmond (Near Shore Wind Park) and just outside the Coastal Sea (Q7).

Sand extraction is not permitted within the 20 m isobath with respect to DOL, however many sand extraction areas are present just outside the Coastal Sea area. The acreage permitted for sand extraction is, however, many times larger than the acreage where actual extraction occurs. Shell extraction takes place in experimental areas at various locations off the Wadden Islands and off the Walcheren coast. Off the coast of Noord-Holland and Zuid-Holland there

are various dredge disposal areas.

Along the Holland and Wadden coast (underwater) supplementation takes place in order to maintain the basal coastline. Beach supplementation with a similar objective takes place along the entire coast.

Various MOD training grounds are located in the Coastal Sea, where ammunition is fired into the sea and where airplanes and helicopters are flying. Off the Zeeland coast three areas are present (one in the Coastal Sea and two outside) in which old sea-mines and other dangerous ammunition that are fished from the sea are detonated.

The main transport routes are mainly outside the Coastal Sea. Therefore, route-bound traffic is limited (except for the approaches to the main seaports of Rotterdam, Antwerp and IJmuiden). The smaller, non-route-bound traffic, by contrast, is limited to the Coastal Sea. In addition there is an anchorage within the Coastal Sea and several just outside. Due to the heavy shipping traffic in the Coastal Sea, there are many wrecks on the seabed. The number of reports of discharges is restricted, except for the Holland Coast. There are several helicopter lanes from airports to gas and oil platforms in the North Sea. The Coastal Sea is attractive for visits to the beaches, water sports and angling (from the shore or from vessels). Measured in visitor num-

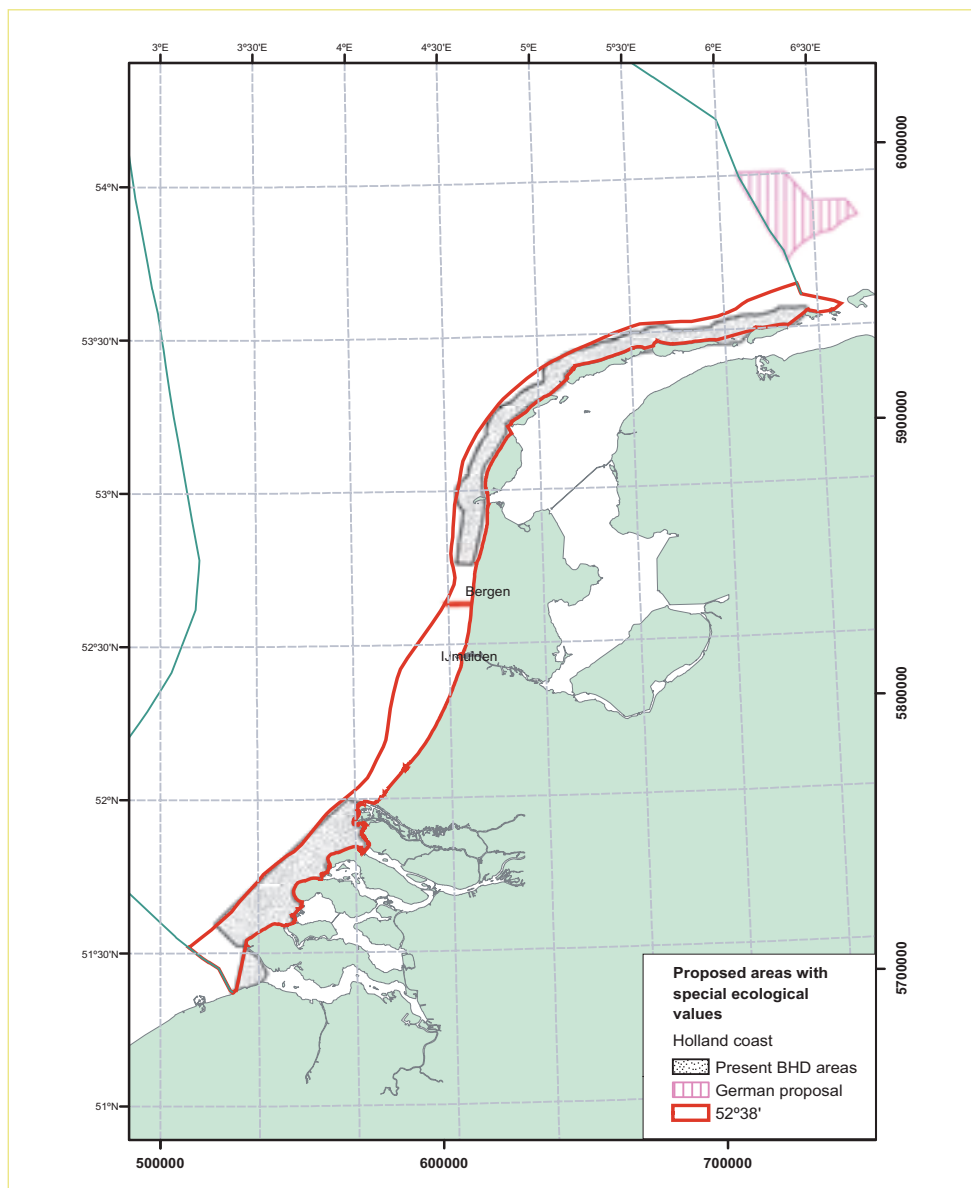


Figure 5.5: The Coastal Sea with high natural values for birds and benthos The entire area qualifies for both an area under the Habitats and Birds Directive. Dotted areas have been submitted as such already.

bers, the North Sea coast is the most important recreational area of the country.

The small boats of the Dutch trawler fleet (< 300 hp) fish intensively in the area. Ships >300 hp are not allowed to fish within the 12-mile-zone and therefore not within the Coastal Sea. The area off the Holland coast and in the mouth of the Westerschelde in particular, is fished intensively. The demersal pair trawlers and otter trawlers fish mainly for cod and whiting. The intensity of demersal pair trawlers is relatively high off the Holland coast in relation to other areas. Furthermore, shrimp cutters are active in the Coastal Sea and shellfish such as *Spisula*, cockles and American jack-knife shells (*Ensis*) are fished for. Other forms of fishing activity rarely occur in the Coastal Sea.

Developments

There is a possibility of one or more platforms being constructed in the Coastal Sea and it is likely that seismic research will have to be carried out for this. In addition to the new pipelines for the platforms extra cables and pipelines are predicted at Maasvlakte-England, Balgzand-Bacton and Callandsoog-Norway.

Within the 12-mile-zone no new wind farms are permitted to be constructed, except for the Near Shore Wind Park. Outside the area, the number of wind farms will increase greatly in order to realize policy and the zone off the Holland coast in particular qualifies for this.

Sand extraction just outside the Coastal Sea has increased greatly in the past few years, but it is expected to stabilize in the future. Deep sand extraction, however, will possibly take place for the construction of the 'Tweede Maasvlakte'. Both forms of sand extraction, however, are only permitted outside the Coastal Sea.

The extent of supplementation is expected to remain about the same in the next decade. It may be possible though, that a shift in the number of beach supplementations takes place in favour of the number of underwater supplementations but there is currently no information available on this. The extent of shipping traffic is not expected to increase any further, although there will be a shift towards increasingly larger ships that will rarely use the shipping lanes further offshore.

The use by the MOD will remain more or less the same. The anti-aircraft-artillery camp Botgat/Falga will be closed down. Beach recreation will stabilize, while recreational shipping will increase in extent.

Vulnerability to use

The intensive beam trawl fishing activity is threatening to the valuable zoobenthos and the demersal fish populations (fish dwelling near the sea bed) in the area. As most fish species are very mobile, it is not certain whether this will cause long-term effects, and the effects will be species specific. In general, long-lived species with a relatively low reproduction rate have disappeared or strongly reduced in number by frequent fishing and disturbance of the seabed. The Coastal Sea is an important foraging and resting area for birds and marine mammals. Intensive shipping activity has possibly caused disturbance of these species, which may show avoidance behaviour or by contrast will be attracted to the noise or lights of the ships. However, with frequent occurrence a certain degree of habituation will occur in these animals. Operational or incidental discharges of oil may form a potential threat to the birds of the Coastal Sea. Ships often discharge their ballast water in the Coastal Sea in particular, which makes it possible for non-native species may enter the system.

Wind farms in the Coastal Sea will undoubtedly cause fatalities amongst birds that collide with the rotor blades or that will get caught in the wake of the rotors. Whether this will have effects on population levels is not known and this will be investigated after the planned wind farms have been constructed. Around a wind farm a safety zone is installed in which other functions such as shipping and fishing are excluded. This results in the development of a protected habitat and in this way a wind farm may function as a refuge area for fish and zoobenthos. The poles and the riprap around the poles to avoid erosion of sediment, form the right substratum for specific organisms. It remains to be seen however, whether this alien biotope may be considered desirable.

The main impacts of the oil and gas platforms are noise and light disturbance. The discharge of production water may lead to pollution of water and the seabed. The effects are considered to be limited to marginal. Birds in this area are, in general, used to human disturbance (both on land and at sea), as is the case for the MOD-activities in the Coastal Sea. Noise created by firing and flying will cause disturbance to birds in particular and possibly to marine mammals as well. But repeated noise results in habituation to a certain degree.

Turbidity from sand and shell extraction or by dredge disposal, or during beach and underwater supplementation generally causes little impact on visibility in the turbid Coastal Sea. The removal of sediment during extraction of shells and the smothering of zoobenthos by a layer of sediment (in dredge disposal and supplementation) will cause local mortality of (part of) the zoobenthos. However, the organisms in the Coastal Sea are adapted to the generally high dynamics of the sediment in the area, which enables a relatively fast recovery. When a *Spisula* bed is smothered,

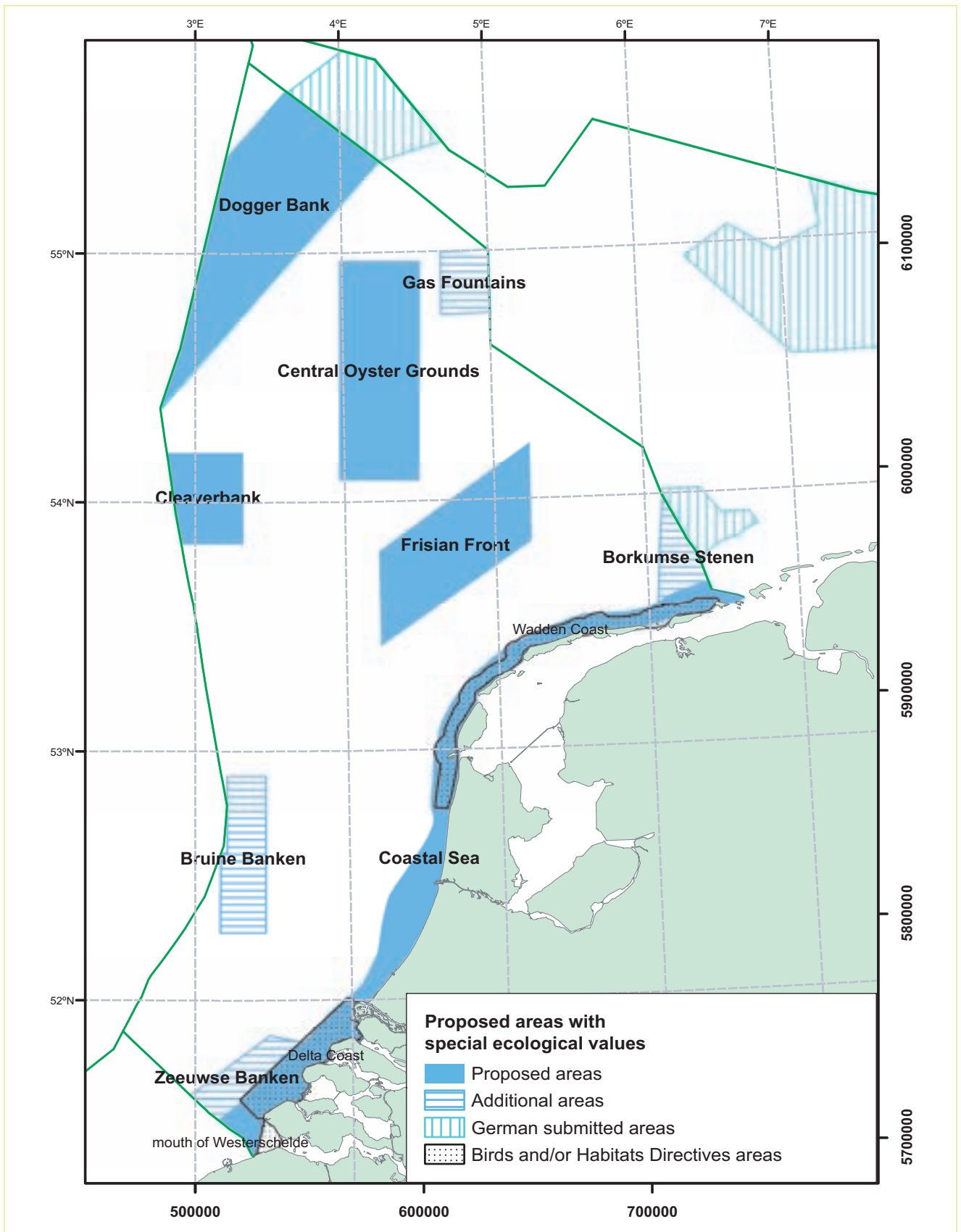


Figure 5.6: Areas with special ecological values at the DCS.

this will cause greater effects by the loss of a large biomass of bird food. It is not known how frequently this happens but this is currently being investigated.

The effects of beach and water recreation are considered to be limited to marginal. It is in particular a question of disturbance of birds and marine mammals and extraction of fish by angling.

5.8 Other areas possibly qualifying

In addition to the five areas mentioned in the National Spatial Strategy, it appeared from this study that a few other areas may possibly qualify as zones to be protected (see Figure 5.6).

In the first place, these are the coastal areas mentioned above beyond the –20 m zone and consisting of sandbanks off the Delta-region coast (*Zeeuwse Banks*) and the *Borkumse Stones* north of Schiermonnikoog. The description of the Coastal Sea mentions these areas and the reasons for their qualification.

It is possible that the area with a high concentration of gas seeps or gas fountains, in the map grids B3 and B6 qualifies. Currently, it is not known whether biogenic structures are found around these seeps as mentioned in the Habitats Directive. A micro-flora will probably be present that may cause the generation of such structures. Whether they will be really formed depends on the (future) age of such seeps and the degree of disturbance. Research into this matter is desirable.

The *Bruine Bank* possibly qualifies as well. Here indications have been found for a higher natural value of birds, in winter in particular, and a comparatively more frequent occurrence of porpoises. Whether it is an accident or not, is uncertain and further research into it is advisable.

The activities that currently appear to be important for the *Zeeuwse Banks* and the *Borkumse Stones* are described in short below. We have not made impact tables for these areas. Before it makes sense to pay attention to the use of and its impact on the *Bruine Bank* and the Gas seeps, further research is necessary into the values of the area and possible boundaries.

Zeeuwse Banken

No oil and gas extraction is taking place at the *Zeeuwse Banks*. Though various cables and pipelines are present. In the area no wind farms are allowed in connection with the reservation for deep sand extraction. Several regular sand extraction areas are located in the area as well. Dredge disposal and shell extraction are not being considered. The intensity of shipping is relatively high, although no approaches are located in the area. The number of reports of discharges is considerable, as is the number of wrecks. An MOD-restricted zone occurs in the area, in which mines are occasionally detonated. Intensity of fishing activity is high.

Borkumse Stenen

A few gas platforms and various telecom cables are present in the area. No wind farms are permitted in the area because of the presence of a shipping lane and a MOD practicing ground for the air force and navy.

A few smaller sand extraction areas are located in the area but shell extraction and dredge disposal are not being considered.

The shipping lane in the southern part of the area is relatively busy. Shipping intensity outside the route is low. The number of reports of discharges and the presence of wrecks is high.

The area of the *Borkumse Stones* partly overlaps with MOD practicing grounds for the air force and navy. There are almost daily flying and artillery practices in this area with (low-flying) F16s and navy-vessels.

The area overlaps for the greater part with the 'plaice box'. The intensity of trawling therefore is relatively low.

5.9 Impact of use on the described areas with special ecological values

Figure 5.7 shows the complete overview (from top to bottom) of the values of the various areas (shown in green), the impacts of the current and future use (with five categories of impact level).

It is e.g. remarkable that the Coastal Sea has many ecological values that are under pressure by several forms of human activities.

	Dogger Bank	Cleaverbank	Central Oyster Grounds	The Frisian Front	Coastal Sea	Borkumse Stenen	Zeeuwse Banken
Values							
Zoo benthos			incl. Icelandic cyprine	incl. Icelandic cyprine			?
Birds				Guillemot Great Skua	Various species		
Fish	Thornback Ray						
Marine mammals							
Impacts							
Current situation	Fishing	Fishing	Fishing	Fishing	Fishing	Fishing (Plaice box)	Fishing
			Shipping	Shipping	Shipping	Shipping	Shipping
				Oil- and gas	Wind	Sand extraction	Sand extraction
				MOD	Shells	MOD	
					Dredging dumps		
					Sand suppletions		
					Angling		
New activities	Oil/gas	Oil/gas	Oil/gas	Oil/gas	Oil/gas	?	?
	Cabel		Cabel		Cabels	?	?
		Sand extraction			Shellfish farm		
					Land reclam.		
New activities with eff. into area					Wind farms		Deep sand extraction
					Deep sand extraction		

Figure 5.7 Values (green) and impacts of the use on protected areas

Impact:

Red = very negative

Pink = considerably negative

Yellow = negative to some extent

Blue = marginally negative

Grey = positive and/or negative

White = impact irrelevant

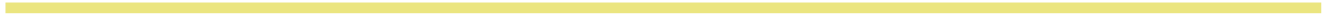
White and ? = inadequate information available

5.10 Remaining points of attention

A number of aspects have not been taken into account in this study. These are aspects that cannot be controlled by policy aimed at the area or effects of human activities on species (groups) for which the area is not specifically assigned, or for which no spatial difference can be made. These issues require attention in a continuation of this study.

The following aspects are of importance:

- The water quality does not yet meet the target values. The concentrations of nutrients and chemical pollutants that are brought in by rivers and bordering sea areas are still too high, in the Coastal Sea in particular. Obviously, this has negative effects on the values to be protected. As emissions cannot be controlled via policy aimed at the area, no attention has been paid to this within the scope of the study.
- The lights on oil and gas platforms have a considerable impact on migrating song birds, especially in clouded nights. The birds get disoriented by this and subsequently may die, because they cannot reach land due to energy loss during the delay at the platforms. Mortality of migrating birds will probably occur as well in wind farms when birds get hit the rotor blades. This may cause problems when the number of wind farms expands. As the areas are not assigned specifically for migrating birds, these effects have not been described in this study.
- Disturbance of sea birds by light, sounds and vibrations were taken into account in this study, but sea birds seem to be less susceptible to it. Little research has been carried out into disturbance of birds at sea. Little research has been carried out as well into disturbance of fish and marine mammals by underwater noise.
- Sonar - mainly used by the Navy - affects marine mammals considerably including hearing impairments. These effects may occur all over the DCS and therefore are not taken into account in the areas.
- Effects of noise vibrations in the water column on marine mammals are still largely unknown.



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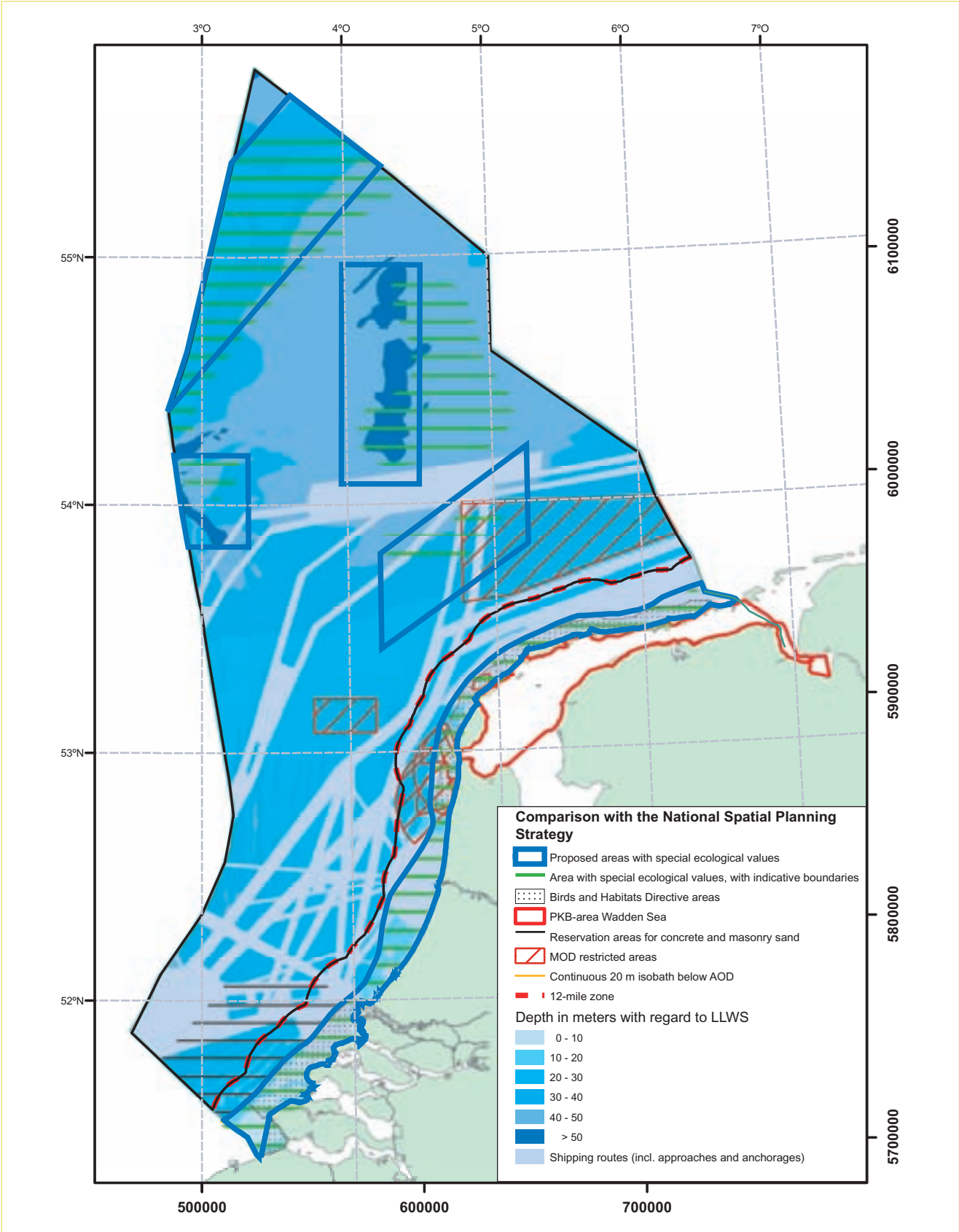
Glossary

abiotic	absence of life, the non-living environment
basal coastline	the coastline that serves as a reference within the scope of the policy of maintaining the coast (generally it is the position of the 'average' coast line on 1-1-1990)
benthos	organisms living on or in the seabed. Macrobenthos = all benthos >1mm
biodiversity	number of species occurring in a certain area
biomass	weight of the living material (plants, animals)
biota	all living organisms
Birds Directive	BD, 1979. EU-directive concerning the conservation of the wild bird population and their environment in the EU territory.
bird value	value of an area based on birds that occur there
beam trawling	the main type of fisheries in the Netherlands, in which the net is held open by a steel pipe (beam) with so-called shoes that keep the beam and the net at the desired height above the sea bed, it is used for fishing for flat fish that are startled by a tickler chain from the sea bed and end up in the net
otter trawler	trawler with nets that have skimming boards attached at their ends. When the vessel moves through the water the boards skim outward causing the net to be pulled open horizontally
blow-out	the uncontrolled escape of oil or gas from a well, releasing hydrocarbons (oil/gas), drilling mud or water
chart datum	reference level at charts showing the lowest astronomic tide
demersal	living or occurring on the bottom of the sea
discards	undersized and/or non-marketable fish that is discarded into the sea in commercial fisheries
ecosystem	a dynamic complex of communities of plants, animals and micro-organisms and their abiotic environment that mutually form a functional unit
fauna	the animal life of a given place or time; aquatic macrofauna: the aquatic invertebrates that are visible with the naked eye
forage	search for food
forebank suppletion	aka underwater bank suppletion. Addition of sand on the underwater bank, seaward of the low water mark
habitat	the specific environment of a plant or animal or a biotic community
Habitats Directive	HD, 1992. EU-directive concerning the conservation of the natural habitats and the wild flora and fauna in the EU territory.
High water spring tide mark	the line determined by high-high water springtide
Hill0 index	standard for biodiversity
imposex	pseudo-hermaphroditic condition in female snails, resulting in infertility
line of equidistance	a line of which all points have equal distances to the nearest points on the basal line of 2 states
low low water spring tide	see LLWS
low water mark	boundary between sea and beach at low water
macrobenthos	see benthos
morphology	geometric structure of for instance an area
natural value	the value of an area based on abiotic and biotic characteristics
nutrients	inorganic nutrients for plants.
pelagic	of or relating to the water column
phytoplankton	tiny plants suspended freely in the water
pock mark	place where a huge gas release in the past has left a clear crater in the sediment
primary production	production generated by photosynthesis, serves as basic food in the food chain of the system
seismic research	research with noise vibrations into particular minerals
Shannon-index	standard for biodiversity, the higher the index, the higher biodiversity
shoal	a shallow part in a channel above low-tide level
side scan sonar	sonar "looking" sideways; cf radar, but with sound pulses instead of electromagnetic pulses
Simpson's index	standard for biodiversity
substratum	the (non-)living material on which an animal or plant grows or lives
trawl	fisheries: the launch and hauling in of a trawl net

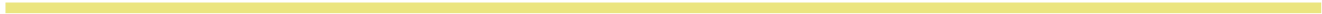
Abbreviations

BD	Birds Directive
BHD	Birds and Habitats Directives
BIOMON	Bio-monitoring program of the Ministry of Transport and Public Works for the North Sea
BTS	Beam Trawl Survey, routine fish population survey, carried out in the North Sea since 1985
IBTS	International Bottom Trawl Survey, routine fish population survey, carried out in the North Sea since 1965
DCS	Dutch Continental Shelf
DFS	Demersal Fish Survey, routine fish population survey, carried out in the North Sea since 1969
GIS	Geographic Information System
HD	Habitats Directive
HELCOM	Helsinki Commission. Commission for the protection of the Baltic marine environment
IMPN	Integral Management Plan North Sea
JNCC	Joint Nature Conservation Centre
LLWS	Low-Low-Water Spring, lowest low water mark
MCC	Marine Classification Criterion, used to determine the bird values
MILZON	Environmental zoning project on the DCS of the Ministry of Transport and Public Works based on characteristics of the ecosystem
MOD	Ministry of Defense
MPA	Marine Protected Area
NIOO-CEME	Dutch Institute for Ecologic Research –Centre for Estuarine and Marine Ecology in Yerseke
NIOZ	Royal Dutch Institute for Research of the Seas based at Texel
OSPAR	OsloParis Convention 1992. Convention for the protection of the marine environment in the NE-Atlantic
PAH	Polycyclic Aromatic Hydrocarbon
PKB	Dutch instrument: National Spatial Planning key decision
RIKZ	National Institute for Coastal and Marine Management, based in the Hague (Middelburg and Haren)
RIVO-CSO	Dutch Institute for Research on Fisheries - Centre for Shellfish Research, in Yerseke
SAC	Special Area of Conservation
SNS	Sole Net Survey, routine fish population survey carried out in the North Sea since 1969
TNO-NITG	Dutch Organization for Applied Scientific Research- Dutch Institute for Applied Geosciences
VOC	volatile organic compound gas/vapour emission at platforms
WL	WL/Delft Hydraulics

Appendix 1



Newly proposed boundaries, projected on the PKB map from the National Spatial Planning Strategy



Appendix 2: impact tables

The Impact Tables have been prepared per area. The head of each table indicates in short the extent of the various user forms in the area concerned. In each table it is indicated for each user function what kind of pressure it causes on the characteristics of the ecosystem and, in colour, to which degree.

Per area the table indicates the impact on the processes in the ecosystem (e.g. pollution, turbidity, disturbance etc.) and a second table indicates the impact on the species groups (e.g. plankton, benthos, etc.)

The following tables are concerned:

The following tables are concerned:

- Dogger Bank
- Cleaverbank
- Central Oyster Grounds
- Frisian Front
- Island Coast (= Coast of the Wadden Isles)
- NZHCoast (= Coast off Noord-Holland and Zuid-Holland)
- Delta (except the mouth of the Westerschelde)
- WSDelta (Mouth of the Westerschelde).

Impact table Dogger Bank

Processes

		Energy	Cables and pipelines	Wind turbine park	Oil and gas	Sediment transport	Shell extraction	Suppletions	Dumping areas	Flying and shipping	Helicopters	Recreation	MOD	Fisheries	Pelagic fisheries
		Cables and pipelines	No wind turbine	No wind turbine	No rigs (one nearby)	Sand extraction	No shell extraction	No suppletions	No dumping areas	No important shipping lanes	One helicopter lane crossing very small part of area	No recreation	No military training grounds	Relatively few fisheries	
extent of use	negative effects	One telephone cable in use and one cable planned	No wind turbine parks	No wind turbine parks	No rigs (one nearby)	No sand extraction (one disused area)	No shell extraction	No suppletions	No dumping areas	No important shipping lanes (casarmites)	One helicopter lane crossing very small part of area	No recreation	No military training grounds	Relatively few fisheries	
<i>pollution (water)</i> chemical		Slow release of heavy metals due to leaching								Oil discharges, both operationally and incidentally (casarmites)					
nutrients										Introduction of exotic species by ballast water.				Discards	Discards
waste										Production of solid waste by crew members				Production of solid waste by crew members	Production of solid waste by crew members
<i>turbidity (water)</i>		During construction												Turbidity by stirring of sediment by trawler	
<i>change in sediment (sea bed)</i> removal/covering										Increase of amount of hard substratum (wrecks)				Sorting by whirling of fine silt particles	
<i>disturbance</i> Noise and vibrations (water)					Constant noise production by generator					Noise production by ship-engines				Noise production by ship-engines	Noise production by ship-engines
					Constant noise production by generator					Noise production by ship-engines				Noise production by ship-engines	Noise production by ship-engines
					By day and night (mantel lights)					Visual presence of ships				Visual presence of ships	Visual presence of ships
Electro-magnetic radiation		Limited as no cables to and from wind turbine parks are present												Part of local zoobenthos community dies after passing of trawler	Decrease of fish populations by fisheries
<i>Extraction</i> zoobenthos														Decrease of fish populations by fisheries	Decrease of fish populations by fisheries
fish														By-catches of marine mammals in nets ???	
birds															
marine mammals															
positive effects <i>refugium function (sea bed, water)</i>															
Effects															

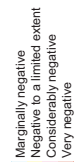
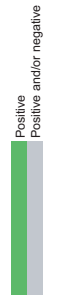
Marginally negative
Negative to some extent
Considerably negative
Very negative

Positive
Positive and/or negative

Impact table Dogger Bank

Species groups

extent of use	Energy Cables and pipelines		Wind turbine park		Oil and gas		Sediment transport		Shell extraction		Supplitions		Dumping areas		Flying and shipping		Helicopters		Recreation		MOD		Fisheries		
	Cables and pipelines	One telephone cable in use and 1 planned	No wind turbine parks	No wind turbine parks (one nearby)	No rigs (one nearby)	No sand extraction (though one disused area)	No shell extraction (through one disused area)	No supplitions	No dumping areas	No important shipping lanes	One helicopter lane across a small part of the area	No recreation	No military training grounds	Relatively few fisheries	Pelagic fisheries										
Plankton	Decreased production due to turbidity during construction																								Indirect effects due to change in food chain
Zoobenthos	Burying during construction			Pollution by production water																					Indirect effects due to change in food chain Destruction of part of zoobenthos
Fish	Reduced visibility during construction			Disturbance by underwater noise Pollution by production water																					Removal of fish Shift in population composition
Birds	Reduced visibility during construction			Visual disturbance Pollution by production water																					Indirect effects by change in food chain Eating of/becoming entangled in solid waste
Marine mammals	Reduced visibility during construction			Disturbance by underwater noise Pollution by production water																					Indirect effects by change in food chain Eating of/becoming entangled in solid waste
Physical characteristics	Release of heavy metals Increase in turbidity during construction																								Indirect effects by change in food chain Eating of/becoming entangled in solid waste Eating of/becoming entangled in solid waste
Effects																									Turbidity Disturbance of sediment composition



(1) Little is known about the effects of electro-magnetic radiation by electric cables on fish. It may be expected though that there are no effects.
 (2) Little is known about the effects of underwater noise production by wind turbines on fish and marine mammals. Possibly their behaviour is affected.
 (3) Disturbance holds for songbirds passing the oil rigs by night and becoming disoriented by the lights. These songbirds, however, are not important whether the areas qualify for areas to be protected.
 (4) It is not clear to what degree spina barns are affected by the underwater supplitions. The right data are lacking as of yet and further research is advisable.
 (5) Possibly a temporary increase in food due to mortality of zoobenthos. Later on there will be less food for a while as the zoobenthos community has to recolonize the area.
 (6) It is not known how many fish is caught by anglers. Estimations for cod vary from 100 to well over 400 tonnes per year.

Impact table Cleaverbank

Processes

extent of use	Energy	Wind turbine park	Oil and gas	Sediment transport	Shell extraction	Suppletions	Dumping areas	Flying and shipping	Helicopters	Recreation	MOD	Fisheries	Pelagic fisheries
	Cables & pipelines No cables, 2 oil/gas pipelines are present	No wind turbine parks planned	No rigs through a few nearby	Sand extraction No sand extraction	No shell extraction	No suppletions	No dumping areas	Shipping One shipping lane in southern edge, but density of ships is limited	One lane	n/a	No military training grounds	Trawler Relatively low densities in the area	
negative effects													
pollution (water) chemical	Slow release of heavy metals due to leaching							Oil discharges both operational and incidental (calamities)					
nutrients Organisms								Introduction of exotic species by ballast water				Discards	Discards
waste								Solid waste production by crew members				Solid waste production by crew members	Solid waste production by crew members
turbidity (water)	During construction											Turbidity by stirring of sediment by trawler	
change of sediment (sea bed) removal/cover Changes in sediment composition								Increase of amount of hard substratum (wrecks)				Sorting by stirring of fine silt particles	
disturbances noise and vibrations (water)			Constant noise production by generator					Noise production by ship-engines				Noise production by ship-engines	Noise production by ship-engines
noise and vibrations (air)			Constant noise production by generator					Noise production by ship-engines	Noise production by passing helicopters			Noise production by ship-engines	Noise production by ship-engines
Visual disturbance			By day and by night (marker lights)					Visual presence of ships				Visual presence of ships	Visual presence of ships
Electro-magnetic radiation													
Extraction zoobenthos													
fish													
birds marine mammals													Part of local zoobenthos communities off after passing of trawler
													Decrease of fish populations by fisheries
													Decrease of fish populations by fisheries
													By-catches of marine mammals in nets ???
positive effects reflight/function (sea bed, water)													



Impact table Cleaverbank

Species groups

extent of use	Energy		Cables and pipelines		Wind turbine park		Oil and gas		Sediment transport		Shell extraction		Suppletions		Dumping areas		Flying and shipping		Helicopters		Recreation		MOD		Fisheries		Pelagic fisheries		
	Cables and pipelines	No cables, 2 oil/gas pipelines present	Wind turbine parks planned	No wind turbine parks planned	No current rigs, though present nearby	No sand extraction	No shell extraction	No shell extraction	No	No	No dumping areas	One shipping lane at the southern edge of the area, but density of ships is limited	One shipping lane at the One lane	n/a	No military training areas	Relatively low densities in the area													
Plankton	Decreased production due to turbidity during construction																	Introduction of exotic species via ballast water										Indirect effects by change in food chain	
Zoobenthos	Burying during construction																	Introduction of exotic species via ballast water										Indirect effects by change in food chain	
Fish	Reduced visibility during construction																	Disturbance by noise production										Removal of fish	
Birds	Reduced visibility during construction																	Disturbance by noise production										Shift in population composition	
Marine mammals	Reduced visibility during construction																	Disturbance by presence/noise										Indirect effects by change in food chain	
Physical characteristics	Release of heavy metals																	Disturbance by presence/noise										Indirect effects by change in food chain	
Effects	Marginally negative																	Disturbance by presence/noise										Eating of/becoming entangled in solid waste	
	Negative to a limited extent																	Incidental (calamities) and operational oil discharges										Eating of/becoming entangled in solid waste	
	Considerably negative																	Incidental (calamities) and operational oil discharges										Eating of/becoming entangled in solid waste	
	Very negative																	Incidental (calamities) and operational oil discharges										Eating of/becoming entangled in solid waste	
																		Chemical pollution										Turbidity	
																		Chemical pollution										Disturbance of sediment composition	

- (1) Little is known about the effects of electro-magnetic radiation by electric cables on fish. It may be expected though that there are no effects
- (2) Little is known about the effects of underwater noise production by wind turbines on fish and marine mammals. Possibly their behaviour is affected
- (3) Disturbance holds for songbirds passing the oil rigs by night and becoming disorientated by the lights. These songbirds, however, are not important whether the areas qualify for area to be protected
- (4) It is not clear to what degree spitsula banks are affected by the underwater suppletions. The right data are lacking as of yet and further research is advisable
- (5) Possibly a temporary increase in food due to mortality of zoobenthos. Later on there will be less food for a while as the zoobenthos community has to recolonize the area.
- (6) It is not known how many fish is caught by anglers. Estimations for cod vary from 150 to well over 400 tonnes per year.

Impact table Central Oyster Grounds

Processes

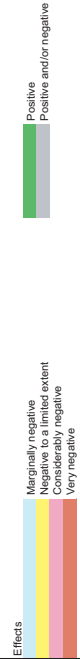
	Energy Cables and pipelines One telephone cable in use and 1 planned	Wind turbine park No wind turbine parks	Oil and gas 2 oil and gas rigs, 3 rigs nearby	Sediment transport Sand extraction No sand extraction	Shell extraction No shell extraction	Suppliations No suppliations	Dumping areas No dumping areas	Flying and shipping Shipping Shipping lane large ships at the southern edge of the area. Density of ships: relatively low	Helicopters One helicopter lane	Recreation No recreation	MOD No military training areas.	Fineries Fished relatively intensively, except for the 2nd quarter	Pelagic fisheries
extent of use													
negative effects													
pollution (water)	slow release of heavy metals due to leaching		slow release of heavy metals due to leaching; oil in production water					Oil discharges, both operationally and incidentally (tarballs)					
nutrients													
Organisms								Introduction of exotic species via ballast water					
waste			Production of solid waste by crew members					Production of solid waste by crew members				Discards	Production of solid waste by crew members
causing turbidity (water)	During construction		During construction										
change in sediment (see bed)													
deformation/sinking			Locally under-rip-cap substratum (poles and rubble)					increase of hard substratum (ship wrecks)					
Change in sediment composition													
disturbance			Constant noise production by generator					Noise production by ship engines					Noise production by ship engines
noise and vibrations (water)			Intermittent noise production by generator					Noise production by ship engines	Noise production by passing helicopters				Noise production by ship engines
noise and vibrations (air)			By day and by night (marker lights)					Visual presence of ships					Visual presence of ships
Visual disturbance													
Electro-magnetic radiation	limited as there are no cables to and from a wind turbine park												
Extraction													
zoobenthos													Part of zoobenthos community dies after passing of trawler
fish													Decrease of fish population due to fishing
birds													By-catches of marine mammals in nets ???
marine mammals													
noise like effects													
refugium function (see bed, water)			Other functions are excluded around platform										
Effects													



Impact table Central Oyster grounds

species groups

extent of use	Energy Cable and pipelines		Wind turbine park		Oil and gas		Sediment transport		Shell extraction		Suppliments		Dumping areas		Shipping		Helicopters		Recreation		MOD		Fisheries		Public fisheries		
	One telephone cable in use and 1 planned	No wind turbine	2 oil and gas rigs, 3 rigs nearby	No sand extraction	No shell extraction	No suppliments	No dumping areas	Shipping lane large ships at the southern edge of the area. Density of ships relatively low.	One helicopter lane	No recreation	No military training areas.	Fishes or relatively intensively, except for the 2nd quarter	Indirect effects by changes in food chain	Indirect effects by changes in food chain	Indirect effects by changes in food chain	Indirect effects by changes in food chain	Indirect effects by changes in food chain	Indirect effects by changes in food chain	Indirect effects by changes in food chain	Indirect effects by changes in food chain	Indirect effects by changes in food chain	Indirect effects by changes in food chain	Indirect effects by changes in food chain	Indirect effects by changes in food chain	Indirect effects by changes in food chain	Indirect effects by changes in food chain	Indirect effects by changes in food chain
Plankton	Decreased production due to turbidity during construction		Decreased production due to turbidity during construction																								
Zoobenthos	Buried during construction		Buried zoobenthos during construction																								
Fish	Decreased during construction		Decreased during construction																								
Birds	Reduced visibility during construction		Reduced visibility during construction																								
Marine mammals	Reduced visibility during construction		Reduced visibility during construction																								
Physical characteristics	Release of heavy metals increased during construction		Release of heavy metals																								



(1) Little is known about the effects of electro-magnetic radiation by electric cables on fish. It may be expected though that there are no effects
 (2) Little is known about the effects of underwater noise production by wind turbines on fish and marine mammals. Possibly their behaviour is affected
 (3) Disturbance holds for songbirds passing the oil rigs by night and becoming disoriented by the lights. These songbirds, however, are not important whether the areas qualify for area to be protected
 (4) It is not clear to what degree spicule banks are affected by the underwater suppliments. The right data are lacking as of yet and further research is advisable
 (5) Possibly a temporary increase in food due to mortality of zoobenthos. Later on there will be less food for a while as the zoobenthos community has to recolonize the area.
 (6) It is not known how many fish is caught by anglers. Estimations for cod vary from 150 to well over 400 tonnes per year.

Impact table Friesland Front

Processes

	Energy Cables and pipelines	Wind turbine park	Oil and gas	Sediment transport Sand extraction	Shell extraction	Suppliments	Dumping areas	Fishing and shipping Shrimps	Helicopters	Recreation	MOD	Fisheries Trawlers	Public fisheries
extent of use	1 pipeline and various telecom cables	No wind turbine parks	1-3 rigs, depending on boundaries High density southwest of the Friesland Front	No sand extraction	No shell extraction	No suppliments	No dumping areas	Deep water lanes / hazardous substances. Non route-bound relatively low intensity (0.25-0.5) in some areas. High reports of discharges relatively high	One helicopter lane crossing part of the area	No recreation	Training grounds of air force and navy, daily at 30-50% of Friesland Front	High intensity in all seasons	
negative effects													
production (water)	Slow release of heavy metals due to leaching		Slow release of heavy metals due to leaching, oil in production water					Oil discharges, both operationally and incidentally (oil spillages)					
chemical								Ballast water					
nutrients								Introduction of exotic species by wastewater production by crew members					Discards
waste			Solid waste production by crew members										Solid waste production by crew members
turbidity (water)			During construction										
changes in sediment (sea bed)													
atmosphere			Locally under rubble (poles and rubble)										
Change in sediment composition								Increase amount of (hard) substratum (wrecks)					
disturbance			Constant noise production by generator					Noise production by ship- engines					
noise and vibrations (water)			Constant noise production by generator					Noise production by ship- engines					Noise production by ship- engines
noise and vibrations (air)			By day and by night (marker lights)					Noise production by ship- engines					Noise production by ship- engines
Visual disturbance								Visual presence of ships					Visual presence of ships
Electro-magnetic radiation	Limited as no cables are buried in and to wind turbine parks												
Extraction													
zoobenthos													
fish													
birds													
marine mammals													
Positive effects			Other functions are excluded around the rig										
refugium function (sea bed, water)													
Effects													



Impact table Frisian Front

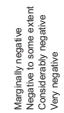
Species groups

	Energy cables and pipelines	Wind turbine park	Oil and gas	Sediment transport	Shell extraction	Suppliments	Dumping areas	Fishing and shipping	Recreation	MOD	Fisheries	Trawlers	Paologic fisheries
extent of use	in poles and cables	No wind turbine parks	<3 rigs depending on boundaries. High density to the Frisian Front	No sand extraction	No arse extraction	No suppliments	No dumping areas	Deep water area / One helicopter lane	No recreation	Training	High intensity in all	High intensity in all	Paologic fisheries
Pariekton	Decreased production due to	Decreased production due to	Decreased production due to					Introduction of exotic species via ballast water			Indirect effects by change in food chain		Indirect effects by change in food chain
Zoobenthos	Buying during construction	Buying during construction	Buying of zoobenthos					Introduction of exotic species via ballast water			Indirect effects by change in food chain		Indirect effects by change in food chain
Fish	Reduced visibility during construction	Reduced visibility during construction	Reduced visibility during construction					Introduction of new species via ballast			Disturbance by noise production		Disturbance by noise production
Birds	Reduced visibility during construction	Reduced visibility during construction	Reduced visibility during construction					Disturbance by noise production			Disturbance by noise production		Disturbance by noise production
Marine mammals	Reduced visibility during construction	Reduced visibility during construction	Reduced visibility during construction					Disturbance by noise production			Disturbance by noise production		Disturbance by noise production
Physical characteristics	Release of heavy metals	Release of heavy metals	Release of heavy metals					Disturbance by noise production			Disturbance by noise production		Disturbance by noise production
Effects	Marginaly negative	Marginaly negative	Marginaly negative					Disturbance by noise production			Disturbance by noise production		Disturbance by noise production
	Decreased production due to	Decreased production due to	Decreased production due to					Introduction of exotic species via ballast water			Indirect effects by change in food chain		Indirect effects by change in food chain
	Buying during construction	Buying during construction	Buying of zoobenthos					Introduction of exotic species via ballast water			Disturbance by noise production		Disturbance by noise production
	Reduced visibility during construction	Reduced visibility during construction	Reduced visibility during construction					Introduction of new species via ballast			Disturbance by noise production		Disturbance by noise production
	Reduced visibility during construction	Reduced visibility during construction	Reduced visibility during construction					Disturbance by noise production			Disturbance by noise production		Disturbance by noise production
	Release of heavy metals	Release of heavy metals	Release of heavy metals					Disturbance by noise production			Disturbance by noise production		Disturbance by noise production
	Marginaly negative	Marginaly negative	Marginaly negative					Disturbance by noise production			Disturbance by noise production		Disturbance by noise production

(1) Little is known about the effects of electro-magnetic radiation by electric cables on fish. It may be expected though that there are no effects.
 (2) Disturbance to zoobenthos is expected to be limited to the construction phase.
 (3) Disturbance to birds is expected to be limited to the construction phase.
 (4) It is not clear to what degree spittle banks are affected by the underwater suppliments. The right data are lacking as of yet and further research is advisable.
 (5) Probably a temporary increase in load due to mortality of zoobenthos. Load on there will be less. Load on a while as the zoobenthos community has to recolonize the area.
 (6) It is not known how many fish are caught by trawlers. Estimations for cod vary from 100 to over 400 tonnes per year.

Impact table IJssel Coast

Processes													
Energy	Cables and pipelines	Wind turbine park	Oil and gas	Sediment transport	Shell extraction	Suppeltions	Dumping areas	Shipping	Helicopters	Recreation	AGD	Fisheries	Pelagic fisheries
extent of use	Various cables and pipelines	Wind turbine park future parts planned	Oil and gas 3 gas rigs and 1 nearby	Sand extraction (in 20 m, but just below there is just below there is)	Shell extraction (local) shells	Suppeltions in period 1998-2003, beach suppeltions as well	No dumping areas	Shipping per 1000 m ² on average. Many non-out- board traffic	Helicopters mainly IJssel and northern half of Noord-Holland	Recreation vacation, beach, angling	AGD nearby IJssel to coastal zone of IJssel and Noord-Holland coast	Fisheries nearby IJssel to coastal zone of IJssel and Noord-Holland coast	Pelagic fisheries
negative effects													
pollution (water)	Slow release of heavy metals due to leaching		Slow release of heavy metals due to leaching, oil in production water					Oil discharges, both operationally and incidentally (collimines)		enfouling, oil, lead	Slow release of heavy metals due to leaching		
air quality								Introduction of exotic species by ballast water		Organic burdening		Discards	
waste			Solid waste production by crew members					Solid waste production by crew members		Solid waste production by crew members		Solid waste production by crew members	Discards Solid waste production by crew members
turbidity (water)				Effects from nearby sand extraction areas	Turbidity of the water column							Turbidity by stirring of sediment by trawlers	
changes in sediment (sea level, removal/cover)				Possible effects by change sedimentation patterns	Extraction of hard substratum (local shells)	underwater suppeltions may cause negative effects on spousa banks. Detailed knowledge is absent							
Changes in sediment composition			Increase of amount of hard substratum (poles and rubble)		Sawdust in steel of shell	More or less similar sediments are dumped		Increase of amount of hard substratum (wrecks)					Sorting by stirring of the salt particles
disturbance noise and vibrations (water)			Constant noise production by generator			Noise production by ship engines		Noise production by ship engines		Jet skis, motor boats			Noise production by ship engines
noise and vibrations (air)			Constant noise production by generator			Noise production by ship engines		Noise production by ship engines		Jet skis, motor boats			Noise production by ship engines
Visual disturbance			By day and by night (marker lights)			Visual presence of ships		Visual presence of ships		Presence of recreational vessels			Visual presence of ships
Electro-magnetic radiation	Limited as there are no turbines and to wind turbine parks												
Extraction zoobenthos					Eggs which is carried off with shells								
fish					Fish eggs, deposited on the seabed, are carried off with the shells					Extraction of fish by angling			Part of local pelagic community dies after passing of a trawler
birds													Decrease of fish populations by fisheries
marine mammals													Decrease of fish populations by fisheries
positive effects													
regulation function (sea level, water)				Other functions are excluded around the eggs									
Effects													



Impact table IslandCoast

Species groups

	Energy Cables and pipelines Wind turbine park Oil and gas Various cables and pipelines	Wind turbine park No wind turbine parks planned	Oil and gas 3 gas rigs and 1 nearly	Sediment transport Sand extraction No extraction within a 100 m distance of the seabed just beneath 20 m	Shell extraction - three areas for extraction of (fossil) shells	Dumping areas No dumping areas	Flying and shipping Shipping 3-7 ships per 1000 A few helicopter landings on Molukse eilanden Mainly non-rotte- bound traffic	Helicopters A few helicopter landings on Totel and the Noord- Holland	Recreation coastal recreation, beaches, angling (Bogal/Falga), Firing range Zeefront; Firing range Zevenroos; Firing range Zevenroos (EPR 1) being used anymore)	MOD Firing ranges for try-out of the new artillery firing camp (Bogal/Falga, Firing range Zeefront; Firing range Zevenroos; Firing range Zevenroos (EPR 1) being used anymore)	Fisheries Trawlers Intensity in particular off Totel and the Noord Holland coast	Pulchric fishes Intensity in particular off Totel and the Noord Holland coast
extent of use	Various cables and pipelines	No wind turbine parks planned	3 gas rigs and 1 nearly	No extraction within a 100 m distance of the seabed just beneath 20 m	- three areas for extraction of (fossil) shells	No dumping areas	3-7 ships per 1000 A few helicopter landings on Molukse eilanden Mainly non-rotte-bound traffic	A few helicopter landings on Totel and the Noord-Holland	coastal recreation, beaches, angling (Bogal/Falga), Firing range Zeefront; Firing range Zevenroos; Firing range Zevenroos (EPR 1) being used anymore)	Firing ranges for try-out of the new artillery firing camp (Bogal/Falga, Firing range Zeefront; Firing range Zevenroos; Firing range Zevenroos (EPR 1) being used anymore)	Intensity in particular off Totel and the Noord Holland coast	Intensity in particular off Totel and the Noord Holland coast
Plankton	Decreased turbidity during construction	Decreased production turbidity during construction	Decreased production turbidity during construction	Effects of nearby change in production due to turbidity	Decreased production turbidity due to turbidity	Decreased production turbidity due to turbidity	Pollution by production water	Pollution			Indirect effects by change in food chain	Indirect effects by change in food chain
Zoobenthos	Burying during construction	Burying of zoobenthos	Burying of zoobenthos	Effects of extraction nearby: higher concentrations of suspended matter	Removal of epibenthos and substratum of epibenthos	Burying of zoobenthos, for instance spatula banks (1)	New habitat (hard substratum)				Indirect effects by change in food chain	Disturbance of part of zoobenthos
Fish	Reduced visibility during construction	Reduced visibility during construction	Reduced visibility during construction	Effects of nearby extraction: reduced visibility	Removal of fish eggs and substratum of fish eggs	Possible temporary increase in food (5)	New habitat (hard substratum)				Removal of fish	Shift in population composition
Birds	Reduced visibility during construction	Reduced visibility during construction	Visual disturbance mainly by night (songbirds) (3)	Effects from nearby extraction: reduced visibility			New habitat (hard substratum)				Removal of fish	Shift in population composition
Marine mammals	Reduced visibility during construction	Reduced visibility during construction	Pollution by production water	Effects from nearby extraction: reduced visibility		Possible temporary increase in food (5)					Removal of fish	Shift in population composition
Physical characteristics	Release of heavy metals	Release of Zn en Al cathodes	Change of soil composition (cubule and bore dust)	Effects from nearby extraction: reduced visibility	Change in sediment type						Removal of fish	Shift in population composition



(1) Little is known about the effects of electro-magnetic radiation by electric cables on fish, it may be expected though that there are no effects
 (2) Little is known about the effects of underwater noise production by wind turbines on fish and marine mammals. Possibly their behaviour is affected
 (3) Disturbance holes by songbirds passing the oil rigs by night and becoming disoriented by the lights, noise and glare, however, are not important whether the areas qualify for area to be protected
 (4) It is not known how many fish is caught by anglers. Estimations for cod vary from 150 to well over 400 tonnes per year.
 (5) Possibly a temporary increase in food due to mortality of zoobenthos. Later on there will be less food for as while as the zoobenthos community has to recolonize the area.
 (6) It is not known how many fish is caught by anglers. Estimations for cod vary from 150 to well over 400 tonnes per year.

Impact table NZH-Coast

Processes

	Energy cables and pipelines	Wind turbine park	Oil and gas	Sediment transport	Shell extraction	Suppliments	Dumping areas	Flying and shipping	Helicopters	Recreation	MOD	Fisheries	Pelagic fisheries
extent of use	Solar cables and pipelines	Wind turbine park. 2.0 km offshore, one of planned within the 20 meter line (NSW). 07 beyond 12 mile-zone	Oil and gas	Sand extraction within 20 m, though there is just beneath -20 m	Shell extraction - none	Suppliments at various locations carried out in period 1998-2003, beach-suppliments as well	Dumping areas including 'Looswal Noord' ('Dumping ground North'). A total of 5 areas, 2 of which just beneath -20m	Shipping approach lanes for ships to IJmuiden and Rotterdam. Anchorage	A few helicopter landings	Recreation coastal recreation, beach, angling	MOD ranges for anti-aircraft artillery (Bogal/Falga) are partly present in this area	Harvesting during all seasons	Pelagic fisheries
negative effects													
pollution (water)	Slow release of heavy metals due to leaching	Slow release of heavy metals due to leaching	Slow release of heavy metals due to leaching	Effects from sand extraction areas			Dumped silt as a rule more polluted	Oil discharges, both operationally and incidentally (catamites)					
nutrients								Introduction of exotic species by ballast water					Discards
Organisms								Solid waste production by crew members					Solid waste production by crew members
waste													
turbidity (water)	During construction	During construction	During construction	Effects from sand extraction areas									
changes in sediment (sea bed) removal/cover		Locally beneath rubble	Locally beneath rubble	Possible effects from changing sedimentation/erosion patterns			Covering of original seabed, local effects						
Change of sediment composition		Increase of amount of hard substratum (poles and rubble)	Increase of amount of hard substratum (poles and rubble)			Dumping of more or less similar sediment	Dumped sediment usually has a finer grain size	Increase of amount of hard substratum (weeks)					
disturbance noise and vibrations (water)		During construction (sinking) and later during production (turning rotor blades)	Constant noise production by generator			Noise production by ship-engines	Noise production by ship-engines	Noise production by ship-engines		Jet skis, motor boats		Noise production by ship-engines	Noise production by ship-engines
noise and vibrations (air)		During construction (sinking) and later during production (turning rotor blades)	Constant noise production by generator			Noise production by ship-engines	Noise production by ship-engines	Noise production by ship-engines		Jet skis, motor boats	Booming of explosives during firing practice	Noise production by ship-engines	Noise production by ship-engines
Visual disturbance		By day and by night (marker lights)	By day and by night (marker lights)			Visual presence of ships	Visual presence of ships	Visual presence of ships		Presence of recreation vessels		Visual presence of ships	Visual presence of ships
Electro-magnetic radiation	Cables to and from wind turbine park in particular												
Extraction zoobenthos													
fish													Part of local zoobenthos dies off after passing of trawler
birds		Bird mortality by bumping into wind turbines											Decrease of fish populations by fisheries
marine mammals													By-catches of marine mammals in nets ???
positive effects													
recreation function (sea bed, water)		Other functions are excluded in area	Other functions are excluded in area							Extraction of fish by angling			
Effects													



Impact table NZHCoast

Species groups

extent of use	Energy Cables and pipelines	Wind turbine park	Oil and gas	Sediment transport	Shell extraction	Suppliments	Dumping areas	Flying and shipping	Helicopters	Recreation	MOD	Fisheries Trawlers	Pelagic fisheries
	Several cables and pipelines	One wind turbine park planned within -20 m (NSV), 07 Beyond 12-mile-zone	2 gas rigs, 1 of which underwater	No extraction within -20 m, but present just beneath -20 m	None	underwater suppliments at various places carried out in 1980-2003, also beach suppliments	Important dumping areas, including Loewal (1980-2003) and 2 of which just beneath -20m	Important approaches for ships to Limuiden and Rotterdam. Anchorage	A few helicopter lanes	coastal recreation, beaches, angling	Firing range for testing (Peters) and anti-aircraft (Bojaar/Fabja) are partly in this area	High intensity during all seasons	
Plankton	Reduced production due to turbidity during construction	Reduced production due to turbidity during construction	Reduced production due to turbidity during construction	Effects of nearby extraction: change of production due to turbidity	Effects of nearby extraction: higher concentrations of suspended matter	Reduced production due to turbidity	Reduced production due to turbidity	Introduction of exotic species via ballast water		Pollution		Indirect effects due to change in food chain	Indirect effects due to change in food chain
Zoobenthos	Burying during construction	Burying of zoobenthos during construction	Burying of zoobenthos during construction and drilling	Effects of nearby extraction: higher concentrations of suspended matter	Effects of nearby extraction: higher concentrations of suspended matter	Burying of zoobenthos, e.g. spisie banks (4)	Burying of zoobenthos	Introduction of exotic species via ballast water				Indirect effects by change in food chain	Indirect effects by change in food chain
		New habitat (hard substratum)	New habitat (hard substratum)			Change in zoobenthos composition due to change in sediment composition	Change in zoobenthos composition due to change in sediment composition	Incidental (calamities) and operational oil discharges				Disturbance of part of zoobenthos	
Fish	Reduced visibility during construction	Reduced visibility during construction	Reduced visibility during construction	Effects from nearby extraction: reduced visibility	Effects from nearby extraction: reduced visibility	Reduced visibility	Reduced visibility	Disturbance by noise production		Production of solid waste	Disturbance by noise production (herring)	Removal of fish	Removal of fish
	Disturbance due to electromagnetic radiation (1)	Disturbance by underwater noise during construction and production phase (2)	Disturbance by underwater noise during construction and production phase(2)			Possibly temporary increase in food (5)	Possibly temporary increase in food (5)	Introduction of new species via ballast		Catching by anglers (6)		Shift in population composition	Shift in population composition
		New habitat (hard substratum)	New habitat (hard substratum)			Turbidity	Turbidity	New habitat (wrecks)					
		refugium (exclusion of other functions)	refugium (exclusion of other functions)					Incidental (calamities) and operational oil discharges					
Birds	Reduced visibility during construction	Reduced visibility during construction	Reduced visibility during construction	Effects from nearby extraction: reduced visibility	Effects from nearby extraction: reduced visibility	Reduced visibility	Reduced visibility	Disturbance by presence/noise		Eating of/becoming entangled in solid waste	Disturbance by noise production	Indirect effects by change in food chain	Indirect effects by change in food chain
		Disturbance by noise during construction and production	Visual disturbance (mainly by night) (sounding of production)			Possibly temporary increase in food (5)	Possibly temporary increase in food (5)	Incidental (calamities) and operational oil discharges		Disturbance		Eating of/becoming entangled in solid waste	Eating of/becoming entangled in solid waste
		refugium (exclusion of other functions)	refugium (exclusion of other functions)					Eating of/becoming entangled in solid waste					
		Mortality by impact											
Marine mammals	Reduced visibility during construction	Reduced visibility during construction	Reduced visibility during construction	Effects of nearby extraction: reduced visibility	Effects of nearby extraction: reduced visibility	Reduced visibility	Reduced visibility	Disturbance by presence/noise		Eating of/becoming entangled in solid waste	Disturbance by noise production	Indirect effects by change in food chain	Indirect effects by change in food chain
		Disturbance by underwater noise during construction and production phase(2)	Disturbance by underwater noise during construction and production phase(2)			Possibly temporary increase in food (5)	Possibly temporary increase in food (5)	Incidental (calamities) and operational oil discharges		Disturbance		Eating of/becoming entangled in solid waste	Eating of/becoming entangled in solid waste
		refugium (exclusion of other functions)	refugium (exclusion of other functions)					Eating of/becoming entangled in solid waste					
		Release of heavy metals	Release of heavy metals										
Physical characteristics	Release of heavy metals	Release of heavy metals	Release of heavy metals	Effects of nearby extraction: higher concentrations of suspended matter	Effects of nearby extraction: higher concentrations of suspended matter	Turbidity	Turbidity	Chemical pollution				Turbidity	Disturbance of sediment composition
	Increased turbidity during construction	Change in soil composition (rubble)	Change in soil composition (rubble and bore soil)			Change in soil composition	Change in soil composition						

Effects

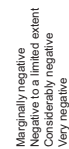
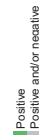
- Marginally negative
- Negative to a limited extent
- Considerably negative
- Very negative
- Positive
- Positive and/or negative

(1) Little is known about the effects of electro-magnetic radiation by electric cables on fish, it may be expected though that there are no effects
 (2) Little is known about the effects of underwater noise production by wind turbines on fish and marine mammals. Possibly their behaviour is affected
 (3) Disturbance holds for songbirds passing the oil rigs by night and becoming disoriented by the lights. These songbirds, however, are not important whether the areas qualify for areas to be protected
 (4) To what degree spisie banks are a result of the underwater suppliments is not clear. Further research is advised
 (5) Possibly a large number of fish are caught by anglers. Estimations for cod vary from 150 to well over 400 tonnes per year.
 (6) It is not known how many fish is caught by anglers. Estimations for cod vary from 150 to well over 400 tonnes per year.

Impact table Delta

Processes

	Energy Cables and pipelines Several cables and pipelines, concentrated off the Wadden coast	Wind turbine park No wind turbine parks planned	Oil and gas No rigs	Sediment transport Sand extraction No extraction within -20 meter, present just beneath -20 m	Shell extraction Experimental shell extraction area off the Wadden coast	Supplitions No underwater supplitions, beach supplitions are present	Dumping areas No dumping areas	Flying and shipping Shipping Traffic mainly concentrated in approaches to Antwerp and Rotterdam. Density from 3 to up to over 45 ships per 1000 km ²	Helicopters A lane to the Maasvlakte	Recreation coastal recreation, beaches, angling	MOD location to have mines exploded, this is seldom used	Fisheries Trawler High intensity, in 2nd and 3rd quarter in particular	Pelagic fisheries	
extent of use														
negative effects														
pollution (water/chemical)	Slow release of heavy metals due to leaching							Oil discharges, both operationally and incidentally (catamines)		antifouling, oil, lead	Slow release of heavy metals, due to leaching			
nutrients														
Organisms waste								Introduction of exotic species by ballast water production of solid waste by crew members		Organic burdening		Discards	Discards	
turbidity (water)	During construction			Effects from sand extraction areas nearby	Turbidity of the water column	Temporary turbidity of the water column								
change in sediment (sea bed) removal/cover				Possible effects from changing sedimentation/erosion patterns	Extraction of hard substratum (fossil shells)	underwater supplitions may have negative effects on banks of spits. Detailed knowledge is absent								
Changing sediment composition					Sand/silt in stead of shell substratum	dumping of more or less similar sediment		Increase of hard substratum (wrecks)						
disturbances noise and vibrations (water)						Noise production by ship engines		Noise production by ship-engines		Jet skis motorboats	Booming of explosives	Noise production by ship-engines	Noise production by ship-engines	
noise and vibrations (air)						Noise production by ship engines		Noise production by ship-engines		Jet skis motorboats	Booming of explosives	Noise production by ship-engines	Noise production by ship-engines	
Visual disturbance						Visual presence of ships		Visual presence of ships		Presence of recreational vessels		Visual presence of ships	Visual presence of ships	
Electromagnetic radiation	Limited as there are no cables from and to wind turbine parks													
Extraction zoobenthos					Echinorhos is carried off with shells						Mortality due to explosions	Part of zoobenthos community dies after trawling		
fish					Fish eggs, deposited on shell substratum are carried off					extraction of fish by angling	Mortality due to explosions	Decrease of fish populations by fishing	Decrease of fish populations by fishing	
birds marine mammals											Mortality due to explosions		By-catches of marine mammals in nets 177	
positive effects refugium/function (sea bed, water)														
Effects														



Impact table Delta

Species groups

	Energy Cables and pipelines Several cables and pipelines concentrated off Vlissingen	Wind turbine park No wind turbine parks planned	Oil and gas No rigs	Sediment transport Sand extraction No extraction within 20 m, trial sand extraction off present just beneath ~20 m. Wateren	Shell extraction Trial shell extraction off Wateren	Dumping areas No dumping areas	Flying and shipping Shipping Traffic concentrated mainly coastal recreation, beaches, angling used	Helicopters One line near the maasvlakte	Recreation coastal recreation, beaches, angling used	MOD Location for mine operation, though rarely used	Fisheries Trawlers High intensity in 2nd and 3rd quarter in particular	Pelagic fish High intensity in 2nd and 3rd quarter in particular
extent of use												
Plancton	Decreased production due to turbidity during construction			Effects changed production turbidity in extraction areas	Decreased production due to turbidity	Decreased production due to turbidity	Introduction of exotic species via ballast water Incidental (calamities) and operational discharges	Pollution			Indirect effects by changes in food chain	Indirect effects by changes in food chain
Zoobenthos	Buried during construction			Effects: higher concentrations of suspended matter	Removal of epibenthos and substrate of epibenthos (4)	Buried zoobenthos, for instance spissula banks Change in zoobenthos composition Turbidity	Introduction exotic species via ballast water Incidental (calamities) and operational discharges New habitat (wrecks)	Mortality due to explosions			Indirect effects by changes in food chain Destruction of part of zoobenthos	Indirect effects by changes in food chain Destruction of part of zoobenthos
Fish	Reduced visibility during construction			Effects of nearby extraction: reduced visibility	Removal of fish eggs and substratum of fish eggs	Decreased visibility Possibly a temporary increase in food (5)	Disturbance by noise production Introduction new species via ballast water Incidental (calamities) and operational discharges New habitat (wrecks)	Disturbance by noise production Catching of fish by anglers (5)	Mortality due to explosions		Removal of fish Shift in population composition	Removal of fish Shift in population composition
Birds	Reduced visibility during construction			Effects of nearby extraction: reduced visibility		Reduced visibility Possibly a temporary increase in food (5)	Disturbance by noise production Eating of/becoming entangled in solid waste	Disturbance by noise production Eating of/becoming entangled in solid waste			Indirect effects by changes in food chain Eating of/becoming entangled in solid waste	Indirect effects by changes in food chain Eating of/becoming entangled in solid waste
Marine mammals	Reduced visibility during construction			Effects of nearby extraction: reduced visibility		Reduced visibility Possibly a temporary increase in food (5)	Disturbance by noise production Eating of/becoming entangled in solid waste	Disturbance by noise production Eating of/becoming entangled in solid waste			Indirect effects by changes in food chain Eating of/becoming entangled in solid waste	Indirect effects by changes in food chain Eating of/becoming entangled in solid waste
Physical characteristics	Release of heavy metals Increasing turbidity during construction			Effects of nearby extraction: higher concentrations of suspended matter	Change in sediment types	Turbidity Changing soil composition	Chemical pollution	Chemical pollution			Turbidity	Disturbed sediment composition

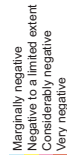


(1) Little is known about the effects of electromagnetic radiation by electric cables on fish. It may be suspected though that there are no effects
(2) Little is known about the effects of underwater noise production by wind turbines on fish and marine mammals. Presumably their behaviour is affected
(3) Disturbance holds for songbirds passing the oil rigs by night and becoming disoriented by the lights. These songbirds, however, are not important whether the areas qualify for area to be protected
(4) It is not clear to what degree spissula banks are affected by the underwater suppleions. The right data are lacking as of yet and further research is advisable
(5) Possibly a temporary increase in food due to mortality of zoobenthos. Later on there will be less food for a while as the zoobenthos community has to recolonize the area.
(6) It is not known how many fish is caught by anglers. Estimations for cod vary from 150 to well over 400 tonnes per year.

Impact table WSDelta

Processes

	Energy Cables and pipelines Number of cables limited to 1 telephone cable	Wind turbine park 1 Nearshore park planned in Belgium at the Vlaakie van Raan	Oil and gas No rigs	Sediment transport Sand extraction No extraction within 20 m, just beneath 20 m there is.	Shell extraction Experimental shell extraction -20	Suppletions No suppletions	Dumping areas No dumping areas (Westerschelde)	Flying and shipping Shipping Important approaches for ships to A'nhwerp lanes	Helicopters Some helicopter lanes	Recreation coastal recreation, beaches, angling grounds	MOD No military practice grounds	Fisheries Trawlers High intensity	Pelagic fisheries
negative effects													
<i>pollution (water)</i> chemical								Oil discharges, both operationally and (casualties)		antifouling, oil, lead			
nutrients Organisms								Introduction of exotic species by ballast water		Organic burdening		Discards	Discards
waste								Solid waste production by crew members		Solid waste production by holiday-makers		Solid waste production by crew members	Solid waste production by crew members
<i>turbidity (water)</i>													
<i>change in sediment (sea bed)</i> removal/cover													
Change of sediment composition								Increase in amount of hard substratum (wrecks)					Sorting by stirring up of fine silt particles
<i>disturbance</i> noise and vibrations (water)								Noise production by ship-engines		Jet skis motor boats		Noise production by ship-engines	Noise production by ship-engines
noise and vibrations (air)								Noise production by ship-engines		Noise production by passing helicopters		Noise production by ship-engines	Noise production by ship-engines
Visual disturbance								Visual presence of ships		Presence of recreational vessels		Visual presence of ships	Visual presence of ships
Electro-magnetic radiation													
Extraction zoobenthos													
fish													Part of zoobenthos community dies off after passing of trawler
birds													Decrease of fish populations by fisheries
marine mammals													Decrease of fish populations by fisheries
positive effects <i>refugium function (sea bed, water)</i>													By-catches of marine mammals in nets. ???
Effects													



Impact table WSDelta

Species groups

	Energy Cables and pipelines: limited to 1 telephone cable	Wind turbine park: No rigs park planned in Belgium at the Vlaakte van Raan	Oil and gas No rigs	Sediment transport Sand extraction: Shell extraction within <20 m, just extraction beneath ~20 m there is	Suppliments Dumping areas (Waterscheids)	Flying and shipping Shipping approaches to Antwerp	Helicopters Some helicopter lines	Recreation Beach, fishing, beaches, angling	MOD Military testing grounds	Fisheries Trawlers High intensity	Pelagic fisheries
extent of use											
Plankton	Reduced production due to turbidity during construction			Nearby extraction causes higher turbidity in production due to turbidity		Introduction of exotic species via ballast water Incidental (accidents) and operational oil discharges		Pollution		Indirect effects due to change in food chain	Indirect effects due to change in food chain
Zoobenthos	Burying during construction New habitat (refugium substratum)			Removal of epibenthos and of substratum of epibenthos suspended matter		Introduction of exotic species via ballast water Incidental (accidents) and operational oil discharges New habitat (wrecks)				Indirect effects due to change in food chain Destruction of part of zoobenthos	Indirect effects due to change in food chain Destruction of part of zoobenthos
Fish	Reduced visibility during construction Disturbance by underwater noise during construction and in production phase (2) refugium (new habitat substratum)			Effects of nearby extraction: reduced visibility substratum of fish eggs		Disturbance by noise production Introduction of new species via ballast Incidental (accidents) and operational oil discharges New habitat (wrecks)	Disturbance by noise production	Production of solid waste Catching by anglers (6)		Removal of fish Shift in population composition	Removal of fish Shift in population composition
Birds	Reduced visibility during construction Disturbance by noise during construction and production phase Visual disturbance Mortality by impact			Effects of extraction near by: reduced visibility		Disturbance due to presence/noise Incidental (accidents) and operational oil discharges Eating of/becoming entangled in solid waste	Disturbance due to noise production	Eating of/becoming entangled in solid waste Disturbance		Indirect effects by change in food chain Eating of/becoming entangled in solid waste	Indirect effects by change in food chain Eating of/becoming entangled in solid waste
Marine mammals	Reduced visibility during construction Disturbance by underwater noise during construction and production phase (2) refugium			Effects of extraction near by: reduced visibility		Disturbance due to presence/noise Incidental (accidents) and operational oil discharges Eating of/becoming entangled in solid waste	Disturbance due to noise production	Eating of/becoming entangled in solid waste Disturbance		Indirect effects by change in food chain Eating of/becoming entangled in solid waste	Indirect effects by change in food chain Eating of/becoming entangled in solid waste
Physical characteristics	Release of heavy metals Higher turbidity during construction			Effect of extraction near by: higher concentrations of suspended matter		Chemical disturbance				Turbidity Disturbance of sediment composition	Turbidity Disturbance of sediment composition
Effects	Marginally negative Negative to a limited extent Cautious Very negative										



(1) Little is known about the effects of electro-magnetic radiation on fish, it may be expected though that there are no effects
 (2) Little is known about the effects of underwater noise production by wind turbines on fish and marine mammals. Possibly their behaviour is affected
 (3) Disturbance holds for songbirds passing the oil rigs by night and becoming disoriented by the lights. These songbirds, however, are not important
 (4) Possibly a temporary increase in food due to mortality of zoobenthos. Late on there will be less food for a while as the zoobenthos community has to recolonize the area.
 (5) It is not known how many fish is caught by anglers. Estimations for cod vary from 150 to well over 400 tonnes per year.
 (6) It is not known how many fish is caught by anglers. Estimations for cod vary from 150 to well over 400 tonnes per year.

Appendix 3

Coordinates of the vertices of the areas with special ecological values as shown in figure 5.6 (WGS84 coordinates system) Numbering from North to South and clockwise.

Borders with neighbouring countries are indicated with _B or _G or _GB.

For practical reasons the landward boundary of the Coastal Sea was set at the low water mark.

Code no.	POINT_X	Edegr	Emin	Esec		POINT_Y	Ndegr	Nmin	Nsec
Borkumse stenen	6.10657	6	6	23.6		53.99841	53	59	54.3
Borkumse stenen	6.26293	6	15	46.5		53.81399	53	48	50.4
Borkumse stenen	6.33153	6	19	53.5		53.75011	53	45	0.4
Borkumse stenen	6.39263	6	23	33.5		53.64026	53	38	24.9
Borkumse stenen	6.05247	6	3	8.9		53.56296	53	33	46.6
Bruine Bank	3.45534	3	27	19.2		52.90104	52	54	3.8
Bruine Bank	3.45209	3	27	7.5		52.26957	52	16	10.4
Bruine Bank	3.15700	3	9	25.2		52.27033	52	16	13.2
Bruine Bank	3.16127	3	9	40.6		52.59046	52	35	25.7
Bruine Bank	3.20507	3	12	18.3		52.59039	52	35	25.4
Bruine Bank	3.20602	3	12	21.7		52.90061	52	54	2.2
Central Oyster Grounds	4.52798	4	31	40.7		54.96086	54	57	39.1
Central Oyster Grounds	4.49153	4	29	29.5		54.07770	54	4	39.7
Central Oyster Grounds	3.95619	3	57	22.3		54.08315	54	4	59.3
Central Oyster Grounds	3.97911	3	58	44.8		54.96811	54	58	5.2
Dogger Bank*	3.63556	3	38	8.0		55.64472	55	38	41.0
Dogger Bank*	4.26000	4	15	36.0		55.36500	55	21	54.0
Dogger Bank	2.76240	2	45	44.6		54.37722	54	22	38.0
Dogger Bank	2.89688	2	53	48.8		54.62094	54	37	15.4
Dogger Bank	3.20748	3	12	26.9		55.38103	55	22	51.7
Frisian Front	5.23371	5	14	1.4		54.22331	54	13	23.9
Frisian Front	5.22712	5	13	37.6		53.82974	53	49	47.1
Frisian Front	4.21599	4	12	57.6		53.41647	53	24	59.3
Frisian Front	4.2497	4	12	53.9		53.79984	53	47	59.4
Gas Fountains	4.99859	4	59	54.9		54.99931	54	59	57.5
Gas Fountains	4.99859	4	59	54.9		54.74929	54	44	57.5
Gas Fountains	4.66266	4	39	45.6		54.74535	54	44	43.2
Gas Fountains	4.66836	4	40	6.2		54.99411	54	59	38.8
Cleaverbank	3.31583	3	18	57.0		54.19938	54	11	57.8
Cleaverbank	3.31766	3	19	3.6		53.83120	53	49	52.3
Cleaverbank	2.90389	2	54	14.0		53.83644	53	50	11.2
Cleaverbank	2.86525	2	51	54.9		53.96258	53	57	45.3
Cleaverbank	2.80626	2	48	22.5		54.20143	54	12	5.2

Code no.	POINT_X	Edegr	Emin	Esec	POINT_Y	Ndegr	Nmin	Nsec
Coastal Sea**	6.39263	6	23	33.5	53.64026	53	38	24.9
Coastal Sea**	6.41257	6	24	45.2	53.60427	53	36	15.4
Coastal Sea**	6.58646	6	35	11.3	53.57706	53	34	37.4
Coastal Sea**	6.61840	6	37	6.2	53.56872	53	34	7.4
Coastal Sea**	6.62209	6	37	19.5	53.56705	53	34	1.4
Coastal Sea**	3.36819	3	22	5.5	51.37035	51	22	13.2
Coastal Sea**	3.36325	3	21	47.7	51.37278	51	22	22.0
Coastal Sea**	3.35256	3	21	9.2	51.37861	51	22	43.0
Coastal Sea**	3.30738	3	18	26.6	51.43408	51	26	2.7
Coastal Sea**	3.29505	3	17	42.2	51.44917	51	26	57.0
Coastal Sea**	3.21088	3	12	39.2	51.48398	51	29	2.0
Coastal Sea**	3.14277	3	8	34.0	51.51945	51	31	10.0
Zeeuwse Banken	3.47050	3	28	13.8	51.85621	51	51	22.3
Zeeuwse Banken	3.67079	3	40	14.9	51.82596	51	49	33.5
Zeeuwse Banken	3.14309	3	8	35.1	51.51933	51	31	9.6
Zeeuwse Banken	3.08005	3	4	48.2	51.55084	51	33	3.0
Zeeuwse Banken	2.96681	2	58	0.5	51.61920	51	37	9.1

* As given by Germany as border of the German area of the Dogger Bank.

** The seaward boundary and the landward boundary of the Coastal Sea consist of the continuous –20m isobath and the low-water line.

Colophon

Title

- Areas with special ecological values on the Dutch Continental Shelf

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Project management/editing

- A.J.M. Geurts van Kessel (RWS/RIKZ), project manager
- H.J. Lindeboom (Alterra), project manager
- A. Berkenbosch (RWS/RIKZ), project manager up to 1-10-2004
- B. Korf (RWS/RIKZ)
- F. van der Meulen (RWS/RIKZ)
- C.M. Visser (RWS/RIKZ)

In cooperation with:

- C.M. Berrevoets (RWS/RIKZ)
- E. Dijkman (Alterra)
- G. Gonzales (Alterra)
- J.G.C. Groos (RWS/RIKZ)
- S.H. Kabuta (RWS/RIKZ)
- M.F. Leopold (Alterra)
- C.T.W. Simons (RWS/RIKZ)
- C.J. Smit (Alterra)
- F. Twisk (RWS/RIKZ)
- A.M. Walburg (RWS/RIKZ)
- J.W.M. Wijsman (WL | Delft Hydraulics)
- B.S. Willemsse (RWS/RIKZ)

Consultants:

- J. de Vlas (RWS/RIKZ)
- N.M.J.A. Dankers (Alterra)

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- Lindeboom, H.J., Geurts van Kessel, A.J.M. & Berkenbosch, A. 2005
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Inquiries

Rijksinstituut voor Kust en Zee
Dept of Communication
PO Box 20907, 2500 EX Den Haag
Tel: +3170-311-4311/4271

Key words

National Spatial Strategy, North Sea, Dutch Continental Shelf/DCS, areas of conservation, boundaries, OSPAR, MPA, BHD, ecological values, use and impact.

Grids used

In Figures 3.1 up to and including 3.12 and 5.1 up to and including 5.6 the grid of geodetic datum ED50 has been used, projected in UTM31N zone.

In Figures 4.1 up to and including 4.8 the grid of geodetic datum WGS84 has been used, projected in UTM31N zone. For the map of Appendix 1 (PKB-map 10 from the National Spatial Strategy) the RD-system was used, a projection in geodetic Bessel.

The coordinates of Appendix 3 are expressed in geodetic datum WGS84.

Cover photographs

P. Penning (Thornback ray), G.W.N.M. van Moorsel (Dead man's fingers), C.A. Schipper (Sea anemones) and archives RIKZ

Layout

P.J.G. van Elk en A.H. Akkerman (RWS/RIKZ)

Graphic realisation

Quantes, Rijswijk

Disclaimer

In this report we have taken into account the existing sea borders, agreed with our neighbouring countries. As far as there is no border agreed, we have taken an equidistant line, from which we have drawn a straight line to the border of the EEZ. This line has been decided upon for practical reasons.

