Marine Strategy for the Netherlands part of the North Sea 2012-2020, Part 1

Marine Strategy for the Netherlands part of the North Sea 2012-2020, Part I

Disclaimer: In all cases the Dutch version of this publication prevails.

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Summary

Rationale

Marine Strategy Framework Directive
The European Marine Strategy Framework Directive (MSFD, 2008) obliges Member States to establish and implement the necessary measures to achieve and/or maintain good environmental status in their marine waters.

In 2012, the Cabinet will have to decide on the *initial assessment*, *good environmental status* to be achieved and the associated targets and indicators for the Netherlands part of the North Sea. This, as a whole, constitutes the *Marine Strategy, Part I.* By 2014 at the latest, the Netherlands must report on the accompanying monitoring programme (Marine Strategy, Part II) and by 2015 at the latest on the programme of measures (Marine Strategy, Part III).

This document comprises the Marine Strategy Part I: the initial assessment, good environmental status to be achieved and the associated targets and indicators. In extension, the Cabinet formulates on headlines the policy assignments until 2020. Publication of relevant information on marine protected areas is also elaborated, in accordance with article 13, sub 6 of the directive. Part I furthermore contains an exploration on headlines of the knowledge and monitoring assignments.

Implementation of the programme of measures starts in 2016. This will be followed by six-year cycles during which the Marine Strategy will have to be revised. The working process regarding the first update is scheduled for the 2018-2021 period. At that time, it will also be assessed whether the environmental targets with which to achieve good environmental status are being met or whether good environmental status is being maintained.

The draft version of the Marine Strategy, Part I was made available for public consultation from May 25th through July 5th 2012 . The response of the Cabinet to the outcome was compiled in a Note of Reply and, where so required, public views were elaborated into the Marine Strategy Part I as appropriate.

The Dutch Marine Strategy

Ambition
The Cabinet's ambition is to establish good environmental status of, and biodiversity in the North Sea for current and future generations, and safeguard it as a key resource for the economy and the food supply. The Marine Strategy sets out the Cabinet's course between 2012 and 2015.

This aspirational aim is conform part of the National Water Plan (NWP): *The North Sea is a healthy and resilient marine ecosystem that can be used in a sustainable manner.* This way, the Marine Strategy serves to implement the NWP, setting the (spatial) preconditions for the sustainable, spatially efficient and safe use of the North Sea, in balance with the marine ecosystem's interests as documented in the Water Framework Directive, the Marine Strategy Framework Directive, and the Birds and Habitats Directives.

The MSFD is the European environmental cornerstone of the integrated maritime policy in the marine waters. The Cabinet's ambition is akin to that of the MSFD: the marine environment must be protected and maintained by preventing degradation and, where possible, repairing damage. Contamination of, other disturbances to, and impacts on the ecosystem must be reduced to such extent that there are no further significant risks to the marine environment, biodiversity, public health and use of the sea. Use of the North Sea must be sustainable. Negative human impacts must be minimal, so that the marine ecosystem functions optimally and retains its resilience.

Approach
The Cabinet opts for a sensible and pragmatic approach aimed at managing the main risks to the marine ecosystem and the best opportunities for sustainable use in relation to achieving and maintaining good environmental status.

Relation to existing policy
Where necessary, the Marine Strategy supplements existing and initiated policy as well as the implementation of international conventions and framework directives with new policy assignments and measures. Existing and initiated policy are the starting point and are integral to identifying new policy assignments and measures aimed at achieving good environmental status. As such, the Marine Strategy solely complements existing and initiated policy, thus not explicitly including it in the set of new policy assignments and measures.

Approach to content and implementation
Combined with the precautionary principle, the ecosystem-based approach is the core of the establishment of supplementary policy assignments and the programme of measures. Through adaptive management, it is possible to learn from experiences and adjust policy during implementation. The process of learning and adjusting will be reflected in the monitoring programme and the formal six-yearly review of the whole Strategy. It is being fed by the progressive exchange of experiences in the international multi- and bilateral discussions and in the Strategy's knowledge assignments. This adaptive approach does not, therefore, rule out interim policy adjustments and/or new policy assignments.

Elements
The Marine Strategy comprises the following steps:

- ***Initial assessment***. An inventory has been made of ecological values and economic use, threats to the ecosystem, and existing and initiated policy, including its effectiveness. The current state (or historic development) and expected developments until 2020 and beyond have been outlined based on the latest scientific knowledge and on insights from stakeholders.
- ***Good environmental status 2020.*** Good environmental status is described as: The North Sea is clean, healthy and productive, the ecosystem functions optimally and is resilient, and use of the sea is sustainable.
- ***Environmental targets 2020.*** In relation to good environmental status to be achieved or maintained, feasible targets have been formulated to counter degradation in the event of identified damage and risks and, where possible, to improve the marine environment.
- ***Policy and knowledge assignments until 2020.*** The Marine Strategy includes new policy assignments in areas where policy is lacking or needs to be enhanced. Specific knowledge subjects have been formulated for which to fill knowledge gaps, particularly in the following areas: possible new policy assignments, the development of indicators, measures, and updating the Marine Strategy.
- ***Indicators and monitoring.*** Indicators have been specified to monitor whether the targets and good environmental status are being achieved or whether adjustment of policy or measures is required. Indicators for some targets are still missing; they are being developed, need to be improved or will be added later. The monitoring programme will be completed in 2014.
- ***Measures.*** The new policy assignments are the starting point for developing the most effective and cost- and implementation-efficient measures. A decision on the programme of measures will be taken in 2015. Implementation will start in 2016.

Participation and basis of support
The Dutch Marine Strategy Part I was established in broad consultation with scientific institutes and as many stakeholders as possible, and has also been shared and reviewed multilaterally at OSPAR and EU levels as well as bilaterally with neighbouring states. The responses from the submission for consultation were fully considered for the Strategy.

International approach and seizing opportunities
In implementing the Marine Strategy at the EU and OSPAR levels, the Netherlands is working closely with neighbouring countries in the North Sea subregion (synergy, coherence, cost effectiveness). Efforts take shape within the context of the sustainability agenda ('green growth'), a feature of which is seizing opportunities for development, innovation and social initiative. This is preferable to excluding and regulating.

Findings from the initial assessment

Ecological values
The Netherlands part of the North Sea is shallow and nutrient-rich, containing a natural wealth of species and a large biomass. Fish stock is originally extensive and the coastal zone in particular constitutes the habitat of large numbers of various different species of birds. This is by

and large the result of the significant supply of nutrients in the water from the rivers that discharge into the North Sea. The relatively limited depth of the North Sea facilitates a strong interaction between water column and seabed processes, a factor that contributes to the variety of species and productivity.

Direct and indirect use
The Netherlands part of the North Sea is one of the most intensively used seas in the world. Shipping and port activities, oil and gas recovery, sand extraction and fisheries are the most extensive uses, with the ports and oil and gas recovery being responsible for the largest part of the total added value of about 35 billion euros (2007). The space provided by the North Sea is also used to build wind farms. The beach is an attraction for tourists from the Netherlands and abroad, and therefore of economic importance.

Threats: ecological degradation and loss of biodiversity
Positive developments can be observed in the Netherlands part of the North Sea, helped along by prevailing policy. A number of commercially exploited fish species but also marine mammals, for example, are doing much better than before. Pollution has decreased considerably. Nevertheless, the current state of the marine environment does not yet guarantee a healthy structure and healthily functioning marine ecosystem functions. Human activity has changed or damaged benthic habitats. Vulnerable structures have completely disappeared from vast stretches of the sea. Some fish species and benthic animals have become endangered or they have disappeared altogether. A decline in the populations of certain bird species has also been observed. While the development of marine mammal populations is showing a positive trend again, they are still vulnerable because of the deficient habitat quality. There still are substantial knowledge gaps, however. The exact nature and magnitude of biological damage to the marine ecosystem caused by use is still hard to determine, but the fact is that progressive change and degradation in biodiversity in the North Sea are still being observed.

Good environmental status and environmental targets

An overview of the descriptions of good environmental status in 2020 and the associated targets for the eleven descriptors of the MSFD is provided below. Given their significant mutual interrelationships, the four descriptors biodiversity, food webs, commercially exploited fish and shellfish, and sea-floor integrity have been combined into the descriptor ‘Marine Ecosystem’ in the Marine Strategy.

Overview of MSFD descriptors, good environmental status and environmental targets 2020

Descriptor	Good environmental status 2020	Environmental target 2020
Marine ecosystem (comprises the descriptors biodiversity, commercially exploited fish and shellfish, food webs, and sea-floor integrity)	• Biological diversity is maintained. The quality and occurrence of habitats and the distribution and abundance of species are in line with prevailing physiographic, geographic and climatic conditions. • Populations of all commercially exploited fish and shellfish are within safe biological limits, exhibiting a population age and size distribution that is indicative of a healthy stock. • All elements of the marine food webs, to the extent that they are known, occur at normal abundance and diversity and at levels capable of ensuring the long-term abundance of the species and the retention of their full reproductive capacity. • Sea-floor integrity is at a level that ensures that the structure and functions of the ecosystems are safeguarded and that benthic ecosystems, in particular, are not adversely affected.	**Main target: structure of the ecosystem:** The interim target for 2020 is to reverse the trend of degradation of the marine ecosystem due to damage to seabed habitat and to biodiversity towards a development of recovery. This constitutes a first step towards a situation in which the marine ecosystem in the Netherlands part of the North Sea can (in part) recover in the long term. This implies a structure in which the relative proportions of the ecosystem components (habitats and species) are in line with prevailing physiographic, geographic and climatic conditions. **Sub-targets:** **1. Species:** *Benthos:* a) Improvement of the size, quality and distribution of populations of long-living and/or vulnerable (i.e. sensitive to physical disturbance) benthic species. *Fish:* b) Improvement of the size, quality and distribution of populations of vulnerable fish species, in so far as deterioration has been caused by human activity. This includes fish species with a long-term negative trend in population size and fish species with a low reproductive capacity (e.g. skates, rays and sharks). As regards improving the status of the Habitats Directive species, the targets are in accordance with the national targets of the Habitats Directive. Items c and d below apply to commercially exploited fish and shellfish covered by this description. c) The fishing mortality rate (F) for all commercially exploited fish and shellfish stocks remains at the same level as or below the value of a Maximum Sustainable Yield, (MSY): F≤Fmsy. The target for depleted stocks of sharks, skates and rays exploited by the EU fleet is 'rebuilding', in accordance with the European Community Action Plan for the Conservation and Management of Sharks, Commission Decision 2009/40. This is a process target. Moreover, achieving the target not only depends on the Netherlands, but on many other countries as well. d) The Spawning Stock Biomass (SSB) of commercially exploited fish and shellfish is above the precautionary level Bpa. e) Minimization and, eventually, elimination of discards from fishing. *Birds:* f) The targets for Birds Directive species are in line with the national targets of the Birds Directive. For pelagic seabirds for which the Netherlands part of the North Sea is important but no BD areas are designated, the aim is to attain a favorable conservation status at the regional scale. For species for which this is relevant the decrease in food availability resulting from lessening fisheries discards and decreasing eutrophication are taken into account.

Overview of MSFD descriptors, good environmental status and environmental targets 2020 *(continued)*

Descriptor	Good environmental status 2020	Environmental target 2020
		Marine mammals: g) The targets for marine mammals covered by the Habitats Directive (common seal, grey seal and harbor porpoise) are the same as the national targets pursuant to the Habitats Directive. *Demographic characteristics:* h) The demographic characteristics of fish, bird and marine mammal populations are indicative of resilient populations in terms of, for instance, natural size and age groups, male/female ratio, reproduction and mortality. Sub-targets c and d contribute to this sub-target for commercially exploited fish species. **2. Food webs:** i) The effect of human interventions on interactions between the different trophic levels in the food web is being reduced where problems are identified. **3. Habitats:** j) The distribution and area of predominant habitat types remain more or less the same (i.e. within the limits of natural variation at EUNIS level 3). k) For the special habitat types protected under the Habitats Directive the national targets of the Habitats Directive apply. l) Supplementary improvement of the quality of the deeper, silty parts and deeper, non-dynamic sandy seabeds in the Netherlands part of the North Sea. The quality of the habitats applies to the physical structure, ecological function and diversity and structure of the associated species communities. m) 10-15% of the seabed of the Netherlands part of the North Sea is not appreciably disrupted by human activities.
Non-indigenous species	Non-indigenous species introduced by human activities are at levels that do not adversely alter the ecosystems.	Minimize the risk of new introductions of non-indigenous species.
Eutrophication	Human-induced eutrophication is minimised, especially adverse effects thereof, such as losses in biodiversity, ecosystem degradation, harmful algae blooms and oxygen deficiency in bottom waters.	• Reduce the concentrations of nutrients where these do not meet the targets of the Water Framework Directive, pursuant to its timeline. • Algae biomass and blooms approximate 50% above the background value. The concentration of chlorophyll a during the phytoplankton growth season (March - September) that is consistent with good environmental status does not exceed 50% above the background value, in accordance with the Water Framework Directive (up to 1 nautical mile from the baseline) and OSPAR (beyond). • No increased occurrence of harmful algae blooms. • No oxygen deficiency due to eutrophication.

Overview of MSFD descriptors, good environmental status and environmental targets 2020 *(continued)*

Descriptor	Good environmental status 2020	Environmental target 2020
Hydrographical properties	Permanent alteration of hydrographical conditions does not adversely affect marine ecosystems.	Human activities do not result in permanent, large-scale negative effects on the ecosystem due to changes in hydrographical conditions. **Operational target:** All developments must comply with the existing regulatory regime (e.g. EIA, SEA, and Habitats Directive) and regulatory assessments must take into consideration any potential impacts arising from permanent changes in hydrographical conditions, including cumulative effects, at the most appropriate spatial scales following the guidance prepared to this end (EUNIS level 3, reference year 2008).
Contaminants	Concentrations of contaminants are at levels not giving rise to pollution effects.	• Counter the concentrations of contaminants where these do not meet the targets of the Water Framework Directive, pursuant to its timeline. • Ensure that concentrations of other known substances, where these meet the Water Framework Directive standards, do not exceed current concentrations and, where possible, reduce them. • A prevention target for currently observed effects of pollution from TBT and oil. **Operational target:** Occurrence and extent of significant acute pollution events (e.g. slicks resulting from spills of oil and oil products or spills of chemicals) and their impact on biota affected by this pollution should be minimised through appropriate risk based approaches
Contaminants in sea food for human consumption	Contaminants in fish and other seafood do not exceed the levels established by Community legislation or other relevant standards.	The levels of contaminants in fish and other sea food from the North Sea do not exceed the standards of national and international legislation.
Litter	Properties and quantities of marine litter, including their degradation products such as small plastic particles down to microplastics do not cause harm to the coastal and marine environment and their volume decreases over time.	• The quantity of visible beach litter has decreased (basic reference 2002-2009). • There is a decreasing trend in the quantity of litter in marine organisms (basic reference 2005-2009).
Underwater noise	Introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment. Loud, low and mid frequency impulsive sounds and continuous low frequency sounds introduced into the marine environment through human activities do not have adverse effects on marine ecosystems	• Individual cases: prevent harmful effects at ecosystem level, particularly on marine fauna, resulting from specific activities such as pile-driving and seismic surveys. • Background noise and accumulation of effects on populations or at the ecosystem level: targets in 2018, when more knowledge has been gathered.

Overview of the established need for supplementary policy assignments and knowledge assignments.

Marine ecosystem (= biodiversity + food web + commercially exploited fish stocks + sea-floor integrity) →	Supplementary policy assignment; supplementary knowledge assignment
Non-indigenous species →	No supplementary policy assignment;
Eutrophication →	No supplementary policy assignment;
Hydrographical conditions →	No supplementary policy assignment;
Contaminants →	No supplementary policy assignment;
Contaminants in fish and seafood products →	No supplementary policy assignment;
Litter →	Supplementary policy assignment; supplementary knowledge assignment
Underwater noise →	No supplementary policy assignment; supplementary knowledge assignment

Policy assignments

Marine ecosystem

The effects of physical, chemical and biogenic disturbances in the past century have contributed to the current status of the marine ecosystem to differing degrees. For certain is that vulnerable benthic ecosystems in particular have been affected by physical damage to the seabed as a result of bottom-disturbing activities, including traditional beam trawling in particular. The balance in the diversity of the fish stock has also been affected. Populations of some vulnerable species have declined; a number of shark, skate and ray species in particular has suffered heavily. Fish species that migrate up river have become rare due to the barrier effect of dykes and coastal structures. Discarding by-catches is an enormous waste. While alternative, more environmentally friendly fishing techniques are available, they are only allowed to a limited extent under the European Common Fisheries Policy (CFP). Non-indigenous species introduced by shipping or aquaculture affect the ecosystem.

The management plans being developed for Natura 2000 areas comprise such measures as fishing restrictions and mitigation of the barrier effect by engineering structures. These are intended to prevent an accumulation of disturbances in the coastal zone. Prevailing policy for non-indigenous species, pollution and eutrophication is resulting in a drastic decrease in the risks to the marine environment (see below). Consequently, improving the status of the marine ecosystem outside the protected areas will depend mainly on the ongoing sustainable exploitation of fisheries within the framework of revision of the CFP (expected term 2013-2022).

Supplementary policy assignment(s) until 2020:

- As regards the revision of the CFP, the Cabinet is focusing mainly on the sustainable use and preservation of natural marine resources and ecosystems. This includes the following: reducing the impact of bottom trawling and preventing the by-catch of vulnerable species.
- In addition to the existing Natura 2000 areas, the *Friese Front* (Frisian Front) and *Centrale Oestergronden* (Central Oyster Grounds) are considered search areas for protective measures aimed at reducing bottom trawling to be taken within the CFP framework. If necessary, other uses will also be explored.

The negotiations on the CFP revisions are ongoing. It is difficult to evaluate in advance to what extent the new CFP will contribute to the Netherlands' ambitions. Collaboration with other Member States is another key condition given the international dimensions of fisheries and the transboundary distribution of some fish stocks. Expectations are that this effort will likely not lead to good environmental status in 2020 and possibly not even in 2027. This cautious estimate relates to both the uncertainty as to whether the CFP will produce the desired sustainability and the rate of recovery of the ecosystem, resulting from the reduction of fisheries pressure in general and specific area protection. The Cabinet's interim target for 2020: to reverse the trend of degradation of the marine ecosystem due to damage to seabed habitat and biodiversity.

Non-indigenous species

Non-indigenous species also pose a threat to biodiversity in the Netherlands part of the North Sea. The food supply of the common scoter, for example, has become more limited because its staple food, the bivalve *Spisula subtruncata* has

been replaced by the Atlantic jackknife clam. The European flat oyster has been ousted by the Pacific oyster. Human intervention in these processes is virtually impossible. Prevailing policy is expected to dramatically decrease the risk of new introductions between 2020 and 2030. With respect to the introduction of non-indigenous species the status in 2020 can be defined as good environmental status.

Supplementary policy assignment until 2020: none.

Hydrographical conditions
Large-scale interventions in the past, such as the construction of the Delta Project and Maasvlakte 1, brought about hydrographical modifications that mainly affect the North Sea coastal ecosystem (including upstream fish migration). These interventions are of national importance and are irreversible. The scope of a number of activities that may affect hydrographical conditions has increased: sand extraction for coastal defenses and filling sand, dredging waterways to seaports, construction of wind farms, sinking oil/gas pipelines and laying cables. The physical damage as a result of these activities is local and relatively minor. Where necessary, requirements stipulated for licensing based on environmental impact assessments provide for mitigating or compensatory measures. The conclusion is that the current situation is sufficient to safeguard good environmental status.

Supplementary policy assignment until 2020: none.

Pollution/eutrophication/contaminants in fish and other seafood products
Until recently, pollution and eutrophication of the North Sea posed a threat to the marine ecosystem. The expectation is that the risk of harmful effects of eutrophication and contaminants on the ecosystem will be minor between 2020 and 2027. This is the result of past and prevailing policy (based on the Water Framework Directive, MARPOL, OSPAR and European legislation on food safety). This is sufficient to achieve good environmental status.

Supplementary policy assignment until 2020: none.

Litter
The expectation is that the quantity of litter from the key sources, i.e. shipping, fisheries, leisure activities and rivers, will not decrease in the coming years, despite prevailing and initiated policy. Although little is known about the environmental effects of microplastics in the sea, there are indications of potentially major risks for food webs. The target for 2020 is a decrease in the quantity of litter on the beach and a downward trend in the quantity of litter in marine organisms.

Supplementary policy assignment until 2020: the aim, at an international level, is to reduce litter and explore the presence and effects of marine litter, particularly microplastics. In terms of reducing litter, the Cabinet is focusing mainly on prevention. Possible tracks being explored are an integrated source approach, raising awareness, a more efficient use and reuse, and collection. The feasibility of removal is also being investigated.

Knowledge assignments: due to a lack of knowledge on the full scope and effects of litter on the ecosystem, it is not possible to make any predictions on the achievement of good environmental status. The aim is to accumulate more knowledge of the presence and effects of marine litter, particularly microplastics.

Underwater noise
The underwater noise produced by shipping and other human activities has increased significantly since the mid-20th century. Due to lack of measurement data it is not known to what extend underwater noise poses a problem and what the possible cumulative effects are. The target for 2020 is to prevent adverse impact, at an ecosystem level, resulting from specific, isolated activities such as pile-driving and seismic surveys. Thereof as a precaution, the production of impulse noise from pile-driving for wind farms is regulated; where required, rules for other activities, such as the use of seismic for oil and gas exploration, will also be drawn up. Targets at an ecosystem level (cumulation and background noise) will be set in 2018, when more knowledge has been gathered.

To date practically applicable methods to describe or predict cumulative effects are lacking. To counter or mitigate cumulative effects, the Cabinet opts for an applicable approach aiming at concrete decisions concerning (combinations of) activities related to specifically sensitive components of the ecosystem. The Cabinet wishes to explore whether this approach can be translated into a methodology to, at the level of the southern part of the North Sea, describe or predict the cumulative effects of various development scenario or policy strategies as they relate to the descriptors of the MSFD.

Supplementary policy assignment until 2020: none for the time being.

Knowledge assignments: due to a lack of knowledge about the effects of underwater noise on the ecosystem, good environmental status cannot be described exactly at this point in time. Aspects to be investigated are: determining the character of the sources of noise, noise levels (including temporal and spatial variations) and the nature of the main noise disruptions. The accumulation of the effects of different kinds of noise is also important.

Specification of supplementary policy assignments into a programme of measures
Through its commitment to supplementary policy assignments for fisheries, seabed protection and litter, the Cabinet wants to have reversed the downward trend in the marine ecosystem to one of recovery and to reduce the amount of litter in the marine environment by 2020. A decision on measures to be implemented will be taken by 2015 at the latest, in the successor to the National Water Plan. Where possible, measures may be implemented earlier.

Indicators and monitoring programme
The Cabinet seeks to use an as limited a set of preferably existing indicators as possible to monitor all MSFD descriptors effectively, efficiently and at a reasonable cost, and to collect specific information to assess the effectiveness of the policy. This is necessary to perform adaptive management. All targets developed for other directives and the OSPAR assessment criteria are included in this approach.

Where possible, the MSFD monitoring programme uses parameters already measured (or to be measured) in relation to OSPAR, WFD, BHD or CFP level. As such, the programme follows the monitoring programmes (to be) established within these frameworks. The indicators for the MSFD monitoring programme to be completed by 2014 have been outlined in general. Some indicators are being adjusted and new indicators may be developed. This is necessary to be able to assess during the six-yearly update of the Marine Strategy whether the environmental targets are being met and whether good environmental status will eventually be within reach or has been maintained. Where possible, the monitoring programme will be developed together with neighbouring countries (synergy, coherence, cost effectiveness).

Knowledge programming
Until the update of the initial assessment in 2017, the priorities in knowledge programming for the development of indicators, the programme of measures and updating of the Marine Strategy are as follows:
- *Marine ecosystem:* developing indicators, gathering knowledge about the effects of the key disruptive uses, including bottom trawling fisheries, and identifying these effects and any cumulative effects in different habitats and species, taking full advantage of existing international knowledge structures (BHD, WFD, OSPAR).
- *Litter:* studying the risks of microplastics, in particular.
- *Underwater noise* (impulse noise and background noise): the aim is to gather knowledge in order to be able to develop specific policy in the future, where necessary.
- *Specification and elaboration of the three focal points of measures:* researching the (cost) effectiveness of possible measures under the CFP, for supplementary seabed protection and for litter, in preparation for the programme of measures, the draft of which is to be completed in the course of 2014.
- *Cumulation:* improved insight in the cumulation of effects on the marine ecosystem resulting from developments in use and other external influences with a view of the period beyond 2020.

As regards knowledge programming, the main approach will be international coordination and collaboration with knowledge institutes and stakeholders.

Costs
The expenditure relates to policy development and measures, the development of indicators, knowledge programming and the monitoring programme. These activities are supplementary to existing or initiated policy. The expenditure will contribute towards implementing the MSFD and will be covered by the budgets of the Ministry of Infrastructure and the Environment and the Ministry of Economic Affairs, Agriculture and Innovation. The Cabinet also wants to take full advantage of existing national and international cooperation and financing options.

A prerequisite for specification and implementation is a pragmatic approach, i.e. realism, a focus on the key risks, a balance between social costs and benefits, and seizing opportunities for development, innovation and social initiative instead of excluding and 'regulating'.

Context
The Marine Strategy is not an isolated policy. Implemented on its own, it could never successfully achieve good environmental status. As with the implementation of existing and initiated policy, effective collaboration with other countries is of vital importance. Much will also depend on the willingness of the business community and NGOs to invest in innovative initiatives towards the sustainable use of the North Sea.

Chapter 1 Introduction

The Cabinet's ambition is to establish and safeguard good environmental status and biodiversity of the North Sea for current and future generations as a key resource for the economy and the food supply. The Marine Strategy Part I represents the Cabinet's course between 2012 and 2015.

This chapter outlines the rationale for the Marine Strategy (1.1), the delineation of the scope (1.2) and the formation of this Part I of the Marine Strategy (1.3). The chapter ends with an explanation of the structure of this document (1.4).

1.1 Rationale: the Marine Strategy Framework Directive

In 2008, the European Parliament considers the Marine Strategy Framework Directive (MSFD, Directive 2008/56/EC)[1] *). This Directive establishes a framework within which Member States take the necessary measures to achieve, maintain or restore good environmental status in the seas under their management by the year 2020 at the latest. In 2010, the MSFD was embedded in Dutch legislation by means of a modification of the Water Decree under the Water Act.[2]

The European Commission regards the MSFD as the 'environmental cornerstone' of *Integrated Maritime Policy for the European Union*. The Directive obliges Member States to develop an administratively approved Marine Strategy by 15 July 2015 at the latest.3 This is to be effected in coordination with other Member States in the same marine region. The Marine Strategy must comprise the following elements[4]:

1. an initial assessment of the marine environment, to be completed by 15 July 2012
2. a determination, to be established by 15 July 2012, of good environmental status for the waters concerned
3. establishment, by 15 July 2012, of a series of environmental targets that determine good environmental status, and associated indicators
4. establishment and implementation, by 15 July 2014, of a monitoring programme for ongoing assessment and regular updating of targets
5. development, by 2015 at the latest, of a programme of measures designed to achieve and/or maintain good environmental status in 2020. This programme of measures is to become effective by 2016 at the latest.

Part I of the Marine Strategy serves the fulfilment by the Netherlands of the elements 1 through 3 of the Directive. By extension, the Cabinet outlines the policy challenge until 2020. It also serves to fulfil the obligation to make publicly available all relevant information on marine protected areas, pursuant to Article 13, paragraph 6 of the Directive. Part I also comprises a general exploration of the knowledge and monitoring tasks until 2020. This is the prelude to the Marine Strategy Part II about the monitoring programme and Part III about the programme of measures to achieve the environmental targets set.

*) Footnotes are listed at the end of each chapter

Figure 1. Coverage of the Marine Strategy in the Netherlands part of the North Sea.

Good environmental status, environmental targets and the programme of measures will be included in successor to the National Water Plan in 2015. At that time, following coordination with the Dutch House of Representatives, the formulations of good environmental status and the environmental targets will become effective. Until such time, pursuant to Article 3, paragraph 4 of the EU Convention, it is not permitted to act contrary to the targets under the Directive.[5]

According to the Directive, Member States must update their Marine Strategies every six years.[6] As such, the Netherlands will update the elements *initial assessment, good environmental status and targets and indicators* in 2018, followed in 2020 by the second monitoring programme, and in 2021 by the second programme of measures.

In 2012-2013, the Commission will judge the initial assessment, the formulation of good environmental status and the environmental targets and indicators of all Member States against the Directive. Eventual adjustments to the Marine Strategy that are deemed necessary will be elaborated into the successor of the National Water Plan.

1.2 Delineation of scope

Geographical
The Dutch Marine Strategy relates to the Netherlands part of the North Sea[7]. This coverage comprises the water, the seabed and the subsoil seaward of the base line[8] from where the width of the territorial sea is measured. The outer limit of the coverage is defined by the international boundaries of the Dutch Continental Shelf (also the boundary of the Exclusive Economic Zone (EEZ)). The Oosterschelde, the Westerschelde and the Wadden Sea are beyond the coverage of the Marine Strategy; although these areas clearly do relate to the North Sea they are already fully protected under the Birds Directive[9] and the Habitats Directive[10] (together the BHD) and are, as such, designated Natura 2000 areas. They are also governed by the Water Framework Directive[11] (WFD). This safeguards the ecological protection of these areas.[12]

The Netherlands part of the North Sea is part of the MSFD subregion of the North Sea – in the broad sense and including the Kattegat and the English Channel – in the northeastern part of the Atlantic Ocean. This position was taken into account when drafting the Marine Strategy.[13]

Up to one kilometer seaward from the baseline the territorial sea has been divided assigned to the administration of province and municipality. Beyond that, the national government bears full responsibility. The national government has more jurisdiction within the territorial sea than in the beyond EEZ. Measures on fisheries fall exclusively under the Common Fisheries Policy[14] (CFP) of the European Commission. In accordance with the European Commission's initial plans, the new CFP (2013 and beyond) would grant Member States more authority to regional implementation of the fisheries policy.

Contents
In the National Water Plan,[15] (NWP), the Cabinet has determined its strategy for the implementation of the MSFD from now until 2020. The policy opted for in the NWP aims for the sustainable, spatially efficient and safe use of the North Sea for the period until 2020. As set out in the MSFD, WFD and BHD, use should be in balance with the ecosystem. By detailing the MSFD requirements, supplementary to policy already implemented in line with the BHD, CFP and WFD, the Marine Strategy provides a more detailed specification of the maritime part of the NWP policy framework.

The description of the initial assessment, environmental targets and indicators, and the specification of the programme of measures under the Marine Strategy take into account what has been agreed and initiated as part of other EU policy and (regional marine) conventions.[16] (For a complete overview of conventions relevant to the Marine Strategy, see appendix 1). Of particular relevance in this context are: the Water Framework Directive, the Birds and Habitats Directive, The Common Fisheries Policy, the OSPAR Convention (Convention on the protection of the marine environment of the North-East Atlantic)[17] and the Biodiversity Convention[18].
The Marine Strategy provides full insight into how existing and initiated policy contributes to good environmental status of the North Sea. To achieve the good environmental status the Marine Strategy formulates the appropriate *supplementary* policy, knowledge and monitoring assignments as deemed necessary. In brief, the Marine Strategy is complementary to existing and initiated policy while not explicitly including this policy as such.

This concludes the formal delineation, on which the Marine Strategy is specifically based. The Cabinet's ambition, however, is broader than that. The NWP is also about supporting all serious initiatives for a more sustainable use of the North Sea that contribute to a more robust economy and ecology. These are not part of the reporting obligation of the MSFD. This broader policy-related and social challenge is consistent with the Cabinet's view on 'green growth'. It will be detailed in the period to come in the Agenda for the North Sea, as reported in a letter to the House of Representatives in response to the recommendation from the Councils for the Environment and Infrastructure *Een zee van mogelijkheden [A sea of opportunities]*[19].

1.3 Formation of the Marine Strategy Part I

The Marine Strategy Part I came about in consultation with North Sea users and other North Sea stakeholders. The Netherlands was also closely involved in international alignment consultation between the Member States within the context of the OSPAR Convention and in the working and expert groups established by the Member States and the European Commission as part of the *Common Implementation Strategy*[20] of the informal EU consultations between Marine Directors.

Scientific counsel
Where appropriate, formulation was based on the latest scientific insights. The scientific basis for the *initial assessment* is contained in the advice documents from the Deltares and IMARES knowledge institutes drawn up for this purpose.[21] The description of *good environmental status*, *environmental targets* and *associated indicators* was also based on the Deltares and IMARES advice documents.[22,23] This knowledge was supplemented with studies and results from workshops and working groups organised at OSPAR or EU level.

Stakeholder consultation
According to the joint fact-finding approach, North Sea stakeholders were closely involved in the formation of the advice documents. Close coordination with stakeholders was continued during the actual writing of the Marine Strategy Part I. In accordance with the procedure stipulated by the Water Act, the draft Marine Strategy Part I was made available for public inspection in the period from 25 May through 5 July 2012. The results of, and the Cabinet's response to the outcome of the public consultation were compiled in a Note of Reply.[23a] This also serves to fulfil the obligation to make publicly available all relevant information on marine protected areas, pursuant to Article 13, paragraph 6 of the Directive.[23b] The Cabinet will endorse the Marine Strategy Part I after this public consultation opportunity.

International coherence
The Netherlands has advocated optimal coordination of and consistency between the Member States' individual marine strategies, particularly within the OSPAR[23c] framework, but also in the working parties and expert groups established by the European Commission. Where possible, the Netherlands has taken the initiative to improve synergy and efficiency in the approach by means of collaboration. In the OSPAR framework a high level of information exchange en joint assessment of the marine waters has taken place. Much energy was invested in the exchange of ideas on, and coordination of further development of existing methodologies for assessing the (good) environmental status (indicator development), In addition, much work was done on development of coordinated environmental targets and indicators. In the process, priority was given to working with neighbouring countries: the United Kingdom, Germany and Belgium. While the Cabinet's draft decision was available for public consultation, the Netherlands extended alignment consultations to include France and Denmark, the other countries with which the Netherlands shares the southern part of the MSFD subregion of the North Sea.
In the Note of Reply following the public consultation is indicated which public views (national and international) gave cause to modifications of the Marine Strategy Part I.

The process of public consultation and information provision outlined above and the participation of technological institutes amply fulfill the requirements of the MSFD for stakeholder participation, international coordination and collaboration, and use of existing international collaboration structures such as regional marine conventions.[24] Various universities also contributed.

The Cabinet intends to continue applying this method when working out the Marine Strategy in the monitoring programme (Part II) and in the programme of measures (Part III). For a summary of the activities for coordination with stakeholders and other Member States, see Appendices 2 and 3.

1.4 Structure of this document

The next two chapters detail the Marine Strategy Part I. Chapter 2 presents the *initial assessment*. It contains a brief characterization of the Netherlands part of the North Sea, a description of the features and current environmental status of the ecosystem, an economic and social analysis of use, the predominant disturbances, the effectiveness of policy and the costs related to counteracting degradation of the environment. The chapter ends with a conclusion concerning the current environmental status of the ecosystem, looking forward to the environmental status to be expected for 2020 and beyond if policy does not change.
Chapter 3 outlines the policy efforts until 2020, with the Cabinet formulating its ambition and general approach. Their specification contains the description of *good environmental status, environmental targets and indicators*. Where existent and initiated policy does not suffice, supplementary policy assignments are indicated. Based on this, this chapter also provides an initial impetus for the monitoring programme in 2014 (Marine Strategy Part II), the programme of measures in 2015 (Marine Strategy Part II) and the associated knowledge programming. In conclusion, a horizon to 2015 is given, followed by an overview of finances.

Footnotes

[1] *Richtlijn 2008/56/EG van het Europees Parlement en de Raad tot vaststelling van een kader voor communautaire maatregelen betreffende het beleid ten aanzien van het mariene milieu (Kader-richtlijn mariene strategie)* (Brussel, 17 juni 2008) Artikel 1, lid 1.

[2] *Besluit van 23 augustus 2010, houdende wijziging van het Waterbesluit in verband met de implementatie en de uitvoering van de Kaderrichtlijn Mariene Strategie.* Staatsblad nr. 330 (Den Haag, 2010).

[3] *Richtlijn 2008/56/EG*, Art. 5.1.

[4] *Ibidem*, Art. 5.2.

[5] Conform het Waterbesluit (Staatsblad 2010 nr. 330, *wijziging* D). Deze planvorm staat momenteel ter discussie. Mogelijk gaan de EU-plannen als zelfstandige vorm verder.

[6] *Richtlijn 2008/56/EG* , Art. 17.

[7] *Wet Grenzen Nederlandse territoriale zee, Artikel 2 en de Rijkswet EEZ, Artikel 1, op grond van het VN Zeerechtverdrag UNCLOS.*

[8] *Richtlijn 79/409/EEG van het Europese Parlement en de Raad tot vaststelling van een kader voor communautaire maatregelen betreffende het beleid ten aanzien van het behoud van de vogelstand (vogelrichtlijn)* (Brussel, 2 april 1979).

[9] *Richtlijn 92/43/EEG van het Europese Parlement en de Raad tot vaststelling van een kader voor communautaire maatregelen betreffende het beleid ten aanzien van de instandhouding van de natuurlijke en wilde flora en fauna (habitatrichtlijn)* (Brussel, 21 mei 1992).

[10] *Richtlijn 2000/60/EG van het Europese Parlement en de Raad tot vaststelling van een kader voor communautaire maatregelen betreffende het beleid ten aanzien van water (kaderrichtlijn water)* (Brussel, 23 oktober 2000).

[11] *Besluit van 23 augustus 2010, houdende wijziging van het Waterbesluit*, 5.

[12] *Richtlijn 2008/56/EG*, Art. 4.

[13] *Verordening 2371/2002/EG van het Europese Parlement en de Raad tot vaststelling van een kader voor communautaire maatregelen betreffende het beleid ten aanzien van de instandhouding en duurzame exploitatie van de visbestanden in het kader van het gemeenschappelijk visserijbeleid (het gemeenschappelijk visserijbeleid)* (Brussel, december 2002).

[14] Ministerie van Verkeer en Waterstaat, *Nationaal Waterplan* (Den Haag, 2009) 204-206.

[15] *Richtlijn 2008/56/EG*, Art. 10.1, 13.2.

[16] OSPAR. *Het verdrag voor de bescherming van het mariene milieu van de noord-oost Atlantische Oceaan (het OSPAR verdrag)* (Parijs, 22 september 1992).

[17] *Verdrag in zake Biologische Diversiteit (het biodiversiteitsverdrag)* (Rio de Janeiro, 29 december 1993).

[18] Ministerie van Infrastructuur en Milieu, Kabinetsreactie "*Een zee van mogelijkheden*", IENM/BSK-2012/6423.

[19] *Besluit van het informele overleg van EU Mariene Directeuren,* Brno (28-29 mei 2009).

[20] Deltares, IMARES, *Initial Assessment, Implementation of the Marine Strategy Framework Directive for the Dutch part of the North Sea Background document 1 (of 3)* (Delft, 2011).

[21] Deltares, IMARES, *Determination of Good Environmental Status. Implementation of the Marine Strategy Framework Directive for the Dutch part of the North Sea Background document 2 (of 3)* (Delft, 2011).

[22] Deltares, IMARES, *Environmental targets and associated indicators. Implementation of the Marine Strategy Framework Directive for the Dutch part of the North Sea Background document 2 (of 3)* (Delft, 2011).

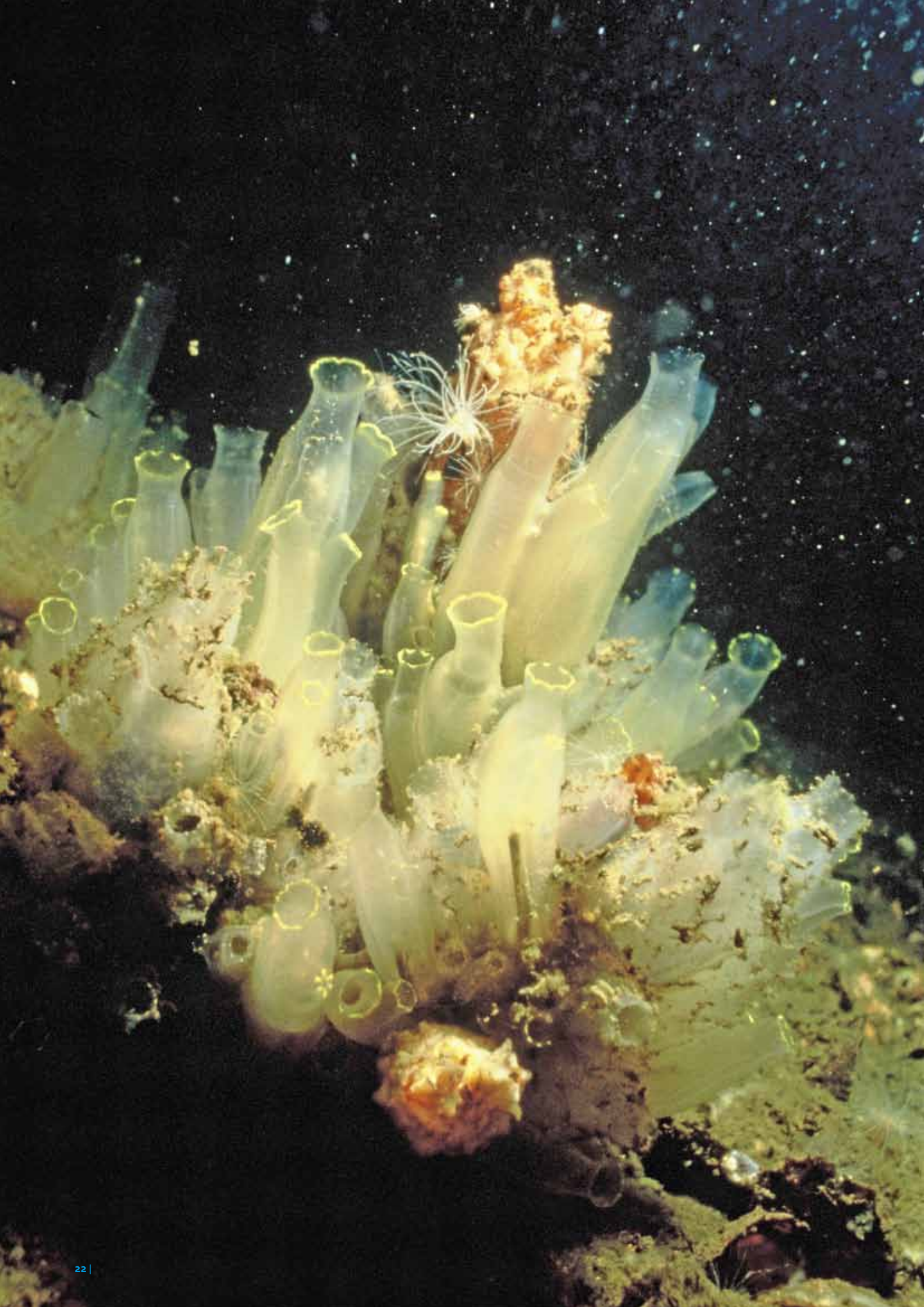
[23] *Besluit van 23 augustus 2010, houdende wijziging van het Waterbesluit,* wijziging B en H (betreffende het invoegen van Art 8.1a, lid 4)

[23a] Ministerie van Infrastructuur en Milieu, Nota van Antwoord - *Naar aanleiding van de terinzagelegging van de Ontwerp Mariene Strategie voor het Nederlandse deel van de Noordzee 2012-2020 - deel I* (Den Haag, 2012)

[23b] *Richtlijn 2008/56/EG*, Art. 13 lid 6, 29.

[23c] OSPAR Commission, *Finding Common Ground - towards regional coherence in implementing the Marine Strategy Framework Directive in the north-east Atlantic region through the work of the OSPAR Commission (London, 2012)*

[24] *Richtlijn 2008/56/EG*, Art. 4, Art. 5.2, 6, 19.



Chapter 2 Initial assessment (MSFD, Article 8)

2.1 Introduction

This chapter describes (as required under Article 8 of the MSFD) the *initial* assessment of the current environmental status of the ecosystem in the Netherlands part of the North Sea.

This introduction outlines the marine ecosystem and human use of the Netherlands part of the North Sea. Section 2.2., then, outlines the characteristics and the current environmental status of the marine ecosystem. Section 2.3 outlines the economic and social significance of the North Sea, and section 2.4 the associated predominant disturbances that affect the marine ecosystem, as well as the effectiveness of prevailing and initiated policy. Section 2.5 addresses the social cost of countering the negative effects of the current use of the North Sea. Section 2.6 closes this chapter with conclusions about the current status of the marine ecosystem of the Netherlands part of the North Sea and about the human activities that currently have the biggest disruptive impact.

With a view to applying as consistently an international approach in the North Sea subregion as possible, the latest insights outlined in the *Quality Status Report* issued by OSPAR in 2010[25] were used, as were the assessment techniques developed in OSPAR. Other OSPAR countries, including our neighbours, also used this shared basis. The most recent assessments under the BHD, WFD and CFP were also employed. Where necessary, these sources were supplemented with insights from other (national) sources, such as the advisory report that Deltares and IMARES drafted for the initial assessment.

Requirements from the MSFD, Article 8, Initial Assessment

In summary, the initial assessment of a Member State's marine waters must comprise the following elements:

- an analysis of the essential features and characteristics, and current environmental status of those waters, covering the physical and chemical features, the habitat types, the biological features and the hydro-morphology;
- an analysis of the (trends in) predominant pressures and impacts, including human activity, on the environmental status (through cumulative and synergetic effects)
- an economic and social analysis of the use of marine environment and of the cost of degradation of the marine environment.

The analyses referred to shall take into account relevant assessments such as those carried out in the context of Community legislation (BHD, WFD and CFP) or in the context of Regional Sea Conventions (OSPAR).

Member States shall make every effort to ensure that assessment technologies are consistent across the marine region or subregion. For the Netherlands, this is the North Sea subregion, within which the Netherlands will focus primarily on the southern part which, according to the division pursuant to the National Water Plan, extends from the English Channel to the Dogger Bank. Transboundary impacts must also be taken into account.

2.1.1 Brief description of the Netherlands part of the North Sea

Marine ecosystem

The Netherlands part of the North Sea is part of the relatively shallow (up to 50 meters) Southern North Sea, which the Netherlands shares with Great Britain, France, Belgium, Germany and Denmark. In the North, the Dogger Bank constitutes a natural boundary with the deeper Central and Northern North Sea.

Given its limited depth, there is a strong interaction in the Southern North Sea between physical and chemical processes and life in and on the seabed and in the water column. Leaving aside the tidal effects and variable wind effects, the water in the North Sea moves according to a fixed pattern. For the most part, seawater from the Atlantic Ocean flows along Scotland to the South, then turns against the clock eastward, and finally leaves the North Sea along the coast of Norway. This water extends southward up to the East Anglia-Frisian Front line. As a result, the water in the northern half of the Netherlands part of the North Sea is different from the water in the southern half, which comes from the English Channel and flows along the Wadden Islands towards the German Bight.

The major influence of the Scheldt, Meuse, Rhine, Ems, Weser and Elbe rivers, whose vast basins reach as far as the Alps characterizes the coastal waters in the southeastern part of the North Sea. The river plume, which extends along the entire Dutch coast, contains a lot of clayey floating material that causes natural turbidity of the seawater. The rivers also carry nutrients to the sea. Of these, nitrogen and phosphorus are essential for algal growth. The productivity of this vegetable plankton is at the basis of the marine food web. The supply of river water – particularly from the Rhine – has meant that the Dutch coastal waters have always been very productive, with rich fish and bird populations.

Use

The Southern North Sea is surrounded by densely populated countries with large urban conurbations, a high degree of industrialization, intensive agriculture, and a dense and intensively used transport network. Consequently, the North Sea has many uses, such as shipping, oil and gas recovery, sand extraction, fisheries, wind farms and recreation. The Southern North Sea is one of the most intensively used seas in the world, particularly in terms of shipping.

The North Sea is an important hub in the international transport network, with some 260,000 shipping movements in the Netherlands part of the North Sea as a whole, specifically concentrated between Texel and the Belgian border. Located around the Southern North Sea are the major seaports of Rotterdam, Amsterdam, Antwerp, Hamburg, Le Havre and London.

The North Sea has also been of major importance for energy supply for several decades. A total of 130 platforms for oil and gas recovery can be found in the Dutch part. In and on the seabed in the Dutch part are some 3,700 kilometers of

pipeline and 4,000 kilometers of cable. Two wind farms have been erected to date for the production of electricity from wind energy, and several licenses have been granted for the construction of new wind farms. At least three new farms will be operational before 2020. Apart from shipping and energy production, interests such as sand extraction, nature reserves and military activities also call for a lot of space.

Finally, the nutrient-rich shallow Southern North Sea – including the entire Dutch part – has traditionally undergone intensive fishing. The coastal zone of the densely populated hinterland provides the platform for busy recreation and tourism.

2.2 Characteristics and current environmental status of the marine ecosystem

This section outlines the characteristics, developments and current status of:

- the different habitats in the Netherlands part of the North Sea (2.2.1)
- plankton (2.2.2)
- benthos (2.2.3)
- fish (2.2.4)
- birds (2.2.5)
- marine mammals (2.2.6)
- the impact of climate change (2.2.7)

2.2.1 Habitats

Characteristic aquatic bottom habitats can be distinguished according to differences in seabed composition and depth (see figure 2).[26] Their borders mainly coincide with those of the different habitats that can be distinguished in the water column.[27,28] The two types of habitat are, therefore, jointly described. The classification used is based on the European Nature Information System EUNIS level 3.[29] The classification has been adjusted to conditions in the Netherlands part of the North Sea. The description of the different types of habitat runs roughly from south to north through the Netherlands part of the North Sea. A number of these habitats, or parts thereof, have been identified as Natura 2000 areas because of their special ecological significance at European level, as per the BHD.

Shallow fine sand. This type can be found in a wide stretch along the coast. The seabed consists of fine sand with a depth gradually increasing to 15-20 meters. The water originates in the English Channel, but is strongly influenced by the major rivers, which results in variable salinity (27-34‰) and increased nutrient and silt concentrations. The sediment is mobile as a result of the strong tidal current (up to 1.0 m/s) and wind-generated waves; there is no permanent sedimentation. Transparency is limited. According to the Habitats Directive, this habitat type is known as H1110 B (sandbanks that are slightly covered by sea water all the time, subtype B). A large section of it along the Dutch coast has been designated as a Natura 2000 area.

Mid-depth mixed sand. This type covers the southern half of the Netherlands part of the North Sea outside the coastal zone. The seabed in this area is made up of medium-fine to coarse sand at a depth of 20-30 meters. The water originates from the English Channel. It is clear and has a salinity in excess of 34‰. The water column is fully mixed throughout the year. Given the strong tidal current (up to 1.0 m/s), there is no permanent sedimentation of suspended material. Wind-generated waves may also cause seabed material to move.

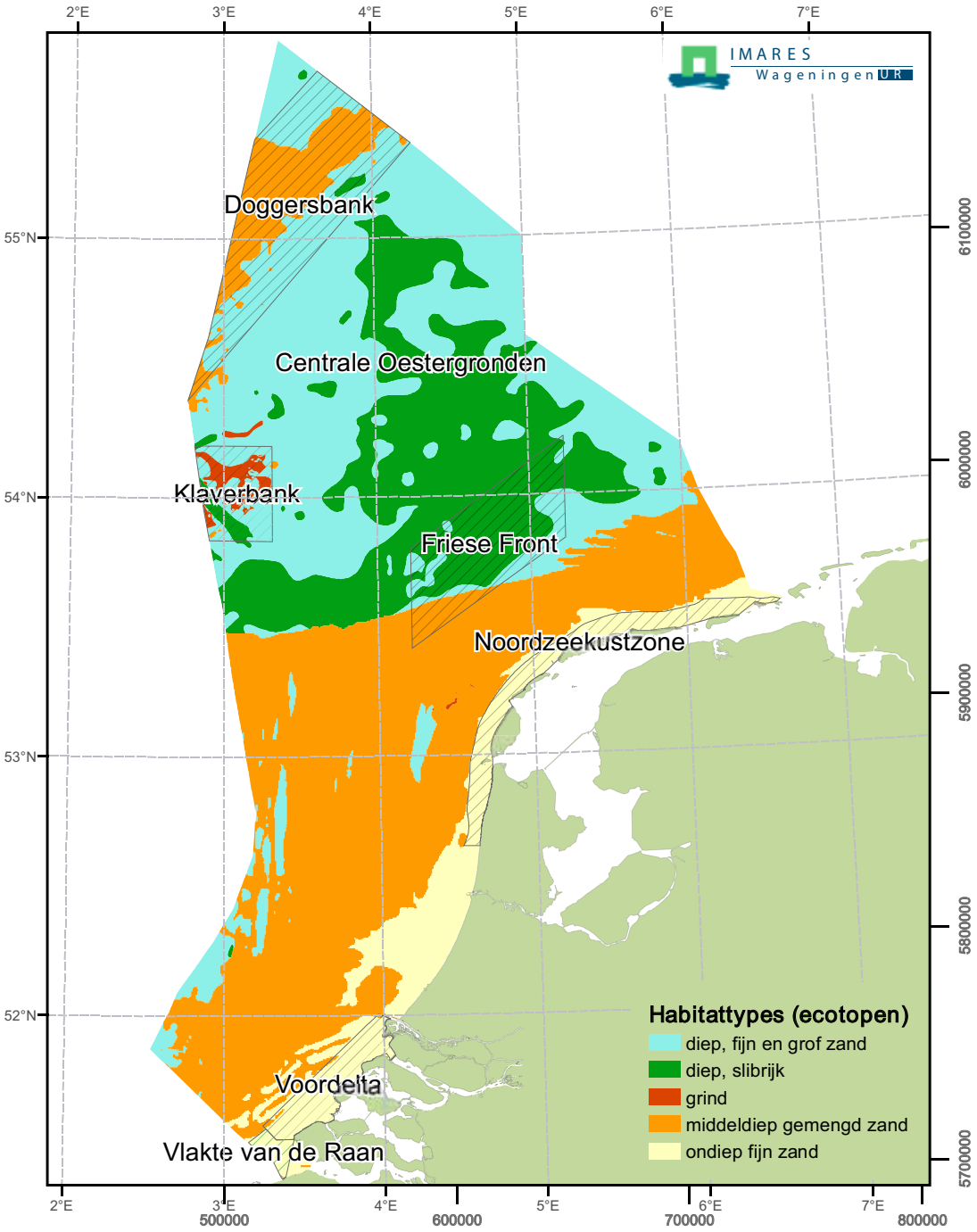
Deep fine and coarse sand. A part of the seabed of the Oyster Grounds consists predominantly of very fine sand with transitions to silty sand. The water here is 40-50 meters deep and wind-generated waves rarely reach the seabed. The tidal current is weak. As a result of these conditions, the water at the bottom is less turbulent. In summer, temperature differences create separate water layers in the water column (thermal stratification). As a result, there is limited exchange between water column and seabed.

Deep silty seabed. The seabed of the central parts of the Oyster Grounds is silty and located at a depth of approximately 50 meters. The properties of the habitat in the water column are the same as those above the sandier parts of the Oyster Grounds.

Frisian Front. The narrow transitional zone between the 20-30-metre deep southern half of the Dutch North Sea and the 40-50-metre deep Oyster Grounds is also the point where water from the English Channel and Atlantic water from the north meet each other. Silty water from East Anglia and water from the Thames and Humber rivers cross the North Sea here. Silt deposits here because of differences in rates of flow. Across a short distance, the seabed composition changes towards the north, from sand to silt to silty sand. In summer, the water above the Oyster Grounds is stratified. Where it borders on permanently mixed water from the south, a front emerges, where increased concentrations of nutrients from the lowest water layer of the Oyster Grounds becomes available to the phytoplankton, resulting in increased production. The Frisian Front will be designated as a Natura 2000 area under the Birds Directive. There is no seabed protection under the Habitats Directive.

Mid-depth gravel and stones, Klaver Bank. The Klaver Bank has an average depth of over 40 meters. The seabed is covered with gravel and – scattered – larger stones. The water, originating

Figure 2. Types of habitat in the Netherlands part of the North Sea.



Source: H.J. Lindeboom et al., *Ecologische atlas Noordzee ten behoeve van gebiedsbescherming [Ecological atlas of the North Sea for area protection purposes]*, (Wageningen, 2008), 55.

in the north, is permanently mixed and clear. Sufficient light penetrates to the bottom to enable the growth of crust-forming red algae. According to the Habitats Directive, the Klaver Bank comes under type H1170 (open-sea reefs) and an application to be designated as a special protection zone under Natura 2000 has been submitted. The European Commission has included the area in the European list of areas of Community importance for the Atlantic biogeographic region.

Dogger Bank. The seabed of the Dutch part of the Dogger Bank consists mainly of fine sand at a depth of 20-30 meters. The tidal current is weak (0.1-0.2 m/s). The water column is fully mixed and is very transparent, enabling the

growth of benthic diatoms (microalgae) on the seabed. The Dutch part of the Dogger Bank comes under type H1110C of the Habitats Directive (sandbanks which are slightly covered by sea water all the time, subtype C) and an application to be designated as a special protection zone under Natura 2000 has been submitted. The European Commission has also included this area in the European list of areas of Community importance for the Atlantic biogeographic region.

2.2.2 Plankton

Phytoplankton and macroalgae Phytoplankton, microalgae suspended in the seawater, are the basis of the North Sea's productivity. 'Blooms', i.e. brief periods of mass exponential algal growth occasionally occurring over vast surfaces, are characteristic of the phytoplankton in the North Sea. They disappear just as quickly as they appear due to the depletion of the nutrients present, viral infections and zooplankton grazing. Algae blooms occur naturally in the period between March and October throughout the North Sea, but more in the southern part than in the northern part of the Dutch North Sea. With several hundreds of species, phytoplankton in the North Sea is very diverse. Only a limited number of them form mass blooms. Macroalgae (such as bladderwrack, Cryptomonas and sea lettuce) do not occur naturally in the Dutch area of coverage for the MSFD.

Zooplankton. Phytoplankton is grazed by zooplankton, animal organisms floating in the seawater. This highly diverse group ranges from single-celled organisms to pelagic shrimps (krill) and jelly fish. Fish larvae are also considered zooplankton. Zooplankton is usually dominated by Copepods, which make up a large part of the total biomass in the seawater, forming a key link in the food web. Plankton in the shallow Southern North Sea may also be rich in larvae of animals living in or on the seafloor (benthos) such as shellfish and starfish. Zooplankton not only grazes phytoplankton; the different species also eat other zooplankton. Zooplankton as a whole serves as food for small fish. The production pattern of zooplankton is irregular in time and space as a result of variable algae blooms.

A natural mismatch between phytoplankton and zooplankton during spring bloom, when there is little zooplankton in the water, is typical of the North Sea. Blooming phytoplankton is barely grazed. At the end of the spring bloom, the algae die and sink to the bottom. Later in the season, the zooplankton grazes a larger part of the phytoplankton production. In the Southern Bight, this may be 20-50%.

Developments

The phytoplankton and zooplankton composition in the Netherlands part of the North Sea is determined mainly by natural factors, such as origin and composition of the water, local aspects such as water depth and stratification, and the changing of the seasons. Long-term changes that have been observed are related to the quantity and composition of the ocean water flowing into the North Sea. To a degree, human activities also influence the composition of phytoplankton and zooplankton, particularly eutrophication. The cause of a recent change in the composition of phytoplankton, i.e. an increase in dinoflagellates and diatoms, is unclear, but changes in the concentrations and ratios of nutrients may play a role.[30]

Eutrophication

The entire North Sea, except for the Dogger Bank, has long been considered a serious problem area in terms of eutrophication. Although there are still some problems, these are limited.[31] Algae blooms and foam on the beach from decaying algal remains are some of the nuisances caused by eutrophication. Local oxygen deficiency also occurs in the German Bight.

Eutrophication: what is it and how is it measured?

Anthropogenic eutrophication of the coast and sea is the process of an excessive supply of nitrogen and phosphate from human activities. This disrupts the natural balance between nutrients (including organic nutrients), on the one hand, and the growth of algae (phytoplankton), macroalgae (such as sea grass) and various animals, on the other. A nutrient surplus may lead to the unbridled growth of harmful algae (direct effects) and, as a result, a disruption of the plant and animal species diversity. Large quantities of decaying algae can cause foam on the beach and oxygen-deficient areas on the seabed (indirect effects). This is harmful to humans (leisure activities, fisheries and fish consumption) and benthic life.

OSPAR (*Common Procedure*) and the WFD use similar assessment schedules for the degree of eutrophication. These include the influence of river water. As an assessment criterion (for the growth period from April to June), a 50% increase in the natural background values of nutrients and algal pigment *chlorophyll* a is considered acceptable.
OSPAR assesses the entire Netherlands part of the North Sea, the WFD covers it up to 1 nautical mile offshore (including the southwestern Delta and the Wadden Sea). In addition to the key indicator of *chlorophyll a*, OSPAR also uses the foam alga Phaeocystis globosa and the floating layers of sea sparkle *Noctiluca scintillans* as key indicators for assessing eutrophication.

The quantity of chlorophyll a, which is the indicator for eutrophication, has decreased since 1995. In the 2001-2005 period, however, its concentration in coastal waters was still two to three times above the assessment value formulated by OSPAR (50% above the natural background).[32]
Using the same indicator, the waters up to 1 nautical mile off the coast were assessed for the Water Framework Directive. Between 2006 and 2008, scores fluctuated between 'good' and 'moderate', depending on the body of water; the Zeeland Coast and the Northern Delta Coast have had 'moderate' scores for years. The major variation in the intensity of algae blooms has made it impossible to determine a trend for the 1990-2008 period.[33]

The low oxygen values that occur in the Oyster Grounds sedimentation area during some summers are mainly caused by the natural decomposition of deposited organic material of dead algae. In the summer months, thermal stratification of seawater occurs in this area. As a result, vertical mixing of the water column does no longer occur and the water on the seabed no longer gets refreshened.[34]

The effects of eutrophication on benthos and fish have not been measured in the monitoring programme.[35]

See also
- section 2.4.2 (chemical disturbances) on the effectiveness of prevailing and initiated policy on the introduction of nutrients.
- section 2.4.3 (biogenic disturbances) on the effectiveness of prevailing and proposed sources policy on non-indigenous species.

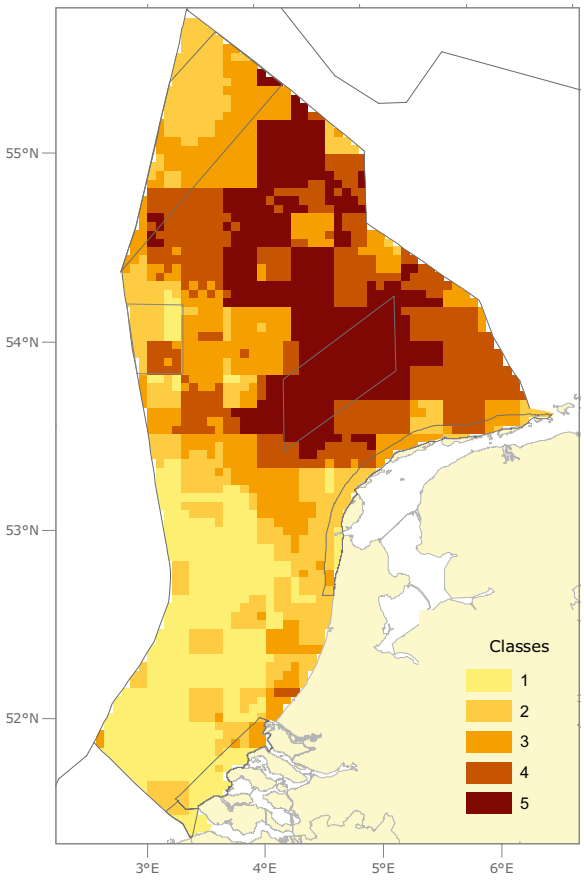
2.2.3 Benthos

A large portion of phytoplankton production in the Southern North Sea eventually reaches the seabed, where it forms the food basis for a rich bottom fauna. Some of the benthic organisms filter algae and other material from the water column (i.e. *filter feeders*, including many shellfish and worms). Other important groups are animals that eat material deposited onto the surface (i.e. *surface deposit feeders*, including brittle stars, sea potatoes and small crustaceans) and animals that digest organic material from the sediment (i.e. *subsurface deposit feeders*, including many worms). There also are animals, such as crabs and some snails and starfish, that live off other benthos. Factors that are of importance for the availability of phytoplankton production for benthos – in addition to grazing pressure from zooplankton – are the force of the tidal current and the impact of wind-generated waves, which determine whether the algal material can deposit onto the bottom for a shorter or longer period of time. As a result of stratification of the water column over the Oyster Grounds, the top-most water layer containing phytoplankton does not circulate all the way down to the bottom in summer, meaning that the phytoplankton is not available for the *filter feeders* among the bottom fauna.

The regular monitoring programme for the Netherlands part of the North Sea identifies some 500 macro-benthos species (bottom-dwelling organisms larger than 1 mm in size). There clearly are different communities of species in the different habitat types. The largest differences in species composition occur between the hard substrates, sandy beds and silty soils:

- The highest benthic biomass in the Netherlands part of the North Sea is found in the *coastal zone*. The species diversity in this highly dynamic environment is low.
- The fauna of the *sandy beds of the Southern Bight* with its strong tidal current is characterised by a relatively low species diversity and a low biomass.
- The *Frisian Front*, on the other hand, has a relatively high benthic biomass, with a large variety of species and relatively many vulnerable, long-living and large species (see figure 4).

Figure 4. Average biodiversity of the total benthos.



Source: O.G. Bos et al, *Biodiversity hotspots on the Dutch continental shelf. A marine strategy framework directive perspective*, IMARES report no. C071/11 (Wageningen, 2011) 53.

- In the *Oyster Grounds*, too, bottom fauna diversity is high, with relatively many vulnerable, long-living and large species, particularly in the silty parts (see figure 4).
- The bottom fauna of the *Dogger Bank* is characterised by a high diversity with relatively many rare and relatively many vulnerable long-living species.
- On the *Klaver Bank*, species diversity and biomass are high, which is related to the very varied sediment composition. Unique for the Netherlands part of the North Sea is the large number of attached organisms on the Klaver Bank.[36] Some 140 species living on the Klaver Bank occur virtually nowhere else in the Netherlands part of the North Sea.

Apart from the coastal zone, the Klaver Bank and the Dogger Bank, it is mainly the deep, silty northern part of the Dutch North Sea that is of importance to benthic biodiversity. The *Frisian Front* and the *Central Oyster Grounds* areas clearly stand out in this respect (see figure 3). These areas are of importance for benthos because of their species diversity and density, the total biomass, distribution of species, and the balanced composition of the benthic community. These areas are also unique because of the densities of vulnerable, rare, endangered and long-living species.[37] 'Long-living' means more than ten years. One such long-living animal is the ocean quahog *(Artica islandica)*, a species that, under undisturbed conditions, could live for hundreds of years.

Developments

Over a period of many years, the seabed in a large part of the Dutch North Sea has changed dramatically. A robust ecosystem with a high biodiversity and a balanced age distribution of the different species has changed into a relatively impoverished system with an unnatural age composition and relatively more opportunistic and scavenging species and fewer vulnerable species. A permanent physical disruption keeps benthic communities captive in an early stage of succession and – due to such factors as a decrease in structure-forming worms – has resulted in a decrease in biogenic structures.[38] As such, populations of long-living species with either low reproduction rates or when many individuals do not become old enough for prolonged reproduction have been decreasing since the 1980s.[39] Biogenic substrates (reefs) of species sensitive to disturbances have become rare.[40] The deterioration of the seabed ecosystem is mainly caused by traditional beam trawl fishing and, in the coastal system, by non-indigenous species. However, eutrophication and climate change also play a role.[41]

Non-indigenous species

Non-indigenous species introduced by human activity have also had a major impact on the ecosystem changing into what it is now. In the ballast water of ships, attached to ship's hulls or through the import living shells, these organisms hitch a ride to places far outside their original distribution area. Their negative effects on the marine

Foam from algae (Phaeocystis) washes upon the beach

ecosystem may include: habitat changes, harmful algae blooms (toxic algae in shellfish for consumption), loss of biodiversity, competition and predation at the expense of indigenous species (as a result of changes in the food web) and physical damage to structures.

There are 37 known established non-indigenous species in the Netherlands part of the North Sea (including estuaries and the Wadden Sea). These mainly concern algae, crustaceans, shellfish (molluscs) and worms. Sixteen of these non-indigenous species are known to be harmful to the ecosystem. Two non-indigenous species whose introduction has had major consequences are the Atlantic jackknife clam *(Ensis directus)* and the Pacific oyster *(Crassostrea gigas)*. The Atlantic jackknife clam currently represents 90% of the biomass in the coastal zone seabed. Twenty years ago, *Spisula subtruncata* was still the most common species in this area, forming large-scale banks. *Spisula* decreased unexpectedly. Subsequently, the Atlantic jackknife clam took over the *Spisula's* ecological niche (and possibly that of other indigenous bivalves) with an as yet poorly understood success (see figure 5). This shift probably also led to the decline in numbers of the common scoter, which feeds mainly on *Spisula*.
The Pacific oyster, the second example, not only proved a formidable competitor of indigenous species, it also brought with it the pathogen Bonamia. The indigenous flat oyster *(Ostrea edulis)* has all but become extinct in the Netherlands part of the North Sea: due to overfishing in the first half of the 20th century, competition from the Pacific oyster and susceptibility to Bonamia. This parasite is possibly also preventing the return of the flat oyster.[42]

See also

- section 2.4.1 on physical disturbances from fisheries and the effectiveness of prevailing and initiated policy on fisheries
- section 2.4.3 on biogenic disturbances and the effectiveness of prevailing and initiated policy on sources of non-indigenous species.

Lost hard substrates and shipwrecks
Hard substrates provide a surface for certain organisms to attach themselves to. As such, they are a separate habitat with a species variety that shows little overlap with those of the dominant sandy and silty seabeds of the Netherlands part of the North Sea.
Typical animals include sea anemones, sponges, sea squirts, the leather coral dead man's thumbs and various sea slugs. Hard substrates also provide some kind of existence to many other species, for example to about 140 macro-benthos species unique to the Klaver Bank.

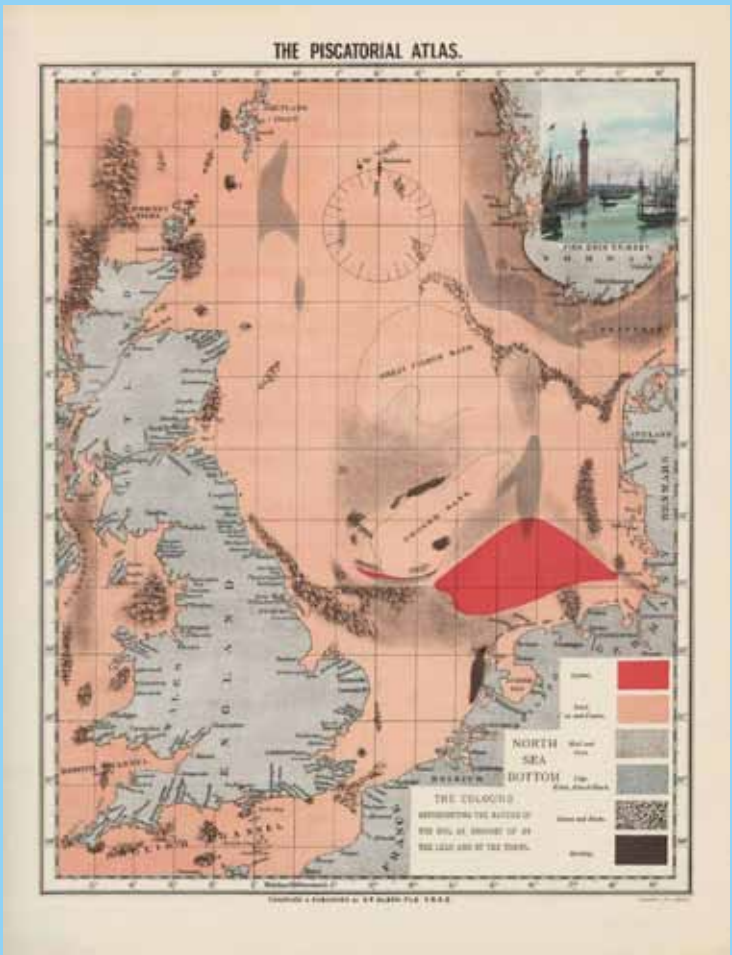
In the late 19th century, over 20% of the bottom of the Netherlands part of the North Sea was covered by hard substrate (see alongside). On the Klaver Bank and the locations Texelse Stenen and Borkumse Stenen, this hard substrate consisted of stones and gravel. However, the largest hard substrate surface was formed by biogenic substrates: on the Oyster Grounds, vast areas filled with clusters of flat oysters, and hard layers of peat along the Noord-Holland coast and on the Dogger Bank. Oysters and peat on the seabed surface formed a suitable substrate for animals to attach themselves to.[1, 2]

Nowadays, hard substrates barely cover 1% of the bottom of the Netherlands part of the North Sea. Not only has surface area diminished, but distribution and diversity have declined sharply as well. Flat oysters were harvested en masse in the early 20th century and have now disappeared completely. The hard layers of peat have also all but gone, having been eroded or covered by travelling sand.

The stones in the Texelse Stenen have been dredged up or disappeared under the sand. The Klaver Bank is now the main location with hard substrates in the Netherlands part of the North Sea.

That said, new hard substrates have also emerged: the Netherlands part of the North Sea is home to approx. 3,000 known shipwrecks. Some of these protrude from the seabed, creating a separate (artificial) habitat whose fauna is significantly different from that of the surrounding seabed. The species composition of the attached fauna depends on the location and is very similar to those on natural hard substrates. The underwater parts of wind turbines and platforms also are a suitable substrate for attaching fauna.

The spatial structure also offers the right living conditions and shelter for other animals. Species such as bibs, young cod and the North Sea crab are often seen around shipwrecks.[3, 4]
Further research into the value of hard substrates in relation to the MSFD will be conducted over the next few years (see section 3.12.3).



The Netherlands part of the North Sea after Olsen, 1883[4]

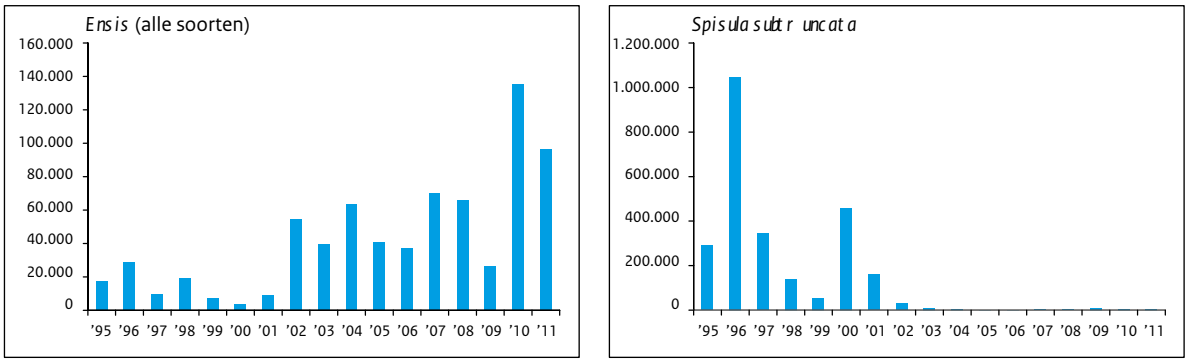
[1] H.J. Lindeboom et al., *'Gebiedsbescherming Noordzee: habitattype, instandhoudingsdoelen en beheermaatregelen' [Area protection of the North Sea: habitat type, conservation targets and control measures]*, WOt working document 114 (2008) 10.

[2] J. Walkek Strather, *'Shelly clay dredged from the Dogger Bank'*, Quarterly Journal of the Geological Society 64 (1912) 324

[3] W. Lengkeek et al., *'Een beschermde status voor wrakken in de Noordzee?* [Protected status for wrecks in the North Sea?], Bureau Waardenburg report no. 11-160 (2011) 13.

[4] O.T. Olsen, *The Piscatorial Atlas of the North Sea, English and St. George's Channels.* Taylor and Francis, (London, 1883).

Figure 5. Population size (in millions of shellfish) in Dutch coastal waters in the 1995-2011 period: Ensis (all species) left, versus Spisula subtruncata right.



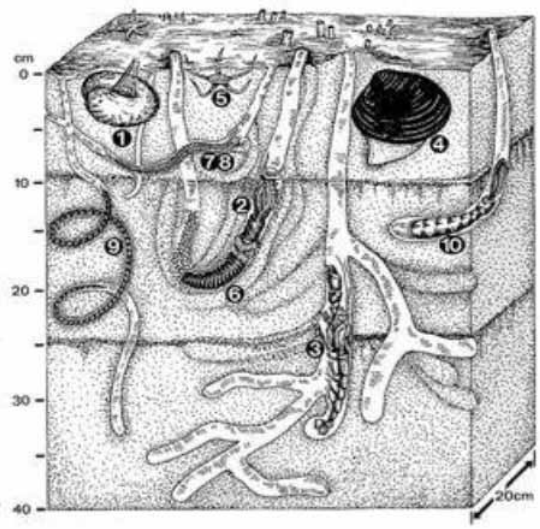
Source: P.C. Goudswaard, K.J. Perdon, J. Jol, J.J. Kesteloo, C. van Zweeden K. Troost *Schelpdieren in de Nederlandse kustwateren. Bestandsopname 2011* [Shellfish in Dutch coastal waters. Stock inventory 2011]. IMARES report C094/11 (Wageningen, 2011), 69.

2.2.4 Fish

The shallow, productive North Sea is by nature very rich in fish. Of the shoaling *pelagic* species, herring is by far the most important, with a total quantity of 1.3 million tonnes. Other important open-water species are mackerel and horse mackerel. Species that play a key role in the food web are the sand eel, sprat, Norway pout and young herring.
The *demersal* species, which live on or near the bottom, can be divided into round fish (including cod-like fish such as cod, whiting, haddock and pollack) and flat fish (such as plaice, sole, dab and flounder).

The diversity in fish species is highest in the coastal zone. Outside the coastal zone, diversity in the southern half of the Netherlands part of the North Sea is higher than in the northern half. Species from warmer waters that enter the North Sea by way of the English Channel spread out by way of the warmer coastal zone, which in part explains the high biodiversity in the coastal zone, as does the relation between the coastal zone and the Wadden Sea. Diadromous species, which live in freshwater part of their lives, also contribute to that biodiversity. These are migrating species such as salmon, eel, river lamprey and stickleback, and, in the past, Allis shad, common sturgeon, North Sea houting, etc. It is difficult to determine a spatial distribution pattern for the diversity of fish species as fish are very mobile and some species migrate large distances during specific periods. Natural fluctuations have a strong impact on recruitment and, consequently, prevalence and species composition.

Figure 3. A drawing of a section of seabed from the Frisian Front/Central Oyster Grounds area, showing the most typical animals and how they live in the seabed.

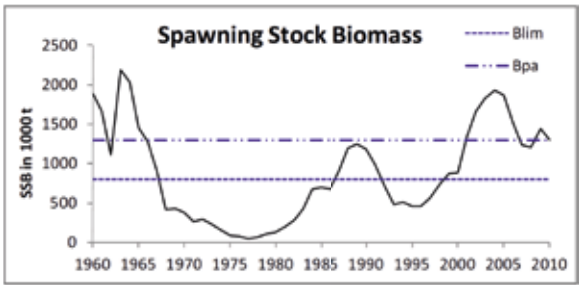


1. Sea potato – Echinocardium cordatum
2. Parcement worm – Chaetopteris variopedatus
3. Burrowing mud shrimp – Callianassa subterrana
4. Ocean quahog – Artica islandica
5. Brittle star – Amphiura filiformis
6. Gekroesde zeerups - Gattyana cirrosa
7. Glycera unicornis
8. Ragworm spp. – Nereis spp.
9. Notomastus latericeus
10. Echiurus echiurus

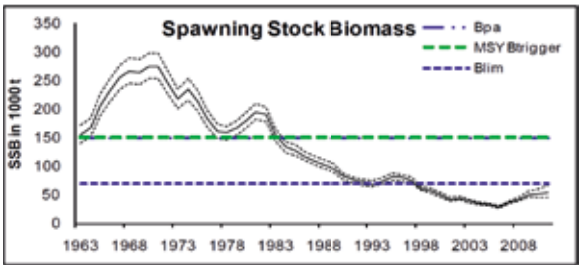
Source: P.A.W. de Wilde, E.M. Berghuis and A. Kok, Structure and energy demand of the benthic community of the Oyster Ground, central North Sea. Neth. J. Sea Res. 18 (1984) 143-159.

Figure 6. Development of the herring, plaice, cod and sole populations in the Southern North Sea, 1957-2010.

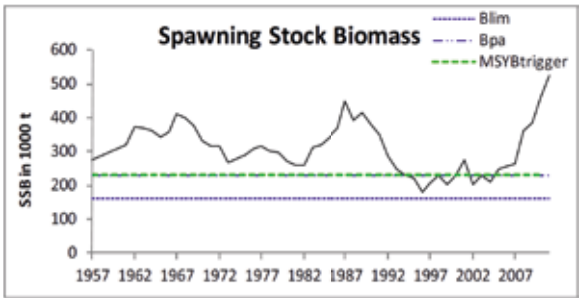
herring



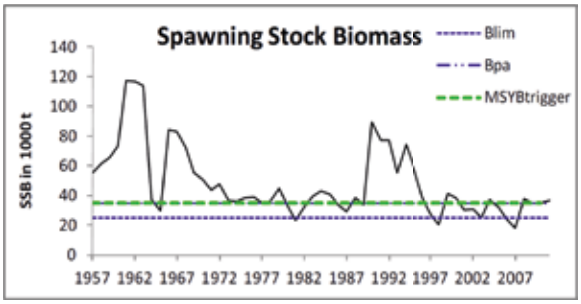
cod



plaice



sole



Source: ICES, Report of the *ICES Advisory Committee* 2011. ICES Advice 2011. Book VI, the North Sea stocks

Developments

In the period between 1960 and 1990, cod-like fish (e.g. cod, haddock, pollack and whiting) boasted strong year classes, referred to as the *gadoid outburst*. However, these species subsequently declined in great number.[43] Major demersal species that reproduce slowly have declined since 1977.
The populations of cod and some elasmobranches (sharks, skates and rays) are a cause for concern. Species such as the porbeagle and common skate have all but disappeared from Dutch waters. Thornback rays and the spiny dogfish have become rare. While more tope have been observed lately[44], no conclusions may be drawn from that.
Stocks of a large number of species, including haddock, plaice and herring, have recovered to 1960s levels. Stocks of a limited number of species (such as cod) are still below the 'Maximum Sustainable Yield', the optimum level of exploitation and recovery used in the fisheries policy.[45] On average, demersal fish have become smaller. Sole and plaice are sexually mature at a younger age and at a shorter length. All in all, total biomass has hardly increased.[46]

Fishing is the main reason behind the current unfavourable status of the cod. Migrating species such as salmon, Allis shad, common sturgeon and houting became rare in the last century due to a loss of spawning areas, river pollution and overfishing. The barrier effect of dykes and engineering structures hinders the recovery of these species.

Despite the decline in the diversity of bottom fishes, the diversity of fish species as a whole in the Netherlands part of the North Sea has been on the up since the early 20th century, mainly as a result of the increase in the number of small, southern species. The decrease in larger predators and changes in temperature may offer a possible explanation for this trend.[47]

See also

- section 2.4.1 (physical disturbances), which addresses the effectiveness of prevailing and initiated policy on physical disturbances on fish species.

2.2.5 Birds

Birds of the open sea, *pelagic species*, live scattered across the Southern North Sea. These are birds such as fulmars, shearwaters, gannets, auks (including guillemots, razorbills, puffins), kittiwakes and skuas, species that often breed on the (rocky) coasts of Great Britain and other parts of the northwest Atlantic area and spend their winters roaming the Southern North Sea. Auks have a clear preference for specific areas: guillemots and auks convene in numbers ranging from the thousands to the tens of thousands in the Southern Bight, while puffins and little auks winter in the northern half of the Netherlands part of the North Sea.[48]

In late summer, the Frisian Front is of particular importance to breeding colonies on the east coast of Great Britain and for skuas from the breeding grounds in northern Scotland and Iceland. For that reason the area will be designated as a special protection zone in the framework of the Birds Directive. Such more or less predictable winter concentrations cannot be deduced from the available counting data for other birds.[49]

The largest concentrations of birds can be found along the coast (see figure 7).[50] These are different species of gulls and terns that breed in the Netherlands, but also wintering and passing fish-eating species (including the red-throated diver, different species of grebe and the little gull) and shellfish-eating species (e.g. common scoter and Eider duck). In conjunction with the accessibility of their food, the shellfish-eating species live in a limited area of the shallow coastal zone. The Dutch coastal waters are of importance to all these species living along the coast. It is for that and other reasons that large parts of the coastal zone (North Sea coastal zone and Voordelta) have been designated special protection zones under the Birds Directive.

Developments

Twelve species of birds more or less depend on the Dutch coastal zone during the breeding season or in winter. Most of them have a moderate to highly unfavourable conservation status under the Birds Directive. Food supply (fish and shellfish) is a bottleneck and summer birds have to contend with the limited availability of suitable breeding places.

Only three coastal birds (cormorant, black-backed gull and arctic tern) have been given a favourable conservation status on all scores.[51] The cause of the bottlenecks is rooted in an accumulation of effects from hydrographical interventions, fishing, and disruption of the living area.

Of all pelagic bird species in the Netherlands part of the North Sea, only the conservation status of the guillemot and the arctic skua has been assessed according to the same method used for coastal birds. In both cases, this was considered favourable on all scores. None of the five pelagic species in the Netherlands part of the North Sea has an unfavourable conservation status at European level. Counts of these species in the Netherlands part of the North Sea initially suggest an increase from 1992 onward, followed by a more or less distinct decrease from about 2002-2005 onward.[52]

The OSPAR target value (Ecological Quality Objective, EcoQO) for oil pollution is that fewer than 10% of birds that wash ashore are oil-stained (in the shorter term: 20% in 2020). The percentage of oil-stained birds has shown a downward trend since 1975, but the current level is still above the target level.

See also

- section 2.4.1 on physical disturbances and the effectiveness of prevailing and initiated policy.

- section 2.4.3 on chemical disturbances due to oil pollution and other factors and the effectiveness of prevailing and initiated policy on preventing oil pollution.
- section 2.4.6 about cumulative and synergetic effects.

2.2.6 Marine mammals

The most common marine mammals in the Netherlands part of the North Sea are the harbour porpoise, the harbour seal, the grey seal and the white-beaked dolphin. Populations of harbour and grey seals and harbour porpoise fell sharply during the last century, but have recovered since the 1980s.[53]

Developments

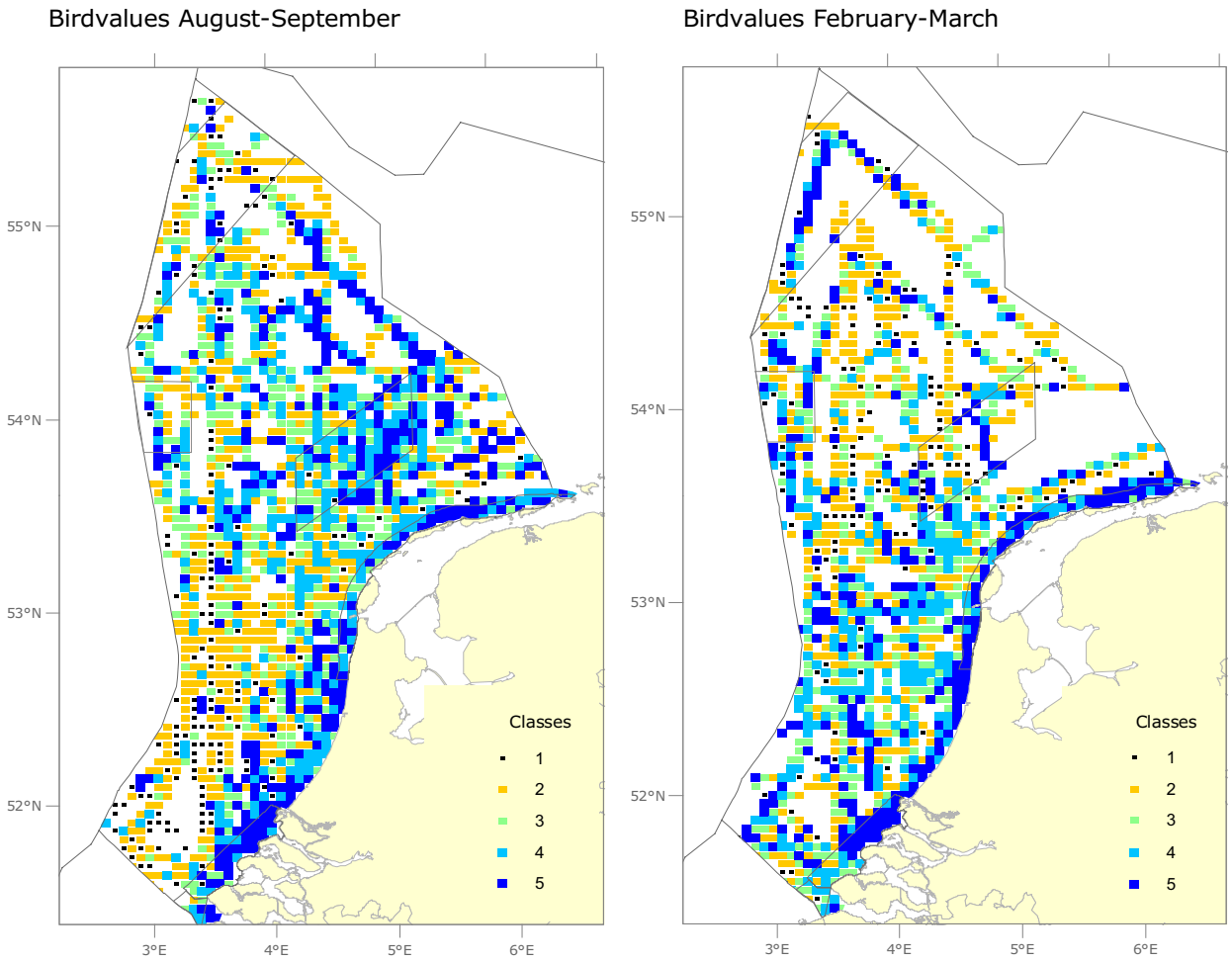
It is estimated that there are 80,000 harbour seals in the marine waters of Northwestern Europe, about a tenth of which live in Dutch waters. Harbour seals in the Netherlands belong to the Wadden Sea population, which lives in an area extending from Esjberg in Denmark to Den Helder in the Netherlands. The harbour seals in the Delta area are, in fact, also part of this population, as they hardly reproduce there and depend on immigration from the Wadden Sea. After having been hunted to extinction in Dutch waters in the Middle Ages, the grey seal started colonizing the western Wadden Sea again in the 1980s. This remigration started in British waters. Expert estimates based on three documents[54,55,56] suggest that the population of grey seals in the marine waters of Northwestern Europe totals 150,000 animals. Some 2% of which (2009 counts)[57] live in Dutch waters. On Dutch territory, the grey seal lives mainly in the Wadden Sea, but also along the Zuid-Holland and Zeeland coast and further from the coast in the Southern Bight and on a wide stretch of the northwestern coastal area from Klaver Bank to Dogger Bank. Harbour and grey seals reproduce in Dutch waters, mainly in the Wadden Sea.

The harbour porpoise lives scattered throughout the northern Atlantic area. There also are small populations in the Baltic, Black Sea and Mediterranean. The harbour porpoises in the Netherlands part of the North Sea are part of a population of some 180,000 animals living throughout the southwestern North Sea and eastern part of the English Channel. Some 14% of this population lives in Dutch waters in summer, and up to approximately 48% in spring. The number of harbour porpoises in the Southern North Sea fell sharply from the 1950s onwards. Counts off the coast and counts for the entire Netherlands part of the North Sea show a considerable increase from 1994 onwards (see figure 9).

Harbour porpoises forage close to the bottom of the sea.[58] Their food consists mainly of fish and shellfish, depending on supply in a certain area. What is not known is whether the harbour porpoise reproduces in the Dutch part of North Sea.[59]

The grey seal and harbour porpoise populations (see figure 9) are developing favourably in terms of population size. Nevertheless, the conservation status of both species under the Habitats Directive is moderately unfavourable. For the

Figure 7. Bird values in the Netherlands part of the North Sea, late summer and winter.



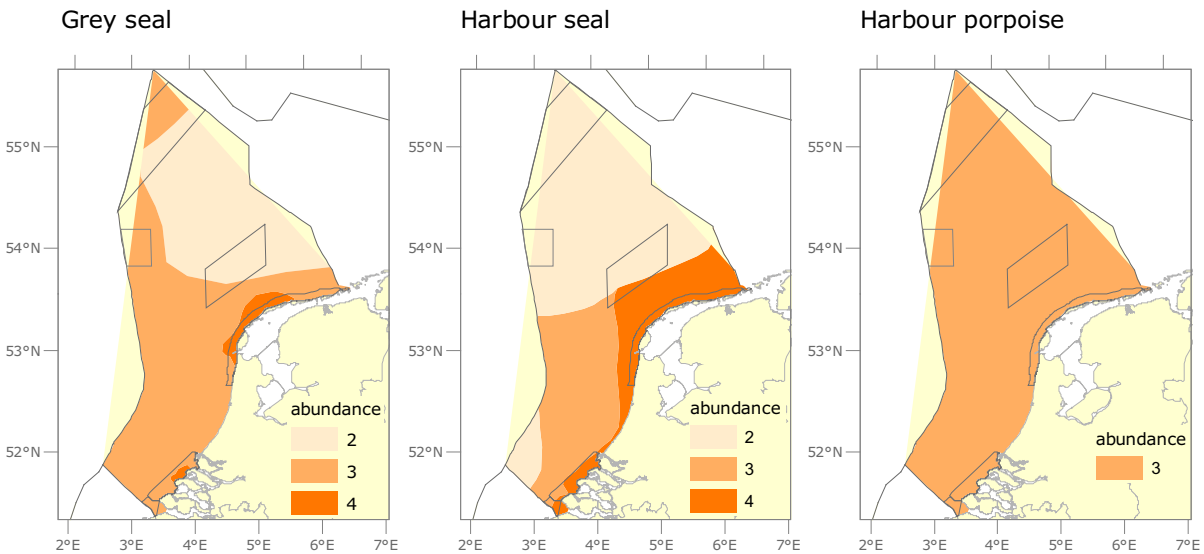
Source: Bos, O.G., et al, *Biodiversity hotspots on the Dutch continental shelf. A marine strategy framework directive perspective,* IMARES report no. C071/11 (Wageningen, 2011) 76.

grey seal, this is due the fact that the quality of its habitat has been deemed unfavourable.60 The significant increase in the number of strandings (see figure 9) of harbour porpoises in recent years is a cause for concern. One possible explanation is an accumulation of factors, such as by-catches in fishing, but also underwater noise. The Conservation Plan for the Harbour Porpoise is endeavouring to unravel these factors.[61]

See also

- section 2.4.1 on physical disturbances and the effectiveness of prevailing and initiated policy
- section 2.4.4 on synergetic and cumulative effects.

Figure 8. Average annual distribution of grey seal, harbour seal and harbour porpoise in the Netherlands part of the North Sea.



Source: Bos, O.G., et al, *Biodiversity hotspots on the Dutch continental shelf. A marine strategy framework directive perspective,* IMARES report no. Co71/11 (Wageningen, 2011) 82.

Contaminants in the North Sea: examples from the past

In the 1970s, a great deal of attention was paid to the presence of contaminants. The concentrations of many contaminants have fallen drastically since. The problems outlined below have now become a thing of the past.

Toxic substances

The accumulation of persistent toxic substances in marine food webs resulted in diminished fertility and decreased resistance in predators that mainly feed off fish. The grey and harbour seal populations, for example, had fallen to critically low numbers in the 1970s. Reproductive success had declined considerably, probably as a result of excessive PCB concentrations[1] in the seawater. The reproductive success of the arctic tern and common tern had also fallen sharply, because DDT[2 3] caused egg shells to break because they were too thin. Liver tumours found in flounder were related to freshwater/saltwater stress and to the presence of PAHs[4] in the seawater.

Given the concurrence of multiple stress factors, the causal relationship between contaminants and identified effects is often difficult to prove. Nevertheless, risk assessments suggest that contaminants, as mentioned in the examples, were the cause of the effects seen.

The populations of marine mammals, birds and fish that suffered from toxic effects in the 1970s are once again developing positively or have reached a new biological equilibrium[5].

Oil pollution

In the second half of the last century, floating layers of oil were a major mortality factor for sea birds, with regular beachings of oil-stained birds in the 1970s and 80s. Pollution has decreased considerably since then.

TBT

TBT (tributyltin) has been used for a long time in ocean shipping as an anti-fouling agent on ships' hulls, entering the marine environment through leaching. In the 1990s, it was revealed that TBT caused imposex in snails such as the dog whelk and the common whelk, which means that female snails grow male sex organs, endangering reproduction.

[1] Wadden Sea Quality Status Report 2004. K. Essink, C. Dettmann, H. Farke, K. Laursen, G. Lüerßen, H. Marencic, W. Wiersinga (Eds.) 135.

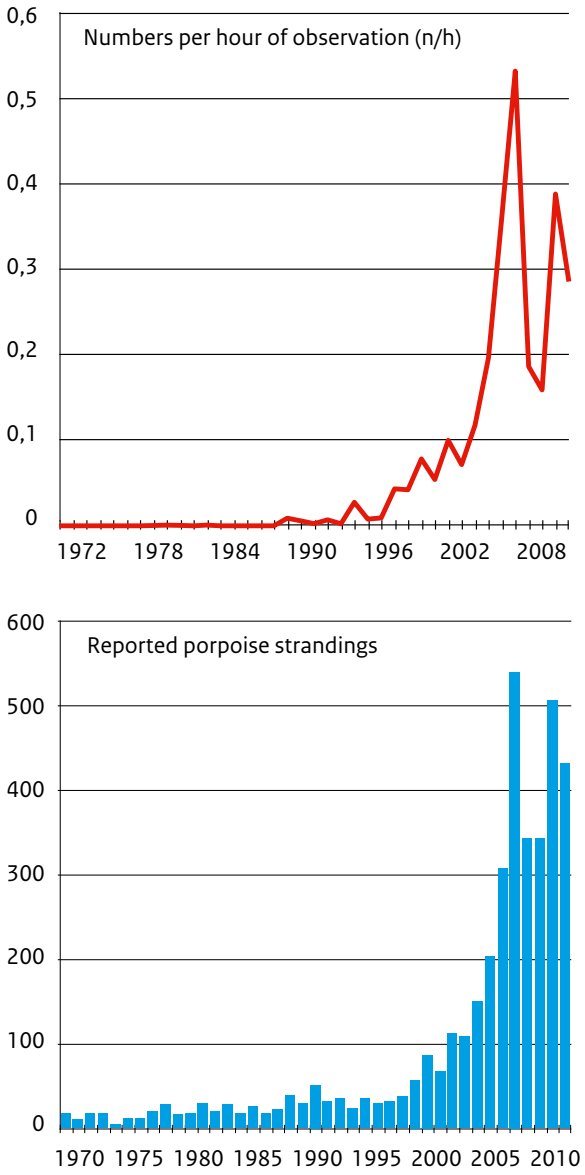
[2] J.H. Koeman., J. Veen, E. Brouwer, L. Huisman de Brouwer & J . L. Koolen. *Residues of chlorinated hydrocarbon insecticides in the North Sea environment,* Helgol. Wiss. Meersunters. 17 (1968) 375.

[3] Anindita Mitra, Chandranath Chatterjee and Fatik B. Mandal, *Synthetic Chemical Pesticides and Their Effects on Birds.* Research Journal of Environmental Toxicology, 5: 81-96 (2011).

[4] Deltares, IMARES, *Determination of Good Environmental Status. Implementation of the Marine Strategy Framework Directive for the Dutch North Sea* (Delft, 2011) 20

[5] Deltares, IMARES, *Initial Assessment, Implementation of the Marine Strategy Framework Directive for the Dutch North Sea* (Delft, 2011) 123/124, 127

Figure 9. Trends harbour porpoise, population and strandings 1970-2010



Source: C.J Camphuysen, M.L. Siemensma, *Conservation plan for the Harbour Porpoise Phocoena phocoena in The Netherlands: towards a favourable conservation status,* NIOZ Report 2011-07, Royal Netherlands Institute for Sea Research (Texel, 2011) 35 and 38.

Note: There were more than 850 strandings in 2011. See www.walvisstrandingen.nl.

2.2.7 Climate change and the marine ecosystem

Climate change may impact a number of abiotic factors in the North Sea environment on which living organisms depend and/or with which they interact. Examples of such non-living components of the ecosystem are: water, light, temperature, seabed minerals, air as a mixture of the gases oxygen, CO2, nitrogen, etc. Potential influences[62] are:

- increase in temperature of the sea water
- a change in the discharge regime of the major rivers and an increase in the nutrient concentrations in river water
- earlier and longer coastal sea stratification period
- more storms
- rising sea levels
- change in CO2 uptake by the sea (and acidification of the sea)
- an increase in coastal erosion
- decreased circulation of sea water in the Atlantic Ocean.

The (potential) effects of these influences on the marine ecosystems are difficult to indicate or predict, as there is too little insight into the workings of the various mechanisms and only limited data is available.
Potential effects[63] are:

- a change in the composition of species, as with climate change species are moving progressively more to the north (already observed in plankton composition, fish species and organisms that live in intertidal areas)
- earlier blooms of (harmful) algae (already observed)
- increase in the number of invasive non-indigenous species, because their living conditions are becoming increasingly favourable
- increase in diseases in aquacultures (shellfish, fish)
- changes in the composition of benthic communities as a result of abrupt changes in the ecosystem
- a change in the structures in the food webs due to changes in availability of prey and the presence of predators
- loss of nesting places for coastal breeding birds and of resting places and nurseries for seals (as a result of storms and erosion)

2.3 Economic and social analysis of the use of the North Sea

2.3.1 Economic analysis

Figure 10 shows the current use of the Netherlands part of the North Sea. Based on an internationally coordinated action plan[64], Statistics Netherlands (CBS) formulated a quantitative economic description of the use of the Netherlands part of the North Sea by different economic sectors that directly or indirectly depend on the North Sea.[65] The analysis uses such terms as production value, added value and employment. This description was given for shipping, fisheries, oil and gas recovery, sand and gravel extraction, wind energy, and activities in the ports and the leisure industry along the coast. The scope of all these activities is given for 2007 – the most recent year for which CBS had definitive figures available – and for the years 1995 and 2000. This creates a picture of the development trends in the different sectors.

Table 1 shows that the total added value of use of the Netherlands part of the North Sea amounted to more than 26 billion euros in 2007. The added value of activities on the North Sea itself totalled some 7 billion euros. The oil and gas recovery sector has the highest added value of all uses in the Netherlands part of the North Sea (5.9 billion euros in 2007). Also noteworthy is the relatively significant increase in production value of oil and gas recovery. This can in part be explained by the sharp price increases in this period. Shipping is also of major economic importance to the Netherlands. In 2007, this sector represented an added value of 1.2 billion euros. Employment in shipping totals approximately 6,000 FTEs, approximately 60% of total employment for all use at sea.

The total added value of directly sea-related economic activities on land amounted to approximately 19 billion euros in 2007. Of the land-based activities with a direct relation to the North Sea, the seaports are of major economic importance. A little over half the added value of activities in the seaports is generated in the port of Rotterdam.[66] The Dutch seaports also are hubs for international flows of goods, as well as business locations for industry and service organisations. Other activities in the coastal zone,[67] such as tourism and recreation, are also of economic importance.[68]

Many economic activities depend on the North Sea in a more indirect manner, such as inland shipping and other transport activities, as well as fish-processing, the trade in ship's parts, etc. This indirect value, which is approximately 50% of the direct value, has not been included in Table 1. When the indirect value is included, the total economic value in 2007 of the economic sectors described here is as

Table 1. Economic description of use of the Netherlands part of the North Sea, 1995, 2000 and 2007.

	1995			2000			2007		
	Production value (x m €)	Added value (x m €)	Employment (FTE)	Production value (x m €)	Added value (x m €)	Employment (FTE)	Production value (x m €)	Added value (x m €)	Employment (FTE)
Shipping	2,626	630	7,000	3,689	927	7,000	4,588	1,208	6,000
Fisheries	102	61	500	111	58	300	113	45	200
Oil and gas recovery	2,692	2,112	3,000	4,306	3,313	3,000	7,644	5,866	2,800
Sand extraction	33	9	110	57	15	195	69	17	154
Wind energy	0	0	0	0	0	0	23	11	pm
Total	*5,453*	*2,812*	*10,610*	*8,163*	*4,313*	*10,495*	*12,437*	*7,147*	*9,154*
Sea ports	32,793	10,198	126,000	49,211	11,510	123,000	80,159	17,806	121,000
Coastal zone	1,810	955	23,000	2,426	1,265	24,000	2,901	1,447	25,000
Total on land	*34,603*	*11,152*	*149,000*	*51,637*	*12,775*	*147,000*	*83,060*	*19,253*	*146,000*
Total	**40,056**	**13,964**	**159,610**	**59,800**	**17,088**	**157,495**	**95,497**	**26,400**	**155,154**

Source: *Statistics Netherlands, Economic description of the North Sea for the Netherlands,* (Voorburg, 2011) 74.
NB: The figures on sand extraction come from Ecorys, *Baseline Scenario Marine Strategy Framework Directive* (Rotterdam, 2010) 24.

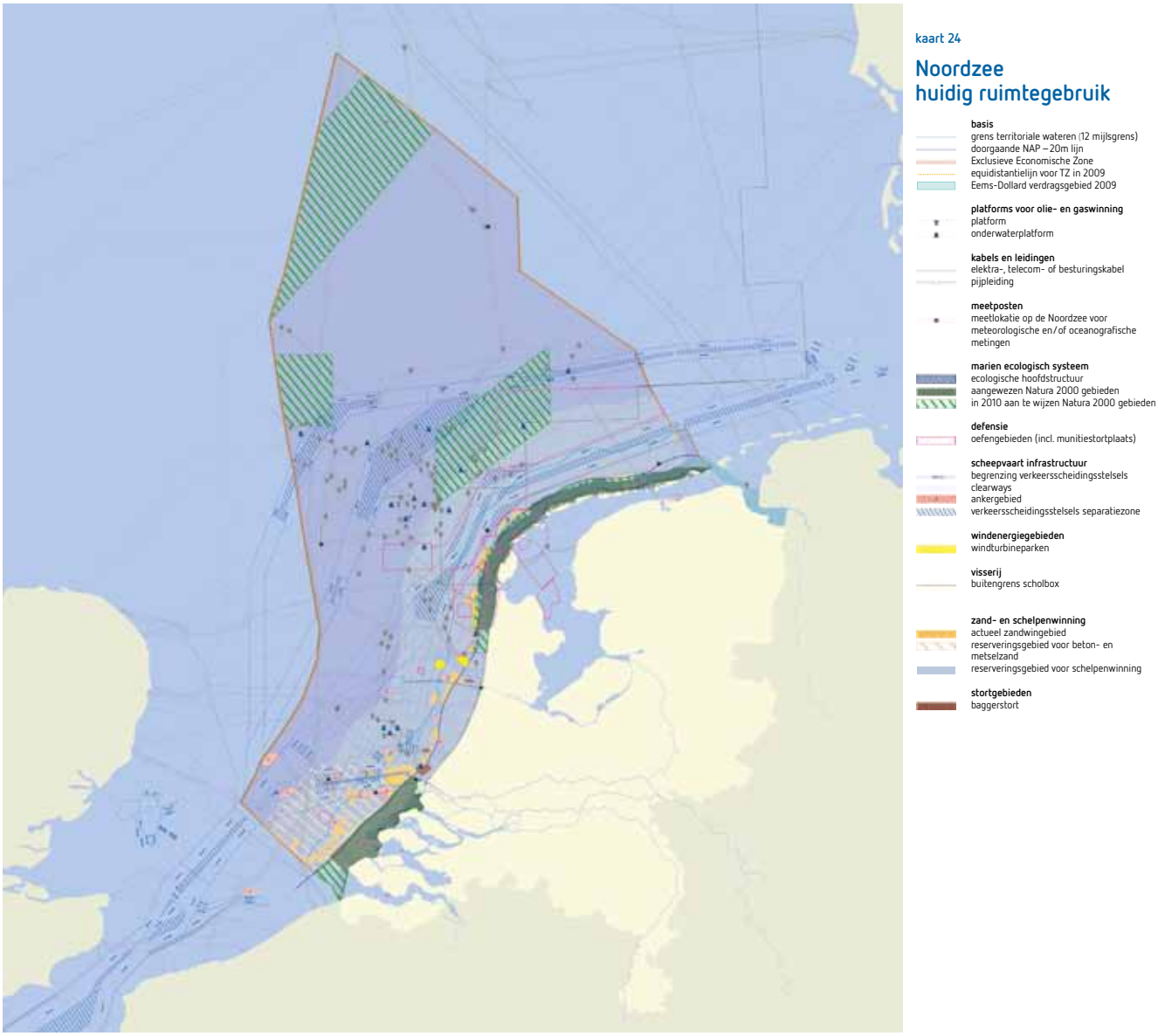
follows: production value 124 billion euros, added value 35 billion euros and employment 246,000 FTEs. By way of comparison, this is approximately 7% of the total added value of the Dutch economy as a whole and 5% of employment.[69]

Some remarks need to be made, however. The division into sectors was also used for the analysis of the costs associated with counteracting the damage to the marine environment (see section 2.5) and is in accordance with international agreements on handling statistics from Eurostat and the United Nations. By using this classification, data can be compared at an international level, which benefits international collaboration and analyses. The drawback to this classification, however, is that the leisure industry is not recognisable as a separate sector, but is covered by multiple sectors. It should also be stressed that the figures only relate to the Netherlands part of the North Sea; this causes some bias. The study by the LEI Agricultural Economics Research Institute, for example, shows that some 21% of the total fishing yield comes from the Netherlands part of the North Sea.[70] This percentage has been included in Table 1. Employment figures relate to the number of FTEs. For fisheries, this means that total employment is being underestimated; in reality, the figure is much higher due to the large number of self-employed persons. According to Statistics Netherlands, self-employed persons represented 56% of total employment in the 'agriculture, forestry and fisheries' sector in 2007 (on a national scale, 12% of all employed persons are self-employed).[71] Moreover, the data presented here relate to businesses registered in the Netherlands, which can be easily added to the figures of other North Sea states to calculate totals for the North Sea. Foreign companies, such as international shipping firms, carriers and fishermen who earn their money on the Netherlands part of the North Sea and its ports have not been included. Finally, the geographical delineation of the analyses excludes certain companies whose (head) office is located outside the coastal zone (such as NAM in Assen).

Taking all of this into consideration, the conclusion is that the North Sea is more important for the Dutch economy than suggested by the figures presented.

Developments until 2040
Based on the most recent publication *Welvaart en Leefomgeving (Prosperity and the Living Environment)* of the CPB (Netherlands Bureau for Economic Policy Analysis) and the Milieu- en Natuurplanbureau72 (Netherlands Environment and

Figure 10. Current use of space in the Netherlands part of the North Sea



Source: Ministry of Transport, Public Works and Water Management, Policy Memorandum on the North Sea (The Hague 2009) 9.

Nature Planning Agency) Ecorys formulated a baseline scenario, estimating how the production value, added value and employment in various sectors directly or indirectly dependent on the North Sea will develop until 2040.[73] Based on interviews with the different sectors, Ecorys adjusted this information to take into account the consequences of the economic crisis as they were known in 2010.

This analysis shows that the economic importance of shipping and sand extraction in particular will increase as a result of the expected increase in goods flows and the expected intensification of suppletion of sand to the coast after 2020 to protect against rising sea levels. The oil and gas sector, on the other hand, will decrease due to the exhaustion of production fields.
Profit margins in the fishing industry are expected to come under pressure from higher costs in the sector. This is expected to result in declining added value and employment. Contrary to this expectation, which is based on CPB scenarios and which concerns the fishing industry as a whole, the Productschap Vis (Dutch Fish Product Board) expects production values of the main commercial fish species in the North Sea (sole and plaice, as well as herring and mackerel) to increase as a result of MSY management.[74]

The development of wind energy at sea is very uncertain. By the end of 2009, permits for a total of 3,250 Megawatt (MW)

had been issued, of which approximately 700 MW will be realised before 2020 (three wind farms). Future developments of wind energy at sea depend, among others, on the extent to which this form of energy can compete with other forms of energy generation.

2.3.2 Social analysis

Apart from having significant economic value, activities at and on the North Sea also represent a key social value.

In its study *Beleving van de Noordzee: Een kwantitatieve consultatie onder Nederlandse burgers over de Noordzee* [Perception of the North Sea, a quantitative consultation among Dutch citizens regarding the North Sea], TNS-NIPO (2011) conducted a random survey among 600 Dutch citizens concerning their knowledge of and affinity with the North Sea. They were also asked what priorities they would give to various alternative solutions (and their given consequences) to a number of (potential) environmental issues presented. The report shows that 46% of respondents consider the North Sea to be (very) important personally, but are not very aware of the different potential environmental problems. When the Dutch think about the North Sea, they only mention positive aspects, such as the beach, the sea, and walks along the beach. However, when they are advised of the different (potential) problems, they find it important that something be done about them. The Dutch perceive the fishing industry to be of great economic importance to the Netherlands.

The majority of the Dutch believe that both the government and citizens themselves are responsible for solving the (potential) environmental issues regarding the North Sea that were presented. By government they mean both the Dutch government and the European Union. As regards the willingness of the Dutch to pay, there appears to be a discrepancy between the socially desirable answer and actual behaviour. This is clear from the fact that half the respondents indicate their willingness to pay in order to counter the environmental problems outlined, while, when given the choice between the different measures, they tend to opt for measures that have no added costs for themselves. For example, with a view to preventing plastic waste in the sea, a price increase for products containing plastics is less acceptable than supermarkets no longer giving away free plastic bags. This type of behaviour appears to indicate that, in the end, people are most sensitive to measures that cost money.

The seabed of the Netherlands part of the North Sea contains many archaeological remains that are a tangible reminder of our past, varying from medieval shipwrecks to aircraft wrecks from the Second World War. The seabed of the North Sea is home to a prehistoric landscape containing the remains of our ancient ancestors. Every year, a wealth of bones from prehistoric animals, such as mammoths, are fished out of the North Sea. The archaeology of the North Sea is of key scientific importance. The wrecks are popular locations for amateur divers and anglers.

2.4 Predominant disturbances and effectiveness of policy

This section deals in more detail with the main disturbances on the current environmental status of the marine ecosystem in the Netherlands part of the North Sea. To this end, the indicative list of disturbances set out in Table 2 of Annex III of the MSFD was applied to the Dutch situation.
For each type of pressure and impact, the description makes a link to the human activities that cause it. For each type of pressure and impact, an estimate is given of the effectiveness of the prevailing and initiated policy to reduce the effect on the ecosystem in the period up to 2020 and beyond.

Disturbances have been divided into three categories:

- 2.4.1 *Physical disturbances:* hydrographical interventions, fisheries, litter, underwater noise
- 2.4.2 *Chemical disturbances:* nutrients, contaminants
- 2.4.3 *Biogenic disturbances:* introduction of non-indigenous species.

Section 2.4.4 addresses the cumulative and synergetic effects of a combination of disturbances.

2.4.1 Physical disturbances

Hydrographical interventions

Hydrographical changes are changes in currents and waves, which influence the physical and chemical properties of the sea, for example bed shear stress, sediment transport, salinity or water temperature. Such impacts on the marine ecosystems can be of particular relevance when they occur on a larger scale. In that case, the marine habitats can change or disappear altogether, which has all kinds of consequences for the composition and size of the communities of fish, benthos and bird species, among others.

Hydrographical changes resulting from human activities (land reclamations, changes in silt supply from the rivers) have been ongoing for many centuries. Until the end of the 20th century, such interventions were limited to the construction of piers in ports and deepening channels to the ports. While, at a local level, these interventions may have resulted in changes to habitat functions such as spawning, breeding and foraging and sometimes also in the total and irreversible disappearance of habitats, there are no effects at ecosystem level as referred to in the MSFD.

Large-scale interventions were introduced throughout the 20th century, such as construction of the Afsluitdijk (IJsselmeer dam), Delta Project and Maasvlakte I. The Delta Project and Maasvlakte I caused drastic changes to the hydrographical conditions of the coastal zone that still

make themselves felt in the North Sea ecosystem. The Delta Project had a major indirect influence on the water movements, salinity and sediment transport of the Zeeland and Zuid-Holland Delta coast. Diadromous fish species (which live both in the sea and in the rivers) suffer greatly from the closure of the tidal inlets, as this blocks their migratory routes to the hinterland. However, the Delta Project has also created the Voordelta, a particularly valuable habitat that has since been designated as a Natura 2000 area.

The Maasvlakte I and the Delta Project are interventions of national importance and have become a historic fact. Although their effects on the ecosystem determine the current environmental status of the coastal waters to an important extent, they are considered to be irreversible in the River Basin Management Plans 2009-2015 set out in accordance with the WFD. In the perspective of the Marine Strategy the effects of Maasvlakte I and the Delta Project are also considered to be irreversible.[75]

In the second half of the 20th century, the number and magnitude of hydrographical interventions increased significantly: sand extraction for coastal defences and filling sand, dredging of waterways to seaports, construction of wind farms, sinking oil/gas pipelines and installing cables. The most extensive activity is location-bound sand extraction for coastal defenses, filling sand and concrete and masonry sand. Sand extraction as a whole is a scattered practice, but the cumulative area is relatively small at approximately 36 km^2. Annually, some 25 million m^3 of sand is being extracted, some 12 million m^3 is designated for sand suppletion onto the coastal foundation to protect the Netherlands from flood risk from the sea. There are incidental large-scale sand extractions for construction projects as well, such as Maasvlakte 2, for which 300 million m^3 of sand was extracted over a period of three years. Every year, some 20 million m^3 of dredged sludge from waterways (rivers), ports and of waterways at sea maintenance is spread out onto the North Sea seabed.

Effectiveness of policy

Under the Environmental Management Act[76] (Wm) and the Environmental Impact Assessment Decree[77] an environmental impact assessment is mandatory for the construction, modification or extension of ports and piers and for sand extraction exceeding 500 ha or 10 million m^3 per permit. For sand extraction at sea of 250 ha or more, the competent authorities determine whether an EIA is required. In addition, the Nature Conservation Act[78] (Nb Act) and the Flora and Fauna Act[79] (Ff Act) also apply. The Nature Conservation Act prescribes an appropriate assessment if, based on the BHD, significant effects on protected areas and/or protected species cannot be ruled out. Moreover, a permit under the Nature Conservation Act is also mandatory for each location of sand suppletion for coastal protection. Given the possible external effects, that obligation also applies to suppletions outside Natura 2000 areas.

To spare the ecologically important coastal zone and prevent the weakening of the coastal foundation, sand

extraction is only allowed in areas outside the continuous NAP -20m isobath. While the physical and biological damage caused by sand extraction is local (total of approx. 36 km^2, in different locations), it does have a great temporary impact, as the seabed and, with it, all benthos, is removed up to a depth of 2 metres. Deep extraction (up to 6 metres below the seabed) is increasingly often carried out, where possible. This limits damage to the benthos to a smaller surface, while the quantity of sand extracted remains the same. By way of a pilot project, sand for Maasvlakte 2 was extracted at even greater depths of up to 20 metres. The outcome of this pilot project will contribute to the decision on the question of whether and under which circumstances very deep extraction is possible.

Direct effects of *sand suppletions* are: destruction of benthos, covering of food for birds and fish, and disruption for foraging animals caused by covering the bottom. Indirect effects are: change in coastal morphology and change in sediment composition. To a lesser extent, sand suppletions may also cause changes in silt contents, current and, possibly, algal growth.
Mitigating measures as part of licensing are:

- monitoring of benthos in the locations to be suppleted (in the month of September of the year prior to the suppletion). If typical N2000 species occur in high densities, the location in question must be spared.
- wave screen suppletions: suppleting the area seaward of the outermost breaker berm (depth of approx. 5 metres) instead of suppleting the ecologically rich troughs between the sandbanks
- use of suppletion sand of the same composition as the area to be suppleted
- carry out suppletions during the season in which the negative effects are smaller.

Individual sand extraction and sand suppletions may have a cumulative effect on the Natura 2000 objectives for underwater sandbanks, marine mammals and shellfish-eating ducks. However, the PlanMER (Strategic Environmental Assessment Statement) and the appropriate assessment of the NWP concluded that these activities are not expected to have any cumulative effects if the method and quantities of sand extraction and suppletion between now and 2020 do not change much.[80] The sand extraction locations and, at a rough estimate, the flora and fauna communities on the beach, will recover in 4-6 years' time.[81,82]

For years, *dredging sludge* from ports and waterways has been spread out onto various unloading banks at sea (including Verdiepte Loswal, Loswal Noord-West, Loswal IJmuiden). This is material that naturally belongs in the sea. Some of the sand from waterway maintenance (Maasgeul) is spread out within the coastal foundations. The designation of dredging sludge is subject to the Soil Quality Decree[83] (Bbk). The silt from waterways is monitored annually based on physical and chemical criteria. Only dredging sludge that meets the requirements for salty dredging sludge under the Soil Quality Regulation[84] (Rbk) may be spread out at sea.

Pursuant to the Rbk, this requires notification. The rest is stored in controlled sludge depots, such as the Slufter on the Maasvlakte. Pursuant to Article 1.1, paragraph 1 Environmental Management Act and Article 2.3 of the Waste Framework Directive85 disposal and re-use according to the Bbk are only allowed if it serves a useful purpose. In that sense, restoring the silt balance and suppletion of the coastal foundation are considered useful purposes. The possibilities of creating an assessment framework for location choices and prerequisites for the useful re-use of dredging sludge are currently being investigated.

Of late, there have been two new, large-scale changes in the hydrographical conditions of the North Sea coastal zone caused by the construction of Maasvlakte 2 and the 'Sand Motor' (also known as the Sand Engine) off the coast of Zuid-Holland. Both projects are being implemented following careful assessment based on EIAs, an appropriate assessment under the Nature Conservation Act and other national and international legislation. The environmental risks of both projects are largely eliminated by mitigating and compensatory measures:

- *Maasvlakte 2.* The construction of the port area causes the disappearance of 2,455 ha (2.8%) of the habitat 'sandbanks which are slightly covered by sea water all the time' (habitat type H1110A/B). This means a loss of foraging area for the Sandwich tern, the common tern and the common scoter. That loss is compensated by the creation of a protected area ten times bigger (24,550 ha) as part of the Voordelta Natura 2000 seabed protection area.
- *The 'Sand Motor'.* This coastal suppletion project off the coast of Zuid-Holland of approx. 1 km² was carried out in 2011. The highly localised deposition of sand immediately in front of and on the coast, which is then spread across the coast by natural erosion, limits the area where benthos and foraging birds are disturbed compared to classic methods of sand suppletion in several locations off the coast. This suppletion method does not cause any permanent alteration of hydrographical properties: the former hydrographical situation is expected to be restored in a natural manner within a few decades.[86]

Until 2020, no new interventions are planned that could affect the hydrography of the North Sea.

In implementing the WFD, hydromorphological targets have been set for the coastal waters as part of good environmental status (Besluit Kwaliteitseisen en Monitoring Water [Decree on Water Quality Standards and Monitoring][87], BKWM). Measures to achieve the objectives have been included in the WFD's River Basin Management Plans. According to the assessment pursuant to the WFD, none of the hydrographical interventions of the past, possibly after mitigation (such as for Maasvlakte 2), have significant effects on the ecological quality elements of the coastal waters (phytoplankton and macro-fauna).[88] The scale of these interventions is limited relative to the size of the WFD water bodies.

Fisheries

The North Sea has been used for fishing for many centuries. A considerable part of the fish biomass is commercially exploited. The main fish stocks for the Dutch fishing industry are: pelagic species (e.g. mackerel, horse mackerel, herring) demersal species (e.g. cod, blue whiting, langoustine and flatfish such as sole, plaice, turbot, brill, dab, flounder, lemon sole and witch) and shrimp. The Dutch fishing fleet is not only active in the subregion of the North Sea (including the English Channel), the Celtic Sea and the Atlantic Ocean; the pelagic segment of the sector also fishes outside EU marine waters. In addition, foreign and foreign-registered fishing boats also fish in the Netherlands part of the North Sea.

Effects of fisheries on the current status
Fisheries affect the marine ecosystem in different ways. First of all, fishing takes away organisms from the marine ecosystem, not only the species targeted by the fishermen (target species), but also by-catch species. Moreover, fishing gear trawled along the seabed disturbs the seabed and/or damages vulnerable habitats.

Effects on target species
Fishing on the North Sea has intensified significantly since the 1960s. The largest catches ever were around 1970, after which they declined to about half the level in that year.[89] Of the dwindling fish stocks, declines in the demersal species are the largest. Many of the fish stocks have been recovering since the early 21st century. Some species are now within biologically safe limits again. A number of the stocks is at or below the maximum sustainable yield level (such as herring, plaice and haddock). Total Allowable Catches for a number of stocks (plaice, sole, herring and whiting) are increasing. Things are still not going well for a number of species (such as cod and some species of shark, skate and ray). There is too little information on many of the fish stocks to make any reliable statements on their population size and development (also see 2.2.4).

Direct and indirect effects of by-catches.
Selecting common fishing techniques is only very limited, which results in considerable by-catches of other species, other benthos and undersized fish. Large quantities of by-catches are tossed overboard.

By-catches constitute a major part of the fisheries pressure in total. Roughly speaking, there are five effects on the current status of the marine ecosystem:

Fisheries activities in the Netherlands part of the North Sea

Beam trawling

Flatfish such as sole are fished mainly by means of traditional beam trawling (see figure 27). The net of this fishing gear drags the bottom of the sea and is held open by means of a steel beam. Tickler chains at the bottom of the beam are designed to disturb the fish and chase them into the net. Following the emergence and disappearance of the beam trawl in the late 19th century, it was reintroduced 1960s and has since become widely used. Since the end of last century, this branch of the sector has decreased in scope to approximately 300 cutters in 2009 (both large cutters and euro cutters). There are approximately 70 large beam trawlers left in the Netherlands. The reasons for the decline are high fuel costs with simultaneously falling fishing possibilities a few years ago, particularly of demersal fish stocks. This category of fishing gear also includes the relatively new sumwing and the pulse trawl, which cause less seabed disruption.

Demersal fisheries with other fishing methods

Dozens of traditional beam trawlers have switched to other fishing methods, such as *fly shooting*, Scottish and Danish seines, *outrigging* and *twin rigging*. Target species are flatfish (such as plaice) and demersal fish (such as cod and non-quota species). These fishing methods require less trawling power and, consequently, less fuel, plus the seabed is not disrupted as much. In 2011, research was launched into the by-catches of these fishing methods.

Pelagic fisheries

This form of fishing targets pelagic species such as mackerel, horse mackerel and herring. The fleet of about fourteen vessels uses nets dragged through the water column. Herring and mackerel fishing has been certified in accordance with the Marine Stewardship Council (MSC)

Shrimp fishing

Shrimp fishers in the coastal zone use a lightweight beam trawl. The vessels are small, with an engine capacity of less than 300 hp. The net rolls across the seabed on towing blocks and only slightly disturbs the seabed. In 2012, there are 204 licensees in the Netherlands, 97 of which (almost half) only fish for shrimp. The others (euro cutters) combine fish, langoustine and shrimp fishing.

Gill net fishing

After an initial increase in this form of fishing in the first decade of the 21st century, the situation has more or less stabilised since 2009. The Dutch commercial fleet now comprises 60 to 80 mostly small, active vessels (a total of 126 licences). In addition, this type of fishing gear is also used by recreational fishing from the beach. Virtually the entire Dutch fleet has a range of no more than 15 miles from their respective port. Dutch gill net fishing targets sole, cod and turbot, mainly in the months of March to October. Foreign vessels (further offshore) also use gill nets. What is not known is how many kilometers of gill nets are put out in the Netherlands part of the North Sea as a whole. Individual vessels are not permitted to carry more than 25 km of net.

Shellfish fishing

Bivalves like Spisula are harvested using dragged metal trawls. Spisula is only permitted if they are present in sufficiently large quantities. However, no permits have been granted since 2008 because Spisula has largely been replaced by the non-indigenous species Ensis. Ensis are harvested by means of water jet dredging, which only a few vessels do.

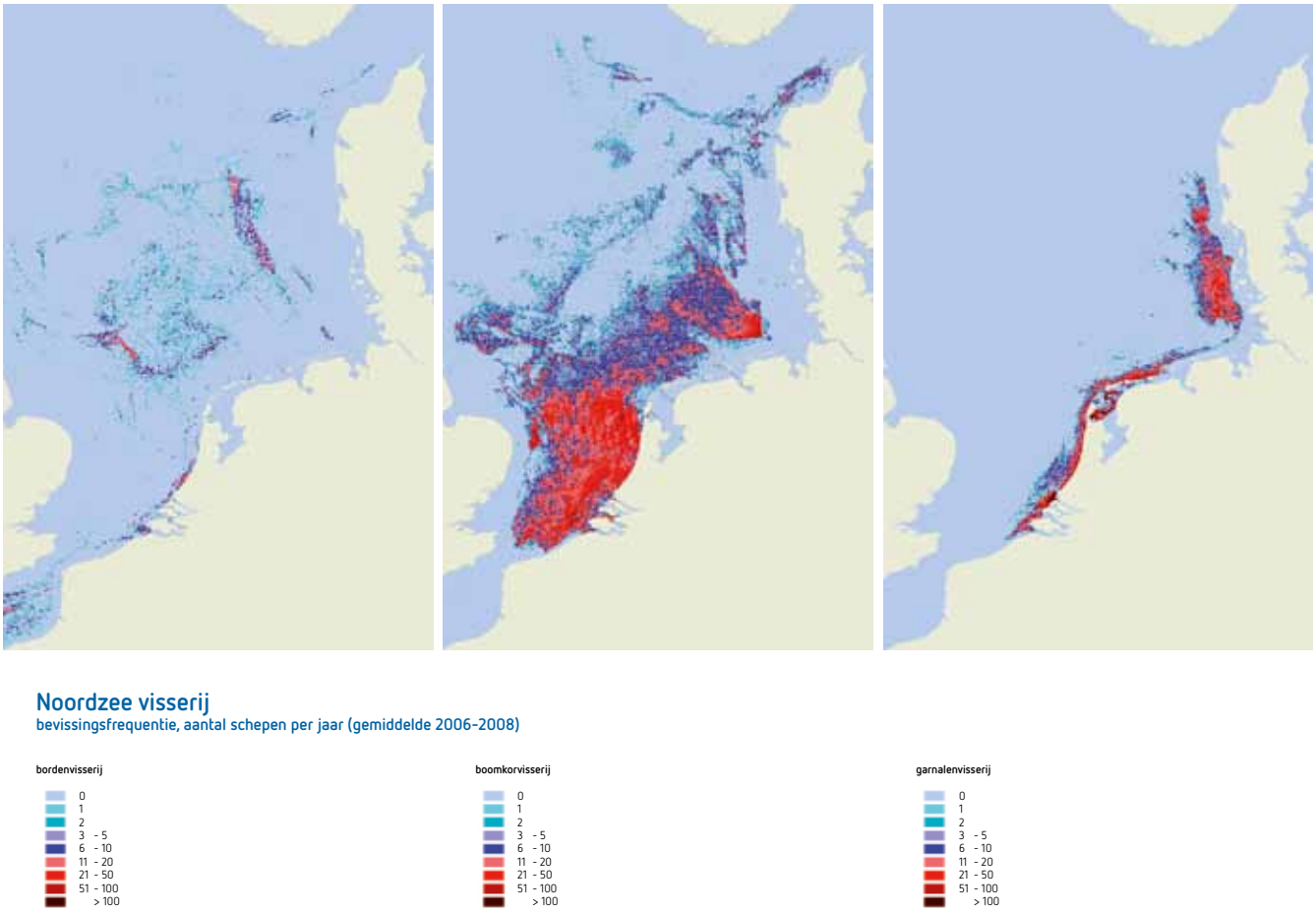
(Recreational) angling, line fishing and other fishing methods

Fishing rods are used for both professional (a few dozen vessels) and recreational purposes on the North Sea. Sports fishing (recreational fishing using fishing rods) is very popular with some 650,000 anglers. The sports fishing sector accounts for 165 million euros on an annual basis.[1] Fishermen fish from the shore, from small vessels and from chartered vessels. The species most frequently fished for are mackerel, sea bass, flatfish and cod. EU Member States have a duty to report recreational catches of a number of species. A study is underway into the impact of sports fishing on species covered by a recovery plan, such as cod.[2] By-catches and discards are practically non-existent where this type of fishing is concerned. Line fishing on a professional basis is very limited. Commercial angling and hand-line fisheries for sea bass are MSC-certified. Recreational fishing with nets was banned as of 1 January 2011. However, a political promise has been made to allow limited recreational gill net fishing from the beach in future.

[1] TNS NIPO, *Enquete zeesportvisserij 2006, Algemene situatie en zeebaarsvisserij* (Amsterdam, 2007)

[2] ICES, *Report of the Planning Group on Recreational Fisheries Surveys (PGRFS)* ICES CM 2011/ACOM:23 (2-6 May 2011, Spain).111.

Figure 11. Fishing frequencies per year for bottom trawling throughout the Southern North Sea.



Source: Ministry of Transport, Public Works and Water Management, Policy Memorandum on the North Sea (The Hague 2009) 16.

- Large groups of fish species that reproduce slowly, such as sharks, skates and rays, have become rare, while the larger species of these groups have all but disappeared (see also section 2.2.4).[90]
- Among demersal species, the number of smaller specimens is increasing because the fish do not have the chance to grow big (and old). As a side-effect, species like cod and plaice have genetically adapted and now reproduce at a younger age and at a shorter length (see also 2.2.4).[91]
- Shrimp fishing comes with considerable by-catches of undersized shrimp and fish.[92] This form of fishing is also practiced in Natura 2000 areas along the coast that are protected because of their seabed habitats
- Surplus withdrawal of certain fish species results in changes to the food webs of the ecosystem. A decline in stocks of such fish as sand eel, Norway pout, sprat and young herring leads to a smaller food supply for top predators such as large fish, terns, and auks.[93,94,95] However, there are a lot of knowledge gaps when it comes to food ecology. Little is known, for example, about the effects of changing food webs on the food supply of marine mammals. Seals eat all kinds of fish, but prefer flatfish.[96] Harbour porpoises are generalists food-wise, but in the Dutch coastal waters they mainly eat gobies and sprat. Indirect effects of fisheries on marine mammals via the food webs have not yet been found for the Netherlands part of the North Sea. However, the Conservation Plan for the Harbour Porpoise does include food ecology as one of the key knowledge gaps on the future knowledge agenda.[97] The favourable status of pelagic opportunistic bird species such as gulls and fulmars (see 2.2.5) can in part be explained from the extent to which they live off fish thrown back into the sea and other discards from fishing vessels. Consequently, the distribution of fisheries is often a determining factor in the spread of these seabirds.[98]
- Diving waterbirds and marine mammals such as harbour porpoises are known to drown in large-meshed gill nets. However, by-catches of birds and marine mammals are


Pulswing

not reported on systematically. This is one of the reasons why it is not possible to say anything conclusive on the extent to which gill net fishing poses a threat to the populations of seabirds and marine mammals, although indications concerning the harbour porpoise do give cause for concern. In recent years, about half of the harbour porpoises stranded in the Southern North Sea died because of the use of gill nets.[99]

Damage to benthos

Traditional beam trawling disrupts the benthos. Analysis of the trawling tracks shows that the passing of a beam trawl causes high mortality among seabed fauna. The repeated seabed disruption by traditional beam trawling has a number of consequences for the seabed ecosystem: structural deterioration (among others because of the decline in structure-forming worms), changed composition of the seabed fauna, with more opportunistic and scavenging species, and disappearance of vulnerable species such as the ocean quahog.

The rate of recovery of the seabed fauna depends on the nature and dynamics of the original seabed fauna, the substrate and the intensity and frequency of disturbance.[100] The impact of bottom trawling is smallest on the dynamic sandy soils in the South and along the coast. After all, those areas already experience the strong effect of natural dynamics on the benthos. Beam trawling has more impact on the more silty, deeper parts of the Netherlands part of the North Sea (Frisian Front, Oyster Grounds) that are naturally less dynamic. The impact is greatest on organisms in the gravel seabed (Klaver Bank).[101]

Fishing intensity varies considerably in the different areas of the Netherlands part of the North Sea. Analysis suggest that in the eight most intensely fished ICES quadrants (surface area per quadrant approx. 1,800 km^2) in the western part and north of the Wadden Islands, 85% of the seabed surface


Hydrorig

is fished at least once a year.[102] It should be noted, however, that, after publication of these analyses (1998), fisheries pressure significantly decreased due to the fleet shrinking (see box) and, in part, the experimental use of fishing techniques with a smaller disruptive effect on the seabed (see below).

Continuous fisheries pressure has changed the seabed ecosystem since the beginning of the last century from a system with a high biodiversity and relatively many old specimens of certain species into a relatively impoverished system with an unnatural age composition.[103]

Research

In view of the damage to benthos and with an aim to possibly adjust management plans the Netherlands is investigating to what extent and at what level current use can continue to take place in protected areas. This is a form of adaptive management as preferred in the Marine Strategy where approriate. Besides this particular research, the Netherlands also aims at modernising fishing methods through stimulating innovations through the European Fisheries Fund, among others. The innovations focus on the beam trawl with heavy tickler chains for which alternatives are being sought and trials are already being conducted with, for instance, the hydro-rig and pulse fisheries.

Effectiveness of policy

In the 2002-2012 period, many steps have been taken to make fisheries more sustainable, often with major consequences for the Dutch fishing industry. The 2002 Common Fisheries Policy (CFP) targets the sustainable exploitation of aquatic resources, taking into account the precautionary approach,[104]the ecosystem approach[105] and the principles of 'proper management'.[106] Policy must contribute to efficient fishing practices and an economically viable sector, including the processing industry. Principles such as Maximum Sustainable Yield (MSY) and the ecosystem approach have been embedded and detailed. At an EU level, management plans have been formulated for the main stocks fished for by Dutch fishermen. The large beam trawl cutters have no access to the 12-mile zone or the Plaice Box. The recovery plans result in a considerable decrease in catch options. Moreover, a number of rationalisation rounds have left the beam trawl fleet considerably smaller.

As a result of the above drastic measures, a large part of the stocks of, for example, herring, plaice and sole, have, after a period of major overexploitation at the end of the 20th century, returned to 1960s levels. Despite the positive developments, several fish stocks are still overfished and a large quantity of unwanted by-catch never reaches the harbour.[107] There is concern about the damage that traditional beam trawling does to vulnerable seabeds and organisms. The fishing industry is facing poor economic results due to sharply increasing costs and a lower price paid for fish.

By-catches of sharks, skates and rays are addressed step by step under the EU Action Plan for Sharks (2009).*108* A lot is being invested in innovations. Improved utilisation and exchange of knowledge and experience between fisheries and science are providing future perspectives. Alternatives to the traditional beam trawl, such as the sumwing, that have less impact on benthos (and use less energy) are becoming increasingly popular. The government, knowledge institutions and fishing industry are also jointly studying the effect and application options of the combination with weak electrical pulses or *hydrorigs* to reduce by-catches. However, under the CFP, such techniques are only allowed to a limited degree.

The competent authorities are responsible for the short-term regulation of beam trawling in the Natura 2000 areas of the North Sea coastal zone and the Vlakte van de Raan. Beam trawling with tickler chains will be prohibited in these areas from 2016 onward; until then, access restrictions apply. Shrimp fishing and shellfish fishing in these areas are also regulated by such means as access restrictions. These forms of fishing (incl. Ensis fishery) have a major, but local impact on the seabed and on birds. In the Voordelta, beam trawling by vessels with a capacity exceeding 260 hp (191 kW) is not permitted. Shrimp and shellfish fishing as well as mussel seed capture installations, on the other hand, are allowed when they have a Nature Conservation Act permit.[109] Trawling with vessels with capacities below 260 hp, otter trawling (other than for shrimp), gill and seine net fishing, and fishing with fishing baskets and fyke nets are allowed. The Natura 2000 areas of Klaver Bank and Dogger Bank are seeing the implementation of the FIMPAS project *(Fisheries Measures in Protected Areas)*, in preparation for the new CFP. This project is aimed at seabed protection measures, including the partial closure of the area.

Other focal areas in a CFP context are the prevention of by-catches of marine mammals, particularly harbour porpoises. The objective of the Conservation Plan for the Harbour Porpoise is to first determine, by means of a targeted monitoring and observation programme, whether there is a problem with by-catch of harbour porpoises, and if so, where, when and in what section of the fleet this is. This information can then be used to develop measures. The use of pingers (small devices attached to gill nets that produce a deterrent noise) appears to be the best way so far to keep harbour porpoises out of the nets. *Council Regulation* 812/2004[110] regulates the use of pingers for vessels longer than 12 metres. This Regulation does not apply to the majority of Dutch vessels that use gill nets. There are still a number of questions regarding the desirability, safety, user-

friendliness and effectiveness of pingers in Dutch coastal waters. Further research is being conducted into such aspects as the effectiveness of pingers in the relatively noisy coastal waters. The large-scale use of loud, deterring noises could cause parts of the coast to become unfit for harbour porpoises to live, given the vast stretches of kilometres of gill nets along the Dutch coast. Moreover, today's pingers are not always effective because they are occasionally out of order or used incorrectly. Using this device requires precision, and to measure its effectiveness demands close monitoring.

Litter

Litter in the marine environment may have negative effects on the ecosystem. Waste that ends up in the sea remains in the marine environment for a long time, particularly plastics, which decompose very slowly. Sea currents spread this material across the globe. Seabirds, fish and other marine animals may mistake it for food, and when they eat it, this indigestible material may cause an obstruction in their stomach. In addition, animals can become entangled in larger pieces of plastic and other waste.

Between 2002 and 2009, no significant change in the quantity of waste was measured; On average, 250 to 500 items of litter are found on a 100-metre stretch of beach. This is below the average for beaches of the Southern North Sea measured with the OSPAR method, which value was 700 items of litter, of which an average of 75% comprises plastics.[111]

In the period between 2005 and 2009, plastic was found in the stomachs of 90% of the fulmars examined throughout the North Sea. The target level of OSPAR's Ecological Quality Objective (EcoQO) is that no more than 10% of the fulmars have more than 0.1 grams of plastic in their stomachs. That target is not reached in the North Sea. The value measured near the Scottish islands was 48% and in the English Channel zone it was 78%. Of the birds that wash ashore in the Netherlands, an average of 58% has more plastic in their stomach than the target value.[112]

The proximity of sources of waste and the prevailing directions of the wind and currents have a major impact on the presence of litter. Moreover, it spreads easily. As a result, no clearly discernible trends have been observed at the measuring locations.[113] In addition, there is no scientific measuring protocol or data series for litter in the water column and on the seabed.

Based on the Fulmar study and the monitoring of litter on the beaches, cautious conclusions can be drawn about the sources of litter in the marine and coastal environments. Shipping and fisheries are the key sources on the North Sea (see also table 2). Sources on land include: beach recreation, supply from rivers and other, so-called diffuse sources. The monitoring data of litter on the beach suggests that 44% of waste comes from shipping and fisheries, 30% from sources on land, and 26% from unknown (or multiple) sources.[114] The Fulmar study also indicates that fisheries and shipping are the main sources of litter in the sea.[115]

The Fulmar study shows a significant decrease in industrial plastics (such as pellets) in litter in the 1979-2007 period. This decrease could be explained from the fact that the economic value of the pellets is an incentive for preventing loss during transport wherever possible. However, the share

Litter: what is it and how is it measured?
Litter in the marine environment is defined as every poorly biodegradable material that has been discarded, dumped or left at sea or on the coast, whether deliberately or not. Marine litter originates from human activities at sea and on land.

The Netherlands monitors the current dispersion of litter on the North Sea in two different ways. The OSPAR method is used to inventory what washes ashore and what is left behind. This practice started in 2002 by taking a record of all litter over a distance of 100 metres between the waterline and the foot of the dunes on four reference beaches: Bergen, Noordwijk, Veere, Terschelling.
The Fulmar study is the second method used to measure the nature and scope of litter on the North Sea: fulmars (Fulmar glacialis) only forage at sea. Analysis of the stomach contents of dead birds provides an indication of the quantity of (small) litter floating on the sea and how much the fulmars ingest.

In addition to the above indicators, the 'Fishing for Litter' initiative also provides information on waste picked up from the seabed in the Netherlands and Belgium by fishermen participating in the scheme. In 2010, 94 fishing boats brought in a total of 442 tonnes of waste. The percentage of plastic objects fished out of the sea is lower than the percentage of plastic objects found on the beaches. This can be explained by the fact that plastic is light and can wash ashore easily.

2. Overview of the top ten of the most frequently found items on the four Dutch reference beaches in 2010.

Ranking in 2010	Item	% of total waste	av. no. of items / 100 m
1	Rope and string (diameter <1cm)	22.3	86.3
2	Plastic or polystyrene 0-2.5 cm	13.3	51.4
3	Nets or pieces of net < 50 cm	5.7	22.1
4	Bottle caps	5.5	21.4
5	PUR foam	5.2	20.2
6	Plastic or polystyrene 2.5-50 cm	5.0	19.2
7	Balloons	3.5	13.6
8	Crisp bags, sweet bags, lollypop sticks	3.5	13.5
9	Entangled nets/rope/string	3.4	13.1
10	Other plastic or polystyrene items	2.5	9.9
	TOP 10 ITEMS	**69.9**	**270.6**

Source: RWS Noordzee, Draft Monitoren zwerfvuil [Draft litter monitors], 2005-2010 (2011) 16.

of consumer plastics – all non-industrial residues of plastic products, such as ropes, bottles or bags – increased significantly in the 1979-2000 period. In recent years, no increase or decrease has been found for either type of plastic.[116]

Microplastics

Microplastics require particular attention. These miniscule plastic parts are created when plastics decompose, or they end up directly in the environment as domestic waste. In addition, microplastics are increasingly being used in household products, cosmetics and the industry. They are also created as a result of wear and tear when synthetic clothing is washed. As only a few scientific studies have been performed, very little is known about the risks that microplastics pose in the marine environment. The wide variety of different types of particles also plays a role.[117] The potential toxic effects of contaminants in and on microplastics in the sea are a cause for concern.[118] Microplastics can end up in the food chain. A study of this phenomenon and its ecological and toxic effects was launched recently.[119] The share of microplastics in litter is likely to increase due to the decomposition of plastic litter already present and due to the increase of its use as a product.

Effectiveness of policy

At an international level, litter in the sea is recognised as a problem and the consensus is that plastic does not belong in the sea. In addition to formulating monitoring and research protocols, a number of international initiatives have been launched to limit waste. The United Nations *International Maritime Organization* (IMO) set out the prevention of waste disposal from ships in Annex V of the MARPOL Convention.[120] Annex V was recently revised and fine-tuned, in part on the Netherlands' initiative. The revised version, which will take effect at a global level from January 2013, assumes a complete ban on waste disposal, with a few exceptions.[121] On the Netherlands' initiative, it has been agreed in IMO that the course on marine environmental awareness will become a mandatory part of maritime educational programme all over the world.[122] At EU level, the European Directive on port reception facilities[123] applies, which aims at increasing the hand over of shipping waste and loading residues by enhancing the availability and use of port receipt facilities. This Directive is currently being revised. The Netherlands is committed to further optimizing this approach by reinforcing the obligation to hand over waste to include ships that leave for a port outside Europe. The Netherlands would also like to see a European information and monitoring system be set up, and harmonisation of the enforcement and financing systems.[124]

The extent to which the land is the source of litter at sea depends on such factors as the method of collection and disposal of domestic and industrial waste. In the Netherlands, only 4% of all waste is dumped. This share will have to be lowered to 3.5% by 2015. Compared to the average of 40% in the EU, this is a very low percentage.[125] For 2012, Dutch environmental policy has a recycling target of 42% for plastic packaging collected from households.[126] Municipal Councils can collect domestic plastic waste in three different manners: citizens can deposit their plastic waste in special collection containers; citizens are given special bags by the municipal council in which their plastic packaging waste is collected; or plastic waste is subsequently separated from other waste. Since 2011, 800 plastic waste containers have been placed in busy public areas. The *Plastic Heroes* campaign

Anthropogenic underwater noise: what is it?
The description in the MSFD is as follows: '*Introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment*'. As such, it includes underwater noise as well as other forms of energy supply, such as heat, light, or electromagnetic fields. Little is known about the effects of heat and electromagnetic fields.[1] Moreover, the European Commission has indicated that measuring underwater noise has the highest priority for the first MSFD cycle. The relevant Commission Decision therefore only includes indicators for underwater noise.[2] The report by the European *Technical Subgroup on underwater noise and other forms of energy*, a group of experts set up by the European Commission, also focuses solely on underwater noise for the time being[3]

It is never completely silent below the surface of the sea; the sea is naturally full of noises. Wind, waves, precipitation and lighting strikes can make a lot of noise, but animals also produce sounds. For many marine animals – marine mammals as well as fish and benthos species – sound is essential for communication, finding food or orientation under water.

Noise produced by human activity (anthropogenic noise) has different characteristics than the naturally present sounds of waves, surf and marine animals. Introduced sounds are sometimes short-lived, such as pile driving for offshore construction activities; others last longer, such as seismic surveys, while others still come from permanent, moving sources (e.g. noise from ships). The intensity of anthropogenic noise is much greater than that of natural sounds, and so are the distances across which they can be heard. Life at sea, particularly marine mammals, is impacted by these unnatural noises. In ascending order, the effects on marine mammals, for example, vary from minor, subtle behavioural changes, avoidance of particular areas and loss of hearing to, in extreme cases, immediate mortality. Other animals may respond to noise as well; fish, for example, are usually sensitive to low frequencies.

[1] M.L.Tasker, et al., *Task Group 11 Report Underwater noise and other forms of energy* (JRC/ICES 2010) 31.

[2] European Commission, *Commission Decision of 1 September 2010 on criteria and methodological standards on good environmental status of marine waters 2010/477/EU* (Brussels, 2010)

[3] Van der Graaf et al., *European Marine Strategy Framework Directive - Good Environmental Status (MSFD GES): Report of the Technical Subgroup on Underwater noise and other forms of energy* (2012).

Port reception facilities for taking in shipping waste

has raised Dutch consumer awareness of the importance of the separate collection of plastic packaging waste.

In 2010, employers' organisation VNO-NCW and the VNG (Association of Netherlands Municipalities) launched the *Focusprogramma Zwerfafval* [Focus Pogramme on Litter][127] which targets four specific areas with a relatively high litter levels: shopping precincts, public transport, school environments and the main road network. There also are various initiatives and campaigns focusing on behavioural change and litter, such as the 'Schoonste Strand' [Cleanest Beach], in place.[128]

It is not clear how the trends resulting from current and initiated policy will develop until and beyond 2020. The quantity of microplastics in the marine environment is likely to increase, in part because of the decomposition of plastic litter already present there.

Introduction of energy, including underwater noise

Shipping became a large-scale source of underwater noise as soon as sailing boats were replaced by motorised vessels. Since the 20th century, other human activities have emerged that have also introduced noise into the marine environment: dredging activities, driving piles into the seabed, seismic surveys for gas and oil recovery, and the use of sonar for civil and military purposes.

Anthropogenic underwater noise need not be a problem as long as it does not hinder the ecosystem and the organisms in it by affecting their habitat or their migratory behaviour. According to the OSPAR *Quality Status Report* from 2010 and noise reports from 2009, the North Sea as a whole, and the southern half of the Dutch part in particular, is one of the most intensively used seas in the world.129, 130 There already exists substantial information on potentially harm-

ful effects of noise and much research (in the Netherlands and internationally) focuses on the quantification of the relation between noise and effects on sea life. Examples in the Netherlands are investigations into effects on fish and sea mammals by IMARES, SEAMARCO and TNO. The actual meaning of the most often occurring direct effects of noise on individuals and behavioral changes, and of (longer term) effects on populations is, however, far less known. Yet, acquiring knowledge on this is still necessary for a sound assessment of the effects of noise or setting concrete targets.

The main unknowns are: the actual noise levels under water, the trends in these levels, and the relationship between the doses of noise received and their effects on populations and at the ecosystem level.. It is also not yet clear how the impact of noise relates to other factors that impact the marine environment. A study conducted for the Netherlands part of the North Sea did not reveal any specific sub-areas where a major risk can be expected for the marine environment due to anthropogenic underwater noise.[131] The most frequent noise in this part of the North Sea comes from shipping and this has resulted in a heightened background noise level. Moreover, there are loud impulse noises from construction activities (for oil and gas platforms and wind farms), from seismic surveys (for oil and gas recovery) and from clearing old ammunition. These are low frequency (less than 1 kHz) and mid frequency (1-10 kHz) noises. High frequency noises such as echo sounders by nature of their poor propagation contribute less to noise levels.[131b] It is not known over what distance and what period harmful effects may occur. Nor is it clear whether increased use (shipping, seismology, wind farms) until 2020 will also result in increased problems.

The lack of knowledge on the effects of underwater noise poses a risk for the marine environment of our heavily used part of the North Sea. The noises from current human activities could already be leading to environmental damage. The Conservation Plan for Harbour Porpoises, for example, has already identified concrete indications for evasive behaviour by harbour porpoises in the face of impulse noises from pile-driving, seismic surveys, underwater explosions and sonar operations. However, there is no documented proof of mortality due to underwater noise.132 Further research is required to gain a clear picture of the impact of these activities, possibly in combination with other disturbances.[133]

Effectiveness of policy

As damage to the marine ecosystem cannot be ruled out, many countries – including the Netherlands – are applying the precautionary principle. The Netherlands, for example, imposes restricting conditions on driving piles for wind farms (e.g. pile-driving only allowed in a certain season). This is based on the EIA procedure and, where necessary, an appropriate assessment, which is mandatory under the Habitats Directive if significant effects cannot be ruled out in advance. The Ministry of Defence employs a code of conduct for clearing explosives: explosives at sea are not set off if there are realistic alternatives.

Sonar and marine mammals

In recent years, international concern has arisen about the potentially harmful effects of underwater noise produced by sonar systems. In 2003, the Ministry of Defence launched a research programmeprogramme that is still ongoing. The goal of this programmeprogramme is to safeguard the future responsible use of sonar systems essential for defence purposes.[1] The ongoing study is aimed at furthering knowledge about animals' sensitivity to sonar. Knowledge gained has already resulted in rules at the Royal Navy for safeguarding the responsible use of sonar. A complete ban on the use of sonar systems for detecting submarines is out of the question, as there is no alternative.

Sonar systems in the Netherlands part of the North Sea only make up a very small part of the total quantity of underwater noise, a 2009 source inventory suggests.[2] Specific measures for the Netherlands part of the North Sea are considered unnecessary. The Royal Navy's control measures are applied globally.

[1] Ministry of Defence, *Defence Sustainability Memorandum* (2009), 24

[2] Ainslie et al, *Assessment of natural and anthropogenic sound sources and acoustic propagation in the North Sea*, TNO-DV 2009 C085 (2009), 65

There are hardly any regulations in the Netherlands regarding underwater noise from seismic surveys, which are necessary for oil and gas recovery on the North Sea, when compared to the countries around us, such as the United Kingdom. Consequently, permits do not impose conditions in this respect.[134] However, regulations will be drafted as part of the Conservation Plan for Harbour Porpoises. The Netherlands cannot unilaterally take measures to regulate noise caused by shipping. Meanwhile, IMO has taken the first steps to study how noise from (commercial) shipping can be limited.[135]

The Strategic EIA of the National Water Plan 2009-2015 warned against the accumulation of underwater noise from simultaneous pile-driving in multiple locations. This could be the case when constructing several wind farms with a total capacity of 6,000 MW (approx. 1,200 turbines) at the same time in the period between 2010 and 2020. This cumulative effect could be even greater if neighbouring countries were to also implement their current energy ambitions. The Cabinet has since abandoned this timeline, therefore reducing the risk of the accumulation of noise impact in the Dutch area until 2020. However, neighbouring countries will still be developing a great deal of wind energy at sea. Pursuant to agreements in the context of the *Espoo Convention*[136] and EU Directive 2001/42/EC[137], the Netherlands exchanges information on the location of wind turbines with neighbouring countries.

The countries around us are conducting a great deal of research at sea in conjunction with developing wind energy. The Dutch government also has a research programme in place to fill the knowledge gaps relating to wind energy.[138] A key shortcoming in the research is the lack of standards to characterise noise.[139] The Netherlands is addressing this by inventorying, characterising and assessing unnatural noises. It has also taken the initiative to draft measurement standards.[140]

2.4.2 Chemical disturbances

Nutrients

Section 2.2.2 addressed the effect of eutrophication on plankton and, indirectly, on the benthos in the southern part of the North Sea subregion. This is caused by a surplus supply of nutrients. The principle source of nutrients introduced into the environment by humans is the use of fertilisers in agriculture. Being discharged throughout the river basins (including the upstream countries and the currents surrounding the North Sea subregion), these fertilisers represent approx. 55% of the eutrophication status of the coastal waters. About one-third of the supply of nitrogen to the Northeastern Atlantic Ocean originates from the (increasing) atmospheric deposition from diffuse sources on land and in shipping. it is not known how much the emissions from shipping on the North Sea itself contribute.[141]

Effectiveness of policy

At an OSPAR level, the target for eutrophication is for no area-specific eutrophication phenomena to occur in the form of direct and indirect effects, as assessed by the *Comprehensive Procedure*.[142] An increase of 50% of the algal pigment chlorophyll a above the background level is considered acceptable at both OSPAR and WFD level (see also section 2.2.2).

Emission reduction at the source

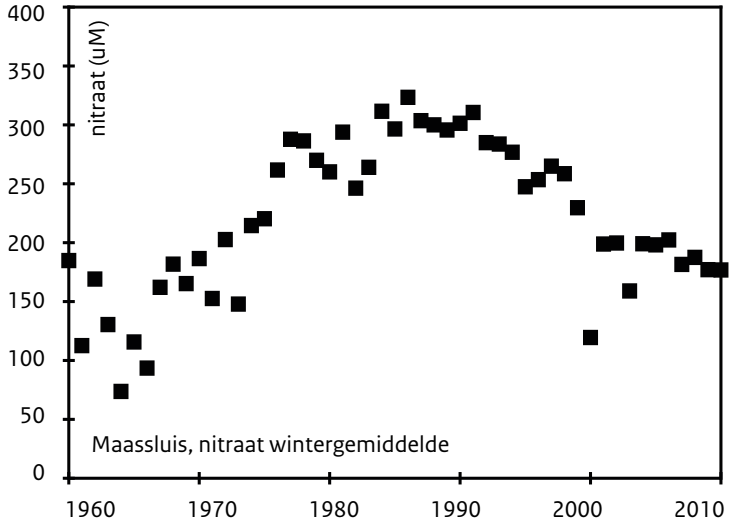
The 1987 North Sea Ministers Conference agreed a 50% reduction at the source of the emissions of nitrogen and phosphorus compared to 1985. This agreement was also laid down in the Rhine Action Plan of the International Commission for the Protection of the Rhine[143] and the North Sea Action Plan[144]. OSPAR laid down this agreement in a recommendation in 1988. The OSPAR Quality Status Report reports on the progress of the reduction, most recently in the QSR 2010. In 2006, the Netherlands had achieved emission reductions at the source totalling 45% for nitrogen and 77% for phosphorus.[145]

Reduction of river loads

As a result of the above-mentioned reduction at the source, the total discharge of nutrients by rivers dropped by 20-40%

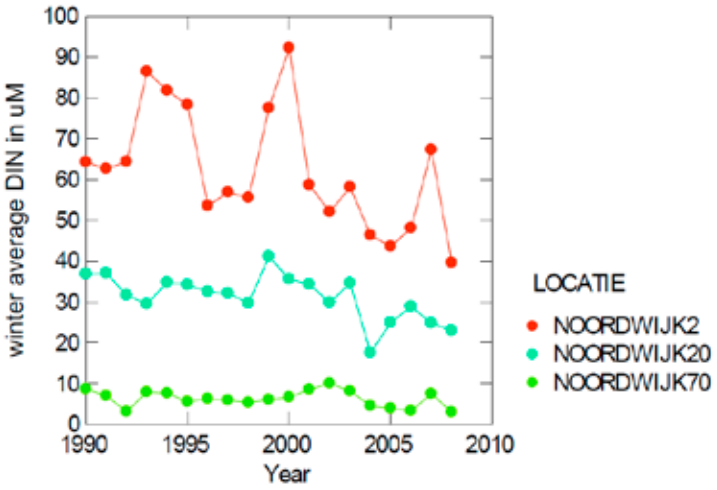
Figure 12. Trends in nutrient concentrations.

Average nitrate concentration in the Nieuwe Waterweg in the 1960-2010 period. Rhine discharge is the main source of nitrogen in the Netherlands part of the North Sea.



Source: Waterbase (2012) web application of the Directorate-General for Public Works and Water Management: http://live.waterbase.nl

Average winter concentration of dissolved anorganic nitrogen at 2, 20 and 70 km off the coast at Noordwijk. The major fluctuations near the coast are a result of the fact that river water here has not fully mixed yet.



Source: J.G. Baretta-Bekker, P. Bot, T. Prins W. Zevenboom, Report on the second application of the OSPAR Comprehensive Procedure to the Dutch marine waters, OSPAR EUC 08/2/6-E(L) (2007).

in the 1990-2006 period, with that of phosphorus dropping by even more than 50%. As such, OSPAR reduction targets for phosphorus have been amply met, but those for nitrogen have not.[146]

The WFD targets of coastal water bodies have not been achieved yet either. To achieve good ecological status in the 1-nautical mile coastal zone of the WFD (and the Wadden Sea), the nitrogen river load must be reduced by 20% compared to the 2006 level. For the Rhine, the International Commission for the Protection of the Rhine translated this to a nitrogen load reduction of 15% (compared to 2006, measured at Maassluis).

The WFD's River Basin Management Plans 2009-2015 indicated that the nitrogen reduction percentage is likely to be achieved through implementation of the current WFD programme of measures.[147] The International Commission for the Protection of the Rhine laid down the approach to the Rhine in the internationally coordinated river basin management plan of the WFD river basin district of the Rhine.[148] Implementation of the Nitrate Directive[149], the Urban Wastewater Treatment Directive[150], the IPPC Directive151 and the Directive on national emission ceilings for certain atmospheric pollutants[152] also contributes to reducing the emission of land-related sources. To achieve a reduction in nitrogen emissions from shipping, IMO is running an NECA pilot *(nitrogen oxides emission control area)* for the Greater North Sea. The MARPOL convention and the UNECE *Convention on Long-range transboundary air pollution* are also important in relation to reducing nitrogen emissions into the air by ocean shipping.

The marine ecosystem is not responding immediately to the measures taken. Moreover, substances already present in the seabed also have a lingering effect. Furthermore, the Netherlands also depends on the efforts of countries upstream and upwind to tackle reducing emissions. The decreasing nutrient concentrations (see also Figure 12) and the minor remaining eutrophication phenomena in the Netherlands part of the North Sea (see 2.2.2) indicate that we are on the right track.

Contaminants

As established in section 2.2.5, there has been a downward trend in the percentage of oiled birds since 1975, but the current level still exceeds the OSPAR-EcoQO target level. Other large-scale polluting effects via food webs on birds and marine mammals are a thing of the past (see section 2.2.5). The OSPAR-EcoQO target level for the effect of TBT on sea snails (i.e. imposex) has not been achieved yet.

About two thirds of the emissions of contaminants on land (e.g. from industry, agriculture, traffic and households)

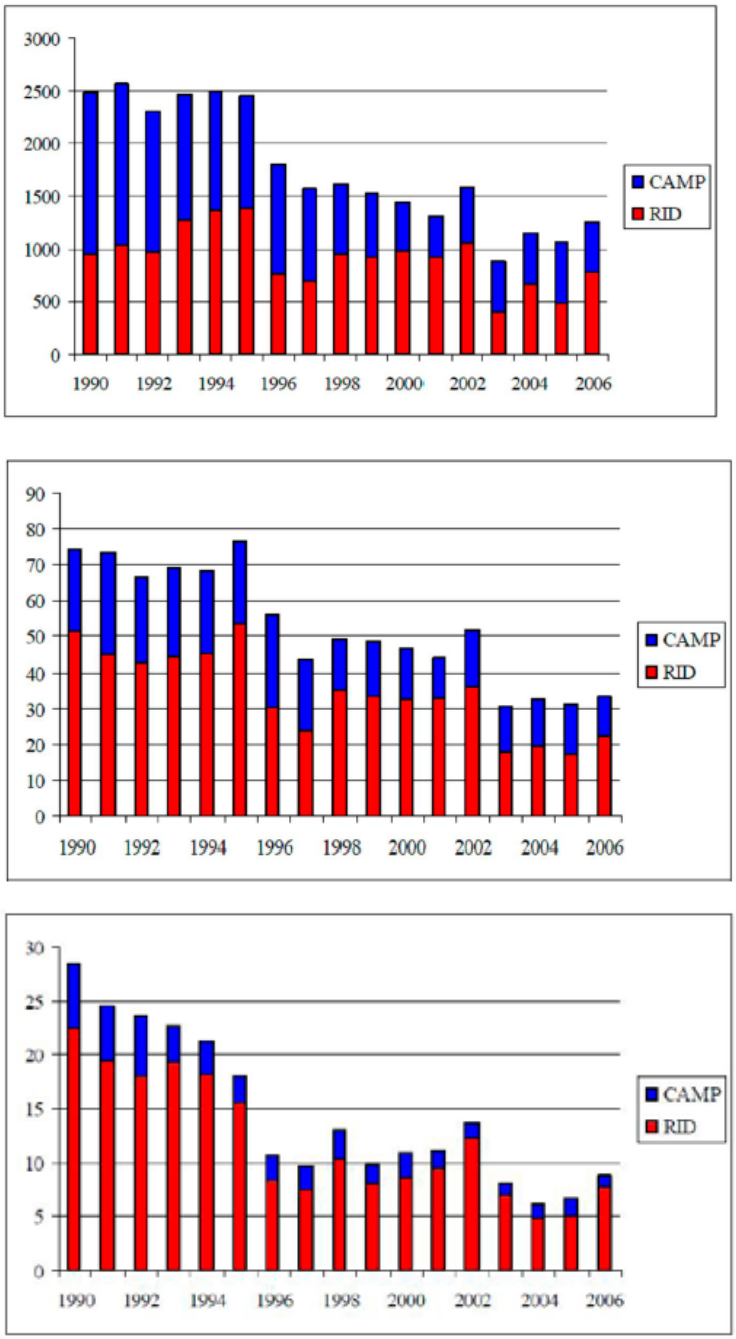
Contaminants: what are they and how are they measured?
Contaminants are defined as all substances that enter the environment through human activity, the physical and chemical properties of which endanger human health and which can be harmful to the quality of air, water and soil on which other living organisms also depend. Contaminants accumulate in food webs, disperse through the sea across great distances, and remain in the marine environment for a long period of time.

The Dutch Territorial Sea (up to 12 nautical miles) is subject to both OSPAR and WFD as assessment frameworks. The WFD's scope is 12 nautical miles for priority substances (list of substances for which the standards have been determined by the European Commission) and 1 nautical mile for other substances. In the 12-mile zone, the OSPAR and WFD assessment methods are incongruent, resulting in an unequivocal picture of the problem substances in the coastal zone. Seaward of the 12-mile zone, only OSPAR applies and no such problems arise. Given the WFD's different monitoring method (in total water), there are also a large number of so-called substances demanding special attention, which cannot presently be measured at all or at least not to a sufficiently reliable degree, and should therefore be considered potential problem substances for now. At OSPAR level, an Ecological Quality Objective (EcoQO) has been set for oil pollution in the form of counts of the numbers of oil-stained guillemots found on the Dutch coast.

ultimately ends up in the marine environment; 80-90% of this transport takes place via rivers and through the air. The specific physical and chemical properties of the substances determine the exact route: via river discharge, via atmospheric deposition or along both routes. The Rhine is a major supply route for the Netherlands part of the North Sea. Part of the contaminants in the Netherlands part of the North Sea (including lead and nitrogen oxides) originates from sources at sea, such as ocean shipping and offshore mining. Contaminants are also supplied from adjacent sea areas via the English Channel.

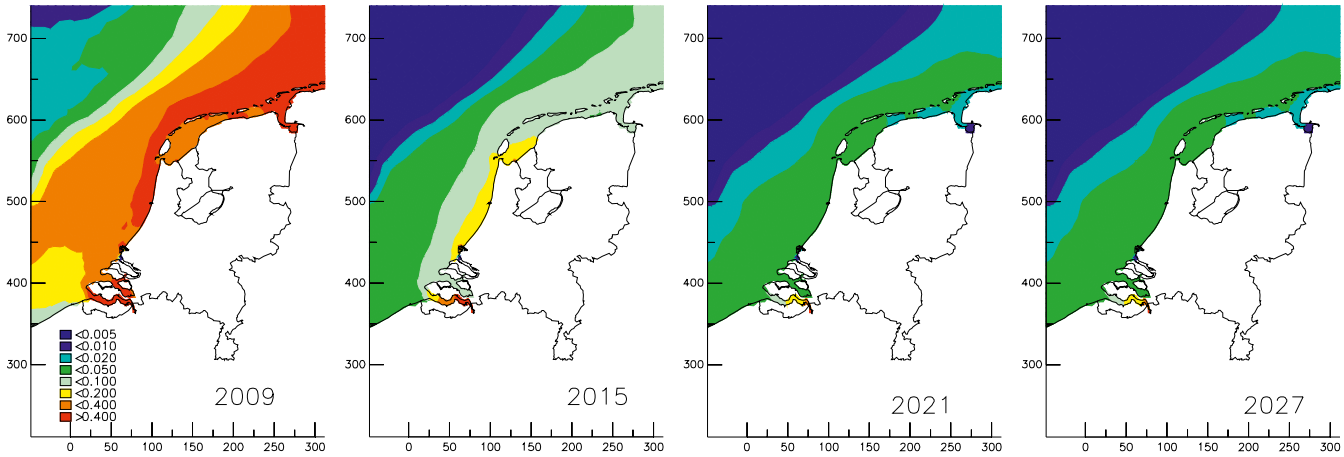
Effectiveness of policy
Contaminants accumulate in food webs, disperse through the sea across great distances, and remain in the marine environment for a long period of time. Once they are in the sea, they cannot be countered in a cost-effective manner, which is why sources of pollution have been dealt with seriously since the 1970s by such measures as licences for effluent discharges and stringent regulations by IMO for ocean shipping and by OSPAR for oil and gas recovery. The

Figure 13. Decrease in the supply of led (top), cadmium (middle) and mercury (bottom) to the North Sea in the 1990-2006 period. Data for the North Sea as a whole. RID = via rivers and direct discharges: CAMP = via the air



Source: OSPAR Commission, *Trends in atmospheric concentrations and deposition of nitrogen and selected hazardous substances to the OSPAR maritime area.* Draft CAMP Assessment, ASMO 09/6/2-E (2008).

Figure 14. Expected development of the TBT concentration in water from 2009 following the structured phasing-out of TBT-containing coatings on ship's hulls in the 1990-2008 period.



Source: J. van Gils Y. Friocourt, *Doelbereik KRW stoffen in de Noordzee - deel 2 : scenarioberekeningen, [WFD target range for substances in the North Sea - part 2 : scenario calculations]*, Deltares report Z4441, (Delft, 2008) 89.

North Sea is a special area under MARPOL, which means it is subject to a higher level of protection against pollution generated by shipping than other sea areas. The status of special area covers oil pollution, litter, and the emission of sulphur oxides *(SOx-Emission Control Area)*. In OSPAR, a ban on dumping oil-containing drilling waste has been formulated, and limits have been imposed on oil concentrations in the production water of offshore installations.[153]

For the future, the Cabinet holds on to a combined approach to contaminants at the source (point sources and diffuse sources), re-use and purification, and the 'polluter pays' principle. This is done on the basis of a general and a supplementary policy framework.154 The general policy framework targets sources of pollution (by way of licensing and general regulations) as set out in the Environmental Management Act, the Water Act, general substances policy155 and the Diffuse Sources Action Programme[156], including the changes that may result from the evaluation of this action programme. The supplementary policy framework focuses on achieving the environmental quality requirements and safeguarding the 'no deterioration' aspect of the WFD bodies of water. It is outlined in the River Basin Management Plans of 2009. The programme of measures comprises a combination of source-oriented measures (end-of-pipe) as described above and planning measures. Moreover, within a WFD context, agreements have been reached with neighbouring countries in the river basin to address the upstream sources in the rivers.

The negative effects of TBT on sea snails is recognised at OSPAR, IMO and EU level. Pursuant to IMO, ship's paints containing TBT or other organotin compounds have been banned, effective from 2003 onward. These types of paint had to have been removed from all ships by 2008 or covered by an impenetrable top layer, so as to prevent any TBT release. The ban on TBT has since been embedded in an EU Regulation.[157] It is expected that TBT will no longer cause any environmental problems beyond 2020 due to the measures that have been introduced. The OSPAR target level for oil pollution will be met around 2030 if the current trend continues.[158] Some other substances, such as lead and PAHs, are still present in excessive concentrations. The expectation is that implementation of the WFD and ocean shipping measures under IMO will further reduce the emissions (see also Figures 13, 14 and 15). The quantities remaining in the marine environment will no longer cause any problems after 2027 (WFD target year).[159]

Dioxin-like substances are still being released in the Northeastern Atlantic zone that may have negative effects on marine mammals and top predators.[160] The Netherlands is cooperating at a global and European level with the phasing out of these substances.

Disaster relief and incident approach

In the 1990s, IMO, at the request of the Netherlands, established a deep water route on the North Sea for tankers carrying oil and chemicals to maintain a greater distance along the vulnerable Dutch coastal areas.

The North Sea countries have reached agreements on dealing with the consequences of incidents and disasters. The Bonn Agreement, for example,[161] sets out cooperation between different national authorities in the event of transboundary disasters. The agreements concern the performance of risk analyses to prevent accidents, acting to

limit the effects of accidents, and the notification duty and reporting on such incidents.
At subregional level, France, the United Kingdom, Belgium and the Netherlands are drafting an operational plan for the area between the Strait of Dover and the approach to the port of Rotterdam. Moreover, regulations pursuant to the Seveso II directive[162] (industrial establishments on and near the coast) seeks to prevent incidents involving dangerous substances and limit their consequences for man and the environment.

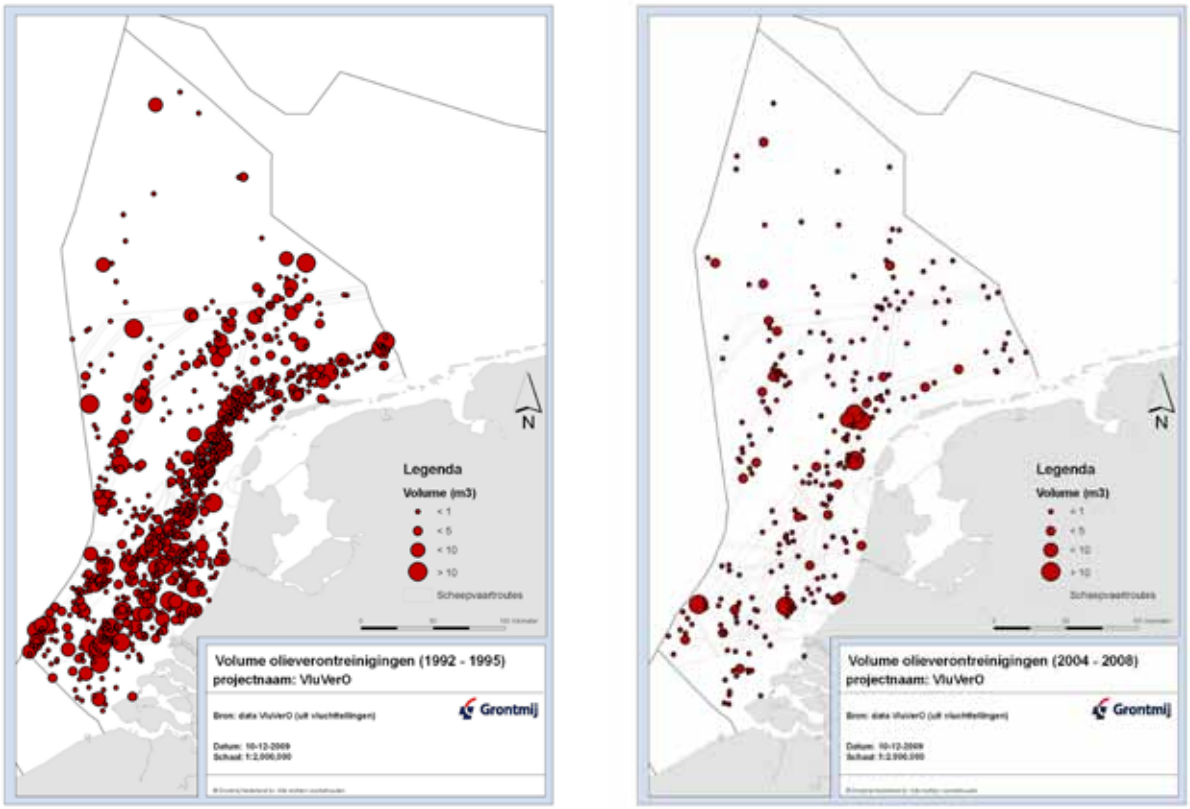
Key agreements on disaster relief and incident approach for the Netherlands have been laid down in the

- North Sea Calamity Plan (2009) of the Regionaal Beheersteam Noordzeerampen [North Sea Calamities Regional Control Team].[163] This decree focuses on a coordinated approach to disaster relief and incident control on the North Sea and establishes procedures for collaboration between the Coastguard Centre and all government bodies and services that may be involved, including land-side authorities.
- Samenwerkingsregeling Bestrijding Kustverontreiniging Rijkswaterstaatdiensten [Cooperation regulation of the departments of the Directorate General for Public Works and Water Management on countering coastal pollution] (2007).[164] The primary goal of this regulation is to set down the cooperation between the departments of the Directorate General for Public Works and Water Management in procedural and operational agreements in order to be able to act in a coordinated manner in the event of coastal pollution.
- Emergency relief plan "wet" module 2 of the Emergency Plan for the North Sea of the Directorate General for Public Works and Water Management (2009). This outlines the role and approach at a tactical/operational level.
- Capacity memorandum to protect vulnerable sea and delta areas (Directorate General for Public Works and Water Management, 2006).[165]

Policy on contaminants in fish and other sea food for human consumption

EU legislation obligating Member States to monitor foodstuffs for the presence of contaminants has been in place for quite some time. Fish and other sea food are governed by the EC's Controls Regulation.[166] Pursuant to this Regulation, Member States must draft multiannual control

Figure 15. Decrease in the number of oil discharges and volume per incident observed by the coastguard aircraft in the 1992-1995 and 2004-2006 periods.



Source: *Deltares, IMARES, Initial Assessment, Implementation of the Marine Strategy Framework Directive for the Netherlands part of the North Sea Background document 1 (of 3)* (Delft, 2011) 129.

plans. The control should take into account the results of the risk assessment. Commission Decision 2010/477/EU[167], which is part of the MSFD, also obligates Member States to perform physical controls of products caught or harvested at sea for the presence of contaminants. The Commission has also made several recommendations on monitoring contaminants in fish, such as those on perfluoralkylated substances.[168]

For a limited number of contaminants in fish and other sea food, legal maximum levels have been set at EU level (these levels used to be set down in national legislation). Maximum levels have been set for lead, cadmium and mercury, dioxins/furans and dioxin-like PCBs (polychlorinated biphenyls) and benzo(a)pyrene.[169] After an amendment to this regulation,[170] European maximum levels for other PCBs also apply as of 1 January 2012. Maximum Residual Levels (MRLs) of pesticides have also been established by law.[171] However, there is no such regulation yet for pesticides in fish.[172] The Commodities Act contains additional MRLs for some biocides in, among others, fish.

In the Netherlands, the RIKILT Institute of Food Safety and IMARES have been monitoring fish and other sea food systematically since 2000. European legislation includes requirements for the sampling method, the laboratories, and the analysis for official controls. The annual monitoring programme covers mussels, shrimp, and some twenty commercially exploited fish species. The programme measures:

- heavy metals
- dioxin-like substances
- organo-chloro pesticides
- PCBs
- TCPM(e) (Tris(4-chlorophenyl)methanol and methane)
- brominated flame retardants, and
- PAHs (polycyclic aromatic hydrocarbons).

Every year, the measurement programme focuses specifically on a group of relatively unknown contaminants in order to gain insight into the presence of these substances. The samples are taken at different fish auctions, so that their geographical origin is not very clear. As a result, it is not possible to establish any temporal trends. Monitoring aimed at the generic environmental quality of the Netherlands part of the North Sea also comprises a set of substances measured in mussels and flatfish (mostly in flounder livers, which are usually not eaten).

At the moment, measurements suggest that in the Netherlands the maximum levels of contaminants in fish and other sea food are not being exceeded. As a result, no consignments of fish and/or other sea food are being rejected. Coastal waters, on the other hand, show increased levels of mercury and cadmium.

The marine environment also contains radionuclides resulting from human activities such as discharges from plants in the nuclear sector (energy generation, isotope production, research institutes) and the non-nuclear sector (offshore oil and gas industry, radiotherapy in hospitals). At a European level, standards have been laid down for radioactive substances,[173] OSPAR has shown that the doses are considerably below the international standards for human exposure. OSPAR is currently testing trends in the concentrations of radionuclides in the marine environment, which show that the level is stabilising. Effects on biota are deemed unlikely. However, OSPAR is drafting environmental assessment criteria for radioactivity in the marine environment.

2.4.3 Biogenic disturbances

Introduction of non-indigenous species

Section 2.2.3 outlined the effect of the introduction of non-indigenous species on the Netherlands part of the North Sea. Introduced non-indigenous species were (and are) transported mainly by way of commercial and non-commercial shipping. Organisms are carried in the ballast water or attach to a ship's hull. The second most important route of introduction is through the import of shellfish for marine aquaculture.

Effectiveness of policy

The success of introducing non-indigenous species in an open, dynamic marine ecosystem is usually considered unpredictable and often irreversible. Successful invasive non-indigenous species cannot be controlled in a cost-effective way without considerable damage to the ecosystem, as is the case with the Atlantic jackknife clam and the Pacific oyster outlined in 2.2.3. These species are edible *('If you can't beat them, eat them')* but cannot be controlled by harvesting them. Current policy, therefore, aims to control them at the source.

IMO has established a successful global collaboration to prevent the further spread of non-indigenous species and thus limit the ecological, veterinary and sanitary risks of a number of species of marine invasive non-indigenous species. Based on the IMO *Ballast Water Convention*[174] and the Dutch ratification of this convention in 2010, national legislation has been adopted. Depending on sufficient ratification, the convention itself will probably take effect in 2013. Ship owners will then be obliged to purify their ballast water. Several ballast water treatment systems have since become available and are being tested across the globe. In July 2011, IMO adopted an international directive on limiting the introduction of non-indigenous species as a result of *hull fouling*, for the time being on the basis of voluntary measures.[175] These guidelines are aimed both at commercial

Non-indigenous species are of all times
The introduction of non-indigenous species as a result of shipping became a significant factor from the late Middle Ages onward, and particularly from the 16th century, when merchant shipping to Africa, Japan, India, Indonesia and Northern and Central America got underway. Introduction came about via the hulls of the slow-moving sailing ships and as a result of ships' lowering ballast rocks or cargo.

A well-known example is the introduction in 1731 of the shipworm, which eroded wooden sea walls. The number of introductions during this period may very well be higher than assumed, as many species that have long been considered indigenous originally travelled to our regions by ship.

From the 18th century onward, introductions of non-indigenous species as a result of shipping increased because of the use of ballast water tanks in steel ships. Taking on ballast water and dumping it far from its origin (at sea and in seaports) serves as a highly effective vehicle for non-indigenous species.

Non-indigenous species can also enter the Netherlands part of the North Sea by natural means (on driftwood in sea currents).

shipping and leisure boating. The results will be monitored closely in the coming years.

In 2007, the Ministry of Economic Affairs, Agriculture and Innovation adopted the Beleidsnota Invasieve Exoten [Policy Memorandum on Invasive Non-indigenous Species].[176] This memorandum mainly seeks to prevent the introduction of invasive non-indigenous species by means of preventive measures, which could relate to the discharge of ballast water or to the regulation of licensing for aquaculture. Moreover, the Netherlands is developing a Beleidslijn Verplaatsingen Schelpdieren [Policy Line on Shellfish Transfer]. Under this policy line, the introduction of invasive non-indigenous species into Natura 2000 areas is prevented by imposing strict requirements on the issuance of Nature Conservation Act permits for shellfish transfer.

This new policy and new legislation are expected to dramatically reduce the risk of introductions of non-indigenous species via ocean vessels in the Netherlands part of the North Sea after 2020.

2.4.4 Cumulative and synergetic effects

The effects of human activities on the North Sea ecosystem should not be considered separately. Observed effects on species and at ecosystem level may be the result of an accumulation (build-up) of effects of various activities (in time and/or in space).
There are different kinds of cumulative effects:

- effects of repeating the same activity (in time and/or in space)
- effects of multiple activities that result in the same kind of disruption
- effects of multiple activities that result in a build-up of disruptions

In addition to direct effects, accumulation may also cause indirect effects on the ecosystem. These cannot be attributed to a single activity, but are the result of a complex interaction of cause and effect relations of different activities.

There is no proper methodology for determining cumulative effects yet.[177] It can be concluded from the previous sections, however, that by repeating the same activity in time and space, traditional beam trawling in particular causes an accumulation of effects on benthos, fish stock and the vitality of the marine ecosystem as a whole.

It is also a known fact that various species of coastal birds in the coastal zone are sensitive to a build-up of disruptions caused by leisure activities, fisheries and shipping. The impact of that disruption may be considerable, particularly in locations where there are high densities of birds due to the availability of food. This fact – together with the effect of fisheries pressure and of non-indigenous species on the availability of prey (e.g. for sea floor, the common scoter) – plays a role in the unfavourable status of most coastal birds according to the Birds Directive. In current policy, this issue is unraveled in the Natura 2000 management plans. In the protection area of the Voordelta, for example, small rest areas have been established with limited rights of access.

The Strategic EIA and the appropriate assessment under the NWP conclude that no significant cumulative effects are expected from sand extraction and sand suppletion until 2020, provided the method and scope do not drastically change. However, sand extraction and sand suppletion together with wind farms may have a cumulative effect on (fish-eating) coastal breeding birds and marine mammals. The appropriate assessment does not entirely rule out any significant effects on the ecosystem resulting from the construction of 6,000 MW of wind farms until 2020.[178] However, at present, it is unlikely that this scope will be realised before 2020. It would be wise to combine the cable infrastructure in order to minimise the negative effects on other uses and nature. This is part of current policy.

2.5 Costs related to the degradation of the marine environment

Based on an internationally coordinated approach179 the LEI performed a quantitative analysis of the (financial) cost incurred to achieve and maintain the current environmental status of the marine ecosystem in the Netherlands part of the North Sea.[180] The overview is an overall presentation of the costs of current policy as described in section 2.4 aimed at countering disruptions due to human activities compared to the returns for society resulting from these activities (section 2.3.1). These costs can now be considered as a minimum for the current degree of protection of the marine ecosystem.[181]

Table 3 shows that the different sectors spend at least 147 million euros each year to prevent or reduce degradation of the marine environment.

Delineation problems are inherent to such an overview. For shipping, for example, it has been assumed that only 10% of the costs incurred by the Dutch shipping industry to protect the marine environment is to be attributed to protecting the Netherlands part of the North Sea. After all, the vessels are only in Dutch waters for a limited period, but the sector must pay the entire amount and therefore spends more than 150 million euros on current measures. Eighty percent of shipping in the Netherlands part of the North Sea is by foreign shipping companies; related costs are not shown in the overview. Moreover, the decision to only consider the costs of measures that have already been detailed means that the overview does not include the costs the fishing industry will have to incur for the Natura 2000 measures. The same applies to current and planned legislation on sulphur.

Apart from industries in and along the North Sea, industries on land also take a lot of measures and incur a lot of costs. These include measures and costs related to the Water Framework Directive, measures the agricultural sector has to meet pursuant to the Nitrate Directive, and investments in sewerage management and sewage purification. While these measures are not primarily taken to improve the environmental quality of the North Sea, they do contribute to it. According to the LEI, this involves at least ten times the amounts mentioned above.[182]

These kinds of observations on sectors that incur more costs to prevent degradation of the marine environment than presented in the LEI study justify the conclusion that actual costs exceed the figures presented.

Table 3. Minimum annual costs to prevent degradation of the Netherlands part of the North Sea environment.

Type of cost	Costs M € year
Shipping • insurance • contributions to the International Oil Pollution Compensation Fund • TBT-free antifouling coating • ballast water treatment systems • port reception facilities	17
Fisheries and mariculture • making fisheries more sustainable (e.g. by adjusting technology, experiments) • preventing the introduction of non-indigenous species into the marine environment • closing areas of the North Sea	8
Oil and gas recovery[183] • measures related to oil and gas exploration, the production process and dismantling of platforms, including measures related to production water	20
Sand and shell extraction • location restrictions	3
Wind energy • environmental impact statements	4
Leisure activities[184] • clearing up beaches	9
Defence • research into the effect of underwater noise • technical measures on board ships	1
Dredging • storage of polluted salty dredging sludge on land instead of spreading it out • onto the seabed	30
Land reclamation: Maasvlakte 2 • environmental impact statements • nature compensation • monitoring the effect on the North Sea environment • excluding fisheries in the Maasvlakte 2 and nature compensation area • implementing and enforcing the above measures	21
Government • policy development/preparation and coordination • management activities • policy evaluation/monitoring • knowledge development	35
Total costs of sea-related measures	**147**

Source: LEI, *The current cost of avoiding degradation of the Netherlands part of the North Sea Environment* (Den Haag, 2010) 9.

2.6 Conclusions of the initial assessment

The area
The Netherlands part of the North Sea is a shallow, nutrient-rich sea containing a natural wealth of species and a large biomass. This is mainly due to the influence of the rivers that flow into the sea. Fish stocks are naturally high, and the coastal zone in particular is the habitat of large numbers of birds. Moreover, the Southern North Sea is one of the most intensively used seas in the world. Shipping, ports, oil and gas recovery and fisheries are the main users. The ports and oil and gas recovery generate the majority of the total direct and indirect added value of at least EUR 35 billion (2007). For the Dutch, the North Sea is above all a place where they like to spend time, and as such it is a key source for tourism from the Netherlands and abroad.

Current status, general
The quality of the seabed habitats in the Netherlands part of the North Sea has declined significantly in the 20th century. Benthic diversity has deteriorated. Species of shark, skate and ray in particular are endangered; some species have already disappeared. The status of many coastal birds is 'unfavourable', while the conservation status of opportunistic bird species is favourable. Marine mammals are increasing in number, even though the recent high number of strandings of harbour porpoises and the quality of their living environment is a cause for concern. Given the environmental status of the Netherlands part of the North Sea, the structure and uses of the marine ecosystem as a whole cannot be safeguarded. The Planbureau Leefomgeving (PBL) estimates that only about 40% of the original natural quality remains.[183]

Fisheries pressure
The current status of the seabed ecosystem and of the fish stock in the Netherlands part of the North Sea can largely be attributed to fisheries pressure, particularly from traditional beam trawling, from the 1960s onward.
Within the context of Common Fisheries Policy, a lot has already been achieved to stem the downward tide from the early 21st century onward. The initial assessment of the marine ecosystem presents the first positive outcomes of this. Nevertheless, the expectation is that the physical disruption due to disruption of the seabed by beam trawling in particular and by-catches will remain so bad that the marine ecosystem will not be able to recover.

Coastal zone
In the coastal zone, there are several factors at play in addition to fisheries pressure: the major hydrographical interventions of the Delta Project and Maasvlakte 1, the effects on benthos of non-indigenous species introduced by shipping and marine culture, and disruptions due to the combination and accumulation of human activities along the coast. The effects resulting from the Delta Project, the construction of Maasvlakte 1 and the introduction of invasive non-indigenous species are seen as irreversible. Management plans for the Natura 2000 areas seek to regulate human activities in the coastal zone (such as fisheries, leisure activities, sand extraction and sand suppletion). The effects of Maasvlakte 2 are being mitigated and compensated. The risk of introducing non-indigenous species is expected to decrease dramatically as a result of recent policy.

Contaminants and nutrients
Up until recently, pollution and eutrophication of the North Sea posed a threat to the marine ecosystem. The status has improved considerably, but nitrogen and a number of contaminants are still present in excessive concentrations. If current source policy (WFD, MARPOL and OSPAR) for rivers, shipping and oil and gas recovery is continued, the effects of eutrophication and known contaminants on the ecosystem will have been minimised after 2020.

Litter
In recent years, a number of steps have been taken to reduce the amount of litter. Between 2002 and 2009, no significant increase or decrease in the amount of litter was measured. However, the current environmental impact of litter is too high. It is not clear how trends will develop until and beyond 2020. The issues related to microplastics are still largely unknown. They are likely to increase, with potential risks to the food web.

Underwater noise
Underwater noise produced by human activities has increased significantly. It is not clear to what extent noise is already a problem and what its (cumulative) effects will be in case of increased use of the sea. The individual production of impulse noise produced by pile-driving (wind farms) is being regulated by permit.

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[97] Camphuysen, Siemensma, *Conservation plan for the Harbour Porpoise Phocoena phocoena,* 134-135.

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[104] *Regulation (EC) No 80/2009 of the European Parliament and of the Council of 14 January 2009 on a Code of Conduct for computerised reservation systems and repealing Council Regulation (EEC),* No 2299/89 (2009).

[105] European Commission, *Communication from the Commission to the Council and the European Parliament, on the role of the CFP in implementing an ecosystem approach to marine management,* [SEC(2008) 449] (Brussels, 2008).

[106] *Council regulation (EC) No 2371/2002 of 20 December 2002 on the conservation and sustainable exploitation of fisheries resources under the Common Fisheries Policy* (Brussels, 2002).

[107] C. Röckmann, F. Quirijns, H. van Overzee, S. Uhlmann, *Discards in fisheries – a summary of three decades of research at IMARES and LEI.* Report number C068/11. Report IMARES (IJmuiden, Wageningen, 2011).

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[110] *Verordening (EG) Nr. 812/2004 van de Raad van 26 april 2004 tot vaststelling van maatregelen betreffende de incidentele vangsten van walvisachtigen bij de visserij en tot wijziging van Verordening (EG) nr. 88/98* (Brussel, 2004).

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[114] RWS Noordzee, *Draft Monitoren zwerfvuil.*

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[117] Deltares IVM, *Microplastics Litter in the Dutch Marine Environment* (Delft, Amsterdam, 2011) 4.

[118] Ibidem.

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[120] IMO, *International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978* (MARPOL 73/78).

[121] Ministerie van Infrastructuur en Milieu, *Motie en Toezeggingen Scheepvaart. IenM/BSK-2011/118115. Brief aan de Tweede Kamer* (Den Haag, 26 september 2011).

[122] Ministerie van Infrastructuur en Milieu, *Motie en Toezeggingen Scheepvaart.*

[123] *Richtlijn 2000/59/EG van het Europees Parlement en de Raad van 27 november 2000betreffende havenontvangstvoorzieningen voor scheepsafval en ladingresiduen* (Brussel, 2000).

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[125] Ministerie van Infrastructuur en Milieu, *Meer waarde uit afval. DP 2011048374. Brief aan de Tweede Kamer* (Den Haag, 25 Augustus 2011) 1-7.

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[129] OSPAR Commission, *Assessment of the environmental impact of underwater noise* (2009)17.

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[131] M.A. Ainslie et al., *Assessment of natural and anthropogenic sound sources and acoustic propagation in the North Sea,* TNO-DV C085 (2009)12.

[131b] Ainslie et al, 2009, p 65

[132] Camphuysen, Siemensma, *Conservation plan for the Harbour Porpoise,* 7.

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[136] *Convention on environmental impact assessment in a transboundary context,* done at Espoo (Finland), on 25 February 1991

[137] *Richtlijn 2001/42/EG van het Europees Parlement en de Raad van 27 juni 2001 betreffende de beoordeling van de gevolgen voor het milieu van bepaalde plannen en programma's* (Brussel, 2001).

[138] A.R. Boon et al, *Monitoring and researching ecological effects of Dutch offshore wind farms- Masterplan,* Deltares (2010).

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[142] OSPAR, *Comprehensive Procedure.*

[143] Internationale Rijncommissie, *Aktionsprogramm 'Rhein'* 8. Rheinministerkonferenz, Straatsburg, 1 oktober 1987.

[144] Ministerie van Verkeer en Waterstaat, *Noordzeeactieplan, Nationaal Uitvoeringsdocument Derde Noordzeeministerconferentie,* Tweede Kamer, vergaderjaar 1990-1991, 21 884, nrs. 1 en 2, 1991(Den Haag, 1991).

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[146] OSPAR Commission, *Trends in waterborne inputs. Assessment of riverine inputs and direct discharges of nutrients and selected hazardous substances to the OSPAR maritime area in 1990-2006,* Publication 448/2009 (London, 2009) 61-62.

[147] Ministerie van Verkeer en Waterstaat, *Stroomgebiedbeheerplannen 2009-2015. Samenvatting Eems, Maas, Rijndelta en Schelde* (Den Haag, 2009) 41.

[148] http://www.iksr.org/index.php?id=298&L=2

[149] *Richtlijn 91/676/EG van de Raad van 12 december 1991inzake de bescherming van water tegen verontreiniging van nitraten uit agrarische bronnen* (Brussel, 1991).

[150] *Richtlijn 91/271/EEG van de Raad van 21 mei 1991 inzake de behandeling van stedelijk afvalwater* (Brussel, 1991).

[151] *Richtlijn 96/61/EG van de Raad van 24 september 1996 inzake geïntegreerde preventie en bestrijding van verontreiniging* (Brussel, 1996).

[152] *Richtlijn 2001/81/EG van het Europese Parlement en de Raad van 23 oktober 2001 inzake nationale emissieplafonds voor bepaalde luchtverontreinigende stoffen* (Brussel, 2001).

[153] OSPAR Commission, *OSPAR Decision 2000/3 on the Use of Organic-Phase Drilling Fluids (OPF) and the Discharge of OPF-Contaminated Cuttings* (2000).

[154] Ministerie van Verkeer en Waterstaat, *Nationaal Waterplan* (Den Haag, 2009) 106-107.

[155] Ministerie van Infrastructuur en Milieu, Vierde Nationaal Milieubeleidsplan, Kamerstuk 27801 nr. 77 Brief aan de Tweede Kamer (Den Haag, 29 juni 2011).

[156] Ministerie van Infrastructuur en Milieu, *Toekomstagenda Milieu en Waterbeleid, Kamerstuk 30 535 en 27 625, nr. 13 Brief aan de Tweede Kamer* (Den Haag, 20 december 2007).

[157] *Verordening (EG) Nr. 782/2003 Van het Europees Parlement en de Raad van 14 april 2003 houdende een verbod op organische tinverbindingen op schepen* (Brussel, 2003).

[158] OSPAR, 2009. *Evaluation of the OSPAR system of Ecological Quality Objectives for the North Sea,* 31.

[159] Deltares, *Doelbereik KRW stoffen in de Noordzee. Deel 2: Scenarioberekeningen* (Delft 2008) 29.

[160] Deltares, *Initial Asessment* , 128.

[161] *Agreement for cooperation in dealing with pollution of the North Sea by oil and other harmful substances, 1983, as amended by the Decision of 21 September 2001 by the Contracting Parties to enable the Accession of Ireland to the Agreement* (Bonn, 2001).

[162] *Richtlijn 96/82/EG van de Raad van 9 december 1996 betreffende de beheersing van de gevaren van zware ongevallen waarbij gevaarlijke stoffen zijn betrokken* (Brussel, 1996).

[163] *Besluit van 12 november 2009, nr. 09.003229 tot vaststelling van regels inzake de organisatie en de coördinatie van de bestrijding van schadelijke gevolgen van ongevallen op de Noordzee* (Besluit Rampenplan voor de Noordzee 2009) Staatscourant nr. 18323 (den Haag, 2009).

[164] Ministerie van Verkeer en Waterstaat, Rijkswaterstaat Noordzee, *Samenwerkingsregeling Bestrijding Kustverontreiniging Rijkswaterstaat-diensten* (Rijswijk, 2007).

[165] Ministerie van Verkeer en Waterstaat, Rijkswaterstaat *Noordzee, om kwetsbare zee- en deltagebieden te beschermen, Capaciteitsnota 2006-2010* (Rijswijk, 2006).

[166] *Verordening (EG) Nr. 882/2004 van het Europees Parlement en de Raad van 29 april 2004 inzake officiële controles op de naleving van de wetgeving inzake diervoeders en levensmiddelen en de voorschriften inzake diergezondheid en dierenwelzijn* (Brussel, 2004).

[167] Europese Commissie, *Besluit van de Commissie van 1 september 2010 tot vaststelling van criteria en methodologische standaarden inzake de goede milieutoestand van mariene wateren* (2010/477/EU) (Brussel, 2010).

[168] Europese Commissie, *Aanbeveling van de Commissie van 17 maart 2010 betreffende de monitoring van perfluoralkylverbindingen in levensmiddelen* (2010/161/EU) (Brussel, 2010).

[169] *Verordening (EG) Nr. 1881/2006 van de Commissie van 19 december 2006 tot vaststelling van de maximumgehalten aan bepaalde verontreinigingen in levensmiddelen* (Brussel, 2006).

[170] *Verordening (EU) Nr. 1259/2011 van de Commissie van 2 december 2011 tot wijziging van Verordening (EG) nr. 1881/2006 wat betreft de maximumgehalten voor dioxinen, dioxineachtige pcb's en niet-dioxineachtige pcb's in levensmiddelen* (Brussel, 2006).

[171] Zie bijlagen van *Verordening (EG) Nr. 396/2005 van het Europees Parlement en de Raad van 23 februari 2005 tot vaststelling van maximumgehalten aan bestrijdingsmiddelenresiduen in of op levensmiddelen en diervoeders van plantaardige en dierlijke oorsprong en houdende wijziging van Richtlijn 91/414/ EG van de Raad* (Brussel, 2005) .

[172] Omdat in Bijlage I van Verordening (EG) nr. 396/2005 in de productentabel groep 11 (Vis en dergelijke) nog niet is ingevuld.

[173] Onder andere in *Verordening (Euratom) nr. 3954/87 van de Raad van 22 december 1987 tot vaststelling van maximaal toelaatbare niveaus van radioactieve besmetting van levensmiddelen en diervoeders ten gevolge van een nucleair ongeval of ander stralingsgevaar* (Brussel, 1987).

[174] IMO, *International Convention for the control and management of ships ballast water & sediment* (London, 2004).

[175] IMO, *Guidelines for the Control and Management of Ships' Biofouling to Minimise the Transfer of Invasive Aquatic Species* (London, 2011).

[176] Ministerie van Landbouw, Natuur en Voedselkwaliteit, *Biodiversiteit beleidsvoornemen Invasieve Exoten, kamerstuk 26 407 nr. 27 Biodiversiteit, Brief aan de Tweede Kamer* (Den Haag, 12 oktober 2007).

[177] Deltares, *Initial Assessment* , 55-57.

[178] Royal Haskoning, *PlanMER Ontwerp NWP,* xiv-xv.

[179] 'Cost based Approach' *Europese handreiking economische analyses KRM, §4.3.*

[180] LEI, *The current cost of avoiding degradation of the Dutch North Sea Environment* (Den Haag 2010).

[181] Deze methode is vergelijkbaar met de manier waarop Nederland de analyse van de milieu- en hulpbronkosten heeft uitgevoerd voor de Europese Kader Richtlijn Water: R. Van der Veeren, W. Dekking, *Kostenterugwinning van waterdiensten in Nederland* (2008). De basisgedachte is gebaseerd op R. Hueting, Nieuwe Schaarste en Economische Groei (Amsterdam, Brussel, 1974).

[182] LEI, *The current cost of avoiding degradation,* 8.

[183] Cijfers met betrekking tot olie- en gaswinning zijn gebaseerd op de 4-jaarlijkse bedrijfsmilieuplannen van de sector. Zie X. Keijser, R.J.H.M. van der Veeren, *Economic and social analyses for the Marine Strategy Framework Directive. Part 1: Initial Assessment* (2011) 48.

[184] Voor Nederland en België samen komen Mouat et. al op 10,4 miljoen euro voor kosten voor het opruimen van de kust. Wanneer wordt aangenomen dat 85 procent van dit bedrag kan worden toegerekend aan de Nederlandse kust, dan worden kosten voor de Nederlandse geschat op 8,8 miljoen euro. Zie: J. Mouat, J., R.L. Lozano, en H. Bateson, *Economic impacts of marine litter* (2010) 45.

[185] Planbureau voor de Leefomgeving, *Natuurkwaliteit en biodiversiteit van de Nederlandse zoute wateren* (Den Haag/Bilthoven 2010) 9.

Chapter 3 Good environmental status, environmental targets and indicators (MSFD articles 9 and 10)

3.1 Introduction

This chapter presents the first steps toward the Marine Strategy until 2020.

Sections 3.2 through 3.12 consecutively outline the *policy approach*, *good environmental status*, the *environmental targets* and the *associated indicators*. Based on this, section 3.13 provides an initial impetus for elaborating the Marine Strategy into a *monitoring programme* and a *programme of measures*. Pursuant to the Directive, the Cabinet will decide on the monitoring programme (Marine Strategy Part II) by 2014 and on the programme of measures (Marine Strategy Part III) by 2015 at the latest. Section 3.13 provides an impetus to the elaboration of te Marine Strategy through 2020. Sections 3.14 and 3.15 then present the horizon beyond 2015 and the finances of the Marine Strategy.

3.2 Marine Strategy policy approach

Ambition: clean, healthy and productive
The Cabinet is convinced that the economic potential of the sea can be put to even better use in the 21st century if approached in a sustainable manner, in balance with the marine ecosystem. This vision on 'green growth' has been explained in the letter to the Dutch House of Representatives on the Sustainability Agenda.[186] As regards the North Sea, this not only concerns the growth of a sustainable economy, but also the chance for the marine ecosystem to develop as naturally as possible or – if it has been damaged in the past – to recover. Today's society is responsible for passing on the sea – which has so much to offer – in good condition to future generations.

The Cabinet's ambition is to establish good environmental status and biodiversity of the North Sea for current and future generations, and safeguard it as a key resource for the economy and the food supply. This is the joint task of the countries in the North Sea subregion; the Netherlands will contribute to its own part of the North Sea.

The National Water Plan as a policy framework
In the National Water Plan (NWP), the Cabinet has set out its strategy for implementing the MSFD until 2020.[187] The plan creates the (spatial) conditions for the further development of national interests such as shipping/ports, oil and gas recovery, sand extraction, wind energy and CO2 storage. At the same time, the NWP aspirational aim for the North Sea is a healthy and resilient marine ecosystem that can be used in a sustainable manner. Economic, ecological and socio-cultural values must be in balance according to *the people, planet, profit* principle. The Netherlands should achieve its (international) targets by contributing towards integrated policy, towards measures to protect marine biodiversity and towards the establishment of a global network of protected marine areas. The ecosystem approach and the precautionary principle are actively implemented.

The NWP's policy choice towards 2020 is a sustainable, spatially efficient and safe use of the North Sea, in balance with the marine ecosystem, as set out in the MSFD, WFD

Summary of the key requirements under the MSFD for establishing and implementing the Marine Strategy

Main task of the MSFD
Member States shall take the necessary measures to achieve or maintain good environmental status by 2020 at the latest. For that purpose, marine strategies shall be developed and implemented (Article 1.1 and 1.2). 'Good environmental status' means the environmental status of marine waters where these provide ecologically diverse and dynamic oceans and seas which are clean, healthy and productive, and the use of the marine environment is at a level that is sustainable. The structure, functions and processes of the constituent marine ecosystems function fully and maintain their resilience. Marine species and habitats are to be protected and maintained. Human-induced decline of biodiversity is prevented and damage is restored, where practicable. The diverse biological components function in balance. Hydro-morphological, physical and chemical properties support these ecosystems. Pollution must be reduced to ensure that there are no significant risks to marine biodiversity, marine ecosystems, the marine environment, human health or legitimate uses of the sea (Article 3.5).

Elements of the Marine Strategy (Article 5.2)
- Completion of an initial assessment, determination of good environmental status, and establishment of environmental targets and associated indicators, by 15 July 2012 at the latest
- Establishment and implementation, by 15 July 2014, of the monitoring programmeprogramme
- Development of a programmeprogramme of measures in 2015
- Entry into operation of the programmeprogramme of measures in 2016

Requirements for determination of Good Environmental Status and environmental targets
By reference to the initial assessment made and on the basis of the qualitative descriptors listed in Annex I to the Directive, Member States shall determine a set of characteristics for good environmental status (Article 9.1). In doing so, they must take into account the criteria from Commission Decision 2010/477 EU[1] (Article 9.3) in order to assess the extent to which good environmental status has been achieved (2010/477, Article 1). The criteria in the Commission Decision present suggestions for a total of 56 indicators for further elaboration. The environmental targets serve to guide progress towards achieving good environmental status (GES), taking into account the characteristics of GES and the Commission Decision criteria.

Taking into account European legislation and Regional Sea Conventions
When making the initial assessment and determining the environmental targets and measures, Member States must take into account international legislation (such as that from IMO) and European legislation (such as that from the WFD, BHD, Urban Wastewater Treatment Directive, Bathing Water Directive, environmental legislation, CFP, etc.) (Article 8.2, 10.1, 13.1, 13.4). The initial assessment shall also take into account other relevant assessments such as those carried out in the context of Regional Sea Conventions (Article 8.2). For the Netherlands, that is OSPAR.

International collaboration
Member States sharing a marine region or subregion shall cooperate to ensure that, the different elements of the marine strategies are coherent and coordinated (Article 5.2). Where practical and appropriate, Member States shall use existing regional institutional cooperation structures, including those under Regional Sea Conventions (Article 6). For the Netherlands, this concerns the subregion southern North Sea within an OSPAR context.

Adaptive management based on the ecosystem approach
Adaptive management on the basis of the ecosystem approach shall be applied with the aim of attaining good environmental status (Article 3.5).

[1] Commission Decision 2010/477/EU. *Commission Decision on criteria and methodological standards on good environmental status of marine waters* (Brussels, 1 September 2010).

and BHD. The Marine Strategy fleshes out the NWP's policy framework by detailing the MSFD requirements, supplementary to policy that have already been implemented under the BHD and the WFD.

Building on existing policy
Economic activities (shipping/ports, oil and gas recovery, fisheries, tourism) at and along the North Sea have increased enormously since the mid-20th century. Sand extraction is of importance to strengthen the coast and protect the hinterland from floods. The extracted sand is also be used as fill sand for houses and roads. Over the same period, society has increasingly succeeded in countering the negative effects of these economic activities on the marine environment. To this end, many policies were initiated in recent decades, together with neighbouring countries and users of the sea. The milestones reviewed in chapter 2 included the implementation of the OSPAR convention, the Biodiversity Convention, ASCOBANS, BHD, WFD, CFP and the approach towards shipping pollution within the framework of the International Convention for the Prevention of Pollution from Ships (MARPOL), to name the most important ones. These have created a solid foundation on which the Marine Strategy can build.

The Marine Strategy determines to what extent existing and initiated policy under EU legislation and the BHD, WFD, CFP and international conventions contributes to achieving the good environmental status in accordance with the MSFD. By doing so and supplementing policy, where required, the Marine Strategy provides a complete overview of what needs to be done until 2020 to achieve good environmental status. In short, the Marine Strategy complements existing and initiated policy, while not including it in the set of new policy assignments and measures of the strategy. The Marine Strategy is framed by the MSFD conditions for good environmental status, targets and measures to be outlined for the prescribed eleven descriptors.

The Cabinet's ambition goes beyond the Marine Strategy
Society's challenge does not end with a directive's framing. Cabinet policy in the NWP seeks to support every serious initiative for a more sustainable use of the North Sea that contributes to a stronger economy as well as a robust ecology, even if such an initiative cannot be covered within the frameworks and duty to report of the MSFD which this Marine Strategy specifically targets.

Common sense and pragmatism
Good environmental status and environmental targets are performance obligations or aspirational goals.[188] In implementing the MSFD, the Cabinet is taking a pragmatic, common-sense approach: do what is necessary and feasible. Realism prevails here: we cannot go back to the ecological status of the 19th century. However, our modern day and age does offer the knowledge, opportunities and innovations to strike a sustainable balance between ecology and use in a sea that has so much to offer, taking social and economic considerations into account. In the implementation of the MSFD, the Cabinet recognises the added value of an integrated approach towards the ecosystem as a whole and all uses in their mutual relationships.

To achieve good environmental status, the Cabinet is taking a *risk-based approach*, tackling what are, according to the latest insights, the biggest risks for the environment and biodiversity in relation to achieving good environmental status in the period up to 2020. *Adaptive management* is expressed in the six-yearly update of the targets and measures based on an update of the initial assessment of the marine ecosystem. This is, in turn, based on the information from the monitoring programme to be drafted, and on progressive knowledge on the effect of use, on pollution, on changing circumstances and on the effectiveness of measures for the marine ecosystem. This process is supported by the progressive exchange of experiences and insights by means of international multi- and bilateral alignment consultations. This adaptive approach does not rule out interim policy revisions.

It will not always be possible to achieve good environmental status as set out in the MSDF in every respect by 2020 through the measures that have been or are yet to be taken. This is due to the physical conditions of our marine waters, the inherently very limited controllability of impacts on the marine environment (including the climate) and dependence on other, international policy fields. Current knowledge may also be insufficient to properly determine the disturbances of the marine environment or the effect of policy. As much as possible, these circumstances have been taken into consideration when setting the goals for 2020. These circumstances will be used as well when formulating the programme of measures. If there is insufficient or incomplete proof of negative effects on the ecosystem, but there are reasonable grounds for concern, the Netherlands applies the precautionary principle.[189]

International cooperation
The Marine Strategy is, above all, an international strategy. In the open sea, where neither ecosystem nor use stays within national boundaries, an international approach is the most effective. The Netherlands focuses on international collaboration within the framework of the OSPAR Convention and the CFS scope, emphasizing the countries in the southern part of the North Sea subregion.

Appendix 1 provides an overview of all the conventions and EU legislation relevant to the Marine Strategy, and indicates for which MSFD descriptors these conventions make a posi-

Ecosystem approach

The ecosystem approach can be described as follows: "the comprehensive integrated management of human activities based on the best available scientific knowledge about the ecosystem and its dynamics, in order to identify and take action on influences which are critical to the health of marine ecosystems, thereby achieving sustainable use of ecosystem goods and services and maintenance of ecosystem integrity" (OSPAR definition[1]).

As a strategic policy principle, the ecosystem approach has been laid down in the 1992 Rio de Janeiro Convention on Biological Diversity. For the North Sea, the principle has been ratified in various North Sea Ministers' Conferences and as part of the Marine Strategy Framework Directive.

When detailing the ecosystem approach for the (North) Sea, we basically differentiate between the following elements:

- Monitoring, analysis of measurement data, scientific research of ecological processes and evaluation as the basis for management and policy
- Developing ecological quality objectives and economic and social quality targets
- Including potential ecological consequences of intended activities in decision-making on activities at sea
- Protecting the marine environment, aimed at sustainable development and applying the precautionary principle
- Adaptive management, which provides an opportunity to anticipate economic developments and knowledge accumulation
- Involving stakeholders in managing the sea

When applying the ecosystem approach, the aim is to substantiate the measures scientifically. It is recognised that cause-and-effect relationships are not always unequivocal; as such, the precautionary principle is a crucial part of the ecosystem approach.

Precautionary principle

The precautionary principle is a crucial starting point for planning and designing intended activities at sea, modeled on the way in which it has been implemented for many years in international and national policy. The precautionary principle is detailed in Article 191 of the Treaty on the Functioning of the European Union (EU). It aims at ensuring a higher level of environmental protection through preventative decision-taking in the case of risk. However, in practice, the scope of this principle is far wider and also covers consumer policy, European legislation concerning food and human, animal and plant health.

According to the Commission[2] the precautionary principle may be invoked when a phenomenon, product or process may have a dangerous effect, identified by a scientific and objective evaluation, if this evaluation does not allow the risk to be determined with sufficient certainty. Application of the principle fits in the general framework of risk analysis and more particularly in the context of risk management which corresponds to the decision-making. The Commission stresses that the precautionary principle may only be invoked in the event of a potential risk and that it can never justify arbitrary decisions.

Application of the precautionary principle means that advance measures are taken to prevent possibly long-term, irreversible and unwanted effects of activities and – if the relevant activity appears admissible – to limit them. Degradation of the marine environment not only concerns unwanted emissions of substances, but also disruption of the ecosystem. Instruments comprise the formulation and assessment of Environmental Impact Statements, the performance of risk analyses and risk assessment, the application of clean technologies, control systems, monitoring and control of flows of waste/substances.

How this is executed in practice differs. In specifying the WFD, the principle forms the basis for source policy (using the best available technologies). Licensing practices for the North Sea include the performance obligation to prevent negative effects on the environment as much as possible. Where negative effects on species and habitats from the BHD cannot be ruled out, mitigation and compensation are subject to a result obligation.

[1] Statement on the Ecosystem Approach to the Management of Human Activities "Towards an Ecosystem Approach to the Management of Human Activities", First Joint Ministerial Meeting of the Helsinki and OSPAR Commissions (JMM), Bremen: 25 - 26 June 2003, Record of the meeting, Annex 5.

[2] Commission of the European Communities, *Commission announcement on the precautionary principle,* COM/2000/1 (Brussels, 2000).

tive contribution towards achieving good environmental status.

3.3 Overview of good environmental status, environmental targets and indicators.

This section presents a comprehensive overview of good environmental status in 2020, the environmental targets for 2020 and associated indicators for each of the descriptors. This section also explains the general considerations in relation to describing good environmental status, environmental targets and indicators, as an introduction to the details for each descriptor in sections 3.4 through 3.11.

This is based on relevant Deltares and IMARES advice documents[190,191], which also guided the active Dutch contribution towards international coordination at EU and OSPAR level. This contribution led to such things as the recommendations that were drafted in the course of 2011 by OSPAR working groups for detailing the different MSFD descriptors and the recommendations of the technical subgroups for noise and litter set up by the European Commission. The prevailing legal frameworks under EU legislation in the coverage area for the MSFD were also taken into account: BHD, WFD, CFP and legislation in the area of contaminants in commercially exploited fish and other seafood.

Table 4. Overview of MSFD descriptors, good environmental status and environmental targets 2020

Descriptor	Good environmental status 2020	Environmental target 2020
Marine ecosystem (comprises the descriptors biodiversity, commercially exploited fish and shellfish, food webs, and sea-floor integrity)	• Biological diversity is maintained. The quality and occurrence of habitats and the distribution and abundance of species are in line with prevailing physiographic, geographic and climatic conditions. • Populations of all commercially exploited fish and shellfish are within safe biological limits, exhibiting a population age and size distribution that is indicative of a healthy stock. • All elements of the marine food webs, to the extent that they are known, occur at normal abundance and diversity and at levels capable of ensuring the long-term abundance of the species and the retention of their full reproductive capacity. • Sea-floor integrity is at a level that ensures that the structure and functions of the ecosystems are safeguarded and that benthic ecosystems, in particular, are not adversely affected.	**Main target: structure of the ecosystem:** The interim target for 2020 is to reverse the trend of degradation of the marine ecosystem due to damage to seabed habitat and to biodiversity towards a development of recovery. This constitutes a first step towards a situation in which the marine ecosystem in the Netherlands part of the North Sea can (in part) recover in the long term. This implies a structure in which the relative proportions of the ecosystem components (habitats and species) are in line with prevailing physiographic, geographic and climatic conditions. **Sub-targets:** **1. Species:** *Benthos:* a) Improvement of the size, quality and distribution of populations of long-living and/or vulnerable (i.e. sensitive to physical disturbance) benthic species. *Fish:* b) Improvement of the size, quality and distribution of populations of vulnerable fish species, in so far as deterioration has been caused by human activity. This includes fish species with a long-term negative trend in population size and fish species with a low reproductive capacity (e.g. skates, rays and sharks). As regards improving the status of the Habitats Directive species, the targets are in accordance with the national targets of the Habitats Directive. Items c and d below apply to commercially exploited fish and shellfish covered by this description. c) The fishing mortality rate (F) for all commercially exploited fish and shellfish stocks remains at the same level as or below the value of a Maximum Sustainable Yield, (MSY): F≤Fmsy. The target for depleted stocks of sharks, skates and rays exploited by the EU fleet is 'rebuilding', in accordance with the European Community Action Plan for the Conservation and Management of Sharks, Commission Decision 2009/40. This is a process target. Moreover, achieving the target not only depends on the Netherlands, but on many other countries as well. d) The Spawning Stock Biomass (SSB) of commercially exploited fish and shellfish is above the precautionary level Bpa. e) Minimization and, eventually, elimination of discards from fishing. *Birds:* f) The targets for Birds Directive species are in line with the national targets of the Birds Directive. For pelagic seabirds for which the Netherlands part of the North Sea is important but no BD areas are designated, the aim is to attain a favorable conservation status at the regional scale. For species for which this is relevant the decrease in food availability resulting from lessening fisheries discards and decreasing eutrophication are taken into account.

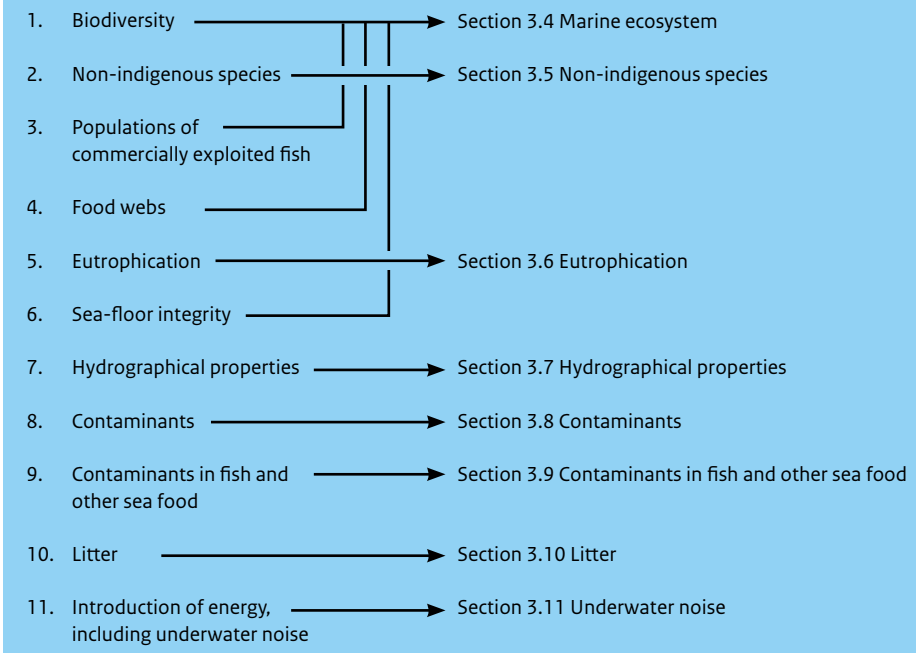
Table 4. Overview of MSFD descriptors, good environmental status and environmental targets 2020 *(continued)*

Descriptor	Good environmental status 2020	Environmental target 2020
		Marine mammals: g) The targets for marine mammals covered by the Habitats Directive (common seal, grey seal and harbor porpoise) are the same as the national targets pursuant to the Habitats Directive. *Demographic characteristics:* h) The demographic characteristics of fish, bird and marine mammal populations are indicative of resilient populations in terms of, for instance, natural size and age groups, male/female ratio, reproduction and mortality. Sub-targets c and d contribute to this sub-target for commercially exploited fish species. **2. Food webs:** i) The effect of human interventions on interactions between the different trophic levels in the food web is being reduced where problems are identified. **3. Habitats:** j) The distribution and area of predominant habitat types remain more or less the same (i.e. within the limits of natural variation at EUNIS level 3). k) For the special habitat types protected under the Habitats Directive the national targets of the Habitats Directive apply. l) Supplementary improvement of the quality of the deeper, silty parts and deeper, non-dynamic sandy seabeds in the Netherlands part of the North Sea. The quality of the habitats applies to the physical structure, ecological function and diversity and structure of the associated species communities. m) 10-15% of the seabed of the Netherlands part of the North Sea is not appreciably disrupted by human activities.
Non-indigenous species	Non-indigenous species introduced by human activities are at levels that do not adversely alter the ecosystems.	Minimize the risk of new introductions of non-indigenous species.
Eutrophication	Human-induced eutrophication is minimised, especially adverse effects thereof, such as losses in biodiversity, ecosystem degradation, harmful algae blooms and oxygen deficiency in bottom waters.	• Reduce the concentrations of nutrients where these do not meet the targets of the Water Framework Directive, pursuant to its timeline. • Algae biomass and blooms approximate 50% above the background value. The concentration of chlorophyll a during the phytoplankton growth season (March - September) that is consistent with good environmental status does not exceed 50% above the background value, in accordance with the Water Framework Directive (up to 1 nautical mile from the baseline) and OSPAR (beyond). • No increased occurrence of harmful algae blooms. • No oxygen deficiency due to eutrophication.

Table 4. Overview of MSFD descriptors, good environmental status and environmental targets 2020 *(continued)*

Descriptor	Good environmental status 2020	Environmental target 2020
Hydrographical properties	Permanent alteration of hydrographical conditions does not adversely affect marine ecosystems.	Human activities do not result in permanent, large-scale negative effects on the ecosystem due to changes in hydrographical conditions. **Operational target:** All developments must comply with the existing regulatory regime (e.g. EIA, SEA, and Habitats Directive) and regulatory assessments must take into consideration any potential impacts arising from permanent changes in hydrographical conditions, including cumulative effects, at the most appropriate spatial scales following the guidance prepared to this end (EUNIS level 3, reference year 2008).
Contaminants	Concentrations of contaminants are at levels not giving rise to pollution effects.	• Counter the concentrations of contaminants where these do not meet the targets of the Water Framework Directive, pursuant to its timeline. • Ensure that concentrations of other known substances, where these meet the Water Framework Directive standards, do not exceed current concentrations and, where possible, reduce them. • A prevention target for currently observed effects of pollution from TBT and oil. **Operational target:** Occurrence and extent of significant acute pollution events (e.g. slicks resulting from spills of oil and oil products or spills of chemicals) and their impact on biota affected by this pollution should be minimised through appropriate risk based approaches
Contaminants in sea food for human consumption	Contaminants in fish and other seafood do not exceed the levels established by Community legislation or other relevant standards.	The levels of contaminants in fish and other sea food from the North Sea do not exceed the standards of national and international legislation.
Litter	Properties and quantities of marine litter, including their degradation products such as small plastic particles down to microplastics do not cause harm to the coastal and marine environment and their volume decreases over time.	• The quantity of visible beach litter has decreased (basic reference 2002-2009). • There is a decreasing trend in the quantity of litter in marine organisms (basic reference 2005-2009).
Underwater noise	Introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment. Loud, low and mid frequency impulsive sounds and continuous low frequency sounds introduced into the marine environment through human activities do not have adverse effects on marine ecosystems	• Individual cases: prevent harmful effects at ecosystem level, particularly on marine fauna, resulting from specific activities such as pile-driving and seismic surveys. • Background noise and accumulation of effects on populations or at the ecosystem level: targets in 2018, when more knowledge has been gathered.

Figure 16. Specification of the eleven descriptors from MSFD in the Marine Strategy



3.3.1 Considerations regarding good environmental status 2020

Describing the environmental status concerns the good environmental status to be achieved, restored or maintained. This description is not about a pristine, untouched, natural ecosystem, but about an ecosystem that operates optimally and retains its resilience despite human-induced environmental changes.[192]

Annex I of the MSFD sums up eleven descriptors relevant to the implementation of the Directive, including a qualitative description of good environmental status in 2020. In their recommendations on good environmental status, Deltares and IMARES attempted to gear these descriptions towards the general features for the Netherlands part of the North Sea. This has not resulted in any appreciable further contextualisation of the descriptions from the Directive,[193] which is why this Marine Strategy has literally copied the descriptions of good environmental status from Annex I. In some instances additional descriptions on which consensus was reached in OSPAR were entered, i.e. litter and underwater noise. At the level of associated environmental targets, the initial assessment (chapter 2) is used as a basis to outline to what extent and in what manner good environmental status can be achieved or maintained. At that level, the achievement of good environmental status and environmental targets is geared to the situation in the Netherlands part of the North Sea (see 3.3.2) based on the criteria from Commission Decision 2010/477.

At an OSPAR level, the Member States agree that of the eleven *descriptors* given, the three about *biodiversity, food webs* and *sea-floor integrity* are central to the perspective of the ecosystem approach. They are closely interlinked and cannot, therefore, be considered in isolation.[194] That said, the descriptor on the *populations of commercially exploited fish* cannot be considered separately from it either. After all, from the standpoint of the ecosystem approach and particularly that of food webs, it would illogical to tackle commercially exploited species separately from the rest of the marine ecosystem. The Cabinet therefore opts to combine the four descriptors *biodiversity, food webs, commercially exploited fish* and *sea-floor integrity* and make them the core of the Marine Strategy under the heading of the marine ecosystem (see Figure 16). The other seven descriptors concern disturbances to the marine ecosystem as a result of human activities. Good environmental status of these seven descriptors is outlined in terms of what is needed for the marine ecosystem to function properly.

3.3.2 Considerations regarding environmental targets 2020

Targets at criterion level

The basic principle in the Marine Strategy is that by 2020 good environmental status is achieved or maintained, if the current situation is already good environmental status. Environmental targets have been formulated for all of the descriptors in order to monitor the progress of achieving, restoring or maintaining good environmental status of the

Marine Strategy. The environmental targets are structured in accordance with the 29 criteria from Commission Decision 2010/477/EU. The Member States are to use these criteria to assess the extent to which good environmental status has been achieved. The Cabinet's basic principle is to keep formulations as transparent and simple as possible and to specify targets for the main disturbances currently known and the risks for the functioning of the marine ecosystem, i.e. by relating them to the descriptors *biodiversity, food webs, commercially exploited fish populations* and *sea-floor integrity*. Where possible, quantitative targets will be established.

Realistic targets
When establishing targets for achieving or maintaining good environmental status, in addition to aspects of feasibility, affordability, and social and economic considerations[195],the response time of the ecosystem was also taken into account. First of all, an estimate was made of the extent to which prevailing and initiated policy can help to achieve or maintain good environmental status in 2020. This was based on the initial assessment of current environmental status and the expected developments until 2020 and beyond, including an estimate of the effectiveness of prevailing and initiated policy (chapter 2). When it is expected that good environmental status cannot be achieved by 2020, the Cabinet will consider supplementary policy.

In a number of cases, achieving good environmental status by 2020 is not possible because of the long time it takes the ecosystem to respond to measures. Moreover, our marine waters are an integral part of the marine North Sea subregion, which in turn is openly connected to the northeastern part of the Atlantic Ocean and is also subject to influences from surrounding countries. As a result, the Netherlands part of the North Sea is also subject to the transboundary effects of other (sea) areas.[196] That means that the year 2020 is often too soon to already be able to observe clear results from supplementary policy on the ecosystem.

It is partly because of the ecosystem response time that current policy – which contributes significantly to good environmental status pursuant to the MSFD – often has a later target date than 2020. This is the case for the descriptors *eutrophication* (section 3.7) and *contaminants* (3.8), which depend on WFD targets being achieved in 2027. Policy areas such as Natura 2000 and CFP also target effects beyond 2020. As a result, good environmental status of the marine ecosystem (3.4) will also be achieved later. The feasibility and affordability, social and economic considerations and the measures to be taken in these policy areas in relation to the targets to be achieved in time have been assessed previously, which in most cases also included international coordination. The good environmental status of the descriptors mentioned is to be reached in the 2020-2027 period (concurrent with the second period in which achievement of the targets is to be assessed in accordance with the Directive). For 2020, interim targets[197] have been established that reflect the desired course. If necessary, a supplementary policy assignment will be formulated. Incidentally, it has also been recognised in an OSPAR context that it would be realistic in some cases to consider good environmental status as an aspirational aim that can only be achieved some time after 2020.[198]

In case of the descriptors *marine ecosystem* (section 3.4) – which comprises the descriptors *biodiversity, food webs, commercial fish populations* and *sea-floor integrity – litter* (3.10) and *underwater noise* (3.11), there is not enough knowledge to exactly determine good environmental status or to establish a link between the disturbances and good environmental status, environmental targets and measures. As regards these descriptors, the Cabinet aims to gather more knowledge, in the mean time establishing interim targets that indicate the desired direction in a qualitative manner. The European Commission acknowledges this method: '*The issue of interim targets (Annex IV.6 of the MSFD), which might be formulated by some Member States, was raised. (...) The Commission elaborated that intermediate targets can be useful to express the aim to stop or reverse a trend, but where the ultimate GES determination is not yet possible to express.*'[199] As regards certain elements of underwater noise, more knowledge will have to be gathered before it will be possible to reasonably establish environmental targets that can be evaluated. This is in line with the recommendation from the *Technical Subgroup Noise* established by the European Commission.[200] If, in the above cases, there is a reasonable cause for concern about the negative effects on the ecosystem, preventive measures pursuant to the precautionary principle are appropriate.

This analysis results in realistic environmental targets for 2020 consistent with good environmental status to be achieved in 2020 or 2027. The above considerations regarding the way in which the Netherlands establishes environmental targets for 2020 have been included as examples in the working document for a common understanding of the initial assessment and determination of good environmental status and establishment of environmental targets.[201] It was drafted as part of the *Common Implementation Strategy* of the European Commission.

Supplementary policy assignment if required
Supplementary policy is only formulated if it is expected that good environmental status cannot be achieved with prevailing or initiated policy. Supplementary policy assignments will be fleshed out until 2015 and included in the programme of measures (Marine Strategy Part III), which will also contain an overview of prevailing and intended policy already contributing to achieving good environmental status.

3.3.3 Considerations regarding the indicators

The indicators are intended to help assess, during the six-yearly update of the Marine Strategy, whether the established environmental targets are being met and whether good environmental status has ultimately been achieved or maintained. In line with the environmental targets, the indicators have been structured concurrently with the 29 criteria from Commission Decision 2010/477/EU, using the list of 56 indicators put forward in the Decision. The Cabinet is aiming for an as limited a set of possible indicators to be able to keep monitoring effective, efficient and within existing budgets wherever possible. The indicators must also tie in with those of other countries in the same marine region. The decision was based on the best available knowledge as collated in the advise documents from Deltares and IMARES, the ICES recommendations, the recommendations from the EU and OSPAR working groups, and workshops organised by OSPAR, and on progressive insight from other studies. The indicators selected provide guidance for the monitoring programme for 2014 (Marine Strategy Part II) (see section 3.12.2).

Pursuant to the ecosystem approach, the main consideration for the choice of indicators is that they are capable of establishing a link between the impact of human activities and the functioning of the marine ecosystem, bearing in mind that the indicators often relate to subareas of ecosystem functioning as a whole. There also are many knowledge gaps concerning the relationship between the values measured and the actual effects on the ecosystem. In some cases, more knowledge will be required before indicators can be reasonably established. This applies for the descriptors *litter* (3.10) and *underwater noise* (3.11), and partly for the combined descriptor *marine ecosystem* (3.4).

Where existing indicators are used, the section refers to the sources where these indicators are detailed. For new indicators to be developed, a description is given of how, in what context and within which timeframe these will be detailed.

The scale of the indicators differs for each descriptor and is in line with the appropriate level at which parts of the ecosystem can best be assessed. Incidentally, the scale is still a subject of discussion within the context of the *Common Implementation Strategy* of the MSFD and within OSPAR. The outcome of these discussions will be included in the specification of the indicators, but the scale will at any rate be consistent with that in current EU legislation (as BHD, WFD and CFP) and OSPAR.

3.3.4 Relation to conventions and EU legislation

When formulating environmental targets and any supplementary policy assignments, everything that has already been agreed and rolled out as part of relevant conventions (such as MARPOL, ASCOBANS, OSPAR) and other EU legislation was fully taken into account. It goes without saying that achieving the objectives within these frameworks contributes to the MSFD targets. What can be achieved here will serve as the starting point for the Marine Strategy. In as far as this is relevant and possible, targets and indicators from existing EU legislation (such as WFD, BHD, CFP and various regulations on contaminants in fish and other sea food for human consumption) have been copied literally. The advantage of existing targets, indicators and assessment criteria is that experience has been gained from using them in integrated assessments and that, in most cases, they have been coordinated with neighbouring countries. The MSFD also prescribes that current directives and marine conventions be taken into account. Sometimes it is not possible to literally copy into the Marine Strategy because the scope of other Directives does not coincide with that of the MSFD in a geographical sense or because no targets were established for 2020. In those cases, conflict between EU regulations has been avoided.

Literally copying objectives, aspirational aims or assessment criteria developed as part of the OSPAR convention is not always suitable. The objectives or aspirational aims are not related to particular years, but are considered *'aspirational goals'* for the long term.[202] The assessment criteria have no legally binding status.[203] They also mostly concern the functioning of subareas of the ecosystem as a whole; often there are knowledge gaps about the relationship between the level of the criteria and the occurrence of effects on the ecosystem. In that case, an additional analysis, sometimes of multiple indicators, is required to be able to assess the extent of the target reach in the ecosystem. Where objectives or assessment criteria have not been literally copied into the Marine Strategy, they are, therefore, at the very least not incompatible. They are included in the development of the indicators and in the assessment.

3.4 Marine ecosystem

(MSFD, Annex I, descriptors 1, 3, 4, 6)

As argued in section 3.3.1, the Cabinet combines the descriptors *biodiversity, commercially exploited fish and shellfish, food webs* and *sea-floor integrity,* as described in the MSFD into a single descriptor: *the marine ecosystem*. This combined descriptor is the key aspect of the Dutch Marine Strategy's ecosystem approach. This section details how the prescribed good environmental status for the four descriptors from the MSFD with the associated criteria that the Member States must use to assess the degree to which good environmental status has been achieved are translated into environmental targets and indicators for a single marine ecosystem in the North Sea.

The central descriptor *marine ecosystem* is linked to all of the other seven descriptors; the policy underlying the other descriptors directly or indirectly contributes to good environmental status underlying this central descriptor. In order to avoid any doubling, a choice has been made as to what policy is addressed as part of *marine ecosystem* and what policy is addressed as part of one of the other descriptors. The description in this section of the policy on achieving good environmental status only took into account physical disturbances such as fisheries and the accumulation of activities in the coastal zone, such as recreation, fisheries and shipping. The reason behind this decision is that all other kinds of disturbances are addressed in the context of the other descriptors linked to specific forms of physical (hydrographical activities, litter, underwater noise), chemical (eutrophication, contaminants) and biogenic (non-indigenous species) disturbances. These are discussed in subsequent sections.

3.4.1 Good environmental status of the Dutch North Sea ecosystem 2020

(MSFD, Art. 9)

- **Biological diversity is maintained. The quality and occurrence of habitats and the distribution and abundance of species are in line with prevailing physiographic, geographic and climatic conditions.** (MSFD, Annex 1, descriptor 1).
- **Populations of all commercially exploited fish and shellfish are within safe biological limits, exhibiting a population age and size distribution that is indicative of a healthy stock.** (MSFD, Annex 1, descriptor 3).
- **All elements of the marine food webs, to the extent that they are known, occur at normal abundance and diversity and at levels capable of ensuring the long-term abundance of the species and the retention of their full reproductive capacity.** (MSFD, Annex 1, descriptor 4).
- **Sea-floor integrity is at a level that ensures that the structure and functions of the ecosystems are safeguarded and that benthic ecosystems, in particular, are not adversely affected.** (MSFD, Annex 1, descriptor 6).

Marine ecosystem
Criteria for the assessment of good environmental status (Commission Decision 2010/477/EU)

Descriptor 1, biodiversity
Assessment criteria:
1.1 Species distribution
1.2 Population size
1.3 Population condition
1.4 Habitat distribution
1.5 Habitat extent
1.6 Habitat condition
1.7 Ecosystem structure

Descriptor 3, populations of commercially exploited fish and shellfish
Assessment criteria:
3.1. Level of pressure of the fishing activity
3.2. Reproductive capacity of the stock
3.3. Population size and age distribution

Descriptor 4
Assessment criteria:
4.1. Productivity (production per unit biomass) of key species or trophic groups
4.2. Proportion of selected species at the top of food webs
4.3. Abundance/distribution of key trophic groups/species

Descriptor 6, sea-floor integrity
Assessment criteria:
6.1. Physical damage, as regards substrate characteristics
6.2. Condition of the benthic community

Overview of current and initiated policy

Specification of the Birds and Habitats Directive at a national level:
- Nature Conservation Act and Flora and fauna Act to be declared applicable to Dutch EEZ
- designation of Natura 2000 areas in the North Sea, with conservation targets for the habitats sandbanks and reefs, as well as for birds, migratory fish and marine mammals
- implementation of measures to achieve the conservation targets (improvement or maintenance of size and quality) within the framework of the management plans for Natura 2000 areas, or mitigation and compensation as part of licensing (pursuant to the Nature Conservation Act and the Water Act)
- access restrictions for bottom-trawling fisheries in Natura 2000 areas can only be determined under CFP

Initiated policy pursuant to the Conservation Plan for the Harbour Porpoise (ASCOBANS, Habitats Directive), including:

- setting up a national scientific committee to monitor implementation of the prioritised knowledge agenda
- (intensifying) monitoring the population, determining size and data on growth or decline
- conducting a scientific by-catch observation programme
- studying the controlled use of pingers to counter by-catches
- measures relating to loud impulse noises: see section 3.11.1

Common Fisheries Policy (EU legislation):

- management based on the ecosystem approach, i.e. adhering to the precautionary level and (where possible) MSY in fish stock management
- improving knowledge of fish stocks
- improving knowledge of sharks, skates and rays, tackling shark defining practices and, where possible, the recovery of populations thinned out by EU fisheries
- improving knowledge of by-catches of marine mammals and birds and, where possible, countering by-catches
- decreasing the effect on seabed habitats
- decreasing the effect on biodiversity in general

Attainability of good environmental status in 2020

The initial assessment in chapter 2 concluded that the seabed habitats of the Netherlands part of the North Sea have degraded significantly over the course of the 20th century. Benthic diversity has deteriorated. Some shark, skate and ray species have become endangered or have disappeared altogether. Demersal species such as cod are having a hard time. The conservation status of coastal birds is unfavourable, while that of opportunistic bird species is favourable and marine mammals are increasing in number, even though the recent high number of strandings of harbour porpoises is a cause for concern. The environmental status of the marine ecosystem as a whole is not good enough to guarantee its structure and functions.

The current status of the seabed ecosystem and of the fish stock in the Netherlands part of the North Sea can largely be attributed to fisheries pressure from the 1960s onward. Traditional beam trawling has played a particularly large part in this. A further factor in the coastal zone is the impact of previous large-scale hydrographical interventions (see 3.7), the introduction of non-indigenous species (see 3.5) and the disturbances and cumulative effects of human activities along the coast. The initial assessment does not indicate other cumulative effects on the marine ecosystem as a result of (the increase in) different activities in the Netherlands part of the North Sea between now and 2020.

Common Fisheries Policy has achieved a lot from the early 21st century onwards. The initial assessment of the marine ecosystem presents the first positive outcomes of this, such as the MSY status of plaice, herring, haddock and pollack; sole has almost achieved this status. European Common Fisheries Policy is to be reviewed in 2012. The revised CFP will (in principle, from 2013 onwards) continue on the current course towards sustainability, such as fishing at MSY level and protecting vulnerable species such as sharks, skates and rays. New policy does not change this in any significant way. In accordance with the Johannesburg agreements (*World Summit on Sustainable Development*, 2002), fish stocks will have to be managed on an MSY level, where possible, by 2015. However, we only have enough knowledge to calculate MSY levels for a handful of species. Alternative, innovative methods that enable more selective fishing practices and cause less damage will be studied and put into practice, where possible. However, electrical fishing practices developed in the Netherlands that cause less seabed disturbance and are more energy-efficient as well, such as pulse wing, are only allowed to a limited degree by the European Commission, as the technology is (still) prohibited in the EU. This will have to change. A final benefit of the CFP is the step-by-step approach to discarding by-catch. This puts an end to unnecessary wasteful practice.

For the revised CFP to make a successful contribution towards good environmental status of the marine ecosystem, it will have to be simple, effective, practical and enforceable. Support from the industry is also crucial. In that sense, the Netherlands depends on the efforts of other European (North Sea) Member States, the European Commission and the European Parliament. Climate also plays a role; it impacts the increase in the fish stocks, and management must be able to anticipate this.

The initial assessment identifies a number of milestones in area and species protection. Management plans will be drafted for the Natura 2000 areas along the coast and further offshore. These plans outline targets and management measures for regulating the cumulative effects of human activities along the coastal zone (such as leisure activities, sand extraction and sand suppletion). They also indicate which parts of the protected area, within the context of CFP, are no longer accessible to bottom-trawling. Birds, marine mammals and habitats are also protected by the requirements for mitigation and compensation of activities that may have an impact and require a permit. A species conservation plan is being formulated for the harbour porpoise. However, protection of the BHD areas on the North Sea is not yet sufficient to meet the obligation under Article 3.14 of the MSFD to establish spatial protection measures contributing to coherent and representative networks of marine protected areas, adequately covering the diversity of the constituent ecosystems. The benthic ecosystem of

the deep, silty northern part of the Netherlands part of the North Sea, in particular, is not protected yet. This ecosystem is located in the areas of the Frisian Front and the Central Oyster Grounds. This part of the marine ecosystem is important for its unique combination of elements: there is a great variety and abundance of species, there are vulnerable, rare and endangered species (such as long-living shellfish), total biomass is extensive, the species distribution is specific and the benthic communities have a balanced composition. These qualities also apply from the broader perspective of the marine subregion of the Southern North Sea, which is all the more important because, under the heading 'sea-floor integrity' (descriptor) the MSFD specifically requires that the disproportional degradation of the seabed ecosystem within the larger whole of biodiversity and food webs of the marine ecosystem be countered.

Despite the targets in current policy on fish (MSY as part of CFP), birds, marine mammals and habitat (BHD), good environmental status cannot be clearly defined at the level of the ecosystem as a coherent whole, because it cannot be compared to a situation in which the system was (relatively) undisturbed. It is, therefore, difficult to gauge whether current and initiated policy will be adequate to generate sufficient recovery to achieve good environmental status in 2020. This is also hampered by the fact that benthos and the different fish species, in particular, need a considerable time to recover, while scientists also need time to detect such recovery.

The initial assessment does justify the conclusion that – according to current insights and provided that policy does not change – the physical disturbances caused by bottom trawling fisheries and by-catches from traditional beam trawling fisheries remains so significant that the marine ecosystem cannot recover and good environmental status cannot be achieved. That is why, supplementary to current and initiated policy, the Cabinet is focusing on a revised CFP, with which it wishes to offer a better perspective for fisheries and better prospects to achieve good environmental status in accordance with the MSFD and the targets of the BHD. The Cabinet also wants to introduce additional seabed protection in the Frisian Front and the Central Oyster Grounds. Expectations are that this effort will likely not lead to good environmental status in 2020 and possibly even not in 2027. This cautious estimate relates to both the uncertainty as to whether the CFP will produce the desired sustainability and the rate of recovery of the ecosystem, resulting from the reduction of fisheries pressure in general and specific areal protection. The Cabinet believes that these additions to current policy measures will suffice to reverse the downward tide in 2020 and cause an upturn in the recovery of the ecosystem in our part of the North Sea.

3.4.2 Environmental targets 2020

(MSFD Art. 10)

Main target for the structure of the ecosystem:

The interim target for 2020 is to reverse the trend of degradation of the marine ecosystem due to damage to seabed habitat and to biodiversity towards a development of recovery. (Commission Decision Criterion 1.7).

This constitutes a first step towards a situation in which the marine ecosystem in the Netherlands part of the North Sea can (in part) recover in the long term. This implies a structure in which the relative proportions of the ecosystem components (habitats and species) are in line with prevailing physiographic, geographic and climatic conditions.

Subtargets:

1) Species:
Benthos:

a) **Improvement of the size, quality and distribution of populations of long-living and/or vulnerable (i.e. sensitive to physical disturbance) benthic species**. (Commission Decision, criteria 1.1, 1.2, 1.3, 1.6, and 6.2).

Fish:

b) **Improvement of the size, quality and distribution of populations of vulnerable fish species, in so far as deterioration has been caused by human activity**. (Commission Decision, criteria 1.1, .1.2, 1.3, 4.1 and 4.3). This includes fish species with a long-term negative trend in population size and fish species with a low reproductive capacity (e.g. skates, rays and sharks). As regards improving the status of the Habitats Directive species, the targets are in accordance with the national targets of the Habitats Directive. Items c and d below apply to commercially exploited fish and shellfish covered by this description.

c) **The fishing mortality rate (F) for all commercially exploited fish and shellfish stocks remains at the same level as or below the value of a Maximum Sustainable Yield, (MSY)**: *F≤Fmsy.* (Commission Decision, criterion 3.1).[204]
The target for depleted stocks of sharks, skates and rays exploited by the EU fleet is 'rebuilding', in accordance with the European Community Action Plan for the Conservation and Management of Sharks, Commission Decision 2009/40. This is a process target. Moreover, achieving the target not only depends on the Netherlands, but on many other countries as well. (Commission Decision, Criteria 3.1 and 3.3).

d) **The Spawning Stock Biomass (SSB) of commercially exploited fish and shellfish is above the precautionary level Bpa.** (Commission Decision, criterion 3.2).[205]

e) Minimisation and, eventually, elimination of discards from fishing. (Commission Decision, criteria 1.1, 1.2 and 1.3).

Birds:

f) The targets for Birds Directive species are in line with the national targets of the Birds Directive. (Commission Decision, criteria 1.1, 1.2, 1.3, 4.1 and 4.3).
For pelagic seabirds for which the Netherlands part of the North Sea is important but no BD areas are designated, the aim is to attain a favorable conservation status at the regional scale. For species for which this is relevant the decrease in food availability resulting from lessening fisheries discards and decreasing eutrophication are taken into account.

Marine mammals:

g) The targets for marine mammals covered by the Habitats Directive (common seal, grey seal and harbour porpoise) are the same as the national targets pursuant to the Habitats Directive. (Commission Decision, criteria 1.1, 1.2, 1.3, 4.1 and 4.3).

Demographic characteristics:

h) The demographic characteristics of fish, bird and marine mammal populations are indicative of resilient populations in terms of, for instance, natural size and age groups, male/female ratio, reproduction and mortality. (Commission Decision, criteria 1.3 and 3.3) Sub-targets c and d contribute to this subtarget for commercially exploited fish species.

2. Food webs:

l) The effect of human interventions on interactions between the different trophic levels in the food web is reduced where problems are identified. (Commission Decision, criteria 1.7, 4.1, 4.2 and 4.3).

3. Habitats:

j) The distribution and area of predominant habitat types remain more or less the same (i.e. within the limits of natural variation at EUNIS level 3). (Commission Decision, criteria 1.4 and 1.5).

k) For the special habitat types protected under the Habitats Directive the national targets of the Habitats Directive apply. (Commission Decision, criteria 1.4, 1.5 and 1.6).

l) Supplementary improvement of the quality of the deeper, silty parts and deeper, non-dynamic sandy seabeds in the Netherlands part of the North Sea. (Commission Decision, criterion 1.6). The quality of the habitats applies to the physical structure, ecological function and diversity and structure of the associated species communities.

m) 10-15% of the seabed of the Netherlands part of the North Sea is not appreciably disrupted by human activities. (Commission Decision, criteria 1.6 and 6.1).

3.4.3 Policy assignment supplementary to existing and initiated policy

- *Revision of Common Fisheries Policy.* The Cabinet is committed to capitalising in Europe on the road taken in the Netherlands to make fisheries more sustainable by way of the revision of Common Fisheries Policy.[206] In Europe, the Cabinet is committed to sustainably managed fish stocks, reducing seabed disruption and countering by-catches. Policy should be aimed primarily at the sustainable use and maintenance of natural marine resources and ecosystems, and maintaining opportunities for a socially accepted fishing industry that operates in a sustainable manner and meets a considerable demand for food. Policy in that respect should be simple, effective, practical and enforceable.

- *Supplementary seabed protection.* To supplement the implementation of the BHD and the generic commitment to making fisheries more sustainable, protection is offered for the seabed ecosystem in the *Frisian Front* and the *Central Oyster Grounds*. These are considered search areas for spatial protective measures. In 2015, decisions will be taken on limiting the areas within these search areas in which spatial protective measures will be taken. Such decisions will also cover the nature of the measures to be taken. The following prerequisites will apply:
  - the ambition to safeguard 10-15% of the Netherlands part of the North Sea against seabed disruption (including parts of the designated Habitats Directive areas, Dogger Bank, Klaver Bank, North Sea coastal zone and Vlakte van de Raan) and
  - minimising inconvenience for fisheries.

  Moreover, this will take into account the differences in nature value of the areas as well as considerations towards efficiency and enforcement (such as the spatial concentration of the BHD and MSFD tasks). For this a process will be set up, to which the fishing industry and nature organisations will also be invited. The measures will be implemented as part of CFP, but also uses beyond fisheries will be explored as necessary.

3.4.4 Indicators

(MSFD, Art. 10)

The indicators referred to below and the associated assessment values will be worked out in more detail in coordination with neighbouring countries and other countries in the North Sea subregion in the EU and OSPAR collaborative frameworks. Some indicators and assessment values can be delivered before the 2014 monitoring programme; others will require more time to prepare. The Cabinet is seeking to establish an as limited a set of indicators as possible, which can be monitored as effectively and as cost-efficiently as possible.

As indicated in section 3.3.3, the main consideration for the choice of indicators is that – in line with the principle of the ecosystem approach – they can link the impact of human activities with the functioning of the ecosystem. One consideration is that the indicators usually relate to subareas of the ecosystem function as a whole, and that there is a considerable knowledge gap concerning the relationship between the values measured for the indicators and the occurrence of effects on the ecosystem resulting from human activities. Supplementary analyses and knowledge development will remain necessary for all current indicators and those to be newly developed in order to be able to draw conclusions on the extent to which targets are achieved at ecosystem level. Often, a set of different indicators is needed to be able to estimate the effects of human activities and assess whether environmental targets and good environmental status are being achieved or maintained.

Where possible, the indicators from OSPAR and ICES in relation to CFP and BHD are used, the advantage being that experience has been gained with using these indicators in integrated assessments, that they have usually been coordinated with neighbouring countries, and that they take into account other directives and marine conventions. Current monitoring efforts are geared towards the ICES and OSPAR indicators, focusing on the harmonisation of a variety of current and proposed assessment methodologies.

Species

Benthos

1. **Aggregated indicators for distribution, occurrence and condition of exponents of long-living benthos species and biogenic structures sensitive to seabed disturbance** (Commission Decision, criteria 1.1, 1.2, 1.3, 1.6 and 6.2).
   Indicators yet to be developed. There is no corresponding OSPAR indicator. The OSPAR/COBAM recommendation refers to three related indicators: 'composition of typical species', 'abundance of organisms that form biogenic structures' and 'size distribution of shellfish and other sensitive/indicator species in the species community'. Within the OSPAR framework, there is limited agreement on the suitability of these indicators.

Fish

2. **The primary indicator for fisheries pressure on commercially exploited fish stocks is the mortality of commercially caught fish (=F). If values for F are not available, the (change in) *Catch per Unit of Effort* can be taken as a starting point** (Commission Decision, criterion 3.1).
   These are existing ICES indicators.
3. The Spawning Stock Biomass (SSB of commercially caught fish) (Commission Decision, criterion 3.2).
   This is an existing ICES indicator. An aggregated OSPAR *indicator based on this is available:* the OSPAR EcoQO for commercially exploited fish: number of stocks with SSB Bpa (in so far as known).

4. **Size distribution of fish stocks, of both commercially exploited and vulnerable species. For each species, the 95% percentile of the fish length distribution observed in surveys by research ships** (Commission Decision, criterion 3.3).
   Yet to be developed indicator. There is an OSPAR indicator. This will have to be revised within an ICES context.
5. **Aggregated indicators for population size, distribution and condition of sharks, skates and rays, fish species with a long-term negative trend and migratory fish** (Commission Decision, criteria 1.1, 1.2, 1.3 and 4.3).
   Yet to be developed indicator. For commercially exploited fish species in the ICES framework, for fish species not commercially exploited in OSPAR.
6. **Fisheries discards** (Commission Decision, criterion 4.3).
   Yet to be developed indicator in conjunction with the discussion on the revision of CFP.

Birds

7. **Distribution, population size, condition and future perspectives of populations of vulnerable bird species and the quality of the habitat** (Commission Decision, criteria 1.1, 1.2, 1.3, 4.1 and 4.3).
   Yet to be developed indicator. Supplementary to these indicators under the Birds Directive, OSPAR indicators are being developed with a view to international coordination. The OSPAR/COBAM recommendation refers to a number of similar indicators, including the EcoQO seabirds. There is a lot of agreement in OSPAR on the suitability of these indicators. It is not clear yet to what extent they are in line with the Dutch Birds Directive targets.

Marine mammals

8. **Distribution, population size, condition and future perspectives of populations of marine mammals and the quality of the habitat** (Commission Decision, criteria 1.1, 1.2, 1.3, 4.1 and 4.3).
   Related existing OSPAR indicators: EcoQO population trends of common and grey seal (no decrease in population size 10% over 5-year average); EcoQO grey seal pup production (no decrease 10% over 5-year average); EcoQO harbour porpoise by-catch (1.7% of the population).
   Yet to be developed indicator. The indicators for the harbour porpoise are yet to be developed as part of the Conservation Plan for the Harbour Porpoise.

Demographic characteristics

9. **Relevant indicators have already been mentioned under 'species'** (Commission Decision, criteria 1.3 and 3.3).

Food webs

10. **Share of large fish in bottom trawl catches of benthic species (IBTS): length-frequency distribution** (Commission Decision, criteria 1.7 and 4.2).
    There is a comparable OSPAR indicator: EcoQO large fish indicator (weight percentage of fish caught having a length 40 cm).
11. **Indicators for seabirds, marine mammals, and sharks, rays and skates as top predators** (Commission Decision, criteria 1.7 and 4.3).

Here, the indicators referred to under 'species' can be used.

12. **Food relationships of key species** (Commission Decision, criterion 1.7).
    Yet to be developed indicator. (e.g. common scoter - Spisula; Sandwich tern - sand eel/sprat/greater sand eel; harbour porpoise - sprat). No comparable indicator has been proposed within the OSPAR framework yet. There is a lack of agreement because these species do not strictly depend on a single prey species.

Habitats

13. **Distribution and population size of common habitats (EUNIS level 3) and habitats under the Habitats Directive** (Commission Decision, criteria 1.4 and 1.5).
    Yet to be developed indicator. There is no corresponding OSPAR indicator. The OSPAR/COBAM recommendation[207] refers to four related indicators which together comprise spatial distribution, distribution pattern and habitat surface area of predominant and registered (HR and OSPAR) habitats. There is a high degree of agreement on these indicators.
14. **Seabed area that is not disturbed** (Commission Decision, criteria 1.6 and 6.1).
    Yet to be developed indicator. There is no corresponding OSPAR indicator. The OSPAR/COBAM recommendation refers to a similar indicator: *Area of habitat damage.* There is a high degree of agreement in OSPAR on such an indicator.
15. **Indices for the composition of benthic communities** (Commission Decision, criterion 1.6), e.g. WFD indicator BEQI-2.[208]
    There is no corresponding OSPAR indicator. The OSPAR/COBAM recommendation refers to a similar indicator: "Multimetric indices to quantify the relative size of benthic species or species groups." There is a high degree of agreement in OSPAR on such an indicator.
16. Indicators for the quality of the different habitats at EUNIS level 3 (Commission Decision, criterion 1.6).
    Yet to be developed indicator. Similar OSPAR indicator as for BEQI-2 (see under 15).

Exploration of knowledge gaps

The main knowledge gaps are:

- the choice of characteristic species for habitats and of species sensitive to human pressure for aggregated indicators
- the extension and division of current indicators for benthic communities into habitat types distinguished within the Marine Strategy and the Habitats Directive

- detailing indicators for the BHD targets in terms of suitability of the habitat for species and the future prospect of species

An ongoing consideration for the next few years is that insights at ecosystem level and at species and habitat level within the MSFD and BHD framework continue to tie in with each other. As announced in the letter dated 14 September 2011, the Natura 2000 target document will be evaluated in 2015, based in part on the assessment of the favourable conservation status.[209] This will be based on the latest insights in the functioning of the ecosystem that have been gained as part of the international implementation of the MSFD.

3.5 Non-indigenous species

(MSFD, Annex I, descriptor 2)

This section outlines how good environmental status for non-indigenous species prescribed in the MSFD - including associated criteria that the Member States must use to assess the extent to which good environmental status has been achieved - is translated into environmental targets and indicators for the North Sea.

3.5.1 Good environmental status non-indigenous species 2020

(MSFD, Art. 9)

Non-indigenous species introduced by human activities occur at levels at which the ecosystem does not change. (MSFD, Annex I, descriptor 2).

Non-indigenous species:
Criteria for the assessment of good environmental status (Commission Decision 2010/477/EU)

2.1. Abundance and characterisation of the status of non-indigenous species, particularly invasive species.
2.2. Environmental effects of invasive, non-indigenous species

Overview of current and initiated policy

- Beleidsnota Invasieve Exoten [policy document on invasive non-indigenous species], focusing particularly on introductions of new, invasive non-indigenous species
- the IMO Ballast Water Convention is expected to take effect in 2013 or later
- establishing conditions for Nature Conservation Act permits for the transfer of living shellfish to Natura 2000 areas
- the development of a Beleidslijn Verplaatsingen Schelpdieren [Policy line on shellfish transfer]
- the IMO guideline (2011) to prevent the import of non-indigenous species by commercial and recreational vessels through voluntary measures. Over the next four years, the development of voluntary measures will be monitored and evaluated.

Attainability of good environmental status in 2020

The initial assessment (chapter 2) already showed some negative effects on benthos due to non-indigenous species, particularly in the coastal zone. The food supply of the common scoter, for example, is limited because its staple food, Spisula, is being displaced by the Atlantic jackknife clam, while the Pacific oyster has ousted the flat oyster. Human intervention is virtually impossible. These results are considered irreversible: successful non-indigenous species cannot be curbed in a cost-effective manner without considerable damage to the ecosystem.

If we consider the effects of non-indigenous species on the ecosystem that occurred in the past as a given, achieving good environmental status is equivalent to the aim of not allowing the ecosystem to change any further as a result. The goal, therefore, is to minimise the risk of new introductions. It is expected that current policy will cause this risk to fall sharply by 2020.

3.5.2. Environmental targets 2020

(MSFD, Art. 10)

Minimise the risk of new introductions of non-indigenous species. (Commission Decision, criteria 2.1 and 2.2).

3.5.3 Policy assignment supplementary to existing and initiated policy

None.

3.5.4 Indicators

(MSFD, Art. 10)

1. **The number of invasive non-indigenous species present** (Commission Decision, criterion 2.1). *Indicator yet to be developed.*
2. **The number of new, invasive non-indigenous species a year** (Commission Decision, criterion 2.1). *Indicator yet to be developed. To be developed within OSPAR framework.*
3. **The ratio between a) abundance or biomass of invasive non-indigenous species and b) abundance or biomass of indigenous species for a selection of specific species groups (e.g. phytoplankton, macrobenthos, fish) in Natura 2000 areas** (Commission Decision. 2.2). *Indicator yet to be developed.*

OSPAR does not distinguish between indicators 1 and 3, but is developing something for 2. In addition, an indicator is being developed within the OSPAR framework that highlights the (possible) distribution by sources *(pressure indicator)*. In the Netherlands, existing non-indigenous species such as the Atlantic jackknife clam are counted as part of various measurement programme and their numbers compared to indigenous species. The results are written up in occasional reports. There is no ongoing monitoring other than sampling and analysis of ballast water.

A cost-effective development of indicators is being sought, partly in conjunction with the development of indicators for the marine ecosystem (see 3.4.4).

Exploration of knowledge gaps
Ongoing monitoring and analysis of ballast water have revealed the following knowledge gaps:

- Because no monitoring is in place for the presence of invasive non-indigenous species, there is no knowledge on the timely recognition, the establishment and the establishment rates of invasive non-indigenous species.
- The recognition of new non-indigenous species is also hampered by a lack of specialist taxonomic knowledge about invasive non-indigenous species and the lack of (new) recognition techniques such as DNA bar-coding.
- There is no knowledge of the possible environmental risks and ecological effects of invasive non-indigenous species at the point when a new invasive non-indigenous species is discovered.

The Netherlands seeks to fill these gaps in an international context.

3.6 Eutrophication
(MSFD, Annex I, descriptor 5)

This section outlines how good environmental status for eutrophication prescribed in the MSFD - including the associated criteria that the Member States must use to assess the extent to which good environmental status has been achieved - is translated into environmental targets and indicators for the North Sea.

3.6.1 Good environmental status - Eutrophication 2020
(MSFD, Art. 9)

Human-induced eutrophication is minimised, especially adverse effects thereof, such as losses in biodiversity, ecosystem degradation, harmful algae blooms and oxygen deficiency in bottom waters (MSFD, Annex I, descriptor 5).

Eutrophication:
Criteria for the assessment of good environmental status (Commission Decision 2010/477/EU)
5.1. Nutrient levels
5.2. Direct effects of nutrient enrichment
5.3. Indirect effects of nutrient enrichment

Overview of current and initiated policy

- International sets of measures have been agreed as part of the WFD's River Basin Management Plans, with the aim of reducing nitrogen by approximately 20%.
- Implementation of the Nitrate Directive, the Urban Wastewater Treatment Directive, the Directive on National Emission Ceilings for certain pollutants, the MARPOL Convention and the UNECE *Convention on Long-range transboundary air pollution* contributes to minimizing eutrophication.

Attainability of good environmental status in 2020
The initial assessment (Chapter 2) indicated that the supply of nutrients by rivers decreased by 20-40% in the 1990-2006 period. The OSPAR reduction targets for phosphorus have been amply met, those for nitrogen have not.

As estimated in section 2.4.2 of the initial assessment, the risks of undesirable eutrophication effects on the marine environment will decrease further as a result of current policy, and will be minor between 2020 and 2027 and beyond. What is worth considering in this respect is that substances such as phosphate and nitrogen have a long lingering effect in the sea bed (long after measures have been taken), and that eutrophication effects have decreased to the extent that the effect of policy is difficult to demonstrate. Given these conditions, it is justifiable to conclude that a policy task supplementary to prevailing policy would not just be a matter of course. The dependency on emission reduction efforts of countries upstream also plays a role.

It is estimated that good environmental status beyond 2020 is within reach, provided that the measures agreed (internationally) under the WFD for achieving good environmental status for nutrients are implemented. The fact that there are only a few eutrophication phenomena in the Netherlands part of the North Sea (see 2.4.2) indicates that we are on the right path. Environmental status will be monitored closely.

3.6.2 Environmental targets 2020
(MSFD, Art. 10)

- **Reduce the concentrations of nutrients where these do not meet the Water Framework Directive, pursuant to its timeline** (Commission Decision, 5.1)

- **Algae biomass and blooms approximate 50% above the background value** (Commission Decision, criterion 5.2).
- The concentration of chlorophyll a during the phytoplankton growth season (March - September) that is consistent with good environmental status does not exceed 50% above the background value, in accordance with the Water Framework Directive (up to 1 nautical mile from the baseline) and OSPAR (beyond).
- **No increased occurrence of harmful algae blooms** (Commission Decision, criterion 5.3).
- **No oxygen deficiency due to eutrophication** (Commission Decision, criterion 5.3).

3.6.3 Policy assignment supplementary to existing and initiated policy

None.

3.6.4 Indicators

(MSFD, Art. 10)

1. **Nutrient levels** (Commission Decision. 5.1).
   Existing indicators. Area-specific average winter concentrations (December-February) of nutrients: dissolved inorganic nitrogen (DIN, i.e. nitrate, ammonium and nitrite) and phosphorus (DIP), respectively, do not exceed 50% above the background values (OSPAR). The nitrogen-phosphorus ratio can be derived from these concentrations, which is important to gain insight into the growth of toxic algae.
2. **Direct effects** (Commission Decision, 5.2).
   Existing indicator. Concentration of chlorophyll a during the phytoplankton growth season (March-September).
3. **Indirect effects** (Commission Decision, 5.3).
   Existing indicator. Local oxygen deficiency in sedimentation areas and below massive harmful algae blooms.

Indicators for macrophytes, seagrass and transparency are not relevant for the Dutch situation. Seagrass does not occur naturally in the Dutch area of application of the MSFD. Transparency is not an indicator, but a parameter for light conditions for algal growth.

Environmental status of the sea is assessed using the existing WFD and OSPAR systems. To assess eutrophication of the coastal sea (1 nautical mile), the WFD uses phytoplankton as a measure (chlorophyll a and *Phaeocystis*), with nutrient concentrations as supporting parameter. The WFD assessment is carried out for individual bodies of coastal water. The OSPAR, *Comprehensive Procedure* (COMPP)[210] assesses areas seaward of the basic coastline of the Netherlands part of the North Sea, taking specific area properties and conditions into consideration. Two other indicators in addition to those mentioned above are included in this assessment: area-specific plankton species and changes in benthos/fish mortality. The scores for these five indicators together form the basis for determining whether or not an area constitutes a problem. The advantages of the COMPP procedure are that it is geared to the marine environment, that it applies to the sea as a whole, that it is internationally accepted, and that it allows for a reliable assessment. It is, therefore, a given that OSPAR COMPP be mainly used for identification in the MSFD.[211]

There is a possibility that assessment of the eutrophication status of the coastal sea up to 1 nautical mile based on both the WFD and OSPAR methods will yield different results. The aim is to harmonize the assessment systems.[212]

Exploration of knowledge gaps
None.

3.7 Hydrographical conditions

(MSFD, Annex I, descriptor 7)

This section outlines how good environmental status for hydrographical properties prescribed in the MSFD - including the associated criteria that the Member States must use to assess the extent to which good environmental status has been achieved - is translated into environmental targets and indicators for the North Sea.

3.7.1 Good environmental status - Hydrography 2020

(MSFD, Art. 9)

Permanent alteration of the hydrographical conditions does not harm the marine ecosystems. (MSFD, Annex I, descriptor 7).

Hydrographical properties:
Criteria for the assessment of good environmental status (Commission Decision 2010/477/EU)
7.1. Determining the spatial characteristics of permanent changes
7.2. Effects of permanent hydrographical changes

Overview of current and initiated policy
- Dredging sludge may be deposited pursuant to a notification in the Besluit Bodemkwaliteit [Bbk, Soil Quality Decree] within the framework of the Environmental Management Act and the Waste Framework Directive.
- Under the Environmental Management Act and the Environmental Impact Assessment Decree, the effects of sand extraction and suppletion are determined for each project and mitigating measures indicated, taking into account the criteria on environmental impact assessment

given in the EU Directives. The Nature Conservation Act and the Flora and Fauna Act also apply. The appropriate assessment of the Nature Conservation Act will be necessary if significant effects on protected areas and protected species are to be expected. To spare the ecologically important coastal zone and prevent harm to coastal defences, sand extraction is only allowed in areas outside the continuous NAP -20m isobath.
- The *Sand Motor* project involves sand being deposited in a highly localised manner that subsequently spreads along the coast due to natural erosion. Compared to classical sand suppletion methods, this method limits the area where benthos and foraging birds are disturbed. The Sand Motor itself creates a varied habitat with new opportunities for nature.
- Pursuant to the BHD, the loss of habitat and foraging area for birds in a part of the coastal zone due to the construction of the Maasvlakte 2 port area is compensated for by creating the Natura 2000 area of the Voordelta, which is ten times larger.

Attainability of good environmental status in 2020
The initial assessment (Chapter 2) indicated that the deterioration of the seabed ecosystem and of diadromous fish species in the coastal zone can, in part, be explained by the permanent hydrographical effects of the Delta Project and Maasvlakte I. These projects are of national significance and the effects are considered irreversible. The OSPAR advice document on the hydrographical properties descriptor indicates that the largest permanent change in hydrographical properties is linked to such large-scale projects. According to the advice, it is plausible that a return to former conditions will be accompanied by a loss of invested capital and practical value.[213]

Relatively limited interventions, such as sand extraction and suppletion and dredging are subject to permits; negative effects on the marine ecosystem are mitigated. The local effects may be major, but they are not permanent: recovery occurs within four to six years after the intervention. While Maasvlakte 2 does lead to changes in hydrographical properties in a part of the coastal zone, the negative effects on the marine ecosystem are compensated. Until 2020, no new interventions have been planned that will negatively affect good environmental status of the hydrographical properties of the North Sea.

Assuming that negative effects as a result of past permanent changes in hydrographical properties are irreversible, it can be concluded that good environmental status has already been achieved in the current situation. Current policy safeguards the conservation of good environmental status in the case of new activities and is aimed at preventing permanent effects at EUNIS level 3. This is also in line with the OSPAR advice.[214]

3.7.2 Environmental targets 2020
(MSFD, Art. 10)

Human activities do not result in permanent, large-scale negative effects on the ecosystem due to changes in the hydrographical conditions (Commission Decision, criteria 7.1 and 7.2).
It is not possible to formulate generic and quantitative targets for this descriptor. The effects of hydrographical interventions for individual projects depend to a large extent on local conditions and impact-effect relations.

Operational target:
All developments must comply with the existing regulatory regime (e.g. EIA, SEA, and Habitats Directive) and regulatory assessments must take into consideration any potential impacts arising from permanent changes in hydrographical conditions, including cumulative effects, at the most appropriate spatial scales following the guidance prepared to this end (EUNIS level 3, reference year 2008).[214a]

Within the framework of WFD implementation, targets and measures have been drawn up to improve the migration opportunities for diadromous fish.

3.7.3 Policy assignment supplementary to existing and initiated policy

None.

3.7.4 Indicators
(MSFD, Art. 10)

The indicators depend on the intervention and are to be determined for each individual project in the EIA (see also the OSPAR advice on this descriptor).[215] In general, these existing indicators are as follows:

1. **the size of the affected (benthic) area** (Commission Decision, criterion 7.1)
2. **the size of permanently altered habitat types** (Commission Decision, criterion 7.1)
3. **changed functions of habitats** (for spawning/reproduction, resting, foraging and migration of species) (Commission Decision, criterion 7.2).

The assessment scale is EUNIS level 3. Measurements are performed by the project initiator.

Exploration of knowledge gaps
Project-dependent

3.8 Contaminants

(MSFD, Annex I, descriptor 8)

This section outlines how good environmental status for contaminants prescribed in the MSFD - including the associated criteria that the Member States must use to assess the extent to which good environmental status has been achieved - is translated into environmental targets and indicators for the North Sea.

3.8.1 Good environmental status - Contaminants 2020

(MSFD, Art. 9)

Concentrations of contaminants are at levels not giving rise to pollution effects (MSFD, Annex I, descriptor 8).

Contaminants:
Criteria for the assessment of good environmental status (Commission Decision 2010/477/EU)

8.1. Concentration of contaminants
8.2. Effects of contaminants

Overview of current and initiated policy

- Ocean shipping: Stringent IMO regulations for dumping. The North Sea is, among others, a special area for oil pollution, litter and SOx emissions. IMO prohibits organotin compounds on ship's hulls. The ban on TBT has been embedded in a EU Regulation.
- Oil and gas recovery: OSPAR decisions on reducing emissions have been implemented in the Mining Act.
- Land-based point sources: a general policy framework, as laid down in the Environmental Management Act, the Water Act and general substances policy.
- Diffuse sources: diffuse sources action programme.
- River basin areas: within a WFD context, the approach to sources upstream is subject to agreements with neighbouring countries in the basin areas of the major rivers.

Approach to incidents and disasters: pursuant to the Bonn Agreement and the Seveso II Directive. This collaboration agreement includes agreements on performing risk analyses to prevent accidents, limiting the effects of accidents, a notification duty and reporting on incidents.

Attainability of good environmental status in 2020

Until recently, pollution of the North Sea posed a threat to the marine ecosystem. The initial assessment in section 2.4.2 shows that concentrations of contaminants have been reduced drastically since the 1970s. This is the result of robust measures and source decontamination. As of yet, the OSPAR objective for TBT and for oil-stained birds has not been achieved. TBT and several other substances, such as lead and PAHs, are still present in excessive concentrations, also according to the WFD. Major polluting effects on birds and marine mammals by way of the food webs are a thing of the past.

As estimated in section 2.4.2 of the initial assessment, the risks of undesirable pollution effects on the marine environment will decrease further as a result of current policy, and will be minor between 2020 and 2027 and beyond. What is worth considering in this respect is that polluting substances have a long lingering effect in the sea bed, long after all abating measures have been taken (such as those for TBT, lead and PAHs). Moreover, the effects of policy are difficult to demonstrate for the current reduced concentrations. Given these conditions, it is justifiable to conclude that a policy task supplementary to current policy would not be a matter of course. The robustness of current policy also contributes to this conclusion. The Netherlands will implement current policy on pollution sources.

It is estimated that good environmental status beyond 2020 is within reach. For some substances (especially PAHs), a lowering of the targets within the WFD context will be inevitable, as all possible measures have already been taken. The development in the concentrations of substances will be monitored closely.

3.8.2 Environmental targets 2020

(MSFD, Art. 10)

- **Counter the concentrations of contaminants where these do not meet the targets of the Water Framework Directive, pursuant to its timeline** (Commission Decision, criterion 8.1).
- **Ensure that concentrations of other known substances, where these meet the Water Framework Directive standards, do not exceed current concentrations and, where possible, reduce them** (Commission Decision, criterion 8.1).
- **A prevention target for currently observed effects of pollution from TBT and oil.**(Commission Decision, criterion 8.2).

Operational target:
Occurrence and extent of significant acute pollution events (e.g. slicks resulting from spills of oil and oil products or spills of chemicals) and their impact on biota affected by this pollution should be minimised through appropriate risk based approaches.[215a]

3.8.3 Policy assignment supplementary to existing and initiated policy

None.

3.8.4 Indicators

(MSFD, Art. 10)

1. Concentrations of contaminants (Commission Decision, criterion 8.1).

Existing indicators:

- In the zone from the sea baseline up to 12 nautical miles from the baseline, the measurement method pursuant to the WFD is applied, in total water.
- Additionally, the measurement method in accordance with OSPAR's Coordinated Environmental Monitoring Programme is applied, in biota.

For the time being, substance concentrations in the area where WFD and OSPAR overlap will be taken and assessed in two different ways: in total water and in biota, respectively. This may result in different conclusions about the status of the sea in terms of pollutants, which is an undesirable situation. Within the EU and OSPAR, efforts are being made to harmonise the two assessment systems. The Netherlands will actively contribute to this. As regards deriving assessment values, the Netherlands intends to apply MSFD's *Technical Guidance Document* [216], which Member States and the European Commission jointly developed for the WFD. Given the concurrence of multiple stress factors, the causal relationship between contaminants and identified effects is often difficult to prove. Supplementary analysis is needed to estimate the effects of (a combination of) substances on the ecosystem (Commission Decision, criterion 8.2). In this context, measuring substance concentrations of hydrophobic or bio-accumulating substances in biota is preferred, because this highlights the biological effects the best. Alternatively, sediment measurements may be taken in certain cases, where necessary (as is already done once every three years). Passive sampling of total water samples could also provide a solution because it is both more reliable and cost effective.

2. Effects of TBT and oil (Commission Decision, criterion 8.2).

Existing indicators:

- the incidence of imposex in sea snails (gastropods) due to TBT (OSPAR-EcoQO)
- the percentage of oil-smeared beached birds (OSPAR-EcoQO). The assessment value for oil pollution is that less than 20% of the beached guillemots are oiled in 2020.

The EcoQO for oil-smeared guillemots was designed for diffuse oil input into the marine environment and is not deemed suitable for acute oil pollution due to accidents.215

Exploration of knowledge gaps

None.

3.9 Contaminants in fish and other sea food for human consumption

(MSFD, Annex I, descriptor 9)

This section outlines how good environmental status for contaminants in fish prescribed in the MSFD - including the associated criteria that the Member States must use to assess the extent to which good environmental status has been achieved - is translated into environmental targets and indicators for the North Sea.

3.9. 1. Good environmental status - Contaminants in fish and other sea food for human consumption 2020

(MSFD, Art. 9)

Contaminants in fish and other sea food for human consumption do not exceed the limits determined by Community legislation or other relevant standards (MSFD, Annex I, descriptor 9).

Criteria for the assessment of good environmental status (Commission Decision 2010/477/EU)

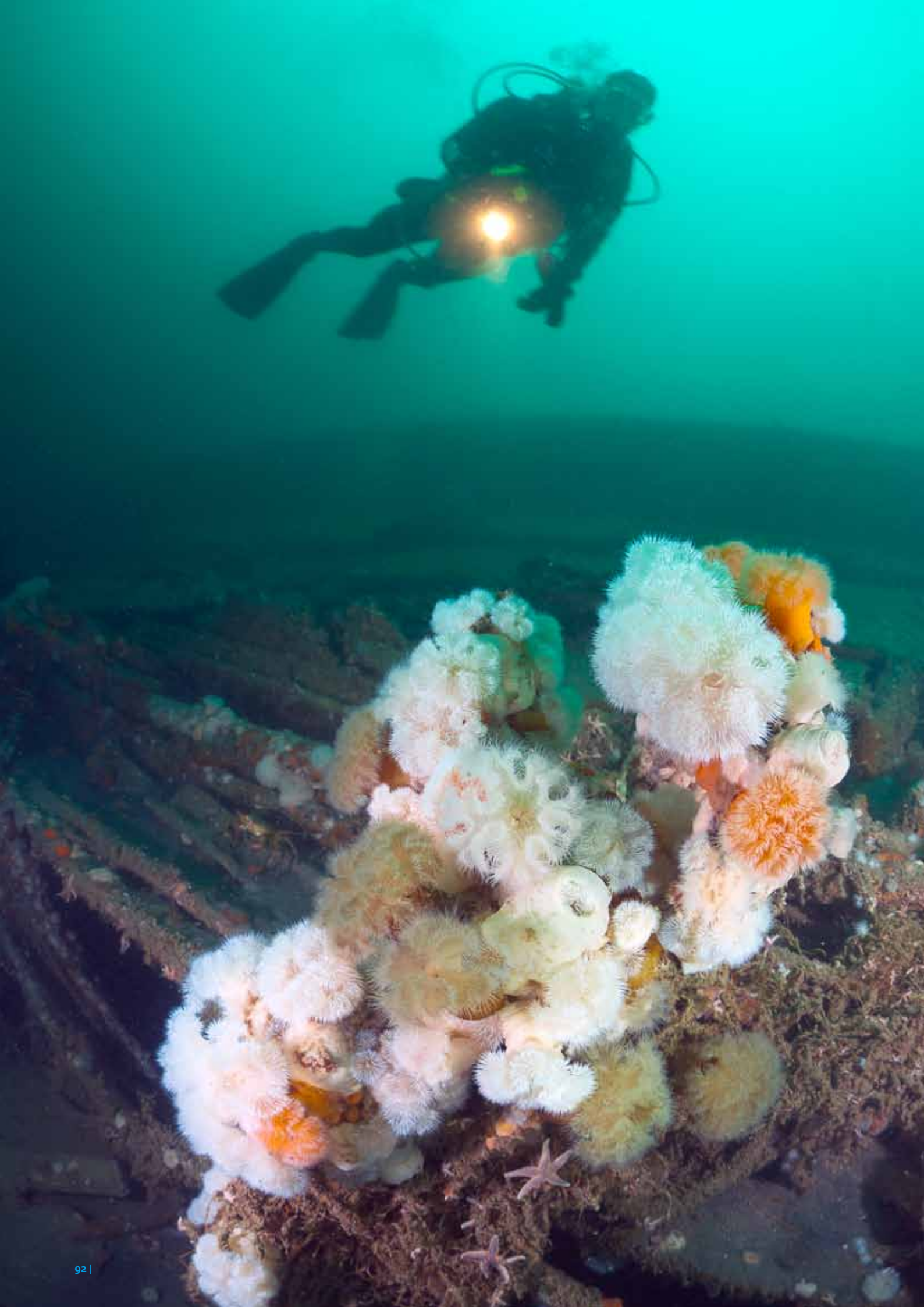
9.1. Levels, number and frequency of pollutants

Overview of current and initiated policy

- Commission Regulation (EC) no. 1881/20062[18] states the maximum levels for certain contaminants in foodstuffs. For fish and other sea food, maximum levels have been set for lead, cadmium and mercury, dioxins/furans and dioxin-like PCBs, and benzo(a)pyrene.
- As a result of an amendment to this regulation – by means of Regulation (EU) no. 1259/2011[219] – European maximum levels for PCBs in fish and other sea food also apply as of 1 January 2012.
- The annexes to Regulation (EC) no. 396/2005 cover statutory Maximum Residual Levels (MRLs) for pesticides.
- The Commodities Act contains additional MRLs for some biocides in, among others, fish for consumption.
- Levels for radioactive substances in foodstuffs have been set down at a European level (e.g. in Regulation (Euratom) no. 3954/87.

Attainability of good environmental status in 2020

The initial assessment (Chapter 2) outlined that the levels of contaminants in fish and other sea food do not exceed the standards in national and international legislation. The expectation is that this will remain the case. In the current situation, good environmental status is achieved. If policy does not change, the Netherlands will be able to maintain this status in 2020 and beyond.



3.9.2 Environmental targets 2020
(MSFD, Art. 10)

The levels of contaminants in fish and other sea food from the North Sea do not exceed the standards of national and international legislation (Commission Decision, criterion 9.1).

3.9.3 Policy assignment supplementary to existing and initiated policy

None

3.9.4 Indicators
(MSFD, Art. 10)

In accordance with prevailing legislation, the current indicators for caught fish are as follows (Commission Decision, criterion 9.1):

- **The frequency with which the applicable limits are exceeded**
  Existing indicator.
- **The actual values measured.**
  Existing indicator.
- **The number of contaminants that, as measured, concurrently exceeded limits.**
  Existing indicator.
- **The source of contamination (geological versus anthropogenic, local versus long distance).**
  Existing indicator.

An intake calculation could also be assessed, which would include the contribution of the fish species in question to total exposure.
The current annual monitoring programme covers mussels, shrimp, and some twenty commercially exploited fish species. The programme measures heavy metals, dioxin-like substances, organo-chloro pesticides, PCBs (polychlorinated biphenyls), TCPM(e) (Tris(4-chlorophenyl) methanol and methane) brominated flame retardant and PAHs (polycyclical aromatic hydrocarbons) in these fish. Every year, the measurement programme focuses specifically on a group of relatively unknown contaminants in order to gain insight into the presence of these substances. The samples are taken at different fish auctions, so that their geographical origin is not clear. As a result, it is not possible to establish any temporal trends. Monitoring aimed at generic environmental quality also comprises a set of substances measured in mussels and flatfish (mostly in flounder livers, which are usually not eaten). European legislation includes requirements for the sampling method, the laboratories, and the analysis for official controls.

Exploration of knowledge gaps
The geographical origin of the fish is not always clear during monitoring, meaning that it is not always clear where at sea the pollution measured occurred.

3.10 Litter
(MSFD, Annex I, descriptor 10)

This section outlines how good environmental status for litter prescribed in the MSFD - including the associated criteria that the Member States must use to assess the extent to which good environmental status has been achieved - is translated into environmental targets and indicators for the North Sea.

3.10.1 Good environmental status - Litter 2020
(MSFD, Art. 9)

Properties and quantities of marine litter, including their degradation products such as small plastic particles down to microplastics do not damage the coastal and marine environment, and the volume decreases over time.[219a] (MSFD, Annex I, descriptor 10).

Criteria for the assessment of good environmental status (Commission Decision 2010/477/EU)
10.1. Characteristics of litter in the marine and coastal environments
10.2. Impact of waste on marine life

Overview of current and initiated policy
- MARPOL Convention Annex V imposes a complete ban on waste disposal as of 1 January 2013, with some exceptions (food remnants). In addition, keeping a Garbage Record Book is already compulsory.
- The Netherlands is committed to optimising the European Directive on port reception facilities by such measures as the mandatory delivery of waste when a ship leaves for a port outside the EU, a European information and monitoring system, and harmonisation of the enforcement and financing systems.
- At the Netherlands' initiative, the *marine environmental awareness* course will become a mandatory part of maritime educational programmes all over the world.
- The Netherlands has put the issue of plastic waste in the sea on the UNEP agenda.
- Waste processing in the Netherlands is organised in a high-grade and sustainable manner: only 4% of waste ends up being dumped. This percentage must be cut to 3.5% by 2015.
- By 2012, 42% of plastic packaging waste collected from households in the Netherlands will have to be recycled.

- There also are various initiatives and campaigns in place that focus on reducing litter on land, such as the 'Schoonste Strand' [cleanest beach] award.

Attainability of good environmental status in 2020
The conclusion from the initial assessment (section 2.4.1) is that litter, primarily plastics, constitutes a complex problem in the marine environment. There are a lot of unknowns regarding the sources, magnitude and effects on the ecosystem. Hereby notably plastic is a substance that is hard to remove from the environment, if at all. It is, therefore, not possible to judge whether good environmental status can be achieved in 2020; formulating quantitative targets is problematic. In this case, setting a qualitative target that provides the right direction is more realistic (also see section 3.3.2, particularly the European Commission's comment on this).

At any rate, the Cabinet is of the opinion that litter does not belong in the sea. Internationally, awareness of the problem of plastics in the sea is also growing. At the same time, the initial assessment made it clear that, despite current policy efforts and many initiatives, litter in our part of the North Sea is not expected to decrease. Contamination with microplastics is likely to increase. To that end, a reduction target and supplementary policy assignment will have to be formulated for 2020.

3.10.2 Environmental targets 2020
(MSFD, Art. 10)

- **The quantity of visible beach litter has decreased (basic reference 2002-2009)** (Commission Decision, criterion 10.1).
- **There is a decreasing trend in the quantity of litter in marine organisms** (basic reference 2005-2009) (Commission Decision, criteria 10.1 and 10.2).

3.10.3 Policy assignment supplementary to existing and initiated policy

To reinforce the efforts being made, the Cabinet is committed to an integral approach, emphasising prevention. The supplementary policy assignment is aimed at:
- Supplementary source-oriented policy to tackle litter arising from beach recreation, fisheries, rivers and shipping. The Netherlands intends to pay attention to the waste flow in the rivers as part of reframing the WFD.
- Awareness about plastic waste in the sea is a key component of prevention. As such, the Cabinet will encourage awareness of plastic waste in the sea.
- More attention should be paid to product development and the more sustainable and efficient use of, in particular, plastics. This is in line with the 'green growth' concept favoured by the Cabinet in the sustainability agenda. Economy and environment can go hand in hand, which provides opportunities for the private sector.218 The cradle-to-cradle concept is worth mentioning in this context.

Given the international character of the problem, international collaboration is being sought to arrive at effective policy.

3.10.4 Indicators
(MSFD, Art. 10)

1. **Trends in the amounts, composition, distribution and sources of litter found on beaches** (Commission Decision, criterion 10.1).
   Existing indicator: monitoring on beaches is recognised within Europe as the most important method of identifying the extent of pollution of the marine environment due to litter.[221] This method uses the OSPAR Beach Litter Monitoring programme, which measures the average amount of litter on four reference beaches (for instance on the basis of a five year rolling average).[222]
2. **Trends in the quantity and composition of plastics found in the stomachs of marine organisms.**[223] (Commission Decision, criteria 10.1 and 10.2).
   Existing indicator. The OSPAR-EcoQO 'quantity of plastics in fulmar stomachs' is used as indicator. This EcoQO is indicative of the quantity of litter found in marine organisms in the Netherlands part of the North Sea, and it provides information on the quantity of plastics floating on the sea.[224]

These indicators are in line with the recommendations from OSPAR and the EU Technical Subgroup Marine Litter on the use of indicators for this descriptor[225] The Netherlands actively contributes to this subgroup.

Exploration of knowledge gaps
Due to a lack of knowledge and reliable research methods, it is difficult to get a complete picture of the trends and consequences of litter in the marine environment. That also makes it difficult to establish good environmental status with no damage to the marine environment. The recommendation of the EU Technical Subgroup Marine Litter provides examples of possible research and monitoring methods to which every Member State can join up.224 The main knowledge gaps are:
- There is no research protocol and data series for litter in the water column.
- There is no research protocol and data series for litter on the seabed. The expectation is that the existing International Bottom Trawl Survey (IBTS) can be extended to enable research into litter on the seabed.
- There is no research protocol and data series for microplastics in the marine environment.
- There is a lack of knowledge about the consequences of litter and plastics for marine organisms and ecosystems.

- There is insufficient knowledge for identification and standardization of sources of litter.

As a result, not enough quantitative information is available to provide clarity on how measures can contribute to achieving good environmental status. It is possible, however, to indicate which indicators are affected by the measures. In 2011, a cost-effectiveness analysis was performed based on expert knowledge. This led to a first possible ranking of potential measures.[227] The results from these analyses can be used to elaborate the supplementary policy assignment into measures.

When developing knowledge and drafting the monitoring programme, the Netherlands will work with other Member States in the European Technical Subgroup Marine Litter.

3.11 Underwater noise

(MSFD, Annex I, descriptor 11)

This section outlines how good environmental status for underwater noise prescribed in the MSFD - including the associated criteria that the Member States must use to assess the extent to which good environmental status has been achieved - is translated into environmental targets and indicators for the North Sea.

3.11.1 Good environmental status - Underwater noise 2020

(MSFD, Art. 9)

The introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment. Loud, low and mid frequency impulsive sounds and continuous low frequency sounds introduced into the marine environment through human activities do not have adverse effects on marine ecosystems[227a] (MSFD, Annex I, descriptor 11).

Criteria for the assessment of good environmental status (Commission Decision 2010/477/EU)

11.1. Distribution in time and space of loud impulse noises with a low or medium frequency

11.2. Uninterrupted low-frequency noise

Overview of current and initiated policy

- Individual production of impulse noise by pile-driving activities for the construction of wind farms is subject to licensing under the Water Act and the Nature Conservation Act.
- The Ministry of Defence applies a code of conduct for clearing explosives.
- The Ministry of Defence also applies rules to control sonar system emissions.
- Rules for seismic surveys, in part because of the Conservation Plan for Harbour Porpoises, will be adjusted (in consultation with concerned stakeholders if appropriate),also taking into account prevailing regulations from neighbouring countries.
- The Ministry of Defence is exploring the effects of clearing explosives and looking at the possibilities of introducing alternative techniques or mitigating measures.

The Netherlands cannot unilaterally take measures to regulate noise generated by shipping. Meanwhile, IMO has taken the first steps to study how noise produced by (commercial) shipping can be limited.

Attainability of good environmental status in 2020

The initial assessment (Chapter 2) shows that underwater noise produced by human activities in the Southern North Sea has increased considerably. In accordance with the precautionary principle, the aim is to prevent significant effects on the ecosystem resulting from specific activities such as pile-driving and seismic surveys by enclosing conditions within permits.

It is not clear to what extent current background noise from, for example, shipping, already presents a problem and what the (cumulative) effects are of the increased use of the sea. No information is available on background noise levels in the North Sea, as this is not being measured yet. There are no concrete indications that the (probably) increased level of noise in the Netherlands part of the North Sea has harmful effects. This conclusion cannot be drawn for the marine mammal species living in the North Sea either, especially given the presence of (sensitive) species such as the harbour porpoise in wind farms.[228] programme, From 2014 onward monitoring will take place. This will (in accordance with article 11, sub 2, of the MSFD) be established in consultation with other North Sea states, but it will be some years before a clear picture emerges. Validated background noise levels will, therefore, not be available in the short term (but probably before 2018). As such, setting a concrete target for (the accumulation of) background noise is somewhat premature at this time. Having said that, the recent increase in the number of harbour porpoise strandings is a cause for concern though.

3.11.2 Environmental targets 2020

(MSFD, Art. 10)

- **Individual cases: preventing harmful effects on the ecosystem, particularly on marine fauna, resulting from specific activities such as pile-driving and seismic surveys** (Commission Decision, criterion 11.1).

- **Background noise and cumulation of effects on populations or at the ecosystem level: targets in 2018, when more knowledge has been gathered** (Commission Decision, criterion 11.2).

3.11.3 Policy assignment supplementary to existing and initiated policy

For the time being, no policy assignments are expected until 2015. However, international progressive insight may lead to a supplementary policy assignment after all.

3.11.4 Indicators

(MSFD, Art. 10)

1. **Distribution in time and space of loud impulse noises with a low or medium frequency** (Commission Decision, criterion 11.1).
   Indicator yet to be developed.
   This indicator seeks to obtain an overall picture of preventing loud impulse noises and – for the first time – insight into the cumulative effects of various sources of noise, particularly the possible loss of habitat as a result of impulse noise. This initially involves known sources of loud noises, such as construction activities (pile-driving), seismic surveys, sonar systems and explosives. Existing data can probably be used in most cases to collate data.
2. **Uninterrupted low-frequency noise** (Commission Decision, criterion 11.2).
   Indicator yet to be developed.
   This indicator seeks to gain insight into the possible (cumulative) effects of increases in the level of noise produced by human activity, particularly commercial shipping. A monitoring strategy will have to be developed for the cost-effective collecting of the required data. Supplementary measurements and models yet to be developed will probably be used to monitor this indicator.

The two indicators are in line with the recommendations from the *Technical Subgroup Noise* established by the European Commission.[229] The aim of this subgroup is to enable the practical application of the assessment criteria and suggestions for indicators from Commission Decision 2010/477/EU for this descriptor, given the lack of clarity on underwater noise in many respects and the need to elaborate the indicators. The Netherlands actively contributes to this subgroup. Meanwhile, TSG Noise has formulated unequivocal descriptions of the indicators and the acoustic definitions to be used. As such, the indicators can be used.

Exploration of knowledge gaps
Knowledge about the effects of the noise on organisms in the ecosystem is still limited. Monitoring should not only focus on the quantity of current noise, but also on developing knowledge on the effect of various sources of noise and possible cumulative effects. This information can serve as the basis for making a policy choice on supplementary environmental targets for background noise and cumulative effects in the revision of the Marine Strategy in 2018. At this point in time, that would be premature. When developing knowledge and drafting the monitoring programme, the Netherlands will work with other Member States in the European TSG Noise.

3.12 Cumulation of effects

The matter of impact of all users put together and their joint influences and developments on the interaction of processes within the marine ecosystem is highly complex. Hereby the southern part of the North Sea is under intensive use for long already but there is insufficient data for a sound reference situation. Internationally, already much has been invested in generic instruments to describe or predict cumulative effects. As indicated in section 2.4.4 good and practically applicable methodologies are lacking.

To mitigate or prevent cumulative effects, through current policy the Cabinet opts for an application oriented approach that focuses on concrete decisions on specific (combinations of) activities in relation to particular sensitive components of the ecosystem. The precautionary principle as this relates to the BHD is thereby the most important guiding motive. Part of current policy is countering the cumulation of effects in the Natura 2000 areas in the coastal zone. An example from the Voordelta is the reduction of cumulative effects from a combination of recreation, fisheries and sand mining on the Black sea duck and its habitat and food. Part of making fisheries policy more sustainable aims at countering of cumulative effects on marine life resulting from repeating the same activity in the same area over a longer period of time. For issuance of permits, in the environmental impact assessment attention is paid to the effect(s) of such activity on the ecosystem in combination with other already present activities in the area concerned. An example is licensing for wind turbine parks whereby the total effect from all permit requests is assessed on the effects on birds and marine mammals. This also is standing practice for licensing of sand mining. At the planning level, in the environmental impact assessment of the plan potential cumulative effects of discrete spatial decisions are also assessed, taking de expected autonomous development of other activities into account. This has also been done for the spatial decision making of the North Sea policy in the National Water Plan, whereby caution was issued for the combination of large scale sand mining in combination with locations with large scale wind turbine parks closer to the coast in relation with birds and marine mammals (also see: section 2.2.4)

However, there is no insight into what the total of possible or eventual cumulative effects on the marine ecosystem of the Netherlands part of the North Sea could be as a consequence of expected autonomous developments and current and initiated policy, besides that this cannot be regarded in isolation from developments in our neighbouring countries in the North Sea region.

The Cabinet wishes to explore whether the above described concrete application oriented approach can be translated into a methodology to describe or predict cumulative effects of different development scenario of policy strategies at the level of the southern North Sea, related to the MSFD descriptors in the mid and long term (until 2040). This exploration is part of the updating of the North Sea policy in the successor of the National Water Plan (Policy Paper North Sea). The aim is to carry out this exploration in collaboration with the other countries in the region. If deemed necessary, this can lead to an adjustment of the prevailing integral eligibility framework for activities that require compulsory licensing as elaborated in the Integrated North Sea Management Plan.

3.13 First step towards drafting the Marine Strategy until 2020

The previous sections concluded for all descriptors which supplementary policy assignments remain over and above prevailing and initiated policy in order to achieve the environmental targets for good environmental status in 2020. The indicators (to be developed) were also determined and the main knowledge gaps in relation to the development of indicators and specification of the supplementary policy assignment were explored. This section uses that as a basis to present an initial impetus for elaborating Marine Strategy Part I in a programme of measures (3.13.1), a monitoring programme (3.13.2) and a knowledge programme (3.13.3).

3.13.1 The policy assignment: initial impetus for a programme of measures

The Cabinet believes that, both nationally and internationally, with major involvement of the users of the sea, much has been done in recent decades to achieve good environmental status of the North Sea. This is paying dividends.

For two of the descriptors, good environmental status of the Netherlands part of the North Sea is already a reality: (a) minimizing the effects of new hydrographical interventions and (b) contaminants in fish and other sea food for human consumption.
The current regulatory framework ensures that this good environmental status can be maintained.

For four of the descriptors, achieving good environmental status of the Netherlands part of the North Sea between 2020 and 2027 is within reach: (c) minimizing the effects of contaminants, (d) eutrophication, (e) minimizing the risk of introducing new non-indigenous species and (f) reducing noise pollution of individual, impulse noise-producing activities. However, in order to achieve this, our attention must not flag, and current source-oriented policy and initiated policy must be implemented down to the finest detail. After all, there are still excessive concentrations of nitrogen and several contaminants present in the current status. Implementation of the WFD measures, legislation on seismic surveys for oil and gas recovery and the detonation of old ammunition require special attention. It is not yet clear to what extent the current background noise from, for instance, shipping is already a problem and what the (cumulative) effect is from the increase in use of the North Sea. Concrete indications that the marine environment incurs damage from background noise are, however, lacking.

As regards protection of the marine ecosystem (descriptors biodiversity, food webs, commercially exploited fish, and sea-floor integrity), it is important that marine protected areas have been/will be designated in the North Sea under Natura 2000 (Dogger Bank, Klaver Bank, Frisian Front, Voordelta, North Sea coastal zone and Vlakte van de Raan). Three years after designation, all management plans to actually protect these areas in practice are being completed. Moreover, the National Water Plan (NWP) outlines a (spatial) consideration framework targeting a sustainable, spatially efficient and safe use of the North Sea as a whole in balance with the marine ecosystem. This framework was recently put into practice in the updated Integrated Management Plan for the North Sea 2015,[230] which also provides direction for licensing all activities for which obtaining a permit is compulsory. The Marine Strategy supplements the consideration framework of the NWP by establishing targets at the level of the marine ecosystem, in conjunction with the frameworks under the Water Framework Directive and the Birds and Habitats Directives. The management plans for the Natura 2000 areas along the coast are aimed particularly at countering the combination and cumulation of human disruptions to the environment. The NWP's Strategic Environmental Assessment Statement indicates that implementation of this policy framework combined with planned developments concerning the use of the North Sea will not result in negative cumulative effects on the ecosystem.

Much has been achieved in recent years within CFP, as well as in the field of reducing litter. The initial assessment of the marine ecosystem presents the first positive outcomes of this. However, current efforts are not sufficient to achieve good environmental status in 2020. According to current

insight, physical disruption in the form of seabed disruption and by-catches due to – in particular – traditional beam trawling will continue to be of such a magnitude outside the protected Natura 2000 areas that the highly degraded marine ecosystem will not be able to recover. The problem of litter, particularly (micro) plastics, is widely recognized as a risk. To supplement current policy in these areas, additional policies are required before 2020 in order to take a clear step towards good environmental status in the near future.

When developing the programme of measures in the period until 2015, the Cabinet will focus on the following three spearheads:

1. **Common Fisheries Policy:** The Cabinet champions capitalising on the sustainability route taken in the Netherlands by way of the revision of Common Fisheries Policy (CFP). On a European level, the Cabinet is also committed to the sustainable management of commercially exploited fish stocks and reducing seabed disruption and by-catches.
2. **Supplementary seabed protection**: As a supplement to the implementation of the BHD and the above generic commitment to making fisheries more sustainable, protection is offered for the seabed ecosystem in the *Frisian Front* and the *Central Oyster Grounds*. These are considered areas of consideration for spatial protective measures. In 2015, a decision will be made about delineating such areas within which spatial protective measures will be taken and about the nature of these measures. The following prerequisites will apply:
   - the ambition to safeguard 10-15% of the Netherlands part of the North Sea against seabed disturbance (including parts of the designated habitats directive areas Dogger Bank, Klaver Bank, North Sea coastal zone and Vlakte van de Raan) and
   - minimising inconvenience for fisheries.

   Moreover, this will take into account the differences in nature value of the areas as well as considerations of efficiency and enforcement (such as the spatial concentration of the BHD and MSFD tasks). A process will be set up for these measures, to which the fishing industry and nature organisations will also be invited. The measures will be implemented as part of CFP, but other uses will be explored where necessary.
   The announcement of these two areas of search, in addition to the areas protected under the BHD and with reference to Figure 17, fulfils the obligation of making relevant information on marine protected areas available in accordance with Article 13, paragraph 6 of the MSFD. By way of implementing the Water Decree, this information is made publicly available as part of this draft Marine Strategy Part I.[231]
3. **Litter:** internationally, the aim is to reduce litter and explore the presence and effects of marine litter, particularly microplastics. In terms of reducing litter, the Cabinet is focusing mainly on prevention. Possible tracks being explored are integrated source approach, awareness, more efficient use and reuse, and collection. The attainability of cleaning is also being investigated.

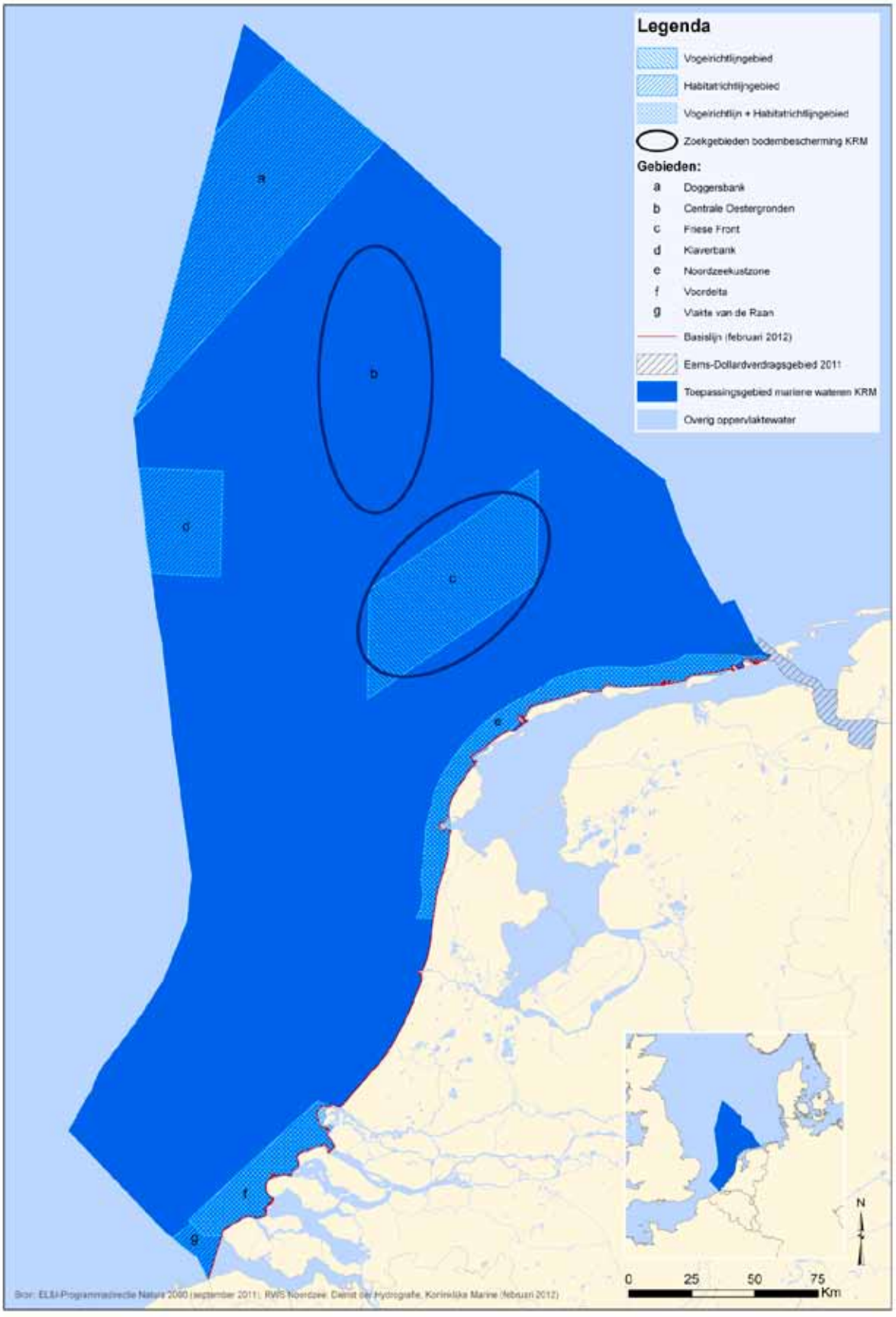
Through its commitment to the above spearheads, the Cabinet wants to have reversed the downward trend in the marine ecosystem to one of recovery by 2020 and to reduce the amount of litter in the marine environment. Decisions on the measures to be taken will be made in 2015 at the latest. Where possible, measures may be implemented earlier.

The three spearheads of the Marine Strategy will be detailed in the context of the 'green growth' concept. The strategy is aimed mainly at seizing opportunities for sustainable development and innovation, and strengthening ecology and economy together with the stakeholders at sea. This is preferable to excluding and regulating, and is in line with the Cabinet's 'green growth' vision, as well as the recommendation of the Councils for the Environment and Infrastructure *Een zee van Mogelijkheden* [A sea of opportunities]. Implementation of the MSFD is on the agenda for the North Sea.[232]

Pursuant to the Directive, the programme of measures, Marine Strategy Part III, must be adopted by 15 July 2015 and put into practice in 2016. Pursuant to the Water Act, good environmental status, targets and the programme of measures must be incorporated into the successor of the National Water Plan set to be published in 2015. They will come into effect following agreement with the Dutch House of Representatives. To concur with the (statutory) term for decision-making on plans pursuant to the Water Act, the draft programme of measures must be finalised in the course of 2014. In addition to a programme of measures detailing the three spearheads, the programme will contain an overview of prevailing and initiated policy that contributes to the environmental targets in 2020 to achieve good environmental status. The specification of the spearheads in a programme of measures will include a social cost-benefit analysis.

Considerations for elaborating the Marine Strategy
A permanent item for consideration in the Marine Strategy is to ensure the continuous harmonization of insights at ecosystem level and at species and habitat level. As announced in the letter to the Dutch House of Representatives dated 14 September 2011, the Natura 2000 target document will be evaluated in 2015, based, in part, on the assessment of the favourable conservation status.231 The assessment will also use the latest insights into the

Figure 17. Designated and notified BHD areas and MSFD areas of search Central Oyster Grounds and Frisian Front.



functioning of the ecosystem obtained as part of the international implementation of the MSFD.
The exception in the MSFD for military activities (in relation to national security) is not a complete exemption: Member States shall 'endeavour to ensure that such activities are conducted in a manner that is compatible, so far as reasonable and practicable, with the objectives of this Directive'. In other words, the objectives of the Marine Strategy are also taken into account for defense activities by taking appropriate measures that do not hinder, for example, the operational possibilities of navy vessels or the Defence operations (see also Appendix 5).

3.13.2 Initial impetus for a monitoring programme

On 15 July 2014, the MSFD monitoring programme (Marine Strategy Part II) must have been adopted and put into practice pursuant to the Directive. The MSFD monitoring programme aims to assess the status of the marine ecosystem over time based on established indicators. The monitoring programme contains the translation of the indicators into need for information, the translation of the need for information into empirical measurement efforts, and the translation of these empirical measurement efforts into trends in the established indicators. These trends in the established indicators form the foundation for assessing the marine ecosystem in our part of the North Sea in relation to achieving good environmental status and the targets to be achieved for that in 2020. The trends in the established indicators will be assessed for the first time in 2017-2018 for the second MSFD cycle, and subsequently every six years in accordance with the MSFD policy cycle.

The MSFD prescribes that the above obligations (e.g. WFD, BHD and CFP) be taken into account for specifications and methodological standards for monitoring. Moreover, the monitoring programme must be internationally consistent with other monitoring programme in the marine North Sea subregion. When structuring the MSFD monitoring programme, the Cabinet is committed to effective and efficient monitoring against reasonable costs. Where possible, the programme will be coordinated with the monitoring programme of neighbouring countries in our marine region. Parameters already measured or to be measured within an OSPAR, WFD, BHD or CFP context will be used wherever possible. The MSFD monitoring programme is based on and builds on the monitoring programme drafted or to be drafted at OSPAR, WFD, BHD or CFP level.

The MSFD monitoring programme will be included in the annual update cycle for marine monitoring, in which, on a yearly basis, the national government assesses how the information need for policy and management of the North Sea can be met as cost efficiently as possible. To ensure that the MSFD monitoring programme is operational in 2014, the empirical measurement efforts for the programme must be clear in the autumn of 2012. This time is needed to implement any necessary changes to existing parameters so that the parameters can fill the information need under the MSFD in 2014 as well. Every year, an assessment will be made of how new indicators and parameters, innovations and international collaboration will be incorporated into the monitoring programme. Moreover, within the context of the Informatiehuis Marien [Marine Information Centre] to be established, all marine monitoring data will be combined and opened up. This Informatiehuis Marien may, in due course, become a central authority for answering questions, developing the monitoring programme and actually gathering basic information.

In a number of areas, new indicators will have to be developed and, possibly, the associated measurement efforts implemented, for instance for the descriptors of the marine ecosystem that have been drawn up and the relatively new policy areas on litter and underwater noise. Developing new indicators, including the related knowledge development, is part of knowledge programming as outlined in the following section.

3.13.3 Knowledge programming

The North Sea is a marine ecosystem that functions autonomously and responds to natural changes and impact from human use. The multiple aspects of the North Sea ecosystem, including the effects of human use, have been studied for decades, at a national, international and European level. Despite this, not everything that occurs in the North Sea ecosystem is known; nor are all the effects of use of the sea.

Drafting this Marine Strategy Part I implicitly provides a general overview of such knowledge gaps, which were brought to light when describing the current status of the marine environment, establishing good environmental status and formulating the environmental targets and associated indicators. Preparations for the MSFD monitoring programme and a programme of measures also reveal knowledge gaps. Not everything is clear about the current status, and historical data is also lacking on what the North Sea was like 100 years and longer ago, and how the consequences of human use in the past are making themselves felt today. The main knowledge gaps must be filled to be able to draft the MSFD monitoring programme and the programme of measures in 2014-2015 and to prepare for the second MSFD cycle, which is due to start in 2018.

Priorities in knowledge programming
Until the update of the initial assessment in 2017, priorities in knowledge programming will benefit the development of

indicators, the programme of measures and updating of the Marine Strategy:

- *Marine ecosystem*. Additional knowledge is needed to develop indicators for this combined descriptor, also with a view to detailing the BHD. It is also important to gather knowledge about the effects of the primary disturbances, including bottom trawling, and about how these effects and possible cumulative effects can be identified in the different habitats and species. Optimal use of existing interdepartmental knowledge structures (BHD, WFD, OSPAR) would seem obvious.
- *Litter* (including microplastics). Knowledge about the presence and risks of microplastics is a high priority. In a more general sense, the development of research protocols for the specification of indicators for the presence of litter on the seabed and in the water column also requires attention.
- *Underwater noise* (impulse noise and background noise). This concerns establishing noise levels, including temporal and spatial variations, the main noise disruptions and sources of noise. The effects of different types of noise and accumulation of noise will also have to be studied. Cost effectiveness of mitigating measures for notably possibilities to prevent or reduce noise emissions will be assessed.
- Specification of the three core measures. Research into the (cost) effectiveness of possible measures under the CFP, into supplementary seabed protection and into countering litter is needed to prepare the programme of measures to be completed in the course of 2014.
- Cumulation: a better understanding of the cumulation of effects on the marine ecosystem resulting from developments in use and other external influences with a view beyond 2020.

The Cabinet seeks to combine knowledge programming with other planned activities by optimally aligning them with existing international strategic and fundamental research programme (such as the EU programme LIFE, Horizon 2020 and Interreg). At a national level, too, efficiency gains are possible by improving coordination between knowledge programming of the departments and knowledge institutes involved in the areas of applied, strategic and fundamental research.

Artificial substrates
Over the next few years, the Netherlands wants to explore the use of artificial substrates, also at an international level. This will involve multiple aspects, such as the value for the marine ecosystem and cultural history, the obligation to remove discarded items and shipwrecks, the (spatial) harmonization with other uses, cost aspects and opportunities for sustainable development. The Cabinet will establish its stance on this by 2014 at the latest.

3.13.4 International coherence and cooperation

Policy concerning the North Sea by definition is international policy. Both the dynamic marine ecosystem and users do not adhere to boundaries and most obviously for knowledge and policy development consultation in the international arena should be sought. In addition, the competent authority for important use groups such as international shipping (IMO) and fisheries (EU) lies with the international level and establishment of nature and environmental policy for its largest part takes place at the EU and OSPAR levels. Since use of the Netherlands part of the North Sea is highly intensive, is of great economic importance and the area contains high natural values at the same time, the Cabinet adds much value to providing an effective input in those policy arenas in order to via that road have an as large influence as possible and contribute to the own national ambitions.

Past efforts
From 2008 onward, in notably the OSPAR framework and in European Commission established working and expert groups within the *Common Implementation Strategy,* the Netherlands in as much as possible strongly promoted coordination and consistence between the individual marine strategies of the member states. Where possible, the Netherlands took initiatives to attain more synergy and efficiency in approaches through collaboration. At the OSPAR level a high measure of knowledge exchange and joint assessment of the marine waters took place. Much energy was dedicated to the exchange and coordination of further developing existing methodologies for assessment of the good environmental status (indicator development). Work was also done on the development of coordinated environmental targets and indicators. Money and manpower, among others, were invested in the emerging policy fields of marine litter and underwater noise, in development of indicators for assessing the marine ecosystem and in harmonization between OSPAR, the MSFD as well as the WFD in the international river basins. Chapter 2, sections 3.4-3.11 and annex 2 further elaborate the activities thus far undertaken in support of the initial assessment and the formulation of the good environmental status, environmental targets and the development of indicators.

Activity priorities thus far were set with the countries in the southern part of the North Sea between the British Channel and the Dogger Bank: Denmark, Germany, the United Kingdom, Belgium and France. To this effect, since 2011 the Netherlands organised informal consultative sessions with the other North Sea states.

Efforts for the years to come
As expressed in the previous sections, also with the further elaboration of the Marine Strategy towards the monitoring

programme (Marine Strategy Part II), the programme of measures (Marine Strategy Part III) and development of the indicators and associated knowledge programming, the Cabinet wishes to explicitly engage in an international approach. The approach is aimed at international cooperation in institutional collaborative ventures, such as the European Commission's *Common Implementation Strategy*, OSPAR, IMO and CFP. The emphasis is on collaborating with neighbouring countries in the North Sea subregion. The aim is to reinforce international cohesion between strategies and implementation efficiency (in relation to measures, knowledge development and monitoring) and to create more synergy when implementing related EU legislation. This mainly concerns the MSFD, WFD, BHD and CFP. This fits the ambition of the National Water Plan to arrive at an international strategy for the southern part of the North Sea.

From 2013 onward, in the working groups under the *EU Common Implementation Strategy* of the member states and the European Commission, targeted activities are deployed to enhance the coherence and effectiveness of MSFD implementation. For this, the results from the Commission's assessment of the parts I of the marine strategies of the member states constitute the basis. Hereby close cooperation with the four regional sea conventions within the EU borders will take place. In 2011-2012 within OSPAR an analysis of the measure of regional coherence between ambitions in the marine strategies of the contracting parties was already done and actions were listed to further enhance regional coordination.[234] In this context work of importance within OSPAR is the coordinated approach towards environmental targets and indicators concerning the marine ecosystem (the descriptors biodiversity, indigenous species, food webs and sea bottom integrity) and at the European level the knowledge en policy development in the fields of litter and underwater noise. Streamlining the approach between the MSFD, the WFD, the CFP and the biodiversity strategy is another important issue. The Netherlands will continue to actively contribute to working programmes of the European Commission and OSPAR.

To direct the international efforts towards increased coherence and cooperation, the Netherlands took the initiative to set up an informal agenda with the countries bordering the southern North Sea (Denmark, Germany, United Kingdom, Belgium and France). The aim is to attain more harmonization among ambitions and to seek efficiency within the different international scale levels on which the programme of measures, the monitoring programme, the indicators and the associated knowledge programming are being elaborated: southern North Sea, OSPAR and EU levels and the global level. The approach is pragmatic, so as to departing from concrete linking points for cooperation or harmonization to bundle the powers as neighbouring countries and operate more effectively within the activities that are being initiated by the European Commission and OSPAR to also provide direction to these. A next step is to also better align the environmental targets towards the second MSFD cycle.

3.14 Horizon beyond 2015

The Directive decides that the Marine Strategy be updated every six years, for the first time in the 2018-2021 period. The initial assessment will be updated in 2017-2018 and, where necessary, the descriptions of good environmental status, environmental targets and indicators will be adjusted. This will be followed in 2020 and 2021 by the second monitoring programme and the second programme of measures, respectively. In this way, policy can be reconciled with the latest insights into the ecosystem and into the effectiveness of policy, and with international developments, thereby fleshing out the *adaptive management* approach prescribed in the Directive.

3.15 Finances

Government expenditure on the implementation of the Marine Strategy between 2012 and 2020 total approximately 26 million euros. The amounts have already been included in the multiannual budget of the Ministry of Infrastructure and the Environment and the Ministry of Economic Affairs, Agriculture and Innovation (see also Table 5). Expenditure only covers the measures needed on top of current and initiated policy and existing statutory obligations to implement the MSFD. These resources will be used on the basis of more detailed proposals aimed at: detailing the seabed protection of the Frisian Front and Central Oyster Grounds, intensifying policy on litter (including microplastics), developing new indicators and knowledge programming, and generating information from the monitoring programme. Government expenditure on (the implementation and monitoring of) policy that contributes to the MSFD challenge but that is already in force or proposed within existing statutory frameworks (such as WFD, Natura 2000, ASCOBANS, MARPOL) is not included in the overview below. Costs associated with the supplementary policy assignment in the CFP in relation to the MSFD will also be met with the budget already adopted for the CFP and are, therefore, not included in the overview either.

The plan is to perform the necessary research in collaboration with national and international knowledge institutes and international and EU research programme (Interreg and framework programme). The intention is also to link up with ongoing programme for fundamental and strategic research. Existing international conventions and EU

Table 5. Forecast of government expenditure for detailing the Marine Strategy 2013-2020 (x1 m €) supplementary to existing and initiated policy.

activity	2012	2013	2014	2015	2016	2017	2018	2019	2020
Policy development and implementation	0.8	1.1	0.7	0.6	1.0	1.0	1.0	1.0	1.0
Knowledge and monitoring	2.2	2.2	2.1	2.1	1.7	1.7	1.7	1.7	1.7
Coordination, communication and public participation	0.2	0.2	1.2	1.2	0.7	0.7	0.7	0.7	0.2
Total	**3.2**	**3.5**	**2.92**	**2.82**	**2.77**	**2.77**	**2.77**	**2.77**	**2.77**

Sources:
- multiannual budget 2012-2014, Chapter 12, IE/DGRW: MSFD and OSPAR items (own capital and BOA) 13.5 m (annual series: 0.9 m 2012; 1.7 m 2013; 1.6 m 2014; 1.6 m 2015; 1.5 m a year for 2016-2020 and beyond)
- multiannual budget IE/RWS 2012-2024 Infrastructure Fund: national Water Management and Basic Information tasks: 2.25 m (annual series: 0.25 m a year for 2012-2020)
- multiannual budget EAI, Operational target 18.3, maintaining international/national biodiversity and reinforcing our nature: 10.5 m (annual series: 2 m 2012; 1.5 m 2013; 1 m a year for 2014-2020).

legislation will be respected. The prerequisite for developing the MSFD monitoring programme is that the total set of monitoring obligations on the North Sea does not become more expensive. The challenge, therefore, is to seek synergy between the different measurement effort obligations, innovation, and international collaboration in the North Sea subregion.

An average amount of 1 million euros a year has been earmarked for developing and implementing measures. The exact (social) costs for implementing the supplementary measures in relation to CFP, seabed protection and litter cannot be determined yet. Decisions on the programme of measures will be taken in 2015. A sensible and pragmatic approach is seen as a prerequisite, i.e. being realistic, tackling the main risks, benefits outweighing the social costs (environmental targets 2020). Seizing opportunities for development and innovation is preferable to excluding and regulating. The costs for the government ensuing from the measures will be covered by the available budgetary resources of the Ministry of Infrastructure and the Environment and the Ministry of Economic Affairs, Agriculture and Innovation.

Footnotes

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[220] Ministerie van Infrastructuur en Milieu, *Agenda duurzaamheid.*

[221] MSFD GES Technical Subgroup on *Marine Litter, Marine Litter Technical Recommendations for the Implementation of MSFD Requirements* (2011) 11.

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Acronyms

ASCOBANS	Agreement on the Conservation of Small Cetaceans
BDC	Biodiversity convention
BEQI-2	Benthos Ecosystem Quality Index-2
Bpa	Spawning Stock Biomass precautionary assessment
BSK	Central Administration of the Ministry of Infrastructure and the Environment
CBS	Centraal Bureau voor de Statistiek, Statistics Netherlands
CIS	Common Implementation Strategy of the EU for the MSFD
COBAM	The intercessional correspondence group within OSPAR for the coordination of biological assessment and monitoring (ICG-COBAM)
CoG	OSPAR Coordination Group
COMPP	Common Procedure for the Identification of the Eutrophication Status of the OSPAR Maritime Area (2005).
EC	European Commission
EcoQO	Ecological Quality Objective within OSPAR
EEC	European Economic Community
EC	European Community
EEZ	Exclusive Economic Zone
EU	European Union
EUCC	European Coastal Marine Union
EUNIS	European Nature Information System
EUROSTAT	Eurostat is the statistical office of the European Union situated in Luxembourg.
EL I	Ministry of Economic Affairs, Agriculture and Innovation
Ff Act	Flora and Fauna Act
FIMPAS	Fisheries Measures in Marine Protected Areas
FMSY	Fish Mortality at MSY
FTE	fulltime equivalent
GES	Good Environmental Status
GMT	Goede milieutoestand, good environmental status
CFP	Common Fisheries Policy
HD	Habitats Directive
IA	Initial Assessment
IBN 2015	Integral Management Plan North Sea 2015

ICES	International Council for the Exploration of the Sea
IDON	North Sea Interdepartemental Consultation Directorate
IenM	Ministry of Infrastructure and the Environment
IMO	International Maritime Organization
IPPC	Intergovernmental Panel on Climate Change
JRC	Joint Research Centre of the EU
MSFD	Marine Strategy Framework Directive
WFD	Water Framework Directive
KW	Kilowatt, 1,000 watts
LEI	Landbouw Economisch Instituut
MARPOL	International Convention for the Prevention of Pollution from Ships
EIS	Environmental Impact Statement (the report outlining environmental effects)
m.e.r.	environmental impact assessment (the procedure)
MRL	Maximum Residue Limit
MSFD	Marine Strategy Framework Directive
MSY	Maximal Sustainable Yield
MPR	Maximum Permissible Risk
MW	Megawatt, 1 million watts
NAP	Nieuw Amsterdams Peil, Amsterdam Ordnance Level, reference for water level in the Netherlands
NWP	National Water Plan
Nb Act	Nature Conservation Act 1998
DCS	Dutch Continental Shelf
NGO	Non-governmental Organisation
OIM	Overleg Infrastructuur en Milieu, consultative body on Infrastructure and Environment
OWN	Overlegorgaan Water en Noordzee, consultative body on water and the North Sea in the Netherlands
OSPAR	Oslo-Paris Convention. OSPAR Convention, Convention for the Protection of the marine Environment of the North-East Atlantic Ocean
PAHs	Polycyclic aromatic hydrocarbons
PCB	Polychlorinated biphenyl
PBL	Planbureau voor de Leefomgeving, Netherlands Environmental Assessment Agency
Plan-MER	Strategic Environmental Assessment Statement (the report outlining environmental effects that is part of an environmental plan or programme)
PUR	Polyurethane
RWS	Rijkswaterstaat, Directorate-General for Public Works and Water Management
SSB	Spawning Stock Biomass
TCPM	Tris(4-chlorophenyl)methanol and methaan
TBT	Tributyltin
UNCLOS	United Nations Convention on the Law of the Sea
UNECE	United Nations Economic Commission for Europe
BHD	Birds and Habitats Directive
UN	United Nations
BD	Birds Directive
Zbt	Zoute baggertoets, salt dredging test

Appendices

Appendix 1 Overview of international conventions and legislation and their relationship with the descriptors in the Marine Strategy Framework Directive.

Convention / EU legislation	Informal name	Effective internationally (y/n)	Ratified by the Netherlands (y/n)	Embedded in NL legislation (y/n)	Effect in MSFD descriptor(s)	Effect(s) on good environmental status
United Nations						
UN Convention on the Laws of the Sea, 1982.	UNCLOS	yes	yes	yes	almost all	Promotes the marine environment targets by regulating environmental monitoring, activities, research, etc.
UN Convention on the Law of Non-Navigational Uses of International Watercourses.		no	yes	Set of instruments already sufficient upon ratification	1,4,5,8,9,10	Promotes sustainable use of rivers. This contributes to the marine environment of the coastal waters and the rest of the sea.
Convention on Fishing and Conservation of Living Resources of the High Seas, 1958.		yes	yes	yes	1,3,4,(6)	Seeks to maintain the marine ecosystem for the "High Seas".
International Convention on Load Lines, 1966.	LL	yes	yes	yes	1,4,6,8	Protects the ecosystem against naval disasters and, consequently, protects indirectly against environmental disasters.
Convention on the International Regulations for Preventing Collisions at Sea, 20-10-1972.	COLREG	yes, 15 June 1977	yes	yes	1,4,6	Protects the ecosystem against naval disasters and, consequently, protects indirectly against environmental disasters.
International Convention for Safe Containers, 1972.	CSC	yes, 6 September 1977	yes	yes	1,4,6,8	Protects the marine ecosystem by preventing environmental disasters due to deficient/leaking, etc. containers.
International Convention for the Safety of Life at Sea, 01-11-1974.	SOLAS	yes, 25 May 1980	yes	Yes	1,4,6	Protects the ecosystem against naval disasters and, consequently, protects indirectly against environmental disasters.
Convention on the International Maritime Satellite Organisation, 03-09-1976.	INMERSAT	yes, 16 June 1979	yes	no	1,4,6	Using navigation regulations, protects the ecosystem against naval disasters and, consequently, protects indirectly against environmental disasters.

Convention / EU legislation	Informal name	Effective internationally (y/n)	Ratified by the Netherlands (y/n)	Embedded in NL legislation (y/n)	Effect in MSFD descriptor(s)	Effect(s) on good environmental status
The Torremolinos International Convention for Safety of Fishing Vessels, 1977.	SFV	no	yes	Yes	1,4,6	Using safety regulations on board larger fishing vessels, protects the ecosystem against naval disasters and, consequently, protects indirectly against environmental disasters.
International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978.	STCW	yes, 28 April 1984	yes	yes	1,4,6	Safety by trained crews on ships can help prevent naval and environmental disasters.
International Convention on Standards of Training, Certification and Watchkeeping for Fishing Vessel Personal, 07-07-1995	STCW-F	Yes	yes	yes	1,4,6	Safety by trained crews on ships can help prevent naval and environmental disasters.
UNESCO						
Convention concerning the Protection of the World Cultural and Natural Heritage, 1972.	World Heritage Convention	yes, 17 December 1975	yes	yes	1,4,6,(7)	Promotes protection of cultural and natural heritage.
Convention on Wetlands of International Importance especially Waterfowl Habitat, 12-02-1971.	RAMSAR Convention	yes, 21 December 1975	yes	yes	1, 10	Mainly birds in territorial coastal waters. Bird protection areas.
Treaty on the Protection of Underwater Cultural Heritage, 2001.		yes	no	no	6	Protection of historic underwater sites, shipwrecks.
UNEP						
UN Framework Convention on Climate Change (UNFCCC, 1992.		yes, 21 March 1994	yes	yes	14	Promotes stabilisation of the greenhouse gas effect and, as such, of the marine environment.
Kyoto Protocol to the UNFCCC, 1992.		yes, 16 February 2005	yes	yes	14	Stabilises the greenhouse gas effect on the marine environment.
Convention on Biological Diversity, 1992.		yes, 29 December 1993	yes	yes	13	Promotes the marine ecosystem and, among others, the sustainable use of biological material (including fish)

Convention / EU legislation	Informal name	Effective internationally (y/n)	Ratified by the Netherlands (y/n)	Embedded in NL legislation (y/n)	Effect in MSFD descriptor(s)	Effect(s) on good environmental status
Cartegena Protocol on Biosafety to the Convention on Biological Diversity, 2000.		yes, 11 September 2003	yes	yes	1,3,4	Counteracts negative effects of biotechnology at sea.
Convention on the Conservation of Migratory Species of Wild Animals, 1979.	Bonn Agreement / CMS	yes, 01 November 1983	yes	yes	1,(4)	Protects migratory animals, e.g. birds.
Convention on International Trade in Endangered Species Wild Fauna and Flora, 1973.	CITES	yes, 01 July 1975	yes	yes	1,2 (indirectly)	Protects endangered species and limits the introduction of non-indigenous species
Basel Convention of the Protection of Transboundary Movements of Hazardous Wastes and their Disposals, 1992.	Basel convention	yes, 05 May 1992	yes	through EU law	1,4,8,9, 10	Protects the marine environment against dumping and waste.
Vienna Convention for the Protection of the Ozone layer, 1985.		yes, 22 September 1988	yes	through EU law	14	Protects the marine environment.
Montreal Protocol to the Vienna Convention on Substance that Deplete the Ozone Layer, 1987.		yes, 01 January 1989	yes	through EU law	14	Protects the marine environment.
Stockholm Convention on Persistent Organic Pollutants, 2001.	Stockholm convention	yes, 17 May 2004	yes	yes	1,4,8,9	Protects the marine environment against the effects of POPs (Persistent Organic Pollutants).
Rotterdam Convention on the Prior Informed Consent Procedure for Hazardous Chemical and Pesticides in International Trade, 1998.		yes, 24 February 2004	yes	through EU	1,4,8,10	Protects the marine environment against hazardous substances.
UNECE						
Convention on Long-Range Transboundary Air Pollution, 1979		yes, 16 March 1983	yes	law	1,4,8	Protects the environment, including the marine environment.
Convention on Environmental Impact Assessment in a Transboundary Context, Espoo Convention or EIA), 1991.		yes, 10 April 1997	yes	yes	1,4,7	Arranges EISs and information and consultation sessions between states for activities at sea.

Convention / EU legislation	Informal name	Effective internationally (y/n)	Ratified by the Netherlands (y/n)	Embedded in NL legislation (y/n)	Effect in MSFD descriptor(s)	Effect(s) on good environmental status
Convention on the Protection and Use of Transboundary Watercourses and International Lakes, 1992.	Helsinki Convention	yes, 06 October 1996	yes	Yes	1,4,8	Focuses on national measures to reinforce the ecological management of transboundary surface water.
Convention on the Transboundary Effects of Industrial Accidents, 1992.		yes, 19 April 2000	yes	Yes	1,4,6,8	Protects the environment in the event of transboundary industrial accidents.
Convention on Access to Information, Public Participation in Decision-making and Access to Justice Environment Matters, 1998.	Aarhus Convention	yes, 30 October 2001	yes	Yes	1,4	Influences the relationship between citizens and government, also in respect of environmental legislation.
Council of Europe						
Convention on the Conservation of European Wildlife and Natural Habitats.		yes, 01 June 1982	yes	Yes	all	Note: provides facilitating actions such as education, etc., for the conservation of flora and fauna.
FAO						
International Plant Protection Convention, 1977.		yes, 04 April 1991	yes	Yes	2	Protects the environment against the introduction of non-indigenous species.
Code of Conduct for Responsible fisheries, 1995. Straddling Stocks.		yes, 11 December 2001	yes	Yes Not directly, but inspires NL and EU policy.	3	Promotes sustainable fisheries.
Environmental Pollution						
International Convention for the Prevention of Pollution from Ships, 1973, modified by protocol of 1978.	MARPOL	yes, 02 October 1983	yes	Yes	1,4,6, 8,10	Seeks to regulate pollution from ships.
International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties (INTERVENTION), 1969.		yes, 06 May 1975	yes	Yes	1,4,6,8	Regulates States' rights to intervene in the case of oil pollution.
Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (LC), 1972.	London Convention	yes, 30 August 1975	yes	Yes	1,4,6, 8,10	Seeks to regulate pollution from ships.

Convention / EU legislation	Informal name	Effective internationally (y/n)	Ratified by the Netherlands (y/n)	Embedded in NL legislation (y/n)	Effect in MSFD descriptor(s)	Effect(s) on good environmental status
International Convention on Oil Pollution Preparedness, Response and Cooperation, 1990.	ORPC	yes, 13 May 1995	yes	Yes	1,4,6, 8	Regulates the collaboration between parties and Member States in the case of environmental disasters.
International Convention on the Control of Harmful Anti-Fouling Systems on Ships, 2001	AFS	yes	yes	Yes	1,2,4,6, 8	Protects the environment by banning anti-fouling systems, etc., which is related to the supply of non-indigenous species.
International Convention for the Control and management of Ship's Ballast Water and Sediments, 2004.	Ballast water convention	no	yes	Yes	2	Protects the environment against the introduction of non-indigenous species.
Liability (there are more of these under IMO)						
Convention relating to Civil Liability in the Field of Maritime Carriage of Nuclear Material,17-12- 1971.	NUCLEAR	yes, 15 July 1975	yes	no	1,4,6	Regulates liability for damage resulting from the transport of nuclear material.
Convention on Limitation of Liability for Maritime Claims, 1976.	LLMC			Yes	1,4,6	Regulates liability for damage depending on freight tonnage.
Regional maritime conventions						
Convention for the Protection of the Marine Environment of the North-East Atlantic, 1992.	OSPAR	yes, 25 March 1998	yes	yes	all	Promotes the entire marine ecosystem by providing, among other things, a legal framework.
Agreement for Cooperation in Dealing with Pollution of the North Sea by Oil and other harmful Substances, 1983.	Bonn Agreement	yes, 01 October 1989	yes	yes	1,4,6,8	Regulates location and collaboration between countries in the case of oil and other pollutions.
Agreement on the Conservation of Seals in the Wadden Sea, 1990. Part of the Bonn Agreement	Agreement on seals in the Wadden Sea	yes, 01 October 1991	yes	yes	1	Contributes to the biodiversity and conservation of the species.
Agreement on the Conservation of Small Cetaceans, 1992. Part of the Bonn Agreement.	ASCOBANS	yes	yes	yes	1	Contributes to the biodiversity and conservation of the species.

Convention / EU legislation	Informal name	Effective internationally (y/n)	Ratified by the Netherlands (y/n)	Embedded in NL legislation (y/n)	Effect in MSFD descriptor(s)	Effect(s) on good environmental status
Agreement on the Conservation of African-Eurasian Migratory Waterbirds,15-08-1996. Part of the Bonn Agreement.	EAWA	yes	yes	yes	1	Contributes to the biodiversity and conservation of the species.
Miscellaneous						
28-04-1989 IMO Salvage	SALVAGE	yes	yes	yes	1,4,6	Regulates rewards for minimising damage to the environment in the case of naval accidents.
Nairobi International Convention on Removal of Wrecks, 2007.		no	yes	yes	1,4,6	Regulates the removal of shipwrecks that have a negative effect on the environment.
International Maritime Dangerous Goods Code.	IMDG Code			yes	4, 8, 9	Protects the marine environment against the risk of occasional pollution by hazardous substances.
EU legislation						
Commission Regulation (EC) no. 1881/2006		yes	yes	yes	4, 9	Protects the marine environment against pollution in general and, more specifically, commercially exploited fish and other sea food for human consumption.
Commission Regulation (EU) no. 1259/2011		yes	yes	yes	4, 9	Protects the marine environment against pollution in general and, more specifically, commercially exploited fish and other sea food for human consumption.
Commission Regulation (EC) no. 396/2005		yes	yes	yes	4, 9	Protects the marine environment against pollution in general and, more specifically, commercially exploited fish and other sea food for human consumption.
Council Regulation (Euratom) no. 3954/1987		yes	yes	yes	4, 9	Protects the marine environment against pollution in general and, more specifically, commercially exploited fish and other sea food for human consumption.

Convention / EU legislation	Informal name	Effective internationally (y/n)	Ratified by the Netherlands (y/n)	Embedded in NL legislation (y/n)	Effect in MSFD descriptor(s)	Effect(s) on good environmental status
EU Commission Decision 2010/477/EU		yes	yes	yes	all	Protects the marine environment against pollution in general and, more specifically, commercially exploited fish and other sea food for human consumption.
EC Council Regulation 2371/2002		yes	yes	yes	3	Promotes sustainable fisheries
EU Commission Decision 2009/40		yes	yes	yes	1	Protects endangered shark species
Council Directive 2000/60/ (WFD)	Water Framework Directive				5, 8, 9	Protects, among others things, the marine environment against pollution and eutrophication
Directive 2006/7/EC	Bathing Water Directive				5, 8	Helps to protect the marine environment against pollution
Council Directive 2008/56/ EC (MSFD)	Marine Strategy Framework Directive	yes	yes	yes	all	Concerns complete protection of the marine environment
Council Directive 79/409/ EEC, 1979	Birds Directive	yes	yes	yes	1 , 6	Protects biodiversity/ species
Council Directive 92/43/ EEC, 1992	Habitats Directive	yes	yes	yes	1, 6	Protects biodiversity / species and habitats

Appendix 2 International coordination of Marine Strategy

Following acceptance of the Marine Strategy Framework Directive in 2008, the Netherlands took the initiative within OSPAR to raise the discussion on how the structure and working methods of the OSPAR Commission could be improved and adjusted. The aim was to be able to meet the Directive's requirement that Member States coordinate implementation within the relevant regional marine conventions and also collaborate with third party countries on that. The OSPAR ministerial meeting of 23-24 September 2010 held in Bergen, Norway, concluded agreements on this, which has resulted in a regrouping of the theme committees and a new OSPAR Coordination Group. This Coordination Group supervises and heads the 'horizontal' subjects, such as collaboration on and harmonisation of implementation of the MSFD. The Netherlands advocated this and developed many initiatives, including some relating to the formulation of the *OSPAR Quality Status Report 2010.* In 2010 and 2011, the Netherlands organised workshops on coordination regarding litter at sea, and on biodiversity indicators and monitoring, which are subjects that are under a great deal of development. Previously – in 2009 – a workshop was held in the Netherlands on the ecosystem assessment of cumulative effects of human activities at sea.

Another process of relevance to international coordination is the establishment of the *Common Implementation Strategy* (CIS) of the European Commission and the Member States of the MSFD. This process is headed by the informal meeting of Marine Directors of the EU. The strategic marine coordination group and the working parties that report to it ensure coordination between the 27 Member States of subjects relevant to the implementation of the Directive. Activities are primarily aimed at a common understanding of establishing good environmental status, the environmental targets and the reports to the European Commission, and at performing socio-economic analyses. Knowledge development and monitoring are other key subjects for future steps towards the implementation of the Directive. The Netherlands has been active in all these areas in the EU CIS groups, earmarking manpower and money for channeling policy developments on such subjects as underwater noise and litter.

In addition, the EU makes formal decisions in the regulatory committee under Art. 25, MSFD, in which the Netherlands, applying a *risk-based approach,* made a key contribution to detailing the concept of good environmental status.

The overview below outlines the most important steps taken in both international frameworks to which the Netherlands made an active contribution.

Period	Action
June 2008	Prompted by a workshop initiated by the Netherlands in May 2008, the OSPAR Commission decided to launch a process for reviewing the OSPAR structure and method with a view to the coordinated implementation of the MSFD.
May 2009	Establishment of the EU *Common Implementation Strategy* supervised by the informal meeting of Marine Directors.
September 2010	OSPAR ministerial meeting in Bergen, Norway. Adoption of the ministerial declaration and the *North-East Atlantic Environment Strategy*, and adjustment of the OSPAR Commission's working structure to act as a platform for international coordination of the implementation of the MSFD in the marine region and subregion[235]. Publication of the *OSPAR Regional Implementation Framework for the EU Marine Strategy Framework Directive, MSFD Road Map.* Publication of the OSPAR Quality Status Report 2010, partly as a basis for the coordination of MSFD initial assessments of current environmental status to be performed by countries. EU: Adoption of the Commission Decision criteria and methodological standards for describing good environmental status, including a framework for applying the criteria.
October 2010	First meeting of the OSPAR Coordination Group (CoG) and Intersessional Correspondence Group MSFD with a view to organizing the work for international coordination.
June 2011	OSPAR: Development by committees and working parties, and reporting via CoG to OSPAR Commission of advice documents on methods for describing good environmental status, establishing environmental targets, and selecting the associated indicators. EU: Report to the Marine Directors on a guideline for methods of economic and social analysis needed for the initial assessment of the state of the marine environment.
August – December 2011	Informal bilateral coordination with neighbouring countries Belgium, Germany and the United Kingdom on the Dutch Marine Strategy that was being developed and the strategies of our neighbouring countries.
December 2011	OSPAR: Provisional completion of advice documents for all qualitative descriptors for describing good environmental status, establishing environmental targets, and selecting the associated indicators.
February – March 2012	Completion of first coordination round between OSPAR Contracting Parties about descriptors of good environmental status and environmental targets with associated indicators. EU: Adoption by the Marine Directors of a guideline for a common understanding of the initial assessment, the description of good environmental status and the establishment of environmental targets (Articles 8, 9 and 10, MSFD). Finalisation of the above-mentioned OSPAR advice documents and first steps toward a coordinated 'high level' text for describing good environmental status at marine region level. Also: first steps towards further efforts in OSPAR in the second implementation round of the MSFD in 2012-2018.
June 2012	OSPAR report on the results of regional coordination of implementation of the MSFD.[236]

[235] OSPAR Commission, *Bergen Statement, §§ 11- 13. Strategy of the OSPAR Commission for the Protection of the Marine Environment of the North-East Atlantic2010–2020, Agreement 2010-3* (2010), § 3, §§ 13- 14.

[236] OSPAR Commission, *Finding Common Ground - towards regional coherence in implementing the Marine Strategy Framework Directive in the north-east Atlantic region through the work of the OSPAR Commission* (London, 2012)

Appendix 3 Overview of participatory process

There are three participants to the participatory process for establishing the Marine Strategy Part I:

1. The stakeholders
2. The citizens
3. The public participants

Participation per group is described in brief below.

Re 1 The stakeholders
The parties involved in the North Sea are officially represented in the Overleg Infrastructuur en Milieu (OIM, a consultative body on Infrastructure and the Environment, called Overlegorgaan Water en Noordzee [Consultative Body on Water and the North Sea] until 2011), a nationwide consultative body of stakeholders in issues related to water and the North Sea, of which the Ministry of Infrastructure and the Environment acts as secretary. Once a year, stakeholders provide advice on MSFD products in the regular OIM meeting. This advice is presented to the State Secretary.
In March 2010, the OIM requested applications for a MSFD core group, with stakeholders who wanted to hone in on the details and discuss the establishment of the initial assessment, good environmental status, environmental targets and indicators. This core group has met seven times since 6 May 2010 to discuss the progress, products and policy of the Marine Strategy. This process was aimed at *joint fact-finding* during the formulation of the Deltares and IMARES scientific recommendations for the different components of the Marine Strategy Part I, and at proper coordination during formulation of the Cabinet's decision. The stakeholders represent all of the North Sea sectors: fisheries, shipping, nature and the environment, hydraulic engineering, the offshore industry and leisure activities. Three brainstorming workshops on initial assessment and good environmental status were also held in 2010 to allow experts with optimum knowledge and expertise to discuss these issues. Where necessary, bilateral consultations were held with individual stakeholders.

Re 2 The citizens
The Kust Zee association is a collaborative venture of the Dutch and Belgian members and member organisations of the European *Coastal Marine Union* (EUCC). Kust Zee is committed to a rich, healthy and attractive coast and sea for people and nature alike, where conservation, use, management and development go hand in hand. On behalf of the Ministry of Infrastructure and the Environment, the association looks after the exhibition about the MSFD at the Scheveningen Pier. The subject alternates every two months. Films are made and special film evenings organised about these subjects. During holidays, special theme days are organised, such as a beach cleaning day in the summer or a sustainable Christmas market. The exhibition also has permanent elements and there is plenty of educational material for children.
TNS-NIPO conducted a survey on citizens' perception of the North Sea. The study *Beleving van de Noordzee: Een kwantitatieve consultatie onder Nederlandse burgers over de Noordzee* [Perception of the North Sea, a quantitative consultation of Dutch citizens regarding the North Sea] surveyed

600 citizens, whose knowledge of and affinity with the North Sea were examined in a random sample. They were also presented with various environmental problems and asked to prioritise possible solutions and their consequences.

Re 3 The public participants
As of 25 May through 5 July 2012, the Marine Strategy was made available to the public for inspection for a period of six weeks. During this process, citizens and neighbouring countries have the opportunity to peruse the document and submit their opinion on the Marine Strategy, if they wish.

The meetings/events that have taken place as part of this process to date are stated below. If a report on an event is available, this is indicated in the last column.

Agenda		
Date	**Meeting / event**	**Report**
19-01-10	Workshop on the initial assessment	R
03-03-10	Regular OWN: proposal for OWN core group	R
06-05-10	OWN core group discussion of comments on Deltares/IMARES IB advice	R
06-07-10	OWN core group discussion of comments on Deltares/IMARES IB advice	R
27-09-10	2nd GMT workshop	R
25-11-10	OWN core group: discussion of Deltares/IMARES GMT advice	R
27-01-11	Regular OWN: discussion of Marine Strategy and economic analysis	R
11-03-11	OWN core group discussion of Marine Strategy and economic analysis	R
01-05-11	Opening MSFD exhibition on Scheveningen Pier	
26-05-11	OWN core group: discussion of Deltares/IMARES IB and GMT advice	R
02-09-11	Publication of TNS-NIPO report Beleving van de Noordzee	R
22-09-11	OWN core group: discussion of Marine Strategy version 1	R
18-11-11	OWN core group: discussion of Marine Strategy version 2	R
29-02-12	Regular OIM: discussion of draft Marine Strategy	R
25-05-12 – 06-07-12	Public Consultation on Cabinet endorsed concept Marine Strategy Part I	R

Appendix 4 Initial assessment in neighbouring countries

Belgium[237, 238]

Compared to the Netherlands part of the North Sea (over 57,000 km2) the Belgian part of the North Sea is small (3,454 km2). Very busy international shipping lanes are typical of the open Belgian part of the North Sea, which is also intensively used for port activities, wind farms, fisheries, sand and gravel extraction, mariculture, dredging and depositing dredging sludge, military activities, pleasure boating, etc. The maximum depth is 45 m and the seabed consists of sediment in elongated sandbanks, with some shell and gravel banks. The coastal water is influenced by the rivers Seine, Scheldt, Rhine and Meuse.

The benthic communities of the sedimentary sea beds display major annual changes. In the past two decades, the introduction of non-indigenous species has brought about major shifts in the composition of the benthos. Gravel banks have always had a high biodiversity. Seabed-disrupting human activities have brought about considerable changes in species composition. Artificial hard substrates such as coastal defenses and wind turbine poles are home to a (deteriorated) representation of species of the French and English Channel coasts.

Nutrient levels exceed the OSPAR assessment values, although phosphate has dropped significantly. A reduction in nitrogen levels will have to result from the further reduction of supply from land, based on existing policy. According to OSPAR criteria, the coastal waters of the Belgian North Sea constitute a eutrophication problem area due to high algal concentrations.

The concentrations of a large number of chemicals in the water of the Belgian North Sea are below the limit values; exceptions are TBT and some PAHs. As for sediment, the status for 86% of the substances measured are favourable and 14% unfavourable. In 55% of the cases, no trend is visible; in 38%, there is a clear downward trend. For marine organisms, the status for 64% of the substances measured is favourable and 36% unfavourable. In 86% of the cases, no trend is visible, and for the six PCBs, there has been a decrease in the concentrations in flounder muscular tissue. There is clearly a downward trend in the observed supply of hazardous substances. Illegal dumping of hydrocarbons by ships has halved over the past ten years.

Fishing is mainly done using beam trawls and focuses mainly on flatfish species. Fishing has decreased in the past few decades. While there is a recovery plan for cod, the Belgian fishing fleet only fishes a fraction of its quota

[237] Federal public service. Public health, safety of the food chain and the environment. *Initial assessment for Belgian marine waters. Marine Strategy Framework Directive – Art. 8, paragraphs 1a 1b* (Brussels, 2012).

[238] Federal public service. Public health, safety of the food chain and the environment. *Socio-economic analysis of the use of Belgian marine waters and costs related to the degradation of the marine environment. Marine Strategy Framework Directive – Art. 8, paragraph 1c* (Brussels, 2012).

as by-catch. Anadromous fish on the Habitats Directive list have greatly declined in Belgian waters, mainly as a result of problems in the rivers.

The Belgian coast has been impacted too much to house any seal colonies, although common and grey seals can be found in Belgian waters. Harbour porpoise numbers have increased in the past few decades. By-catches in gill nets are considered the main human threat to this species.

Fish-eating seabirds that are not dependent on fishing waste increased between 2005 and 2008, which is indicative of the greater availability of prey fish.

Some hundred non-indigenous species have been identified in the Belgian coastal waters. Four species appear to be truly invasive species that are dominant in today's marine coastal habitats: the Atlantic jackknife clam Ensis directus, the Pacific oyster *Crassostrea gigas,* the Australasian barnacle *Elminius modestus* and the common slipper shell *Crepidula fornicata.*

Human activities that have been attributed with having had a great impact on the quality of the ecosystem are mainly bottom-disturbing activities such as fisheries, aggregate extraction, the dredging and deposition of dredging sludge, and artificial hard substrate, such as wind farms. Incidentally, these wind farms also have positive effects on the productivity and biodiversity of the ecosystem.

United Kingdom[238]

The marine area of the United Kingdom is large (867,400 km2) and very varied physically, chemically and biologically. In general, current knowledge is insufficient. The initial assessment is based on the national area evaluation *Charting Progress 2*. The marine area has been divided into eight subregions.

Fish stocks have improved due to a reduction in fisheries pressure, but most stocks are not at a safe level yet. Sensitive species such as cartilaginous fish, deep sea fish and migratory fish are under pressure in particular. Marine mammal populations are relatively stable. Most species of seabird have benefited from the protective measures put in place in the second half of last century. However, the breeding success of a number of species that forage far offshore is declining due to a number of factors.

The effects of various human activities on seabed habitats, especially sediment, are widespread. The intensity of the activities has not changed very much over the past decade. Plankton is being impacted more by temperature increases than by direct human interventions.

Some sixty non-indigenous species have settled in the waters of the United Kingdom; it is not clear what percentage of them is having a significant impact on the quality of the ecosystem.

Eutrophication is limited to some smaller areas, which are, incidentally, subject to measures to reduce the problem.

Concentrations of hazardous substances have generally dropped, but are often still above the assessment values in coastal areas, and risks to organisms cannot be ruled out. These are usually historic contaminations, but new synthetic substances can also be found. Monitoring the concentrations over time is needed to be able to signal that additional measures are needed, where appropriate. Production platforms dumping oil has decreased due to measures concerning production water. Inadvertent dumping does not happen often and major dumping necessitates cleaning campaigns. Litter on the beach is considered a problem. Relatively little is known about waste on the seabed and in the water column, even though accumulations are found as a result of currents and wind.

Too little is known about underwater noise to make a proper assessment. Increased construction activity at sea has led to a higher impulse noise impact. There is no information on whether background noise has changed along with changes in the intensity of ocean shipping.

Germany[239]

The German part of the North Sea covers a surface area of 41,300 km2, which is smaller than the Dutch part. This part of the North Sea has geomorphological similarities with the Dutch part and is also used intensively. The German part of the Wadden Sea is governed by the MSFD; the Dutch part is not.

The German initial assessment is based on current reports under the BHD, WFD, OSPAR and *Trilateral Wadden Sea Cooperation.* Given the knowledge gaps, these do not cover all aspects of the requested status assessment under the MSFD. A semi-quantitative and descriptive assessment of

[239] HM Government, *UK Initial Assessment and Proposals for Good Environmental Status,* Marine Strategy Framework Directive consultation (London, 2012).

[240] Die Bundesregierung, *Umsetzung der Meeresstrategie-Rahmenrichtlinie RICHTLINIE 2008/56/EG zur Schaffung eines Ordnungsrahmens für Maßnahmen der Gemeinschaft im Bereich der Meeresumwelt (Meeresstrategie-Rahmenrichtlinie). Entwurf Anfangsbewertung der deutschen Nordsee, nach Artikel 8 Meeresstrategie-Rahmenrichtlinie. Stand 14.10.2011* (Bonn, 2011).

the current status has been made: overall the German part of the North Sea does not yet achieve good environmental status.

Except for the mud flats, none of the protected areas have a favourable conservation status, which is mainly as a result of the effects of bottom trawling and nutrient enrichment.

The German part of the North Sea is considered a problem area or a potential problem area in terms of eutrophication caused by the supply of nutrients. The concentrations of hazardous substances, as well as biological disturbance are still too high. Climate change belongs to the main pressures on phytoplankton, zooplankton and fish stocks. No scientifically substantiated assessment framework is available for the status of zooplankton.

As a result of nutrient loads and bottom trawling, macrophytes in the coastal waters, particularly seagrass fields, do not display their natural extensions.

According to the assessment of the WFD, macrozoobenthos is predominantly qualified as 'moderate'. Of the Red List species, 15.7% are endangered or have disappeared altogether. It is difficult to attribute changes to separate individual causes. Enrichment with nutrients and bottom trawling are the main pressures.

The status of many commercially exploited fish stocks and Red List species is unfavourable or poor. The age and size distribution of some commercially exploited stocks does not meet the requirements of good environmental status. Fisheries, climate change and nutrient enrichment have the most impact on the scope and distribution of the development of fish stocks and composition and distribution of fish species.

Depending on the review framework used, the population size of seals has been deemed as 'good' or 'moderate'; that of harbour porpoises as 'moderate'. Populations are increasing. Fisheries, hazardous substances and underwater noise are considered key pressures on the populations.

Only the TWSC has a framework for assessing seabirds, and they have been given a predominantly 'poor' rating. Fisheries, shipping, litter and hunting are key impacts.

Non-indigenous species and microbial pathogens cannot be assessed at the moment.

Appendix 5 Exceptions for military activities and national security[241]

Article 2 of the MSFD outlines the scope of the Directive. The second paragraph includes an exception for 'activities, the sole purpose of which is defence or national security', such as the operations by Royal Navy warships. This exception for warships in the European Marine Strategy Framework Directive is based on the UN Convention on Law of the Sea, under which warships have immunity. The Netherlands can, for example, not impose any requirements on foreign warships. This immunity for warships has been internationally endorsed and is embedded in relevant European shipping directives and regulations.
However, the said exemption is not a complete exemption: Member States shall 'endeavour to ensure that such activities are conducted in a manner that is compatible, so far as reasonable and practicable, with the objectives of this Directive'. This means that the objectives of the Directive are also taken into account for military activities. In so far as reasonable and practicable, appropriate measures are taken that do not hinder the operational options of navy vessels or Defence operations.
In terms of the national implementation of the Directive, interpretation of the requirement 'so far as reasonable and practicable' is formally left to the Ministry of Defence, as is the case with implementation of MARPOL, for example. Such policy freedom is important for the MARPOL Convention, which includes technical requirements for ocean-going vessels, because the construction and rigging of a warship is quite simply subject to different requirements than the construction and rigging of a merchant vessel; a warship has to be fast and manoeuvrable, and often has a large crew and a lot of military equipment and weapons on board. This is of particular importance for smaller units such as minesweepers and submarines. In addition, in some areas and for some operations, it may not always be possible to call into a nearby port, so flexibility and the freedom to assess are key. Given the arguments above, this applies both in times of war and in peacetime. Incidentally, this distinction is becoming increasingly blurred, what with all the surveillance operations, embargo enforcements, anti-piracy and other operations, including the related exercises.
On land, Defence uses and manages large areas, partly nature reserves. Defence manifests itself as a good administrator of these areas. At sea, where it is important that the training grounds of the Royal Navy and the Royal Airforce remain intact, Defence will also deal with the environment with due care. Exceptions can only be applied for Defence activities for weighty reasons if the objectives of this Directive are incompatible with Defence's operational activities. In practice, this means that, during military exercises and basically all operations, warships refrain from dumping any materials that are not allowed under the MARPOL Convention. It would also not make much sense to only include civil engineering activities such as pile-driving and seismic surveys when monitoring the environmental impact of, say, theme 11 'loud impulse underwater noise' and selectively ignore some of the impact (such as marine sonars and explosive clearance). These last two

[241] Ministry of Defence, *Defensie Duurzaamheidsnota* [Defence Sustainability Memorandum] (2009).

activities are subject to legislation to ensure that they are carried out in a sound manner. The Ministry of Defence invests in knowledge to safeguard future responsible use.

Colofon

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