Marine Strategy (part 1)

Update of current environmental status, good environmental status, environmental targets and indicators

2018-2024

MAIN DOCUMENT

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MINISTRY OF INFRASTRUCTURE AND WATER MANAGEMENT
MINISTRY OF AGRICULTURE, NATURE AND FOOD QUALITY

Summary

The EU Marine Strategy Framework Directive (MSFD) entered into force in 2008. The MSFD obliges Member States to achieve and/or maintain good environmental status of their marine waters and to take measures to meet the established targets. The directive provides that Member States must describe how they will implement the MSFD in practice in three documents. The Dutch Marine Strategy Part 1 describes the current environmental status, the good environmental status to be achieved and the targets that have been set to achieve or maintain good environmental status. The Marine Strategy therefore establishes the framework for sustainable use of marine waters, within the constraints of the ecosystem and taking into account international and European regulations. Part 1 also contains indicators for measuring the extent to which the current situation deviates from good environmental status. Part 1 of the Marine Strategy was drafted in 2012 and covers the period 2012-2018. This document is an updated version of Part 1, covering the period 2018 to 2024. In addition to revising the information about the current status, it also indicates whether additional policies or measures are needed.
Parts 2 and 3 of the Marine Strategy contain the monitoring programme and the programme of measures, respectively. These documents will be updated in 2020 and 2021, respectively.

The principal findings of Marine Strategy Part 1 2018-2024 are:

- Good environmental status is coming closer.
- Existing policy will lead to a significant decline in the pollution of the marine environment, growth of commercial fish stocks, an increase in the number of marine mammals and a decline in the number of new non-indigenous species.
- Continuation of existing policy will have to be accompanied by measures to address gaps in knowledge and uncertainties.
- Future developments such as the construction of new wind farms and climate change could have an impact on the environmental status. Wind farms could also create opportunities for restoring the ecosystem.
- Efforts to achieve good environmental status are mainly – or even exclusively – effective when they are the result of international cooperation and coordination.

Closer to good environmental status
The updated Marine Strategy Part 1 provides a more precise definition of good environmental status and the associated targets than was possible in 2012. Consequently, it has also been possible to formulate more precise environmental targets and establish more clearly the contribution that measures have made to meeting the targets. The assessment of the current environmental status in the Netherlands' part of the North Sea shows that the main objective, achieving good environmental status, has come closer to being met.

The criteria for good environmental status have not all been formulated more precisely in the updated Marine Strategy Part 1, generally because of a lack of knowledge or scientific underpinning. Uncertainties lead to knowledge assignments, and could eventually also lead to additional policy assignments.
A policy assignment has also been formulated in the Marine Strategy for some aspects of good environmental status that have not yet been clearly circumscribed. For example, it has not yet been established what criteria an internationally representative and coherent network of protected areas must meet, although the measures for attaining them, such as the designation of protected areas and the adoption of measures to protect valuable areas and vulnerable species, are known.

The results of existing policy

Contaminants
Good environmental status is within reach as far as contaminants are concerned. The concentrations of substances that cause eutrophication and pollution in the Netherlands' part of the North Sea are now so low that they no longer harm organisms. This situation is stable, and the concentrations of some substances are still declining. Continuation of existing policy will be sufficient to maintain the status quo. The effects of earlier discharges of some hazardous substances persist for a long time. Permanent attention is required for new substances, including the residues of medicines, and the increased use of copper-containing paint on ships.
The levels of hazardous substances found in fish, fish products and shellfish are below the standards prescribed in national and international legislation. Good environmental status has already been reached on this aspect thanks to the current legislation.

Litter
Another positive development is that less litter washed up from the sea is being found on Dutch beaches in the annual survey. The quantity of plastic in the stomachs of fulmars found washed up on Dutch beaches is also declining. However, efforts to further reduce the volume of litter are continuing unabated because litter does not belong in the sea. Among other things, the Netherlands is working at EU and OSPAR level on measures to reduce the quantity of microplastics in the marine environment.

Commercial fish stocks
A quarter of the commercial fish stocks meet the assessment criteria 'maximum sustainable yield' and 'spawning stock biomass'. The situation is steadily improving, but not enough to qualify as good environmental status. Continuous efforts are required under the Common Fisheries Policy. There are no suitable reference values for assessing the composition of the fish stocks (measured by size classes). It is therefore not yet possible to establish what constitutes good environmental status in relation to this aspect.

Marine mammals
The populations of porpoise and grey seals are gradually increasing, but their numbers are not yet large enough to speak of a favourable conservation status, and hence of good environmental status. The effects of underwater noise on marine mammals have been contained by conditions laid down in Wind Farm Site Decisions for new wind farms.

Non-indigenous species
The number of non-indigenous species entering the Netherlands' part of the North Sea is declining. The entry into force of the Ballast Water Management Convention in September 2017 will reinforce that trend. Most of the non-indigenous species that are already to be found in the North Sea will not disappear. In view of the small number of new species appearing, good environmental status appears to have been achieved.

Addressing gaps in knowledge and uncertainties

Noise
In recent years much progress has been made in terms of knowledge development and monitoring of underwater noise. A number of specific measures have also been taken. There is still insufficient knowledge to definitively determine threshold values for impulsive noise. Based on the research that has been conducted, however, conditions to restrict noise have been laid down in the Wind Farm Site Decisions for the construction of offshore wind farms in order to minimise the cumulative effects on harbour porpoises and other marine animals. In addition to this, the Ministry of Defence has made adaptions in its activities. The Netherlands is coordinating the the implementation of a joint monitoring programme to enable the assement of continuous sound.

Protected areas
The Netherlands' seabed is still substantially disturbed. At the moment, it appears that in particular the numbers of the long-living, vulnerable species are smaller than they should be and that there is also insufficient biodiversity.
The Netherlands has taken some important steps to protect the most valuable areas of the marine ecosystem. For example, Natura 2000 areas have been designated and management plans and seabed protection measures have been adopted. Proposals have been discussed with neighbouring countries to restrict or prohibit bottom fishing in those areas. These proposals will be submitted to the European Commission for adoption in an EU Regulation.
At international level, the Netherlands is helping to develop indicators for determining the disturbance of the seabed which could be used for a regional assessment of benthic habitats. With the national benthos indicator, good environmental status can be defined more precisely and the effect of existing or planned protective measures can be established.

Sharks and rays
The status of shark and ray stocks is still a concern, but there are some early signs of recovery. Good environmental status is impossible to determine because of knowledge gaps, but there is clearly still a long way to go. In anticipation of more specific targets, a Shark and Ray Action Plan has been drawn up providing for further research and mitigating measures.

Seabirds
Worryingly, the situation is not good for all seabirds. Above all, the breeding success of seabirds has been low in recent years. It is not yet clear how good environmental status can be achieved. The reasons for the downward trend have not yet been identified. This is therefore a knowledge assignment that could also lead to an additional policy assignment.

Future developments
Future developments could put additional pressure on efforts to meet environmental targets and to achieve and/or maintain good environmental status. The enlargement of the area devoted to wind farms by the Netherlands and other North Sea countries could affect environmental status. Plans for the construction of wind farms are assessed for their cumulative effects for marine mammals, birds, bats and underwater habitats. This is another knowledge assignment, which is being addressed in the Offshore wind energy ecological programme (Wozep).
The consequences of climate change and the acidification of the North Sea represent another knowledge assignment. The physical changes to the North Sea could have effects for the ecosystem and biodiversity. There could be an additional (international) policy assignment at a later stage. Constant assessment of the North Sea environment and of the programme of measures will remain necessary. The MSFD's six-year cycle allows for that.

The government has started preparing a North Sea Strategy 2030 for the post-2020 period. The framework for the policy is derived from the long-term scenarios of the Netherlands' Environmental Assessment Agency (PBL). The North Sea Strategy 2030 is one of the building blocks of the National Environmental Planning Vision to be published in 2019. In the context of that document, the Marine Strategy establishes the framework for a healthy sea that is used sustainably. In view of their interconnectedness, the North Sea Strategy 2030 and the updated Marine Strategy Part 1 have been drafted simultaneously, and harmonised wherever possible.

International cooperation is crucial
The EU Member States collaborate in the regional implementation of the MSFD. To this end, under the auspices of OSPAR and ICES a wide range of common indicators and/or criteria has been drawn up. The next step is to reach agreement among the North Sea countries on joint or individual measures to address transnational environmental problems. This will

require the North Sea countries to formulate joint targets on issues such as litter, underwater noise and cumulative effects. The OSPAR countries have already drawn up a joint action plan to tackle litter and protect species and habitats covered by the convention. Work is proceeding on a joint programme of monitoring and research into acidification and cumulative effects. Cooperation is also required in drafting a uniform definition of the concept ‘a coherent and representative network of protected marine areas’.

1. Introduction

1.1 The Marine Strategy

The Netherlands' part of the North Sea extends from the coast to the external boundary of the Netherlands' Continental Shelf and encompasses an area of approximately 58,000 km^2, roughly a tenth of the total area of the North Sea. The Netherlands benefits from a safe, clean, heathy and ecologically diverse North Sea that helps to meet economic and social needs. The sea can only make an optimal contribution to these needs with a further recovery and increase in its natural resilience.

The European Marine Strategy Framework Directive from 2008 (MSFD [1]) obliges Member States to draw up a strategy for establishing and/or maintaining good environmental status in their marine waters in 2020 in order to allow their sustainable use. There are three parts to the Netherlands' Marine Strategy. Part 1 describes the current environmental status, good environmental status and the environmental targets, together with associated indicators, for the Netherlands' part of the North Sea [2]. Accordingly, the Marine Strategy establishes the framework for sustainable use of the waters, within the constraints of the ecosystem and taking into account international and European regulations. Parts 2 and 3 contain the related monitoring programme [3] and programme of measures [4].

The third part of the Marine Strategy was adopted by the government at the end of 2015 as part of the National Water Plan 2016-2021 and the associated Policy Document on the North Sea 2016-2021. This marked the completion of the first six-year MSFD cycle. Meanwhile, work also began on implementation of the proposed measures and on the monitoring of environmental status. The second cycle must be completed by 2024. The directive provides that the Member States must update the three parts of their Marine Strategy in the intervening period.

This Marine Strategy Part 1 is the update of the 2012 version pursuant to Article 17 of the MSFD. Part 1 implements Articles 8, 9 and 10 of the directive (see appendix III). The government must adopt Part 1 of the Marine Strategy again by 15 July 2018 and then report on it to the European Commission within three months as the first step in preparation for the programme of measures in 2021.

1.2 Purpose and context

The Marine Strategy Part 1 sets out the government's vision on the further implementation of the MSFD. The document also contains an analysis of the effectiveness of current and future policies for the North Sea, on the basis of which any necessary supplementary policies are formulated and the priorities for the programme of measures are defined. Part 1 also contains an outline survey of the knowledge and monitoring assignments up until 2024, the year in which Part 1 of the Marine Strategy will be updated again.

Policy framework

The North Sea Policy Document 2016-2021 [5] (part of the National Water Plan 2016-2021 [6]) contains the national policy framework for the Marine Strategy. The Netherlands' integrated North Sea policy encompasses all the targets and ambitions for the Netherlands' part of the North Sea. The ecosystem approach and the precautionary principle are important points of departure for the integrated policy. The measures in the first MSFD cycle are laid down in the Marine Strategy Part 3, an abridged version of which is incorporated in the Policy Document on the North Sea.

Long-term strategy
The government is preparing a North Sea Strategy for the period until 2030. The strategic assignments in these areas were formulated in 2017. They are 'sustainable energy provision', 'a future-proof food supply' and 'a healthy and vigorous natural environment'. Because of the connection between the North Sea Strategy 2030 and the updated Marine Strategy, they have been drafted simultaneously, and harmonised wherever possible. The North Sea Strategy 2030 is one of the building blocks of the National Environmental Planning Vision to be published in 2019. The Marine Strategy Part 1 establishes the framework for the drafting of the North Sea Strategy and National Environmental Planning Vision.

International context
The status of the marine environment is not determined by purely national factors and the MSFD accordingly obliges the Member States to adopt a regional approach (Article 5(2) and (6) of the MSFD).The directive therefore assigns a major role to the regional sea conventions, such as OSPAR[1]. Accordingly, the current environmental status was assessed in the regional context of the OSPAR *Intermediate Assessment* in 2017 [7]. Wherever possible, jointly established criteria and indicators have been used in updating the environmental status of the Netherlands' part of the North Sea. Where information specific to the Netherlands was necessary and available, it was included in the assessment.

As required by the MSFD, the policies, preconditions and ambitions in relation to the various policy areas of relevance for good environmental status have been taken into account in updating the Marine Strategy Part I. Wherever necessary to achieve and/or maintain good environmental status the Marine Strategy supplements those policy frameworks, the principal ones in this context being the Common Fisheries Policy [8], the Water Framework Directive [9], the Birds Directive [10], the Habitats Directive [11], the OSPAR Convention [12] and the Biodiversity Convention [13].

The United Nations' Sustainable Development Goals [14] include a specific target for 2030 with regard to the sustainable use and the protection of our oceans and seas (SDG14 '*Life below water*').

Assessment by the European Commission in 2014
In 2014 the European Commission assessed the Netherlands' Marine Strategy Part 1 (pursuant to Article 12 of the MSFD) and made recommendations for further action [15]. These recommendations formed an important starting point for this update, as did the recently adopted Commission Decision[2] [16] clarifying the criteria and methodological standards for determining good environmental status of marine waters. Wherever possible, the criteria laid down in that Decision have been followed in the update.

The following list contains the European Commission's recommendations accompanied by a brief explanation of how the Netherlands has addressed them.

- *Recommendation: improve the methodology of socio-economic analysis so that the degradation and restoration costs and the cost-benefit analysis prescribed by the framework directive can be assessed.*
  In accordance with the EU's guidance document, the Netherlands has used the 'cost based approach' [17] to identify the costs of degradation and restoration. A survey was also carried out to quantify ecosystem services. Cost-benefit analyses are not part of Marine Strategy Part 1 (on the grounds of Article 8 of the MSFD), but have been performed for Part 3, the programme of measures.

[1] Convention for the Protection of the Marine Environment of the North-East Atlantic (https://www.ospar.org/)
[2] Modification of Commission Decision 2010/477/EU adopted in 2010.

- *Give a more precise definition of good environmental status for the biodiversity descriptors that goes beyond the framework of existing legislation*.
  The definition of good environmental status has been tightened up by defining it for each group of species and for each criterion, which was not formerly the case. This version of the Marine Strategy integrates a variety of laws and regulations relating to the marine environment and only includes additional aspects where necessary, for example in the context of the OSPAR Convention. This is in line with the directive itself and with the new Commission Decision 2017/848/EU. Where necessary, the Netherlands has formulated supplementary policy, for example on seabed protection and litter.

- *Improve the definitions of good environmental status with particular attention to quantitative aspects and baselines to make good environmental status quantifiable.*
  The definitions of good environmental status are no longer formulated at the level of descriptors, but in relation to criteria, and wherever possible they have been quantified in order to make them measurable. Wherever indicators developed at regional level and/or indicators laid down in laws and regulations were available, they were used.

- *Eliminate knowledge gaps identified in the initial assessment, for example via the monitoring programme.*
  See the reaction to the next recommendation.

- *Further improve the methods for assessing the effects of the most important pressures (quantitative).*
  A national research agenda for the North Sea has been drawn up to identify relevant knowledge gaps and to guide the research. Since 2014, the central government and knowledge institutes have been working closely together in the Working Group Knowledge and North Sea (IDON). OSPAR has also drafted a Science Agenda [18], which will be updated in the course of the Intermediate Assessment. The Netherlands is the coordinator of the process.

  The national knowledge agenda focuses mainly on wide-ranging issues such as sources and effects of litter and underwater noise, the coherence of the marine ecosystem and the cumulative effects of human actions. Within OSPAR, the Netherlands has also contributed to the generation of knowledge in relation to indicators for the food web and for benthic and pelagic habitats.

- *Ensure that the objectives encompass all the relevant pressures, are SMART and sufficiently ambitious*.
  Objectives (SMART where possible) have been formulated for all the relevant pressures. They focus on the most severe degradation of and risks to the marine ecosystem. Good environmental status is expected to be achieved in 2020 or to come within reach in the coming decade, depending on the descriptor.

- *Establish greater coherence between the criteria used for good environmental status, the impact assessment and the proposed objectives.*
  This coherence has been enhanced by following the DPSIR cycle more closely: driver, pressure, status, impact and response. This is illustrated with model calculations (ODEMM model) in the programme of measures.

- *Expand the scope of marine waters, as defined in the directive, to all WFD coastal waters.*
  According to the Water Decree pursuant to the Water Act, the MSFD now covers the waters seawards from the coastal base line. The Wadden Sea and transitional and inland waters therefore do not fall within the scope of application. These areas

already enjoy adequate ecological protection by virtue of the Water Framework Directive, the Birds Directive and the Habitats Directive. See also section 2.2.

1.3 The drafting process

The updating of the Marine Strategy Part 1 has been discussed at national and international level. In the Netherlands, the process was formally coordinated by the Interdepartmental Directors North Sea Consultative Body (*Interdepartementale Directeuren Overleg Noordzee,* IDON). Consultation with stakeholders was organised in the Infrastructure and Environment Consultative Platform (*Overleg Infrastructuur en Milieu*, OIM). Prior to the deliberations in the OIM, a stakeholder workshop was organised and individual stakeholders were contacted. OSPAR played an important role in the international collaboration as a regional platform, for example by developing common indicators and performing the Intermediate Assessment. There were also consultations with neighbouring countries on the definitions of good environmental status and the environmental targets.

The OIM's advisory report contains the reactions of three parties [19], whose responses led to clarification or improvement of the text on a number of points. The ministers of Infrastructure and Water Management and Agriculture, Nature and Food Quality explained the government's response to the advisory report in a joint letter.

The draft of the Marine Strategy Part 1 was laid for public inspection for six weeks at the beginning of 2018 and everyone, including neighbouring North Sea countries, could submit their views. The Minister of Infrastructure and Water Management and the Minister of Agriculture, Nature and Food Quality will jointly adopt the updated Marine Strategy Part 1 no later than 15 July 2018.

The formulation of the Marine Strategy Part 1 is also part (as environmental framework) of the wider process of producing a long-term strategy for the North Sea (North Sea 2030) in consultation with civil-society partners.

1.4 Structure of this document

The Marine Strategy Part 1 consists of this main document and 44 factsheets. For the reader's convenience, it was decided to keep the main document brief and concise. The MSFD factsheets contain the detailed technical information about the assessment of the current environmental status and can be found on the website www.noordzeeloket.nl. The factsheets also provide an important basis for the report to the European Commission.

Chapter 2 provides a description of the Netherlands' part of the North Sea, an economic and social analysis of its use, the costs of preventing degradation of the environment, and anticipated developments. Chapter 3 contains the definition of good environmental status, an assessment of the current environmental status, the environmental targets and associated indicators, and the ensuing (supplementary) policy assignments. Chapter 4 discusses climate change, cumulative effects and the network of protected marine areas, as well as all the overarching themes that have an impact on environmental status. Chapter 5 presents the main conclusions drawn from the preceding chapters and describes their impact on the other parts of the Marine Strategy and the associated knowledge programme. The appendix, finally, contains lists of the descriptors, good environmental status, criteria, targets, pressures and activities.

2. Description of the North Sea

2.1 Introduction

This chapter contains a brief description of the marine ecosystem and human use of the Netherlands' part of the North Sea. Section 2.2 discusses the scope of application of the MSFD and the administrative division of the North Sea. Section 2.3 describes the most important ecological characteristics and economic uses of the North Sea. Section 2.4 presents a socio-economic analysis and section 2.5 enumerates the costs of measures taken to counter the negative effects of the current use of the North Sea as prescribed by Article 8(1)(c) of the MSFD. Section 2.6, finally, describes the main developments that could have an impact on the marine ecosystem in the future.

2.2 Geographic and administrative scope

The Marine Strategy relates to the Netherlands' part of the North Sea and its scope of application embraces the water, the seabed and the subsurface on the seaward side of the baseline from where the extent of the territorial sea is measured (Article 3 of the MSFD). The outer limit of the coverage is defined by the international boundaries of the Dutch Continental Shelf (which are also the boundaries of the Exclusive Economic Zone, EEZ).

The area of application of the MSFD partially overlaps with that of the Water Framework Directive (WFD), which is the zone extending 12 nautical miles from the baseline (the so-called 'coastal waters'). According to Article 2 of the MSFD, the directive is here only applicable to elements that are relevant for the protection of the marine environment and are not covered by the Water Framework Directive. Only the MSFD applies in the offshore waters beyond 12 nautical miles.

The Eastern Scheldt, the Western Scheldt and the Wadden Sea do not fall within the scope of application of the MSFD [20] because they are landward of the baseline and the marine environment is already adequately safeguarded by the other Community legislation. These bodies of surface water are covered by the Water Framework Directive and are designated Natura 2000 areas pursuant to the Birds Directive and /or the Habitats Directive. The policy designed to protect the North Sea, and above all the North Sea coastal zone, also has a direct or indirect impact on the functioning of these areas.

The fact that the Netherlands' part of the North Sea is part of the MSFD subregion of the North Sea – in a broad sense and including the Kattegat and the English Channel – in the north-eastern part of the Atlantic Ocean was taken in account in drafting the Marine Strategy.

Administrative

Beyond approximately one kilometre from the coast the North Sea does not fall under the administrative responsibility of a municipality or a province. The national government bears full responsibility. The Minister of Infrastructure and Water Management is the minister responsible for coordinating the implementation of the integrated North Sea policy, sharing that responsibility with the Minister of Agriculture, Nature and Food Safety by reason of his responsibility for the policy areas of biodiversity, nature and fisheries.
The national government has more jurisdiction within the territorial sea (up to twelve miles from the baseline) than in the EEZ. Measures relating to fisheries outside the territorial sea fall under the exclusive competence of the European Commission by virtue of the

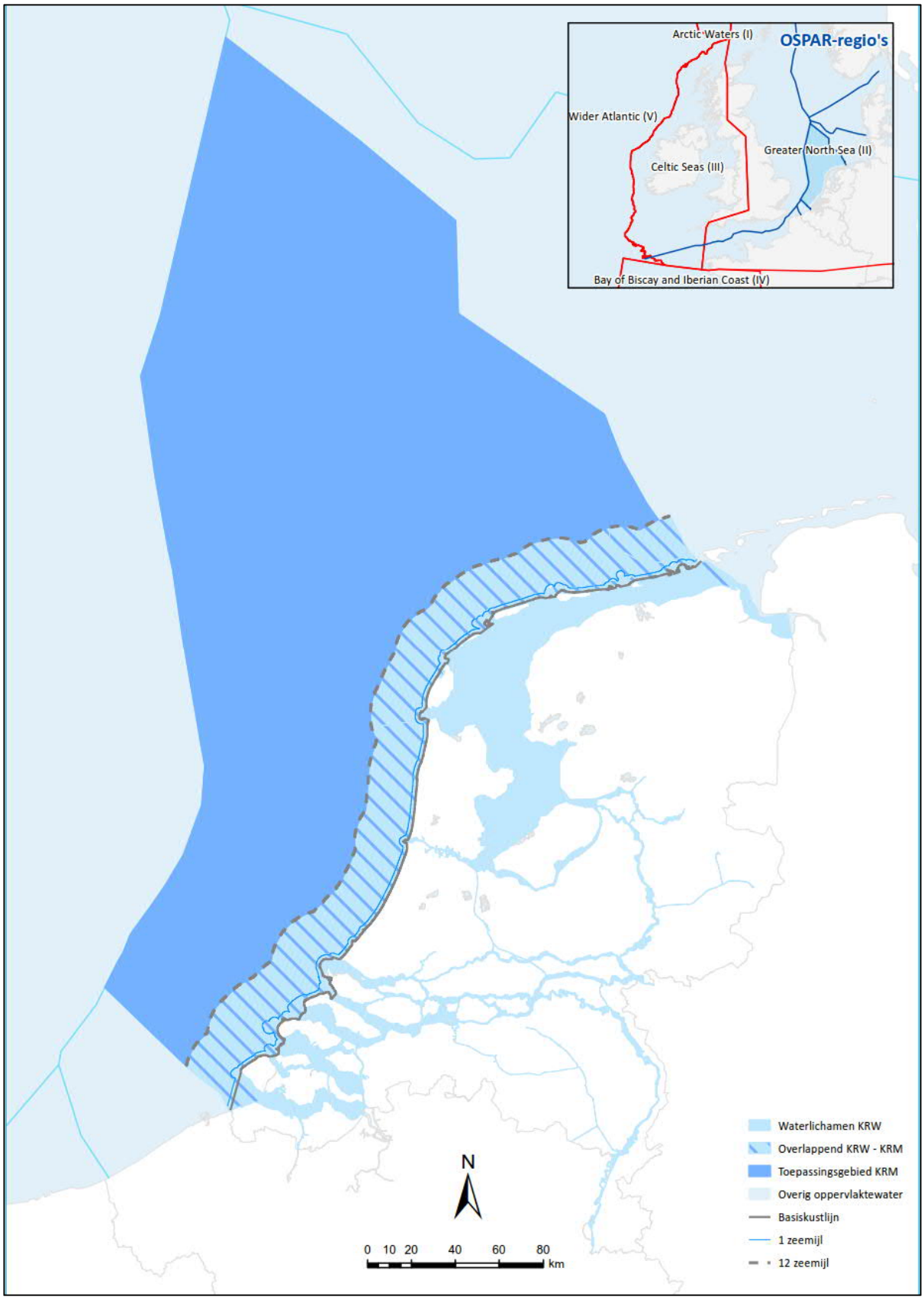

Figure 1. MSFD areas of application, bodies of water covered by the Water Framework Directive and OSPAR areas

Common Fisheries Policy (CFP)[3]. Measures relating to shipping fall within the jurisdiction of the International Maritime Organisation (IMO).

Neither the ecosystem of the North Sea nor its various uses are contained within the boundaries of a particular country's part of the North Sea. None of the North Sea countries can resolve all of the problems in its part of the North Sea alone, and sometimes do not have the full and exclusive jurisdiction to do so. This applies in any case for shipping policy and fisheries policy. For that reason, and because the North Sea countries are not all EU Member States, the MSFD obliges the EU Member States to adopt a regional approach, explicitly providing that they should coordinate their strategies through existing regional sea conventions, such as OSPAR.

2.3 Brief characterisation

Marine ecosystem
The Netherlands' part of the North Sea runs from the coast to the external boundary of the Dutch Continental Shelf and is relatively shallow (an average depth of 35 metres, rising in a northerly direction to over 60 metres). Given its limited depth, there is a strong interaction between physical and chemical processes and life in and on the seabed and in the water column. The water in the northern half of the Netherlands' part of the North Sea is influenced by the current from the Atlantic Ocean. The current in the southern half comes from the English Channel and flows along the Wadden Islands in a north-easterly direction (the so-called coastal river).

A characteristic feature of the Dutch coastal waters is the heavy influence of the Scheldt, Meuse, Rhine and Eems rivers. The water from the rivers flows from south to north along the length of the coast and contains a large quantity of clayey floating material, which intensifies seabed dynamic and causes natural turbidity. The rivers also carry a lot of nutrients to the sea. These are essential for the growth of plankton, which forms the basis of the marine food chain. Consequently, by their nature, the Dutch coastal waters are highly productive and have large fish and bird populations.

The North Sea is a very complex and open marine ecosystem without boundaries, but with specific habitats (see table 1). The biodiversity in the Netherlands' part of the North Sea includes approximately 1,300 species (excluding fungi and single-cell organisms). Six percent of the species are of non-indigenous origin (see figure 2, [21]). The North Sea is an important link in the international network of migration routes and foraging areas for birds. The North Sea also has a vital function as a habitat for fish, seals and porpoises. The EU has designated some characteristic seabed habitats in the North Sea, or parts of it, as Natura 2000 areas because of their exceptional ecological importance (pursuant to the Birds Directive and/or the Habitats Directive) or as protected areas (pursuant to the MSFD).

Table 1. Types of habitat in the Netherlands' part of the North Sea [22]

	Types of habitat *					
Features	Shallow to moderately deep coarse sediment	Shallow to moderately deep, mixed sediment	Shallow to moderately deep silt-rich sediment	Deep coarse sediment	Deep sandy sediment	Deep silt-rich sediment

[3] The Common Fisheries Policy is divided into regions. Various agreements on policies and implementation are made at regional level. The countries around the North Sea also constitute a region. These countries convene in the so-called Scheveningen Group.

Depth	0-30 m	0-30 m	0-30 m	30-70 m	30-70 m	30-70 m
Median grain size	>500 µm	>63 µm (typically <20% silt)	< 63 µm (typically >20% silt)	>500 µm	>63 µm	< 63 µm
Tidal current	Strong (up to 1.0 m/s)	Strong (up to 1.0 m/s)	Weak	Strong (up to 1.0 m/s)	Strong (up to 1.0 m/s)	Weak
Occurrence in Dutch Continental Shelf (zones)	Dogger Bank and parts of Coastal Zone, locally Offshore	Dogger Bank, Offshore, Coastal Zone, edge of Oyster Grounds	Oyster Grounds, Offshore and Coastal Zone (sporadic presence everywhere)	Oyster Grounds and Offshore	Dogger Bank, Oyster Grounds and Offshore	Oyster Grounds

**this classification is based on the European Nature Information System EUNIS level 3 and differs from the classification used in the Habitats Directive.*

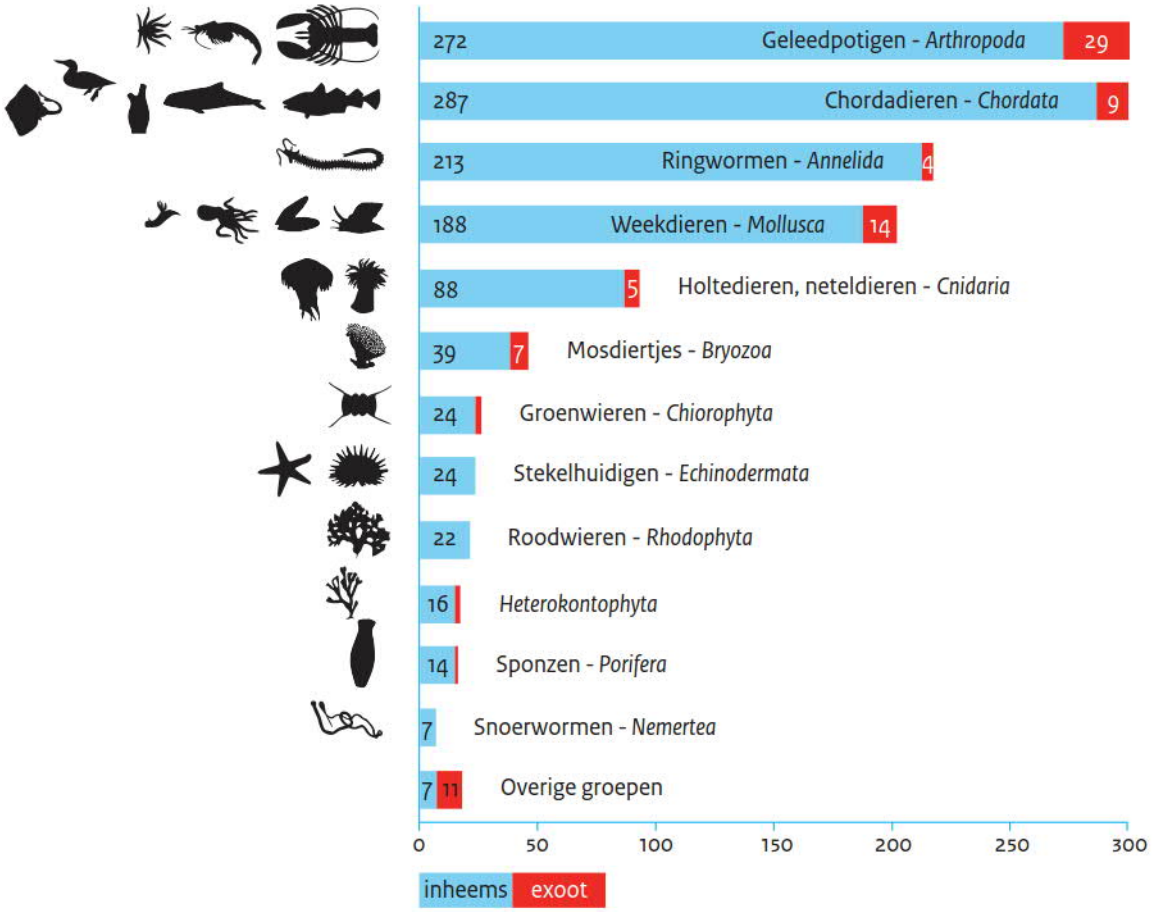

Figure 2. Variety of species in the Netherlands' part of the North Sea [21]

Uses

The Netherlands' part of the North Sea is used for numerous purposes (see table 2). It is one of the most intensively used seas in the world, particularly for shipping. The large ports of

Rotterdam, Amsterdam, Antwerp, Hamburg, Le Havre and London are all located in the southern part of the North Sea. The North Sea is also an increasingly important source of energy generation. There are oil and gas platforms, wind farms occupy a growing area and there are many pipelines and cables in the seabed. In addition, a lot of space is devoted to sand extraction, nature protection and military activities. Finally, the Netherlands has traditionally had an intensive fishing sector. Section 2.4 presents a socio-economic analysis of the use of the North Sea by the Netherlands.

Table 2. Use of space in the Netherlands' part of the North Sea

Use	**Numbers**	**Use of space in km^2**	**Percentage***
Oil and gas recovery	161 platforms	126	0.2
Commercial surface mining	13 mln. m^3/yr.	80 (5-year average)	0.1
Sand extraction for coastal suppletion	12 mln. m^3/yr.		
Dredged material disposal sites	6	37	0.1
Cables (in use)	3300 km	3300	5.7
Pipelines	4500 km	4500	7.8
Shipping routes		3600	6.2
Military exercise terrains	5	4200	7.2
Wind energy Installed	957 MW	160	0.3
Wind energy Planned	3450 MW	575 with 6 MW/km^2	1.0
Nature Voordelta		924	1.6
Raan Flats		175	0.3
North Sea Coastal Zone		1444	2.5
Dogger Bank		4735 (28 percent seabed protection)	
Frisian Front		2882 (Birds Directive); 1000 (seabed protection; MSFD)	5.0 1.7
Central Oyster Grounds		1000	
Cleaver Bank		1539 (45 percent seabed protection)	1.7 2.7
Fisheries		EEZ and territorial sea minus closed areas for nature and energy	

*percentage of the Dutch Continental Shelf (58,000 km^2)

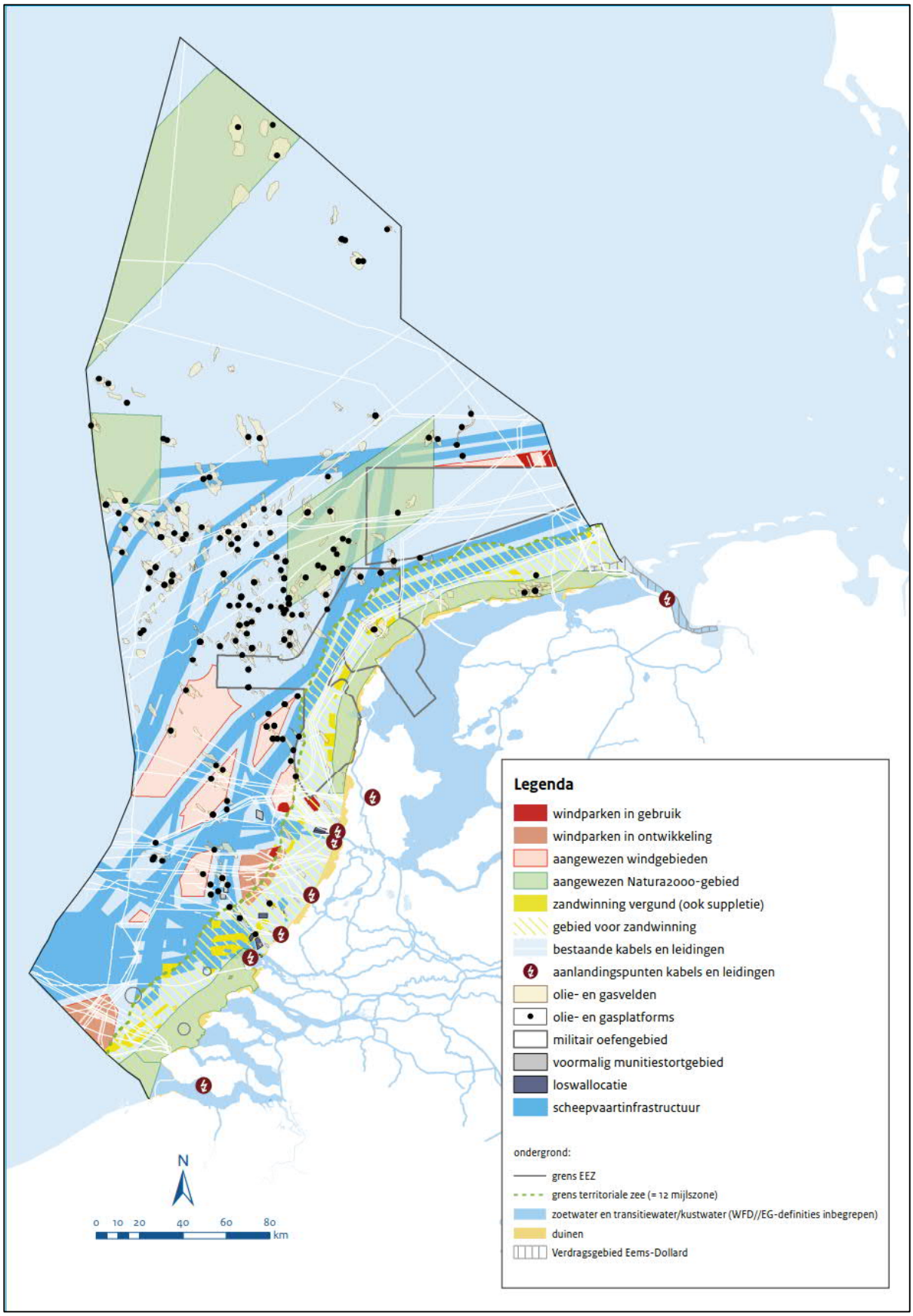

Figure 3. Use of space in the Netherlands' part of the North Sea (draft)

2.4 Economic sectors

The economic activities on and along the North Sea largely determine the extent of the impact on the marine environment and on the current and future environmental status. Statistics Netherlands (CBS) produced an economic analyses of the use of the Netherlands' part of the North Sea (in 2010 and 2014) by the sectors that depend directly or indirectly on the North Sea [23]. See table 3. The total added value (production value minus expenses) of the use of the North Sea (including the coastal zone and seaports) amounted to just over 23 billion euro in 2014, which was slightly higher than in 2010. The total added value of the economy as a whole came to 568 billion euro in 2010 and 586 billion euro in 2014. The North Sea economy therefore represented 4.1 percent of the total economy in 2010 compared with 4.0 percent in 2014.

Table 3. Economic analysis of the Netherlands' part of the North Sea [23]

	Employment (number of employed persons, x 1,000)		**Production value** (mln. €) (in 2010 prices)		**Added value** (mln. €) (in 2010 prices)	
	2010	**2014**	**2010**	**2014**	**2010**	**2014**
Fisheries	0.3	0.3	168	108	92	48
Shipping	9.1	9.5	5,035	6,099	1,281	1,790
Oil and gas recovery	2.9	4.0	5,298	5,077	4,447	3,473
Sand extraction	0.3	0.3	138	133	60.5	51.9
Wind energy	0.04	0.04	90	80	35	39
Total	12.64	14.14	10,729	11,497	5,915.5	5.401.9
Sea ports	139	136	73,154	82,242	15,492	16,171
Coastal Zone*	36	38	3,101	3,477	1,642	1,723
Total	175	174	76,255	85,719	17,134	17,894
Total	**188**	**188**	**86,984**	**97,216**	**23,050**	**23,296**

** The figures for the Coastal Zone include recreation and tourism within the zone, such as hotel overnight stays and restaurants.*

Offshore economic activities

The economic activities on the Netherlands' part of North Sea generated an added value of 5.4 billion euro in 2014. The oil and gas production sector generates the greatest added value of all the economic sectors in the North Sea economy (3.4 billion euro in 2014). Shipping is also a very important economic sector for the Netherlands.

The sectors sand extraction, fisheries and wind energy are relatively small economic sectors compared with the extraction of oil and gas and shipping. Sand extraction is carried out because of coastal defence, infrastructure and/or land reclamation. The demand for sand has declined. The economic importance of offshore wind energy has increased in recent years in light of the energy transition and to comply with the targets agreed in the Paris Climate Agreement (see section 2.6).

The added value of the fisheries sector almost halved between 2010 and 2014. This is largely explained by the fact that 2010 was an exceptionally successful year for the fisheries sector, which also enjoyed good years in 2016 and 2017. Nevertheless, since 2005 there has been a downward trend in the sector's profits and in the number of self employed fishermen.

Land-based economic activities

The total added value of land-based economic activities directly related to the North Sea was approximately 17.9 billion euro in 2014. The sea ports are of considerable economic importance. Activities in the port of Rotterdam generate slightly more than half of the added

value. Other activities in the coastal zone, such as tourism and recreation, are also important for the economy.

2.5 Costs of degradation of the marine environment

Wageningen Economic Research (WER) has calculated the costs of degradation of the marine environment by economic activities [24]. According to the quidance document of the European working group on economic and social analysis,such an analysis can be done in various ways. The Netherlands has opted for a pragmatic method which provides an overview of the annual costs incurred to prevent further degradation of the marine environment: the cost-based approach. According to WER, the alternative method, the ecosystem goods and services approach, is not yet mature enough in conceptual, methodological and empirical terms to be used.

Table 4 presents an overview of the annual costs incurred in 2015 for measures to improve the environmental status of the Netherlands' part of the North Sea, or to prevent environmental damage. According to WER, these costs represent the lower boudn value of the willingness to pay to prevent further degradation of the marine environment. The costs are calculated for all measures mentioned in the MSFD programme of measures (Marine Strategy Part 3), which lists roughly seventy measures that are required to achieve good environmental status and meet the environmental targets for 2020.

The categorisation in the table below is based on uses and human activities that occur at sea or have an impact on the sea, as presented in table 2 in Annex III of the MSFD.. As the table shows, the Netherlands spends between 0.5 and 1.5 billion euro annually on measures to prevent or mitigate degradation of the marine environment.

Table 4. Estimate of the total minimum annual costs (in 2015) of preventing degradation of the marine environment in the Netherlands' part of the North Sea [24]

Type of activity	**Annual costs, x € mln.**
Physical restructuring of rivers, coastlines or seabeds	62-64
Extraction of non-living resources	7.4
Energy production	65.4-176.6
Extraction of living resources	29.1-32
Cultivation of living resources	9.1-58.8
Transport	56.2-63
Urban and industrial activities	175-1,131
Tourism and recreation	4.4-6
Security and defence	0.3
National government	35
Other activities and measures	8.9-9.8
Total estimated costs	**>0.453-1,584**

In addition to sectors active on and along the North Sea, land-based sectors also adopt numerous measures to protect the North Sea, including measures in the context of the Water Framework Directive, measures the agricultural sector is required to take to comply with the Nitrates Directive, and investments in the maintenance of sewers and sewage treatment. These measures are not primarily intended to improve the environmental quality of the North Sea, but do help to achieve that goal.

The programme of measures under the MSFD was included in the assessment of the environmental status presented in chapter 3. If supplementary policy is required to meet the

environmental targets, additional measures could be included in the next programme of measures (2021) and the costs to improve the (ecological status of the) marine environment could be higher than those shown in the table above.

2.6 Developments and challenges

The burden on the marine environment (in terms of emissions to water, pressure on fish stocks, etc.) is determined to a great extent by the scale of socio-economic activities on and along the North Sea, as well as relevant developments such as the extent to which those activities become more sustainable. This is an important consideration, because these developments could have an impact on the extent to which the anticipated environmental status deviates from the current situation. The effects could either narrow or widen the gap between the existing environmental status and good environmental status.

To learn more about potential future developments, the Netherlands Environmental Assessment Agency (Planbureau voor de Leefomgeving, PBL) produced scenarios for the development of various uses and sectors on the Netherlands' part of the North Sea [25]. The scenarios explore the situation in 2050, with 2030 as an intermediate milestone. The agency wrote four scenarios, each with a different level of international cooperation, socio-economic growth and technological development. The scenarios are also based on varying levels of intensity in the steps taken to meet the targets in the Paris agreements to tackle climate change.

Developments in relation to the North Sea until 2030 are expected to be dictated mainly by how the government and stakeholders address strategic challanges relating to the energy transition, future-proofing the food supply and creating robust natural systems. The government's policy response to these challanges will be formulated in a long-term strategy drafted in consultation with users, nature conservation organisations and research institutes. This Strategic Agenda for the North Sea 2030 will be incorporated in the National Environmental Planning Vision (2019). At the same time as the strategic agenda, a detailed programme of projects, pilots and research to implement the agenda will be published, including details of how they will be financed.

The Environmental Assessment Agency's scenarios provide a framework for planning the new policy. An important consideration raised by its study is to what extent the themes of the energy transition, food security and nature can be addressed together, both in technological and spatial terms.

Energy transition

The Paris Climate Agreement will have a major influence on developments. The agreement calls for a substantial transition to sustainable energy. By 2023, 16 percent of the energy must be produced from renewable sources. To meet that target, 4,450 megawatts of offshore wind energy will have to be operational by 2023, which represents an expansion of 3,500 MW compared with the existing capacity of wind farms. Major policy efforts and investments will be required to meet that target. In 2014, the government designated additional areas for the construction of new wind farms and plans to further increase the number of sites for offshore wind energy (Coalition Agreement 2017 [26]). The growth in the number of offshore wind farms, which are expected to range in size from very small (12 GW in 2050) to very large (65 GW in 2050) in the scenarios of the Netherlands' Environmental Assessment Agency, could have significantly negative effects on marine mammals and birds. The Wind Farm Site Decisions will prescribe measures that have to be taken to mitigate negative effects as far as possible.

The government will set out when and where wind farms will be allowed in the period from 2024 up to 2030 in the Offshore Wind Energy Roadmap 2024-2030. The roadmap will take the utmost account of synergies with and opportunities for other interests in the North Sea

Food supply
According to the Environmental Assessment Agency's scenarios, the space available for fishing in the North Sea will become scarcer, because of the construction of wind farms (depending on whether or not it is decided to allow bottom-disturbing fishing in wind farms) and the designation of Natura 2000 areas. The outcome of the Brexit negotiations will also have an impact. Furthermore, the sector is coming under growing public pressure to produce in a more sustainable and animal-friendly manner. These trends will have consequences for the Dutch fisheries sector. On the other hand, the Environmental Assessment Agency anticipates further growth of aquaculture (the breeding of fish, crustaceans and shellfish), mariculture (the cultivation of marine crops), and the provision of services for the wind farms.

Given the importance of the North Sea for the food supply and the pressure on the traditional fisheries, the challenge is to develop a sustainable and economically healthy use of the North Sea for food production – including fisheries – in consultation with all the stakeholders.

Nature
Human action and climate change have altered and damaged the nature in the North Sea over the last century. It is impossible to point to a single biggest threat. Rather, human actions are having a cumulative effect on a natural system that we cannot yet fully comprehend. Measures to enhance the sustainability of all the uses of the North Sea are needed to prevent further changes in the status of the marine environment and further loss of biodiversity and to promote their recovery. The targets are laid down in the MSFD, the Water Framework Directive, the Birds Directive and the Habitats Directive. In all of its scenarios, the Environmental Assessment Agency forecasts an improvement of the natural environment as a result of these measures to increase sustainability.

The task in relation to nature is to meet the national and international targets for the marine ecosystem. Instruments being used to achieve this include an integrated policy, measures to protect biodiversity, the creation of a network of protected areas and the reduction of pollution. The ecosystem approach and the precautionary principle are actively applied in meeting the targets.

3. Environmental status and pressures

3.1 Introduction

This chapter contains the assessment of the current environmental status of the Netherlands' part of the North Sea and the prevailing pressures influencing that status. Section 3.2 describes the underlying principles employed and the related considerations. Sections 3.3 and 3.4 indicate the current environmental status for each descriptor, describe the extent to which good environmental status has been achieved and whether there are supplementary policy assignments, and list the environmental targets and indicators for monitoring the progress towards good environmental status, thereby satisfying the requirements of articles 8(1)(a), 8(1)(b), 9 and 10 of the MSFD). Detailed information about the assessment of the current environmental status can be found in the MSFD factsheets (see appendix VIII).

3.2 Underlying principles

Requirements in determining good environmental status and environmental targets
Following on from the initial assessment in 2012 and the elements listed in annex I to the directive, the Member States are required to determine a series of characteristics for good environmental status (article 9(1) of the MSFD). In doing this, they must use the criteria from Commission Decision (EU) 2017/848 (article 9(3) of the MSFD) for assessing the extent to which good environmental status has been achieved. For each of the descriptors, the Commission Decision makes suggestions for the further elaboration of a total of 42 criteria. The environmental targets serve to monitor progress towards good environmental status, taking account of the lists of pressures and impacts contained in table 2 in annex III, and the indicative list of characteristics contained in annex IV of the MSFD.

Taking account of European regulations and regional sea treaties
In assessing the environmental status and determining the environmental targets and measures, the Member States are required to take account of international and European regulations (article 8(2), 10(1), 13(1), 13(4) of the MSFD). On an international level, for example, the IMO Convention applies. At European level, various regulations are in place including the WFD, BD, HD, the Urban Wastewater Directive, the Bathing Water Directive, CFP, etc. In assessing the environmental status, account is also taken of assessments in the framework of regional sea conventions (article 8(2) of the MSFD). For the Netherlands this is OSPAR.

Cooperation within a single marine region or subregion
Member States who occupy the same marine region or subregion collaborate to ensure that the various elements of their marine strategy are coherent and are coordinated (article 5(2) of the MSFD). As far as suitable and feasible, the Member States make use of existing regional institutional cooperation structures including regional sea conventions (article 6 of the MSFD). Within OSPAR, the Netherlands is part of the subregion Southern North Sea. For the CFP, this is the Scheveningen Group.

Adaptive management based on the ecosystem approach
In order to achieve good environmental status, the directive requires adaptive management on the basis of the ecosystem approach (article 3(5) of the MSFD). Adaptive management is expressed in the six-yearly updating of targets and measures. This of course calls for

Good environmental status
In describing good environmental status (article 9 of the MSFD), the environmental status referred to is the status that is to be achieved, recovered or maintained. Good environmental

status does not refer to the virgin marine ecosystem from the past, but an ecosystem that functions optimally and is resilient, thereby offering opportunities for sustainable human use.

In annex I, the MSFD lists the following eleven elements (or 'descriptors') on the basis of which the Member States are required to determine good environmental status:

- D 1 – Biological diversity (birds, fish, sea mammals)
- D 2 - Non-indigenous species (exotics)
- D 3 - Commercially-exploited fish and shellfish
- D 4 - Food webs
- D 5 - Eutrophication
- D 6 – Sea-floor integrity (habitats)
- D 7 - Hydrographical conditions
- D 8 - Contaminants
- D 9 - Contaminants in fish and other seafood for human consumption
- D10 - Litter
- D11 - Introduction of energy, including underwater noise

In Commission Decision (EU) 2017/848, the descriptors are elaborated into 42 primary and secondary criteria[4] (see appendix IV). The Member States are required to use these criteria to describe good environmental status and assess the extent to which it has been achieved. The Dutch descriptions of good environmental status are structured on the basis of these criteria, with a focus on the situation in the Netherlands' part of the North Sea.

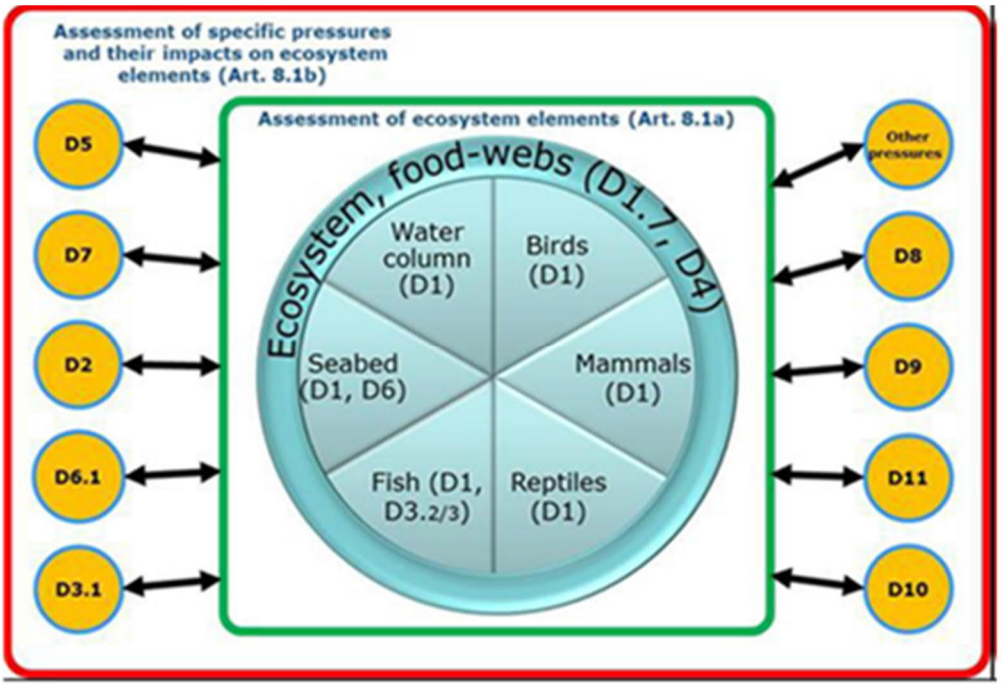

Figure 4. Layout of the descriptors according to ecosystem and pressures

Of the eleven descriptors, the three descriptors on biological diversity, food webs and sea-floor integrity are crucial, from the point of view of the ecosystem approach. These are the so-called 'status descriptors' (see figure 4). They describe the structure, the function and the processes within the marine ecosystem (article 8(1)(a) of the MSFD). The analysis of the

[4] In principle, primary criteria should be used to ensure coherence between Member States. However, if Member States decide to not use one or more primary criteria, they must provide supporting arguments. The Member States themselves are authorised to decide on the use of the secondary criteria. For example, if good environmental status cannot be achieved or maintained.

environmental status and the related targets appears in section 3.3.
The other descriptors relate to disruptions of the marine ecosystem (also known as pressures) as a result of human activities. The good environmental status described for these descriptors is derived from what is needed for the good functioning of the marine ecosystem (see section 3.4).

Relation to existing policy
For each descriptor the Marine Strategy assesses the extent to which current policy contributes to reaching good environmental status. By also indicating where existing policy must be supplemented with additional measures, the Marine Strategy provides a total overview of what is needed in order to achieve or maintain good environmental status. The Marine Strategy therefore integrates policy in various fields that influence the marine environment and where necessary supplements that policy.

In as far as relevant and possible, descriptions of good environmental status, criteria, targets and indicators are copied directly from existing EU legislation, including the WFD, BHD, CFP and the array of rules for contaminants in fish and other seafood for human consumption. However, because the scope of operation of other directives does not always geographically match the scope of the MSFD, and because there are sometimes discrepancies in the deadlines for achieving the targets, one on one copying is not always possible.

The OSPAR objectives, target values and assessment values are also not always precisely copied as a description of good environmental status. These objectives or target values are not linked to specific years but are viewed as aspirational goals for the long term. There is no international agreement on using these values as threshold values for the MSFD. The assessment values have no legally binding status, and in many cases relate to the functioning of subareas of the total ecosystem.

Current environmental status
In drawing up the Marine Strategy part 1 in 2012, the initial assessment of the environmental status and the most important pressures (article 8 of the MSFD) was based on the (often national) information available. In this update to part 1, the assessment of the current environmental status is based on the specified criteria and implemented using the information from the MSFD monitoring programme. To ensure an internationally consistent approach, the results from the OSPAR *Intermediate Assessment*[5] 2017 and the assessment methods developed within OSPAR have primarily been used. The other OSPAR countries have also used this common basis for updating their Marine Strategy.

Wherever necessary for assessing the Netherlands' part, the OSPAR results are supplemented with explanations or additions derived from the most recent assessments according to the BHD, WFD and CFP and based on insights from other (national) sources. This information appears on the factsheets. On the basis of all this information, an assessment was made of the development of the environmental status since 2012, the extent to which good environmental status has now been achieved, and how effective current policy is.

Environmental targets
To make the policy objective 'good environmental status' manageable, (operational) environmental targets were drawn up (article 10 of the MSFD). The government aims to keep these as clear and simple as possible, and focused on the most important disruptions and risks for the functioning of the marine ecosystem (*risk based approach*). This means that the environmental targets are related to the most important pressures and activities that cause disruption and risk. As far as possible, quantitative environmental targets have been set.

[5] https://oap.ospar.org/en/OSPAR assessments/intermediate-assessment-2017/

Wherever there is uncertainty about the causes of disruptions or risks, research assignments have been formulated.

In setting the environmental targets, estimates were made about the effectiveness of the existing and proposed policy, based on the assessment of the current environmental status and taking account of the developments through to 2020 and beyond. Account was also taken of the response time to measures, by the ecosystem.

The environmental targets are indicated in the sections below with a code. D1T1 means: descriptor 1, target 1.

Indicators
Indicators, as the name suggests, indicate whether the environmental targets have been achieved, and whether good environmental status has been reached or maintained. They also offer handholds in assessing whether good environmental status can be permanently maintained. To make that possible, the indicators must be able to establish a relationship between the influence of human activities and the functioning of the marine ecosystem (the ecosystem approach). In other words, the indicators provide information both about the progress towards environmental targets and reaching good environmental status[6]. The scale at which the indicators apply differs from descriptor to descriptor, and depends on the level at which effects can best be assessed. The indicators then help set the course for the monitoring programme.

The first programme of measures was adopted at the end of 2015. For a number of the measures, it is still too early to be able to determine whether they are having the desired effect. Wherever the current status suggests that there are new or greater assignments, the government will consider supplementary policy. In that sense, the measures are part of the policy analysis, but are by themselves not a subject of discussion. That discussion will take place in 2021, when the Marine Strategy part 3 (the programme of measures) is updated.

If there is insufficient or incomplete evidence of the negative effects of human activities on the ecosystem but there are reasonable grounds for suspicion, the Netherlands has decided to apply the precautionary principle. Adaptive management is expressed in the six-yearly updating of the targets and measures.

DPSIR cycle
The Marine Strategy is based on the so-called DPSIR cycle (see figure 5) drivers, pressure, change in states, impact and response. This cycle is based on the line of reasoning that human activities (drivers) exercise pressure on the marine environment, thereby leading to changes in the status of the environment, which may have negative impacts that could be prevented or mitigated through measures (response). These measures in turn lead to a change to the activities, thereby completing the cycle.

[6] In the directive itself, the term ‘indicators’ is only used for the environmental targets (article 10 of the MSFD). However, the term indicator is also used for assessing the status of the marine environment pursuant to article 8 and 9 of the MSFD. Sections 3.3 and 3.4 list the indicators that in most cases can be used both for assessing of the environmental status (article 8/9), and the progress towards the environmental targets (article 10).

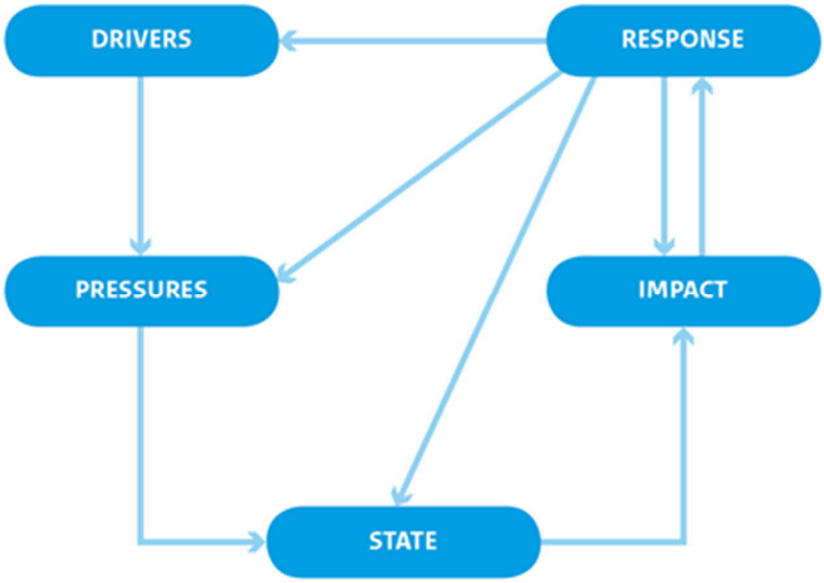

Figure 5. Drivers, Pressure, State, Impact and Response model

The five functions from the DPSIR cycle match the various articles from the MSFD (see table 5). Appendix VI contains an overview of the most important pressures and activities for each descriptor.

Table 5. Explanation of the DPSIR cycle and relationship to the MSFD

DPSIR	**Explanation**	**Related MSFD article**
D- *Drivers*	Human activities and processes that influence the marine environment	Article 8(1)(c) – an economic and social analysis of the use of marine waters
P – *Pressure*	The pressure exercised on the marine environment	Article 8(1)(b) – an analysis of the prevalent pressures and impacts
S – *State*	The status of the marine environment	Article 8(1)(a) – an analysis of the essential features and characteristics, and the properties and the current environmental status of the waters
I – *Impact*	The consequences of the pressure exercised for the marine environment	Article 8(1)(c) – an economic and social analysis of the cost of degradation of the marine environment
R – *Response*	The response to tackle environmental problems	Article 10 - environmental targets

3.3 Current environmental status and targets

This section contains an analysis of the essential characteristics and properties and current environmental status of Dutch marine waters, based on the indicative list of elements contained in table 1 of annex III of the MSFD, pursuant to article 8(1)(a) and the list of criteria from the Commission Decision (EU) 2017/848. Appendix V contains a summary of the following analysis.

3.3.1 Species

Birds – D1 (biological diversity)

According to the OSPAR assessment, over the past 20 years, there has been a considerable decrease in the number of breeding pairs for a growing proportion of the breeding birds. In 2014, only 50 percent of the species fulfilled the assessment criteria for individual species, as compared to 80 to 90 percent of species, in the nineteen nineties. The OSPAR assessment also shows that not only numbers (within particular species) are falling but also that the breeding success of marine birds has been particularly low over the past decade. This above all relates to species that search for food at the water surface and wading birds. The food supply is a major bottleneck and there is limited availability of suitable breeding grounds.

The number of birds making use of the North Sea outside their breeding season has also decreased considerably. In the OSPAR assessment, only counts of coastal birds have been considered. The decrease was most severe among benthic-feeding birds. The Netherlands' part of the North Sea is only of marginal importance for these species. Numbers of common scoter and common eider, which are of considerable importance in the Netherlands, fluctuate widely and there is no clear long-term trend.

On the basis of the combined assessment of numbers of breeding birds, breeding success and numbers of non-breeding birds, good environmental status for birds has not yet been achieved.

A number of bird species are more or less dependent on the Dutch coastal zone in their breeding season or the winter season. These species will be reported on in 2019 according to the Birds Directive (BD). In the BD report, in addition to the OSPAR assessment, data from aircraft counts will also be taken into account which could influence the total assessment of the environmental status for birds. If the BD report demonstrates a further decline in number of marine bird species, an assessment will be made of underlying pressures and of the best framework for taking action (MSFD or BD). This represents a potential supplementary policy assignment.

Large parts of the coastal zone (the Voordelta, the North Sea coastal zone and the Frisian Front) were designated in 2008, 2010 and 2016 respectively, as special protection zone according to the BD. For the Voordelta and the North Sea coastal zone, (new) management plans were drawn up in 2015 [27] [28]. In the long term, these plans are expected to have a positive effect on the bird populations. The Netherlands will also contribute to the further development of the assessment of bird populations and the identification of the most important pressures at regional level (OSPAR).

Offshore wind energy ecological programme (Wozep)
In 2016, a five-year research programme was launched aimed at investigating gaps in knowledge about the ecological effects of offshore wind energy. The Offshore wind energy ecological programme (Wozep) is undertaken by Rijkswaterstaat on behalf of the Ministry of Economic Affairs and Climate Policy. Wozep is investigating the (cumulative) effects of the construction and use of offshore wind farms, on the protected habitats and species groups (and habitat areas) of sea mammals (porpoise and two types of seal), marine birds and coastal birds, migrating land birds, underwater habitats (for seabed fauna and fish) and bats migrating across the North Sea. The effect of underwater noise and the existing underwater noise-mitigating measures will also be investigated.

Dutch and foreign assignments for developing renewable energy at sea may place good environmental status under further pressure. In the Wind Farm Site Decisions, mitigating measures are specified aimed at limiting the negative effects as far as possible. In addition, however, the wind farms may create new opportunities for the recovery of underwater nature and seabed life. This will depend on the decision whether or not to allow bottom-disturbing

fishing in wind farms. The Wozep monitoring and evaluation programme[7] (see text block) is investigating the effects of wind farms on marine birds. A greater insight into the cumulative effects of new wind farms on the ecosystem, including the populations of marine birds, is of vital importance (see also section 4.3). This represents a knowledge assignment and potential supplementary policy assignment.

From 2019 onwards, fishing boats are subject to a landing obligation. This means that fishermen are no longer permitted to throw their by-catch overboard but must instead land all fish caught. Because the fish thrown overboard represent an important food source for a number of marine bird species (above all seagulls), the populations of these species are expected to fall, as a result of the landing obligation.

Table 6. Birds – D1 (biological diversity)

Good environmental status	Overarching: population densities and demography of populations of birds indicate healthy populations − D1C2: for each functional group, the population size of at least 75 percent of the species is above the threshold value for 1992 (OSPAR assessment value). − D1C2: populations of marine birds must comply with the national targets from the BD. − D1C3: for each species, a lack of breeding success may not occur in more than three years in six (OSPAR assessment value).
Current environmental status	Good environmental status not yet achieved (on the basis of the OSPAR assessment), breeding birds abundance and breeding success in decline.
Environmental targets	• D1T1: contributing to the further development of the assessment of bird populations and identifying the most important pressures at regional level (OSPAR). • D1T2: recovery of undisturbed situation for sea mammals and birds due to reduced fishery on the Raan Flats and in the North Sea coastal zone (in the framework of the VIBEG agreement). • D1T3: achieving the conservation objective for habitat types and species in the Natura 2000 areas at sea (BHD). • D1T7: monitoring of bird collisions with wind turbines in the framework of Wozep.
*Measures**	*Implementing the Porpoise Conservation plan; limiting by-catch and other activities in Natura 2000 areas; implementation of the OSPAR list of endangered species; licensing requirements for large-scale interventions such as the Ecology and Cumulation Framework for offshore wind energy).*
Supplementary policy assignment	Potential (existing policy may not suffice) and knowledge assignment in respect of causes of decline and cumulation and possible mitigation of effects of wind farms.
Indicators	− OSPAR – Marine Bird Abundance − OSPAR – Marine Bird breeding success or failure − NL – BD Bird assessment.

**Selection from the programme of measures (2015).*

[7] Offshore wind energy ecological programme (https://www.Noordzeeloket.nl/functies-en-gebruik/windenergie/ecologie/wind-zee-ecologisch/)

Fish community, including commercially exploited fish species – D1 (biological diversity), D3 (commercially exploited fish and shellfish)
The OSPAR assessment shows that deterioration in the composition of fish communities from the past has halted and that in certain areas of the North-East Atlantic Ocean there appears to be some recovery. The *proportion* of vulnerable fish species is also not falling any further. The proportion of large fish is still too low, but is recovering. One footnote that must be added is that the assessment was undertaken in comparison with the nineteen eighties. By that stage, the vast majority of sensitive fish species had already disappeared.

The current status of many shark and ray species is still of concern. A number of species have disappeared or only occur in areas subject to low fishing pressure (in particular: dogfish, common skate and the angel shark). There are also a number of positive signals. For example, numbers of small spotted dogfish and smoothhound appear to be increasing. ICES[8] has also issued positive reports over the past few years on the thornback ray and the spotted ray [29].

For all migratory fish with the exception of the river lamprey, population size has been assessed under the Habitats Directive as (moderately) unfavourable [30]. The next Habitats Directive report is due to be issued in 2019. A number of species such as the allis shad and the sturgeon have disappeared. Monitoring indicates that houting numbers have risen and that houting have reproduced in the Rhine Basin [31]. Other species are showing no clear trend. All in all, the fish community has not yet achieved good environmental status.

The current status of commercially exploited fish and shellfish stocks is described in section 3.4. At present, 10 of the 27 commercially exploited fish and shellfish species comply with at least one of the two criteria for maximum sustainable yield or a healthy spawning stock. There is an upward trend, so that a good status is expected to be achieved, in the near future.

The assessment of the fish community is displaying the first positive effects of the CFP. The CFP was revised in 2013. During the revision of this European regulation, the Netherlands called for better harmonisation with the objectives of the MSFD and increased sustainability of fishery, including fishing at the level of MSY[9] and the protection of vulnerable species including sharks and rays. In addition, alternative methods are currently under investigation that allow more selective fishing and cause less damage. The introduction of the landing obligation is part of the reformed CFP. All in all, these measures are expected to bring about further recovery. As a result, there is no supplementary policy assignment.

Table 7. Fish community, including commercially exploited fish species – D1 (biological diversity), D3 (commercially exploited fish and shellfish)

Good environmental status	Overarching: the population densities and demography of populations of fish suggest healthy populations. − D1C2 – Commercially exploited fish populations: see D3C1en D3C2 – Commercially exploited fish − D1C2: rise in the proportion of vulnerable species of fish in the fish community (OSPAR assessment value). − D1C2: population of migratory fish must comply with favourable reference value for population size (FRP) from the Habitats Directive. − D1C2: improvement in the population size of sharks and ray in the North Sea and above all in the coastal zone.

[8] International Council for the Exploration of the Sea (http://www.ices.dk/Pages/default.aspx)
[9] Maximum Sustainable Yield

	− D1C3: rise in the proportion of large fish in the fish community (OSPAR assessment value). − D1C4: spread of migratory fish in the river area complies with favourable reference value for population range (FRR) from the Habitats Directive. − D1C5: reduction in barriers in migratory routes so that at the latest by 2027 they represent no obstacle for sustainable populations in the river basin (WFD).
Current environmental status	Status improving, but good environmental status not yet achieved.
Environmental targets	• D1T5: research into sharks and rays in combination with the taking of mitigating measures as laid down in the Shark and Ray action plan: − communication and education − reduced unwanted by-catch − increased survival rates. • D1T6: tackling the remaining fish migration bottlenecks in the Netherlands to recover connectivity between water systems (WFD). • D1T8: research into the necessity of no-catch zones around engineering structures to promote migration opportunities for migratory fish (WFD). • D3T1: the management of all commercially fished stocks complies with F≤Fmsy and a spawning stock biomass above the precautionary level MSY Btrigger. • D1T3: achieving maintenance targets for habitat types and species in the Natura 2000 areas at sea (BHD).
*Measures**	*Limiting fishery and other activities in Natura 2000 areas; implementation of OSPAR list of endangered species; licensing requirements for large-scale interventions; partially opening of Haringvloet locks; See section 3.4 under 'Extraction or mortality/injury of species living in the wild as a result of commercial and recreational fishery';*
Supplementary policy assignment	No (existing policy is sufficient)
Indicators	− NL - WFD Fish migration bottlenecks − NL - HD Assessment of migratory fish − OSPAR - FC1 Recovery of populations of sensitive species − OSPAR - FC2 Proportion of large fish in fish communities − CFP - FMSY and spawning stock biomass

**Selection from the programme of measures (2015).*

Marine mammals – D1 (biological diversity)
In the OSPAR assessment, the population of both harbour seals and grey seals in the North Sea region are demonstrating stable or rising trends. The number of pups of grey seals born each year has risen since 1992 in the entire North Sea. Nonetheless, numbers of seals in the Netherlands are still just a fraction of the population size in the past.

The large-scale ten-yearly counts of small cetaceans in the European Atlantic waters (SCANS 1994, 2005 and 2016) reveal no clear trends in populations of porpoise, white-beaked dolphin and minke whale [32] [33] [34]. The area of distribution of the porpoise is

however changing. In the North Sea region, it is shifting southwards. The Netherlands' part of the North Sea has therefore become relatively more important for the porpoise.

In the Netherlands' part of the North Sea the grey seal and porpoise are developing favourably in terms of population size. Nevertheless, the conservation status of both species under the Habitats Directive is (moderately) unfavourable [30]. This is because the quality of the habitat for both species has been estimated unfavourable. For the grey seal, there is a shortage of dry sandbanks in the zones along the coastline, where pups can grow. The harbour porpoise is above all threatened by the risk of fishing nets and the expected influence of fishery on the availability of food.

Good environmental status for sea mammals has not yet been achieved, but the current situation is improving. For a number of activities that cause loud underwater impulsive noise, a permit is required in the framework of the Nature Conservation Act which has been in force in the EEZ since 1 January 2017. The licencing procedure provides for an appropriate assessment and a species conservation assessment with accompanying mitigating measures to prevent or mitigate possible harmful effects. For activities requiring no licences (such as Defence activities, see appendix VII), the effects of underwater noise on sea mammals are restricted, via regulations. In the framework of the Porpoise Conservation plan, investigations are underway as to which measures are necessary to prevent the harmful effects of impulsive noise [35].

No international agreement has yet been reached on uniform ecological regulations for the construction of wind farms. The Netherlands will therefore be continuing its current approach (based on the Ecology and Cumulation Framework, see section 4.3) and will take any measures necessary on the basis of new insights. On an international scale (mainly via OSPAR and on the basis of the *Political declaration on energy cooperation*[10] signed in 2016), the Netherlands will strive to promote the exchange of knowledge and harmonisation of targets. In the framework of Wozep, the effects of wind farms on porpoise and seal populations will be further investigated.

There is a risk that good environmental status will come under further pressure as a consequence of the Dutch and foreign targets for the development of offshore renewable energy. However, wind farms can also create opportunities for the recovery of underwater nature and seabed life. This will in part depend on the decision whether or not to allow bottom-disturbing fishing in wind farms. A greater understanding of the cumulative effects of new wind farms on the ecosystem (see also section 4.3) and more specifically the population of sea mammals is of vital importance. This represents a knowledge assignment.

Table 8. Sea mammals – D1 (biological diversity)

Good environmental status	Overarching: the population densities and demography of populations of sea mammals suggest healthy populations. − D1C1: by-catch of porpoises is lower than 1 percent of the best available population estimate (ASCOBANS). − D1C2: the population of the grey seal (H1364), harbour seal (H1365) and porpoise (H1351) must comply with a favourable reference value for the population size (FRP) according to the Habitats Directive. − D1C3: no reduction in the birth rate of the grey seal by more than 1 percent since the last assessment and not more than 25 percent reduction since 1992 (OSPAR assessment value). − D11C1: for impulsive noise: distribution in space and time

[10] https://ec.europa.eu/energy/en/topics/infrastructure/north-seas-energy-cooperation

	and noise levels of loud impulsive sources are such that direct and indirect effects of loud impulsive sound do not threaten the favourable status of maintenance of species (see further elaboration under D11). − D1C4: distribution of harbour porpoise and harbour seal satisfies the favourable reference value for population range (FRR) according to the Habitats Directive. Also relevant is the extent to which the area and quality of habitats of sea mammals continue to develop: − D1C5: preservation of the size and quality of the habitat of the grey seal (H1364), the harbour seal (H1365) and the porpoise (H1351) (HD)
Current environmental status	Status is improving but good environmental status not yet achieved.
Environmental targets	• D1T2: recovery of undisturbed situation for sea mammals and birds through reduction of fishery on the Raan Flats and in the North Sea coastal zone (in the framework of the VIBEG agreement). • D1T3: achieving the maintenance targets for habitat types and species in the Natura 2000 areas at sea (BHD). • D1T4: implementation of mitigating measures in the framework of the 2012 Harbour Porpoise Conservation plan, including: − by-catch monitoring and research into the use of mitigating measures (pingers) − preventing and reducing the harmful effects of underwater noise on porpoise populations (Nature Conservation Act, also pursuant to the Ecology and Cumulation Framework) − further research into the effects of construction and operation of offshore wind farms on porpoise populations (in the framework of Wozep). • D1T8: further research into the cumulative effects within OSPAR.
*Measures**	*Implementation of the Porpoise Conservation Plan; restricting by-catch and other activities in Natura 2000 areas; implementation of OSPAR list of endangered species; permit requirements for large-scale interventions; see section 3.4 'Introduction of anthropogenic noise'.*
Supplementary policy assignment	Potential (existing policy may not suffice) and a knowledge assignment in respect of cumulation
Indicators	− OSPAR – Seal abundance and distribution (M3) − OSPAR – Cetacean abundance and distribution (M4-B) − OSPAR – Rise in grey seal pup numbers (M5) − OSPAR – Porpoise by-catch (M6) − OSPAR – Impulsive noise − NL - HD - Assessment of grey and harbour seal and porpoise.

**Selection from the programme of measures (2015).*

3.3.2 Habitats

Pelagic habitats – D1 (biological diversity)

In the recent past, a start has been made on within OSPAR developing assessment methods for pelagic habitats. The first assessments in the framework of the OSPAR *Intermediate Assessment* reveal fluctuations in composition, biomass and abundance of the plankton community. However, it is too early to assess whether good environmental status has been achieved, on that basis.

Table 9. Pelagic habitats – D1 (biological diversity)

Good environmental status	D1C6: for pelagic habitats, good environmental status will have been achieved if the spatial and temporal variation in the plankton community remains within a bandwidth that suggests good environmental status. The bandwidths to be used must still be determined on a regional basis, in cycle two.
Current environmental status	Unknown.
Environmental targets	• D6T4: further development and testing of regional assessment methods that can be used in the future for assessing benthic and pelagic habitats.
*Measures**	*See section 3.4 'Introduction of nutrients and organic material'*
Supplementary policy assignment	Unknown. There is however a knowledge assignment relating to the development of an assessment method.
Indicators	− OSPAR PH1/FW5 – Changes in phytoplankton and zooplankton communities − OSPAR PH2 – Changes in biomass of phytoplankton and abundance of zooplankton.

**Selection from the programme of measures (2015).*

Benthic habitats – D1 (biological diversity), D6 (sea-floor integrity)
The Dutch seabed is still substantially disturbed. Biogenic reefs, such as shell beds and other reef-forming species, have practically disappeared entirely. Seabed damage due to (beam) trawling has played an important role in this respective. The national assessment of the benthos community (with the Benthos Indicator Species Index, BISI [36]) reveals that in particular large and long-lived species are clearly less common than desirable, and that biological diversity is still insufficient [37]. Good environmental status has therefore not yet been achieved. The OSPAR assessment of the diversity of the benthic communities serves in this case as a background indicator, revealing that the deeper offshore waters do demonstrate higher benthos diversity than shallower areas.

If specific areas on the North Sea are considered within the national BISI assessment, Dogger Bank has for two decades been show a decrease in quality. At present, there seem to be signs of some recovery, but the quality is still low. This also applies to the shallow sandy habitat of the North Sea coastal zone and the Voordelta. The deeper silt-rich habitats of the Frisian Front and the Central Oyster Grounds, on the other hand, after a period of improvement, are now demonstrating further degradation. The Raan Flats has as yet demonstrated no improvement.

The Habitats Directive report published in 2013 [30] previously concluded that the extent and distribution of sandbanks which are slightly covered by seawater all the time (habitat type 1110) and reefs (habitat type 1170) are sufficient, but that their quality is deteriorating. The recent extended national benthos monitoring programme aims to provide clarity on how reefs are developing. The first report will be issued in the Habitats Directive report in 2019.

Since 2012, in addition to the Raan Flats, Voordelta and North Sea coastal zone, Dogger Bank and the Cleaver Bank have also been designated as Habitats Directive areas (see also section 4.4). In the framework of the MSFD, the Frisian Front and the Central Oyster

Grounds have been proposed as seabed protection areas. This supplementary policy assignment will continue to apply until the European Commission has adopted the proposals for fishery restricting measures (expected in 2018). At that point, the ambition of the government is to exempt between 10 and 15 percent of the bed of the North Sea from notable disruption will be complied with. It will probably be between two and three more MSFD cycles of six years, before the first signs of recovery are visible.

The Netherlands and the other North Sea countries face huge challenges in developing offshore renewable energy. This could lead to a further rise in pressure on good environmental status. It is therefore of vital importance to gain a better insight into the cumulative effects of new wind farms on the ecosystem (see also section 4.3), including benthic and pelagic habitats. Wind farms also offer possibilities for active recovery of (vanished) hard substrate and shell beds. This represents a knowledge assignment.

Table 10. Benthic habitats – D1 (biological diversity), D6 (sea-floor integrity)

Good environmental status	Overarching: improvement in the size, condition and global distribution of populations of the community of benthos species. − D6C3: improvement in the quality of the assessed areas and habitats in the Netherlands' part of the North Sea (Benthic Indicator Species Index). − D6C5: the diversity of benthos demonstrates no further downward trend in the assessed areas (OSPAR assessment value).
Current environmental status	Good environmental status not yet achieved (partially also unknown).
Environmental targets	• D6T1: 10-15 percent of the surface of the Netherlands' part of the North Sea will not be notably disturbed by human activities. • D6T2: improvement in the quality of the assessed areas and habitats. • D6T4: further development and testing of regional assessment methods (OSPAR and ICES) which can be used in the future for assessing benthic and pelagic habitats. • D6T5: return and recovery of biogenic reefs including flat oyster beds • D1T3: conservation objective for habitat types and species in the Natura 2000 areas at sea (BHD).
*Measures**	*Seabed protection in the Coastal zone and on the Raan Flats, Dogger Bank, Cleaver Bank, Frisian Front and Central Oyster Grounds; conditions on licencing for sand extraction and suppletion; encouraging alternative fishing gear*
Supplementary policy assignment:	Yes (supplementary policy from 2012 to be continued) and a knowledge assignment in respect of the assessment method, cumulation and hard substrate
Indicators:	− OSPAR – Condition of benthic communities (MMI) − NL - Benthic Indicator Species Index (BISI) − NL – HD assessment H1110 and H1170

**Selection from the programme of measures (2015).*

3.3.3 Ecosystem

Food webs – D4 (food webs)
Food webs are complex and are not restricted to the Netherlands' part of the North Sea. The relationships between all parts of the marine food web therefore represent one of the most difficult descriptors of the MSFD to assess. At present, there are still no suitable indicators for the criteria from the adapted Commission Decision 2010/477/EU. As a result, it is not possible to assess whether the food web in the Netherlands' part of the North Sea meets good environmental status. Therefore, an action plan has been developed[11] within OSPAR to address the knowledge gaps and to further develop and apply the assessment methods.

An OSPAR assessment has nonetheless been undertaken of the composition of the fish community measured according to the size of individual fish. This reveals that the reduction in the average size of fish has been halted both for demersal and pelagic fish communities. It should however be noted that the assessment was undertaken in comparison with the nineteen eighties. The vast majority of sensitive fish species had already disappeared by that time. In addition, the OSPAR assessment of pelagic habitats reveals fluctuations in the plankton community which form the basis for the marine food web. The precise relevance of this is as yet unclear.

Due to the coherence with other descriptors of the marine ecosystem and the implemented policy, no supplementary policy assignments are considered necessary. According to expectations, the proposed status of seabed conservation area of the Frisian Front and Central Oyster Grounds will further strengthen the food webs. In particular the Frisian Front is unique because of its hydrographical gradient that generates high primary production. This is of benefit to sea animals as well as fish, including sprat and herring, which in turn are a food source for the common murre.

There is a knowledge assignment in respect of cumulative effects of new wind farms on the marine ecosystem. A greater insight into these effects is of key importance (see also section 4.3), given the possibility that Dutch and foreign assignments for the development of offshore renewable energy could place further pressure on good environmental status. However, wind farms can also create opportunities for the recovery of underwater nature and seabed life. These factors will depend on a decision whether or not to allow bottom-disturbing fishing methods in wind farms.

Table 11. Food webs – D4 (food webs)

Good environmental status	Overarching: the effect of human interventions on interactions between different trophic levels in the food web is reduced. − D4C1: the diversity (species composition and abundance) of at least three selected trophic guilds is at a level or within a bandwidth which indicates good environmental status. The trophic guilds and levels and bandwidths to be employed must still be regionally determined in the second cycle. − D4C2: the ratio in abundance between at least three selected trophic guilds is at a level or within a bandwidth that indicates good environmental status. The trophic guilds and levels and bandwidths to be employed must still be regionally determined in the second cycle. − D4C3: the size structure (length) of the fish community

[11] https://www.ospar.org/work-areas/bdc/ecaprha/about-ecaprha

	remains above the historical minimum value.
Current environmental status	Good environmental status not yet achieved (partially also unknown).
Environmental targets	• D4T1: developing and testing regional assessment methods that can also be used in the future for assessing the status of food webs. • Targets for birds, fish, benthic and pelagic habitats (D1T2, D1T3, D1T4, D1T5, D1T6, D3T1, D6T1, D6T2, D6T5).
*Measures**	*See measures for birds, sea mammals, fish, pelagic and benthic habitats*
Supplementary policy assignment	No (existing policy is sufficient) although there is a knowledge assignment in respect of the assessment method and cumulation.
Indicators	− D4 - OSPAR - FW3 Size distribution in fish communities.

**Selection from the programme of measures (2015).*

Physical, hydrological and chemical characteristics
The physical, hydrological and chemical characteristics of the Netherlands' part of the North Sea are described in section 2.3.

3.4 Prevailing pressures and objectives

This section comprises an analysis of the prevailing pressures and impacts affecting the environmental status of the Netherlands' part of the North Sea, based on the indicative list of elements contained in table 2 of appendix III of the MSFD, pursuant to article 8.1b of the MSFD and the Commission Decision 2017/848. Appendix V contains a summary of the following analysis.

3.4.1 Biological pressures

Introduction or distribution of non-indigenous species – D2
The OSPAR assessment reveals that in the period 2003-2014, the number of non-indigenous species (exotic species) introduced at North Sea level varied considerably from year to year as a result of which the number of new introductions shows no clear trend. The sum of the number of introductions over the years shows that numbers are still rising. The total number of new introductions in the period 2009-2014 was nonetheless lower than in the period 2003-2008.

A national study has revealed that to date, 54 non-indigenous species (with an origin outside Northwestern Europa) have established in the Netherlands' part of the North Sea [38]. The number of observations of new non-indigenous species seems to have fallen, since 2012. In the period 2012-2017, just one new introduction was observed (the *Monocorophium uenoi*). The primary introduction of non-indigenous species has mainly taken place via ballast water, hull fouling and the transport of shellfish (including oysters). Two non-indigenous species of which the introduction has had huge consequences for Dutch marine waters of the American jackknife clam (*Ensis leei*) and the Japanese oyster (*Magallana gigas*). The American jackknife clam now represents 90 percent of the biomass in the seabed in the coastal zone.

The presence of already established non-indigenous species is viewed as irreversible. Once non-indigenous species have become established, it is not possible to remove them cost effectively and without considerable damage to the ecosystem. This means that achieving

good environmental status is equivalent to striving to not allow the current ecosystem to undergo further changes as a result of new introductions. The aim is therefore to minimise the risk of new introductions. According to expectations, based on the current policy, this risk will have been sufficiently mitigated by 2020.

The policy is above all aimed at preventive measures. In the past period, various measures have been taken, such as imposing conditions on permits for the transport of shellfish. This has minimised the risk of the transfer of non-indigenous species to Natura 2000 areas. In addition, in 2017, the Netherlands implemented the IMO Ballast Water Treaty in its national legislation and regulations [39]. As an extension of that policy, the Netherlands is also striving to establish international agreements on hull fouling.

One area for attention is the introduction of non-native hard substrate to the North Sea (for example for the dumping of erosion protection around wind farms) which engenders the risk of primary or secondary introduction of non-indigenous species into the North Sea.

Table 12. Introduction and distribution of non-indigenous species (D2)

Good environmental status	Overarching: non-indigenous species (exotics) introduced through human activities occur at a level whereby the ecosystem does not change. − D2C1: downward trend in the number of introductions of non-indigenous species per policy period (six years; OSPAR).
Current environmental status	Good environmental status appears to have been achieved, given the low number of introductions since 2012.
Environmental targets	• D2T1: minimise the risk of new introductions of non-indigenous species via shellfish transport, ballast water and hull fouling.
*Measures**	*Further implementation of the International treaty for the control and management of wastewater and sediment from ships; striving to establish international agreements on anti-fouling; conditions on licencing for shellfish transport to Natura 2000 areas.*
Supplementary policy assignment	No (existing policy is sufficient) but there is a knowledge assignment in respect of the rise in hard substrate.
Indicators	− D2 - OSPAR – Trends in new data on non-indigenous species (NIS) introduced due to human activities. − D2: Periodic overview of observed non-indigenous species in the Netherlands' part of the North Sea and their transport vectors; on the basis of the best available knowledge.

**Selection from the programme of measures (2015).*

Introduction of microbial pathogens – no special descriptor

The Bathing Water Directive (2006/7/EC, [40]) imposes provisions for the control of and classification of bathing water quality, the management of bathing water quality and the issuing of information about bathing water quality to the public. This also applies to coastal waters. The directive specifies the measures that must be taken by the Member States, above all for water assessed as 'poor'. For that reason no supplementary policy is required from the MSFD.

Introduction of genetically modified species and translation of indigenous species – no accompanying descriptor

For the trasport of shellfish from one area to another, a licence is required on the basis of the Nature Conservation Act. To limit the scale of sanitary, veterinary or ecological risks as far as possible, strict conditions are imposed in the policy line on the transport of shellfish [41] in terms of the granting of licences. As a result, the introduction of invasive non-indigenous species into Natura 2000 areas has been minimised. No supplementary policy is therefore required from the MSFD.

Loss or alteration to natural biological communities as a consequence of the breeding of animal or plant species – no accompanying descriptor
Aquaculture in the Netherlands takes place on a limited scale, mainly in estuaries that fall beyond the scope of the MSFD. There are however development opportunities for seaweed and mussel farms on the North Sea. The first pilots have already been launched. These represent a knowledge assignment concerning the consequences for the marine ecosystem of larger scale aquaculture on the North Sea and the Waddenzee.

Species disruption – no accompanying descriptor
Already discussed under 'Species' in section 3.3.

Extraction or mortality/injury of species living in the wild as a result of commercial and recreational fishery – D3 (commercially exploited fish and shellfish)
Good environmental status will have been achieved if all 27 commercially exploited stocks of fish and shellfish comply with two criteria: maximum sustainable yield and healthy spawning stock [42]. At present seven fish populations meet both criteria. One population (Norway lobster) only fulfils the criterion maximum sustainable yield and two fish populations (sprat and sand eel) fulfil only the criterion for a healthy spawning stock. These scores indicate a rising trend but good environmental status has not yet been achieved.

For commercially exploited fish species, a third criterion has been formulated; concerning the age and size distribution of individuals in the populations. Which pressures (in addition to fishery) influence this criterion is not yet clear. Any policy aimed primarily at protecting large fish is in contradiction with European policy aimed at maximum sustainable yield. ICES has therefore recommended further elaborating this criterion, before it can be used [43].

The CFP was revised in 2013 [8]. The CFP is a set of regulations for the management of the European fishing fleet and the preservation of fish stocks. The aim of the CFP is to ensure that both fisheries and aquaculture are ecologically, economically and socially sustainable and represent a source of healthy food for the citizens of the European Union. In addition, the CFP should encourage a dynamic fishery sector and guarantee a good standard of living for fishing communities. Measures within the CFP include: total allowed catches (TACs), fish quotas and technical measures. At a regional level, multiyear plans are operated. This is all expected to bring about further recovery. There is therefore no supplementary policy assignment.

Specifically for the North Sea coastal zone, a new North Sea coastal fishery agreement (VIBEG-2) was signed on 31 May 2017 for the period 2017-2026 [44]. As well as the closure of areas and a reduction of the effect of shrimp fishing, the aim is a sustainable fishing industry that operates in an ecologically responsible manner and is economically viable. To that end, innovative methods (such as pulse fishing for prawns) are keenly being taken up and implemented by the industry.

Table 13. Extraction or mortality/injury of species living in the wild as a result of commercial and recreational fishery - D3 (commercially exploited fish and shellfish)

Good environmental status	Overarching: gradual recovery and maintenance of populations of fish stocks above a biomass level that can be achieved via the maximum sustainable yield.

	− D3C1: for each commercially exploited fish stock, the fishing mortality rate (F) must be at or below a value which relates to the Maximum Sustainable Yield (MSY): F≤Fmsy (CFP). − D3C2: the biomass of spawning stock (Spawning Stock Biomass or SSB) of commercially exploited fish and shellfish is above the precautionary level MSY Btrigger (in line with ICES catch recommendations; CFP). *It has been agreed internationally that good environmental status for commercially exploited fish species will have been achieved if for each commercially exploited stock, both criteria are satisfied. If this is not the case the species is not yet in good status.*
Current environmental status:	Status is improving but good environmental status has not yet been achieved.
Environmental targets:	• D3T1: the management of all commercially exploited stocks satisfies F≤Fmsy and a spawning stock biomass above the precautionary level MSY Btrigger.
*Measures**	*Catch management for commercially exploited fishery; landing obligation; encouraging alternative fishing gear; certification*
Supplementary policy assignment:	No (current policy is sufficient)
Indicators:	− CFP - FMSY and spawning stock biomass.

**Selection from the programme of measures (2015).*

3.4.2 Physical pressures

Physical disturbance of the seabed – D1 (biological diversity), D6 (sea-floor integrity)
The seabed can be physically disrupted by bottom-disturbing fishery, sand and shell extraction and sand suppletions.

The Fishing Pressure Indicator, as recommended by ICES (on the basis of the BENTHIS project[12]), shows that in 2015, around 54 percent of the seabed of the (international) North Sea (depth 0-200 meter) was disrupted [45]. Because no threshold values were set, it is not possible to assess whether this represents the good environmental status. As compared with the whole of the North Sea, the Netherlands' part is more disrupted.

The ecosystem is able to recover relatively rapidly, following damage. Following sand extraction at sea, the destroyed seabed fauna recovers within four to six years. This is revealed by studies into the effects of sand extraction at a depth of 2 metres in the seabed [46]. Because the presence of sandbanks and sand waves give the seabed a highly variable profile (with depth differences of up to approx. 10 metres) it is expected that recovery will be of a similar order of magnitude in the event of sand extraction of between 6 and 8 metres. In the case of even deeper sand extraction, such as for Maasvlakte 2 (with extraction to a depth of 20 metres), we do not know the outcome. This is currently being investigated.

On the Dutch Continental Shelf, each year, on average 25 million m^3 of sand are extracted, approximately half of which is used for coastal suppletions. To match coastal defences with

[12] BENTHIS is investigating the effects of fishery on the benthic ecosystem thereby offering a scientific basis for assessing the effects of current fishing (www.benthis.eu).

the rise in sea level, an additional 20 million m^3 of suppletion sand is expected to be required in the future, each year [47]. This rise is part of the scenarios drawn up by the PBL, and will be given a place in the North Sea Strategy (North Sea 2030).

Table 14. Physical disturbance of the seabed – D1 (biological diversity), D6 (sea-floor integrity)

Good environmental status	Overarching: physical disruption of the seabed due to human activities is restricted to ensure that the scale, condition and global distribution of populations of the community of characteristic benthos species increases, and targets for specific habitats are achieved. − D6C2: no significant rise in physical disturbance over time on the total seabed of the entire North Sea and the NCP. − D6C3: no rise in physical disturbance over time in the habitats described in the framework of the MSFD. − D6C3 for the habitats described in the framework of the Habitats Directive, the conservation objective for these habitats are achieved.
Current environmental status:	Good environmental status not yet achieved (partially also unknown).
Environmental targets:	• D6T1: 10-15 percent of the surface of the Netherlands' part of the North Sea is not notably disrupted by human activities. • D6T3: no rise in the physical distrubance due to fishing activities over time on the total seabed of the NCP and on the habitats described in the framework of the MSFD. • D1T3: achieving the conservation objective for habitat types and species in the Natura 2000 areas at sea (BHD).
*Measures**	*See section 3.3 'Extraction of or mortality/injury of species living in the wild due to commercial and recreational fishery; see 'Benthic habitats' in section 3.3.*
Supplementary policy assignment:	No (existing policy is sufficient) and a knowledge assignment in respect of cumulation.
Indicators:	− ICES/NLD6 – Fishing pressure indicator.

**Selection from the programme of measures (2015).*

Physical loss of the seabed – D6 (sea-floor integrity)

Physical damage and destruction due to platforms for oil and gas production, new wind farms or land suppletions are local and relatively limited. All these activities are subject to licencing and must complete an EIA procedure. Part of the procedure is the obligation to mitigate or compensate any (cumulative) effects on the marine environment. As a result, in the period since 2012, no significant loss of natural seabed has occurred.

Table 15. Physical loss of the seabed – D6 (sea-floor integrity)

Good environmental status	Overarching: physical loss of the seabed due to human activities is restricted to ensure that the scope, condition and global distribution of populations of the community of characteristic benthos species rises and targets for specific habitats are achieved. − D6C1: no significant loss of the natural seabed as compared with the situation in 2012 as a result of

	human activities. − D6C4: no significant loss as a result of human activities of the habitats described in the framework of the MSFD.
Current environmental status	Good environmental status achieved in 2012 and retained.
Environmental targets	See physical disturbance.
*Measures**	*Conditions on the issuing of licences;*
Supplementary policy assignment	No (existing policy is sufficient).
Indicators	− NL – D6 – Distribution and spatial scope of physical loss.

**Selection from the programme of measures (2015).*

Changes in hydrographical conditions – D7 (hydrographical properties)
Hydrographical changes are changes to the state of the seabed, currents and waves. These influence the physical and chemical properties of the sea for example bottom shear stress, sediment transport, salinity and water temperature. Such influences on marine ecosystems can be relevant if occurring on a larger scale and if permanent in character. As a result, marine habitats can be altered or disappear entirely.

Relatively limited interventions, such as sand extraction, suppletion and dredging work are regulated by licencing; the negative effects on the marine ecosystem are mitigated or compensated. Local effects of such interventions are relatively limited and non permanent. The same applies to such interventions as the construction of the Sand motor. The construction of Maasvlakte 2 has on the other hand led to permanent hydrographical changes but its negative effects on the marine ecosystem have been compensated. An evaluation of the sand extraction for the construction of Maasvlakte 2 reveals that the effects were very local and far less extensive than expected. [48].

The initial assessment (2012) suggests that the decline in the seabed ecosystem and in diadromous fish species in the coastal zone is partially explained by permanent hydrographical effects of the Delta works and Maasvlakte 1 and 2. These projects are of national importance, and are viewed as irreversible. It was therefore concluded in 2012 that a new reference value had been established for good environmental status. In the past period, this good environmental status has been maintained by imposing requirements on new activities in the granting of licences.

Between now and 2020, as compared with 2012, no new large-scale interventions are planned, which could influence the hydrographical properties of the North Sea. In addition, current policy (via the awarding of licences) guarantees maintaining the good environmental status in the event of new activities. To improve the migration opportunities for diadromous fish (fish migrating between freshwater and saltwater), WFD measures have been formulated, including the Kierbesluit Haringvlietsluizen due to be implemented in 2018. There are no supplementary policy assignments.

There is special attention for Dutch and foreign assignments for the development of offshore renewable energy. This means an increase in the number of wind turbines. Physical loss is local and appears relatively limited. Nonetheless, when cumulated, and combined with sand extraction and sand suppletion, these activities may have a possibly significant effect. This represents a knowledge assignment.

In addition to permanent changes to the hydrographical properties due to human action, the influence of climate change is also important (see section 4.2). Sea level rise and a new regime for water discharge from the large rivers can for example have direct effects on the hydrographical conditions, as well as indirect effects, such as the need for more sand suppletions.

Table 16. Changes to hydrographical conditions – D7 (hydrographical properties)

Good environmental status:	The marine ecosystem suffers no negative effects as a result of permanent changes to the hydrographical properties. *No quantitative descriptions of good environmental status at criterion level.*
Current environmental status:	Good environmental status achieved in 2012 and maintained.
Environmental targets:	• D7T1: all developments must satisfy the requirements of the existing legislative regime (for example the Environmental Management Act and the Nature Conservation Act) and any legal assessments must be carried out in such a way that potential effects of permanent changes to hydrographical properties, including cumulative effects, are taken into consideration at the most suitable spatial scale, on the basis of the guidelines developed for that purpose. (EUNIS level 3, reference year 2012).
*Measures**	*Assessment of hydrographical interventions and compensation of undesirable effects.*
Supplementary policy assignment:	No (existing policy is sufficient), but there is a knowledge assignment in respect of the cumulative effects of offshore wind energy and also sand extraction and sand suppletion.
Indicators:	None.

**Selection from the programme of measures (2015).*

3.4.3 Substances, litter, energy

Input of nutrients and organic matter – D5 (eutrophication)
Eutrophication still occurs in the North Sea, but to a far lesser extent than in the past. The OSPAR assessment reveals that since 1990 the introduction of nutrients by rivers has fallen considerably. The concentrations of nitrogen and phosphate in the North Sea waters are therefore significantly lower as a result of which the volume of algal biomass has also significantly fallen. Phosphate now complies with the standard, but nitrogen does not yet. In coastal waters, nutrient concentrations are considerably higher than in offshore waters. This is because they are more heavily influenced by river discharge.

Despite the lower nutrient concentrations, blooms of the harmful algae *Phaeocystis* are still observed. The Netherlands' part of the North Sea is therefore designated as a 'problem area' in the OSPAR assessment. *Phaeocystis* however is not a sound or reliable indicator for the effects of eutrophication. As a result, the Netherlands does not include this indicator in its own assessment.

Coastal waters (up to 1 nautical mile from the coast) have been assessed on the basis of the WFD [49] [50] [51] [52]. This assessment reveals that the bodies of water Zeeland coast and Wadden coast (two of the five bodies of water) do not yet comply with the targets for algal biomass. As a result, good environmental status for eutrophication has not yet been achieved. Due to the huge downturn in phosphate content in coastal waters, the ratio between nitrogen and phosphate in the North Sea is not ideal. Once the nitrogen levels have also fallen sufficiently (pursuant to the WFD and OSPAR), the balance will recover to a more natural ratio.

According to expectations, as a result of current policy, the risk of undesirable eutrophication effects on the marine environment will decrease further through to 2027 (end date of the WFD) and beyond that time will remain minor. It is worth considering in this respect that the effects of eutrophication have fallen to such an extent that the effect of policy is difficult to demonstrate. The effect of policy may also be disrupted by the long lingering effects in the seabed of such substances as phosphate and nitrogen (long after measures have been taken). Other uncertain factors are: the effects of climate change (see section 4.2), the rise in atmospheric deposition (due to sources on land but also at sea such as shipping) and the emission reduction efforts of countries upstream.

It is estimated that good environmental status beyond 2020 is within reach, so a supplementary policy assignment on top of current policy is not necessary. It is however essential 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 indicates that we are on the right path. The environmental status will be monitored closely.

To prevent stagnation, further reduction of nutrients is also one of the priorities of the Delta approach to water quality and freshwater [53]. Key operations in that framework are the Delta Plan for Agricultural Water Management[13] and the sixth action programme Nitrate Directive [54] for the period 2018 through to 2021.

Table 17. Input of nutrients and organic matter – D5 (eutrophication)

Good environmental status	Overarching: the concentrations of winter DIN and DIP are below the level suggesting harmful eutrophication effects. − D5C1 (coastal waters): in coastal waters, the nutrient concentrations in the winter comply with the WFD standards − D5C1 (offshore waters): the nutrient concentrations in the winter satisfy the assessment values of OSPAR. Overarching: algal biomass (determined on the basis of chlorophyll -a-measurements) is not at a level that suggests harmful effects of enrichment with nutrients, pursuant to the assessment according to WFD and OSPAR. − D5C2: algal biomass (determined on the basis of chlorophyll-a measurements) in coastal waters is not higher than the good status pursuant to the WFD for the relevant coastal water types. − D5C2: algal biomass (determined on the basis of chlorophyll-a measurements) in offshore waters satisfies the assessment values of OSPAR. Overarching: no oxygen deficiency due to eutrophication in the deeper water layer (stratified waters) or in the surface water layer of mixed waters. − D5C5 (coastal waters): the lowest water layer (stratified waters) or the surface water layer of mixed waters in coastal waters is saturated with at least 60 percent

[13] Delta Plan Agricultural Water Management is an initiative of LTO Nederland, to contribute to the water assignments in agricultural areas and achieving an economically solid and sustainable agricultural sector (http://agrarischwaterbeheer.nl/)

	oxygen. − D5C5 (offshore waters): in the offshore waters, the lowest water layer (stratified waters) or the surface water layer of mixed waters contains at least 6 mg/l oxygen.
Current environmental status:	Status improving but good environmental status not yet achieved.
Environmental targets:	• D5T1: reduced introduction of nutrients where they do not meet the WFD targets pursuant to its timeline for the river basin management plans. • D5T2: concentrations of nutrients that do meet the WFD standards should not be allowed to rise and their introduction should as far as possible be further reduced.
*Measures**	*Implementation of Annex V MARPOL, reduction of emissions; measures on the basis of the WFD in respect of agriculture, urban wastewater and wastewater treatment installations*
Supplementary policy assignment:	No (existing policy is sufficient), but there is a knowledge assignment in respect of the phosphate-nitrogen ratio.
Indicators:	− NL – WFD assessment − D5 OSPAR Nutrient concentrations − D5 OSPAR Introduction of nutrients − D5 OSPAR Chlorophyll concentrations − D5 OSPAR Dissolved oxygen concentration − OSPAR COMP.

**Selection from the programme of measures (2015).*

Input of other substances – D8 (contaminants)
The OSPAR assessment reveals that the concentrations of contaminants have been considerably reduced and are still demonstrating a downward trend or are stable. What remains are often persistent bio accumulating and toxic substances. These are substances for which measures have already been taken to restrict or end their emission, but which due to their properties are still universally present and will still remain in the marine environment for a considerable time. These are for example PAHs, PBDEs, PCBs and organotin compounds (such as TBT).These substances also still occur in coastal waters in excessively high concentrations according to the WFD [49] [50] [51] [52]. Due to the nature of the sources (incineration processes) and the persistent nature of these substances, these concentrations are only set to fall very gradually.

However, the large effects of contamination are a thing of the past. For example, since the ban on the use of ship paints containing tributyltin (TBT) and other organotin compounds, we have seen a downturn in the trend for reproductive damage in molluscs. The use of copper as a substitute for TBT has however risen considerably. The consequences of the rise in input of copper in the marine environment have been placed on the agenda at OSPAR, and will be monitored over the coming period. This represents a knowledge assignment. A start has now been made within OSPAR on collecting the necessary information.

The OSPAR assessment shows a downturn in discharges of hydrocarbons and harmful chemicals from offshore installations and radioactive discharges by the nuclear sector. Reports in the framework of the Bonn Agreement on incidents reveal that both the number of oil discharges and the volume per incident have fallen over the past decade [55]. The same applies to reports of oiled birds. At present, the IMO is working on a worldwide ban on the discharge of rinsing water with cargo residues containing persistent, highly viscous

substances that float on the water, such as paraffin and wax (stricter MARPOL requirements annex II, [56]).

For the majority of substances, good environmental status is likely to be achieved in the years beyond 2020. At present it only remains difficult to demonstrate the effects of policy for the persistent substances because these substances remain present in the environment for such a long time. For this reason, no supplementary policy assignment is necessary on top of the current policy. Prevention policy (pursuant to the WFD) remains applicable. This is also notable in the awarding of licences on land and on the use of *Best Available Technique Reference documents* (BREFs). The development of substance concentrations including the rise in copper concentrations will be closely monitored.

The presence of medicines and other new micro contaminants in the surface water will demand particular attention over the next few years. In the framework of the Delta approach to water quality and freshwater, a structural chain approach is being developed for these so-called 'emerging substances' while the possibilities of purification are being further investigated. Agreements on these issues were laid down in a declaration of intent at the end of 2016 [53].

Table 18. Input of other substances – D8 (contaminants)

Good environmental status	Overarching: concentrations of contaminants relevant for the marine environment, measured in the most suitable compartment ((water, sediment or marine biota) are lower than the concentrations whereby negative effects can occur or demonstrate a downward trend. − D8C1 (coastal waters): the concentrations of contaminants relevant for the marine environment, measured in the most suitable compartment (water or marine biota) comply with the environmental quality requirements used in the WFD in the 12-mile zone (for priority substances) or the 1-mile zone (for specific contaminants). − D8C1 (offshore waters): the concentrations of contaminants relevant for the marine environment, measured in the most suitable compartment (sediment or biota) comply with the Environmental Assessment Criteria (EAC) and/or Background Assessment Criteria (BAC) from OSPAR, or where target values have not yet been formulated, demonstrate a downward trend (pursuant to OSPAR). Overarching: the health of the species is not harmed by contaminants. − D8C2: downward trend as compared with Imposex 2012. − D8C3: the spatial extent and duration of significant, serious acute pollution events is reduced to a minimum.
Current environmental status	Status improving, but good environmental status not yet achieved.
Environmental targets	• D8T1 (coastal waters): reduction in the input of contaminants not yet meeting the WFD targets, pursuant to the timeline of the river basin management plans. Concentrations of contaminants that already meet WFD standards are not permitted to rise. • D8T2 (offshore): wherever possible reducing

	concentrations of contaminants. • D8T4: reducing input of heavy metals to the marine environment. • D8T3: regional monitoring of copper concentrations now that this heavy metal is used as a replacement for TBT (OSPAR). • D8T5: as quickly as possible eradicating acute pollution, wherever necessary in collaboration within the Bonn Agreement • D8T6: reducing the use of lead for example in sport fishing (WFD).
*Measures**	*Implementation of measures pursuant to the WFD in respect of industrial emissions, crop protection agents and inland shipping discharges; reduced discharge due to incidents and disasters; reduced discharge from oil and gas production (OSPAR); reduced discharges from shipping (MARPOL) and ban on TBT.*
Supplementary policy assignment	No (existing policy is sufficient), but there is a knowledge assignment in respect of emerging substances and copper.
Indicators	Coastal waters: − NL - WFD specific contaminants in the 1-mile zone and priority substances in the 12-mile zone. − OSPAR D8C2 Imposex. Offshore waters: − OSPAR – PAHs in biota and sediment − OSPAR – PCBs in biota and sediment − OSPAR – PBDEs in biota and sediment − OSPAR - organotin in sediment − OSPAR - metals in biota and sediment Sources of heavy metals: − OSPAR – Sources of heavy metals NL-copper concentrations: − Copper concentrations are not yet included in the MSFD monitoring programme. This is expected to be introduced at the latest in 2020. Acute contaminations: − Number of oil discharges and volume per incident (Bonn Agreement).

**Selection from the programme of measures (2015).*

Contaminants in fish and other seafood for human consumption – D9 (contaminants in fish and other seafood for human consumption)

The current levels of contaminants in fish and other seafood for human consumption do not exceed the limits determined by national and international legislation [57]. This was also not the case at the time of the initial assessment in 2012. The standards in question were adopted in EU regulation 1881/2006 and the revision to this regulation by EC regulation 396/2005 [58]). The levels of contaminants in fish and other seafood for human consumption are in fact often below the analytical quantification limit. In other words, in the current situation, good environmental status is achieved. The expectation is that this will remain the case over the coming period.

Levels for radioactive substances in foodstuffs have been set down at a European level. The OSPAR assessment reveals that the doses are far below the international standards for human exposure to radiation.

If policy does not change, the Netherlands will be able to maintain this status in 2020 and beyond. As a result there are no supplementary policy assignments in respect of contaminants in fish and other seafood for human consumption

Table 19. Contaminants in fish and other seafood for human consumption – D9 (contaminants in fish and other seafood for human consumption)

Good environmental status	Overarching: the levels of contaminants (including PAKs, dioxins and heavy metals) in fish and other seafood for seafood for human consumption from the North Sea do not exceed the limits determined in EU regulation EC 1881/2006.
Current environmental status	Good environmental status achieved in 2012 and maintained.
Environmental targets	− D9T1: the levels of contaminants in fish and other seafood for human consumption compliant with national and international legislation must not be allowed to rise, and if possible should be further reduced.
*Measures**	*Legal standards*
Supplementary policy assignment	No (existing policy is sufficient).
Indicators	− NL - Assessment according to EG1881/2006

**Selection from the programme of measures (2015).*

Input of litter – D10 (litter)

The OSPAR assessments for beach litter, seabed litter and plastic in the stomachs of fulmars show that litter (including mostly plastic) is common on the beaches, in the water column and on the seabed of the North Sea. At North Sea level, there are still no indications of a significant decrease. On the other hand, a significant decrease in the total number of litter items has been observed on Dutch beaches. For the first time, a significant decrease has also been observed in plastic in the stomachs of northern fulmars washed up on the Dutch coast.

Although the volume of litter in the Netherlands' part of the North Sea appears to be decreasing, volumes remain high. There are also still lots of unknowns about the sources, distribution routes and effects on the ecosystem. Because plastic is a persistent substance barely subject to natural degradation, if at all, this type of waste will continue to build up in the marine environment over a long period.

There is special attention for riverine and especially microplastics. Rivers are a huge source or pathway litter. There is still little known about the scale of the sources, but research has given an initial indication of the magnitude of the input of waste from Dutch rivers (see text block).
Awareness is constantly growing of the (primary and secondary) sources and effects of microplastics but further research remains necessary. It seems likely that the proportion of microplastics in litter is set to increase as a consequence of the degradation of the already present plastic macro litter.

Litter: riverine litter and microplastics
Due to a lack of knowledge for precisely determining good environmental status and given the need to gain a greater insight into the effects of litter, a variety of knowledge programmes have been initiated in the recent period. Considerable progress has been achieved in respect of riverine litter and microplastics.

Initial field studies (based on cleaning campaigns along riverbanks and waste collection in rivers) provide an indication of the volume of litter in the Dutch river basin of the Rhine, Meuse and Scheldt [59]. Riverine litter comprises mainly plastics. The volumes of macroplastics vary between 10-100 m^3 per year for the Meuse and Scheldt and 50-500 m^3 for the Rhine. The volumes of microplastics range on average between 10-100 particles (approx. 0.1 – mg) per m^3 river water (Meuse and Rhine).

More and more is known about the sources of microplastics and the presence and effects of microplastics in the sea. Microplastics enter the sea when plastic litter, already present in the marine environment, degrades into ever smaller particles and through direct emissions of microplastics into the water, from sources on land. Examples of such sources are pellets, fibres from clothing, car tyres, paint and microplastics added to cosmetics and abrasive cleaning and polishing agents. There are indications of potential risks for marine animals and transfer within the food chain [60].

Recent studies have shown that microplastics are present in various volumes in all compartments (water, sediment, marine biota) of the marine environment [61]. This has been taken as the basis for the development of an (OSPAR) indicator for microplastics in sediment. Further research continues to be necessary into the presence and environmental effects of microplastics.

The operating principle for the Government is that (plastic) litter does not belong in the sea. In 2012, therefore, a reduction target[14] and supplementary policy assignment for litter were formulated. This has resulted in a set of MSFD measures for beaches, shipping, fishery, river basins, education and awareness and specific plastic products. The implementation of these measures was broadly started in 2016. In addition, in 2014, OSPAR adopted the *Regional Action Plan Marine Litter* [62].

The Dutch National Circular Economy programme [63] represents a major impulse for reduced levels of litter in the sea. This programme is aimed at achieving an economy based on the reuse of raw materials and energy. One of the subjects of the programme is tackling the throw-away mentality. Also important is the proposal from the European Commission to revise the Port Reception Facilities Directive in 2017. The Netherlands is aiming for further harmonisation of the regulations and the tightening up of the mandatory delivery of waste.

The data from monitoring and assessment suggest a decrease in the levels of litter in the Netherlands' part of the North Sea. It is expected that existing policy, the (proposed) measures and initiatives from society will ensure that this trend continues. Because there is no doubt about the contribution from the initiated policy towards the development of good environmental status, although the effectiveness and pace of that development remain difficult to prove, the supplementary policy assignment from 2012 will be continued.

[14] The international ambition for the longer term is to work towards quantitative (regional) targets for beach litter (e.g. 30 percent reduction) and plastic in the stomachs of northern fulmars (10 percent of the birds; OSPAR EcoQO). How these objectives can be achieved will have to be further determined in consultation with the EU programme for the Circular Economy and in careful harmony with neighbouring countries.

The lack of knowledge makes it difficult to precisely determine good environmental status. It is also essential that an unambiguous relationship be established between sources, good environmental status, environmental targets and measures. For all of these reasons, various knowledge programmes have been initiated in the recent period. Nonetheless, additional research remains necessary, above all in respect of river waste and microplastics. There is also a continuing need for international cooperation in respect of the litter problem.

Over the past few years, paraffin-like substances have regularly washed onto the Dutch coast. These substances will be made part of regular beach waste monitoring. The problem of tackling paraffin and paraffin-like substances is the responsibility of IMO (stricter MARPOL annex II).

Table 20. Input of litter – D10 (litter)

Good environmental status	Overarching: the quantity of marine litter will decrease over time. − D10C1 (beach): significant downward trends in the total of the most common categories of litter (contributing to 80 percent of the total volume of litter) found on the beach. − D10C1 (floating, short term): A significant downward trend in the number of northern fulmars with more than 0.1 g of plastic particles in their stomach during the past ten years. − D10C1 (seabed litter): significant decrease in the volume of litter on the seabed. Overarching: the volume of micro litter at sea will decrease in the long term. − As yet no quantitative description due to the absence of an indicator for microplastics and the accompanying baseline. Overarching: the quantity of litter and micro litter ingested by marine animals is at a level that is not harmful to the health of the species in question. − D10C3: see D10C1.
Current environmental status	Status improving, but good environmental status not yet achieved (partially also unknown).
Environmental targets	− D10T1: at regional level working towards quantitative (regional) targets for beach litter (e.g. 30 percent reduction) and plastic found in stomachs of northern fulmars (10 percent of the birds; OSPAR EcoQO). − D10T2: at regional North Sea level working towards the development of an indicator for microplastics in sediment.
*Measures**	*Communication and awareness; teaching modules, beach cleaning campaigns, Green Deal Clean Beaches; Clean Meuse approach, extension into other river basins; litter collection scheme; Green Deal Ships' Waste Chain; implementation EU Directive on Port Reception Facilities; ban on waste disposal from sea ships (MARPOL); Fishing for Litter (fishery); Green Deal Fishery for Clean Seas; implementation of waste policy; reduction in use of plastic bags and balloons; reduction of microplastics in cosmetics and cleaning agents.*

Supplementary policy assignment	Yes (supplementary policy from 2012 to be continued), and knowledge assignment in respect of riverine litter and microplastics.
Indicators:	− OSPAR – Beach litter − OSPAR - Plastic in marine birds stomachs − OSPAR – Seabed litter − For microplastics not yet developed.

**Selection from the programme of measures (2015).*

Input of anthropogenic sound – D11 (input of energy)
Underwater noise is distinguished into impulsive noise (such as pile driving, seismic and sonar systems) and continuous noise (mainly shipping and operational wind farms). During the preparation of the initial assessment in 2012, the extent to which the noise burden (both impulsive and continuous noise) represented a serious problem and what its possible cumulative effects could be were unclear. Major advances have been achieved over the past few years in respect of knowledge development and monitoring. A number of concrete measures have also been taken. There has been intensive international coorperation. One of the results is the European monitoring guidance for underwater noise [64].

To obtain a greater understanding of impulsive noise, a common impulsive noise register was established within OSPAR. An initial analysis of the data of 2015 reveals that there are large variations over time in the number of sources and their spatial distribution. Although measurement data for a longer period are still lacking, it is already clear that activities can vary widely from year to year. As yet, there is no international agreement on the interpretation of the data and assessment of the effects of impulse noise at ecosystem level.

On a national level, it had been concluded that the construction of new wind farms can lead to an unacceptable reduction in the harbour porpoise population. Regulations have therefore been adapted. By imposing conditions in the Wind Farm Site Decisions, significant effects on the ecosystem are avoided. To reduce the number of disturbance days specifically for the harbour porpoise, noise regulations have been included in the Wind Farm Site Decisions. The Ministry of Defence has also made changes to its method for clearing explosives. For the time being, there are no internationally agreed quantitative targets.

With regards to continuous underwater noise, there has been intensive international cooperation over the past few years. As a result, an OSPAR monitoring strategy and plan for the North Sea have been drawn up [65]. On this basis, over the coming period, seven of the North Sea countries will be collecting data on the distribution and levels of continuous noise. This will be carried out in the framework of the Interreg project *Joint Monitoring Programme For Ambient Noise in the North Sea* (JOMOPANS), led by Rijkswaterstaat. The aim is to have compiled sufficient knowledge in time for the next MSFD cycle, to be able to determine whether, and if so, which measures are necessary to restrict continuous noise.

For the time being this appears sufficient (at least in respect of impulsive noise) to achieve good environmental status by 2020. For that reason, no supplementary policy assignments have been formulated. The Dutch and foreign assignment for achieving renewable energy generation and new insights into the (cumulative) effects of impulsive noise for the construction of wind farms may in the future still result in a supplementary policy assignment.

Research has shown that continuous noise from operational wind farms is restricted to the farms themselves. For the time being the noise levels measured are assessed as low. As the area employed for the generation of wind energy grows, account must be taken of a rise in continuous noise levels. Possible measures for reducing continuous noise caused by shipping will be undertaken via the IMO. The Netherlands supports initiatives within the IMO (such as those undertaken by Canada) for limiting noise produced by shipping.

Table 21. Input of anthropogenic sound – D11 (input of energy)

Good environmental status	Overarching: distribution in time and space and sound levels of loud impulsive sound sources are such that the direct and indirect effects of loud impulsive sound do not threaten the favourable conservation status of maintenance of species. − D11C1: for harbour porpoises, reduction of population size is prevented by imposing a limit on the number of harbour porpoise disturbance days Overarching: distribution in time and space and levels of continuous sound sources are such that they do not threaten the favourable conservation status of maintenance of species. − D11C2: *for this criterion, it is not yet possible to draw up quantitative descriptions for good environmental status.*
Current environmental status	Status in respect of impulsive sound is improving, but good environmental status for continuous sound is not yet known.
Environmental targets	− D11T1: continuation of stricter regulations concerning the prevention of harmful effects of impulse noise. − D11T2: development of a limit for the number of disturbance days at regional level (OSPAR). − D11T3: starting an international monitoring programme for continuous sound to map the level and distribution of continuous sound.
*Measures**	*Licence requirements imposed for the construction of wind farms; code of conduct on clearing explosives; regulations on use of Defence sonar; regulations on seismic research; implementation of IMO guidelines on underwater noise produced by shipping.*
Supplementary policy assignment	No (existing policy is sufficient), but there is a knowledge assignment in respect of cumulation and continuous sound.
Indicators	− OSPAR – Impulsive noise − OSPAR – Abundance and distribution of cetaceans

**Selection from the programme of measures (2015).*

Input of other forms of energy
Other forms of energy include light (from platforms and wind turbines), electromagnetic radiation and heat radiation. Criteria for these forms of energy are not yet available, so that no good good environmental status and environmental targets have yet been formulated. Nonetheless (pursuant to the precautionary principle) the Netherlands already takes account of these forms of energy in the issuing of licences. Within OSPAR, (at the initiative of the Netherlands), voluntary guidelines were adopted in 2015 to reduce the effects of lighting by offshore platforms on migratory birds [66]. Wozep is also investigating the effects of electromagnetic radiation (from transport cables for wind turbines) on the marine environment.

3.4.4 Activities

The activities contributing to the pressures are described in chapter 2 and in appendix III.

4. Overarching themes

4.1 Introduction

The previous chapter described the assessment of the current status of the marine environment on the basis of the 11 descriptors defined in the MSFD. Agreements were made at national level and within OSPAR to add assessments of a number of additional themes, i.e., long-term developments such as climate change and acidification (section 4.2), the cumulative effects of increasing human activities (section 4.3) and the establishment of a network of marine protected areas (section 4.4). These themes are incorporated in the Marine Strategy because of the substantial impact they will have on the future functioning of the marine ecosystem.

4.2 Climate change and acidification

The climate has always been subject to change, but in the last few decades there have been a combination of accelerated changes driven by global warming. Climate change can affect the North Sea's ecosystem in various ways. The three principal effects are:

- increase in the sea surface temperature,
- rise in sea levels, and
- increase in ocean carbon uptake (acidification).

The expected increase in temperature depends on the intensity of measures taken worldwide to reduce CO_2 emissions. Nevertheless, even with maximum efforts the average temperature (at global level) will rise between 1.5 and 2 °C by 2100 [67]. The water temperature in the North Sea is therefore expected to rise in the coming decades, which will cause changes in ecological communities, with possible consequences for fishing and other ecosystem services in the North Sea.

Sea levels are also visibly rising worldwide. The rising sea level is most likely to have a direct effect on the shallowest zones along the coast. In time, sandbanks that currently still dry up might only dry up for shorter periods or not at all at low tide, with the result that there are fewer nesting, foraging and resting sites for wading birds and essential resting places and nurseries for seals. Forecasts of the extent of the rise in the sea level along the Dutch coast up to 2100 vary, depending on the climate scenario used, from 25 centimetres to 1 metre [68].

Ocean acidification is the phenomenon of a steady increase in the acidity of the seawater as a result of the greater uptake of CO_2 from the atmosphere. Acidification occurs more rapidly in coastal seas like the North Sea than in oceans. The acidity of the North Sea has increased in a relatively short space of time because the rising water temperature has been accompanied by a decline in the nutrient loading. Organisms use up more energy to form a shell or calcium skeleton in seawater with a higher level of acidity and that energy can no longer be used for growth and procreation or to strengthen the immune system. Ultimately, there is even a risk of degradation of the shells of molluscs. Further acidification of the North Sea is likely.

Agreement was reached at the climate conference in Paris in 2015 to limit global warming to below 2°C compared with the pre-industrial era and to endeavour to contain global warming to 1.5°C [69]. It is now up to national governments to formulate the necessary policies and specific measures to implement them.

Dutch policy is aimed at addressing the causes of climate change (mitigation, with particular emphasis on reducing emissions). For the North Sea and its use, this means, for example, the construction of wind farms (energy transition).
The Netherlands is also endeavouring to minimise the negative effects of the consequences of climate change (adaptation, including flood protection measures). As regards the North Sea, that could mean an increase in sand extraction for the purposes of sand suppletion along the coast. For the time being, the Netherlands will maintain the current volume of sand extraction for suppletion of 12 million m^3 a year [5]. On the basis of the findings from the research and monitoring programme 'Kustgenese 2', a decision on whether to increase the volume of sand suppletion will be made around 2020 [47].

A lot is still not known about the impact of climate change. For example, it is still uncertain how the communities of plankton, benthos, fish, marine birds and marine mammals will respond. The existing monitoring programme will be used to observe changes in these ecological communities. The Netherlands is also taking part in an OSPAR programme designed to effectively monitor acidification. The National Water and Climate Knowledge and Innovation Programme is also mapping the consequences of climate change (acidification, increase in temperature).

4.3 Cumulative effects

The North Sea is used increasingly intensively. The construction of wind farms, sand extraction, oil and gas exploration and recovery, shipping, fisheries, military activities and recreation all require space and have an impact on the marine environment. Although the impact of each individual activity might not in itself be serious, the cumulative effects (in time and/or space) could be. In addition to direct effects, the cumulative effects can also have an indirect impact on the ecosystem. These effects are often not attributable to a single activity, but can be the result of a complex interaction of various cause-and-effect relationships.

Mapping cumulative effects is a complex process. One of the problems is that the southern part of the North Sea has been used intensively for so long that there are insufficient data to establish a good reference situation. In recent years, therefore, significant efforts have been made at national and international level to develop instruments to describe or predict cumulative effects. The recent emphasis has been on application-oriented methods, particularly with regard to the development of offshore wind farms.

The Netherlands has drafted a Framework for assessing ecological and cumulative effects of offshore wind farms [70] [71], which concentrates specifically on the cumulative effects of wind farms for marine mammals (underwater noise), birds and bats. The framework is incorporated in the North Sea Policy Document 2016-2021 and use of the instrument is therefore mandatory in procedures to designate areas for wind energy and in drafting Wind Farm Site Decisions.
OSPAR has developed an overarching/regional method for identifying and assessing cumulative effects (Cumulative Effects Assessment) [72]. The Netherlands uses that method to produce an integrated cumulative effects assessment (iCEA) of activities on the North Sea for the indicator marine mammals [73].

The Netherlands will continue the existing policy in relation to cumulative effects in the coming years. The cumulative effects of new activities and plans will be a criterion in licensing and Environmental Impact Assessment (EIA) procedures. Meanwhile, the methods mentioned above will be further developed. For example, a major update of the Framework for assessing ecological and cumulative effects of offshore wind farms is planned for the middle of 2018. The Netherlands also wants to use the framework's application-oriented

approach for other sectors. At regional level, the intention is to assess cumulative effects in the next OSPAR Quality Status Report.

In response to the Paris climate agreement, the energy ministers of the countries around the North Sea issued a declaration [74] in June 2016 stating their intention to collaborate more intensively in the development of offshore wind farms. In that context, a method of addressing the cumulative effects of sustainable offshore energy generation will be developed. This method will correspond as closely as possible with the Framework for assessing ecological and cumulative effects of offshore wind farms and OSPAR's method of assessment.

4.4 Network of protected areas

The EU's Birds Directive and Habitats Directive provide that areas of exceptional ecological value must be protected. The aim is the sustainable conservation of important flora and fauna – in a European perspective – by creating a network of nature areas. The creation of a coherent and representative network of marine protected areas is also one of the goals of the MSFD. That network interacts with and is supportive of the entire North Sea area and other protected areas.

Protected areas: what, why and how?

What are we trying to protect?
Various habitats, such as reefs, sandbanks, silt-rich seabeds and all the associated species and ecological communities and as many as possible of the gradients (transitions) in depth, abiotic factors, species and habitats that together determine the biodiversity of the North Sea.

Why are we trying to protect them?
The pressure exerted on biodiversity by human activities is causing the quality of areas to deteriorate. The purpose of the Marine Strategy is to halt the loss of biodiversity and reverse the trend in the direction of recovery.

How will we do that?
By protecting areas with habitats and species characteristic of the North Sea and by monitoring developments in those areas. For this purpose, the Netherlands has developed the national benthos indicator, which is based on measurements taken over the last 30 years as well as indicators developed by ICES and OSPAR.

The Netherlands has joined initiatives by the EU and OSPAR to evaluate the coherence and representativeness of marine protected areas and how they are managed. An initial evaluation of the status of protected areas and their management and monitoring and an initial attempt to assess their ecological coherence has already been made in the OSPAR Intermediate Assessment (2017). Together with neighbouring countries, the Netherlands is further developing the methodology in order to provide a better assessment of the ecological coherence of protected areas in which aspects such as connectivity, representativeness and resilience are considered.

The Voordelta (2000) and the North Sea Coastal Zone (2009) are areas along the Dutch coast that have been designated as Birds Directive areas and Habitats Directive areas and the Raan Flats (2010) has been designated as a Habitats Directive area. Management plans have been drawn up for these areas [27] [28] [75] setting out how activities will be prevented from degrading the nature and even help to improve it. Since 2012, the Dogger Bank (2016)

and the Cleaver Bank (2016) have both been designated as Habitats Directive areas [76] [77] and the Frisian Front (2016) as a Birds Directive area [78]. Management plans will be drawn up for these areas in the coming period. International coordination and decision-making on measures to limit fishing are organised in the Scheveningen Group. On the grounds of Article 11 of the Regulation establishing the Common Fisheries Policy, the North Sea states in this group can make joint recommendations for measures relating to fisheries to the European Commission, which has exclusive powers to adopt such measures.

Other valuable areas in the North Sea are the seabeds of the Frisian Front, the Central Oyster Grounds and the Brown Ridge. A proposal has been made to assign the status of 'seabed protection area' to an area of 2,000 km^2 of the Frisian Front and Central Oyster Grounds under the MSFD. It is not yet known when the European Commission will make a decision on this proposal.
The decision on whether to designate Brown Ridge as a Birds Directive area will be made in the coming period. Until then, the area's status as 'potentially ecologically valuable' will be maintained.

A long-term programme has been started to monitor the quality of the habitats of the marine protected areas. With this programme it will also be possible to assess the effectiveness of the measures taken and determine whether the management objectives have been achieved.

5. Conclusions and follow-up

5.1 Introduction

Chapters 3 and 4 described the current environmental status in relation to all the descriptors and the overarching themes and determined whether supplementary policy is required to ultimately achieve good environmental status. The knowledge assignments were also identified. Section 5.2 summarises the main conclusions arising from those descriptions. On the basis of those conclusions, section 5.3 contains suggestions for the updating of the monitoring programme (Marine Strategy Part 2) in 2020 and of the programme of measures (Marine Strategy Part 3) in 2021 and the associated knowledge programme. The conclusions also describe the implications of the updated Marine Strategy Part 1 for the North Sea 2030 strategy.

5.2 Main points of the assessment

The environmental status in the Netherlands' part of the North Sea is improving and is steadily approaching the desired good environmental status. This finding largely corresponds with the conclusions reached in the OSPAR Intermediate Assessment (see text box).

Conclusions of OSPAR Intermediate Assessment (2017)

1. Eutrophication is still a problem in some areas.
2. Contaminant concentrations are decreasing, but concerns remain.
3. Discharges from offshore oil and gas installations have decrease due to OSPAR measures.
4. Radioactive discharges from the nuclear sector have decreased.
5. Marine litter is a problem.
6. A network of international marine protected areas has been established and is expanding.
7. Benthic habitats and animals are affected by bottom fishing.
8. Marine birds are in trouble.
9. Fish communities show signs of recovery in some areas.
10. Mixed signals for marine mammals.
11. International cooperation is required to improve the marine environment.
12. New developments in the way biodiversity is assessed.

As in 2012, good environmental status was achieved in the Netherlands' part of the North Sea for the descriptors 'Hydrographical properties' and 'Contaminants in sea food for human consumption'. Good environmental status now also appears to have been achieved for 'Non-indigenous species'. Existing legislation will ensure that good environmental status is also maintained in future for these descriptors. Good environmental status could be reached between 2020 and 2027 in relation to three descriptors: 'Contaminants', 'Eutrophication' and 'Underwater noise', but that will depend on current policy being fully implemented.

With the designation of Natura 2000 areas, the drafting of management plans and the proposed seabed-protection measures under the MSFD important steps have been taken to protect the marine ecosystem (descriptors 'Biodiversity', 'Commercially exploited fish species', 'food webs' and 'sea-floor integrity'). The status in relation to these descriptors is generally improving, with the exception of birds, but in some cases there is still no method for properly assessing their status. There is also too little insight into cumulative negative effects.

The assessment of the current status has yielded initial positive signs from the Common Fisheries Policy and measures to reduce litter. Accordingly, the status for the descriptors ‘commercially exploited fish species’ and ‘litter’ has improved. Existing (supplementary) policy and associated measures are therefore having an impact. No further intensification of policy is required for the time being.

5.3 Implications for policy

The above conclusions have the following implications for the monitoring programme (Marine Strategy Part 2), the programme of measures (Marine Strategy Part 3) and the knowledge programme for the MSFD. There is also substantial symbiosis with the development of the North Sea 2030 strategic agenda (2018) as part of the National Environmental Planning Vision (2019).

Monitoring programme
If necessary, the MSFD monitoring programme will be revised annually in light of new insights and international coordination under the auspices of OSPAR and ICES. The updating of the monitoring programme must be completed no later than 15 July 2020. Assessment methods will be developed for a number of subjects (such as the marine ecosystem, litter and underwater noise) and it might be necessary to perform associated measurements. The knowledge programme includes the development of methods of assessment within OSPAR.

Programme of measures
The programme of measures must be updated by the end of 2021 at the latest. The programme is a building block for the policy agenda for the period up to 2030. The current programme dating from 2015 supplements existing policy (arising from the Water Framework Directive, the Birds Directive and the Habitats Directive, the Common Fisheries Policy, the International Maritime Organisation (IMO) and OSPAR) with measures for seabed protection in the Frisian Front and the Central Oyster Grounds. Additional measures have also been adopted to reduce litter, with an emphasis on prevention in the sectors that are the main sources of (micro)plastics. The assessment of the current environmental status does not indicate any new or supplementary priorities for the period up to 2024. The government will therefore proceed with the existing (supplementary) policy assignments. Specific attention will be devoted to the effectiveness of existing policy (for birds, for example), carrying out the assignment for sustainable offshore energy and the drafting of the North Sea Strategy 2030.

Knowledge programme
The process of updating the Marine Strategy Part 1 has also yielded an overview of the knowledge gaps. It is important to fill in the major knowledge gaps before updating the monitoring programme and the programme of measures. Priorities for the knowledge programme are:

- Cumulative effects of new wind farms and other human activities on the ecosystem. As regards wind farms, these are mainly the effects on populations of marine birds and the consequences of underwater noise for populations of marine mammals during the construction phase. With regard to other activities, the main priorities are the effects of fisheries on populations of marine mammals, sharks and rays.
- (Cumulative) effects of sand extraction and beach suppletion on sea-floor life.
- Possibilities for active recovery of biogenic reefs, such as shellfish beds, for example in wind farms.
- The breeding success of marine birds and factors that can influence it.
- Methods of assessing benthic and pelagic habitats.
- Relationships in the food web in the North Sea formed by a network of seabed flora and fauna (benthos), small and large fish and marine mammals.

- Consequences of acidification.
- The phosphate-nitrogen balance.
- Microplastics, copper, medicine residues and other substances that are becoming more common.
- Assessment framework for a coherent and representative network of offshore marine protected areas.

The government's research programme will dovetail as far as possible with existing national and international research programmes (such as EU programmes LIFE, Horizon 2020 and Interreg). At national level, the Knowledge of the North Sea Working Group (part of the IDON) has been formed to coordinate the research programmes of the relevant ministries and knowledge institutes. The Offshore wind energy ecological programme (Wozep) will also play an important role in eliminating the knowledge gaps.

The results of the knowledge creation programme could lead to revision of the policy assignments, which will then be addressed in the North Sea Strategy 2030.

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II. Abbreviations

ASCOBANS	Agreement on the Conservation of Small Cetaceans of the Baltic, North-East Atlantic, Irish and North Seas
BD	Birds Directive
BHD	Birds and Habitats Directive
CBD	Convention on Biological Diversity
CBS	Statistics Netherlands
CFP	Common Fisheries Policy
EC	European Community
EcoQO	Ecological Quality Objective
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment (the procedure)
EU	European Union
EUNIS	European Nature Information System
EZK	Ministry of Economic Affairs and Climate Policy
GES	Good Environmental Status
HD	Habitats Directive
HELCOM	Helsinki Commission; manages the Convention on the Protection of the Marine Environment of the Baltic Sea Area
IA	Initial Assessment
ICES	International Council for the Exploration of the Sea
IDON	Interdepartmental Directors North Sea Consultative Body
IenW	Ministry of Infrastructure and Water Management
IMO	International Maritime Organisation
LNV	Ministry of Agriculture, Nature and Food Safety
MARPOL	International Convention for the Prevention of Pollution from Ships
MSFD	Marine Strategy Framework Directive
MSY	Maximum Sustainable Yield
NCS	National Continental Shelf
NWP	National Water Plan 2016-2021
OIM	Infrastructure and Environment Consultative Platform
OSPAR (Convention)	Convention for the Protection of the Marine Environment of the North-East Atlantic
PAHs	Polycyclic aromatic hydrocarbons
PBDEs	Polybrominated diphenyl ether
PBL	Environmental Assessment Agency
PCBs	Polychlorinated biphenyl
PRF	Port Reception Facility
RIVM	National Institute for Public Health and the Environment
SCANS	Small Cetaceans in the European Atlantic and North Sea
TBT	Tributyltin
WER	Wageningen Economic Research
WFD	Water Framework Directive
WMR	Wageningen Marine Research

III. MSFD article 8, 9 and 10

Article 8, 9 and 10 of the Framework Directive Marine Strategy (Directive 2008/56/EC).

Article 8 Assessment

1. In respect of each marine region or subregion, Member States shall make an initial assessment of their marine waters, taking account of existing data where available and comprising the following:

a) an analysis of the essential features and characteristics, and current environmental status of those waters, based on the indicative list of elements set out in Table 1 of Annex III and covering the physical and chemical features, the habitat types, the biological components and the hydro-morphology;

b) an analysis of the predominant pressures and impacts, including human activities, on the environmental status of those waters which:
i) is based on the indicative list of elements set out in table 1 of Annex III and covers the qualitative and quantitative mix of the various pressures, as well as discernible trends;
ii) covers the main cumulative and synergetic effects; and
iii) takes account of the relevant assessments which have been made pursuant to existing Community legislation;

c) an economic and social analysis of the use of those waters and of the cost of degradation of the marine environment.

2. The analyses referred to in paragraph 1 shall take into account elements having regard to coastal, transitional and territorial waters covered by relevant provisions of existing Community legislation, in particular Directive 2000/60/EC. They shall also take into account, or use as their basis, other relevant assessments such as those carried out jointly in the context of Regional Sea Conventions, so as to produce a comprehensive assessment of the status of the marine environment.

3. In preparing assessments pursuant to paragraph 1, Member States shall, by means of the coordination established pursuant to articles 5 and 6, make every effort to ensure that:

a) assessment methodologies are consistent across the marine, region or subregion;

b) transboundary impacts and transboundary features are taken into account.

Article 9 Determination of good environmental status

1. By reference to the initial assessment made pursuant to Article 8(1), Member States shall, in respect of each marine region or subregion concerned, determine, for the marine waters, a set of characteristics for good environmental status on the basis of the qualitative descriptors listed in Annex I. Member States shall take into account the indicative list of elements set out in Table 1 of Annex III and, in particular, physical and chemical features, habitat types, biological features and hydro-morphology. Member States shall also take into account the pressures or impacts of human activities in each marine region or subregion, having regard to the indicative list set out in Table 2 of Annex III.

2. Member States shall notify the Commission of the assessment made pursuant to article 8(1) of the determination made pursuant to paragraph 1 of this Article, within three months of completion of the latter.

3. Criteria and methodological standards to be used by the Member States, which are designed to amend non-essential elements of this Directive by supplementing it, shall be laid

down, on the basis of Annex I and III, in accordance with the regulatory procedure with scrutiny referred to in Article 25(3) by 15 July 2010 in such a way as to ensure consistency and to allow for comparison between marine regions or subregions of the extent to which good environmental status is being achieved. Before proposing such criteria and standards, the Commission shall consult all interested parties, including Regional Sea Conventions.

Article 10 Establishment of environmental targets

1. On the basis of the initial assessment made pursuant to Article 8(1), Member States shall, in respect of each marine region or subregion, establish a comprehensive set of environmental targets and associated indicators for their marine waters so as to guide progress towards achieving good environmental status in the marine environment, taking into account the indicative lists of pressures and impacts set out in Table 2 of Annex III, and of characteristics set out in Annex IV. When devising those targets and indicators, Member States shall take into account the continuing application of relevant existing environmental targets laid down at national, Community or international level in respect of the same waters, ensuring that these targets are mutually compatible and that relevant transboundary impacts and transboundary features are also taken into account, to the extent possible.

2. Member States shall notify the Commission of the environmental targets within three months of their establishment.

IV. MSFD descriptors and criteria

Table 22. Overview of all descriptors and related criteria from Commission Decision 2017/848.

	Descriptor		**Criteria**	**Primary/ secondary**
D1	Biological diversity is maintained. The quality and the occurrence of habitats and the distribution and abundance of species are in line with predominant physiographic, geographical and climatological conditions.	D1C1	The mortality rate per species as a result of incidental by-catch is lower than the level at which the species is endangered, so that the viability of the species is guaranteed in the long term.	Primary
		D1C2	The population density of the species is not harmed by anthropogenic burdens, so that the viability of the species is guaranteed in the long term.	Primary
		D1C3	The demographic characteristics of the population (e.g. size of the body or age structure, gender ratio, fertility and survival rates) of the species indicate a healthy population not harmed by anthropogenic burdens.	Primary for commercially-exploited fish and shellfish and and secondary for other species:
		D1C4	The distribution area and if applicable the distribution pattern of the species is compliant with the prevailing physiographical, geographical and climatological conditions.	Primary for species covered by Annexes II, IV and V of Directive 92/43 and secondary for other species:
		D1C5	The size and condition of the habitat of the species are suitable for supporting the various phases of the lifecycle of the species.	For species covered by Annexes II, IV and V of Directive 92/43/EC and secondary for other species:
		D1C6	The condition of the habitat type, including biotic and abiotic structure and its functions (e.g. the characteristic species composition and their relative abundance, the non-occurrence of particular sensitive or vulnerable species or species that have an essential function, the size composition of species) is not harmed by anthropogenic burdens.	Primary

D2	Non-indigenous species introduced by human activities are at levels that do not adversely alter the ecosystem.	D2C1	The number of non-indigenous species which are newly introduced via human activity into the wild, per assessment period (six years), measured from the reference year as reported for the initial assessment under Article 8(1) of Directive 2008/56/EC, is minimised and where possible reduced to zero.	Primary
		D2C2	Abundance and spatial distribution of established non-indigenous species, particularly of invasive species, contributing significantly to adverse effects on particular species groups or broad habitat types.	Secondary
		D2C3	Proportion of the species group or spatial extent of the broad habitat type which is adversely altered due to non-indigenous species, particularly invasive non-indigenous species.	Secondary
D3	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.	D3C1	The fishing mortality rate of populations of commercially exploited species is at or below levels which can produce the maximum sustainable yield (MSY). Appropriate scientific bodies shall be consulted in accordance with Article 26 of Regulation (EU) no. 1380/2013.	Primary
		D3C2	The spawning stock biomass of populations of commercially exploited species are above biomass levels, capable of producing maximum sustainable yield. Appropriate scientific bodies shall be consulted in accordance with Article 26 of Regulation (EU) no. 1380/2013.	Primary
		D3C3	The age and size distribution of individuals in the populations of commercially exploited species is indicative of a healthy population. This shall include a high proportion of old/large individuals and limited adverse effects of exploitation on genetic diversity.	Primary
D4	All elements of the marine food webs, to the extent that they are known, occur at normal abundance and diversity and	D4C1	The diversity (species composition and their relative abundance of the trophic guild is not adversely affected by anthropogenic burdens	Primary
		D4C2	The balance of the total abundance between the trophic guilds is not	Primary

	levels capable of ensuring the long-term abundance of the species and the retention of their full reproductive capacity.		adversely affected by anthropogenic burdens.	
		D4C3	The size distribution of individuals in the trophic guild is not adversely affected by anthropogenic burdens.	Secondary
		D4C4	The productivity of the trophic guild is not adversely affected by anthropogenic burdens.	Secondary
D5	Human-induced eutrophication is minimised, especially adverse effects thereof, such as losses in biodiversity, ecosystem degradation, harmful algal blooms and oxygen deficiency in bottom waters.	D5C1	Nutrient concentrations are not at levels that indicate adverse eutrophication effects.	Primary
		D5C2	Chlorophyll-a concentrations are not at levels that indicate adverse effects of nutrient enrichment.	Primary
		D5C3	The number, spatial extent and duration of harmful algal bloom events are not at levels that indicate adverse effects of nutrient enrichment.	Secondary
		D5C4	The photic limit (transparency) of the water column is not reduced due to increases in suspended algae, to a level that indicates adverse effects of nutrient enrichment.	Secondary
		D5C5	The concentration of dissolved oxygen is not reduced due to nutrient enrichment, to levels that indicate adverse effects on the benthic habitats (including on associated biota and mobile species) or other eutrophication effects.	Primary
		D5C6	The abundance of opportunistic microalgae is not at levels that indicate adverse effects of nutrient enrichment.	Secondary
		D5C7	The species composition and relative abundance or depth distribution of macrophyte communities achieve values that indicate there is no adverse effect due to nutrient enrichment including via a decrease in water transparency.	Secondary
		D5C8	The species composition and relative abundance of macrofaunal communities, achieve values that indicate there is no adverse effect due to nutrient and organic enrichment.	Secondary
D6	Sea-floor integrity is at a level that ensures that the	D6C1	Spatial extent and distribution of physical loss (permanent change) of the natural seabed.	Primary

	structure and functions of the ecosystems are safeguarded and benthic ecosystems, in particular are not adversely affected.	D6C2	Spatial extent and distribution of physical disturbance pressures on the seabed.	Primary
		D6C3	Spatial extent of each habitat type which is adversely affected, through changes in its biotic and abiotic structure and its functions (e.g. through changes in species composition and their relative abundance, absence of particularly sensitive or fragile species or species providing a key function, size structure of species) by physical disturbance.	Primary
		D6C4	The extent of loss of the habitat type, resulting from anthropogenic pressures, does not exceed a specified proportion of the natural extent of the habitat type in the assessment area.	Primary
		D6C5	The extent of adverse effects from anthropogenic pressures on the condition of the habitat type, including alteration to its biotic and abiotic structure and its functions (e.g. its typical species composition and their relative abundance, absence of particularly sensitive or fragile species or species providing a key function, size structure of species) does not exceed a specified proportion of the natural extent of the habit type in the assessment area.	Primary
D7	Permanent alteration of hydrographical conditions does not adversely affect marine ecosystems	D7C1	Spatial extent and distribution of permanent alteration of hydrographical conditions (e.g. changes in wave action, currents, salinity, temperature) to the seabed and water column, associated in particular with physical loss of the natural seabed.	Secondary
		D7C2	Spatial extent of each benthic habitat type adversely affected (physical and hydrographical characteristics and associated biological communities) due to permanent alteration of hydrographical conditions.	Secondary
D8	Concentrations of contaminants are at levels not giving rise to pollution effects.	D8C1	Within coastal and territorial waters, the concentrations of contaminants do not exceed the threshold values.	Primary
		D8C2	The health of species and the condition of habitats (such as their	Secondary

			species composition and relative abundance at locations of chronic pollution) are not adversely affected due to contaminants including cumulative and synergetic effects.	
		D8C3	The spatial extent and duration of significant acute pollution events are minimised.	Primary
		D8C4	The adverse effects of significant acute pollution events on the health of species and on the condition of habitats (such as their species composition and relative abundance) are minimised and where possible eliminated.	Secondary
D9	Contaminants in fish and other seafood for human consumption do not exceed levels established by European Union legislation or other relevant standards.	D9C1	The level of contaminants in edible tissues (muscle, liver, roe flesh or other soft parts, as appropriate) of seafood (including fish, crustaceans, molluscs, echinoderms, seaweed and other marine plants), caught or harvested in the wild (excluding fish from mariculture) does not exceed the maximum levels laid down.	Primary
D10	Properties and quantities of marine litter do not cause harm to the coastal and marine environment.	D10C1	The composition, amount and spatial distribution of litter on the coastline, in the surface layer of the water column and on the seabed, are at levels that do not cause harm to the coastal and marine environment.	Primary
		D10C2	The composition, amount and spatial distribution of micro litter on the coastline, in the surface layer of the water column and in seabed sediment, are at levels that do not cause harm to the coastal and marine environment.	Primary
		D10C3	The amount of litter and micro litter ingested by marine animals is at a level that does not adversely affect the health of the species concerned.	Secondary
		D10C4	The number of individuals of each species which are adversely affected due to litter, such as by entanglement, other types of injury or mortality or health effects.	Secondary
D11	Introduction of energy, including underwater noise, is at levels that do not	D11C1	The spatial distribution, temporal extent and levels of anthropogenic impulsive sound sources do not exceed levels that adversely affect	Primary

	adversely affect the marine environment.		populations of marine animals.	
		D11C2	The spatial distribution, temporal extent and levels of anthropogenic continuous low-frequency sound do not exceed levels that adversely affect populations of marine animals.	Primary

V. Good environmental status, environmental targets and indicators

Table 23. Overview of good environmental status, the current environmental status and the environmental targets for the Netherlands' part of the North Sea.

Descriptor	Good environmental status	Current environmental status	Environmental target
D1 – Species / birds	Overarching – Population abundances and demography of bird populations indicate healthy populations. D1C2 – For each functional group, the population size of at least 75 percent of the species is above the threshold value for 1992 (OSPAR assessment value). D1C2 - Populations of marine birds must comply with the national targets from the BD. D1C3 – For each species, a lack of breeding success may not occur in more than three years in six (OSPAR assessment value).	The relative abundance of migrating and overwintering coastal birds and breeding marine birds has decreased considerably at regional level (OSPAR). At regional level, it has become clear that the breeding success of marine birds has been very low in the past few years, above all birds that search for food at the water surface. A number of bird species are more or less dependent on the Dutch coastal zone in the breeding season or the winter season. These species will be reported on in the Bird Directive in 2019. The landing obligation may cause the abundance of a number of seagull species to fall over the coming years. This does not indicate a worsening ecosystem. <u>Satisfies GES –</u> On the basis of	Contributing to the further development of the assessment of bird populations and identifying the most important pressure factors at regional level (OSPAR). Recovery of undisturbed situation for marine mammals (porpoise and seal) and birds by reducing fishery on the Raan Flats and in the North Sea coastal zone (in the framework of the VIBEG agreement). Achieving the conservation objective for habitat types and species in the Natura 2000 areas at sea (BHD). Monitoring bird collisions with wind turbines in the framework of Wozep <u>Supplementary policy assignment:</u> possible (existing policy may not suffci fully) If the BD report for 2019 indicates further decline of marine bird

		the OSPAR assessment, the Good environmental status has not yet been achieved, for breeding birds and breeding success there is decline. The Dutch and foreign development of offshore renewable energy (including the Offshore Wind Energy Roadmap 2024-2030) may impose further pressure on the good environmental status. In the assignment decisions for wind farms, mitigating measures are specified to limit negative effects as far as possible.	species, consideration will be given to which pressure factors are the cause and in which framework (MSFD or BD) action can best be taken. There is a knowledge assignment in respect of the causes of decline and cumulation and possible mitigation effects of wind farms.
D1 – Species / marine mammals	Overarching - The population abundance and demography of marine mammal populations indicate healthy populations. D1C1 - By-catch of porpoises is lower than 1 percent of the best available population estimate (ASCOBANS). D1C2 - The population of the grey seal (H1364), harbour seal (H1365) and porpoise (H1351) comply with the favourable reference value for the population size (FRP) according to the Habitats Directive. D1C3 – No fall in the birth rate of the	Populations of both harbour seal and grey seal are demonstrating stable or rising trends in the North Sea region. The number of grey seal pups born each year has also risen since 1992 in the entire North Sea. Nonetheless, numbers of seals in the Netherlands are still just a fraction of the population size in the past. The number of porpoises in the North Sea is stable. A southern shift in distribution means that the Dutch Continental Shelf has become relatively more important for the porpoise, white-beaked dolphin and	Implementation of mitigating measures in framework of the 2012 Harbour Porpoise Conservation plan, including: - by-catch monitoring and research into the use of mitigating measures (pingers) - preventing and reducing the harmful effects of underwater noise on porpoise populations (Nature Conservation Act) - further research into the effects of construction and operation of offshore wind farms on porpoise populations (in the framework of Wozep). Recovery of undisturbed situation

	grey seal by more than 1 percent since the last assessment and not more than 25 percent fall since since 1992 (OSPAR). D11C1 - For impulsive noise (D11C1): Distribution in time and space and levels of loud impulsive sources are such that direct and indirect effects of loud impulsive sounds do not threaten the favourable status of maintenance of species (see further elaboration under D11). D1C4 - Distribution of harbour porpoise and harbour seal satisfies the favourable reference value for population range (FRR) according to the Habitats Directive. Also relevant is the extent to which the area and quality of habitats of marine mammals continue to develop: (D1C5) – Preservation of the size and quality of the habitat of the grey seal (H1364), the harbour seal (H1365) and the porpoise (H1351).	minke whale. In the Netherlands' part of the North Sea, the population size of seals and porpoises is developing positively. Nonetheless, the HD assesses the conservation status of the grey seal and porpoise as moderately unfavourable due to the quality of the habitat. There is still an assignment in respect of habitat quality, but further research will be needed in the future, into the effects of cumulation and pressures. <u>Satisfies GES -</u> Status improving, but good environmental status not yet achieved. The Dutch and foreign development of offshore renewable energy (including the Offshore Wind Energy Roadmap 2024-2030) may apply further pressure to the good environmental status. In the assignment decisions for wind farms, mitigating measures are specified to limit negative effects as far as possible.	situations for marine mammals (porpoise and seal) and birds by reducing fishery on the Raan Flats and in the North Sea coastal zone (in the framework of the VIBEG agreement). Achieving the maintenance targets for habitat types and species in the Natura 2000 areas at sea. Further research into cumulation effects within OSPAR. <u>Supplementary policy assignment:</u> potential (existing policy may not suffice) and a knowledge assignment in respect of cumulation effects of the wind energy assignment.
D1 – Species / fish	Overarching - The population	The OSPAR assessment shows	The management of all

community	abundances and demography of populations of fish suggest healthy populations D1C2 - Commercially exploited fish populations pursuant to D3 : D3C1 – the fishing mortality rate of populations of commercially exploited fish or shellfish species is at or below levels which can produce the Maximum Sustainable Yield (MSY): F≤Fmsy.- D3C2: The Spawning Stock Biomass (SSB) of populations of commercially exploited fish or shellfish species is above precautionary level MSY $B_{trigger}$ (in accordance with ICES recommendation). D1C2 - Improving the population abundance of sharks and rays in the North Sea and above all in the coastal zone. D1C2 – Rise in the proportion of vulnerable species of fish in the fish community (OSPAR). D1C3 – Rise in the share of large fish in the fish community (OSPAR). For the Habitats Directive species, the migratory fish twaite shad (H1103), salmon (H1106), sea lamprey (H1095), river lamprey (H1099) and Allices shad	that the decline in the composition of fish communities from the past has halted, and in certain areas is showing light recovery. The current status of many shark and ray species is still worrying. A number of species have disappeared or only occur in areas with low fishing pressure. There are also positive signals. For all migratory fish, the national maintenance status according to the Habitats Directive has been assessed as (moderately) unfavourable. WFD - The houting has increased and has reproduced in the Rhine river basin. For other migratory fish, no clear trend is visible. Satisfies GES: Status is improving, but good environmental status not yet achieved.	commercially exploited fish stocks complies with F≤Fmsy and a spawning stock biomass above the precautionary level MSY Btrigger (CFP). Research into sharks and rays in combination with the taking of mitigating measures as laid down in the Shark and ray action plan: - communication and education - reduced unwanted by-catches - increase survival rates. Achieving the maintenance targets for habitat types and species in Natura 2000 areas at sea (BHD). Tackling the remaining fish migration bottlenecks in the Netherlands to recover connectivity between water systems (WFD). Research into the necessity of no-catch zones around engineering structures to promote migration opportunities for migratory fish (WFD). Supplementary policy assignment: no (existing policy is sufficient).

	(H1102): - D1C2: Population of migratory fish must satisfy the favourable reference value for population abundance (FRP) from the Habitats Directive. - D1C4: Distribution of migratory fish in the river area satisfies the favourable reference value for the population tange (FRR) from the Habitats Directive. D1C5 – Reduction in barriers in migratory routes so that at the latest by 2027, they represent no obstacle for sustainable populations in the river basin (WFD).		
D1 – Pelagic Habitats	For pelagic habitats, a good environmental status will have been achieved if the spatial and temporal variation in the plankton community remains within a bandwidth over a period of several years that indicates good environmental status. The bandwidths to be used must still be determined on a regional basis, in cycle two.	In the recent past, a start has been made on developing assessment methods for pelagic habitats. The first assessments in the framework of OSPAR reveal fluctuations in composition, biomass and abundance of the plankton community. However, it is too early to assess whether the good environmental status has been achieved, on that basis. This represents a knowledge assignment. <u>Satisfies GES:</u> Unknown	Developing and testing regional assessment methods (OSPAR and ICES) that can be used in the future for assessing benthic and pelagic habitats. <u>Supplementary policy assignment:</u> Unknown. There is however a knowledge assignment relating to the development of an assessment method.
D6– Benthic Habitats	Overarching - Improvement in the size, condition and global distribution of populations of the community of benthos species.	The Dutch seabed is still substantially disrupted. The OSPAR assessment of the benthic communities reveals	10-15 percent of the area of the Netherlands' part of the North Sea is not notably disrupted by human activities.

	D6C3: Improvement in the quality of the assessed areas and habitats in the Netherlands' part of the North Sea (Benthic Indicator Species Index). D6C5 - The diversity of benthos demonstrates no further downward trend in the assessed areas (OSPAR).	that the deeper offshore waters do demonstrate higher benthos diversity than the relatively shallow offshore waters and coastal waters. The national assessment of the benthos communities reveals that above all long-living, sensitive species are clearly less common than desirable and that biodiversity is still insufficient. Seabed disruption by (beam) trawlers plays an important role in this connection. It is still too early to observe the effects of the (proposed) taken measures. The Habitats Directive report published in 2013 shows that the extent and distribution of the habitat types 1110 (sandbanks slightly covered by seawater all the time) and 1170 (reefs) are sufficient but that their quality is deteriorating. <u>Satisfies GES:</u> no (partially not yet known).	Improved quality of the assessed areas and habitats. Development and testing of regional assessment methods (OSPAR and ICES) that can be used in the future for assessing benthic and pelagic habitats. Achieving the conservation objective for habitat types and species in Natura 2000 areas at sea. Return and recovery of biogenic reefs such as flat oyster beds. <u>Supplementary policy assignment:</u> yes (supplementary policy from 2012 to be continued), and a knowledge assignment in respect of the assessments method, cumulation and hard substrate.
D2 – Exotic species	Overarching - Non-indigenous species (exotic species) introduced by human activities are at levels that do not adversely alter the ecosystem. D2C1 - Downward trend in the number of introductions of non-indigenous	The OSPAR assessment reveals that the number of newly introduced non-indigenous species varies from year to year so that no trend in the number of new introductions per year can be determined.	Minimising the risk of new introductions of non-indigenous species via shellfish transport, ballast water and hull fouling. <u>Supplementary policy assignment:</u> no (existing policy is

	species per policy period (6 years).	To date, 54 non-indigenous species have established in the Netherlands' part of the North Sea. The number of observations of new non-indigenous species appears to have fallen since 2012. <u>Satisfies GES -</u> Status improving, but good environmental status not yet achieved.	sufficient), but knowledge assignment in respect of hard substrate.
D3 - Commercially exploited fish and shellfish	Overarching – Gradual recovery and maintenance of populations of commercially exploited fish stocks above a biomass level capable of generating the maximum sustainable yield. D3C1 – For each commercially exploited fish or shellfish stock, the fishing mortality rate (F) must be at rate below a value which relates to the Maximum Sustainable Yield (MSY): F≤Fmsy. D3C2 - The Spawning Stock Biomass (SSB) for commercially exploited fish and shellfish is above the precautionary level MSY $B_{trigger}$ (in line with ICES recommendation). *It has been agreed internationally that the good environmental status for*	Seven of the 27 fish stocks meet both criteria for GES, which is a precondition for referring to a good status. There is a rising trend suggesting that GES will be achieved in the near future. <u>Satisfies GES -</u> Status improving, but good environmental status not yet achieved.	The management of all commercially exploited fish and shellfish satisfies F≤Fmsy and a spawning stock biomass above precautionary level MSY $B_{trigger}$ (CFP). <u>Supplementary policy assignment:</u> no (existing policy is sufficient).

	commercially exploited fish and shellfish will have been achieved if for each commercially exploited stock, both criteria are satisfied. If this is not the case, the species is not yet in good status.		
D4 – Food webs	Overarching - The effect of human interventions on interactions between different trophic levels in the food web is reduced. D4C1 - The diversity (species composition and abundance) of at least three selected trophic guilds is at a level or within a bandwidth which indicates a good environmental status. The trophic guilds and levels and bandwidths to be employed must still be regionally determined in the second cycle. D4C2 - The ratio in abundance between at least three trophic guilds is at a level or within a bandwidth that indicates a good environmental status. The trophic guilds and levels and bandwidths to be employed must still be regionally determined in the second cycle. D4C3 - The size structure (length) of the fish community remains above the historical minimum value.	Assessment of the status of the food web is not currently possible. Within OSPAR, an action plan has been developed for addressing knowledge gaps and developing assessment methods. <u>Satisfies GES:</u> Good environmental status not yet achieved (At present it is clear that the GES has not been achieved and there is still no assessment mechanism for a precise quantitative determination of GES).	Developing and testing regional assessment methods that can also be used in the future for assessing the status of food webs. Targets relating to birds, marine mammals, fish. benthic and pelagic habitats also contribute to food webs. <u>Supplementary policy assignment:</u> no (existing policy is sufficient), but there is a knowledge assignment in respect of assessment methods and cumulation.
D5 – Eutrophication	Overarching: human-induced eutrophication is minimised, especially	Eutrophication still occurs in the North Sea, but to a far lesser	A lower input of nutrients where not yet compliant with the WFD

	the adverse effects thereof such as losses in biodiversity, ecosystem degradation, harmful algal blooms and oxygen deficiency in bottom waters. Overarching: the concentrations of winter DIN and DIP are below the level suggesting harmful eutrophication effects. D5C1 (coastal waters) – In coastal waters, the nutrient concentrations in the winter comply with the WFD standards. D5C1 (offshore waters) - the nutrient concentrations in the winter satisfy the assessment values of OSPAR. Overarching: algal biomass (determined on the basis of chlorophyll-a measurements) is not at a level that suggests harmful effects of enrichment with nutrients, pursuant to the assessment according to WFD and OSPAR. D5C2 - Algal biomass (determined on the basis of chlorophyll-a measurements) in coastal waters is not higher than the good status pursuant to the WFD for the relevant coastal water types. D5C2 - Algal biomass (determined on the basis of chlorophyll-a measurements) in offshore waters	extent than in the past. The OSPAR assessment reveals that since 1990, the introduction of nutrients by rivers has fallen considerably. The concentrations of nitrogen and phosphate in the North Sea waters are therefore significantly lower as a result of which the the volume of algal biomass has also significantly fallen. Phosphate now complies with the standard but nitrogen does not yet. In coastal waters, nutrient concentrations are considerably higher than in offshore waters. According to the WFD assessment, not all coastal waters satisfy the target for algal biomass. <u>Satisfies GES -</u> Status is improving, but good environmental status not yet achieved. On the basis of existing and proposed policy, it appears that GES can be achieved.	pursuant to the timetable for the river basin management plans. Concentrations of nutrients already complying with WFD standards must not be allowed to rise, and if possible should be further reduced. <u>Supplementary policy assignment:</u> no (existing policy is sufficient), but there is a potential knowledge assignment in respect of the phosphate-nitrogen ratio.

	satisfies the assessment values of OSPAR. Overarching: no oxygen deficiency due to eutrophication in the deeper water layer (stratified waters) or the surface water layer of mixed waters. D5C5 (coastal waters) - The lowest water layer (stratified waters) or the surface water layer of mixed waters in coastal waters is saturated with at least 60 percent oxygen. D5C5 (offshore waters) - In offshore waters, the lowest water layer (stratified waters) or the surface water layer of mixed waters contains at least 6 mg/l oxygen.		
D6 – Physical disturbance	Overarching - Physical loss of the seabed due to human activities is restricted to ensure that the scale, condition and global distribution of populations of the community of characteristic benthos species increases, and targets for specific habitats are achieved. D6C2 – No rise in physical disturbance over time on the total seabed of the entire North Sea and the DCS. D6C3 – No rise in physical disturbance over time in the habitats described in the framework of the MSFD.	The Fishing Pressure Indicator shows that in 2015, around 54 percent of the seabed of the (international) North Sea was disturbed. Because no threshold values were set, it is not possible to assess whether this represents the GES. As compared with the whole of the North Sea, the Netherlands' part is more disturbed. <u>Satisfies GES -</u> no (partially also unknown).	10-15 percent of the surface of the Netherlands' part of the North Sea is not notably disturbed by human activities. No rise in physical disturbance due to fishing activities over time on the total seabed of the whole of the North Sea and the DCS and on the habitats described in the framework of the MSFD. Achieving the conservation objective for habitat types and species in the Natura 2000 areas at sea.

	D6C3 - For the habitats described in the framework of the Habitats Directive, the conservation objective for these habitats are achieved.		Supplementary policy assignment: no, but current intensive efforts must be continued. There is also a knowledge assignment in respect of assessment method, cumulation and hard substrate.
D6 – Physical loss	Overarching - Physical loss of the seabed due to human activities is restricted to ensure that the scope, condition and global distribution of populations of the community of characteristic benthos species rises and targets for specific habitats are achieved. D6C1 - No significant loss of the natural seabed as compared with the situation in 2012 as a result of human activities. D6C4 - No significant loss as a result of human activities of the habitats described in the framework of the MSFD.	Physical damage due to platforms for oil and gas production, new wind farms, sand and shell extraction or land suppletion is local and relatively limited. All these activities are subject to licencing and must complete an EIA procedure. Satisfies GES: yes	See physical disturbance Supplementary policy assignment: no (existing policy is sufficient).
D7 – Hydrography	Overarching - The marine ecosystem suffers no negative effects as a result of permanent changes to the hydrographical properties. Since the GES for this descriptor has been achieved, no GES or targets have been formulated at criterion level.	Large-scale hydrographical interventions from the past (such as the Delta works and Maasvlakte I) are viewed as irreversible. In recent times there have been no new large-scale interventions. Satisfies GES - Good environmental status achieved in 2012 and retained.	All developments must satisfy the requirements of the existing legislative regime (for example the Environmental Management Act and Nature Conservation Act) and any legal assessments must be carried out in such a way that potential effects of permanent changes to hydrographical properties, including cumulative effects, are taken into

			consideration at the most suitable spatial scale, on the basis of the guidelines developed for that purpose (EUNIS level 3, reference year 2012). <u>Supplementary policy assignment:</u> no (existing policy is sufficient), but there is a knowledge assignment in respect of the cumulative effects of offshore wind energy and sand suppletion and climate change.
D8 – Contaminants	Overarching - concentrations of contaminants relevant for the marine environment, measured in the most suitable compartment (water, sediment or biota), are lower than the concentrations whereby negative effects can occur or demonstrate a downward trend. D8C1 - coastal waters (up to 12 nautical miles): the concentrations of contaminants relevant for the marine environment, measured in the most suitable compartment (water or biota) comply with the Environmental Quality Standards used in the WFD in the 12-mile zone (for priority substances) or the 1-mile zone (for all other substances). D8C1 – Offshore waters (from 1 or 12 nautical miles respectively): The	Concentrations of contaminants have been considerably reduced and are still demonstrating a downward trend or are stable. What remains are substances the production or use of which are already forbidden but which remain for long periods in the marine environment due to their persistence. According to the WFD, these substances still occur in too high concentrations in Dutch coastal waters. The occurrence of reproductive disruption in molluscs as a result of TBT is showing a downward trend. There is a downward trend in	Coastal waters: Reduction of the input of contaminants not yet meeting the WFD standards, pursuant to the timeline of the river basin management plans. Concentrations of contaminants that already meet WFD standards are not permitted to rise. Offshore – Wherever possible, reducing concentrations of contaminants. Reducing the input of heavy metals into the marine environment. Regional monitoring of copper concentrations now that this heavy metal is used as a substitute for TBT (OSPAR).

	concentrations of contaminants relevant for the marine environment, measured in the most suitable compartment (sediment or biota) demonstrate a downward trend (pursuant to OSPAR). Overarching – the health of species is not adversely affected by contaminants D8C2 - Downward trend as compared with Imposex 2012. D8C3 - the spatial extent and duration of significant serious acute pollution evnets is reduced to a minimum.	discharges of hydrocarbons and harmful chemicals from offshore installations and radioactive discharges by the nuclear sector. The number of oil discharges and the volume per incident are also falling. Satisfies GES - Status is improving, but good environmental status not yet achieved. The presence of medicines and other new micro contaminants in the surface water, as a possible growing threat to the marine environment, will require attention over the coming years.	As quickly as possible eradicating acute pollution, wherever necessary in collaboration with the Bonn Agreement. Reducing the use of lead for example in sport fishing (WFD). Supplementary policy assignment: no (existing policy is sufficient), but there is a knowledge assignment in respect of emerging substances and copper.
D9 – Contaminants in fish and other seafood for human consumption	D9C1 - The levels of contaminants (including PAHs, dioxins and heavy metals) in fish and other seafood for human consumption from the North Sea do not exceed the limits determined in EU Regulation EC 1881/2006.	The current levels of contaminants in fish and other seafood for human consumption do not exceed the standards for national and international legislation. Satisfies GES - Good environmental status achieved in 2012 and retained.	The levels of contaminants in fish and other seafood for human consumption compliant with national and international legislation must not be allowed to rise and if possible should be further reduced. Supplementary policy assignment: no (existing policy is sufficient)
D10 – Litter	Overarching - The quantity of marine litter will decrease over time. D10C1 - For litter on beaches: a significant downward trend in the total	The OSPAR assessment for beach litter, litter on the seabed and plastic in the stomachs of fulmars show that litter (including much plastic) is	At regional level, working towards quantitative (regional) targets for beach litter (e.g. 30 percent reduction) and plastic found in stomachs of northern fulmars (10

	of the most common categories of litter (contributing to 80 percent of the total volume of waste) found on the beach. D10C1 - For seabed litter: significant decrease in the volume of litter on the seabed. D10C1 – For floating, short-term litter: a significant downward trend in the number of northern fulmars with more than 0.1 g of plastic particles in their stomach during the past ten years. Overarching: the quantity of microlitter at sea will decrease in the long term. Overarching: The quantity of litter and microwaste ingested by marine animals is at a level that does not cause adverse effects to the health of the species in question.	common on the beaches, in the water column and on the seabed. At North Sea level, there are still no indications of a significant decrease. On Dutch beaches, a significant decrease has been observed in the total number of litter items. A significant decrease has also been observed in plastic in the stomachs of Northern fulmars. Despite the significant decreases in the Netherlands, the volumes of litter in the marine environment are still very high. <u>Satisfies GES -</u> Status improving, but good environmental status not yet achieved (partially still unknown).	percent of birds; OSPAR EcoQO). In conjunction with the EU programme for the Circular Economy and in careful harmonisation with neighbouring countries, determining how these targets can be achieved. At regional North Sea level, working to develop an indicator for microplastics in sediment. <u>Supplementary policy assignment</u>: yes (supplementary policy from 2012 to be continued), and a knowledge assignment in respect of river litter and microplastics.
D11 - Underwater noise	Overarching – Impulsive noise: distribution in time and space and levels of loud impulsive sound sources are such that the direct and indirect effects of loud impulsive sound do not threaten the favourable conservation status of maintenance of species. D11C1 - Impulsive sound- for harbour porpoises, reduction of population size	As yet, insufficient data are available for assessing the ecosystem effects of impulsive sound. On the basis of the precautionary principle, requirements are however already imposed on offshore construction activities. The actual sound levels for	Continuing tighter rules for the prevention of harmful effects of impulsive sound. Developing a limit for the number of disturbance days at regional level (OSPAR) Launching an international monitoring programme for

	is prevented by imposing a limit on the number of harbour porpoise disruption days. Overarching – Continuous noise: distribution in time and space and levels of continuous sound are such that they do not threaten the favourable conservation status of maintenance of species. D11C2 – *For continuous sound, it is not yet possible to draw up quantitative descriptions for the good environmental status.*	continuous sound in the North Sea are not yet known. A monitoring programme is currently being developed. <u>Satisfies GES -</u> Status in respect of impulsive sound is improving but good environmental status for continuous sound is not yet known (no assessment method). The Dutch and foreign development of offshore renewable energy (including the Offshore Wind Energy Roadmap 2024-2030) may apply further pressure on the good environmental status. In the Wind Farm Site Decisions, mitigating measures are specified to limit negative effects as far as possible.	continuous noise to map the level and distribution of continuous sound. <u>Supplementary policy assignment:</u> no, but continuation of current intensive efforts remains necessary and there is a knowledge assignment in respect of cumulation and continuous sound.

VI. Pressures and activities

Table 24. Overview of the most important pressures and activities for the Netherlands' part of the North Sea.

	Ecosystem characteristic/descriptor	**Relevant pressures**	**Use/activity responsible for pressure**
D1	Birds	Extraction of or mortality/injury rate of species living in the wild (direct mortality)	Fishing and harvesting of shellfish (gill nets)
			Generation of renewable energy (wind turbines)
		Extraction of or mortality/injury rate of species living in the wild (via food web)	Fishing and harvesting of shellfish (discards, Spisula, sand eel, sprat)
		Changes to hydrological conditions	Coastal defences and flood protection land suppletions
		Disruption of species due to human presence	Activities in the framework of tourism and recreation
			Fishing and harvesting of shellfish (including recreational)
			Coastal defences and flood protection (sand suppletions)
			Generation of renewable energy (wind turbines)
		Introduction of other substances (oil: operational discharges and incidents)	Transport – shipping
			Production of oil and natural gas
D1	Fish	Extraction of or mortality/injury rates of species living in the wild (direct mortality)	Fishing and harvesting of shellfish
		Changes to hydrological conditions (migration barriers freshwater-seawater)	Coastal defences and flood protection
			Canalisation and other watercourse changes (river layout)
		Introduction of anthropogenic sound (loud impulsive)	Generation of renewable energy (pile driving wind turbines)
		Temperature rise due to climate change	Global emission of greenhouse gases
D1	Marine mammals	Extraction of or mortality/injury rates of species	Fishing and harvesting of shellfish (gill nets)

		living in the wild (direct mortality)	
		Introduction of anthropogenic sound (loud impulsive noise and continuous sound)	Generation of renewable energy (pile driving wind turbines)
			Production of oil and natural gas (seismic exploration)
			Military operations (sonar, clearing explosives)
			Transport — shipping
D1	Pelagic habitats	Extraction of or mortality/injury rates of species living in the wild	Fishing and harvesting of shellfish
		Introduction or distribution of non-indigenous species	Transport — shipping (ballast water)
		Introduction of nutrients Introduction of organic material	Activities on land (agriculture, urban, industry)
			Transport — shipping (via air)
		Temperature rise due to climate change	Global emission of greenhouse gases
D1/D6	Seabed habitats	Physical destruction	Land suppletion
			Extraction of minerals (sand extraction deep)
			Generation of renewable energy (pile driving)
			Production of oil and natural gas (pile driving)
		Physical disruption of the seabed (abrasion/bottom-disturbing)	Fishing and harvesting of shellfish (bottom-disturbing)
		Physical disruption of the seabed (moving sand/silt)	Coastal defences and flood protection (sand suppletions)
			Extraction of minerals
			Restructuring of seabed morphology (dredging)
		Changes to hydrological conditions (transparency)	Restructuring of seabed morphology (dredging)
			Coastal defences and flood protection Land suppletion
		Extraction of or mortality/injury rates of species living in the wild	Fishing and harvesting of shellfish (demersal)
		Introduction or distribution of non-indigenous species	Transport — shipping (ballast water, hull fouling)
			Aquaculture — marine (import of shellfish)

		Introduction of nutrients Introduction of organic material	Activities on land (agriculture, urban, industry)
			Transport — shipping (via air)
		Temperature rise due to climate change	Global emission of greenhouse gases
D2	Newly introduced non-indigenous species.	Introduction or distribution of non-indigenous species	Transport — shipping (ballast water, hull fouling)
			Aquaculture — marine (import of shellfish)
D3	Commercially exploited fish and shellfish for human consumption	Extraction of or mortality/injury rates of species living in the wild (direct mortality)	Fishing and harvesting of shellfish
D5	Eutrophication	Introduction of nutrients Introduction of organic material	Activities on land: agriculture, urban use, industrial use
			Transport — shipping
			Restructuring of seabed morphology (dredging)
D7	Changes to the hydrographical features	Changes to hydrological conditions (changes to bathymetric and flow)	Land suppletion
			Coastal defences and flood protection
		Changes to hydrological conditions (changes to silt content)	Restructuring of seabed morphology (dredging, raising levels due to spreading)
			Coastal defences and flood protection (raising levels during suppletions)
			Transport infrastructure (ports, lowering levels due to sedimentation)
		Temperature rise due to climate change	Global emission of greenhouse gases
D8	Contaminants	Introduction of other substances (including oil, acute incidents and radioactive substances)	Activities on land: agriculture, urban use, industrial use
			Restructuring of seabed morphology (dredging)
			Transport — shipping (including fishing vessels)
			Production of oil and natural gas
D9	Contaminants in fish and shellfish	Introduction of other substances	*See D8 contaminants*
D10	Litter	Introduction of litter	Transport — shipping
			Transport - land
			Activities in the framework of tourism and

			recreation
			Fishing and harvesting of shellfish
			Aquaculture – marine
			Activities on land: urban use, industrial use
D11	Introduction of energy, including underwater noise	Introduction of anthropogenic sound (loud impulsive noise)	Generation of renewable energy (pile driving wind turbines)
			Production of oil and natural gas (seismic exploration)
			Military operations (sonar, clearing explosives)
		Introduction of anthropogenic sound (continuous sound)	Transport — shipping
			Generation of renewable energy (operational phase)

VII. Military activities

Exception position for military activities and national security

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 Netherlands Navy warships. This exception for warships in the European Marine Strategy Framework Directive is based on the UN Convention on the law of the Sea, under which warships have immunity. For example, the Netherlands can cannot impose any requirements on foreign warships. This immunity for warships has been internationally endorsed and is taken up in relevant European shipping directive 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 the 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 capabilities 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, for example, with implementation of MARPOL. Such policy freedom is important with respect to the MARPOL convention, which includes technical requirements for seagoing vessels, because the construction and equipment of a warship are subject to different requirements than the construction and equipment of merchant vessels; a warship has to be fast and manoeuvrable, and often has a large crew and a lot of military equipment and weapons on board. In particular for smaller units such as minesweepers and submarines this is critical. 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 essential. Given the arguments above, this applies both in times of war and in peacetime. Nowadays this distinction is becoming increasingly difficult to make, with all the surveillance operations, embargo enforcement, anti piracy and other operations, including the exercises needed for these operations.

On land, Defence uses and manages large areas, partly nature reserves. Defence manifests itself as a good steward of these areas; at sea, where it is important that the exercise options of the Royal Netherlands Navy and the Royal Netherlands Air Force remain intact, Defence will also deal with the environment with due care. In practice, this implies that where for defence activities an exeption is possible, these exceptions can only be applied for Defence activities if the objectives of this Directive are incompatible with Defence’s operational activities. In practice, this means that during military exercises and almost all operations, warships refrain from discharges that are not allowed under the MARPOL convention. The now internationally commenced monitoring of underwater noise not only includes civilian activities (such as pile driving and seismic surveys) but also Defence activities (such as navy sonars and explosive clearance). These activities (use of sonar systems and explosive clearance) are subject to rules to ensure that they are carried out in a responsible manner. The Ministry of Defence invests in knowledge to safeguard future responsible use.

VIII. Factsheets

The factsheets are a separate appendix.

See: www.Noordzeeloket.nl