Government of the Netherlands

Appendix 1 to the National Water Programme 2022-2027

Draft Marine Strategy for the Dutch part of the North Sea 2022-2027 (part 3)

MSFD programme of measures

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Summary

The European Marine Strategy Framework Directive (MSFD) has been elaborated for the Dutch part of the North Sea in the Marine Strategy for the Dutch part of the North Sea. The Marine Strategy part 3 contains the programme of measures for a healthy sea with sustainable use. It describes the measures required to achieve and maintain good environmental status and the environmental targets. This programme of measures is an integral review of the first version from 2015 and is the final element of the second implementation cycle of the MSFD. The programme is included in the North Sea Programme 2022-2027, which is an appendix to the National Water Programme 2022-2027.

The MSFD is an ordering and objective-setting directive which integrates several wide-ranging policy fields with respect to environmental policy, the ecosystem policy and all policy aimed at sustainable use. The integrating effect of the MSFD is reflected in the broad spectrum of the eleven descriptors, which form the basis on which good environmental status is ascertained and the actual environmental status can be assessed. They pertain to the topics of biodiversity, non-indigenous species, (commercially exploited) fish and shellfish, food webs, sea-floor integrity, hydrographical conditions, contaminants and eutrophication, marine litter and underwater noise.

Principles for this programme of measures

The marine strategy for the North Sea is based on a vision of a future North Sea that is clean, healthy and productive, with an ecosystem that functions optimally and resiliently, while the use of the sea is sustainable despite increasing use. Such a North Sea offers carrying capacity and development prospects for both nature and the environment and for economic sectors. Starting points for this programme of measures are:

1. Update of the Marine Strategy part 1 (2018)

The objectives as included in the update of the Marine Strategy part 1 (2018) are decisive for the necessity to include additional measures in this programme of measures. For each descriptor, it is determined whether the existing measures (Marine Strategy part 3 (2015) must be continued and whether extra efforts are required to achieve the environmental targets.

2. Build on existing guidelines and agreements

The programme of measures builds on all the existing measures, for example from the Common Fisheries Policy (CFP), the Water Framework Directive (WFD), the Nitrate Directive, the Urban Waste Water Treatment Directive, the Bathing Water Directive and the Directive on Environmental Quality Standards for Priority Hazardous Substances, as well as from international agreements relating to the OSPAR Convention or IMO.

The programme of measures is also in line with international biodiversity agreements that follow from the Convention on Biological Diversity (CBD) and the European Birds Directive and Habitats Directive. This concerns the goals of the common European and international policy to stop loss of biodiversity and strengthen Natura 2000 policy. For the aspect of biodiversity, the programme of measures also relies on international agreements, for example the Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas (ASCOBANS) and OSPAR).

The programme of measures has various features in common with the North Sea Agreement. Agreements in the North Sea Agreement about, for example, spatial protection and species protection are manifested in this programme.

3. Consider the impact of climate change and ocean acidification

This programme of measures takes into consideration accelerated climate change, driven by the rising concentration of greenhouse gases, such as CO_2, in the atmosphere. These changes in the physical environment can affect the ecosystem of the North Sea in various ways. The three most important effects are: rising seawater temperature, rising sea levels and increasing CO_2 absorption by seawater (acidification).

International coordination

The Dutch government is committed to extending international coordination and collaboration. Obviously, the quality of the ecosystem and the marine environment in areas of the North Sea that are the responsibility of different nations is interconnected. The MSFD therefore requires

the member states to adopt a regional approach. In the context of the OSPAR Convention the international collaboration and coordinated approach to the marine strategy are also becoming more important. The international coordination and collaboration between the countries in OSPAR with respect to measures for the various MSFD descriptors was recorded at the beginning of 2016 in the OSPAR Joint Documentation on Coordination of Measures (MSFD).

Continue existing measures

The previous programme of measures (2015) included measures which were based on different policy frameworks. These are measures which had already been adopted under EU legislation or other international agreements, such as OSPAR, IMO or the international river committees. Additional measures, which are important for achieving and maintaining a good environmental status, were also established. All these measures are continued in this programme of measures and form the basis for further progress.

Policy objective

Despite the implementation of the measures from the previous programme of measures (2015), the Marine Strategy part 1 (2018) concludes that there is still a remaining objective for the descriptors biodiversity, sea-floor integrity, marine litter and underwater noise. Additional measures are required to achieve and retain good environmental status. For the descriptors non-indigenous species, hydrographical conditions and contaminants in fish, good environmental status has already been achieved. For the descriptor commercially exploited fish and shellfish, the existing policy is adequate for achieving good environmental status in the coming years. The implementation of existing policy gives the maximum effort possible from the Netherlands, working with other countries, to achieve good environmental status for the descriptor eutrophication, in terms of measures on land (implementation WFD) as well as at sea. No (additional) technical measures will therefore be taken to nullify the presence of eutrophicating and contaminating substances in the Dutch part of the North Sea. The descriptor food webs is a result of the other descriptors, which means that all measures and tasks that are part of those descriptor are also aimed at achieving a good environmental status for food webs.

Additional measures

To achieve good environmental status for the descriptors biodiversity, sea-floor integrity, marine litter and underwater noise, additional measures are required besides existing measures. A brief overview of these additional measures is presented below.

Biodiversity and sea-floor integrity

Spatial protection

The development of an ecological network of protected areas is one of the main instruments for conserving and restoring the ecosystem in the North Sea. In the Dutch part of the North Sea, a coherent and representative network of marine protected areas is being achieved, whereby the diversity of the various ecosystems is adequately covered. In the North Sea Agreement, the following agreements were reached about spatial protection measures:

- The existing agreements about designating and protecting offshore natural nature areas will be implemented and enforced.
- In 2023, 13.7 percent of the ecologically valuable areas will be fully exempt from seabed-disturbing fishery in the Dutch North Sea. This percentage will rise to 15 percent in 2030. Within this section, an area the size of 2.8 percent of the North Sea will be closed to all forms of fisheries.
- Expansion of the area on the Dogger Bank by 557 km², where seabed-disturbing fishery is banned. Ban on Scottish and Danish seining in the management zones of the Dogger Bank. Expansion of the management zones on the Cleaver Bank, whereby an additional area of 552 km² will be closed to all forms of seabed-disturbing fishery.
- The MSFD areas of the Central Oyster Grounds and Frisian Front will be expanded by 1062 km² and 1014 km2 respectively. In the part that overlaps with the BD area Frisian Front, there will be a ban on all forms of fishing. This part will be expanded to 1649 km².
- The new seabed protection area Borkumse Stenen has an area of 653 km².
- Additional spatial protection measures for birds under the North Sea Agreement are:
  - The Brown Ridge will be designated a Natura 2000 area under the Birds Directive.
  - Before 2025, an independent investigation will be conducted to determine whether the Hollandse Kust, Vlakte van de Raan, Borkumse Stenen, Klaverbank, Doggersbank and Central Oyster Grounds meet the selection criteria for designation as a Birds Directive area. Following this, areas that meet these selection criteria will be designated as soon as possible.

In addition to the agreements from the North Sea Agreement, areas where a ban on bottom-disturbing fishing applies and the areas to which a total ban on fishing applies will be changed.

The fishing restriction measures in these areas are implemented through the Article 11 procedure of the Common Fisheries Policy.

Species conservation

- Apart from spatial protection, more generic species conservation is important for long-living and vulnerable species, such as seabirds, marine mammals and certain types of sharks and rays. The following agreements in the North Sea Agreement are aimed at intensification of more generic species protection:
  - Existing action and species conservation plans will be implemented. The progress of the implementation of the plans will be evaluated every two years.
  - For vulnerable species, including birds, marine mammals, fish and benthic species seabed animals which are identified based on international guidelines and the Framework for the Assessment of Ecological and Cumulative Effects (KEC), species conservation plans will be developed and implemented. These plans will describe pressure factors and generic protection measures. The implementation of the plans will be evaluated every two years.
- Marine mammals: In 2020, the Harbour Porpoise Conservation Plan was updated. This plan aims to contribute to good conservation status of the harbour porpoise. Actions included in this plan will be implemented in this planning period. In the framework of the Seal Agreement (2020), an improved stranding registration is being elaborated for seals.
- Fish and squid: The MSFD shark action plan will be evaluated in 2021 and will be continued for a new period of six years.

Integral nature enhancement

The concept of building with nature will be operationalised. To strengthen species populations and habitats which naturally occur in the North Sea, the focus will be on nature-inclusive design and construction of new offshore wind farms and the implementation of nature restoration projects in wind farms.

Marine Litter

The approach to litter is divided into six clusters: education and awareness, beaches, river basins, maritime shipping, fishing and plastic products. The programme of measures presents a set of additional measures within these clusters.

Beaches

- The Clean Beaches Programme replaces the Clean Beaches Green Deal. This programme focuses on knowledge exchange, support for collaboration projects and improvement of local collaboration between municipalities and entrepreneurs.
- Website and newsletter from KIMO for knowledge transfer and informing the beach stakeholders.
- Activity monitoring among beach stakeholders. The information is made accessible to all parties to facilitate knowledge exchange, coordination and collaboration.
- Contribute to national meetings about the beach for the purpose of knowledge exchange and network reinforcement.

River basins

- Continuation and expansion of the collaborations in river basins aimed at a structural and broad approach to litter ('clearing up' and 'keeping clean') with the ambition and where possible concrete goals per collaboration.
- Enshrining of the Litter Collection Regulation in the regular management and maintenance of main water systems by Rijkswaterstaat.
- Put litter problem on the agenda and safeguard a broad approach to litter. This measure is aimed at increasing awareness of the litter problem among site and water managers along rivers, aimed at more (administrative) support for taking structural measures in management zones. To support this measure, the responsibilities of national and local governments will be studied, as well as how these responsibilities and the approach to litter relate to the European regulations (such as MSFD, WFD and KRA).

Shipping

- From 1 January 2021, all ships which unload their cargo in a European port within the designated sea area, indicated in MARPOL Annex II, Regulation 13, must deliver washing water with persistent solidifying cargo residue such as paraffin wax, to the port.
- Apply an improved prewash procedure in Rotterdam and Moerdijk based on voluntary agreements, aimed at a reduction of persistent solidifying substances (such as paraffin wax) which can end up in the environment.

Fishing

- The Fisheries for a Clean Sea Programme is a continuation of the Green Deal Fisheries for a Clean Sea. Within this programme, the chain approach is the starting point. The Single-Use Plastics (SUP) directive, which gives the manufacturers a role in collecting, recycling and raising awareness with respect to fishing gear, will be an important theme for coordination between the participating parties.
- Fishing for Litter programme: the revised Port Reception Facilities Directive also requires a regulation for passively caught waste (Fishing for Litter). Reception facilities will be made mandatory in the port. During the implementation of the Port Reception Facilities Directive,

along with the Fishing for Litter partners involved it will be studied how the programme can best be shaped within the new directive.
- Phasing out of dolly rope, which is used to protect trawling nets, with incentive measures. The aim is to encourage the use of alternative solutions and to gradually phase out the use of conventional dolly rope by 2027 by means of:
  - a financial (tax) incentive to make sustainable alternatives for dolly rope financially more attractive and economically feasible.
  - Facilitating/organising activities to promote sustainable alternatives and increase familiarity and awareness.
- Focus on reducing lead in recreational fishing at sea by means of an inventory of available alternatives to lead per type of recreational fishing, and more targeted communication with recreational fishers to create more awareness about the impact of lead and about the possible alternatives.

Plastic products / Land sources of marine litter at sea

- The Dutch government is continuing to alert municipalities to the policy options available to reduce the release of balloons. This will be included in the support for municipalities with respect to litter by Rijkswaterstaat. Through the introduction of the SUP Directive, producers of balloons are also made aware of their responsibility.
- The Dutch government will implement the OSPAR recommendation (expected to be adopted in 2021) to tackle the presence of plastic pellets in the environment. Responsibility for the approach to pre-production pellets primarily lies with the industry, which has launched Operation Clean Sweep in response.

Underwater noise

The focus of the following measures is to prevent the harmful effects of underwater noise caused by human activity.

- In partnership with industry, an assessment framework for seismic surveying will be developed in analogy with the KEC. This is in line with the agreements in the North Sea Agreement and the Harbour Porpoise Conservation Plan. A noise budget that regulates the time during which the impulsive noise is permitted may be a condition. The industry will be encouraged to reduce impulsive noise.
- Support for the Canadian proposal to more actively follow the IMO guidelines for the reduction of underwater noise of commercial shipping.

Knowledge questions and programming

For each descriptor, various knowledge questions remain. Some of the knowledge questions are related to the lack of an assessment method, indicators and/or threshold values. This knowledge is required to be able to set goals and monitor progress. In addition, there is a lack of knowledge for taking (more) targeted measures. For example, for the various descriptors, it is not possible to explain a certain trend or assess the impact of future developments or cumulative effects.

This programme of measures lists the knowledge questions. However, it is not possible to address all these questions in this planning period. Because the budget is limited, it is essential to prioritise research. The prioritisation of MSFD research also considers the timely availability of the knowledge. Calibration points for this are the OSPAR Quality Status Report in 2023, and the update of the national assessment of the environmental status of the Dutch part of the North Sea in 2024. The availability and term of financing of, for example, WOZEP, EMVAF, MONS, etc. also are decisive factors in this.

Financing additional measures and research

The additional measures for the themes of biodiversity and sea-floor integrity emerge from the North Sea Agreement. The North Sea Agreement leads to several intensifications of (policy) measures and additional objectives for spatial protection, monitoring and research. For these intensifications, the ‘Transition Fund’ may be used if existing or available funding falls short. In the North Sea Consultation, it was agreed that there will be an investigation in 2023 as to whether the goals of the North Sea Agreement will be achieved with the available funding. If further strengthening of the ‘Transition Fund’ proves necessary, parties will discuss this openly and realistically in the North Sea Consultation.

In addition to the ‘Transition Fund’, there is a European Maritime and Fisheries Fund (EMFF) specifically for MSFD measures and research. This is managed jointly by the Netherlands and the European Commission.

The additional measures for the themes litter and underwater noise are funded by the budget of the Ministry of Infrastructure and Water Management. For litter, co-financing will be provided from EMFF resources.

1 Rationale and goal

1.1 Marine Strategy Framework Directive

The European Marine Strategy Framework Directive (MSFD) has been elaborated for the Dutch part of the North Sea in the Marine Strategy. This programme of measures for the period 2022-2027 is part of this. It is an integral review of the first version dating from 2015 which covered the period 2012-2020 and is the final element of the second implementation cycle of the MSFD. Due to the relationship with the North Sea Programme 2022-2027, the term also starts with this update in 2022.

The MSFD requires the member states to draw up a strategy to achieve a Good Environmental Status (GES) in their marine waters, and to take the necessary measures to achieve or maintain that status. The Directive addresses the integral environmental and ecosystem policy and the sustainable use of the sea. More specifically, it concerns the themes biodiversity, non-indigenous species, commercially exploited species of fish and shellfish, habitat, hydrographical conditions, contaminants and eutrophication, marine litter and introduction of energy (including underwater noise). The basic principles are the ecosystem approach and the precautionary principle. The influence of human activities on the marine ecosystem must not prevent achieving or maintaining the GES.

The Marine Strategy consists of three parts, which are each updated every six years.

Marine Strategy part 1

The Marine Strategy part 1 contains the initial risk assessment of the marine environment (art. 8), the description of the GES (art. 9) and the environmental targets and the associated indicators (art. 10) from which the extent to which the actual status deviates from the good status can be derived. As such, the Marine Strategy establishes the frameworks for the Dutch part of the North Sea for sustainable use within the limiting conditions of the ecosystem, taking international and European legislation into account. The Dutch government adopted the updated version of the Marine Strategy part 1 in 2018 and reported to the European Commission.

Marine Strategy part 2

Part 2 of the Marine Strategy is the MSFD monitoring programme (art. 11). This describes how the Netherlands fulfils the requirement to monitor the environmental status in its own part of the North Sea and how it incorporates the monitoring objective for the implementation of the Birds and Habitats Directive. The starting point is the existing monitoring practice resulting from national and international obligations (such as WFD, BHD/Natura 2000, CFP, IMO, OSPAR). The monitoring programme is updated annually based on the latest developments and new insights emerging from the North Sea Agreement and international coordination in the framework of OSPAR and the International Council for the Exploration of the Sea (ICES). The Dutch government adopted the updated document in September 2020. In November 2020, it reported to the European Commission.

Marine Strategy part 3

This part 3 of the Marine Strategy is an update of the 2015 version and covers the period 2012 to 2020. Part 3 implements article 13 of the MSFD, which requires member states to draw up a programme of measures aimed at achieving and maintaining the GES. Among others, the Marine Strategy part 3 describes the development process of the programme of measures and the related analyses that were performed. The document explains the content and expected effectiveness of the measures. The Marine Strategy part 3 is an appendix to the North Sea Programme 2022-2027 which will be adopted as part of the National Water Programme (NWP) at the end of 2021.

1.2 Objective and context

The Netherlands North Sea Policy, as expressed in the North Sea Programme 2022-2027, contains all the objectives and ambitions for integrated marine policy for the Dutch part of the North Sea. In this, the Marine Strategy integrates the preconditions and ambitions from the various policy areas relating to nature, the environment and sustainable economic developments, supplementing them where necessary to achieve and maintain good environmental status. This structure fits the European policy context in which the MFSD is the environmental pillar for the integrated maritime policy (IMP).

The integration in the Marine Strategy also relates to policy implemented at national level based on international frameworks, such as the nature policy (Birds and Habitats Directive, the policy for species and the policy relating to exotic species), the water quality policy, environmental aspects of shipping policy, sustainable fisheries and the associated spatial conservation measures.

The North Sea Programme 2022-2027 describes its overarching goal as: a North Sea that in the future is clean, healthy and productive, with an ecosystem that functions optimally and resiliently, while the use of the sea is sustainable. Such a North Sea offers carrying capacity and development prospects for both nature and the environment and economic sectors. The programme of measures contributes to this goal.

International and European context

In terms of substance, the programme of measures builds on existing measures from the Common Fisheries Policy (CFP), the Water Framework Directive (WFD), the Nitrate Directive, the Urban Waste Water Treatment Directive, the Bathing Water Directive and the Directive on Environmental Quality Standards for Priority Hazardous Substances, as well as international agreements relating to OSPAR or IMO.

The programme of measures is also in line with international biodiversity agreements which follow from the Convention on Biological Diversity (CBD) and the European Birds Directive and Habitats Directive. This concerns the goals of the common European and international policy to stop loss of biodiversity and strengthen Natura 2000 policy. For the aspect of biodiversity, the programme of measures also relies on international agreements, for example the Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas (ASCOBANS).

Finally, the programmes of measures which were produced under the Water Framework Directive through cooperation in the four international river basins of the Rhine, Meuse, Scheldt and Ems also contribute to the programme of measures of the Marine Strategy. This applies among others to achieving the MSFD objective for eutrophication, contaminants, migratory fish, litter and for achieving a good environmental status in the coastal waters.

Climate change and ocean acidification

When drawing up this programme of measures, attention was devoted to the consequences of climate change. Recent decades have seen accelerated climate change, as a result of the increased concentration of greenhouse gases in the atmosphere, such as CO2. These changes in the physical environment can affect the ecosystem of the North Sea in various ways. The three most important effects are:

- higher seawater temperature
- rising sea levels and
- increased CO_2 absorption by seawater (acidification).

The higher sea temperature will cause a change in the composition of biotic communities, with possible consequences for fishing and other ecosystem services in the North Sea. Direct effects of rising sea levels are mainly expected in the shallowest zones along the coast. In the long term, at low tide, banks may be exposed for less time or not at all. This will result in fewer nesting, foraging and resting possibilities for wading birds and essential resting, shedding and nursing places for seals. The acidification of sea water can make it harder for molluscs to form a calcareous skeleton and can lead to the dissolving of existing limestone structures. Particularly in sensitive phases of life (for example the larva phase), certain types of molluscs can be very vulnerable and may ultimately disappear. Furthermore, not very much is known about the influence of climate change on the marine environment, the ecosystems and the ecosystem services. In OSPAR context, the Netherlands contributes to the effective monitoring and assessment of the trends in the acidification of oceans and its impact on the ecosystem. Climate change also receives attention in the assessments which OSPAR performs into the status of the various (biotic and abiotic) components of the marine environment. In the National Knowledge and Innovation Programme Water and Climate, the consequences of climate change (acidification, rising temperature) are also charted.

1.3 Process description

Development of programme of measures

The principle for the programme of measures is the policy objective as included in the update of the Marine Strategy part 1 (2018). The objectives determine the necessity for taking additional measures. For each descriptor, it is determined whether the existing measures (included in the programme of measures of 2015) must be continued and whether extra efforts are required to achieve the environmental targets. Additional efforts appear necessary for the goals 'seabed protection', 'litter reduction' and 'underwater noise reduction'.

The programme of measures has various similarities with the North Sea Agreement. Arrangements as part of the North Sea Agreement about area protection and species protection are manifested in this programme.

The programme of measures from the Marine Strategy is part of the package of measures from the North Sea Programme 2022-2027. For this package, an environmental impact assessment, a pre-assessment based on the Nature Conservation Act and an appropriate assessment were drawn up. For new MSFD measures, where possible a social cost-benefit analysis is performed to determine who best to shape these measures.

National and international coordination

Updating the Marine Strategy part 3 was coordinated at national and international level. In the Netherlands, the departments involved coordinate the MSFD implementation under the direction of the Interdepartmental Directors North Sea Consultative Body (IDON). Coordination with social (lobby) organisations was conducted from 20 October to 10 November 2020 by means of a written consultation in the Physical Environment Consultative Council (OFL). The programme of measures was also discussed with stakeholders during individual discussions and during a stakeholder meeting on 15 October 2020.

The Council of Ministers establishes the Marine Strategy. The state secretary from the Ministry of Infrastructure and Water Management (I&W) is responsible for the preparation and timely and correct implementation of the Marine Strategy for the Dutch part of the North Sea. Pursuant to the Water Act, the Minister of Infrastructure and Water Management (I&W) shares this responsibility with the Minister of Agriculture, Nature and Food Quality (LNV), who is specifically responsible for the policy areas biodiversity, nature and fisheries.

International coordination takes place via OSPAR and Marine Strategy Coordination Group working groups. Both platforms play an important role in the international coordination of the content of the marine strategy parts 1, 2 and 3 and implementing a regional approach. Since the 1970s, the Netherlands has been working with the European Union and fourteen countries in the framework of OSPAR on the protection of the marine environment of the North-East Atlantic.

International coordination

The Dutch government is committed to extending international coordination and collaboration. Obviously, the quality of the ecosystem and the marine environment in parts of the North Sea which are the responsibility of different nations is interconnec ted. The MSFD therefore requires the member states to adopt a regional approach. In the context of OSPAR Convention too, the international collaboration and coordinated approach to the marine strategy are becoming more important. The international coordination and collaboration between the countries in OSPAR with respect to measures for the various MSFD descriptors was recorded at the beginning of 2016 in the OSPAR Joint Documentation on Coordination of Measures (MSFD).

The Netherlands actively supports initiatives for international collaboration in OSPAR, the EU and other relevant international frameworks. The active support of the Netherlands for international collaboration is seen among others in its leadership of various OSPAR working groups, the active contribution to the update of the OSPAR North East Atlantic Strategy, and the various initiatives which are being taken to achieve knowledge sharing and development at international level, such as drawing up the OSPARE Science Needs Agenda and the international research project Jomopans.

Review procedure

In December 2021, the Minister of I&W will establish the draft Marine Strategy part 3, MSFD programme of measures, together with the corresponding Response Document and the entire National Water Programme. As part of the National Water Programme, the draft Marine Strategy part 3 will be available to the public between 1 March 2021 and 1 September 2021. During this period, there will also be consultation with the OSPAR countries.

After it has been established, the programme of measures will be reported to the European Commission.

1.4 How to interpret this document

Chapter 2 addresses the socio-economic importance of the North Sea and expected developments in this field. It gives insight into the pressure factors on the marine environment, which relate to the current and expected developments. Chapter 3 briefly describes per descriptor good environmental status (GES) and related goals, the current measures, the current environmental status, any residual policy objectives (*gap analysis*), necessary additional measures, any exploration and knowledge objectives. Chapter 4 contains a summary of the gaps in knowledge and available research programmes. Finally, Chapter 5 provides an overview of funding for the additional measures.

2 Socio-economic importance of the North Sea

The developments in the pressures on the marine environment (in terms of emissions to water, fisheries and other pressure factors) are strongly influenced by developments in the scale of socio-economic industry activities in, on and along the North Sea. Conversely, various economic activities strongly depend on a well-functioning ecosystem. This chapter therefore describes the past and expected future developments in the following economic activities that are strongly dependent on the North Sea: oil and gas production, fishing, shipping, sand and gravel extraction, and the activities related to offshore wind energy, together with some activities on land that are strongly dependent on the sea, such as port activities and recreation.

General

The Dutch part of the North Sea is one of the most intensively used parts of the North Sea. There, different activities are taking place, such as fishing and shipping (both commercial and recreational), oil and gas production, sand and gravel extraction, and in recent years a significant increase in the production of wind energy. The economic value of the North Sea for the maritime industry and activities on land and sea has increased significantly in recent years (see table 1). This total value is expected to further increase in the coming years. However, the extent to which this will occur varies strongly per sector or activity. For example, the economic value of the relatively large oil and gas industry has clearly declined, while the value of the smaller offshore wind energy sector is increasing. As a result of the energy transition, both developments are expected to continue in the coming years [1].

Shipping

The particularly intensive shipping traffic on the North Sea involves both freight and passenger transport. Barges also sometimes use the EEZ, but their share of total shipping traffic in the North Sea is negligible; they constitute a tiny percentage of the total shipping on the North Sea. Many ships which use the EEZ are operated by foreign shipping companies and do not contribute to the Dutch economy. Their economic value is therefore not included in the further description of this sector.

Shipping can have a negative impact on the environment due to accidents and lost cargo. To limit this impact, there are specific shipping routes that bypass certain areas. In addition, the discharge of ballast water sometimes leads to the introduction of non-indigenous species (D2). To tackle this, measures have been taken within the framework of the Ballast Water Management Convention. In addition, there has been increasing attention in recent years for the possible effects of underwater noise caused by ships (D11) [2].

Between 2010 and 2015, shipping showed a clear increase in all economic indicators (see Table 1). This increase is in line with the developments in international maritime trade. Between 2015 and 2017, the values for the various economic indicators decreased, but measured over the whole period 2010-2017, there is a growth in this sector.

The shipping industry and sea ports are of great economic importance to the Netherlands. This will not change in the future. Shipping traffic in the North Sea is expected to increase in the coming decades. The pace of that growth depends on the further globalisation of the economy. As a result of ongoing economies of scale in the shipping industry, the number of shipping movements will increase less rapidly. An increase in short sea shipping is also predicted. In addition, partly as a result of climate change, it is expected that more ship movements will take place in a northerly direction [2].

Fisheries

The fishing industry is a vital sector which is characteristic for a sea-oriented country like the Netherlands. Besides the direct economic importance of the fishers who operate in the Dutch part of the North Sea, various activities in the ports are also directly or indirectly dependent on the fishing industry. Especially for some communities in vulnerable regions, fishing activities have a great socio-economic significance because of the employment opportunities and the regional identity associated with it. For some communities in vulnerable shrinking regions, the fishing industry has great socio-economic significance due to the employment and regional identity linked with it.

The quality and quantity of the fish stocks in the North Sea strongly depend on the quality and functioning of the marine ecosystem. A well-functioning ecosystem is therefore also important for the fishing industry. Depending on the applied technology, fishing can also harm the ecosystem. Fishing can have an impact on habitats and species under the Birds Directive and Habitats Directive (D1). To limit this, in some areas such as the Natura 2000 areas the Voordelta, the Vlakte van de Raan and the North Sea coastal zone, there are restrictions in place with respect to bottom trawling. In addition, fuel consumption by the fishing industry generates emissions [1]. Damage to the ecosystem can be reduced through innovation within the sector relating to fishing technology (including pulse trawling), but also in the area of shipbuilding.

While turnover and the economic result of the supply sector showed an upward trend in the period between 2010 and 2016, returns and revenues and earnings have been declining since 2017. This decline in turnover and revenue is expected to continue in the coming years. In the future, the fishing industry will continue to face challenges in the North Sea. The consequences of Brexit for the fisheries sector have become clear to a certain extent, as the Trade and Cooperation Agreement (TCA) with the UK entails that the EU fleet has guaranteed access to UK waters for 5,5 years. However, after this period, access to UK waters can be decided on by the UK annually, similar to the situation with coastal states such as Norway. This can create uncertainty. Additionally, 25% of the value of EU quota in British waters will be transferred to the UK over the next 5 years. This obviously has a negative impact on the fishing sector as well. Access to other areas (international and national) is limited by the spatial claims for offshore wind farms, where trawling is not allowed, and the implementation of fishing restriction measures in areas designated under the Birds Directive, Habitats Directive and/or the Marine Strategy Framework Directive. The innovative pulse technique is not permitted under the Technical Measures Regulation (Regulation (EU) 2019/1241) (pulse trawl ban), which means that fisheries using pulse trawling may be forced to switch back to beam trawling with tickler chains. Climate change and the related warming of the sea causes fish to migrate to other areas [2].

There are also opportunities. Where wind farms and nature reserve areas are closed for bottom trawling, room is created for forms of fishing that can be carried out safely in wind farms, which do not have a significant impact on the nature values to be protected in nature reserves. There is also room for aquaculture in wind farms and in natural nature reserve areas. This activity, which is still limited in extent, may become more important in the coming years, although this is still a niche market that does not offer a complete alternative for beam trawling. Arrangements on this have been made in the North Sea Agreement.

The transition to sustainable fishing is a national interest and requires reorientation and ultimate restructuring of the fishing fleet. Increased sustainability is one of the conditions for being able to maintain a dynamic fishing industry in the long term too. The Vision for Trawler Fisheries (Appreciation with the advice Public for sustainable trawler fisheries on the North Sea, 19 June 2020) focuses on an economically healthy sector which fishes with respect for nature and the environment and receives social recognition for doing so. Innovation is an important pillar for this, for example the development of a zero-impact cutter to achieve fisheries with less seabed disturbance, less unwanted bycatch, less greenhouse gas emissions, and less waste.

Oil and gas production

The Netherlands has substantial natural gas reserves and some smaller oil reserves. Since their discovery, these stocks have been exploited to meet national demand and some of it is exported. The extraction of oil and gas has made an important contribution to the national income and economic growth in recent decades. On the Dutch part of the North Sea, there are around 160 production locations. Of the joint total production capacity, 93 percent is used to extract gas and 7 percent to extract oil [3].

A possible impact on the environment of oil and gas production is the emission of contaminants during the discharge of production water by oil and gas installations (D8). This water usually contains oil, heavy metals and polycyclic aromatic hydrocarbons (PAHs). In the Dutch Exclusive Economic Zone (EEZ), the sector is required to treat and test this water before it is discharged [1]. In recent years, the possible impact of underwater noise caused by seismic survey is an area of increasing concern (D11).

Oil and gas production in the North Sea has clearly fallen in recent years. Between 2010 and 2015, the decline was relatively limited, but it accelerated in the two following years. Between 2010 and 2017, the added value decreased more strongly than the production value. This is shown in Figure 2. 1 [4].

Use of empty gas fields - Carbon Capture and Storage (CCS) and storage of hydrogen

In the Climate Agreement, it was agreed that CO_2 would only be stored below the seabed. In the coming decades, capacity is available under the North Sea for the storage of around 1600 Mton[1] of CO_2. This capacity is present in depleted gas fields. It is expected that CO_2 will be transported to the North Sea from the major industrial clusters by pipeline or by ship. Until 2030, it is estimated that a maximum 7.2 Mton will come from industrial CO_2, supplemented by a maximum of 3Mton of CO_2 will come from the electricity sector.

[1] Include reference to the latest study by TNO and EBN (2020) (still in draft)

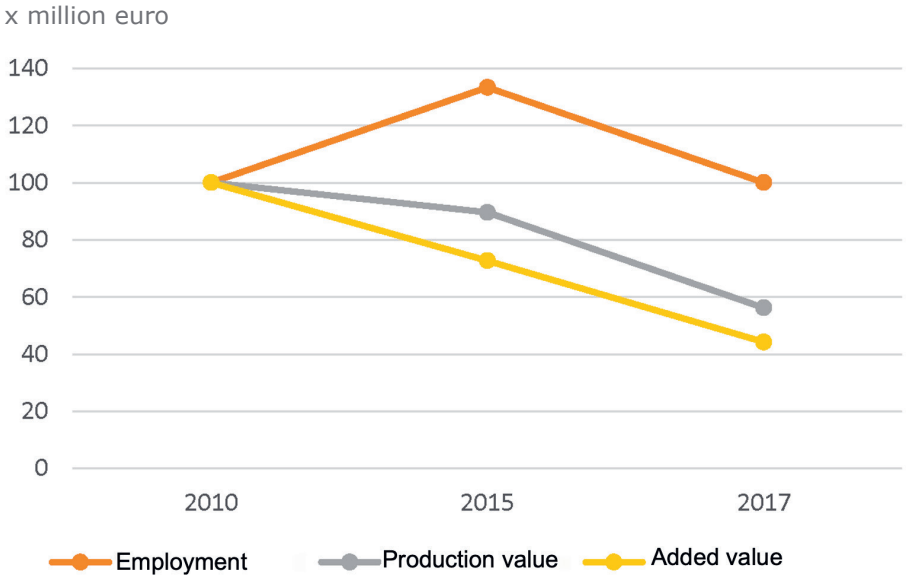

Figure 2.1: Development in production value, employment and added value in oil and gas production in the North Sea over the period 2010-2017 (based on CBS, 2020 [4]).

Besides storing CO_2 storage, gas fields can also be used to store hydrogen. Hydrogen can be considered a storage and transport medium which, in a future of purely renewable energy sources, gives the required flexibility to continue to match the supply and demand for energy. The Climate Agreement formulated the ambition for to scale up electrolysis to approximately 500 MW installed capacity in 2025 and 3 to 4 GW of installed capacity in 2030. With its wind energy potential, existing gas infrastructure, and availability of space, the North Sea is an area where these ambitions can be realised.

Offshore wind energy

Since 2006, the NCP has been used to generate wind energy. That function has become increasingly important in recent years.

Offshore wind energy can help reduce CO_2 emissions, but offshore wind farms can also have a negative impact on various animal species. For example, the construction of wind farms produces underwater noise (D11), and when wind farms are in operation, birds can be killed by rotating blades (D1). To counteract the effects of underwater noise, restrictions apply with respect to when the foundations for wind farms may be constructed. Furthermore, when designating areas for wind farms, the impact on different animal species is explicitly considered.

The increase in the production of energy from offshore wind farms has considerably increased the production value and added value of this economic activity. The change between 2015 and 2017 is the most remarkable: Production and gross added value more than tripled (see also Figure 2.2). The capital-intensive character of the operation and maintenance of the turbines explains why this activity does not contribute much to employment [4].

In a European context, it has been agreed that by 2030 the CO_2 emissions must have been reduced by at least 40 percent compared with the emissions in 1990, and that renewable energy must account for at least 32% of the total energy supply in the EU.

For the Dutch situation, the construction of wind farms in the North Sea plays a major role in making energy production more sustainable. In the Energy Agreement of 2014, it was agreed that approximately 3.5 GW of additional wind energy capacity will be installed at sea by 2023. In 2018, the Dutch government extended the Offshore Wind Energy Roadmap [6] to include a section for the years 2024 to 2030. Until 2030 wind farms will be built in wind energy areas designated in the North Sea Policy Document 2016-2021, part of the National Water Plan. This will lead to a total capacity of approximately 11.5 GW in offshore wind energy in 2030.

At the end of 2020, it became clear that the planned roll-out of the roadmap offshore wind energy 2030 is still insufficient to realise the 49 TWh contribution agreed in the Climate Agreement by 2030 [7]. In addition, in the autumn of 2020, both the European Commission and the European Parliament expressed support for a more ambitious CO_2 reduction target for 2030. It is expected that this will lead to a Government Decision to schedule the construction of additional offshore wind farms in the period up to 2030.

In the North Sea Agreement, it was agreed that space must be found for the installation of 20 to 40 GW of additional offshore wind energy. It was also agreed that an investigation will explore whether (parts of the) already designated but not yet used wind energy areas Hollandse Kust (southwest), Hollandse Kust (northwest) and IJmuiden Ver could remain unused in exchange for new wind energy areas in more northerly parts of the Dutch North Sea. In the framework of the North Sea Programme 2022-2027, space will therefore be sought for 27 GW of offshore wind energy after 2030 on top of the 11.5 GW which is expected to be already be in place at that time. Besides offshore wind energy, there are also opportunities for offshore solar energy. However, it is still not clear whether this will actually be an attractive option in the long term. The first pilot on the North Sea was launched in autumn 2019. In the wind farm Hollandse Kust (north), there

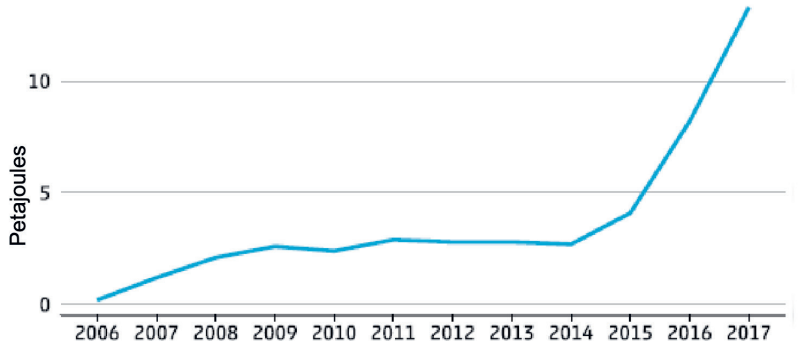

Figure 2.2: The production of wind energy in the EEZ in petajoules in the period 2006-2017 [4]

will also be an experiment with offshore solar energy. These developments, in addition to the EU's ambitions for offshore solar energy and the House of Representatives' request for a roadmap, give cause to conduct in-depth research into the opportunities and limitations of solar energy at sea.

Sand and gravel extraction

The Netherlands extracts over 25 million m^3 of sand every year from its part of the North Sea. Some of these are shallow (<2 metres) and some are deep (>2 metres) extractions. Around half of the extracted sand is used as suppletion sand for coastal maintenance, while the other half is used as filling sand for construction and infrastructure and for flood protection measures in low-lying areas.

Sand extraction can have a negative impact on benthic life (D1) and the stability of the coastal foundation. To counteract this effect, the extraction of sand has been restricted to certain areas. In addition, sand extraction can lead to turbidity. Certain types of dredging equipment reduce turbidity, but this can lead to additional costs [1].

Economic figures about marine sand and gravel extraction are relatively uncertain because they can only be roughly approximated. This is because 'sand and gravel extraction' is not a separate economic sector within the statistical classification used by CBS. The figures show that there was a slight decrease in production and added value between 2010 and 2015 (see Table 2.1). In 2017, however, all the indicators mentioned showed an increase compared with 2015 [4].

The future demand for sand also depends, among other things, on the actual rise in sea levels and on economic growth. If the sea level were to rise by 15 to 35 centimetres between now and 2050, the required volume of suppletion sand would increase in that period from the current 12 million m^3 to between 18 and 48 million m3. The demand for suppletion sand would also rise significantly if the Port of Rotterdam is expanded, for example, and if energy islands would be created for the sustainable generation of electricity and/or hydrogen. In the case of limited economic growth and a shrinking population, the demand for filling sand will probably remain almost the same as the current 13 million m^3 per year. However, if the economy and population both grow, the demand for filling sand could increase to around 18 million m^3 [8].

Ports

The Port of Rotterdam is the largest port in Europe for the transhipment of goods. As shown in Figure 2.3, the added value of the port of Rotterdam is greater than that of all the other Dutch seaports together [4].

In general, transport, storage and communication are the most important activities in the seaports sector. They generate nearly half of the added value and contribute significantly to the growth of the added value of the seaports between 2010 and 2017. The 'industry' sector also has a large share with nearly 37 percent, but this sector is growing the least (less than 8 percent). In terms of production value, this sector is the biggest sector. This overall picture conceals large differences in the distribution of the various sectors over the individual seaports. More details on this are available in the CBS report [4].

If economic growth is limited in the coming years, the global significance of the ports of Rotterdam and Amsterdam may decline. The number of shipping movements will then not increase much. Strong economic growth, on the other hand, is expected to benefit the global position of the ports. The Dutch ports will then profit from, among other things, the greater depth of shipping channels, wide port basins and ongoing automation and robotisation [2].

If the environmental ambitions grow significantly in the coming years and the switch to a low carbon economy really takes place, this will have a major impact on the storage and transhipment of fossil fuels. It is expected that such a transition will not be possible without carbon storage as an intermediary step. Here too, the ports could play an important role [2]. However, this requires the necessary space. Furthermore, due to safety requirements, large-scale storage and transhipment of hydrogen in the form of ammoniac or liquid hydrogen cannot take place at every location. Off-site transhipment in front of the Maasvlakte could then be a serious consideration.

Other marine activities in the coastal zone

To give an impression of various marine activities in the North Sea coastal zone (up to 1 km off the coast), the following sections give an economic description of the sectors 'hotels and restaurants', 'fisheries', 'recreation, culture and sport' and 'retail'.[2]

Recreation and tourism depend on a good quality of the marine environment. Conversely, recreation and tourism can also have a negative impact on the marine environment, for example by leaving behind waste that ultimately ends up in the sea (D10). To tackle this, awareness-raising campaigns are being launched and waste is actively being removed from the beaches by coastal municipalities [1].

In the period 2010-2017, the added value of 'hotels and restaurants' increased, while that of 'fisheries' decreased. The sector 'hotels and restaurants' has the largest share of the coastal area while 'fisheries' only has a small share. The total added value generated in the coastal zone has therefore grown, as shown by Figure 2.3. The other sectors show little change: the sector 'recreation, culture and sport' shows a slight decline in the gross added value and 'retail' a small increase [4].

The number of leisure boats in the Netherlands may decrease significantly if the coming years are characterised by low economic growth, an ageing and shrinking population, and a shift to other forms of leisure and holidays. But the reverse trend could also occur if there is a further rise in welfare, and an increase in the population and the number of pensioners [2]. In view of the increasing dimensions of leisure boats and thus their suitability for sailing at sea, it is possible that in the future there will be more shipping movements of leisure boats at the sea.

With an increasingly ageing population, there is also a definite trend towards more luxury hotels, restaurants and wellness centres along the Dutch coast. Especially in Zeeland, this is expected to contribute to the economic development. Furthermore, an increase in sustainable tourism and eco-tourism is expected. After all, the public is becoming increasingly aware of the value of the natural environment. The Dutch coasts offer the preconditions for such a development. However, it is unclear how much this will contribute to the Dutch economy [9].

[2] Sea fisheries as described above as one of the activities taking place at sea include all the Dutch fishing activities in the EEZ. Fishing in the coastal zone includes all fishing activities anywhere in the world by fishing companies based in the coastal zone. Since there is a partial overlap between the two activities (a fisherman from Scheveningen who fishes in the EEZ), the figures for fishing in the coastal zone and marine activities at sea should not be added together because of possible double counting.

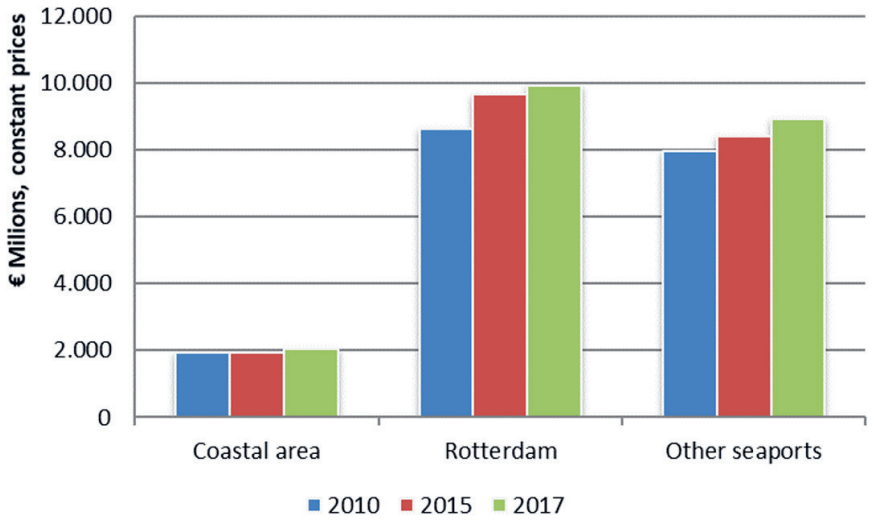

Figure 2.3: Development in added value over time of activities on land [4]

Indirect importance of the North Sea for society: Ecosystem services

The earth's ecosystems have numerous functions for humans, including food produced by agriculture, the purification of air and water, and climate regulation. Such benefits that humans derive from ecosystems are called ecosystem services [10].

Ecosystem services involve the following services:

- Production services: Ecosystems deliver products, such as food, water, wood and genetic sources.
- Regulatory services: People use the regulatory capacity of ecosystems, for example in organic pest control in agriculture, capturing carbon from trees or cross-pollination by insects.
- Cultural services: Ecosystems deliver non-material services, such as recreation, health, historic, ethical and aesthetic services.
- Supporting services: Services that are necessary for the other ecosystem services, such as seabed soil formation, the nutrients cycle and primary production.

For many years, Dutch ecosystems have delivered socially important services. And it is not just ecosystems in nature reserves that provide such services. The agricultural area, the rivers, sea and the city also provide ecosystem services. For example, more than half of the oxygen we breathe comes from marine organisms, and a quarter of the annual CO_2 emissions in the atmosphere produced by humans is absorbed by marine waters. Here, the following applies: the higher the biodiversity, the better nature can guarantee the ecosystem services.

Marine and coastal ecosystems therefore deliver a range of ecosystem services, from fisheries to carbon storage and flood protection. However, pollution, overfishing, climate change and habitat destruction have a negative impact and can have detrimental effects on the capacity of the marine ecosystem to deliver those services, the natural capital of the North Sea.

Sector	Indicator	2010	2015	2017	2021	2030	2050
Shipping	Employment	9,1	9,5	9,2	0	7-13	20-33
	Production value	5035	6601	6059	3-5	10-16	21-40
	Added value	1281	1907	1687	0-5	10	15-35
Fisheries	Employment	0,7	0,8	0,7	0	-20	-60
	Production value	142	153	132	-7 -13	-20 -27	-60 -73
	Added value	78	89	95	-10	-20 -30	-60 -80
Oil and gas production	Employment	3	4	2,9	-8	-24	-100
	Production value	5597	5013	3144	-8	-24	-100
	Added value	4686	3405	2071	-8	-24	-100
Wind energy	Employment	0,04	0,06	0,14	200 - 400	400 - 1400	1100 – 5900
	Production value	90	116	356	159 - 288	197 - 884	531 – 3063
	Added value	35	46	149	106 - 213	31 - 338	-13 - 350
Sand extraction	Employment	0,3	0,3	0,4	0 - 33	33 - 67	67 - 167
	Production value	145,6	135,9	208,3	0 - 16	11 - 53	32 - 142
	Added value	63,8	48,5	79,1	0	0 - 40	20 - 120
Total at sea	Employment	13,14	14,66	13,34			
	Production value	11009,6	12018,9	9899,3			
	Added value	6143,8	5495,5	4081,1			
Ports	Employment	128	127	128			
	Production value	71137	72971	76122			
	Added value	14996	18065	19068			
Coastal zone	Employment	37	39	42			
	Production value	3210	3660	4080			
	Added value	1695	1940	2188			
Total on land	Employment	165	166	170			
	Production value	74347	76631	80202			
	Added value	16691	20005	21256			

Tabel 2.1. Economic importance of the North Sea (2010-2017; source: CBS (2020) [4]; 2021 – 2050 calculated based on WEcR (2019) [2])[3]

[3] For marine activities, the figures in the table only relate to the activities on the NCP insofar as these contribute to the Dutch economy. So, the economic value of foreign shipping is not calculated in the shipping figures. Conversely, much of the economic value of the Dutch fishing industry is not included because it takes place outside the NCP. The reason for only presenting figures relating to the NCP is because the MSFD requirement for the Netherlands relates to the Dutch part of the North Sea.

Furthermore, for wind energy, the CBS figures only relate to the operational phase. The estimate of the future trend is therefore also based on the direct economic impact during the operational phase. WEcR also presents figures for the expected economic effects of the construction phase. These are expected to be significant but are not therefore included in the figures presented above, nor are the indirect effects of the various activities included in these figures. The indirect impact of the different activities is not included in these figures either. This concerns employment generated in the ports for building offshore wind turbines, as well as a possible decrease in employment due to the closure of a coal-fired power station following the switch to wind energy.

3 Policy objectives and measures

3.1 Introduction to this chapter

The majority of the programme of measures was reported in the previous policy cycle and will be continued. In addition, based on the remaining policy objectives, additional measures are included in this chapter. The measures are divided by descriptor:

- Descriptor 1 Biodiversity
- Descriptor 2 Non-indigenous species
- Descriptor 3 Commercially exploited fish and shellfish
- Descriptor 4 Food webs
- Descriptor 5 Eutrophication
- Descriptor 6 Sea-floor integrity
- Descriptor 7 Hydrographical conditions
- Descriptor 8 Contaminants
- Descriptor 9 Contaminants in fish and other seafood for human consumption
- Descriptor 10 Marine litter
- Descriptor 11 Introduction of energy, including underwater noise

Of these eleven descriptors, the three descriptors on biodiversity, food webs and sea-floor integrity are crucial in terms of the ecosystem approach. These three describe the structure, function and processes in the marine ecosystem. The other descriptors relate to disturbances of the marine ecosystem (also called pressure factors) resulting from human activities.

For each descriptor, the environmental status and environmental targets are summarised based on the update of the Marine Strategy part 1 (2018) [11].This is followed by a description of the measures which were implemented in the recent period. The next paragraph addresses the current environmental status and the expected development therein, partly under the influence of economic developments and other developments, such as supply from big rivers and climate change. Based on this, it is determined whether there is a need for a supplementary policy assignment (*gap analysis*), and whether additional measures are required. The starting point here is the update of the Marine Strategy part 1 (2018). The development of these measures partly depends on available knowledge. For each descriptor, a knowledge agenda is therefore included. This knowledge agenda contains the most important knowledge questions. Prioritisation and programming will take place in 2021-2022. The departmental budgets of I&W and LNV for applied research for MSFD and OSPAR will be included in this, as well as resources from the EMFF (European Maritime and Fisheries Fund.). This aims at synergy in the cohesion with the knowledge programming for the implementation of the North Sea Agreement in the framework of the MONS programme (Monitoring-Research-Nature Reinforcement-Species Protection), and research programmes like Natura 2000, the Offshore Wind Ecological programme (Wozep), NWO programmes for strategic and fundamental, mission-driven programmes of top sectors, programming by TO2 institutions and possibilities for EU programmes.

Based on article 14 of the Marine Strategy Framework Directive, in their programme of measures, member states must indicate when good environmental status cannot be achieved by the measures. One cause might be that the member state is not responsible for a certain measure or lack of measure. However, natural circumstances, force majeure or changes in physical properties of marine waters can also mean that the environmental status does not improve in time. The MSFD stipulates that member states are not required to act if there is no significant risk to the environment, or if the costs of the action are disproportionally high in relation to the risk for the marine environment. However, no further deterioration must occur. The relevant paragraph addresses such situations.

3.2 Biodiversity (D1)

Good environmental status and targets

According to part 1 of the Marine Strategy (2018), good environmental status for biodiversity is achieved if the biodiversity is preserved and if the presence and quality of habitats and the distribution and density of species correspond with the prevalent physiographical, geographical and climatological circumstances.

The Netherlands has divided the descriptor Biodiversity (D1) into four sub descriptors: birds, marine mammals, fish and squid, and pelagic habitats. The sub descriptor benthic habitats should also be in D1. However, together with descriptor D6 (Sea-floor Integrity), in the Dutch interpretation of the Marine Strategy it is allocated and justified in this document in paragraph 3.7. The following table presents an overview of the environmental status and environmental targets per sub descriptor.

Birds	
Good environmental status	Overarching: population densities 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 of 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).
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 Vlakte van de Raan and in the North Sea coastal zone (in the framework of the VIBEG agreement). • D1T3: achieving the conservation objectives for habitat types and species in the Natura 2000 areas at sea (BD and HD). • D1T7: monitoring of bird collisions with wind turbines in the framework of Wozep.
Sea mammals	
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 the harbour porpoise (H1351) must comply with the favourable reference value for the population size (FRP) according to the Habitats Directive. • D1C3: no reduction in the birth rate of the grey seals 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 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 at D11). • D1C4: distribution of harbour porpoises and grey and harbour seal satisfies the favourable reference range 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).

Environmental targets	• D1T2: recovery of undisturbed situation for sea mammals and birds due to reduced fishery on the Vlakte van de Raan 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 (BD and HD). • D1T4: implementation of mitigating measures in the framework of the Harbour Porpoise Conservation Plan of 2011. • D1T8: further research into the cumulative effects within OSPAR.
Fish and squid	
Good environmental status	Overarching: the population densities and demography of populations of fish suggest healthy populations. • D1C2: Commercially exploited fish populations: see D3C1 and D3C2 – Commercially exploited fish • D1C2[4]: rise in the proportion of vulnerable species of fish in the fish community (OSPAR assessment value). • D1C2: population of migratory fish must comply with the 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. • 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).
Environmental targets	• D1T5: research into sharks and rays in combination with the taking of mitigating measures as laid down in the MSFD 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: D3T2: the management of all commercially fished stocks complies with F≤FMSY and a spawning stock biomass above the precautionary level MSY Btrigger. • D1T3: achieve maintenance targets for habitat types and species in the Natura 2000 areas (BHD) at sea.
Pelagic habitats	
Good environmental status	D1C6: for pelagic habitats, good environmental status is achieved when the spatial and temporal variation in the plankton population remains within a range which indicates a good environmental status. The ranges to be used must be adopted regionally in the second cycle.
Environmental targets	D6T4: further develop and test regional assessment methods which can be used in the future for assessing benthic and pelagic habitats.

[4] The criteria D1C1, D1C2 and D1C3 must not just be elaborated for fish species, but also for squid species (cephalopod). This has not yet been done, partly because there is not much information available about these species. In 2021, it will be studied how this could be done. See further paragraph 3.4 for the good environmental status of commercial fish populations (D3C1 and D3C2).

Implemented measures

Birds and marine mammals

In 2017, the Nature Conservation Act came into force. This replaces the Flora and Fauna Act and the Nature Protection Act (1998) and implements the EU Birds Directive (BD) and Habitats Directive (HD.). The Act provides for generic protection of species of birds and marine mammals, among others the ban on killing and disturbing animals. Based on the Offshore Wind Energy Act, exemptions can be granted for the construction and operation of wind farms - under conditions - for disturbing or killing species of birds, marine mammals and/or bats. The Nature Conservation Act also provides for the designation of protected BD and HD areas (Natura 2000 areas) for species of birds and marine mammals.

In designated Natura 2000 areas, limited activities are allowed, partly to prevent and mitigate significant effects on species of birds and marine mammals based on the BD and HD. For birds, relevant measures have or will soon be taken in BD areas North Sea Coastal Zone, Voordelta and Frisian Front. In the Frisian Front area, for example, seasonal closures have been introduced for gillnetting fisheries to enable foraging by common guillemots. Marine mammals are protected in the designated HD areas North Sea Coastal Zone, Voordelta, Vlakte van de Raan, Dogger Bank and Cleaver Bank. In four Natura 2000 areas, including the Voordelta, the harbour porpoise was recently added to the Standard Data Form and should therefore also be included in the management plans for those areas, in accordance with Articles 6.1 and 6.2 of the HD. The management plans for the Natura 2000 areas along the coast stipulate that the presence of bird nesting locations must be considered during sand suppletion, cables and pipeline maintenance and beach management. In addition, activities in the coastal zone are regulated with permit requirements, mitigating measures like codes of conduct and exemption conditions. Areas can also be totally or partially closed for activities. It is expected that the measures limiting fishing proposed in the management zones of the Bird Directive area Frisian Front will be implemented before 2022 by means of a delegated act. They will be implemented in combination with research and monitoring for further knowledge development.

Adopted OSPAR recommendations based on the OSPAR list of endangered species and habitats have been or are being implemented.

For a mobile species like the harbour porpoise, it has been decided that, besides spatial measures in Natura 2000 areas, generic species protection measures are more appropriate. In 2011, the first Harbour Porpoise Conservation Plan was drawn up for this. Of the measures included in this conservation plan, the following have been carried out, partly in the framework of the Marine Strategy, part 3 [12]:

- Establishment (2013) of the national scientific Porpoise Advisory Committee (2013), which monitors the implementation of the prioritised knowledge agenda.
- Implementation of population monitoring of porpoises via the MSFD monitoring programme (Marine Strategy, part 2, from 2014 and its optimisation in the updated Marine Strategy, part 2, from 2020).
- Implementation of a scientific by-catch observation programme (2013-2017).
- Research into the controlled application of pingers.
- Amendment of the relevant European fisheries legislation, whereby it becomes more applicable to the Dutch situation.

In 2020, the Harbour Porpoise Conservation Plan from 2011 was updated, see supplementary measures - species protection.

Fish and squid

In the context of the Water Framework Directive, in 2018 the Haringvliet Sluices Management Decision officially came into force. This means that the Haringvliet sluices are opened slightly in the case of incoming tide. When it is open, migratory fish which spend a large part of their lives in the sea, including salmon, eel, sea lamprey, sea trout and twaite shad, can pass through the sluices and swim upstream to their spawning areas.

Another measure for fish migration is the construction of a fish migration river in the Afsluitdijk. This enables migrating species to swim freely between the Wadden Sea and the IJsselmeer. The preparatory work for this measure started in May 2020. Construction will start in 2021, after which the first fish will swim through the river in mid-2023.
As from 2022, fishing-free zones will be introduced around structures like weirs, sluices and pumping stations with a fish migration aid such as a fish ladder or fish passage or with fish-friendly turbine or fish-friendly weir and sluice management. Migration points at fresh water-seawater transition areas will also be fishing free. For the entry points on the Haringvliet and the two sluices in the Afsluitdijk, dimensions will be specifically chosen which suit the local circumstances and the importance of these locations for the migration of fish between the sea and inland waterways.

In the context of the MSFD shark action plan, an information pack was developed for professional fishers, fishing schools and fish auction employees. In addition, an exception was introduced for the discard ban for rays. A code of conduct with respect to not landing the by-catch of sharks and rays in recreational fishing is now part of the identification card for sharks and rays. In the context of Life IP Deltanatuur, a project was started that studies the distribution of shark and ray populations in the North Sea and Wadden Sea. A supplementary study will also be carried out in

the period 2021-2023 into the distribution and survival in the fishing for sharks and rays in the North Sea, among others to further explore the use of Natura 2000 areas and obtain information for the exception of rays in the discard ban.

Current environmental status

Birds

The Dutch seas and coast are important for both nesting and migratory birds: as a source of food and for finding breeding grounds. Millions of migratory birds spend the winter here. According to part 1 of the Marine Strategy (2018), a good environmental status for birds has not yet been achieved. That is the conclusion based on the most recent OSPAR assessments of numbers of breeding birds, breeding success and numbers of non-breeding birds.

According to the underlying - regional - OSPAR assessment, the status for breeding success among breeding birds is deteriorating. This mainly concerns waders and species which find their food on the water surface and for which the supply of food is an important issue. Furthermore, breeding birds also have problems with the limited availability of suitable breeding places. The Netherlands Birds Directive and Habitats Directive report (2019) [13] shows variations in the national development among coastal breeding birds. For example, the Kentish plover, Common tern, Sandwich tern and Little tern are in difficulty because the dynamic environments in which they breed are disappearing or have become unsuitable as a result of recreational pressure.

According to the - regional -– OSPAR assessment, the relative abundance of migratory and wintering coastal birds has also fallen sharply. In the - international - North Sea, however, such species are doing better: the numbers of 75 percent or more of the species are above the reference values for this species in the period 1991-2015. The Netherlands Birds Directive and Habitats Directive report 2019 [13] shows that national trends among migratory birds from sea and coast are overwhelmingly positive. However, certain species in the Delta, in particular the Eastern Scheldt, are under pressure due to the decline in mud flats.

The Dutch and international objectives for the development of sustainable offshore energy may put further pressure on the good environmental status for birds, due to the risk of collisions or loss of habitat. The Offshore Wind Ecological Programme (Wozep) monitors and evaluates the effects of wind farms on seabirds. The discard ban introduced in 2019 may also have a negative impact on numbers of seabirds, because fishers are no longer allowed to throw by-catch overboard.

Marine mammals

The good environmental status for marine mammals has still not been achieved, but the situation is improving. In the Dutch part of the North Sea, the grey seal and harbour porpoise populations are growing well.

In 2019, in the Birds Directive and Habitats Directive 2019 report [13], the Netherlands reported the conservation status of the common seal, grey seal and porpoise to the European Commission as ‘favourable’. For the porpoise, it stated that the future prospects were ‘unknown’. This is because the impact of the large-scale rollout of wind at sea is not yet well known. Furthermore, there continue to be many uncertainties about the development of the population, despite its stability and good level in recent years. The national Red List of Mammals 2020 [14] lists porpoises and the two types of seal in the North Sea as ‘Least Concern’.

The further development of sustainable offshore energy puts pressure on the good environmental status of all marine mammals. Pile driving during the construction of wind farms can lead to them avoiding areas, disturbance of behaviour and to physiological effects. But continuous noise during the operational phase of wind turbines can also have an impact in the longer term.

Fish and squid

The fish population does not yet have good environmental status. The OSPAR assessment shows that the deterioration of the composition of fish populations from the past has stopped. In some areas in the North-East Atlantic Ocean, there seems to be some recovery. According to the assessment, the number of big fish is still too small, but is recovering.
The current status of many shark and ray species is still cause for concern. The Netherlands Red List of Fish (2015) [15] lists the status of the common skate as ‘extinct’, the status of the spiny dogfish as ‘critically endangered’ and the status of the spotted ray as ‘endangered’. Spiny dogfish, spotted ray, thornback ray and common skate, along with the angel shark are also on the OSPAR list of endangered species and habitats (2008). The numbers of small-spotted catshark and starry smooth-hound also seem to be increasing.

Of the five species of fish that migrate between sea and fresh water (diadromous fish) and about which the Netherlands reported in 2019 for the EU Habitats Directive [13], three (sea lamprey, twaite shad and salmon) had a ‘very unfavourable’ conservation status and two (houting and European river lamprey) a ‘moderately unfavourable’ status.

Of the squid species in the Dutch North Sea, five originate here. Two of these are significant for the fishing industry. Eight squid species are incidentally or periodically found in the Dutch North Sea, of which one is also significant for the fishing industry. The available observation and catch data of squid are not yet suitable for deriving population trends. In 2021, it will now be explored how this could be done.

Pelagic habitats

According to the Marine Strategy part 1 (2018), the current environmental status of pelagic habitats is unknown. The possibilities to monitor and assess pelagic habitats are still not sufficiently well developed. A pragmatic approach has therefore been chosen for now. The status of zooplankton and phytoplankton is assessed based on data provided by the United Kingdom to the Netherlands in OSPAR context. This data is collected with the Continuous Plankton Recorder. However, the monitoring methodology and ecological interpretation are still being developed. The Netherlands is also setting up a monitoring network for this goal. This network can provide additional information for the OSPAR assessments. The joint goal is to create the most cohesive possible international system of monitoring and evaluation and to extend the number of measuring points.

Supplementary policy assignments

Birds and marine mammals

The Marine Strategy part 1 (2018) suggests a potential supplementary policy assignment for birds and marine mammals because existing policy may not be sufficient. There is also a knowledge objective aimed at obtaining more insight into the reasons behind the deterioration of birds and to gather more information about cumulation and possible mitigation of the effects of wind farms. A project is also being planned about monitoring and mitigation of by-catch of all sensitive species.

Fish and squid

The Marine Strategy (part 1, 2018) indicates that there is no supplementary policy assignment for the fish population (including D3 – commercially exploited fish and shellfish), because existing policy is satisfactory. In the framework of the further elaboration of the North Sea Agreement, it will be studied whether an additional objective (knowledge objective and possibly measures) is required.

Pelagic habitats

According to the Marine Strategy part 1 (2018), the supplementary policy assignment for pelagic habitats is unknown. However, there is a knowledge objective for the development of an assessment method.

Additional measures

Spatial protection measures

The development of an ecological network of protected areas is one of the main instruments for maintaining and restoring the ecosystem in the North Sea. In the Dutch part of the North Sea, a cohesive and representative network of protected marine areas is being created, whereby the diversity of the various ecosystems is adequately covered.

In the North Sea Agreement (NSA) [16], the following arrangements about spatial protection measures were agreed:

- Measures about designating and protecting offshore natural areas are implemented and enforced.
- Nature objectives for the North Sea must be formulated quantitatively (percentage of protected area) and qualitatively: Which natural areas are worth protecting and how can they be protected? In doing so, the scale of areas must justify the nature objective.
- Protecting nature must be based on an integral consideration of the ecological qualities of an area, taking the socio-economic (integral MSFD assessment framework) consequences into account, and with the application of other effective spatial protection measures.
- Nature values to be protected in an area form the basis for acceptable multiple use, taking the precautionary principle into account. Forms of multiple use, including fishing, which do not have a significant impact on defined nature values, are permitted. If the nature values justify complete exemption from potentially harmful activities, the agreements mentioned in 3. 7 about fishing in natural areas are observed.
- On balance, gas production in Natura 2000 areas will decline. The practice that gas can be produced in Natura 2000 areas under strict conditions will be continued. These conditions fulfil the to-be-formulated supra-statutory Best Available Techniques for sustainable and nature-enhancing building and exploitation, which will be periodically recorded in the governance structure of the North Sea Consultation (NSC.).

Paragraph 3. 7 gives the other agreements about additional measures relating to spatial protection.

Species protection

Apart from spatial protection, more generic species protection is important for long-lived and vulnerable species, such as seabirds, marine mammals and certain types of sharks and rays. The following agreements in the NSA ('extra miles towards a healthy North Sea') are aimed at intensification of more generic species protection:

- Existing action and species conservation plans (for example for sharks, harbour porpoises and seabirds) will be implemented. The progress of the implementation of the plans will be evaluated every two years.
- For vulnerable species, including birds, marine mammals, fish and benthic species identified on the basis of international guidelines and the Framework for the Assessment of Ecological and Cumulative Effects (KEC), species conservation plans will be developed and implemented. Priority is given to the planning (period 2019-2022) and implementation (period 2023-2030) of plans for species that have already been identified in the KEC as vulnerable for effects of offshore wind farms. Within two years at the latest of agreeing the NSA, a list will be drawn up of other species for which conservation plans will be made and implemented, including the timeline of the plans.
- Species conservation plans will describe pressure factors and generic protection measures. These might include measures aimed at reproduction, the availability of food, safety and tackling existing threats. These measures must be considered and monitored in developments on the North Sea.
- The Government (Ministry of LNV) draws up the species conservation plans in collaboration with relevant social organisations and scientific organisations. The implementation of the plans will be evaluated every two years.

Marine mammals

In 2020, the Harbour Porpoise Conservation Plan was updated [17]. This plan aims to contribute to the favourable conservation status of the porpoise. Actions included in this plan will be implemented in this planning period. The main actions are:

- Application of an optimised design for (aircraft) surveys and making better use of different data flows, also from neighbouring countries.
- Alternative methods for studying population, ecology and abundance, including tagging and passive acoustic monitoring (PAM).
- Improvement of the registration of strandings.
- Development of an OSPAR indicator for contaminants in porpoises.
- Cumulating noise sources other than wind, including seismic survey.
- An international approach to reducing by-catch.

In the framework of the Seal Agreement (2020) [29], an improved stranding registration is being elaborated for seals.

Birds

Additional spatial measures for birds from the NSA are:

- *New Birds Directive area and limitations fishing Brown Ridge*
  The Brown Ridge is designated as a Natura 2000 area under the Birds Directive. This process is ongoing and is expected to be completed before 2022. Possible limiting measures for fishing will also be explored.
- *Research Birds Directive areas*
  Before 2025, independent research will be conducted to establish whether the Hollandse Kust, Vlakte van de Raan, Borkumse Stenen, Cleaver Bank, Dogger Bank and the Central Oyster Grounds fulfil the selection criteria for designation as Birds Directive area. Areas which fulfil these selection criteria will then be designated as soon as possible.

Fish and squid

The MSFD shark action plan will be evaluated in 2021. It can then be continued for a new period of six years.

Knowledge agenda

This paragraph contains the most important knowledge questions about biodiversity. Prioritisation and programming will take place in 2021-2022.

- Cumulative effects of pressure factors of the construction and operation of wind farms, fishing and seismic surveys for birds, bats and marine mammals.
- Strengthening the basic data of marine mammals, birds, bats, fish and benthic species.
- The effects of the distribution and availability of fish food on the temporal and spatial dynamics of marine mammals on the North Sea.
- Shaping an intensification of the data collection of sea, coastal and migratory birds for an inventory of (future) BD areas and new wind energy areas in the northern part of the EEZ.
- Additional knowledge for the recovery and/or protection of sharks and rays: What is the lifecycle of sharks and rays in the North Sea? What is the population structure of sharks and rays? What is the role of sharks and rays in the North Sea ecosystem (trophic ecology)? Effects of increasing changes such as electromagnetic fields in relation to wind energy farms and incidental by-catch.

- Specific attention with respect to seabirds for the current knowledge concerning the species (for example population size, reproduction, migration, trend), threats/pressure factors for the species (for example wind farms, disease, predators, by-catch when fishing, reduced food availability), existing and new protection methods at sea and on land, and existing and new monitoring and research programmes.
- The OSPAR expert group Pelagic Habitats is working on the further development of regional assessment methods of pelagic habitats and threshold values. More insight is needed here into the relationship between natural variations in the plankton population and changes which are the result of anthropogenic pressure factors.
- The Action Plan from the Harbour Porpoise Conservation Plan (2020) [17] provides an overview of all recommendations per chapter, prioritised in time and urgency and with a designated action holder. These are also subdivided into Monitoring, Research, Mitigation, Management of Policy. The key knowledge questions focus on habitat quality and food availability, cumulation of effects of different activities and by-catch.

3.3 Non-indigenous species (D2)

Good environmental status and targets

According to the Marine Strategy part 1 (2018), a good environmental status for non-indigenous species is achieved when the species introduced by human activities do not cause a change in the ecosystem. The following table presents an overview of the environmental status and environmental targets.

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).
Environmental targets	• D2T1: minimise the risk of new introductions of non-indigenous species via shellfish transport, ballast water and hull fouling.

Implemented measures

After the 2015 introduction of the EU regulation (1143/2014) on the prevention and management of the introduction and spread of invasive alien species [18], the Netherlands submitted several action plans to the European Commission (2020) to tackle the routes along which non-indigenous species are introduced. Policy rules relating to shellfish movements (2012); amended in 2017) [19] are also seen as an action plan. The policy rules set conditions to licences based on the Nature Conservation Act for importing and sowing of marine shellfish in the Eastern Scheldt and for the transport of mussel seeds from the Eastern Scheldt to the Wadden Sea. Measures are also included in the management plans of the Natura 2000 areas to prevent the import of non-indigenous species and to tackle the presence of invasive alien species. The type of measures varies per Natura 2000 area and depends on the nature objectives. Regular checks are conducted for enforcement. The manager may intervene in the event of the introduction of invasive alien species. The risk of alien species moving to Natura 2000 areas is thus minimised.

In addition, the Regulation for the use of alien and locally absent species in aquaculture [33] bans the movement of alien and locally absent species in aquaculture without a permit from the Minister of LNV.

In 2017, the Netherlands implemented the IMO Ballast Water Management Convention in national legislation. This convention requires ship owners to treat their ballast water. The Netherlands has also made efforts to secure additional international agreements about hull fouling. These agreements are still voluntary and are being evaluated in IMO context. After this evaluation, it will be decided whether additional measures are required.

Current environmental status

The Marine Strategy part 1 (2018) indicates that good environmental status seems to have been achieved. The number of observations of new non-indigenous species has declined since 2012. In the period 2012-2017, one new introduction was discovered (the amphipod *Monocorophium uenoi*). The primary introduction of non-indigenous species mainly occurs via ballast water, hull fouling and transport of shellfish, including oysters.

Supplementary policy assignment

Marine Strategy part 1 (2018) indicates that there is no supplementary policy assignment. The existing policy is satisfactory, but there is a knowledge objective concerning the increase of hard substrate.

The Netherlands considers the presence of already established non-indigenous species as irreversible. It is not possible to tackle established non-indigenous species cost effectively and without considerable harm to the ecosystem. This means that achieving a good environmental status is the same as striving not to change the current ecosystem by new introductions. Minimising new introductions is therefore the goal.

One attention point is the disposal of foreign hard substrate in the North Sea, for example to protect the foundations of wind turbines from erosion. This activity may involve a risk of introducing non-indigenous species.

A new focus looks at possible initiatives for open sea cultivation of refined native seaweed species or non-indigenous seaweed species. This development, also due to the precautionary principle, should be considered undesirable.

Additional measures

The current policy is satisfactory. There is therefore currently no need to take additional measures. However, it must be explored whether further measures are necessary to prevent non-indigenous or refined seaweed species from being cultivated in open seas like the North Sea.

Knowledge agenda

This paragraph contains a knowledge question contained Marine Strategy, part 1 (2018):

- The introduction of non-indigenous hard substrate in the North Sea (for example, for erosion-protection of wind farms), with the possible risk of introducing non-indigenous species to the North Sea.

3.4 Commercially exploited fish and shellfish (D3)

Good environmental status and targets

According to Marine Strategy part 1 (2018), there is a good environmental status for commercially exploited fish and shellfish when the populations of all commercially exploited species remain with safe biological boundaries. The length and age distribution and the size of these populations show a structure which is characteristic for healthy stocks.

Paragraph 3. 2 gives criteria for good environmental status and environmental targets for the entire fish population, including commercial species. The table below presents the goals for achieving a good environmental status for commercial fish.

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 Spawning Stock Biomass (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 a good environmental status for commercially exploited fish species will have been achieved if for each commercially exploited stock both criteria are satisfied. If that is not the case, the species is not yet in good status.
Environmental targets	• D3T1: the management of all commercially exploited stocks satisfies F≤FMSY and a spawning stock biomass above the precautionary level MSY Btrigger.

The indicator for length-age distribution in fish populations (D3C3) is not currently used because there is no agreement at international level. The Netherlands wants to work nationally to obtain more knowledge about length and age distribution of commercial fish stocks, possibly with an international elaboration (see knowledge agenda).

Implemented measures

The above-mentioned targets have been internationally agreed. Measures from the Common Fisheries Policy (Regulation (EU) 1380/2013) are leading for achieving these goals.

The measures described in the programme of measures 2015-2021 will be continued. This means:
- Continue collecting the Statutory Research Objectives (WOT) information about fish stocks in the North Sea for international quota management (TAC & Quota).
- In the context of the discard ban, continue focusing on minimising and phasing out discards.
- Continue to stimulate innovation in the sector. For example, by implementing the vision for the future of the Dutch cutter fleet and with the use of national and international resources like the European Maritime and Fisheries Fund (EMFF). The Vision for the future of the Dutch cutter fleet focuses on an economically healthy fishing industry, respects the natural and environmental values of the sea and is socially recognised for doing so. Innovation is an important theme here, for example the development of a zero-impact cutter to enable fishing with less seabed disturbance, less undesired by-catch, lower emissions of greenhouse gases and less waste.
- Continue issuing certificates which stimulate sustainable fisheries.

Current environmental status

As mentioned in paragraph 3. 2, the fish population does not yet have a good environmental status. The OSPAR assessment shows that the deterioration of the composition of fish populations from the past has stopped and that in some areas in the northeast Atlantic Ocean there has been a slight recovery. According to the assessment, the number of big fish is still too small, but is recovering. Furthermore not all commercial species are fished with a F≤Fmsy.

The current environmental status is subject to global developments, such as climate change.

This has led to increased sea surface temperature. These and other changes in the ecosystem could lead to migration of fish species to other regions or to deeper areas of the North Sea.

Supplementary policy assignment

Based on the available data and knowledge, the conclusion is that it is possible to achieve the targets 'fishing mortality is less than or equal to FMSY' (D3C1) and 'maintain a spawning stock biomass of spawning stock above the precautionary level MSY Btrigger' (D3C2). The North Sea long-term plan and the Common Fisheries Policy takes socio-economic aspects of fishery management into account. In mixed fisheries, practical difficulties arise for fishing all species F≤Fmsy. This is because of the so-called choke species, species for which the available quota are exceeded (long) before the quote are exceeded of (several) other target species with which they are caught together. The Netherlands therefore continues to support policy aimed at selectivity and increasing survival chance of by-catch.

Additional measures

For the duration of this programme of measures, no additional measures are taken. The existing measures are continued. It is expected that this policy will achieve a good environmental status.

Knowledge agenda

This paragraph contains the most important knowledge questions concerning commercially exploited species of fish and shellfish. Prioritisation and programming will take place in 2021-2022.

- Length and age distribution in the commercial species landed by the Dutch fishing fleet and the way in which a more natural length and age distribution can be achieved in the fished populations. Delivery is 2023, for the updating of the description of the environmental status of the North Sea in the Marine Strategy part 1, in 2024. After a national inventory, it will be progressed in ICES context.
- The influence of infrastructure around the wind farms on the occurence, the reproduction and survival success of juvenile fish and on the availability of food for (commercial) fish species. This is a national knowledge question.
- Research into different forms of gillnetting which are and are not suitable in specific (closed) areas and in relation to protected bird and mammal species. Delivery in the period of this programme. This is a national knowledge question which might be combined with international catch research with North Sea countries, among others.
- Monitoring by-catch of marine mammals, birds, 'non-commercial' fish (including sharks and rays) and squid. This is part of the ongoing fishery research.
- Effects of the area closures on the fishing industry as well as the side effects on the areas surrounding the closed areas (displacement research). This is a national knowledge question with an international component by area closures in other North Sea countries.
- Effect of construction and exploitation of offshore wind farms on (commercial) fish stocks and megafauna. This is a national knowledge question.
- The improved sustainability of the fishing industry, such as the reduction of seabed disturbance, selectivity and possibilities for combinations of fisheries with fixed gear and/or aquaculture with nature recovery projects and/or the nature inclusive construction of offshore infrastructure (wind farms). This is a national knowledge question.
- Impact of the distribution and availability of food on the temporal and spatial dynamics of sea birds and marine mammals on the North Sea. This is a national knowledge question.

3.5 Food webs (D4)

Good environmental status and targets

The good environmental status of food webs is achieved if all the elements of the marine food chains – insofar as these are known – occur in normal densities and diversity and at levels which guarantee the density of the species in the long term and the preservation of their full reproduction capacity. The sub goal for food webs is the reduction of the effect of human interventions on interactions between different trophic levels.

Descriptor 4 has a special position in relation to all the other descriptors. Achieving a good environmental status in the other descriptors is a condition for achieving a good environmental status in descriptor 4. In other words: disturbance of biodiversity and habitats must have been sufficiently reduced, the risks associated with non-indigenous species limited and the pollution of the environment sufficiently reduced. The functioning of the food web is therefore the ultimate litmus test for achieving a (generally) good environmental status.

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 be 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 remains above the historical minimum value.
Environmental targets	• D4T1: developing and testing regional assessment methods that can 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).

Implemented measures

For food webs specifically, no measures were formulated in the previous edition of Marine Strategy part 3. Measures for the descriptors birds, marine mammals, fish, pelagic and benthic habitats implicitly contribute to the good environmental status of food webs.

Current environmental status

Due to the lack of sufficient indicators for descriptor 4, food webs, it cannot yet be established to what extent a good environmental status has been achieved. From the assessments in Marine Strategy part 1 (2012, 2018), it appeared that physical disturbance of the habitat, particularly that of seabed fauna, and the associated impact of climate change have the biggest negative impact on the marine ecosystem and the food web. An increasingly important pressure factor for marine mammals, but possibly also for other organisms, are sound pulses under water. The expected increase in the number of wind farms in the Dutch part of the North Sea is expected to create more pressure on this descriptor, largely due to the assumed impact caused by physical, hydraulic effects. On the other hand, the construction of wind farms can mean that a larger area of the EEZ will be closed to seabed-disturbing fishery, which can have a positive impact on the development of benthos populations.

Supplementary policy assignment and measures

The character of descriptor 4 as a result of the other descriptors has the logical consequence that all measures and assignments given under those descriptors are also about achieving a good environmental status for food webs. It is therefore not easy to formulate policy and measures which focus specifically and solely on this descriptor. The assessments performed in 2012 and 2018 create the impression that the measures aimed at limiting seabed disturbance and designating protected areas and habitats are relatively important for descriptor 4.

However, that does not mean that there is no room or necessity for action concerning descriptor 4. Because this descriptor can place the success of measures for other descriptors in a more integrated, holistic perspective, it is important that there are enough present and future indicators to be able to adequately assess the environmental status based on this descriptor. Due to the complexity of the interactions and the layers of the system, as well as a lack of scientific insights, the development of sufficient indicators has been delayed.

Together with other countries, in the context of OSPAR, the Netherlands is developing indicators for descriptor 4. An example of this is the indicator 'Size distribution in fish communities'. The application in the North Sea of indicators which have been developed for other OSPAR regions is currently being developed. In addition, new indicators are being prepared, aimed at trophic interactions between organisms, at trophic levels of organisms and at more model-based analysis of the monitoring data which are being made available in the framework of descriptor 1 (biodiversity) and descriptor 2 (non-indigenous species).

In the North Sea Agreement too, system definition, cumulation of effects, carrying capacity and an ecosystem approach are key. Research offers chances to take steps, together with the international partners in OSPAR, in monitoring and assessing the status of food webs. The influence of more autonomous developments, like climate change, is also receiving more attention.

Knowledge agenda

This paragraph contains the most important knowledge questions about food webs. Prioritisation and programming will take place in 2021-2022.

- Effects of climate change and acidification on the physical system and how this can impact the food web.
- Effect of offshore wind farms on the carrying capacity of the ecological system (primary, secondary and tertiary production).
- Trophic interactions in the North Sea and the link between the functioning of the basis of the food web and 'higher' animal species.
- Increase the basic insights into the functioning of the North Sea: including water quality nutrients, physical factors, eDNA), phytoplankton, zooplankton.
- The role of the microbial food web within the North Sea ecosystem and the influence of climate change on the microbial food web.
- The effects of upscaling in wind farms and of possible other structures on the hydrodynamics of the North Sea ecosystem and the possible impact on the ecosystem.
- The effect on the increase in hard substrate populations on the food web in the North Sea.
- The extent of the primary production of the North Sea ecosystem and its dynamics in space and time.
- The extent and dynamics in space and time of the zooplankton population in the North Sea.
- The carrying capacity of the North Sea for different forms of mariculture. This mainly concerns the availability of nutrients and the effects of the removal of nutrients.

3.6 Eutrophication (D5)

Good environmental status and targets

Eutrophication is caused by an abundant supply of nutrients (mainly nitrogen and phosphate) and leads to the loss of biodiversity, harm to the ecosystem, harmful algal bloom and lack of oxygen in the waterbed. The good environmental status is achieved by minimising eutrophication caused by humans. The following environmental targets apply:

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 chlorophyl-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 (established based on chlorophyl-a measurements) in the 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 chlorophyl-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 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.
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.

Implemented measures

The last Marine Strategy part 3 included measures which relate to the main sources of eutrophication, namely:

- Shipping: The pollution of the sea by shipping is regulated in the international MARPOL convention, drawn up by the IMO. MARPOL regulates the emissions from substances and chemicals to the air and water and the discharge of household waste. Enforcing this convention by means of the Prevention of Pollution from Ships Act will reduce nitrogen.
- Agriculture: On 1 January 2014, the Dutch government introduced compulsory manure processing. Measures relating to agriculture are included in the Fifth Action Programme Nitrate Directive. These measures will be continued via the Manure Law. To supplement the Fifth Action Programme Nitrate Directive, the agricultural and horticultural sector drew up the Delta Plan Agricultural Water Management. This delta plan will be continued on a voluntary basis but is not free of obligations, as the targets of the Nitrate Guideline must also be achieved. Efforts have also been made to reduce livestock numbers. The accent lies on reducing nitrogen concentrations, but the measures will certainly have an impact on phosphate concentrations.
- Urban wastewater: The Netherlands has implemented the EU Urban Wastewater Treatment Directive and fulfils the minimum area yield requirements for phosphorous and nitrogen. The treatment of urban wastewater is included in the Water Decree, Environmental Management Act. In 21 installations distributed over eleven water boards, the intention is to further purify these effluents for phosphate and nitrogen. The improvement of the treatment efficiency of the wastewater treatment plants will be voluntarily continued. In relation to the EU Urban Wastewater Treatment Directive, this is not free of obligation and will lead to the reduction of nitrogen and phosphate concentrations.
- River basins: Nutrient supply from the rivers to the sea also has foreign sources. The realisation of the programmes of measures under the WFD river basin management plans in the Netherlands and those of our neighbouring countries constitutes a big step towards achieving the WFD goals and the reduction of nutrients in the transitional and coastal waters designated as surface water bodies.

In the middle of 2019, it was established that the nitrogen concentrations in natural areas are too high. New policy was consequently developed and is (partly) still under development to reduce these concentrations. Some measures have already been implemented: reduction of the maximum speed on roads and reducing the number of farms with livestock. This last aspect also has an important impact on phosphate emissions.

Current environmental status

Eutrophication still occurs in the North Sea but is much less extensive than previously. In the North Sea, over 50 percent of the eutrophication of the coastal waters is caused by fertilisers from agriculture in the river basins. This has remained virtually constant since 2005. Throughout the North-East Atlantic Ocean area, atmospheric deposition from various sources on land and sea contributes to a third of the eutrophication. The contribution of shipping is not exactly known but is estimated to be considerable.

The interaction between climate change and eutrophication is complex and not always the same everywhere. Changes in rainfall, resulting in more or less runoff and river drainage can lead to changes in the nutrient transports to the sea, for example. These can either increase (heavy rainfall) or decrease (drought). In recent years, however, no clear associated trend has been observed in annual loads. The increasing rise in the temperature of seawater and the changing light climate promote the growth of algae. There are signs that the growth season is starting earlier in the year. This can lead to higher chlorophyl values which are characteristic for the increase of eutrophication.

Supplementary policy assignment

It is uncertain whether the current measures are enough to maintain a good environmental status. Since 2003/2004, the downtrend trend of nitrogen concentrations in the coastal waters has levelled off and no further improvement has been measured. In fresh water too, the fall has levelled off. Some WFD coastal waters have gone from a good to moderate eutrophication status. In these waters, the nitrogen concentrations are therefore close to the threshold value. This means that a slight rise can change the assessment from favourable to unfavourable. The downward trend in phosphate concentrations is also levelling off. In a considerable part of the WFD coastal waters, a shift from quality class for particularly chlorophyl-a has recently taken place. The assessment of the eutrophication status according to the OSPAR/MSFD is currently being reviewed, striving to achieve coherence between the North Sea countries. This can also lead to change in the eutrophication status in MSFD areas.

In the implementation plan of the OSPAR North-East Atlantic Environment Strategy NEAES (2020–2030), [5] operational goals are included to obtain better insight into the eutrophication

[5] This NEAES still needs to be approved by OSPAR (summer 2021).

status. The goals focus on more uniformity in reporting and assessment of eutrophication between the different countries, consensus about the contributions of sources of nutrients, the join adoption of reduction goals and establishing measures to achieve these goals. Where possible, the impact of the changing climate is also considered.

Additional measures

The implementation of existing policy gives the maximum effort possible from the Netherlands, working together with other countries, to achieve a good environmental status for the descriptor eutrophication, in terms of measures on land (implementation WF) and at sea. No (additional) technical measures will be taken to nullify that presence of eutrophicating substances in the Netherlands part of the North Sea.

Exceptional situations pursuant to Article 14 of the MSFD

With respect to nutrients from agriculture, the Nitrate Action Programmes will contribute to achieving a good environmental status. It is estimated that the current Nitrate Action Programme, in combination with measures for other sources, will eventually lead to a good environmental status. For that reason, further intensification of measures for the agricultural sector is currently considered disproportionally expensive. On that basis, Art. 14. 4 of the MSFD is applied. However, the development of the status will be monitored, and additional measures considered if necessary.

Due to natural circumstances, it will take several years before the effects of the policy to reduce nutrients in the environment become visible. The presence of high levels of nutrients in the seabed means that these will leach into rivers and into the sea for some years to come. On that basis, Art. 14. 1e (natural circumstances) MSFD applied.

Some of the nutrients in the Dutch rivers come from upstream areas abroad. It limits the possibilities for the Netherlands to include sufficient measures in its programme of measures to achieve a good environmental status in the Dutch part of the North Sea. For that reason, the Netherlands is appealing to the exemptions under Art. 14. 1a of the MSFD.

Knowledge agenda

This paragraph contains the most important knowledge questions about eutrophication. Prioritisation and programming will take place in 2021-2022.

- The possibility to further reduce the presence of eutrophicating substances in the Dutch part of the North Sea with (additional) technical measures. At European level, model studies are being performed which, based on the effectiveness of measures and possible additional measure, could be guiding.
- The effects of new phosphate-nitrogen ratios.
- The influence of the primary production capacity of the North Sea ecosystem due to the declining eutrophication.
- Contribution of climate change to eutrophication.

3.7 Sea-floor integrity / benthic habitats (D6)

Good environmental status and targets

Soil-disturbing fishery, sand and shell extraction and sand suppletion can physically disturb the seabed. Some human activities can also lead to the loss of seabed areas.

According to the Marine Strategy part 1 (2018), good environmental status for benthic habitats is achieved if physical disturbance and loss of the seabed by human activities is limited to ensure that the extent, condition and general distribution of populations of the characteristic benthic species increases and that goals for specific habitats are achieved.

Benthic habitats	
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).
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 objectives for habitat types and species in the Natura 2000 areas at sea (BD and HD).
Physical disturbance of the seabed	
Good environmental status	Overarching: physical disturbance 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 EEZ. • 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 objectives for these habitats are achieved.
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 disturbance due to fishing activities over time on the total seabed of the EEZ and of 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 (BD and HD).
Physical loss of the seabed	
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.
Environmental targets	See physical disturbance.

Current environmental status

Benthic habitats

The Dutch seabed is still substantially disturbed (see paragraph 3. 4. 2 of Marine Strategy part 1 (2018). The OSPAR assessment of the benthic populations shows that the deeper offshore waters have a higher benthos quality than the relatively shallower offshore waters and coastal waters. The national assessment of the benthos populations shows that the long-lived, sensitive species are clearly less present than desired, and that biodiversity is still insufficient. This situation is largely a result of seabed disturbance by (beam trawl) fishing. It is still too soon to observe the effects of the (proposed) measures.

The Habitats Directive report from 2019 shows that the distribution and area of permanently flooded sandbanks (habitat type 1110) and reefs (habitat type 1170) are sufficient, but that the quality of the habitats is not satisfactory and has even been assessed as very unfavourable. Good environmental status for benthic habitats has not yet been achieved, although for part of the Dutch North Sea it is not possible to make any statements due to gaps in knowledge.

Physical disturbance

Around 54 percent of the (international) seabed pf the North Sea has been disturbed. This is according to the *Fishing Pressure Indicator*, (assessment year 2015; see also Marine Strategy, part 1 (2018). Because no threshold values have been set, it cannot be assessed whether and to what extent there is a good environmental status. Compared with the entire North Sea, the Dutch part is more disturbed.

Physical loss

Physical damage by offshore oil and gas platforms, new wind farms or the disappearance of the seabed due to land reclamation is local in nature and relatively minor. All these activities require licences and undergo an Environmental Assessment.

Due to the minor damage, the current environmental status for 'physical loss' meets the requirements for good environmental status.

Implemented measures

For the Natura 2000 areas North Sea Coastal Zone, Voordelta, Vlakte van de Raan, Dogger Bank, Cleaver Bank and Frisian Front (BD and HD areas in the Dutch EEZ) and the MSFD areas the Central Oyster Grounds and Frisian Front, in the framework of Article 11 of the CFP internationally coordinated measures to limit fisheries have been submitted to the European Commission. The Commission must convert the common recommendations into delegated action. This concerns limiting seabed-disturbing fishery in the HD and MSFD areas to protect the seabed habitat.

Large-scale interventions in the North Sea, such as land reclamation, sand extraction and suppletion and dredging are subject to licensing. For this, a Strategic Environmental Assessment is mandatory. The consequences of these interventions on the biodiversity are mitigated or compensated. Activities which may have an impact on the Natura 2000 conservation objectives are also subject to licensing.

Supplementary policy assignment

Environmental goal D6T1 stipulates: '10-15 percent of the surface of the Netherlands' part of the North Sea will not be notably disturbed by human activities'. To further achieve this environmental objective, additional spatial measures are required. This is a supplementary policy assignment.

In addition, with respect to cumulative effects, the knowledge objective has been formulated to draw up threshold values in international context (EU/OSPAR) for more seabed disturbance (TG-SEABED).

Additional measures

Spatial measures North Sea Agreement (NSA) [16]

- In the NSA, it is agreed that in 2023, in the Dutch North Sea 13.7 percent of the ecologically valuable areas will be fully exempt from seabed disturbance by fisheries. This percentage will rise to 15 percent in 2030. Within this area, an area the size of 2.8 percent of the North Sea will be closed to all forms of fishing. The spatial measures have been recorded in the NSA but have not yet been fully implemented.
- *Expansion Natura 2000 area, limitations to fishing Dogger Bank and shift management zones Cleaver Bank*
  In the NSA, it is announced that on the Dogger Bank, the area in which seabed-disturbing fishery is banned will be expanded by 557 km². As such, the border of the Natura-2000 area Dogger Bank will need to be extended. The designation decree will be amended, and the fisheries measures will be changed in accordance with the Article 11 procedure from the

Common Fisheries Policy, so that they apply to the extended area. There will also be a ban on Scottish and Danish seining in the management zones of the Dogger Bank. The management plan will be amended accordingly.
Furthermore, the management zones on the Cleaver Bank will be extended, whereby an additional area of 552 km² will be closed to all forms of seabed-disturbing fishery. To implement this change, fishing measures will be adjusted in accordance with the Article 11 procedure from the Common Fisheries Policy. The management plan will be amended accordingly.

- *Extension on ban on seabed-disturbing fishery in the Central Oyster Grounds and Frisian Front, fishing ban for part Frisian Front, and new designation Borkumse Stenen*
  In accordance with the NSA, the MSFD areas the Central Oyster Grounds and Frisian Front will be expanded and a new MSFD area will be designated on the Borkumse Stenen. The MSFD area the Central Oyster Grounds will be expanded by 1062 km². The eastern MSFD area Frisian Front will be expanded by 1014 km2. In the part that overlaps with the BD area Frisian Front, there will be a ban on all forms of fisheries. This part will be expanded to 1649 km2. The new seabed protection area Borkumse Stenen has a surface of 653 km². This area overlaps the seabed protection area as agreed in the framework of the VIBEG agreement.
- *Change in areas with a ban on seabed-disturbing fisheries North Sea coastal zone*
  The areas where there is a ban on seabed-disturbing fisheries and the areas on which there is a general ban on fishing will be changed. In 2018, this was decided in the VIBEG consultation (VIBEG2). The measures to limit fisheries in these areas will be implemented via the Article 11 procedure from the Common Fisheries Policy.

Integral nature enhancement

With the rollout of offshore wind farms, due to the presence of hard substrate in the form of armour rock and the fact that they are closed to seabed-disturbing activities, there is also the potential to contribute to integral nature enhancement. To strengthen species populations and habitats which naturally occur in the North Sea, since 2015 the focus has been on nature-inclusive design and building new offshore wind farms and the implementation of nature restoration projects in wind farms. This targets species and habitats from the EU Habitats Directive which do not have a nationally favourable conservation status, species on national red lists and species or habitats on the OSPAR List of Threatened and/or Declining Species and Habitats for which recommendations have been adopted. Nature-inclusive building is still in a development phase. In this planning period, the concept will be further operationalised.

Knowledge agenda

This paragraph contains the most important knowledge questions about sea-floor integrity / benthic habitats. Prioritisation and programming will take place in 2021-2022.

Knowledge questions relate to:

- Development of threshold values (TG Seabed).
- Development of an indicator for disturbance as a result of sand extraction by ICES expert group (WGEXT).
- Explore the possibilities to better coordinate monitoring activities and measuring programmes and perhaps ultimately implement them jointly by the Benthic Habitat Expert Group (OBHEG) under OSPAR.
- Necessity for additional measures for other activities than fishing in the protected areas under MSFD.
- Ecological consequences (among others for fish and benthos) of the increasing sand extraction and bigger suppletion volumes and how these consequences can be minimised (national).
- Cumulating effects of new wind farms on the benthic habitats (national).
- Opportunities offered by wind farms for active restoration of (lost) hard substrate and shellfish banks (national).
- Strengthen the basic data of benthic species (national).
- Perhaps set up species conservation plans for benthic fauna research (national).
- Develop and apply innovative benthos monitoring techniques (national).
- Annual changes in the benthic fauna populations in the EEZ (national).
- Room for restoration of hard substrate such as oyster banks and honeycomb reef worms (national).
- Develop innovative techniques and installations (hatcheries) for cultivating flat oysters to put back into the wild for nature restoration purposes (national).

3.8 Hydrographical conditions (D7)

Good environmental status and targets

Change of hydrographical conditions such as currents and waves can affect the physical and chemical conditions of the sea, such as, salinity, temperature and transport of sediment. Such changes are relevant if they occur on a large scale. Good environmental status is achieved if a permanent change in the hydrographical conditions does not cause permanent damage to the marine ecosystems.

Activities which can affect the hydrographical conditions include the construction of coastal defence works, land reclamation, damming major rivers, large-scale sand extraction and installing structures in coastal waters or open sea, such as large-scale aquacultures or wind turbine parks and other installations for energy generation.

The environmental objective is aimed at ensuring that human activities to not cause changes in hydrographical conditions which lead to permanent large-scale negative effects on the marine environment.

Good environmental status	The marine ecosystem suffers no negative effects as a result of permanent changes in the hydrographical properties.
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 in 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).

Implemented measures

To prevent changes in hydrographical conditions having permanent negative effects on the ecosystem, the previous Marine Strategy part 3 stipulated that an assessment of hydrographical interventions must be performed and, if necessary, compensation of effects. The effects of new large-scale hydrographical interventions must be studied in the environmental impact assessments, as prescribed at European level. In the Netherlands, this EU policy is implemented in Section 7 of the Environmental Management Act and in the EIA Decree. If this shows that the effects of the intervention do not cause permanent large-scale and irreversible changes to the ecosystem, no further action need be taken. In this procedure, it is important to study cumulation of effects and the effects outside the coastal waters. In the coastal waters, the requirements of the Water Framework Directive must be fulfilled.

Current environmental status

The initial assessment (2012) [20] indicated that the downward trend in the seabed ecosystem and in the diadromous fish species in the coastal zone can partly be explained as a result of permanent hydrographical effects of the Delta Works and of Maasvlakte 1 and 2. These works are of national importance and are considered irreversible. In 2012, it was therefore concluded that there is a new reference for good environmental status. As indicated in the updating of Marine Strategy part 1, good environmental status was achieved in 2012 and retained.

Supplementary policy assignment

The construction of offshore wind energy farms is one of the most important developments expected in the Dutch part of the North Sea in the coming years. The cumulative effects of the construction of these wind farms in combination with sand extraction and sand suppletion may be significant.

Additional measures

For new activities, the current policy guarantees the retention of good environmental status and focuses on preventing permanent effects. The Netherlands is not taking additional measures.

Knowledge agenda

This paragraph contains the most important knowledge questions about biodiversity. Prioritisation and programming will take place in 2021-2022.

Knowledge questions relate to:

- The development of a method to determine the physical damage to the benthos at local level and in cumulation with effects of other activities. The consequences for the hydromorphological system of the North Sea in the event of the large-scale rollout of Offshore Wind. Will the ecological and physical processes crucial to the system be sufficiently measured in the monitoring programme?

3.9 Contaminants (D8)

Good environmental status and targets

The good environmental status for the descriptor contaminants will be achieved on the North Sea if the concentrations of contaminants in water, sediment and biota are lower than the concentrations whereby negative effects can occur or if the concentrations show a downward trend. The following table presents an overview of good environmental status and targets.

Of the contaminants that have a negative impact on the marine ecosystem, poorly biodegradable substances which accumulate in food webs are particularly likely to spread over large distances. These form a threat to the marine environment. OSPAR has drawn up a list of 26 contaminants which, based on these properties and the extent to which they are used, will be subject to action first. These include certain (organo)metals, organohalogens, pesticides, phenols, plasticisers, PAHs and several pharmaceutical substances. The WFD sets environmental targets for many of these substances. In addition, the WFD has designated some of the substances as priority dangerous. These partly overlap with the OSPAR list. According to the WFD, the discharge of these substances must be ended by 2027.

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) of 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 the duration of significant serious acute pollution is reduced to a minimum.
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).

Implemented measures

The use of the above programme of measures was focused on reducing the concentrations of contaminants in the sea and on preventing the occurrence of contaminant effects of substances like TBT. In the River Basin Management Plans 2016-2021 Rhine, Meuse, Scheldt and Ems, which were drawn up in the framework of the WFD, measures have been included to further reduce the emission of contaminants to ground and surface water. In recent years, more measures have been taken to reduce industrial emissions, contamination by plant protection products and discharges by inland shipping.

Under the Industrial Emissions Directive, measures have been taken with respect to licence requirements, application of state-of-the-art technology, application of provisions as included in the European reference documents (BREFs) and application of the emission/immission discharge test when assessing emissions to surface water. These programmes of measures reduce industrial emissions to surface water. The Action Plan Sustainable Pesticides leads to reduction of contamination by plant protection products. Discharges of wastewater by inland shipping are reduced by the Ship Waste Decree Rhine and Inland Waterways and the Ship Waste Rhine and Inland Waterways Regulation. Other measures are focused on limiting discharges at sea due to incidents and disasters, oil and gas production and from ships (MARPOL). Via the MARPOL convention, rules have been imposed on discharges of water and emissions to the air. A ban on TBT has also been introduced.

In addition to the above programmes of measures, the policy for the approach of Substances of Very High Concern has been developed with respect to water. In 2016 and 2019, the Immission Discharge Test Manual was updated, including the associated assessment instruments/tools. Besides the existing requirements for wastewater treatment plants, in recent years the Netherlands has worked on the approach to chemical substances, including many which were not standardised under the WFD. 60 million euros is being invested in pilot projects for extra waste treatment. These amendments to the water quality policy ensure that emissions of new substances and substances which are a problem for the water quality are minimised via licences (with priority).

The Ministry of I&W has also launched a training programme for licence issuers from Rijkswaterstaat, water boards, environmental services and water supply companies. This guarantees (in the long term) better licences, resulting in better water quality. These measures contribute to a reduction of the emissions from the Netherlands sources and therefore also of emissions to sea.

Current environmental status

The OSPAR assessment shows that the concentrations of contaminants have been significantly reduced and still show a downward trend or are stable. What remains are mainly persistent, bioaccumulating and toxic substances such as PAHs, PBDEs, PCBs and organotin compounds (mainly TBT). Measures have already been taken to limit or end the emissions of these substances. However, because they are persistent and pervasive, they will be found in the marine environment for a long time to come. The use of copper as a substitute for TBT has risen significantly. The possible consequences for the marine environment have been put on the agenda in the context of OSPAR.

Supplementary policy assignment

There is no supplementary policy assignment. As indicated in the updated Marine Strategy part 1, good environmental status will probably be achieved for most substances in the period 2022-2028. The effects of the policy are only difficult to show for the persistent substances. The development of the concentration of substances, including the increase of copper, is being closely monitored.

Additional measures

Via the Green Deal for Lead-Free Recreational Fishing, the emissions from fishing sinkers to marine waters will be reduced, see paragraph 3.11.

Exceptional situations pursuant to Article 14 of the MSFD

This programme of measures presents the maximum possible use of measures on the land (implementation WFD) and at sea to achieve good environmental status for the descriptor contaminants. Sources on land are an important source for the outflow of priority and specific substances to the sea. The measures referred to are aimed at achieving water quality standards locally and upstream, including the sea. Despite the measures taken, these goals cannot always be achieved. On entering the Netherlands from abroad, concentrations upstream may already be too high, such as mercury. In addition, the presence of high levels of nutrients in the seabed means that these will leach into rivers and into the sea for some years to come.
These substances belong to the group of priority and specific contaminants under the Water Framework Directive. For these substances, no technical measures are available to reduce their concentration in surface water or in the sea. Natural circumstances do not allow the status of this part of the North Sea to improve in time. This is therefore an exceptional situation as referred to in Article 14 (e), (natural circumstances) of the WFD.

Knowledge agenda

The most important knowledge question concerning contaminants relates to the impact of using copper as a substitute for TBT for the marine environment. This knowledge question is on the agenda in OSPAR context.

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

Good environmental status and targets

The good environmental status is achieved if the levels of contaminants in fish and other seafood for human consumption from the North Sea do not exceed the maximum levels established in Commission Regulation (EC) No. 1881/2006. The environmental target is shown in the following table.

Good environmental status	Overarching: 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 the EU (EC) No. 1881/2006.
Environmental targets	D9T1: in 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 reduced.

Implemented measures

National and international legislation imposes standards on the levels of contaminants in fish and other seafood for human consumption[6], among others Commission Regulation (EC) no. 1881/2006 and Commission Regulation (EC) no. 396/2005. Standards have also been set at European level for radioactive substances[7].

Current environmental status

Since 2006, the levels of contaminants are examined in 15 to 18 samples of fish and shellfish, some from near the coast, some from the pelagic part of the North Sea. Until now, the levels of contaminants in each individually examined sample have met the standards for maximum levels. In OSPAR context, it has also been shown that the doses of radioactive radiation in seafood for human consumption are far below the international standards for human exposure.

Policy assignment

The current legislation is effective. The current levels of contaminants in fish and other seafood for human consumption do not exceed the standards of national and international legislation. As such, there is a good environmental status. This is expected to remain the case. The Netherlands should be able to maintain this status with an unchanged policy.

Adapted and additional measures

Because good environmental status has been achieved, no additional measures are required.

6 Including Commission Regulation (EC) No. 1881/2006 of 19 December 2006 setting maximum levels for certain contaminants in foodstuffs (2006) and Commission Regulation (EC) No. 396/2005 of the European Parliament and the Council of 23 February 2005 on maximum residue levels of pesticides in or on food and feed of plant and animal origin and amending Council Directive 91/414/EC (2005).

7 Council Regulation (Euratom) No. 3954/87 of 22 December 1987 laying down maximum permitted levels of radioactive contamination of foodstuffs and feedingstuffs following a nuclear accident or any other case of radiological emergency (1987).

3.11 Marine Litter (D10)

Good environmental status and targets

Marine litter comes from human activities at sea and on land. Awareness of the problem of plastics and other litter in the sea is growing worldwide. In recent years, it has therefore received increasing attention. The transboundary nature of the litter problem in seas and oceans makes international collaboration essential. The Netherlands tackles the problem of marine litter at all levels: local, national, regional and global.

The good environmental status for litter on and along the North Sea will be achieved if the quantity of marine litter and micro litter at sea decreases over time. At regional (North Sea) level, the environmental targets are focused on achieving quantitative (regional) targets (threshold values) for beach litter and for plastic in the stomachs of northern fulmars, and on developing an indicator for microplastics in sediment. The quantity of litter and micro litter absorbed by marine animals must be at a level that is not harmful to the health of the species involved. At the time of writing this programme of measures, there is a EU proposal for establishing a *Threshold Value* for beach litter of 20 items/100 m beach. The basic principle is that litter does not belong in the sea.

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.

Environmental targets	• D10T1: at regional level working towards quantitative (regional) targets for beach litter (e.g. 30 percent reduction) and plastic found in the 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.

Implemented measures

This paragraph gives an overview of the measures implemented in the period 2012-2020. Litter is a "young" policy area with a relatively large number of measures which have largely emerged from the MSFD. In addition, there are similarities with other policy mentioned in this paragraph.

The measures have considerably reduced the quantity of litter in the North Sea and the Dutch rivers. The Netherlands is focusing on prevention by means of an integral source approach, awareness and closing product chains. Collaboration between government, business and industry, knowledge institutes and civilian groups is essential. The Government is therefore focused on signing Green Deals [8]. To tackle litter, international coordination and collaboration are important for sharing knowledge and developing effective measures.

Registration of items found on the beach (top ten) is important for formulating measures and for analysing the effectiveness of the policy. In the previous programme of measures, the main sources of the items found were listed. Based on this, the measures were divided into six clusters: education and awareness, beaches, river basins, sea-going shipping, fisheries and plastic products. The original sea-going shipping cluster was changed into shipping, so that measures for inland shipping and recreational shipping are also included in this cluster. For each cluster, the implemented and additionally introduced measures in the previous planning period are summarised below.

[8] With the Green Deal approach the Dutch government provides scope for innovative initiatives from society to speed up the transition to a sustainable economy. When implementing new sustainable initiatives, various barriers may be encountered. This approach may remove some of these barriers. The role of the government varies per initiative, but it might involve removing obstacles in legislation, providing access to networks, supporting access to the capital market or contributing knowledge. Green Deals have an average duration of two to three years.

Education and awareness

Via (clean-up) campaigns, attention is devoted at national and local level to tackling litter. Municipalities are now aware of the litter problem and have incorporated the approach in their policy. Initiatives were also developed to influence behaviour that causes litter.

Putting the issue on the agenda and raising awareness of the litter problem in schools were key to the 'Waste at School' programme. With co-funding by the European Fund for Maritime Issues and Fisheries, 140 (primary and secondary) schools were provided support in waste education, waste separation and waste prevention. Several knowledge products and tools were also developed (www. slimmetschoolafval. nl). For communication and knowledge sharing with the target groups (nature & environmental education centres, municipalities, waste collectors and schools), a project page (www. afvalopschool.nl) was set up. With funding from the Packaging Waste Fund, several smaller educational projects were also carried out. The focus here was on sharing knowledge about waste separation and on a customised approach by municipalities.

Beaches

Stakeholders and coastal municipalities are responsible for cleaning and maintaining the Dutch North Sea beaches. Social organisations and the public also organise their own clean-up campaigns. For example, the North Sea Foundation organises an annual Beach Clean-up tour on the beaches along the entire Dutch North Sea coast.

In 2014, coastal municipalities, businesses, volunteers and social organisations signed the Clean Beaches Green Deal (CBGD) to reduce litter on beaches. They do this with clean-up campaigns, installing clear-up and disposal facilities on beaches and introducing the Green Key quality mark for beach pavilions. The CBGD is a good example of the joint input and coordination of different parties for cleaning and maintaining the Dutch North Sea beaches. Initiatives and campaigns like the Cleanest Beach election (including the required monitoring) affect the inclusion of these issues on municipal agendas and boost awareness among beach visitors.

River basins

The subject of litter is on the agenda of the Dutch water boards. Led by the Dutch Water Authorities, the litter theme group was founded to focus on sharing knowledge about litter in water. In the south of the Netherlands, the Limburg water board is taking part in a trans-boundary project for tackling litter in the Meuse. In Rijkswaterstaat, the subject of litter is also receiving more attention. The organisation has facilitated a litter knowledge centre and

participates in all the joint ventures for clean rivers as well as organising workshops, networking days and peer review meetings. The main goal of the knowledge centre is to maintain networks for knowledge exchange at national and international level and to communicate about best practices. In addition, Rijkswaterstaat has developed a litter framework that directs management and maintenance objectives relating to national highways, kerb management, care sites along canals, waste at sluices and weirs and the major rivers.

The spatial approach to litter involves stakeholders such as provinces, site managers, water boards, municipalities and NGOs. They are responsible for preventing and clearing up waste in the rivers. Characteristic is the integral approach to litter in and around the water. Each party contributes from their own area of expertise and influence. Continuing the Clean Meuse Limburg approach, joint ventures have been launched to tackle litter in the main (sub) river basins: Waal, Rhine, Lek, IJssel, Scheldt, Haringvliet and the ports of Rotterdam. Around the Wadden Sea, there is an active Plastic-free Wadden Sea Community.

In 2018, Rijkswaterstaat set up the Litter Collection Regulation (ZOR) with which it facilitates the disposal and processing of litter collected by third parties along the riverbanks. The evaluation of the ZOR shows that the regulation is still only used to a limited extent. How often the ZOR is used partly depends on the success of the joint ventures and the willingness of municipalities to dispose of and process the collected waste at their own expense. These measures will be continued. They are explained in the paragraph about the adapted and additional measures.
In OSPAR context, the Netherlands is mainly focusing on reducing the waste flow from the rivers to the sea through collaboration with river commissions. In 2016, OSPAR published an inventory of knowledge about waste in rivers and the measures to tackle the problem [21]. Based on this report, in 2017 a workshop was organised for knowledge sharing between OSPAR experts and river commissions.

Shipping

On 1 January 2013 - partly on the initiative of the Netherlands - the revised Annex V of the MARPOL convention came into force. The revision introduces a total ban on waste discharge by ships, with (under conditions) the exception of food waste.

On the initiative of the Netherlands in the IMO, the marine environmental awareness course, based on the example of the ProSea organisation, has become part of maritime education.
In 2014, the Green Deal on Ship-Generated Waste was signed with various parties in the maritime chain, such as port authorities, ship suppliers, government authorities and social organisations. In this agreement, concrete arrangements were made about closing the maritime waste cycle by waste prevention in stocking, optimising monitoring, optimising waste discharge in the seaports and recycling plastic ship waste on land.
In the OSPAR context, the Netherlands has focused on reducing illegal pollution of the marine environment from ships and on improving the facilities for accepting ship waste. As a result of the OSPAR collaboration, in 2016 a background document was published about the improvement of the ISO standard in relation to the port reception facilities [22].

Fisheries

In the Green Deal Fisheries for a Clean Sea, together with other parties (the Ministry of I&W, ports, waste processors), the fishing industry is looking for ways to close the waste circle. This involves presenting and transporting household waste, nets and ropes, improving collection facilities in the port and recycling nets. The Green Deal network is used for collaboration relating to the DollyRopeFree project, Fishing for Litter and awareness in the fisheries sector. The Netherlands has contributed the experience and knowledge it has acquired in this joint venture to OSPAR. Since 2014, our country has been one of the leaders of the OSPAR actions to tackle waste from fisheries in the OSPAR area and has helped write OSPAR's scoping study on best practices for the design and recycling of fishing gear [23].

In the DollyRopeFree project, the fisheries, NGOs, research institutes and governments have been working together since 2013 to find a sustainable alternative to dolly rope. A lot of materials have been tested, with varying success. No widely applicable alternative has been found. This measure will be continued. Further details follow in the paragraph about the adapted and additional measures

The Fishing for Litter programme, which was launched as a pilot project in the Netherlands in 2000, has now been extended in Europe. Fishers can present waste that they land on board as by-catch, with no costs for transport and processing, in the ports. More than 130 ships take part in the *Fishing for Litter* programme. This measure will be continued. Further details follow in the paragraph about the adapted and additional measures.

In OSPAR context, the Netherlands has worked to extend Fishing for Litter to the entire OSPAR area. The result is the OSPAR Recommendation 2016/01 on the reduction of marine litter through the implementation of fishing for litter initiatives and an update to the associated guidelines. In 2019, OSPAR established the goal of increasing the number of ships in the maritime area of OSPAR taking part in Fishing for Litter by 100 percent between 2017 and 2021.

To raise awareness of the waste problem at sea in the fisheries sector, the ProSea organisation set up an education programme. A four-day course 'Fishing with future' has been developed for trainee fishers at fisheries schools. One of the sections is about preventing waste. For working fishers, there is a series of workshops about 'current challenges at sea', one of which is waste. The marine awareness courses for the fishing industry are embedded in the OCW qualification dossiers. National experiences have led to the Netherlands focusing in OSPAR context on sustainable fisheries education in the OSPAR area. In 2019, at the initiative of the Netherlands, OSPAR issued a recommendation about reducing marine litter through sustainability education programmes for fishers [24].
The exploration 'Reducing interaction with fixed fishing gear' was implemented as part of the previous programme of measures. In the framework of this exploration, an IMARES research report (Jak, 2016) was published in 2016. The main recommendation was to facilitate better communication between gillnetting fishing and other users of the coastal zone. In the Netherlands, gillnetting fishers have (social) media contact with other coastal fishers. The improved communication has led to less damage to fishing gear and thus to less litter (such as ghost nets).

In the Green Deal for Lead-Free Recreational Fishing, signed on 22 May 2018, the sector works alongside the Ministries involved (EZK, LNV, I&W, VWS) towards eventually phasing out lead in recreational fishing in 2028. Sportvisserij Nederland and Dibevo are working to achieve sufficient availability of attractive and sustainable alternatives for lead. They actively promote these alternatives among recreational fishers and stimulate their use. The alternatives to lead may not result in a change to another polluting or scarce material that harms the environment or public health. Although a period of ten years is taken to achieve the objective, the Green Deal continues to 31 December 2021. This must result in a 30 percent reduction in lead use in 2021 and in a total phasing out of lead in recreational fishing in 2027.

Plastic products / Land sources of litter at sea

The measures in the above programme of measures were specifically related to reducing emissions of microplastics in cosmetics and detergents (via a EU ban), and discouraging the release of balloons.

Emissions of microplastics in cosmetics fell in the Netherlands and other European countries because cosmetic companies have voluntarily replaced plastic microbeads. The Netherlands urged the EU to adopt this in the Plastics Strategy (January 2018). Research by Cosmetics Europe shows that the use of plastic microbeads in cosmetics and beauty products was almost totally phased out in the period 2012-2017. This means that the European cosmetics industry is ahead of a European restriction on the deliberate addition of microplastics, both microbeads and other forms of microplastics. Internationally in OSPAR context, the Netherlands has focused on tackling microbeads in the sea by participating in the dialogue with Cosmetics Europe.
To tackle the problem of balloon debris in the environment, there is a ban on or a policy discouraging the release of balloons in more than 60 percent of the municipalities. There has consequently been a reduction in balloon debris on the measured beaches. This measure will be continued and further explained in the paragraph about the adapted and additional measures.
In the programme of measures, an exploration is announced into the possibilities of reducing emissions of microplastics from car tyres, abrasive detergents and paint at national level. Based on this exploration and RIVM, the ‘microplastics policy programme’ (June 2018) and the ‘communal approach to plastics in the rivers’ (November 2018) were formulated. The following measures were included:

- Research into health effects of microplastics (expected spring 2021).
- Tackling plastic litter in rivers: experiment with capturing litter in the river, prevent litter by working with area managers on a source approach to waste (including recreational, construction, business waste) and by promoting behaviour change among the public on riverbanks and developing a monitoring system for microplastics in rivers.
- The Netherlands is urging a European approach to microplastics from car tyres and is communicating about the importance of the right tyre tension via the campaign 'Choose the right tyre'.
- Wear and tear of clothing: RIVM research shows that an approach on multiple fronts is required to prevent microplastic fibres in textiles. The Government is therefore exploring a joint approach with all parties in the textile chain. European action could provide welcome support.
- In 2020, RIVM studied the most promising options for tackling microplastics in paint , focusing on the role of innovation (results, expected spring 2021)
- At the request of the European Commission, since 2018 the European Chemicals Agency (ECHA) has been working on a restriction under the REACH programme of deliberately added microplastics in fertiliser, cosmetics and abrasive detergents. The Netherlands has encouraged this development in Europe and looks forward to the Commission's ultimate proposal.

In OSPAR context, the Netherlands actively contributed to drawing up an assessment document from 2017 about microplastics from sources on land which end up in the marine environment [25]. Two years earlier, in 2015, our country worked with OSPAR to organise a conference about tackling microplastics in the marine environment. In OSPAR context, a measure is currently being developed to tackle pre-production pellets in the environment.

Results and effectiveness Green Deals

The Green Deals Clean Beaches, Fisheries for a Clean Sea and Ship-Generated Waste were evaluated in 2019 (WiBo, 2019). The conclusion was that the Green Deals have helped reduce litter on Dutch beaches and in the North Sea. However, there is no hard data to support this conclusion. From the OSPAR monitoring, a significant downward trend can only be established for a limited number of items. This may be because plastic remains in the environment for a long time and has a transboundary impact, whilst the reach of the measures is limited to the Netherlands. Neither does the data show whether less waste ends up on the beach or whether there is better and more frequent cleaning. The Green Deal for Lead-Free Recreational Fishing will be evaluated in 2021.

By far the greatest added value of the Green Deals lies in the network function and the associate knowledge sharing. The central coordination and availability of pilot funding are also important. Furthermore, the Green Deals have a great publicity value. Organisations can communicate their sustainability ambitions via the Green Deal platform. Within the Green Deals, there are different ideas about continuation after 2020. A certain degree of coordination is desired, but the form can vary per network.

The *Green Deal* Clean Beaches continued through 2020. It proved difficult to measure concrete results due to the lack of SMART objectives. Consequently, it cannot be establis hed whether the beaches have become cleaner due to the Clean Beaches Green Deal. However, it has been established that the number of participants has risen every year and that actions concerning management and knowledge sharing have been implemented well. A sustainable approach to waste by beach visitors can be promoted in a better way. That influencing mainly consisted of information and installing extra waste facilities.

Within the Green Deal on Ship-Generated Waste, the results of separate disposal, transport and processing of plastics by ships in Dutch ports are close to what was envisaged. Relatively low-threshold actions, such as separate collection of plastic waste, have all been implemented. In addition, a financial incentive was introduced in Amsterdam and Rotterdam for the separate delivery of clean plastic which was then collected free of charge by the waste collector. The more complex activities, like coordi nating waste collection at stocking, were less successful and proved more feasible in smaller ports.

The evaluation of the Green Deal Fisheries for a Clean Sea 2019/20 showed a positive attitude towards achieving most goals. The waste management facilities have been improved in most ports, it proved possible to collect different waste flows and big steps have been taken in integral waste management and the processing of different waste flows. In addition, in eight Dutch ports, end-of-life fishing gear is collected separately and recycled where possible. In five ports, dolly rope can be handed in separately. Nevertheless, there are still challenges for the future. A particular challenge concerns awareness measures and facilitating recycling. During 2020, this was elaborated with the partners and incorporated in a new form of collaboration.

Since the Green Deal Lead-Free Recreational Fishing started, there has been targeted communication via the communication channels of recreational fishing about the possibilities of reducing lead use (website, journals, angling shops and trade fairs). More and more fishing competitions are 'lead free'. Information signs have been placed around fishing waters. Exchange campaigns invite recreational fishers to switch to alternatives for lead. Many of these campaigns were initially aimed at recreational fishing on fresh water. However, 76 percent of the lead loss comes from recreational fishing at sea. Communication also targeted this branch about reduction of the use of lead, but this programme needs to be continued.

Consequences of the incident with the MSC Zoë

In the night of 1-2 January 2019, the MSC Zoë lost 342 containers. The weight of the lost containers plus their contents is around 3260 tons. During around 1800 salvage operati ons, 300 containers and over 2400 were salvaged. Much of the waste that originated from the MSC Zoë was removed from North Sea beaches and the banks of the Wadden Sea in mid-2020. The remaining waste that could not be salvaged may be observed during sea monitoring over the coming years.

Such an incident can affect the good environmental status of the North Sea. The results of the exploration of the ecological effects in the long term are expected in 2021. Further steps will then be considered. Other investigations relate to the background of the incident and the options for preventing loss from containers.

There are various procedures to prevent such incidents in the future and, if an incident does occur, to clear it up faster and more effectively. The North Sea and Wadden Sea disaster plans will be improved ("respond faster"). Options to reduce the risk of loss from containers near the coast have already been implemented and are being further explored. For example, container ships in the area above the Wadden in both directions will be warned about the risk of container loss during certain weather conditions and specific information about wave direction and period will be issued in the area. The role of various government authorities in the aftermath of an incident will also be studied to facilitate a timely clear up. The intention is to amend the Collaboration Agreement tackling Coastal Pollution RWS services (SBK) in consultation with the municipalities aimed at reducing environmental damage. Finally, Rijkswaterstaat is conducting a pilot project to explore how volunteers can be used to clear up faster and more effectively after new container disasters. In 2021, the result of the pilot will become clear. In IMO context, the Netherlands is focusing on:

- an improved information position of the crew on board container ships.
- the obligation to have an electronic inclinometer on container ships, which measures and registers the yaw angle.
- putting the development of measures to detect and report lost containers on the agenda.

Finally, there will be an analysis with respect to the usefulness of further investigation and additional proposals in the IMO, for example in relation to loading and lashing of containers.

Other policy that contributes to MSFD goals

Besides the measures described above, the Global, European and Dutch waste and plastic policy also contributes to tackling marine litter.

International

UNEA is working on more awareness and an effective global approach and has adopted four resolutions for this goal since 2014. Based on the report of the Ad Hoc: Open Ended Working Group in 2021 and 2022, UNEA 5 will explore future steps which could lead to a global convention. The Global Partnership of Marine Litter brings together stakeholders to share knowledge and experiences.
In 2018, the IMO adopted an action plan aimed at reducing marine litter originating from shipping. The Netherlands is working on the implementation of these measures.

The Netherlands is also working on stimulating the regional approach to marine litter. Besides the active participation in OSPAR, the Netherlands also supports regional initiatives such as drawing up a regional action plan in the Arctic Area and monitoring in the Dutch Caribbean.

European and national

Effective prevention of marine litter requires well considered, effective and well organised waste management. The Dutch waste policy is enshrined in European and national regulations. In recent years, various proposals and guidelines have been adopted in Europe, including the revision of the Waste Framework Directive, the Single-Use Plastics Directive and the revised Port Reception Facilities Directive.

Dutch legislation for collecting household and commercial waste is largely based on the **European Waste Framework Directive**. In 2018, the EU amended this directive. Under the

motto of waste prevention, all EU member states must take measures to prevent waste production (Arts. 33 and 35). The measures to be taken also include preventing and removing litter on land and in water. This is incorporated in the National Waste Plan and the Waste Prevention Plan which is currently being updated.

Building on the results of the implemented Education measures, the role of education will be further reinforced with the VANG-Buitenshuis programme which, from 2020, will further distribute knowledge from the 'Waste at school' programme via regional meetings in the network of schools, NME centres, municipalities and waste collectors. Part of the objective involves exploring how higher education can be better supported to produce less waste and to promote circular business operations.

In mid-2021, the new **Port Reception Facilities Directive**, (EU) 2019/883, must have been implemented. From that moment, a fully indirect funding of collecting and removing waste, fish nets and passively caught waste applies. This means that a waste contribution will be requested from any ship, regardless of the amount of waste it produces. In addition, a waste reception certificate will be introduced with which shipping companies or captains can report the presentation of their waste at Safe Sea Net Fishing. The new Port Reception Facilities Directive also requires a regulation for passively caught waste, also known as Fishing for Litter. Facilities will be made mandatory in the ports and funded by indirect financing.

The EU member states must now convert the **Single-Use Plastics Directive** (SUP) (EU/2019/904) into national legislation. This involves implementing measures to reduce the effects of certain plastic products on the environment. For example, there will be a ban on various plastic disposable products which are frequently found on beaches and for which alternatives are available. These are cotton buds, cutlery, stirrers, straws, plates and balloon sticks. Food and drink containers of expanded polystyrene and all products made from oxo-degradable plastic will be banned. The directive also requires producers and importers of cigarette filters, balloons, fishing gear, specific food drink packaging and lightweight plastic carrier bags to pay for awareness-improvement measures and for the cost of clearing litter.

The SUP Directive has an important link with MSFD. The measures from the SUP Directive focus on the items which are found most frequently during beach litter monitoring according to the OSPAR protocol. The approach to fishing gear in sea from the SUP has an important link with the MSFD measures for the fisheries sector. Some of the items in the top 80 percent are tackled by the SUP Directive itself. For that reason, no additional measures will be taken from the MSFD. Over the coming year, the impact of the SUP measures on the top 80 percent most found items will become clear and what this means for the 'good environmental status' targeted by the MSFD.

The EU Directive for reducing the use of **lightweight plastic carrier bags** (EU) 2015/720 requires the member states to take sustainable measures to significantly reduce the use of these bags, without leading to a general rise in the production of packaging.
Pursuant to this directive, on 1 January 2016 the Netherlands introduced a ban on free giveaway plastic bags. An evaluation in 2019 showed that 80 percent fewer plastic bags are used and that 60 percent fewer plastic bags are found in litter.

With respect to the further sustainability of packaging, the Waste Framework Agreement makes producers responsible for the return and recycling of packaging. With the implementation of the SUP Directive, producers are also responsible for the costs of litter and awareness measures. Besides these measures, from 1 July 2021, a refundable deposit on small plastic bottles will be introduced. For cans, there is a two-track policy: if the established collection and litter goals are not achieved, a refundable deposit will also be introduced for cans.

Further developments

In the programme Netherlands Circular in 2050, the national government indicates how it will make the transition with stakeholders to a fully circular economy in 2050, for a future in which no more plastics enter the environment. This transition is underway with the Plastics transition agenda, among others. The Dutch Plastic Pact is part of that agenda. This pact, which was signed in February 2019, stimulates the reuse of plastic at national level and tackles the unnecessary use of plastic. Eventually, the goal is to close the plastic chain. This approach was adopted at European level in the European Plastic Pact, which has been signed by thirteen countries and 66 European businesses. With the European Commission as observer, there are also prospects of a contribution to the new European plastic policy in the framework of the European Green Deal.

Current environmental status

The OSPAR assessments of beach litter, seabed litter and plastic particles in the stomachs of northern fulmars show that litter (mainly plastic) is frequently found on the beaches, in the water column and on the bed of the North Sea [26 and 27]. At North Sea level, there is still no significant decline in beach litter. On the Dutch beaches, in the period 2014-2019, significant reductions were established for some specific litter items and a nearly significant reduction in the total number of litter items.

In the most recent OSPAR assessment of plastic particles in the stomachs of northern fulmars [30], a significant reduction in plastics was found. Among northern fulmars washed up on the Dutch coast, over the period 2002-2019 there was a significant reduction in the plastic found in their stomachs [31].

The beach litter monitoring figures show a reduction in the total number of items found on beaches. The score fell from 231 items per hundred metres of beach in 2012 to 140 items per 100 metres in 2019 (table 3.1), a reduction of nearly 40% [9]. Although there are limited direct data to support the reduction of marine litter being the result of the measures taken, several trends can be identified (table 3.2) [10]. In the period between 2014-2019, the number of items in the category fishing gear fell by an average 6. 47 items per 100 metres per year (table 3.3). Measures such as the Green Deal Fisheries for a Clean Sea, the fishing for litter programme and the improvement of the port reception facilities probably contributed to the reduction of absolute amount of beach litter originating from the fisheries sector. In relative terms, fisheries items are the most frequently found (45%). Since the introduction of the ban on free plastic bags, there has been a clear reduction in the number of plastic bags found on beaches. In the previous programme of measures, plastic bags were in third place of the most found items. Now they are no longer among the 80 percent of most found items. There has also been a reduction in the average number of balloons found. This may partly be the result of the policy by municipalities to discourage or ban the release of balloons.

Method	Average + meso-plastics	Average - meso-plastics	Median + meso-plastics	Median - meso-plastics
2012	315	293	259	**231**
2019	251	209	168	**140**
Reduction 2019 compared with 2012	20%	29%	35%	**39%**
Comment	Old method			EU/OSPAR 2020 method

Tabel 3.1. Averages and medians (with and without meso-plastics) of the total number of items per 100 m beach, aggregated for the four Dutch monitoring beaches (2019 and 2012).

Rank	Litter type	Median	% of total amount	Trend [number/ year]
1	**Plastic: string [32]**	59	34,3	**-6.79**
2	Plastic: plastic_large [46]	15	9,02	**-1.14**
3	Plastic: caps [15]	9	5,96	**-0.4**
4	Plastic: foam_sponge [45]	6	5,22	0
5	Plastic: crisp [19]	8	4,83	0
6	**Plastic: fishing_net_small [115]**	4	4,62	**0.909**
7	Plastic: tangled [33]	6	3,95	-0.251
8	**Plastic: industrial [40]**	6	3,46	**-0.505**
9	**Rubber: balloons [49]**	6	3,09	**-0.836**
10	Plastic: cutlery [22]	2	1,76	0
11	Sanitary: buds [98]	2	1,61	0

Tabel 3.2. Top 80% most found items along the Dutch coast in the period 2014-2019 [32]. Significant trends are shown in bold.

Litter type	Median	% of total amount	Trend [number/ year]
Single Use Plastics (SUP)	45	25.5	-3.08
Fishing related litter (FISH)	85	45.5	**-6.47**

Tabel 3.3. Average numbers (median) and trends of Single-Use Plastics (SUP) and Fishing-related items (FISH). The significant trend (FISH) is printed bold (period 2014-2019).

[9] Monitoring data amended by removing meso-plastics (0.5-2.5 cm), in line with the latest EU advice (Hanke et al, 2019) and OSPAR CEMP Guidelines Marine Monitoring of Beach litter (OSPAR 2020). A separate analysis is expected to be conducted for the small particles in the future.

[10] For the items shown in bold in table 3.1, significant reductions were found.

#	Type	Average number per 100 m riverbank	Indication sources
1	Unidentifiable pieces soft/hard plastic and plastic foil < 50 cm (including Styrofoam)	217	Various sources
2	Sweets, snacks and crisp packaging and lollypop sticks	29	Recreation/industry
3	Plastic drinks packaging (bottles, wrappers and lids)	27	Recreation/industry
4	Plastic food packaging (incl. chip trays)	9	Recreation/industry
5	Plastic cotton buds	8	Sewer overflow
6	Various recognisable plastic pieces	8	Recreation/dumping/ industry
7	Various textile (incl. sanitary pads)	8	Recreation/dumping
8	Pieces of string with diameter < 1 cm	6	Recreation (incl. recreational fishing)/ industry
9	Glass jars and/or parts including from food and drinks packaging	6	Recreation/dumping
10	Drinks cans	4	Recreation
11	Plastic cups or parts of cups	4	Recreation
12	Cigarette filters	4	Recreation
13	Sanitary pads or packaging	3	Sewer overflow
14	Plastic cutlery	2	Recreation
15	Plastic toys	2	Recreation/dumping

Tabel 3.4. Top 15 river waste and source indication: what washes up on riverbanks? Results of two years of waste monitoring on the banks of the Meuse and the Waal.

Due to the lack of required knowledge to be able to exactly determine good environmental status and from the need to gain more insight into the sources of litter, various knowledge programmes for riverine litter and microplastics have been implemented in the recent period. Various studies relating to riverine litter provided insight into items, quantities and sources. The first results of the (citizens science) project Clean Rivers (Clean Rivers, 2019) show that along the banks of the Meuse and Waal, an average 496 items of waste per 100 metres of riverbank are found. The main indicative sources are industry, including the plastics sector (plastic granules were found at many measuring places), the construction sector and the transport sector (particularly inland shipping), sand extraction and seabed relocation when filling in sand extraction lakes (with dredging material/seabed containing plastic) and recreation (intentional or unintentional disposal of waste, often disposable plastic).

More is also known about the sources of microplastics and about the presence and effects of microplastics in the sea. A distinction can be made between primary microplastics and secondary microplastics. Primary microplastics are plastic particles which are deliberately added to products, such as cosmetics, detergents, paint and fertilisers. Plastic pellets which are used to make products are also primary microplastics. Secondary microplastics are created by wear and tear of products such as car tyres, litter, paint or textiles or the perishing/disintegration of plastic (disposable) products. Microplastics get into the sea due to emissions from sources on land to the water. They are also created in the sea because plastic litter that is already present in the marine environment disintegrates into smaller particles. There are signs of potential harmful effects for marine animals (including accumulation, inflammations, oxidative stress) and of transfer within the food chain. Recent research shows that microplastics are found in varying amounts in all compartments (water, sediment, biota) of the marine environment. This is a basis for the development of an (OSPAR) indicator for microplastics in sediment. More research into the presence and environmental impact of microplastics is required, including the degree of exposure and the consequences.

Supplementary policy assignment

The paragraph 'implemented measures' indicates that in the recent period, much has been done in the Netherlands to address the litter problem and to achieve a better environmental status. In the coming years, the implementation of the SUP Directive will also ensure a reduction of litter. In this process, the Netherlands is also aiming at synergy between the transition to a circular sustainable economy and the approach to marine litter. Despite this focus, there is still a policy objective for the coming years.

For the Dutch government, the basic principle is that litter does not belong in the sea. Although the quantity of marine litter in the Dutch part of the North Sea seems to be declining, the amount that impacts the marine environment is still considerable. Furthermore, much is still unknown about the sources and distribution routes and about the effects on the ecosystem. Plastics are persistent substances which do not or are difficult to biodegrade in a natural way. This litter continues to accumulate in the marine environment over a longer period. Special attention is needed for litter (particularly including microplastics) that continues to flow to the

sea via the rivers. Little is known about the exact volume of the sources and load. However, research has already provided an initial indication of the extent of primary and secondary sources and of transport via the Dutch rivers, but additional research is still essential. That also applies to knowledge about the effects of microplastics.

The monitoring data and the assessment point to further decline of litter in the Dutch part of the North Sea. As a result of the existing policy, (intended) measures and initiatives from society, this trend is expected to continue. However, the effectiveness and the pace of the measures are not easy to demonstrate. In the Marine Strategy part 1 (2018), it has therefore been decided to continue the policy from 2012. Adaptation and/or supplementation of measures is nevertheless required and the implementation of other policy that contributes to the MSFD goals, such as the SUP Directive, must also be considered.

Adapted and additional measures

In this paragraph, the adapted and additional measures are presented per cluster. Various measures and actions which were introduced under the previous programmes of measures will be continued in an adapted form in the coming years. In addition, new additional measures will be taken for most clusters. These are new programmes or actions which are required to further reduce the pollution through litter and thus contribute to achieving a better environmental status. National and international collaboration between government authorities, industry, knowledge institutes and social organisations is essential here. For an effective implementation of the measures, expected results, indicators and timelines will be further elaborated.

In many areas, public and private parties are taking action to resolve the problem of litter in the sea. The programme of measures supplements existing initiatives and policy wherever possible and thus reduce the amount of marine litter. The policy context is changing fast, among others due to the implementation of the SUP Directive and implementation of the microplastics policy programme. It is important to regularly assess whether adaptations or additions are necessary in the goals and measures of the MSFD (adaptive management).

Beaches

The approach to litter that ends up in the sea from beaches builds on the experiences and network of the Clean Beaches Green Deal. Additional focus is being devoted to some actions.

Adapted measures

The Clean Beaches Green Deal will be replaced by a Clean Beaches Programme. This programme focuses on knowledge exchange, support for collaboration projects and improvement of local collaboration between municipalities and entrepreneurs. The next set of measures must lead to the structural maintenance of clean beaches in the Netherlands.

- Implementation and any adjustment/refinement of the monitoring of tourist beaches. This monitoring is linked to the annual Clean Beaches publication. In 2020 and 2021, a supported measure for beach monitoring was developed and adopted for tourist and non-tourist beaches. The aim is also to gain insight into the waste cleared and transported by the managers.
- To promote knowledge exchange between various organisations, annual knowledge sessions will be organised for the target groups beach municipalities and other managers, pavilion owners and NGOs/voluntary organisations.
- Custom advice to coastal municipalities: support of and knowledge transfer to municipal managers who need it.
- Support municipalities and/or pavilion owners in innovative pilots for cleaning beaches.
- Influence behaviour and promote participation. The aim is to raise awareness among the large numbers of visitors about the importance of keeping our beaches clean and thus influencing their behaviour, perception and participation. This will consciously and subconsciously influence their willingness to contribute to preventing litter in their own living and working environments.
- Contributing knowledge about cleaning beaches and any Sustainable Beaches covenant. Market parties are working on such a covenant.

Additional measures

- Website (existing) and newsletter from KIMO (new) for knowledge transfer and informing the target groups mentioned above.
- Activity monitoring among beach stakeholders. The information is made accessible to all parties to facilitate knowledge exchange, coordination and collaboration.
- Contribute to national meetings about the beach for the purpose of knowledge exchange and network reinforcement.

River basins

The approach to riverine litter builds on the experiences and network of the river basin-focused approach to litter and the implementation of the Litter Collection Regulation. Increasing information is available about the amount, composition and sources of litter in rivers. In the framework of the Microplastics Policy Programme, pilot projects are being implemented to

prevent riverine litter waste. In 2021, it will be studied how the pilots will be continued. In addition, based on the MSFD, the focus will be on placing and keeping the litter collection problem on the agenda.

Adapted measures

- *River basin approach to litter*
  As indicated for the implemented measures, in recent years joint ventures have been organised along the (sub) river basins Meuse, Waal, Rhine, Lek, IJssel, Scheldt, Haringvliet and ports of Rotterdam to tackle litter in rivers. The coordination is largely performed by IVN and Rijkswaterstaat. Continuation and expansion of the collaborations are required to develop a structural and broad approach to litter ('cleaning up' and 'keeping clean'). It will be studied whether an ambition and - where possible - concrete goals can be set for each joint venture.
- *Roll out Litter Collection Regulation*
  In 2018, Rijkswaterstaat launched the Litter Collection Regulation (ZOR) as a pilot project. The organisation is responsible for transporting and processing litter collected along the banks by third parties. The pilot proved successful and will be embedded in the regular management and maintenance of main water systems by Rijkswaterstaat.

Additional measures

- *Put litter problem on the agenda and safeguard a broad approach to litter*
  This measure is aimed at increasing awareness of the litter problem among site and water managers along rivers. More (political) support will thus be created for taking structural measures in their management area, whereby approach and prevention of litter will become part of the regular management. This can be achieved by including prevention of litter in permits and work processes.
  To achieve a structural (broad) litter approach, riverbank, water and quay managers and sector organisations will receive support in developing a litter approach and safeguarding it in their own (management) processes. These might include managers and organisations like Rijkswaterstaat, provinces, municipalities, water boards, Forestry Commission, Dutch Society for Nature Conservation, regional nature organisations and sector organisations like Bouwend Nederland and Sportvisserij Nederland.

  To be able to support the inclusion on the agenda and safeguarding the broad and river basin-focused approach to litter, more clarity is required about the responsibilities of national and local governments and how these responsibilities and the approach to litter relate to the European regulations (such as MSFD, WFD and Waste Framework Directive). The elaboration is part of this additional measure.

Shipping

The Green Deal on Ship-Generated Waste will not be continued. Actions like separate collection of ship's waste are part of the new PRF directive. However, additional measures will be taken to reduce persistent floating cargo residue in the sea. Because no measures are being taken for inland shipping, the following measures only apply to sea-going shipping.

Additional measures

- *Implementation of the duty to deliver persistent floating cargo residue from 2021*
  From 1 January 2021, all ships which unload their cargo in a European port within the designated sea area, indicated in MARPOL Annex II, Regulation 13, must deliver washing water with persistent floating cargo residue such as paraffin wax, to the port. The amendments in Annex II of MARPOL set prewash requirements in a receiving port for specific substances whose cargo residues float after discharge at sea. The new discharge requirements apply to 'persistent floating' substances with a high viscosity. This refers to a viscosity equal to or greater than 50 mPa·s at 20 °C and/or with a melting point equal to or higher than 0°C. For these substances, the prewash procedure must be applied after discharge in a receiving port. The residue/water mix produced during the prewash must be transported to a reception facility in a receiving port.
- *Improve prewash procedure*
  In Rotterdam and Moerdijk, based on voluntary agreements,[11] an improved prewash procedure is currently being applied because experience has shown that too much cargo residue remains in the cargo tanks. The aim is that less persistent floating residue (such as paraffin wax) gets into the environment, simply because the cargo tanks are better cleaned.

Fisheries

The approach to litter that ends up in the sea from fisheries builds on the experiences and network of the Green Deal Fisheries for a Clean Sea and is optimally in line with the implementation of the SUP and PRF directives. Additional focus is being devoted to some actions, namely the reduction of dolly rope and lead in the sea.

Adapted measures

- *Fisheries for a Clean Sea Programme*
  This programme is the continuation of the Green Deal Fisheries for a Clean Sea. A particular challenge still concerns awareness measures and facilitating recycling. The programme will build further on the basis created with the green deal. The chain approach is the starting

[11] The voluntary agreements should end in January 2021. In consultation with the parties involved, the continuation of the agreements is currently being discussed.

point here. The SUP Directive, in which the manufacturers are given a role in the collection, recycling and raising awareness with respect to fishing gear, will be an important theme for coordination between the parties. There will also be coordination with the new Fishing for Litter programme, including the elaboration in the new PRF directive.

- *Fishing for Litter*
  Fishing for Litter is a way to raise awareness in the fisheries sector. Implementation of the programme leads to the seabed becoming cleaner and that useful data becomes available about litter on the seabed. This is in addition to the regular monitoring surveys concerning litter on the seabed. The revised Port Reception Facilities Directive also requires a regulation for passively fished waste, also known as Fishing for Litter. Facilities will be made mandatory in the port. The costs will need to be covered by indirect financing. During the implementation of the Port Reception Facilities Directive, with the FFL partners involved, it will be studied how the programme can best be shaped within the new directive.

Additional measures

- *Phasing out of dolly rope, with incentive measures*
  Since 2013, the fisheries, NGOs, research institutes and governments have been working together to find a sustainable alternative to dolly rope. The previous MSFD programme of measures included an exploration of alternatives. Since then, many materials have been tested, with varying success. Biodegradable dolly rope produced promising test results, but it is still a challenge to make it economically feasible. The aim is to encourage the use of alternative solutions and to gradually phase out the use of conventional dolly rope by 2027. This will be done by:
  - *Phasing out by incentive: a* financial (tax) incentive to make sustainable alternatives for dolly rope financially more attractive and economically feasible.
  - *Facilitating/organising activities to promote sustainable alternatives and increase familiarity and awareness*. This is in line with the awareness measure focused on responsible fishing gear, which must be implemented based on the SUP Directive.

It is being studied whether this measure can be applied in the Cutter Vision and the innovation processes for fishing gear that are taking place therein.

- *Focus on reducing lead in recreational fishing at sea*
  Few alternatives are available for the use of lead in recreational fishing at sea and the supply varies according to the type of fisheries. Consequently, switching to alternatives has only been promote to a limited degree in communications. To be able to catch up, the following measures are planned:
  - List the available alternatives for lead per type of recreational fishing at sea. The aim is to obtain a more complete overview of the sustainability, functionality, costs and availability of these alternatives compared with lead.
  - The results of this inventory should make it possible to communicate in a more targeted way with recreational fishers to create more awareness about the impact of lead and about possible alternatives. This might include communication in ports, in trailer ramps, on popular beaches and recreational fishing vessels, as well as in shops, for example by means of posters, folders and magazines.

Plastic products / Land sources of litter at sea

The amended and additional MSFD measures concern tackling balloons and pre-production pellets. Because much of the approach to plastic products in litter takes place via the SUP Directive and the Plastic Bags Directive, no additional measures are included in the MSFD. However, involvement continues from the MSFD with respect to developments around these directives. If necessary, additional measures may be taken in due course.

In 2021, it will be studied how to continue the actions being taken for microplastics and river waste in the framework of the microplastics policy programme. If necessary, additional measures may be taken here too in due course.

Adapted measures

- *Promote reduction of balloons*
  The Dutch government is continuing to draw attention to the problem of balloon fragments in the environment and informing municipalities about the policy options available to reduce the release of balloons. This will be included in the support for municipalities with respect to litter by Rijkswaterstaat. In more than 60 percent of the municipalities, there is now a ban on or a policy discouraging the release of balloons. By the introduction of the SUP Directive, producers of balloons are also made aware of their responsibility.

Additional measures

- *Pre-production pellets*
  The Dutch government will implement the OSPAR recommendation (expected to be adopted in 2021) to tackle the presence of plastic pellets in the environment. Plastic pellets, also called nurdles or pre-production pellets, can get into the environment as microplastics during production, storage, transport or processing. Responsibility for the approach to pre-production pellets primarily lies with the industry, which has launched Operation Clean Sweep.

Explorations

The ambition to achieve a healthy and sustainably used sea not only requires measures which resolve the current policy issues, but also continuous awareness of opportunities to increase the sustainable use of the North Sea, to further limit the pressure on the marine environment and the ecosystem and - where possible - to actively restore the North Sea ecosystem. Based on this approach, take opportunities and resolve (potential) problems, several explorations are being performed. The results of the explorations are used as input for the future updates of the MSFD goals and measures or lead to adaptations if that is desirable and possible.

Education and awareness

- *Plastic soup in waste programmes*
  The emphasis in the Waste at school programme lay on education about preventing, reducing and separating waste produced in school. An overarching theme was behavioural change among the pupils: by recognising the value of raw materials, they should deal with waste differently. Behavioural change also affects litter, which is caused by throwing away waste. Litter as a subject received less attention during the programme. A study showed that teachers respond enthusiastically to the theme plastic soup and less enthusiastically to the theme of waste, although both themes are inextricably linked.
  This exploration investigates whether there is a better way to include plastic soup in the education programmes to increase awareness of the plastic problem.
- *National communication initiative*
  Based on a Parliamentary question, the state secretary has launched a national communication initiative for the approach to litter. In this, the powers of around 30 stakeholders from government authorities, industry and NGOs are combined. The aim is to achieve a broad and broadly supported programme of actions in 2021 and 2022 to further improve the clean behaviour of the public and businesses. The role of the national government is to connect, strengthen and support. The initiative started in the middle of 2020. At the end of 2020, the plan for 2021 will be announced.

Beaches

- *Explore, develop and communicate policy goals for litter on tourist beaches*
  Objectives form the basis for policy and measures. Up to 2020 inclusive, there were no concrete objectives for the 'cleanliness' of tourist beaches. To focus the efforts of the parties involved in the follow-up to the Clean Beaches Green Deal and to interpret their effect, such objectives are being developed. Obviously, these must be established in terms that reflect the monitoring method and European and regional developments.

Shipping

- *Additional measures for approach to litter in inland shipping*
  From the Source approach project, an inland shipping project was started, which will give a better impression of the problems concerning litter originating from inland shipping. Once the extent of the problem is better known, additional measures can be taken in the period 2022-2027.
- *Explore options approach PUR foam*
  PUR foam is now one of the top 5 most found types of waste. This type of material is mainly used by shipping for various applications. Exploration into the options for taking measures to tackle it. This may extend further than shipping.

Plastic products/Land sources of litter at sea

- *Follow-up policy programme microplastics*
  Before the end of the microplastics policy programme in 2021-2022, it will be studied how to continue the various parts of the programme. It is hereby essential to take the European developments into account.

Fisheries

- *Follow-up Green Deal for Lead-Free Recreational Fishing*
  When writing this programme of measures, there had not yet been an evaluation of the Green Deal for Lead-Free Recreational Fishing. The target for 2021 was 30 percent reduction of lead use by recreational fishers. After the evaluation, it can be explored whether new measures are required to achieve the target for phasing out in 2027.
  Steps are currently being taken to add fish lead to the REACH regulation. On 16 July 2019, the European Commission requested the European Chemicals Agency to make a proposal for limiting the availability (on the market) and the use of lead in bullets and fishing gear. The European Commission will take a decision about this proposal at the end of 2022.
- *Standardisation for circular design and chain approach of fishing gear*
  Within the context of the SUP Directive, NEN is exploring establishing a European and Dutch working group which works on standards for circular design and the waste chain of fishing gear. This involves drawing up voluntary standards for technical requirements for design, material use and circularity of the fishing gear. As well as for collection, monitoring, traceability, repair, recycling, environmental monitoring and reporting of fishing gear. Such a chain approach fits in well with previous MSFD initiatives like the Green Deal Fisheries for a Clean Sea. This initiative can lead to a new measure aimed at further reducing litter originating from fisheries.

Knowledge agenda

Due to the lack of knowledge to exactly determine good environmental status and based on the need to gain more insight into the effects of litter, various knowledge programmes for riverine litter and microplastics have been implemented in the recent period. Various studies involving riverine litter have provided insight into items, volumes and sources. There are signs of potential harmful effects for marine animals and of transfer within the food chain. Recent research shows that microplastics are found in varying amounts in all compartments (water, sediment, biota) of the marine environment. This is a basis for the development of an (OSPAR) indicator for microplastics in sediment. Themes to be considered in the formulation of the knowledge questions are:

- Litter: Source identification, distribution route and effects of litter.
  - Explore standardised method for identification of litter sources of beach and riverine litter for a more targeted source approach.
- Measures: Study into the effectiveness and impact of measures in the context of the EU threshold value for beach litter (number items/per 100 metres beach).
- Microplastics: The extent of the microplastics problem.
- Nanoplastics: Effects of nanoplastics on safety of food from the sea.
- Monitoring:
  - The volume and trends of litter (including microplastics) that flows to the sea via rivers.
  - Develop and apply indicators within OSPAR, including alternative indicators for monitoring seabed litter and floating litter.
  - Riverine litter monitoring: Develop a standardised monitoring system for litter/macroplastics in rivers (banks and water column).

3.12 Introduction of energy, including underwater noise (D11)

Good environmental status and targets

Underwater noise produced by human activities (anthropogenic) has different characteristics than the natural sounds of waves, surf, rainfall and marine animals. Anthropogenic sources of underwater noise include: pile-driving work, seismic surveying and shipping. Sometimes the underwater noise is relatively short, such as pile-driving during construction work at sea, at other times they may last longer. The impact of anthropogenic underwater noise on marine mammals varies from subtle changes in behaviour to avoidance of areas and reduced hearing capacity, and - in extreme cases - even to death. Other animals in and on the water can also respond to sound. Fish, for example, are mainly sensitive to low frequencies.

The good environmental status is achieved when the introduction of energy, including underwater noise, is at a level that does not harm the marine environment. A second condition is that uninterrupted noise with a low frequency and loud impulsive noise with a low and medium frequency resulting from human activities under water do not have harmful effect on ecosystems. The environmental status and targets are summarised in the table below.

Good environmental status	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 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: Continuous noise: distribution in time and space and levels of continuous noise are such that they do not threaten the favourable status of maintenance of species. • D11C2: for this criterion, it is not yet possible to draw up quantitative descriptions for good environmental status.

Environmental targets	• D11T1: continuation of stricter regulations concerning the prevention of harmful effects of impulsive 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.

Implemented measures

The starting point for the measures for underwater noise is a reduction at the source. Noise spreads over long distances and is almost impossible to screen at sea. So, only measures at the source are effective.

The licensing process for wind turbine farms has been amended. The Wozep programme (Offshore Wind Ecological Programme) devotes a lot of attention to underwater noise. This has led to a tightening of the licensing conditions and to better insight into the effects of impulsive noise. As a result, the precautionary principle can be applied more precisely. In the Site Decisions, a maximum permissible noise level is prescribed. A framework has been developed (Framework for the Assessment of Ecological and Cumulative Effects, KEC) [28] to assess the impact of the construction of wind turbine farms and determine the licensing requirements. The use of active sonar has been regulated and impulsive noise has been reduced via the Code of Conduct relating to explosives clearing. Regulations relating to seismic surveying have been amended. For seismic surveys at sea, a license pursuant to the Nature Conservation Act and/or exemption from the Flora and Fauna Act is required. In addition, voluntary guidelines have been drawn up to reduce the impact of platform lights. Finally, the IMO has adopted guidelines to reduce underwater noise by commercial shipping. In addition, the Netherlands led an EU monitoring project (Joint Monitoring of Ambient Noise in the North Sea - Jomopans, 2018-2020). It is still too soon to use Jomopans' results to design new measures.

Current situation

Unless additional measures are taken, the increase in human activities on the North Sea will result in more underwater noise. Since the last Marine Strategy part 3, underwater noise is being monitored. At the initiative of OSPAR, at ICES a register for impulsive noise has been created, in which all activities which produce noise are registered. The Jomopans project has generated better insight into the amount and spread of continuous underwater noise. The results of various studies have led to the establishment of limit values for noise production relating to the construction of wind turbine farms.

Supplementary policy assignment

It is important to continue the current work and research efforts.

Additional measures

Noise budget for seismic survey

One of the impulsive noise sources is the use of air guns in seismic surveys to find oil and gas reservoirs under the seabed. In partnership with industry, an assessment framework for seismic survey will be developed in analogy with the KEC. Further conditions may be based on this. This is in line with the agreements in the North Sea Agreement and the Harbour Porpoise Conservation Plan. A noise budget that regulates the time during which the impulsive noise is permitted may be a condition. The industry will be encouraged to reduce impulsive noise.

IMO guidelines for the reduction of underwater noise of commercial shipping

Shipping is a global sector. An issue like problematic underwater noise from ships must therefore also be discussed at global level. The shipping industry must be encouraged to reduce the production of underwater noise caused by ships. The measure concerns support for the Canadian proposal to more actively follow the IMO guidelines for the reduction of underwater noise of commercial shipping.

Knowledge agenda

This paragraph contains the most important knowledge questions about underwater noise which will be elaborated in this planning period.

- The physical aspects of underwater noise are largely understood, but there is a lack of knowledge relating to the effects of underwater noise on marine species and how these impact on the population and the ecosystem. Ecological models for this are being developed, but validation is a challenge. A lot of attention has been devoted to marine mammals, particularly porpoises. In the coming years, there will also be a focus on fish species and other types of animals.
- Combined effects of several activities (cumulation). The impact of cumulation of the same type of source (for example, several wind farms, the cumulation of various source types (pile-driving, seismic surveying), and finally the cumulation of different pressure factors (sound, by-catch, chemical pollution).

- With respect to the underwater noise of seismic surveys, several parameters are still unknown. These are related to the different source configuration than for pile-driving noise and the fact that the sources move.
- Insight into continuous underwater noise of recreational shipping.
- Another form of energy supply is the electromagnetic field. Due to the construction of offshore wind farms and the associated power cables to the mainland, this form of energy will increase. The impact this will have on some fish species, such as sharks and rays, is unknown.

3.13 Results Strategic Environmental Assessment (SEA) National Water Programme

A SEA was performed for the National Water Plan including the North Sea Programme and the additional measures in this MSFD programme of measures. Of the additional measures, only the spatial measures included in the North Sea Agreement (see paragraph 3.7) have a spatial impact and are therefore assessed. This concerns fisheries limiting measures in the Dogger Bank, Cleaver Bank, Central Oyster Grounds, Frisian Front and Borkumse Stenen. The SEA concludes “Closing parts of the North Sea to (seabed-disturbing) fishery affects the quality of the surface water. Designating areas where no (seabed-disturbing) fishing may take place ensures less disturbance of the seabed. This means the water is less turbid. It also ensures an improvement of the ecosystem, and thus of biodiversity and fish stocks. Some of the areas where (seabed-disturbing) fishing is banned are inside Natura 2000 areas. The measures help enhance the natural system and contribute to the achievement of the nature objectives in these areas of the North Sea.”

4 Gaps in knowledge

Zoals uit het voorgaande hoofdstuk blijkt, zijn er voor elke descriptor kennisvragen. Een deel van de kennisvragen is gerelateerd aan het ontbreken van een beoordelingsmethode, indicatoren en/of drempelwaarden. Deze kennis is nodig om doelen te kunnen stellen en de voortgang te monitoren. Daarnaast ontbreekt ook kennis om gericht(er) maatregelen te treffen. Zo is het bij diverse descriptoren niet mogelijk om een bepaalde trend te verklaren of gevolgen van toekomstige ontwikkelingen of cumulatieve effecten in te schatten. Kennis rondom bepaalde stoffen, rivierafval, microplastics en de effecten op het mariene ecosysteem is ook gewenst.

Overview additional knowledge questions

Besides the knowledge questions described in chapter 3, the updated Marine Strategy part 1 (2018) [11] mentions the following priorities for the knowledge programme:

- Cumulative effects of new wind farms and other human activities on the ecosystem. For wind farms, these are mainly the effects on populations of sea birds and the consequences of underwater noise during the construction phase for populations of marine mammals. For other activities, this mainly concerns the impact of the (relocation of) fishing on populations of marine mammals, sharks and rays.
- Effects (cumulative) of sand extraction and suppletion on benthic life.
- Possibilities for active restoration of (lost) biogenic reefs, such as shellfish banks, for example in wind farms.
- The breeding success of sea birds and factors that could affect this.
- Assessment methods for 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 big fish and marine mammals.
- Consequences of acidification and rising temperatures.
- The phosphate-nitrogen ratio.
- Microplastics, copper, pharmaceutical residues and other (emerging) substances.
- Assessment framework for coherent and representative network of marine protected areas at sea.

The North Sea Agreement assumes an intensification and change in the use of the North Sea and mentions the extra objective of achieving the MSFD goals. Several specific research questions/ assignments are mentioned related to MSFD goals, including goals for spatial and species protection that should be started in the short term. These include:

- To support the additional measures for spatial protection, additional research will be necessary, partly to prepare the international consultations and support to underpin measures to limit fishing. The research questions will (partly) be implemented in the framework of the MONS programme.
- Besides the spatial measures proposed in the North Sea Agreement, the agreements in the North Sea Agreement will also be implemented to conduct research that may lead to additional spatial protection:
  - Before 2025, an independent scientific investigation will be started to establish whether the Hollandse Kust, Vlakte van de Raan, Borkumse Stenen, Cleaver Bank, Dogger Bank and Central Oyster Grounds fulfil the selection criteria for designation as Birds Directive area. Areas that fulfil the selection criteria of the Birds Directive should be designated as Birds Directive area by 2025.
  - From 2020, independent scientific research will be conducted into the presence and distribution of honeycomb reef worms. If that research leads to applicable conclusions, relevant locations may be protected via spatial protection measures under the Habitats Directive or Marine Strategy Framework Directive.

The key knowledge questions have also been identified within OSPAR and the European Commission. This shows that the MSFD is a structuring and converging factor: all European member states with a marine area must perform the same objective at the same time, and they often have to deal with similar knowledge gaps. Furthermore, many knowledge questions can logically only be answered on a regional scale. Local differences due to geography, use or regulations create some diversity, despite the considerable interest within OSPAR and at the European Commission to coordinate marine research.

Research programmes

There are various existing programmes in which research and monitoring take place, such as the MWTL (National Surface Water Monitoring Programme), the WOT (statutory research objectives), Wozep (Offshore Wind Ecological Programme) and the strategic research programmes of the knowledge institutions. Knowledge questions can also be financed through the National Scientific Agenda by NWO, the programme of the top sector Water and Maritime, and the mission-driven research programme Agriculture, Water and Food.

In addition to these programmes, as agreed in the North Sea Agreement, an integrated research and monitoring programme is being elaborated, the NSC programme Monitoring-Research-Nature Reinforcement-Species Conservation Plans (MONS). For this programme, an inventory was drawn up for the key knowledge questions within the three central MONS themes Carrying Capacity, Nature Reinforcement and Species, and Effects of Pressure Factors. These knowledge questions partly have an MSFD character.

There are also European research projects and programmes in which North Sea knowledge questions can be addressed. For example, via the new Horizon Europe programme, the EU framework programme for research and innovation, LIFE+ and Interreg. One of the instruments under Horizon Europe is 'Partnership'. For the marine domain, a Partnership Blue Economy has been drawn up. The Netherlands will be a partner in this programme.

The EMFF (European Maritime and Fisheries Fund) is important for the MSFD and MONS knowledge questions. In 2020, MSFD-relevant knowledge questions were included in the Operational Programme 2021-2027 for the implementation of the EMFF. The EMFF is the European Maritime and Fisheries Fund that supports the maritime sector, fisheries and aquaculture in Europe. The fund co-finances projects that contribute to the European objectives in this theme. EMFF has four union priorities. In the framework of this programme of measures, union priorities 1 and 4 are relevant.

Union priority 1 is to maintain the biological diversity of the sea. The Operational Programme mainly focuses on the indicators D1 (biodiversity), D4 (food webs) and D6 (sea-floor integrity) and/or data collection and measures to conserve species. Projects in the field of measures, research and monitoring can be financed from the fund, such as:

- Further development of existing assessment frameworks, indicators and/or threshold values as well as strengthening of basic data.
- (Species-specific) protection and restoration of nature values and related research, among others related to porpoises, sea birds, sharks and rays, and benthic animals as well as creating space for habitats with a nursery function.
- Development of nature-inclusive building of offshore infrastructure (such as wind farms) in relation to conservation or restoration of nature.
- Development of technology and/or installations to support ecosystem monitoring and conservation and restoration of ecosystem elements.

Union priority 4 is to strengthen the international ocean management and to facilitate safe, secure, clean and sustainably managed seas and oceans. The Operational programme within this theme is aimed at research and monitoring effects of human activities on the ecosystem, to support the implementation of the MSFD - and in relation to that: the Convention for the Protection of the Marine Environment of the North-East Atlantic (OPSAR), EU Birds Directive (BD) and the EU Habitats Directive (HR) and contributing to the related parts of the North Sea Agreement. The joint objectives are summarised as follows:

- Strengthen monitoring to gather basic knowledge about species, habitats, ecosystem functioning and pressure factors resulting from human use. Ocean acidification and climate change and the consequences are also important subjects.
- Developing integrated monitoring programmes and use innovative techniques to generate data more effectively and cohesively.
- Research to obtain better insight into trophic interactions and ecosystem functioning.
- Research into cumulative effects and the carrying capacity of the North Sea ecosystem, to support policy and aimed at regulating human use of the system. For the North Sea Agreement, particularly cumulation of effects of the construction and the use of wind farms, fishing, cultivation of food and seismic surveys are important.
- Contribute to insight into the effectiveness of measures to protect the marine ecosystem and biodiversity.

Prioritise and coordinate research

The many existing knowledge questions cannot all be addressed in this planning period. Since funds are limited, prioritisation of research is essential. The prioritisation of MSFD research also considers the timely availability of the knowledge. Calibration points for this are the OSPAR Quality Status Report in 2023 and the update of the national assessment of the environmental status of the Dutch part of the North Sea in 2024. Prioritisation of the MONS programming will take place in the first half of 2021.

Financing runs over several tracks, with varying durations of programmes. The MONS programme lasts 10 years (2021-2030). The Operational Programme EMFF lasts from 2021-2027. In view of the various durations of financing and the timely availability of knowledge, good coordination of research is necessary, both between the MSFD and the MONS programmes and with other (inter) national research programmes. Coordination also prevents overlap in research and ensures that certain knowledge questions are answered at regional scale, leading to efficient allocation of limited resources.

5 Financial consequences

This programme of measures mainly consists of existing measures (measures which were included in the previous programme of measures) that are being continued, possibly in a slightly different form. Generally, these measures are generated from existing European/international legislation for which national instruments and financing is already available.

For the descriptors D1 biodiversity, D6 sea-floor integrity, D10 marine litter and D11 underwater noise, additional measures are included in this programme of measures. This chapter provides insight into the expected financing of these measures.

Financing additional measures

The additional measures under D1 biodiversity and D6 sea-floor integrity emerge from the North Sea Agreement. The North Sea Agreement leads to several intensifications of (policy) measures and additional objectives for spatial protection, monitoring and research. Action plans with a concretisation of the measures for additional species protection will be drawn up from 2023, depending on what is required based on results from research and monitoring in the coming three years (particularly in the framework of the North Sea Agreement/MONS, Natura 2000, the OSPAR Quality Status Report (QSR) and updating of the initial assessment of the environmental status for the MSFD). For additional intensifications that are the result of agreements made in the North Sea Agreement, an appeal will be made on the 'Transition Fund' if existing or available funding falls short. For this, the Dutch government has made 55 million euros available up to 2030 for monitoring, research and nature restoration. There is also 14 million euros for enforcement of fisheries measures by the NVWA. For the restructuring and sustainability of the cutter fleet, 119 million euros is available until 2030. In the North Sea Consultation, it was agreed that there will be an assessment in 2023 as to whether the goals of the North Sea Agreement will be achieved with the available funding. If further strengthening of the 'Transition Fund' proves necessary, parties will discuss this openly and realistically in the North Sea Consultation.

Besides the 'Transition Fund', a European Maritime and Fisheries Fund is also available, managed jointly by the Netherlands and the European Commission. For specific MSFD measures and research, 5 million euros are available.

The additional measures under D10 Marine Litter and D11 Underwater noise are covered from the budget of the Ministry of Infrastructure and Water Management. For marine litter, co-financing will be provided from EMFF resources.

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Abbreviations

ASCOBANS	Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas)
BAC	Background Assessment Criteria
BAT	Best Available Techniques
BDC	Biological Diversity & Ecosystems (OSPAR committee)
BHD	Birds and Habitats Directive
BREF	BAT Reference documents (European reference documents)
CBD	Convention on Biological Diversity
CBGD	Clean Beaches Green Deal
CBS	Statistics Netherlands
CCS	Carbon Capture and Storage
CFP	Common Fisheries Policy
DIN	Dissolved Inorganic Nitrogen
DIP	Dissolved Inorganic Phosphorus
ECHA	European Chemicals Agency
ECN	Netherlands Energy Research Centre
EcoQO	Ecological Quality Objective
EEZ	Exclusive Economic Zone
EIHA	Human Activities (OSPAR committee)
EMFF	European Marine, Fisheries and Aquaculture Fund
EU	European Union
EZK	Ministry of Economic Affairs and Climate
FFL	Fishing for Litter
FMSY	Fish Mortality at MSY
FRP	Favourable Reference Population
FRR	Favourable Reference Range
GES	Good environmental status
CFP	Common Fisheries Policy
GW	Gigawatt
HASEC	Hazardous Substances & Eutrophication (OSPAR committee)
HD	Habitats Directive
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 Organization
IMP	Integrated Maritime Policy
IPO	Interprovincial Consultation
Jomopans	Joint Monitoring Programme for Ambient Noise North Sea
KEC	Framework for the Assessment of Ecological and Cumulative Effects
KIMO	Dutch Institute of Expertise for Oral Healthcare
KRA	Waste Framework Directive
MSFD	Marine Strategy Framework Directive
WFD	Water Framework Directive
LNV	Ministry of Agriculture, Nature and Food Quality
MARPOL	International Convention for the Prevention of Pollution from Ships
MEPC	Marine Environment Protection Committee
SEA	Strategic Environmental Assessment
MSCG	Marine Strategy Coordination group
MSY	Maximum Sustainable Yield
NCP	Dutch Continental Shelf
NEAES	North-East Atlantic Environment Strategy
ngo	Non-governmental organisation
NME	Nature and environmental education
NZA	North Sea Agreement
NSC	North Sea Consultation
OCW	Ministry of Education, Culture and Science
OFL	Physical Environment Consultative Council
OIC	Offshore Industry (OSPAR committee)
OSPAR (convention)	Convention for the Protection of the Marine Environment of the North-East Atlantic
PAH	Polycyclic Aromatic Hydrocarbons
PAM	Passive Acoustic Monitoring

PBDE	Polybrominated diphenyl ethers
PBL	Netherlands Environmental Assessment Agency
PCB	Polychlorinated biphenyls
PRF	Port reception facilities
REACH (convention)	Registration, Evaluation and Authorisation of Chemical substances
RIVM	National Institute for Public Health and the Environment
RSC	Radioactive Substances (OSPAR committee)
RWS	Rijkswaterstaat [Department of Waterways and Public Works]
rwzi	Sewage treatment plant
SEA	Strategic Environmental Assessment
SMART	Specific, Measurable, Acceptable, Realistic, Time-bound
SSB	Spawning Stock Biomass
SUP	Single-Use Plastics
TBT	Tributyltin
EPR	Extended producer responsibility
Vewin	Association of Dutch Water Companies
VIBEG (agreement)	Fishing in protected areas
VNG	Association of Dutch municipalities
BD	Birds Directive
VWS	Ministry of Public Health, Welfare and Sport
WEcR	Wageningen Economic Research
WOT	Statutory Research Objectives
Wozep	Offshore Wind Ecological Programme
ZOR	Litter Collection Regulation

Annex 1

Overview of international regulations and implementation measures in Dutch legislation

Measure	European/international legislation	National instruments
D1 Biodiversity		
Assessment of (large-scale) interventions and associated compensation	Directive governing environmental impact assessments for certain public and private projects (011/92/EEC)	Environmental Management Act
Limit fishing in the coastal zone	Council Directive on the conservation of wild birds (Birds Directive; 79/409/EEC), Council Directive on the conservation of natural habitats and of wild flora and fauna (Habitats Directive; 92/43/EEC), Council Directive (EU) on the Common Fisheries Policy (CFP) (1380/2013)	Nature Conservation Act and Fisheries Act 1963
Zoning and phasing activities on the coast	Council Directive on the conservation of wild birds (Birds Directive; 79/409/EEC), Council Directive on the conservation of natural habitats and of wild flora and fauna (Habitats Directive; 92/43/EEC)	Nature Conservation Act
Regulation of other indoor activities within the coastal zone	Council Directive on the conservation of wild birds (Birds Directive; 79/409/EEC), Council Directive on the conservation of natural habitats and of wild flora and fauna (Habitats Directive; 92/43/EEC)	Nature Conservation Act
Implementation OSPAR List threatened species and habitats	OSPAR Commission, OSPAR List of Threatened and/or Declining Species and Habitats – correction 2014, Reference Number 2008-6 (2014)	Nature Conservation Act
Kier decree partial opening Haringvliet sluices		Decree concerning management Haringvliet sluices
Limit fishing (Frisian Front) and Bruine bank (follows from NZA, is designated BD area) and possible other areas which qualify under the BD.	Council Directive on the conservation of wild birds (Birds Directive; 79/409/EEC), Council Directive (EU) on the Common Fisheries Policy (1380/2013)	Wet Natuurbescherming
Measures relating to birds, bats and marine mammals		Wind Energy at Sea Act, Nature Conservation Act, Fisheries Act 1963

Measure	European/international legislation	National instruments
D2 Non-indigenous species		
Conditions to issuing permits to prevent the spread of exotic species	Convention on Biological Diversity (CBD); Convention on the conservation of wild animals and plants and their natural habitats in Europe (Bern Convention), Regulation (EU) concerning use of alien and locally absent species in aquaculture (708/2007), Regulation (EU) on the prevention and management of the introduction and spread of invasive alien species (1143/2014), Council Directive on the conservation of wild birds (Birds Directive; 79/409/EEC), Council Directive on the conservation of natural habitats and of wild flora and fauna (Habitats Directive; 92/43/EEC)	Wet Natuurbescherming, Visserijwet 1963, Regeling gebruik uitheemse en plaatselijk niet-voorkomende soorten in de aquacultuur, Beleidsregels houdende vaststelling van beleidsregels inzake schelpdierverplaatsingen
Management Natura 2000 area (exotic species)	Convention on Biological Diversity (CBD), Convention on the conservation of European wildlife and natural habitats (Bern Convention), Regulation (EU) concerning use of alien and locally absent species in aquaculture (708/2007), Regulation (EU) on the prevention and management of the introduction and spread of invasive alien species (1143/2014), Council Directive on the conservation of wild birds (Birds Directive; 79/409/EEC), Council Directive on the conservation of natural habitats and of wild flora and fauna (Habitats Directive; 92/43/EEC)	Nature Conservation Act, Fisheries Act 1963
Regulation prevention and management invasive species	Regulation (EU) on the prevention and management of the introduction and spread of invasive alien species (1143/2014)	Nature Conservation Act
Tackle spread of species via ballast water	International convention for the Control and Management of Ships' Ballast Water and Sediments (Ballast Water Management Convention); OSPAR Convention	Law preventing pollution by ships
Implement protocols for exemptions after introduction of Ballast Water Management Convention	International convention for the Control and Management of Ships' Ballast Water and Sediments (Ballast Water Management Convention); OSPAR Convention	
Implement Biofouling Guidelines	Convention on Biological Diversity (CBD), IMO Biofouling guidelines	
D3 Commercial fish, shellfish		
Catch management commercial fisheries	Council Directive (EU) on the Common Fisheries Policy (CFP) (1380/2013)	
Minimise and phase out discards	Council Directive (EU) on the Common Fisheries Policy (CFP) (1380/2013)	
Promote alternative fishing gear		Economic instrument EMFF, Cutter Vision
Sustainability certificates fisheries	Council Directive (EU) on the Common Fisheries Policy (CFP) (1380/2013)	

Measure	European/international legislation	National instruments
D5 Eutrophication		
Implement Annex V MARPOL convention	IMO International Convention for the Prevention of Pollution from Ships (MARPOL)	Law preventing pollution by ships
Compulsory manure processing	Council Directive concerning the protection of waters against pollution caused by nitrates from agricultural sources (Nitrate Directive; 91/676/EEC), Directive establishing a framework for Community action in the field of water policy (Water Framework Directive; 2000/60)	Manure Law
Treatment of urban waste water	Directive concerning urban waste-water treatment (91/271/EEC), Directive establishing a framework for Community action in the field of water policy (Water Framework Directive; 2000/60)91/27	Water Decree, Environmental Management Act
Action Programme Nitrate Directive	Council Directive concerning the protection of waters against pollution caused by nitrates from agricultural sources (Nitrate Directive; 91/676/EEC)	Implementation regulation Manure Law
Delta Plan Agricultural Water Management		Voluntary, but in relation to the Nitrates Directive not voluntary
Improvement in treatment efficiency water treatment plants		Voluntary, but in relation to the Urban Wastewater Directive not voluntary
D6 Seabed protection		
Expansion of limitations on seabed-disturbing fishery fishing on Cleaver Bank, Dogger Bank and Frisian Front	Council Directive on the conservation of wild birds (Birds Directive; 79/409/EEC), Council Directive on the conservation of natural habitats and of wild flora and fauna (Habitats Directive; 92/43/EEC)	Nature Conservation Act
Expand seabed protection Frisian Front and the Central Oyster Grounds and introduce seabed protection Borkumse Stenen	Council Directive establishing a framework for Community action in the field of marine environmental policy (Marine Strategy Framework Directive; 2008/56/EC); Council Directive (EU) on the Common Fisheries Policy (1380/2013)	Water Act
Limit seabed-disturbing fishing in areas to be determined equivalent to 13. 7% of the North SeaUnder HR or MSFD	Council Directive on the conservation of natural habitats and of wild flora and fauna (Habitats Directive; 92/43/EEC), Council Directive establishing a framework for Community action in the field of marine environmental policy (Marine Strategy Framework Directive; 2008/56/EC), Council Directive (EU) on the Common Fisheries Policy (1380/2013)	Water Act and Nature Conservation Act
Change in areas with a ban on seabed-disturbing fisheries North Sea coastal zone	Council Directive on the conservation of wild birds (Birds Directive; 79/409/EEC), Council Directive on the conservation of natural habitats and of wild flora and fauna (Habitats Directive; 92/43/EEC); Council Directive (EU) on the Common Fisheries Policy (1380/2013)	
D7 Hydrographical conditions		
Assessment of hydrographical interventions and compensation of effects	EU Directive governing environmental impact assessments for certain public and private projects (011/92/EU)	Environmental Management Act

Measure	European/international legislation	National instruments
D8 Contaminants		
Implementation of the Directive concerning the quality of bathing water	Council Directive concerning the management of bathing water quality and repealing Directive 76/160/EEC (Directive concerning the quality of bathing water; 2006/7/EC)	Act/Decree management of bathing water quality
Reduce discharges by shipping (MARPOL Annex V)	IMO International Convention for the Prevention of Pollution from Ships (MARPOL)	Law preventing pollution by ships
Ban on TBT	International Convention on the Control of Harmful Anti-fouling Systems on Ships	Law preventing pollution by ships
Reduce pollution by reducing shipping incidents	IMO (shipping routes)	Change to shipping routes 1 Aug. 2013
Reduce discharges of contaminants by oil and gas installations	**Drilling:** 1 OSPAR Decision 2000/3 on the Use of Organic-phase Drilling Fluids (OPF) and the Discharge of OPF-contaminated Cuttings 2 OSPAR Recommendation 2006/5 on a Management Regime for Offshore Cuttings Piles **Use and discharge of chemicals:** 3 OSPAR Decision 2000/2 on a Harmonised Mandatory Control System for the Use and Reduction of the Discharge of Offshore Chemicals(as amended by OSPAR Decision 2005/1) 4 OSPAR Recommendation 2010/3 on a Harmonised Offshore Chemical Notification Format Amended by Recommendation 2014/17 5 OSPAR Recommendation 2010/4 on a Harmonised Pre-screening Scheme for Offshore Chemicals 6 OSPAR Recommendation 2005/2 on Environmental Goals for the Discharge by the Offshore Industry of Chemicals that Are, or Contain Added Substances, Listed in the OSPAR 2004 List of Chemicals for Priority Action 7 OSPAR Recommendation 2006/3 on Environmental Goals for the Discharge by the Offshore Industry of Chemicals that Are, or Which Contain Substances Identified as Candidates for Substitution **Discharge of production water:** 8 OSPAR Recommendation 2001/1 for the Management of Produced Water from Offshore Installations. Amended by OSPAR Recommendation 2006/4 and Recommendation 2011/89 OSPAR Recommendation 2012/5 for a risk-based approach to the management of produced water discharges from offshore installations **Other wastewater from production processes:** PARCOM Recommendation of a 40 mg/l Emission Standard for Platforms, 1986	Mining Act, Mining Decree and Mining Regulation

Measure	European/international legislation	National instruments
Prevent and limit industrial emissions	Directive on industrial emissions (integrated prevention and control) (2010/75)	Activities decree environmental management, Water Act, Decree and Regulation environmental law
Reduce environmental risks resulting from serious accidents	Directive on the control of major-accident hazards involving dangerous substances (Seveso III), Directive establishing a framework for Community action in the field of water policy (Water Framework Directive; 2000/60)	Decree risks serious accidents 2015
Ban on discharge of ship waste inland shipping	Directive establishing a framework for Community action in the field of water policy (Water Framework Directive; 2000/60)	Ship Waste Decree Rhine and Inland shipping + Regulation
Action plan sustainable plant protection	Directive establishing a framework for Community action to achieve the sustainable use of pesticides (2009/128/EC); Directive establishing a framework for Community action in the field of water policy (Water Framework Directive; 2000/60)	Plant protection products Act
Preparation, collaboration and coordination during disasters and incident approach at sea		Maritime Accident Control Act, Decree Incident Response Plan North Sea, Memorandum Maritime and aeronautic response on the North Sea 2010-2015, Cooperative Agreement Coastal Pollution Control Rijkswaterstaat departments, Cooperative Agreement Oil-covered Birds, Capacity Memorandum 2006-2010
International collaboration for disasters and incidents	Agreement concerning collaboration in combating pollution of the North Sea by oil and other harmful substances (Bonn Agreement), Bonn Agreement Counter Pollution Manual, International convention concerning action at sea in response to accidents that can cause contamination by oil	Response to maritime accidents Act, Bonn Agreement Action Plan 2013-2016
D9 Contaminants in fish		
Standardisation contaminants in in fish and other seafood for human consumption	see also Commission Regulation (EC) no. 1881/2006 and Commission Regulation (EC) no. 396/2005	Working directly
D10 Litter		
(Clean-up) campaigns		
Approach Clean Meuse Limburg		
Stakeholder initiatives on beaches		
Implementation new EU directive 2019/833 Port reception facilities	Directive on port reception facilities for ship-gnereated waste and cargo residues (2000/59/EC)	Law preventing pollution by ships
Ban on discharging waste by ships (MARPOL Annex V)	IMO International Convention for the Prevention of Pollution from Ships (MARPOL)	Law preventing pollution by ships

Measure	European/international legislation	National instruments
Marine environmental awareness course	International Convention on Standards of Training, Certification and Watchkeeping for seafarers (STCW Convention)	OCW education act
Programme Fishing for Litter		
Implementation (litter) waste policy		
Netherlands Circular 2050 (previously From Waste to Raw Material (VANG))		Policy programme
Sustainable packaging (previously packaging framework agreement)		Covenant
Broad approach to litter (previously national approach to litter)		
Plastic Pact (previously Chain Agreement Plastic Recycling)		Covenant
National Waste Management Plan (LAP) 3		Policy programme
Reduce the use of plastic bags	Directive (EU) 2015/720 of the European Parliament and of the Council of 29 April 2015 amending Directive 94/62/EC as regards reducing the consumption of lightweight plastic carrier bags	Environmental Management Act
Litter on the agenda of stakeholders and in education		Continued within the Policy programme VANG
Clean beaches: Clean Beaches Green Deal		
Rivers: River basin approach to litter		Regional joint ventures, partially via covenant. Policy programme Microplastics
Rivers: Rollout Litter Collection Regulation		Regulation Rijkswaterstaat economic instrument
Fisheries: Green Deal Fisheries for a clean sea		Covenant
Plastic products: Promote reduction of balloons	Directive (EU) 2019/904 of the European Parliament and of the Council of 5 June 2019 on the reduction of the impact of certain plastic products on the environment	
Plastic products: Focus on EU ban on emissions from microplastics in cosmetics and detergents	EU plastic strategy 2018 and EU Circular Economy Action Plan 2020 (CEAP) (part of EU Green Deal)	Voluntary phasing out of microbeads by the Netherlands Cosmetics Association
Rivers: Putting on the agenda and embedding the approach to litter on banks among managers along rivers.		

Measure	European/international legislation	National instruments
Shipping: 1. Implementation of the duty to deliver persistent floating cargo residue from 2021. 2. Improve prewash procedure: submit IMO proposal to improve prewash procedure for this cargo residue.	Implementation IMO legislation	to be determined
Fisheries: If an alternative for dolly rope is found, we will aim to phase out conventional dolly rope by the year 2027. This will be part of the Green Deal Fisheries for a clean sea Possible action lines: 1. Phasing out by incentive: financial (tax) incentive use alternatives (link UPV and MIA/VAMIL) to make alternatives financially more attractive 2. Facilitate/ organise promotion activities of alternatives	to be determined	to be determined
D11 Underwater noise		
Permit regimes wind farms	Council Directive on the conservation of wild birds (Birds Directive; 79/409/EEC), Council Directive on the conservation of natural habitats and of wild flora and fauna (Habitats Directive; 92/43/EEC)	Nature Conservation Act
Reduce impulsive noise via the Code of Conduct explosion clearing		Royal Netherlands Navy Code of Conduct using munition on the North Sea, 2005 (to be replaced in 2016 by new instruction Command Naval Forces)
Regulation sonar use		Instruction Command Naval Forces-Directorate Operations MWC 230 Responsible use of active sonar (2015)
Explore possibilities to amend regulation seismic survey	Council Directive on the conservation of wild birds (Birds Directive; 79/409/EEC), Council Directive on the conservation of natural habitats and of wild flora and fauna (Habitats Directive; 92/43/EEC)	Mining Act
Implement IMO guidelines for the reduction of underwater noise of commercial shipping	Guidelines for the Reduction of Underwater Noise from Commercial Shipping to Address Adverse Impacts on Marine Life, IMO MEPC. 1/Circ. 833	
Limit platform lighting on oil and gas platforms	Guidelines to reduce the impact of offshore installations lighting on birds in the OSPAR maritime area. OSPAR Agreement 2015-08 (2015)	
More actively implement IMO guidelines for the reduction of underwater noise of commercial shipping		to be determined

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