English summary

DRAFT

MSFD Programme of Measures for Marine Protection in the German Parts of the North Sea and the Baltic Sea (including environmental report)

Updated for 2022–2027

Report on the Review and Update of the MSFD Programme of Measures pursuant to Article 45j in conjunction with Article 45h(1) of the Federal Water Act

Die Bundesregierung

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Note on the English summary

The official German programme of measures includes:

Summary report[1] with:

- An executive summary
- In Part I: a summary with general information on the procedures and methods, including regional coordination of measures, for reviewing and updating the programme of measures 2016–2021.
- In Part II: a programme of measures dedicated to the North Sea summarising the findings of the initial assessment, the environmental targets set in 2012, the contribution of measures under other policies and MSFD measures of the first cycle 2016–2021 to achieving the targets, and the additionally planned MSFD measures following the review and update of the programme of measures for 2022–2027. The section includes an environmental report according to the provisions of the Federal Environmental Impact Assessment Act on strategic environmental assessment.
- In Part III: a programme of measures dedicated to the Baltic Sea, in analogy to Part II for the North Sea.
- In Part IV: The environmental report according to the provisions of the Federal Environmental Impact Assessment Act with the strategic environmental assessment of the programmes in Part II and Part III.
- In the Annexes: an overview of the operational environmental targets, progress on achieving the targets and coverage by MSFD measures for national waters in the North and Baltic Seas (Annex 1a and 1b), an overview of the measures under other policies and specifically planned for MSFD to achieve the environmental targets (Annex 2), an overview of the selected national, European and international legislation (Annex 3) and matrix of the assessment of potential impacts of the additional or modified MSFD measures on protected assets (Annex 4).

Attachment 1 to the summary report[2]:

- Fact sheets for each of the planned MSFD measures providing detailed information on those measures. The Attachment presents in part I MSFD measures planned to be added to the programme of measures in the second cycle 2022–2027 or MSFD measures of the first cycle 2016–2021 modified in the update of the programme; part I is subject to public consultation and impact assessment. The Attachment presents in part II MSFD measures of the first cycle 2016–2021 which remained unchanged in substance since 2015.

Attachment 2 to the summary report[3]:

- Background information on the applied approach to socio-economic assessments.

[1] https://www.meeresschutz.info/oeffentlichkeitsbeteiligung.html?file=files/meeresschutz/beteiligung/art13-massnahmen/zyklus22/MSRL_Art13_Massnahmenprogramm_Rahmentext.pdf

[2] https://www.meeresschutz.info/oeffentlichkeitsbeteiligung.html?file=files/meeresschutz/beteiligung/art13-massnahmen/zyklus22/MSRL_Art13_Massnahmenprogramm_Anl_1_Massnahmenkennblaetter.pdf

[3] https://www.meeresschutz.info/oeffentlichkeitsbeteiligung.html?file=files/meeresschutz/beteiligung/art13-massnahmen/zyklus22/MSRL_Art13_Massnahmenprogramm_Anl_2_Soziooekonomische_Bewertung.pdf

The English summary is a compilation of the following excerpts from the above quoted programme of measures:

- Summary report: Executive summary
- Summary report: Part I Summary
- Summary report: from Part IV, the summary of the impact assessment and transboundary aspects
- Overview of environmental targets (established in 2012)
- Summary report Annex 2: Overview of existing and new measures to achieve the environmental targets
- Attachment 1 to the summary report: excerpts of the fields “measure description” and “implementation mode / instrument” and “modifications in review” for the MSFD measures added or modified for updated PoM in part I (for consultation) and reference to the English measure description for the list of MSFD measures of the first cycle which remain unchanged in part II (for information).

Executive summary

The *Länder* of Bremen, Hamburg, Mecklenburg-Western Pomerania, Lower Saxony and Schleswig-Holstein and the Federal Government drew up a joint programme of measures for 2016–2021 to achieve or maintain a good environmental status of Germany's coastal and marine waters in the North Sea and Baltic Sea in accordance with the requirements of the EU Marine Strategy Framework Directive (MSFD).

The present update brings up to date the programme of measures for the years 2022–2027. It refers to the 2018 assessment of the status of German marine waters in the North Sea and Baltic Sea, according to which good environmental status has not yet been achieved in many aspects.

The update also refers to the progress made in achieving the environmental targets. In some cases, it was possible to specify the targets in terms of pollution reduction or level of protection and to assess them against the relevant indicators. Progress is evident above all in the reduction of polluting inputs. Overall, the environmental targets have not yet been achieved in many aspects.

Implementation of the first-cycle measures (2016–2021) is progressing, however with only a few measures completed to date. Further efforts are required to fully implement both the measures specifically planned for MSFD implementation (MSFD measures) and those measures that are to be taken to implement other policies (e.g. Water Framework Directive or Common Fisheries Policy), but which contribute significantly to the achievement of objectives under the MSFD. The updated programme of measures therefore continues the measures of the first cycle and provides for an intensification of their implementation.

To this end, the fact sheets of the first-cycle MSFD measures were updated. Two measures were significantly revised on the basis of new findings and their content was realigned, while two other measures were combined into a new measure and replaced by it. A further eight measures incorporated additional aspects of measures or more concrete specifications. This applies in particular to the first-cycle measures regarding marine litter, which already comprehensively address the issue and have now been expanded and rendered in more specific detail by means of various subcomponents or individual aspects, among others with regard to "ghost nets". Further revisions of first-cycle measures also concern measures on eutrophication, contaminant load, biodiversity, fisheries and underwater noise.

To support the achievement of the environmental targets and good environmental status, the updated programme of measures includes 20 additional measures in the MSFD catalogue of measures. For enhanced protection of marine biodiversity, the establishment and management of resting areas and refuges for marine species and benthic habitats, restoration and development of reefs, measures to prevent the introduction and spread of non-indigenous species, and ecological sediment management are foreseen. With regard to polluting inputs to marine ecosystems, seven measures concern the reduction of inputs of nutrients, contaminants and waste associated with maritime shipping and seaports. Other measures aim to reduce nutrient inputs via the atmosphere and through aquaculture systems, and to increase natural denitrification by seagrass beds. The development of marine-relevant target values at the limnic/marine transfer point and the derivation of reduction requirements inland for inputs of phosphorus, contaminants and plastics create a basis for the effective management of river basin districts under the Water Framework Directive in line with the objectives of marine protection.

The updated planning of measures takes into account the update of the HELCOM Baltic Sea Action Plan and the OSPAR North-East Atlantic Environment Strategy for the next decade as well as, insofar as possible, the planning of MSFD measures by the countries bordering the North and Baltic Seas. The aim of the updated programme of measures is to achieve a more coherent and effective management of marine waters in the two marine regions through synergies, interfaces and joint measures. The additionally planned MSFD measures also take up recommendations by the EU Commission to close gaps in the programme of measures for 2016–2021.

The update of the programme of measures follows the procedures and methods used for the preparation of the programme of measures for 2016–2021, including the following developments:

- Progress in specifying and quantifying operational environmental targets helps to devise actions required.
- A study complements the review of the programme of measures with a systematic-methodological analysis of effectiveness and gaps.
- Interactions between planned measures, expected developments in human activities and pressures, and climate change are explicitly included in the planning of measures.
- For sufficiently concrete measures which have a direct environmental impact, a detailed impact assessment including a cost-benefit analysis that goes beyond a preliminary estimate of the socio-economic consequences is carried out before the programme of measures is finalised.

The measures summarised in the programme of measures for 2022–2027 are suitable for reducing the identified main pressures and strengthening the protection of biodiversity, thus supporting the achievement of the defined environmental targets and of good environmental status.

Insofar as public sector measures are necessary, these will be implemented within the confines of available funding.

There are many reasons why a good environmental status was not achieved by 2020: The planned measures can only have their desired effect once they have been fully implemented. To date there is no concrete planning of measures for some of the individual environmental targets. The period between the entry into force of the programme of measures for 2016–2021 and the target year 2020 was very short. The timelines for targets of other policies and measures that make a significant contribution to achieving the MSFD targets do not always match the MSFD target year. There is a need for increased cooperation on transboundary environmental problems. Scientific uncertainties in the assessment of certain environmental problems (e.g. underwater noise) make it difficult to take targeted measures. Finally, even after all necessary measures have been implemented, there is often a time lag before ecosystems respond.

Summary of the updated programme of measures

1. Rationale and objectives

With its Marine Strategy Framework Directive (MSFD) [4], the EU has created a legally binding framework under which the EU Member States take the necessary measures to achieve or maintain good environmental status (GES) of the marine environment by 2020. To this end, the Member States develop a marine strategy for their marine waters in accordance with the plan of action set out by the MSFD in respect of each of the marine regions or sub-regions concerned. This marine strategy is to be reviewed and updated every six years within an adaptive management regime (Figure I.1). Member States sharing a marine region or sub-region cooperate to ensure that, within each such region or sub-region, their marine strategies and the measures required to achieve the objectives of the MSFD are coherent and coordinated.

The development of a programme of measures constitutes the final step in the six-year cycle of MSFD implementation. It builds on the assessment of the status of marine waters, the description of what constitutes “good” environmental status (GES), the setting of environmental targets and the establishment of a monitoring programme. Germany adopted the first programme of measures for the 2016–2021 implementation cycle in 2015 and reported it to the EU Commission in 2016.[5] The programme has now been reviewed and updated in accordance with Article 45j of the Federal Water Act. The present document updates the programme of measures for the years 2022–2027.

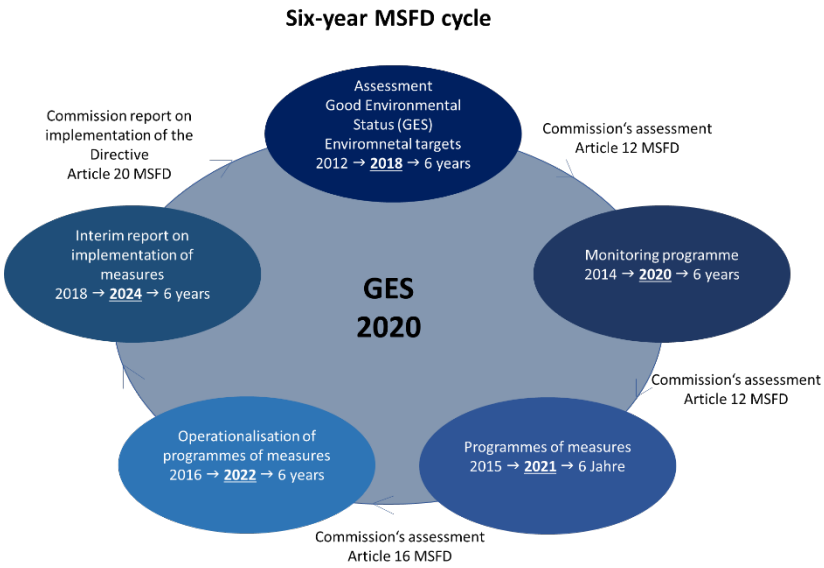

Figure I.1: Six-year MSFD cycle

The update of the programme of measures is based on the environmental targets reported in 2012[6] and confirmed in 2018[7], as well as the latest assessment of the status of German marine waters in the North Sea and Baltic Sea produced in 2018[8]. With the adoption of Commission Decision (EU) 2017/848[9], the EU Member States have specified the requirements for the description and assessment of GES, which are to be implemented through cooperation in the EU and in the marine regions. The Commission Decision’s aim is

[4] Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive) (Text with EEA relevance), OJ L 164, 25.6.2008, p. 19–40.

[5] BMUB (Ed.), 2016, https://www.meeresschutz.info/berichte-art13.html

[6] BMUB (Ed.), 2012c, https://www.meeresschutz.info/berichte-art-8-10.html

[7] BMU (Ed.), 2018a, https://www.meeresschutz.info/berichte-art-8-10.html

[8] BMU (Ed.), 2018a, https://www.meeresschutz.info/berichte-art-8-10.html

[9] Commission Decision (EU) 2017/848 of 17 May 2017 laying down criteria and methodological standards on good environmental status of marine waters and specifications and standardised methods for monitoring and assessment, and repealing Decision 2010/477/EU, OJ L 125, 18.5.2017, p. 43–74

to create a common basis and level of ambition for the description and assessment of GES, which should make it possible in future to assess whether GES has been achieved or when good status can be expected to be achieved. The → 2018 status assessment takes into account, insofar as possible, the requirements of the Commission Decision on criteria and standards for the description and assessment of GES. The qualitative description of GES of 2012 remains unaffected and continues to apply[10]. The → Programme of Measures for 2016–2021 (see → English Summary[11]) has been reviewed and updated in light of these developments and latest assessment results.

The update also takes into account the recommendations made in 2018 by the EU Commission to the EU Member States in general and specifically to Germany upon the occasion of the assessment of the 2016–2021 programmes of measures pursuant to Article 16 MSFD.[12] With regard to the German programme, the EU Commission found a good correlation between pressures and measures and made recommendations per descriptor. In summary, it recommended the following[13]:

- Germany should better address certain pressures and activities in accordance with the descriptor-specific recommendations.
- GES and targets definitions should be better covered for underwater noise and energy (D11), water column habitats (D1, 4) and seabed habitats (D1, 4, 6).
- Germany should develop more efforts to fill knowledge gaps and provide an assessment on when GES will be achieved.
- Germany's programme should establish more links with existing EU policies and international instruments for contaminants in seafood (D9) and underwater noise (D11).
- The programme should provide more information about its spatial protection measures (representation of species and habitats within the marine protected areas (MPAs), the size, number and location of MPAs, the conservation objectives of the MPAs and the policies and measures that will be in place within these areas).
- Germany should quantify the pressures present in its waters and their expected level of reduction as a result of the established measures. This could be facilitated by further efforts to address knowledge gaps and define the methodology for such estimations at regional or EU level. Such quantification would also contribute to linking the measures with the achievement of GES.

The programme of measures, as well as the German marine strategies in general, apply an ecosystem-based approach to the management of human activities, ensuring that the collective pressure of such activities is kept within levels compatible with the achievement of good environmental status and that the capacity of marine ecosystems to respond to human-induced changes is not compromised, while enabling the sustainable use of marine goods and services by present and future generations (*cf.* MSFD Article 1(3)). An operational framework is provided by essential scientific findings in marine science research.

The individual measures as part of the programme of measures are based on the above approach and are devised on the basis of the precautionary principle and the principles that

[10] BMUB (Ed.), 2012b, https://www.meeresschutz.info/berichte-art-8-10.html

[11] https://www.meeresschutz.info/berichte-art13.html?file=files/meeresschutz/berichte/art13-massnahmen/MSFD_Art13_Programme_of_Measures_English-Summary.pdf

[12] EU Commission, 2018a, https://ec.europa.eu/environment/marine/eu-coast-and-marine-policy/implementation/reports_en.htm

[13] EU Commission, 2018b, https://ec.europa.eu/environment/marine/eu-coast-and-marine-policy/implementation/reports_en.htm

preventive action should be taken, that environmental damage should, as a priority, be rectified at source and that the polluter should pay. When drawing up the programme of measures, due consideration must be given to the social and economic impacts of the measures envisaged and impact assessments, including cost-benefit analyses, are to be undertaken (*cf.* MSFD Article 1(3)).

In other words, applying the ecosystem approach, the programme of measures implementing the Marine Strategy Framework Directive should be appropriate to achieve or maintain good environmental status while enabling a sustainable use of marine goods and services (Recital (8) MSFD). Against this background, a comprehensive identification and weighing up of the interests concerned and the impacts of planned measures are required when measures are determined and implemented. Disproportionately high adverse effects of a different kind on socially and economically indispensable foundations of livelihoods (e.g. for shipping and its transport routes in conjunction with the associated guarantee of the safety and ease of shipping traffic to ensure access to seaports) must be avoided.

The present programme of measures for 2022–2027 continues to pursue the aim of reconciling marine ecosystem protection with the sustainable and prudent use of marine waters. On account of the increasing utilisation pressure on the German marine areas and the resultant impacts as well as the limits to the marine ecosystems' carrying capacity, there is a need for integrated management of human activities. The programme of measures describes the necessary measures to be taken in the 2022–2027 period to achieve good environmental status and the environmental targets.

2. Background

In Germany, the establishment and updating of the programme of measures is governed by Article 45j in conjunction with Article 45h of the Federal Water Act (WHG). Pursuant to WHG Article 45a(1), German marine waters are to be managed in a manner that

- prevents a deterioration in their status and
- maintains GES or achieves it by 2020.

In order to achieve these management objectives, marine ecosystems shall be protected and preserved, and restored in areas where they have been adversely affected, anthropogenic inputs of substances and energy into marine waters shall be progressively avoided and reduced, and existing and future opportunities for sustainable use of the sea shall be maintained or created (Article 45a (2) WHG).

The programme of measures is a component of the national marine strategy for achieving GES in the German parts of the North and Baltic Seas. GES is defined with reference to marine biological diversity, non-indigenous species, commercially exploited fish and shellfish stocks, the food web, eutrophication, sea-floor integrity, hydrographical conditions, contaminants, marine litter and the introduction of energy (Table I.1).

The programme of measures is based on the 2018 assessment of the German parts of the North and Baltic Seas (WHG Article 45c, initial assessment pursuant to MSFD Article 8) and the environmental targets derived from this assessment in 2012 and confirmed in 2018 that are required to achieve GES (WHG Article 45e).[14] In 2017, the public was given the opportunity to submit written comments on the draft reports on the initial assessment of the marine waters' environmental status, on the determination of GES, and on the establishment of environmental targets. The submissions received[15] in the course of this consultation were

[14] BMU (Ed.), 2018a and BMUB (Ed.), 2012c, https://www.meeresschutz.info/berichte-art-8-10.html
[15] BMU (Ed.), 2018b, https://www.meeresschutz.info/berichte-art-8-10.html

taken into account in the finalisation of the national reports submitted to the EU Commission in 2018. Where the statements provided specific suggestions for measures to be taken, these were taken into consideration in the development of the present programme of measures.

The seven overarching environmental targets (Table I.2) are further specified by operational targets and associated indicators. The operational targets reported to the EU Commission in 2012 and confirmed in 2018 (Annex 1) predominantly relate to managing human activities, such as reducing pressures and protecting biodiversity. As management targets they relate to concrete implementation measures within the meaning of MSFD Annex IV (2)(c).

In accordance with the decisions of the EU Commission, the Water and Marine Directors and the Joint Working Group of the Federal Government and the *Länder* on Water (LAWA) [16], the WFD measures were used as one basis for the planning of MSFD measures. Therefore, the WFD measures will not be presented in any detail in the MSFD programme of measures. Please refer to the documentation and reporting on the third management plan including the Programmes of Measures for 2022–2027 under the WFD. As part of the planning of MSFD measures 2022–2027, the Federal Government/*Länder* Working Group on the North Sea and Baltic Sea (BLANO) has indicated to LAWA actions required in the area of the Water Framework Directive and the Nitrates Directive from a marine protection perspective. The existing exchange between BLANO and LAWA is being intensively pursued with a view to improved coherence in MSFD and WFD implementation and for the purposes of jointly achieving the MSFD objectives.

For the purposes of coordination and standardised representation of national measures to achieve GES in coastal and marine waters, the catalogue of measures established for the Water Framework Directive (WFD) and the EU Floods Directive was updated to include the measures for MSFD implementation. This approach once again highlights the linkage between WFD measures and the MSFD (LAWA-BLANO Catalogue of Measures), with the WFD measures being implemented in accordance with WFD specifications. The Catalogue was updated on the basis of the third management plan and the present update of the MSFD programme of measures[17]. The allocation of the new MSFD measures to the numbering in the catalogue is set out in Annex 2. To improve legibility and allocation, in the present report each new MSFD measure is also given a consecutive number (y) relating to the relevant environmental target (UZx) and is thus integrated into the existing count of measures per environmental target (UZx-y).

[16] Decision on Agenda Item 3, No. 3 at the LAWA special session, 3–4 July 2014 in Husum, Germany: “The LAWA requests the BLANO to apply the DPSIR approach to water-relevant measures, in a manner analagous to that applied to the WFD.”

[17] LAWA, 2020, https://www.lawa.de/documents/lawa-blano-massnahmenkatalog_2_1595486344.pdf

Table I.1: MSFD descriptors (D) for determining good environmental status in accordance with Annex 1 MSFD, each preceded by a shortcut corresponding to the → 2012 national report determining good environmental status. The colours correspond to the colours allocated to the seven overall national targets given in Table I.2 that are used to roughly assign the descriptors to environmental targets, with all environmental targets serving to achieve GES for descriptors 1, 4 and 6.

D1	*"Biodiversity":* Biological diversity is maintained. The quality and occurrence of habitats and the distribution and abundance of species are in line with prevailing physiographic, geographic and climatic conditions.
D2	*"Non-indigenous species":* Non-indigenous species introduced by human activities are at levels that do not adversely alter the ecosystems.
D3	*"Status of commercially exploited fish and shellfish populations":* Populations of all commercially exploited fish and shellfish are within safe biological limits, exhibiting a population age and size distribution that is indicative of a healthy stock.
D4	*"Food webs":* All elements of the marine food webs, to the extent that they are known, occur at normal abundance and diversity and levels capable of ensuring the long-term abundance of the species and the retention of their full reproductive capacity.
D5	*"Eutrophication":* Human-induced eutrophication is minimised, especially adverse effects thereof, such as losses in biodiversity, ecosystem degradation, harmful algae blooms and oxygen deficiency in bottom waters.
D6	*"Sea-floor integrity":* Sea-floor integrity is at a level that ensures that the structure and functions of the ecosystems are safeguarded and benthic ecosystems, in particular, are not adversely affected.
D7	*"Hydrographical conditions":* Permanent alteration of hydrographical conditions does not adversely affect marine ecosystems.
D8	*"Contaminants":* Concentrations of contaminants are at levels not giving rise to pollution effects.
D9	*"Contaminants in seafood":* Contaminants in fish and other seafood for human consumption do not exceed levels established by Community legislation or other relevant standards.
D10	*"Marine litter":* Properties and quantities of marine litter do not cause harm to the coastal and marine environment.
D11	*"Introduction of energy":* Introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment.

Table I.2: The seven overarching national environmental targets (UZ), each of which is further specified by a number of operational targets (Annex 1), with all environmental targets serving to achieve GES for descriptors 1, 4 and 6. (Source: → 2012 reports on environmental targets for the North Sea and the Baltic Sea).

UZ 1	Seas unaffected by eutrophication
UZ 2	Seas not polluted by contaminants
UZ 3	Seas with marine species and habitats unaffected by impacts of human activities
UZ 4	Seas with sustainable and environmentally sound use of resources
UZ 5	Seas without pressures from litter
UZ 6	Seas not impacted by the introduction of anthropogenic energy
UZ 7	Seas with natural hydromorphological characteristics

3. Methods

Methodologically, the programme of measures follows the "Programmes of measures under the Marine Strategy Framework Directive – Recommendations for implementation and reporting" (hereinafter referred to as "PoM Recommendations") developed within the scope of the EU Common Implementation Strategy (CIS) for the MSFD[18].

Pursuant to the MSFD and the German Federal Water Act (WHG), the programme of measures consists of "existing measures" and "new measures".

“Existing measures” are measures relevant for the achievement and maintenance of GES under the MSFD, that have been adopted for the implementation of other policies andfully implemented (Category 1a) or that have been adopted for the implementation of other policies but have not yet been implemented or fully implemented (Category 1b). Hereafter, existing measures will be referred to as "ongoing measures under other policies".

"New measures" are measures taken specifically to achieve and maintain GES under the MSFD, which either build on existing implementation processes relating to EU law and international agreements but go beyond the requirements set out therein (Category 2a), or do not build on such existing processes (Category 2b). New measures (Categories 2a and 2b) will hereafter be referred to as "MSFD measures". Where required, a distinction will be made between MSFD measures of the first-cycle (2016–2021) and the second-cycle (2022–2027) respectively, depending on their time of adoption.

The establishment of the programme of measures is based on an updated inventory of ongoing measures under other policies, the implementation status of the programme of measures for 2016–2021, the status regarding the achievement of the set environmental

[18] EU MSFD CIS 2020, https://circabc.europa.eu/ui/group/326ae5ac-0419-4167-83ca-e3c210534a69/library/6dfa915a-af46-4a21-a545-1c1bda9909a4/details

targets, a qualitative assessment of the contribution of the programme of measures for 2016–2021 to the achievement of the operational environmental targets, and the identification and definition of any additional MSFD measures required. The selection and assessment of measures is undertaken with reference to the pressures identified in the initial assessment carried out in 2012 and the 2018 status assessment.

Annex 2 provides an overview of the relevant measures identified for achieving the set targets in the updated MSFD programme of measures for 2022–2027. They include measures that have been taken to implement other policies but support MSFD target achievement, as well as measures specifically planned for MSFD target achievement in the first and current implementation cycle. The operational environmental targets to be achieved by these measures are listed in Annex 1.

The further design and implementation of measures must have regard to governmental laws and jurisdictional rights established under international law, especially with respect to shipping, air traffic, military exercises and scientific marine research, as well as to uses agreed under international treaties, intergovernmental commitments, and legal obligations of government agencies. The limitations in the scope of application of the MSFD with regard to “activities the sole purpose of which is defence” also apply to the measures to be taken pursuant to WHG Article 45h. Due to their sovereign defence obligations, due regard is paid to the special characteristics of the German Federal Armed Forces.

3.1 Ongoing measures under other policies

Under the MSFD, a multitude of national, EU and international legal bases must be taken into account when planning and implementing measures. On that basis, Annex 2 sets out in an aggregated and updated form selected measures under other policies and their relation to the overarching environmental targets set under MSFD to which they make a significant contribution under the MSFD.

Pursuant to WHG Article 45h(1) sentence 5 (MSFD Article 13(6) in conjunction with Article 13(4) and (5)), information on existing marine protected areas is published at https://www.meeresschutz.info/berichte-art13.html.

The repertoire of the WFD catalogue of measures is available to address environmental targets with regard to river-borne inputs of nutrients and contaminants. The WFD measures also take account of the MSFD needs for coastal waters and the Exclusive Economic Zone, e.g. in terms of target values for nutrient concentrations at the transition point from limnic to marine waters. The updated draft WFD management programmes for the third WFD management cycle (2022–2027) also provide for efforts to be made to further the implementation of the WFD catalogue of measures for the purposes of the MSFD.

The initiative for improved coherence in the implementation of MSFD and WFD, taken again in 2020, provides for an exchange between BLANO and LAWA on the joint achievement of set targets under the MSFD. In the planning of MSFD measures, measures have been identified under the WFD the adoption and implementation of which are priorities from a marine protection perspective in order to achieve progress towards the set targets under the MSFD. An additional MSFD measure (UZ1-07) provides for close cooperation between BLANO and LAWA in the development of target values for phosphorus, selected contaminants and plastic waste (incl. microplastics) at the transition point from limnic to marine waters in the context of MSFD implementation and the derivation of reduction needs and reduction measures in the context of WFD implementation.

The LAWA has shown in its 2014 paper titled "*Empfehlungen zur koordinierten Anwendung der EG-MSRL und EG-WRRL – Parallelen und Unterschiede in der Umsetzung*"[19] (Recommendations for the coordinated application of the EU MSFD and the EU WFD – Parallels and differences in implementation) that many of the planned WFD measures can be expected to yield positive impacts on the status of marine waters. These measures therefore serve as a basis for the MSFD programme of measures, while their implementation and further development will be pursued through the existing WFD structures.

For this reason, the MSFD programme of measures only provides for some individual *Länder*-specific measures relating to river-borne nutrient and contaminant inputs. In particular, measures relating to the farming sector, which is the main source of land-based nutrient inputs into the marine environment, are determined, in addition to the WFD, primarily by the implementation of the EU Nitrates Directive and the basic requirements to reduce pollution load from agriculture. To this end, the German Fertiliser Ordinance was amended in 2017 and 2020. The current measures will come into force on 1 January 2021. The effectiveness of the Fertiliser Ordinance and the WFD for achieving the MSFD targets will be reviewed in the subsequent MSFD implementation cycle (implementation status of the programme of measures in 2024, assessment of the status of marine waters and the achievement of the environmental targets in 2024, effectiveness review with a view to updating the programme of measures in 2028).

3.2 Status of implementation of the programme of measures for 2016–2021

In order to achieve the MSFD targets, it is necessary to ensure and strengthen the implementation, intensity and effectiveness of the ongoing measures under other policies and the first-cycle MSFD measures.

Within the measures not yet or not fully implemented, which serve to implement other policies and EU Directives, it is necessary to differentiate between WFD measures and other measures. As many as possible of the WFD measures are to be implemented or at least initiated by 2027. A large number of non-WFD measures have meanwhile been implemented. In many cases, however, this merely means that they have seen timely transposition into national law. This does not yet allow for any assertions as to the fulfilment of the relevant targets set, which in some cases, such as in the case of the EU's Common Fisheries Policy (CFP), is still pending.

In 2018, Germany provided its first interim report under Article 18 MSFD on the status of implementation of the programme of measures, focusing on the first-cycle MSFD measures. Their implementation has progressed further since then. Two measures have been fully implemented: The agriculture cooperation project (UZ1-01) and the establishment of a Nitrogen Emission Control Area (NECA) in the North Sea and Baltic Sea (UZ1-04). All other measures are still being implemented. In many cases, components of measures exerting direct controls are still in preparation and planning phases and do not yet have an environmental impact. This is especially true for multi-stage measures in which the process of determining the scope for action precedes their implementation. Full implementation is planned for the majority of measures by 2024 and 2027 (Figure I.2).

[19] LAWA 2014, http://www.wasserblick.net/servlet/is/142651/WRRL_2.7.6_Verlinkungspapier_WRRL_MSRL.pdf?command=downloadContent&filename=WRRL_2.7.6_Verlinkungspapier_WRRL_MSRL.pdf

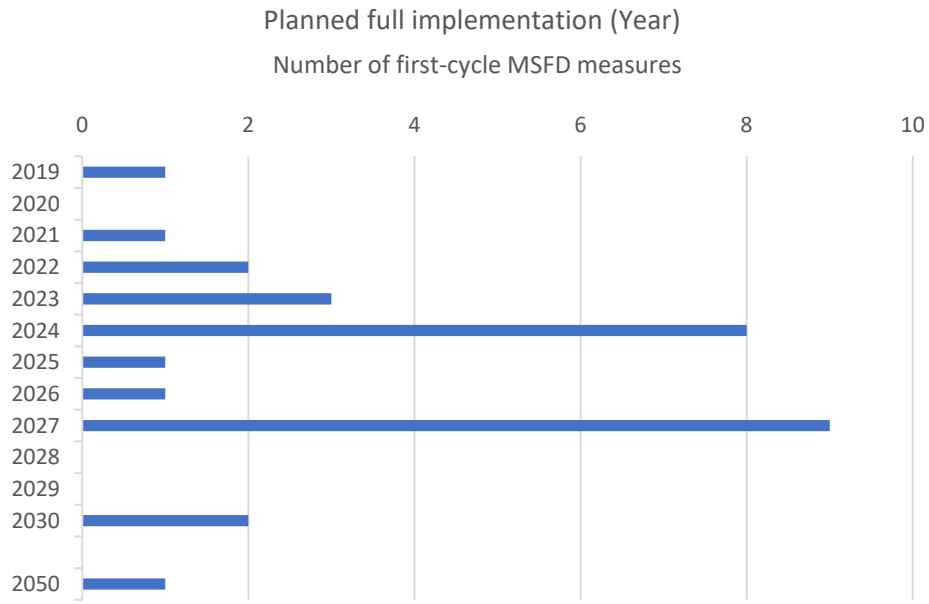

Figure I.2: Number of first-cycle MSFD measures planned for full implementation in the year indicated. Status in 2021 after measures were updated. Two measures have already been implemented (2019, 2021).

3.3 Achieving the environmental targets

The update of the programme of measures is based on the operational environmental targets reported in 2012 and confirmed in 2018 (Annex 1). In some cases, it was possible to assess target achievement in 2018 on the basis of their associated indicators. In many cases, however, an assessment can only be made on the basis of a more detailed specification and quantification of the operational environmental targets. The detailed specification and quantification of environmental targets often depends on the progress made in defining quantified threshold values for GES. For example, since 2012, target values for nitrogen concentrations at the transition point from limnic to marine waters in the German North Sea and Baltic Sea waters have been determined and agreed upon through modelling in order to quantify the national environmental targets. In the context of HELCOM, the tonnage reduction in German nitrogen and phosphate inputs into the Baltic Sea was determined.

In 2020, the BLANO intensified its efforts to further specify/quantify operational environmental targets. For seven operational environmental targets for the North Sea and the Baltic Sea, it was possible to produce more detailed specifications/quantifications in the form of ultimate or intermediate targets. Insofar as their indicators are operational, an up-to-date assessment of target achievement was undertaken for the present planning of MSFD measures. In all other respects, reference is made to the 2018 status assessment for target descriptions and assessments of target achievement.

Work on further specification/quantification continues in the BLANO in order to be able to report on further progress and corresponding assessments of the achievement of targets by the next notification deadline pursuant to Article 10 MSFD.

3.4 Derivation of MSFD measures for the second cycle

Effectiveness and gap analysis

In the first cycle, the assessment of ongoing measures under other policies had shown that overall they were insufficient to achieve the environmental targets and ultimately GES. Therefore the programme of measures for 2016–2021 provided for an additional 31 MSFD measures that go beyond existing regulations and are to be taken specifically for MSFD implementation (first-cycle MSFD measures). These are measures relating to litter, noise and contaminant inputs from anthropogenic sources in the sea and by air, as well as measures to protect marine species and habitats.

The current review of the programme of measures has shown that, in addition to further efforts to implement the measures planned for 2016–2021, additional measures are needed to be able to achieve the environmental targets and ultimately GES.

A study being conducted in 2021 will support the review of the programme of measures through a systematic methodological effectiveness and gap analysis. Its methodology and summary results will be presented here once the study is available.

Identification and determination of measures

The starting point for the identification and definition of MSFD measures are around 190 ideas for measures proposed by BLANO partners for inclusion in the updated programme of measures, either new measures (about 46) or from the pool of measures deferred in 2016 (about 25), or measures proposed by environmental associations (about 16). In addition, roughly 100 ideas for measures were proposed by Member States, non-governmental organisations, HELCOM committees and experts as part of the update of the HELCOM Baltic Sea Action Plan. Based on these ideas, eleven thematic groups, composed of experts from relevant national authorities, developed technical proposals for measures to be included in the updated programme of measures. To this end, individual ideas were further developed or several ideas were combined into a new proposed measure. The following additional considerations were taken into consideration in the development of the technical proposals, based on an assessment of effectiveness and gaps:

- Coverage of operational environmental targets
- Coverage of the main drivers
- Coverage of the main pressures
- Coverage of the main input pathways
- Relevance to the national programme of measures (as distinct from measures that are better to be established at the regional level, e.g. HELCOM or OSPAR)
- Potential effectiveness of the measures in achieving the environmental targets
- Technical feasibility of the measure

The list of proposed measures confirmed by BLANO at the end of September 2020 formed the basis for the further development of measures and for the scoping process for the Strategic Environmental Assessment in October 2020.

The current draft programme provides for 20 additional MSFD measures to be included in the programme. Other ideas for measure were incorporated into the first-cycle MSFD measures by expanding or supplementing the measures' descriptions (e.g. new components added to measures) or specifying in greater detail the measures' implementation. Two MSFD measures from the first cycle were revised on the basis of new findings and realigned in

terms of their substance (UZ1-03, UZ2-04), and two further MSFD measures from the first cycle (UZ5-03, UZ5-09) were withdrawn, merged into and replaced by a new consolidated MSFD measure.

The MSFD measures of the first and second cycle draw on the options in terms of types of measures as set out in Annex VI of the MSFD. The measures are set out programmatically, which means that

- they may include several individual measures, combinations of measures and different modes of action (legal, technical, political, economic);
- they may include measures that can be implemented concurrently or consecutively to 1) directly influence behaviour, 2) prepare measures influencing behaviour, and 3) promote measures at the international level;
- as part of the operationalisation of the programme of measures, they must be specified in greater detail and defined in terms of their spatial/geographic application by the end of 2016 and 2022 respectively.

3.5 Spatial protection measures

For many years now, Germany has actively engaged in pursuing effective marine biodiversity protection. With the entry into force of the European Directive on the conservation of natural habitats and of wild fauna and flora (Habitats Directive, 92/43/EEC) in 1992, the EU Member States have committed to creating a coherent network of protected areas, including marine protected areas. Together with the Special Protection Areas (SPAs) classified under the EU Birds Directive (2009/147/EC), the Special Areas of Conversation (SACs) designated under the Habitats Directive form the Natura 2000 system of protected areas. Germany has notified 43% and 51% of its marine waters in the North Sea and Baltic Sea respectively to the EU Commission for inclusion into the Natura 2000 system of protected areas (Figure I.3). In Germany, all marine protected areas have been designated under national law and management plans have been drawn up. Moreover, Germany created the legal possibilities to include additional species and habitat types as protected assets in marine protected areas throughout the marine area (Measure UZ3-01).

Pursuant to the MSFD and WHG Article 45h, programmes of measures are to include spatial protection measures, contributing to coherent and representative networks of marine protected areas pursuant to Article 13(4)) MSFD. These include Special Areas of Conservation pursuant to the Habitats Directive, Special Protection Areas pursuant to the Birds Directive, and marine protected areas established under international or regional agreements. In Germany, the latter cover marine protected areas established under the OSPAR and HELCOM Conventions (which are largely congruent with protected areas under the Habitats and/or Birds Directives) as well as the recommendations of the OSPAR and HELCOM Conventions for the conservation of marine biodiversity. Spatial protection measures also cover the three Wadden Sea National Parks in Lower Saxony, Schleswig-Holstein and Hamburg as part of the Trilateral Cooperation on the Protection of the Wadden Sea (hereinafter referred to as “Trilateral Wadden Sea Cooperation”) (TWSC, 1982/2010).

Moreover, an additional MSFD measure on "Refuge and resting areas for benthic habitats, fish, marine mammals, sea and coastal birds to protect against anthropogenic disturbance" (UZ3-03) will be implemented. This measure is to take into account positive effects of management measures on protected assets in Natura 2000 sites, which may occur with a time lag of several years. The starting point for the analyses underpinning measure UZ3-03 is the existing suite of protected areas. If the requirements for species and biotopes cannot be met in existing protected areas, spatially defined additional measures outside of protected

areas may be considered. The management plans for the EEZ are taken into account in this regard. The aim is to identify spaces for conservation measures that integrate as many protected assets as possible.

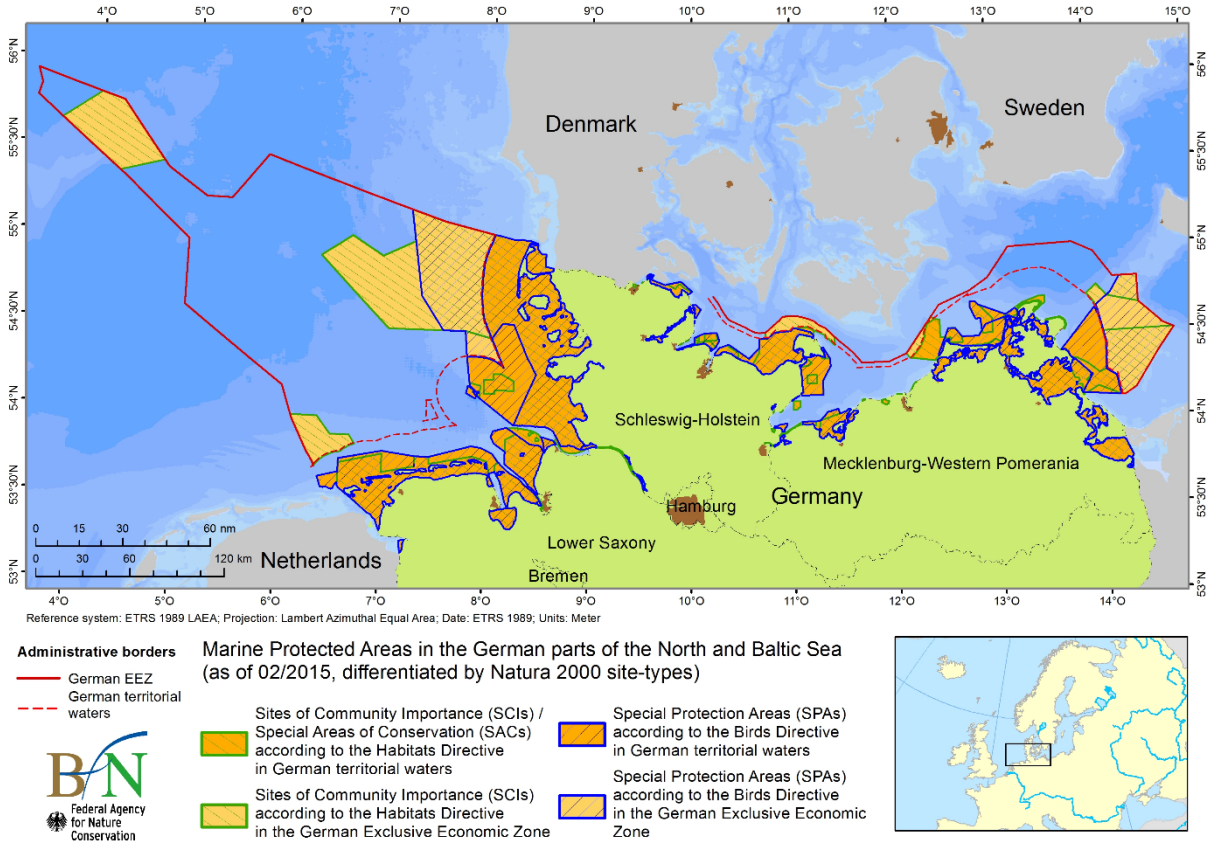

Figure I.3: Marine protected areas in the German North Sea and Baltic Sea (as notified to the EU Commission pursuant to MSFD Article 13(6)[20]).

4. Impact assessment of measures

The good environmental status of the North Sea and the Baltic Sea is an important foundation for the sustainable use of marine waters and for coastal economic sectors such as tourism. Pursuant to the MSFD/WHG, impact assessments must be carried out for new measures prior to the establishment and updating of the Programmes of Measures. In addition to the costs, these assessments must also consider the measures' social benefits in terms of an improving marine environment.

The impact assessment is mandatory for Category 2b measures. For Category 2a measures that build on existing policies, the need for an impact assessment is to be decided on a case-by-case basis. An impact assessment is not required or feasible for measures or components of measures that do not have a direct environmental impact or steering effect, such as measures of a conceptual nature or components that are initially limited to research or planning work and precede the derivation of the actual measure. A detailed impact assessment can only be considered once concrete measures have been derived.

[20] BfN, 2015, https://www.meeresschutz.info/berichte-art13.html

The implementation of a detailed qualitative and quantitative impact assessment depends on the individual measures having been specified in detail and defined in terms of their spatial/geographic application as well as their intensity. These specifications are part of the operationalisation of the measures, which, pursuant to the MSFD/WHG, is to be carried out within one year of the establishment of the programme of measures or its update.

Of the 31 MSFD measures notified in the first cycle, 15 measures have so far been subjected to detailed impact assessments including cost-benefit analyses pursuant to MSFD requirements in the course of the operationalisation and implementation of measures.

As was already the case for the 2016–2021 programme of measures, the impact assessment for the updated programme of measures is also being conducted as a two-step process. In this process, an initial, highly simplified preliminary assessment of socio-economic consequences (socio-economic pre-assessment) is carried out for the preparation of the programme of measures and documented in the fact sheets for each of the measures (Attachment 1 to the summary report). The detailed socio-economic assessment will be carried out when the measures have been specified in sufficient detail. The process and methodology for the socio-economic assessment to be conducted prior to the final establishment of measures are described in Attachment 2 to the summary report. The methodology paper was updated in 2020; the methodology already used in the first cycle has not changed[21].

For the detailed impact assessment, the following distinction is made between measures: Measures that at the time of planning are already specified in sufficient detail to assess their potential impact on the environment, economy and society are subjected to an immediate impact assessment. Measures whose effectiveness focuses on awareness-raising or prevention pose a special challenge with regard to the assessment of benefits in terms of direct environmental impacts. For these measures, in addition to cost estimates, a standardised qualitative presentation of their benefits is envisaged.

Measures that initially provide for planning steps such as conceptual studies or the collection of baseline data in order to derive concrete options for action based on these can only be subjected to a detailed impact assessment once the measures have been specified to a corresponding level of detail. Where possible, cost-effectiveness and impact assessments including cost-benefit analyses for these measures are embedded in the planning steps for these measures. Where measures do not go beyond conceptual activities, a detailed impact assessment is not indicated.

In contrast to the first cycle, the detailed impact assessment for selected aspects of second-cycle MSFD measures will already be carried out in parallel with the public participation process, provided the measures have been specified to sufficient detail. An assessment in parallel with the public participation process is planned for a total of 14 measures of the second cycle. The above-mentioned limitations for measures focusing on awareness-raising or prevention applies to six of these measures. For two MSFD measures of the second cycle, impact assessments are planned for a later stage, when they have been specified to sufficient detail. For six measures, an impact assessment does not appear to be necessary at this point in time.

[21] EN-version reported in 2016: https://www.meeresschutz.info/berichte-art13.html?file=files/meeresschutz/berichte/art13-massnahmen/MSFD_Art13_PoM_annex_2_socio-economic_assessment.pdf

5. Achieving good environmental status by 2020

The 2018 status assessment has shown that, based on the state of knowledge at that time, some aspects achieve good status. However, good status has not yet been achieved for all aspects and all coastal and marine waters (Figure I.4).

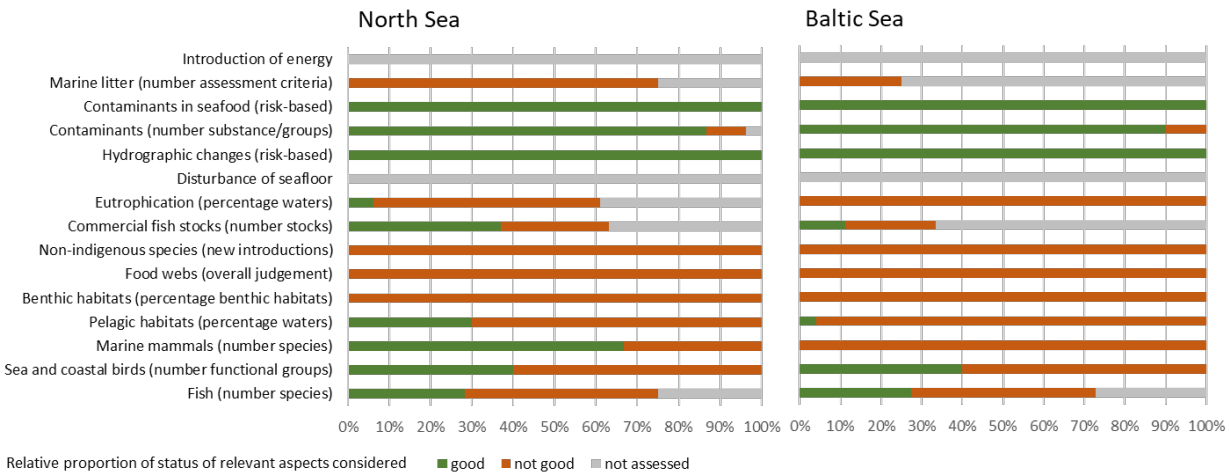

Figure I.4: Overview of the proportional status (good, not good, not assessed) of aspects of ecosystem components and pressures in the North Sea and Baltic Sea as they relate to the 11 MSFD descriptors. Source: → Status reports 2018.

Good status could not be achieved for all aspects by 2020. This is due to a variety of reasons:

- While implementation of almost all measures in the programme – both those under other policies and MSFD measures – has commenced, many are still in the planning phase and have not yet had an impact in the environment.
- For some individual targets, concrete planning of measures is, as yet, lacking. The present draft programme of measures for 2022–2027 is intended to close gaps in this regard.
- The period between the entry into force of the programme of measures for 2016–2021 and the stipulated target attainment in 2020 was too short for the programme of measures to exert its full impact.
- In some cases, essential measures serve to implement policies in other areas (e.g. WFD, waste management, Common Agricultural Policy, Common Fisheries Policy, IMO shipping regulation) the implementation timelines of which do not match the MSFD's targeted achievement by 2020.
- When it comes to transboundary impacts (e.g. eutrophication, marine litter), there is a need for increased cooperation and joint action between the North Sea or Baltic Sea countries within the framework of OSPAR and HELCOM, both in setting quantitative operational targets and in planning measures, in order to make further progress towards GES.
- In individual cases (e.g. underwater sound), due to a lack of assessment tools, it is currently not possible to accurately forecast the size of the gap between the current status and GES or when good status could be achieved.

– Even after all necessary measures have been implemented, there is often a time lag before ecosystems respond.

A summary assessment of the programme of measures based on existing studies and expert judgement has shown that the programmes' combined measures are well suited to reducing the identified predominant pressures in pursuit of the environmental targets and good environmental status as defined, and to strengthening biodiversity protection.

Important steps for the detailed specification of the measures are their geographic localisation for application, their intensity, and temporal planning. They are carried out as part of the operationalisation of the programme, as initiated by the end of 2016 in the first cycle and envisaged by the end of 2022 in the second cycle.

Against this background and taking into account the above-mentioned reasons for the non-achievement of good environmental status in 2020, the Federal Government and the *Länder* have decided to not yet make use of deadline extensions or exemptions pursuant to Article 45g WHG. The present programme focuses on intensifying the implementation of the measures planned so far in pursuit of target attainment.

For land-based pressures on German marine waters in the form of nutrient and contaminant inputs, the German *Länder* in 2009 availed of the opportunity provided for in the Water Framework Directive to extend to 2027 the deadlines for WFD implementation for the purposes of a phased achievement of the objectives for the water bodies in question. Due to the possible use of deadline extensions or exemptions beyond this period for coastal water bodies, reference is made here to the updated management plans and programmes of measures for 2022–2027 and the 2022 reporting under the WFD.

6. Impacts of climate change

The warming of the Earth's atmosphere due to climate change is also changing the marine environment, a fact most recently highlighted once again in the Intergovernmental Panel for Climate Change's (IPCC) Special Report on the Ocean and Cryosphere (→ IPCC SROCC Report 2019). The report shows that marine ecosystems are affected by climate change. Many of the impacts of the Earth's warming atmosphere are clearly detectable and growing, posing major challenges to the adaptive capacity of marine ecosystems and their plant and animal communities. At the same time, the oceans' climate-regulating effects are of great significance and must be preserved. The programme of measures for the protection and management of the marine environment must therefore be flexible and adaptable so as to take account of the dynamic nature of the natural variability of marine ecosystems, the development of various human activities and the changes resulting from climate change impacts (cf. Recital (34) MSFD).

An ambitious climate policy, intensive protection of sensitive marine species and their habitats, the reduction of polluting inputs and solely sustainable use of the oceans must go hand in hand in order to strengthen the oceans' resilience and preserve their natural functions.

Changes observed in the oceans to date

Climate change impacts in the North Sea and Baltic Sea were already described in the → 2018 status reports.

The global ocean has warmed unabated since the 1970s. Since the 1990s, the rate of ocean warming has more than doubled. Marine heatwaves are occurring at greater frequency and are increasing in intensity. Moreover, the steady rise in temperature causes oxygen losses

from the surface down to deep waters. This can give rise to changes in the geographical distribution and seasonal activities of marine species, as well as to shifts in species composition, abundance and biomass production of ecosystems. In the North Sea, such shifts in distribution, to deeper and more northern areas, have already been observed for many demersal fish species.[22] In the same vein, species from the Bay of Biscay and the Iberian shelf (tub gurnard, striped red mullet, European pilchard, European anchovy) are now occurring more frequently in the southern North Sea.[23]

In addition to global warming and its effects on the climate, the increased CO_2 concentration in the atmosphere physically results in the upper waters absorbing more CO_2 and thus to increasing surface acidification. Among others, many marine calcifying organisms are adversely affected by acidification.

The climate change impacts on the marine environment described in the → 2019 IPCC SROCC Report can also be observed in the North Sea and the Baltic Sea, as illustrated by a few examples below. For example, a significant linear trend of an increase in average sea surface temperature of 1.3 ± 0.6°C was observed in the North Sea over a fifty-year period of measurements[24], and an increase of 0.03°C per decade was observed in the Baltic Sea between 1856 and 2005[25]. Marine heatwaves in 2014 and 2018 reached mean surface temperatures of 17.4°C and 14.3°C in the North Sea and 19.5°C and 20°C in the Baltic Sea[26]. Sea levels on the German North Sea and Baltic Sea coasts have risen by about 10–20 cm over the last 100 years (these figures do not include the influence of land subsidence in the Baltic Sea). On the North Sea coast, the initial sea surface of storm surge water also increases with the rising sea level. Especially in the Baltic Sea[27], pronounced instances of hypoxia (low oxygen concentrations < 2 ml O_2/l) have been observed – in 2016, the maximum extent of low-oxygen zones was approximately 70,000 km^2, whereas 150 years ago such events were highly localised and concentrated in the deep basins. A major driver of the strong increase in low-oxygen zones is the eutrophication of the Baltic Sea, with rising water temperatures further exacerbating their adverse effects on the Baltic Sea's oxygen balance.

Outlook / prognosis

Unprecedented environmental conditions are expected during the 21st century, according to the → 2019 IPCC SROCC Report. Marine ecosystems will undergo changes induced by climate change. Foreseeable changes will include further increases in water temperatures, increasing vertical thermal stratification of the water column, marine heatwaves, the expansion of low-oxygen zones, and changes in net primary production. There will be further sea-level rise and extreme water levels will become more frequent. Loss of marine habitats and species diversity as well as damage to marine ecosystem functions are to be expected. Global warming in excess of 2°C compared to pre-industrial levels in combination with further climate-related changes is expected to pose a high risk to sensitive ecosystems such as Zostera beds or kelp forests. Therefore, the biodiversity, structure and functioning of coastal ecosystems are continually at risk.

[22] Dulvy et al., 2008, https://besjournals.onlinelibrary.wiley.com/doi/full/10.1111/j.1365-2664.2008.01488.x
[23] UBA, 2019, http://www.umweltbundesamt.de/publikationen/monitoringbericht-2019
[24] UBA, 2019, http://www.umweltbundesamt.de/publikationen/monitoringbericht-2019
[25] HELCOM, 2020a.
[26] UBA, 2019, http://www.umweltbundesamt.de/publikationen/monitoringbericht-2019
[27] HELCOM, 2020b.

The impacts of the above-mentioned changes on the productivity of marine ecosystems also affect human livelihoods such as the provision of food by fisheries or aquaculture and thus the income generated by various occupational groups. Regional as well as local changes in fishing potential, reduced growth or the decoupling of feeding relationships can already be observed. One example is the continuous decline of the spring spawning herring stock in the western Baltic Sea, caused by shifts in seasonal growth and developmental stages[28]. Unabated ocean warming would also entail a decline in the North and Baltic Seas for commercially important, cold water adapted species such as cod. The successful fertilisation and development of cod eggs depends on particular conditions in terms of seawater salinity and temperature. Even minor increases in temperature can result in increased embryo mortality. Ocean acidification can also have negative effects: A study has shown that temperature-related mortality increases further with falling seawater pH[29].

The role of the oceans in terms of their cultural and intrinsic values, which are important for human identity and well-being, may also be affected by the impacts of climate change.

Challenges to the programme of measures

In the course of updating the MSFD programme of measures, it is technically necessary to take climate change impacts into account in the planning of measures. Appropriate measures must be taken in order to respond to changes that have already occurred and those that are predicted, so as to mitigate the impacts on marine ecosystems. Various aspects play a role in this regard. In the development of measures, special attention is therefore paid to reducing pressures, taking into account the sources.

- Ecosystem resilience

  The biodiversity, structure and function of marine and coastal ecosystems are subject to far-reaching changes due to climate change. Intact ecosystems are more resilient to these changes than ecosystems weakened due to anthropogenic impacts and could therefore make a crucial contribution to mitigating adverse climate change impacts. Reefs, for example, act as natural coastal defences; Zostera beds are natural carbon sinks and nurseries for juvenile fish; sufficient refuges and resting areas provide marine animal and plant species with the opportunity to regenerate. Measures to protect and restore habitats, sustainable and ecosystem-based management of biotic and abiotic resources, and measures to reduce inputs of substances (nutrients, contaminants, waste) and energy (noise, light, heat) therefore contribute not only to achieving GES, but also to strengthening resilience to climate change impacts.

- Changes in anthropogenic pressures and their effects as a result of climate change

  Changes in hydrological conditions associated with climate change can result in altered pressures. For example, persistently high water temperatures in nutrient-rich water can amplify adverse effects of eutrophication such as mass algal blooms, shifts in the composition of planktonic biocoenoses, and oxygen deficits.

  Dry periods followed by increased precipitation due to heavy rainfall events as a result of climate change can increase inputs of nutrients, contaminants and waste from rivers and the atmosphere. Changes in the pH of the marine carbonate system can change the solubility of e.g. heavy metals that are currently bound in sediments.

[28] Polte et al., 2021, https://doi.org/10.3389/fmars.2021.589242 and Thünen-Institut für Ostseefischerei 2021, https://www.thuenen.de/de/of/arbeitsbereiche/monitoring/larven-surveys/

[29] Dahlke et al., 2018, https://advances.sciencemag.org/content/4/11/eaas8821

Rising water temperatures can further facilitate the establishment of non-indigenous species, which can lead to competitive situations and, in the worst case, to the displacement of indigenous species.

– Conflicting objectives of measures to mitigate climate change and its impacts and of marine nature conservation respectively

  In order to mitigate climate change itself as well as its consequences for people and material assets, new activities are being added or intensified in the oceans. In some instances this results in conflicts with the objectives of marine nature conservation and the MSFD. For example, offshore wind farms are expected to make a significant contribution to Germany's climate-friendly energy supply from renewable sources. However, at the same time their construction and operation also brings with it impacts such as input of impulsive sound from pile driving for the foundations, which can lead to hearing damage and/or significant disturbance of marine mammals or disturbance of seabirds, with the vertical structures and rotational rotor movements giving rise to avoidance behaviour.

  As a result of sea-level rise, higher storm surge levels and thus greater pressures on the coasts are to be expected. A predictable level of safety will therefore require intensified coastal protection measures. The growing need for coastal protection measures could thus result in an increasing demand for abiotic seabed resources such as sand and gravel, which in turn may impair the seabed and its habitats. Additionally, in some locations the construction or expansion of coastal protection structures impinges on a variety of coastal habitats.

  In this context it is important to recognise and address conflicts at the time measures are being planned, for example by designating refuges and rest areas or by aligning measures with climate objectives, for example by promoting ship propulsion systems that reduce NO_X emissions while at the same time being considered climate-friendly and sustainable.

Raising awareness about ecologically sustainable use of resources is also of great importance for climate and marine protection. Awareness-raising and information are also essential components of the MSFD programme of measures and this is reflected in the individual measures and their design.

In order to take into account the expected influence of climate change-related changes on various management measures, the measures listed in the LAWA-BLANO catalogue of measures[30] are also subjected to a "climate check" pursuant to the WFD, the Flood Risk Management Directive (FRMD) and the MSFD.

The following aspects were assessed as part of the expert appraisal:

– How does climate change impact on the effectiveness of the measure?

– Does the measure support climate change adaptation?

In the case of marine waters, this not only concerns the water regime in the narrow sense but the entire marine ecosystem, its resilience and its ecological performance and functional capacity.

[30] LAWA, 2020, https://www.lawa.de/documents/lawa-blano-massnahmenkatalog_2_1595486344.pdf. In the course of 2021, the catalogue will be updated to include the second-cycle MSFD measures, including the results of the "climate checks".

In this way, the planned measures are also assessed with a view to ensuring that today's decisions will continue to be sustainable in the future. Moreover, as part of the strategic environmental assessment, the MSFD measures were also assessed for significant impacts on the climate as a protected asset (→ Fact sheets for each of the measures in Annex 1; → Part IV).

7. Regional coordination

7.1 Regional *acquis*

The Contracting Parties to the Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR) and the Baltic Sea (HELCOM) have adopted recommendations, legally binding decisions (OSPAR) and other agreements aimed at reducing pressures arising from human activities and protecting species and habitats. The same is true for the Trilateral Wadden Sea Cooperation (TWSC) as a result of the Joint Declaration on the Protection of the Wadden Sea (1982/2010), the Ministerial Declarations adopted at the trilateral conferences, and the Trilateral Wadden Sea Plan.

This *acquis* of regional and coordinated measures under OSPAR, TWSC and HELCOM aims at improving the status of marine ecosystems. It is integral to national marine policy and was taken into account in the national planning of MSFD measures and, for land-based sources, in the WFD management plans in the coastal *Länder*. Measures agreed under these regimes, which also support the achievement of GES under the MSFD, will thus continue to be implemented and are considered to constitute “existing measures” for the purposes of EU reporting. The inclusion of the regional *acquis* into the national programme of measures does not alter the regional measures’ legal nature.

7.2 Regional cooperation on measures

The active *acquis* of regional measures and agreements will be continued in the context of the updates of the OSPAR North-East Atlantic Environment Strategy and the HELCOM Baltic Sea Action Plan. Both updates are expected to be completed in 2021. They provide the opportunity to stipulate common targets and measures for the next decade of regional cooperation to implement the North Sea and Baltic Sea states’ commitments under the OSPAR and Helsinki Conventions. The OSPAR North-East Atlantic Environment Strategy and the HELCOM Baltic Sea Action Plan will thus continue to contribute to achieving GES under the MSFD, analogous to the *acquis* of regional measures described above.

As chair of the HELCOM Commission from 1 July 2020 to 30 June 2022, Germany endeavours to further strengthen cooperation between the Baltic Sea states and with other organisations in the Baltic Sea region with regard to the adoption and implementation of measures on eutrophication, marine litter, dumped munitions, underwater noise and the protection of species and habitats, for example.

Germany actively supports coordination efforts under OSPAR and HELCOM with a view to

- improved coordination of measures of national interest.
- continuously developing regional measures focussing on transboundary issues.
- developing joint proposals for measures in the competence of the EU or international authorities (e.g. IMO, river basin commissions) or third countries, and agreeing on a concerted regional approach to submitting such proposals to these institutions.

To this end, the coordination of environmental targets, especially those addressing transboundary environmental issues, by way of target agreements or the use of common methods for deriving coherent national environmental targets is indispensable.

7.3 Interfaces between national and regional planning of measures

Germany is actively involved in updating the OSPAR North-East Atlantic Environment Strategy and the HELCOM Baltic Sea Action Plan and is seeking to establish interfaces for national and regional planning of objectives and measures by reconciling the draft regional programmes and the national programme when updating the MSFD programme of measures.

To this end, primarily the more than 100 proposals for action for updating the Baltic Sea Action Plan submitted within the framework of HELCOM in January 2020 were used as a source of ideas for updating the national planning of MSFD measures. Not all of the proposals submitted for the Baltic Sea Action Plan were directly relevant to national planning of MSFD measures. This applied, for example, to proposals that are not measures within the meaning of the MSFD, that are already being implemented in Germany (whether as a measure under other policies or as an MSFD measure), that are not required for the management of national waters, that are suitable for implementation at regional but not national level, or that fall within the scope of the Water Framework Directive or the Nitrates Directive and are to be taken into account for WFD management plans and programmes of measures.

The national MSFD programme of measures takes up a total of 15 tangible ideas and, insofar as this was possible, they were also transposed to the management of the North Sea. They provided ideas for the development of national measures or were incorporated into broad national first cycle MSFD measures in the form of new components or to shape the implementation of measures.

Examples of the development of national measures that synergistically dovetail national requirements and regional approaches are:

- A pilot study on environmentally friendly methods for handling fertiliser cargo in ports (UZ1-09), which look at practices in the North Sea and Baltic Sea and can contribute to and shape the development of best available technology and best environmental practice in the HELCOM context.
- Working towards reducing discharges of solid bulk cargo residues into the sea (UZ2-07), which will support and benefit from planned HELCOM studies and activities related to IMO and explore practical options for action for national and regional application, while also contributing to reducing discharges in the North Sea.
- Measures to implement the IMO Biofouling Guidance (UZ3-06), which at the same time implement the Biofouling Roadmap proposed at HELCOM, which in turn aims at ensuring a coordinated implementation of the IMO Biofouling Guidance in the Baltic Sea region.

Examples of the incorporation of ideas for action into national MSFD measures are:

- HELCOM proposals for reducing the input of continuous and impulsive sound, such as noise-controlling technical equipment for recreational vessels, supports for novel low-emission propulsion systems for commercial vessels, recommendations for state-of-the-art and good practice for reducing impulsive noise. The broad Measure UZ6-04 addressing the development and application of noise abatement measures in the North Sea and the Baltic Sea allows not only to take account of these proposals, but also for taking into account the future development of the HELCOM Regional Action Plan on Underwater Noise and promoting its implementation. The plan is expected to be adopted by HELCOM in 2021.

– The explicit mention of HELCOM proposals on cartridge cases, thin-walled bags and mass balloon releases in Measure UZ5-02 as specific products to be modified, substituted or limited in use, taking into account a life-cycle assessment. The implementation of national measures on marine litter is in turn closely intertwined with the regional action plans on marine litter under OSPAR and HELCOM.

Further examples of national first- and second-cycle MSFD measures could be mentioned that reflect aspects of OSPAR and HELCOM measures and targets (e.g. measure UZ1-10 on criteria, frameworks and practices for sustainable mariculture systems takes into account → HELCOM Recommendation 37/3) or, due to the scope of their description, allow for continuous alignment and follow-up in their operationalisation and implementation (under UZ1-03 to promote NO_x reduction measures in shipping, for example, ongoing work on alternative propulsion systems as part of → HELCOM Green Team activities can be incorporated) in order to take into account developments at OSPAR and HELCOM or in other EU Member States for the purpose of consistent management of marine waters.

The OSPAR North-East Atlantic Environment Strategy, which is currently being revised, primarily defines objectives but not measures; the latter are contained in an implementation plan. Therefore, it is not feasible to directly compare the coherence of measures. However, national measures can contribute to target implementation at the regional level and in turn benefit from knowledge generation and target setting at OSPAR level. Examples of proposed OSPAR targets and interfaces to the national planning of MSFD measures are:

– OSPAR development of maximum inputs values for nutrients to non-problem areas: e.g. Measure UZ1-07 to develop marine-relevant target values for phosphorus, among other nutrients, at the transition point from limnic to marine waters.

– OSPAR commitment to strengthen natural denitrification through the restoration of marine ecosystems: e.g. Measure UZ1-08 on the conservation and restoration of seagrass beds.

– OSPAR preparation of a regional plan of action for joint measures to reduce underwater noise emissions: e.g. measure UZ6-04 on noise reduction, which at the same time also allows for dovetailing with the HELCOM Action Plan on Underwater Noise currently under development.

7.4 Coordination between EU Member States

In order to coordinate its MSFD programme of measures with the EU Member States, Germany uses the bodies established to this end at OSPAR and HELCOM. Germany shared its first preliminary list of proposed additional MSFD measures with the OSPAR and HELCOM Contracting Parties at an early stage (as of September 2020).[31] The Contracting States' varying timetables in the planning of measures pose a challenge for the early coordination of measures and the approach to deadline extensions and exemptions under Article 14 MSFD. Coordination is therefore a continuous process that is ongoing during the planning of MSFD measures until 2021 and beyond. Essential elements of coordination include an analysis of the measures planned by the Parties to examine these for potential coordination or joint action, as well as a common understanding in dealing with the failure to achieve GES by 2020.

[31] Shared via the Intersessional Correspondence Group for the MSFD (ICG MSFD) at OSPAR and the Group for the Implementation of the Ecosystem Approach (GEAR) at HELCOM.

Status of regional coordination

- For OSPAR, please refer to the North-East Atlantic Environment Strategy, which is still under revision, the Measures and Actions Programme as well as the effectiveness analysis of OSPAR measures planned for the Quality Status Report 2023 as a basis for future cooperation.
- For HELCOM, please refer to the Baltic Sea Action Plan, which is still under revision; the HELCOM Explorer on the status of implementation of the current Baltic Sea Action Plan; the joint effectiveness and gap analysis (Sufficiency of Measures – SOM analysis) to derive actions required for a healthy Baltic Sea; the HELCOM ACTION project literature review on natural factors influencing the achievement of GES and on projections of when certain environmental aspects may reach GES, as a basis for regional coordination of the handling of the failure to achieve GES in 2020. The joint documentation on the regional coordination of programmes of measures, still under development in 2021, is intended to provide a common basis for MSFD reporting by the EU Baltic Sea States on the regional coordination they have undertaken in respect of their programmes of measures, as well as an impetus for continued coordination of actions required and measures to achieve GES.

The assessment of transboundary impacts is documented in the fact sheet for each of the proposed new MSFD measures (Attachment 1 to the summary report). The notification to affected countries of transboundary impacts is carried out when the national public consultation commences.

8. Strategic environmental assessment

8.1 National SEA process

In accordance with Article 35(1) No. 1 in conjunction with No.1.9 of Annex 3 to the German Environmental Impact Assessment Act (*Gesetz über die Umweltverträglichkeitsprüfung, UVPG*), a Strategic Environmental Assessment (SEA) must be carried out for the programme of measures for the North Sea and the Baltic Sea pursuant to WHG Article 45h. The aim of the SEA is to determine, describe and evaluate a programme’s environmental impacts at an early stage and to contribute the results to the decision-making process.

From 7 October to 3 November 2020, approximately 300 authorities, institutions, environmental groups and users' associations were invited to submit written statements on the proposed assessment scope which was based on the preliminary list of proposed new measures required. Sixteen submissions were received and taken into consideration in the scoping and assessment of environmental impacts. References to additional information were further taken into account in the scoping and assessment. Continued planning of MSFD measures has resulted in the following changes since the written consultation on the determination of the assessment scope was conducted:

- The proposed measure on "Orientation of national fisheries support and the CFP towards sustainable and ecosystem-compatible fisheries management" was abandoned. This specific measure would come too late to be considered in the national Operational Programme for the EMFAF, and the EU Structural Fund itself already provides for supports and financing opportunities for MSFD implementation. BLANO will continue to pursue opportunities to use EMFAF funding to finance MSFD-related measures and activities without reference to a specific MSFD measure.
- The planned revision of the first-cycle measure "Measures to protect migratory species in marine areas" (UZ3-02) to incorporate more detailed proposals on the establishment of

low-disturbance corridors between seal haul-outs and their feeding grounds (Baltic Sea) and the protection of migratory species in the marine area was abandoned. The aforementioned aspects are already covered by the broad measure and are being taken into account in the context of implementation.

- The proposed measure on "Effective control and monitoring of fishing activities, in particular in and around protected areas" was not pursued for the second cycle, as the review of the EU Fisheries Control Regulation has not yet been completed. The regulation will be an important basis for any effective control measures to be adopted. It is intended that experiences are first to be gained regarding their effectiveness. If necessary, the proposal can be picked up again in the next review of the programme of measures.
- The proposed measure on "Development of recommendations for locating containers gone overboard which contain hazardous goods ", has not yet been consented by Federal/*Länder* partners.
- The contents of the proposed measures were further developed or refined and as a result some of the titles of measure were rendered more precisely.

The assessment of the proposed additional MSFD measures in terms of their impacts on protected assets covered by MSFD/WHG was summarised in the context of the planning of measures; the impact on other assets within the meaning of the Environmental Impact Assessment Act (UVPG), interactions between protected assets and the assessment of alternatives is documented in the relevant fact sheet (Attachment 1 to the summary report) for the MSFD measures and summarised for the programme in the environmental report.

The environmental report pursuant to UVPG Article 40 is integrated into the official Programme of Measures as Section IV for the North Sea and Baltic Sea. The findings of the environmental report were taken into consideration in the establishment of the Programme of Measures.

8.2 Summary of the environmental report

The task of the SEA is to identify, describe and assess the environmental impacts of the present programme and to incorporate these into the decision-making process. The results are summarised in the environmental report.

The assessment of environmental effects is based on the qualitative objectives of good environmental status for marine and coastal waters according to the MSFD and a selected range of overarching environmental protection objectives from national planning and other sectoral legislation as well as international, EU and national agreements, regulations and plans.

The current → 2018 status assessment pursuant to Article 45c WHG has shown that overall the German North Sea and Baltic Sea waters are not at a good environmental status.

The impacts on the assets listed in the Environmental Impact Assessment Act must be assessed both for the individual measures and for the programme as a whole. Transboundary effects must be presented separately.

The programme of measures aims at improving the status of the water, seabed and wildlife/plants/biodiversity assets, and takes into account the objectives for the protection of humans and human health. The assessment of the programme’s impacts on these protected assets is a component of the planning of measures and indicates exclusively positive impacts.

The assessment of the other assets protected under the UVPG revealed that the individual measures have no or exclusively positive effects on the relevant assets protected. The majority of positive effects relate to the protected assets land, soils (terrestrial), landscape, cultural heritage and material assets, and to a lesser extent air and climate. Positive interactions between protected assets are expected for many measures. The magnitude of these impacts will depend on the detailed specification of the measures in the course of their implementation.

The effects of the programme as a whole on the assets protected under the UVPG will also be exclusively positive.

In all cases, the alternative of non-implementation of measures was deemed not preferable because no contribution to target achievement would be possible in the case of non-implementation. Alternatives such as regulatory measures or, in some cases, action by the national state instead of international cooperation were considered ineffective and not useful, and thus rejected.

The compilation of information did not pose any significant difficulties, as use was made of available documents.

To monitor the environmental impacts of the programme of measures, the Federal Government-*Länder* Monitoring Programme (BLMP) in particular is used to monitor and assess the status of marine waters. It provides a set of tools for the ongoing identification, description and assessment of the status of marine waters. With its help, the effectiveness of measures can be checked, potentially emerging problems for the status of marine waters can be identified and appropriate remedial measures can be initiated.

8.3 Transboundary impacts and participation

Following the commencement of its public consultation, Germany will notify the programme of measures including the environmental report and an English summary to the North Sea and Baltic Sea States and give them the opportunity to comment.

The declared purpose of the programme of measures and the measures contained therein is to help achieve a good environmental status of the marine waters of the North Sea and the Baltic Sea with regard to marine biodiversity, non-indigenous species, the state of commercially exploited fish and shellfish stocks, the food web, eutrophication, seafloor integrity, hydrographical conditions, contaminants, marine litter and the introduction of energy. The programme takes into account the environmental targets of other organisations, e.g. OSPAR, TWSC and HELCOM.

The strategic environmental assessment has shown that all the measures may have positive effects on the marine environmental status beyond the borders of Germany's marine waters. However, details of these will only become apparent after the measures have been further specified and implemented.

Measures relating to human activities and their consequent pressures which are not restricted to Germany's marine waters and which are primarily to be pursued at regional or international level are expected to have a spatially far-reaching positive influence on the status of the North Sea and the Baltic Sea. Such measures include, for example, those concerning inputs and emissions from shipping (UZ1-03 and UZ2-07), biofouling management (UZ3-06) or early warning systems and decision support for immediate measures in the event of the introduction of non-indigenous species (UZ3-07). For global level measures (e.g. IMO) however, the extent of these positive effects hinges on the success of efforts to implement international measures.

Other measures that may have a positive transboundary effect are those aimed at species and habitat conservation. For instance, measures for the conservation of migratory species can have a positive effect on the status of ecosystems in the waters of North Sea or Baltic Sea States located in the area of distribution of a particular migratory species: its populations spend part of their life-cycle in those areas and are important for the ecosystems of the region. This also applies to national protected area measures, e.g. for mobile species utilising transboundary habitats, which may also have a positive impact on populations in neighbouring waters (UZ3-03).

The reduction of inputs from both land and marine sources, e.g. nutrients and contaminants introduced via rivers or air, and of litter and noise in the marine environment may also have a positive impact on the marine waters of other North Sea and Baltic states if long-range inputs via sea currents and atmospheric deposition are reduced.

The significance of potential transboundary effects cannot yet be gauged. Initial expectations are that, for the North Sea, these significant positive effects are especially likely in the adjacent marine waters of Denmark, Great Britain and the Netherlands, and for the Baltic Sea in the waters of Denmark, Sweden and Poland.

9. Public participation

In the interest of providing early information to interested parties, stakeholder representatives of the economic and environmental sectors were consulted as part of the scoping process for the Strategic Environmental Assessment (SEA) in October 2020 and were informed, for the first time, of the proposals for potential new measures. At a workshop on 26 October 2020, representatives of government authorities as well as of environmental and users' associations engaged in an informal dialogue on the proposals for MSFD measures.

Pursuant to WHG Article 45i(1) sentence 1 No. 2, the draft programme of measures including the SEA environmental reports and the supplementary fact sheets for each of the measures were published at www.meeresschutz.info and publicly displayed at the offices of the Federal and *Länder* authorities involved. The general public has been given the opportunity to comment in writing on the drafts between 1 July and 31 December 2021.

10. Coordination, implementation and financing of the programme

The national sovereign responsibility for MSFD implementation and the execution of measures in the North and Baltic Seas principally rests with

- the coastal *Länder* Hamburg, Mecklenburg-Western Pomerania, Lower Saxony and Schleswig-Holstein for coastal waters[32] (seaward to 12 nautical miles), and with
- the Federal Government for the Exclusive Economic Zone and the continental shelf including the seafloor and its subsoil (seaward of the 12 nm zone).

The coastal *Länder* named above, Bremen and the Federal Government have agreed to jointly implement the MSFD in the entire German section of the North and Baltic Seas. To this end, the Federal/*Länder* Committee on the North Sea and Baltic Sea (BLANO) was established which, as the national competent authority, has taken on responsibility for coordination and liaison with regard to MSFD implementation. BLANO, as delivery authority for the programme of measures, is also in charge of conducting the SEA process.

[32] Coastal waters are defined in Article 3(2) WHG and comprise the coastal sea (a 12 nautical mile strip extending from the baseline) as well as waters on the landward side of the baseline up to the coastline at mean high water level or to the seaward demarcation of the surface watercourses.

Consultations between government departments within the Federal Government and among the *Länder* governments represented in BLANO, including deliberations in *Land* cabinets, are used to formally coordinate the programme of measures.

The programme of measures will be implemented in keeping with the shared responsibilities between the federal government and *Länder* governments in Germany. Potential delivery authorities/organisations for the various proposed MSFD measures are given in the fact sheets. The determination as to which Federal/*Länder* partners intend to implement which of the individual measures defines the individual measures' spatial scope.

Where public sector measures are required, they will be implemented within the confines of available funding. The implementation of the MSFD programme of measures is therefore subject to the provision of sufficient financial and human resources in the budgets of the Federal Government and the *Länder*. General as well as earmarked funds (e.g. fisheries levy, wastewater levy, tax revenue), among other sources of funding, can be used to finance MSFD measures. The specific funding instruments vary due to the differing spectrum of levies collected by the individual *Länder* and Federal Government authorities. Moreover, financial supports from the EU, the Federal Government and the *Länder* can also be used. It is envisaged, for example, that funding provided under the 2021–2027 European Fisheries Fund EMFAF, the 2021–2027 EU "Connecting Europe" Facility (CEF) for Transport, the European territorial cooperation Interreg and the 2021–2027 European Agricultural Fund for Rural Development EAFRD will be tapped into. The implementation of MSFD measures that build on other policies (Category 2a measures) in some cases requires no or only minor amounts of additional funding.

Annex 1 Operational environmental targets pursuant to WHG Article 45e as the basis for the development and review of measures, as notified to the EU Commission in 2012

Operational Environmental Targets		
	Baltic Sea	**North Sea**
UZ1	Seas unaffected by eutrophication	
1.1	Nutrient inputs from rivers need to be further reduced. Reduction targets have been specified in the programmes of measures as part of the WFD management plans.	Nutrient inputs from rivers need to be further reduced. Reduction targets have been specified in the programmes of measures as part of the WFD management plans.
1.2	Nutrient inputs by transboundary transport from other marine areas need to be reduced. Efforts to achieve this must be made as part of regional cooperation arrangements under HELCOM.	Nutrient inputs by transboundary transport from other marine areas need to be reduced. Efforts to achieve this must be made as part of regional cooperation arrangements under OSPAR.
1.3	Atmospheric nutrient inputs need to be further reduced.	Atmospheric nutrient inputs need to be further reduced.
UZ2	Seas not polluted by contaminants	
2.1	Contaminant inputs from rivers need to be further reduced. Reduction targets have been specified in the programmes of measures as part of the WFD management plans.	Contaminant inputs from rivers need to be further reduced. Reduction targets have been specified in the programmes of measures as part of the WFD management plans.
2.2	Atmospheric contaminant inputs need to be further reduced.	Atmospheric contaminant inputs need to be further reduced.
2.3	Contaminant inputs from marine sources need to be reduced. This applies particularly to gaseous and liquid inputs, but also to solids.	Contaminant inputs from marine sources need to be reduced. This applies particularly to gaseous and liquid inputs, but also to solids.
2.4	Inputs of oil and oil products and mixtures to the sea need to be reduced or avoided. This applies to illegal, permissible and unintentional inputs. Inputs from shipping are permissible only if they comply with the stringent conditions of the MARPOL Convention; to achieve greater reductions, efforts should be made to amend the MARPOL Annexes.	Inputs of oil and oil products and mixtures to the sea need to be reduced or avoided. This applies to illegal, permissible and unintentional inputs. Inputs from shipping are permissible only if they comply with the stringent conditions of the MARPOL Convention; to achieve greater reductions, efforts should be made to amend the MARPOL Annexes.
2.5	Concentrations of contaminants in the marine environment and resultant pollution effects need to be reduced and good environmental status re-established.	Concentrations of contaminants in the marine environment and resultant pollution effects need to be reduced and good environmental status re-established.

Operational Environmental Targets		
	Baltic Sea	**North Sea**
UZ3	Seas with marine species and habitats unaffected by impacts of human activities	
3.1	There are adequate zones for retreat and resting – as regards both space and periods of time – for ecosystem components. To protect marine life from anthropogenic disturbance, for example, areas and periods of time where fishing is prohibited and/or restricted (no-take zones and no-take times based on the CFP rules) are established (cf. for example, MSFD Recital 39).	There are adequate zones for retreat and resting – as regards both space and periods of time – for ecosystem components. To protect marine life from anthropogenic disturbance, for example, areas and periods of time where fishing is prohibited and/or restricted (no-take zones and no-take times based on the CFP rules) are established (cf. for example, MSFD Recital 39).
3.2	The structure and function of food webs and marine habitats are not further altered as a result of bycatch, discards or bottom-trawled fishing gear. Efforts are made to restore ecosystem components damaged as a result of past impacts. The functional groups of biological features (MSFD Annex III, Table 1) or their food sources are not jeopardised.	The structure and function of food webs and marine habitats are not further altered as a result of bycatch, discards or bottom-trawled fishing gear. Efforts are made to restore ecosystem components damaged as a result of past impacts. The functional groups of biological features (MSFD Annex III, Table 1) or their food sources are not jeopardised.
3.3	If, taking into account the impact of climate change, the appropriate habitat needs of species that are either locally already extinct or in such decline as to be endangered at population level are guaranteed and the causes of endangerment for these species are eliminated in large enough marine areas, endeavours to re-establish the species or to stabilise the species' populations are undertaken. Re-introduction projects already in place, such as for the sturgeon species *Acipenser oxyrinchus,* will be concluded once the species has been introduced successfully.	If, taking into account the impact of climate change, the appropriate habitat needs of species that are either locally already extinct or in such decline as to be endangered at population level are guaranteed and the causes of endangerment for these species are eliminated in large enough marine areas, endeavours to re-establish the species or to stabilise the species' populations are undertaken. In the North Sea, species that are locally extinct or in such decline as to be endangered include, for example, the European sea sturgeon (*Acipenser sturio*), the Helgoland population of the European lobster (*Homarus gammarus*), and the European flat oyster (*Ostrea edulis*).
3.4	Anthropogenic structures and activities do not endanger the natural distribution (including migration) of species for which ecologically unhampered migration corridors are key habitats.	Anthropogenic structures and activities do not endanger the natural distribution (including migration) of species for which ecologically unhampered migration corridors are key habitats.
3.5	The total number of unintentionally and intentionally introduced new species approaches zero. Preventive measures have been implemented to minimise (unintentional) introduction. New species' arrivals are identified promptly so that, where necessary, immediate measures that are likely to be successful can be put in place. The signing and implementation of existing regulations and conventions are crucial in this respect.	The total number of unintentionally and intentionally introduced new species approaches zero. Preventive measures have been implemented to minimise (unintentional) introduction. New species' arrivals are identified promptly so that, where necessary, immediate measures that are likely to be successful can be put in place. The signing and implementation of existing regulations and conventions are crucial in this respect.

UZ4	Seas with sustainable and environmentally sound use of resources	
4.1	All commercially exploited stocks are managed according to the maximum sustainable yield (MSY) approach.	All commercially exploited stocks are managed according to the maximum sustainable yield (MSY) approach.
4.2	Stocks of fished species have an age and size structure in which all age and size classes continue to be represented and which approximately reflects natural conditions.	Stocks of fished species have an age and size structure in which all age and size classes continue to be represented and which approximately reflects natural conditions.
4.3	Fishing does not adversely affect the other ecosystem components (non-target species and benthic biocoenoses) to such an extent as to jeopardise the achievement or maintenance of their specific good environmental status.	Fishing does not adversely affect the other ecosystem components (non-target species and benthic biocoenoses) to such an extent as to jeopardise the achievement or maintenance of their specific good environmental status.
4.4	Illegal, unreported and unregulated (IUU) fishing, as defined in EC Regulation 1005/2008, approaches zero.	Illegal, unreported and unregulated (IUU) fishing, as defined in EC Regulation 1005/2008, approaches zero.
4.5	Within the protected areas in the German Baltic Sea, conservation goals and objectives have priority. The special public interest in extraction of non-living resources for coastal protection must be taken into account and such extraction may only be considered following the comprehensive consideration of alternatives.	Within the protected areas in the German North Sea, conservation goals and objectives have priority. The special public interest in extraction of non-living resources for coastal protection must be taken into account and such extraction may only be considered following the comprehensive consideration of alternatives.
4.6	Use or exploration of non-living resources does not damage or significantly disturb the ecosystem components of the German Baltic Sea, especially sensitive, declining and protected species and habitats. Special attention must be paid to the breeding, rearing, moulting, overwintering and migration periods as well as breeding and feeding grounds and resting areas of the species in question.	Use or exploration of non-living resources does not damage or significantly disturb the ecosystem components of the German North Sea, especially sensitive, declining and protected species and habitats. Special attention must be paid to the breeding, rearing, moulting, overwintering and migration periods as well as breeding and feeding grounds and resting areas of the species in question.
UZ5	Seas without pressures from litter	
5.1	Continual reduction of inputs and reduction of existing levels of litter lead to a significant reduction in litter that has a harmful effect on the marine environment on beaches, at the sea surface, in the water column and on the seabed.[5]	Continual reduction of inputs and reduction of existing levels of litter lead to a significant reduction in litter that has a harmful effect on the marine environment on beaches, at the sea surface, in the water column and on the seabed.[5]
5.2	Levels of litter in marine organisms (especially microplastics) that are proven to be harmful are tending towards zero in the long term.[6]	Levels of litter in marine organisms (especially microplastics) that are proven to be harmful are tending towards zero in the long term.[6]
5.3	Other adverse ecological effects (such as entanglement and strangulation in items of litter) are reduced to a minimum.	Other adverse ecological effects (such as entanglement and strangulation in items of litter) are reduced to a minimum.
UZ6	Seas not impacted by the introduction of anthropogenic energy	

6.1	The anthropogenic sound input from impulsive signals and shock waves does not cause physical damage (such as a temporary shift in hearing threshold of harbour porpoises[7]) or significant disturbance to marine organisms.	The anthropogenic sound input from impulsive signals and shock waves does not cause physical damage (such as a temporary shift in hearing threshold of harbour porpoises[7]) and significant disturbance to marine organisms.
6.2	Inputs of noise caused by continuous, especially low-frequency, broadband sound have no adverse effects spatially or over time, such as significant (substantial) disturbance (displacement from habitats, masking biologically relevant signals, etc.) or physical damage to marine organisms. Since shipping is the predominant source of continuous noise inputs, reducing the share of shipping in background noise impacts should be considered as a specific operational target.	Inputs of noise caused by continuous, especially low-frequency, broadband sound have no adverse effects spatially or over time, such as significant (substantial) disturbance (displacement from habitats, masking biologically relevant signals, etc.) or physical damage to marine organisms. Since shipping is the predominant source of continuous noise inputs, reducing the share of shipping in background noise impacts should be considered as a specific operational target.
6.3	The anthropogenic input of heat has no negative impact spatially or over time, and does not exceed agreed limit values. In marine coastal waters rise in sediment temperature does not exceed 2 K at a depth of 30 cm and in the EEZ rise in sediment temperature does not exceed 2 K at a depth of 20 cm.	The anthropogenic input of heat has no negative impact spatially or over time, and does not exceed agreed limit values. In the Wadden Sea rise in sediment temperature does not exceed 2 K at a depth of 30 cm and in the EEZ rise in sediment temperature does not exceed 2 K at a depth of 20 cm.
6.4	Electromagnetic and electrical fields of anthropogenic origin are so weak as to not affect orientation, migratory and foraging behaviour of marine organisms. The values measured at the sediment surface do not affect the geomagnetic field (45 ± 15 µT in Europe). The cables and technology used largely avoid generating electromagnetic fields.	Electromagnetic and electrical fields of anthropogenic origin are so weak as to not affect orientation, migratory and foraging behaviour of marine organisms. The values measured at the sediment surface do not affect the geomagnetic field (45 ± 15 µT in Europe). The cables and technology used largely avoid generating electromagnetic fields.
6.5	Light impacts at sea caused by human activities have no adverse effect on the marine environment.	Light impacts at sea caused by human activities have no adverse effect on the marine environment.
UZ7	Seas with natural hydromorphological characteristics	
7.1	The sum of physical interventions does not bring about permanent change to hydrographical conditions in the affected marine and coastal waters that would have an adverse effect on the marine environment. Physical interventions include, for example, the erection of structures such as bridges, barrages, dams, and wind turbines, the laying of pipelines and cables, as well as the deepening of shipping channels.	There is a natural equilibrium in the (sub-)catchment areas of the tidal flats. The substrate components present and their dynamic equilibrium display a typical composition. There is a natural variability in salinity.
7.2	The overall impact on hydrological processes has no adverse effects on marine ecosystems.	The overall impact on hydrological processes has no adverse effects on marine ecosystems.

7.3	Changes to habitats and in particular to habitat functions (e.g. spawning, breeding and feeding areas or migration routes/flyways for fish, birds and mammals) due to anthropogenically altered hydrographical conditions do not, individually or cumulatively, endanger species and habitats or cause a decline in populations.	Changes to habitats and in particular to habitat functions (e.g. spawning, breeding and feeding areas or migration routes/flyways for fish, birds and mammals) due to anthropogenically altered hydrographical conditions do not, individually or cumulatively, endanger species and habitats or cause a decline in populations.

Fn 5 *Task Group 10 recommends a generally measurable and significant reduction in marine litter by 2020, for example by 10% per year on coastlines from the date the programmes of measures begin.*

Fn 6 *If the 10% per year reduction referred to in Footnote 5 were universally applied to all targets, a marked reduction in the level of plastic particles in fulmar stomachs would be seen from the beginning of the programmes of measures in 2016 (a cautious estimate of 30% of fulmars with more than 0.1 grams of litter in their stomachs between 2020 and 2030 would be enough to achieve the OSPAR objective – theoretically no bird would have more than 0.1 gram of plastic in its stomach by 2050).*

Fn 7 *Beginning of hearing damage in harbour porpoises at a single exposure level (SEL) of 164 dB re 1 mPa²s (unweighted) and a peak sound pressure level (SPLpeak-peak) of 199 dB re 1 mPa.*

Annex 2 – Overview of ongoing and additional measures to achieve the environmental targets

Numerous different processes establish provisions designed to modify human activities impacting on nature conservation and environmental protection in the marine sphere. The selection presented here of measures adopted in pursuit of other policies makes no claim to be exhaustive. It presents individual policy areas and measures of particular importance to achieve the MSFD targets.

The **updates to the OSPAR North-East Atlantic Environment Strategy 2021–2030** and the **HELCOM Baltic Sea Action Plan 2021–2030**, which are currently being negotiated in the course of OSPAR and Helsinki Convention implementation and carry forward existing actions under OSPAR and HELCOM, contribute in an overarching manner to achieving MSFD targets as Category 1b measures. Integration of regional measures, plans and programmes within the national programme of measures does not alter their legal character.

Measure per overarching environmental target (UZ)[33] **Bold: MSFD measure** *Italic: Measures of the 2nd cycle or revised measures of the 1st cycle*	Cata-logue of Mea-sures No.[34]	KTM under WFD and MSFD [35]	Consistency with selected EU Directives and international agreements	Mode of action	Spatial coverage [36]	Region North Sea (N) Baltic Sea (B)		EU measure category [37]			
								Other policies		MSFD	
						N	B	1a	1b	2a	2b
UZ1 Seas unaffected by eutrophication											

[33] The number sequence 901-9xx given in brackets with the titles of measures refers to the reporting codes for measures implementing other policies that are not WFD measures. These measures are published, together with additional reporting information, in the list of existing measures at www.meeresschutz.info/berichte-art13.html (currently being updated). For electronic reporting pursuant to Article 13 MSFD, the unambiguous "Measure Codes" shown in the web forms are generated based on the number sequence beginning with 900 or the numbers contained in the LAWA-BLANO Catalogue of Measures respectively: "M[No.]"*. To facilitate identification, a consecutive number (y) within each environmental target (UZx) is assigned (UZx-y) to the MSFD measures in addition to their catalogue numbers.

[34] LAWA, 2020, LAWA-BLANO Catalogue of Measures, https://www.lawa.de/documents/lawa-blano-massnahmenkatalog_2_1595486344.pdf (currently being updated)

[35] Key Types of Measures (KTMs), see Table 4 (WFD) and Table 5 (MSFD) of the EU MSFD CIS Guidance 12 (as of July 2018) (currently undergoing revision)

[36] Spatial categories for the purposes of electronic reporting pursuant to Article 13 MSFD are: Terrestrial part of MS, Transitional waters (WFD), Coastal waters (WFD), Territorial waters, EEZ, Continental shelf beyond EEZ, Beyond MS Marine Waters. The "Territorial waters" category is not used in this table; "Coastal waters as per WHG" is used instead. Coastal waters are defined in Article 3(2) WHG and include the territorial waters (seaward from the baseline to 12 nautical miles) as well as the waters on the landward side of the baseline up to the coastline at mean high water or, in the case of surface waters, their seaward boundary. In this table, harbours are included in the "terrestrial" category.

[37] ***Measures under other policies*** *are*: ***Category 1.a***: Measures relevant for the achievement and maintenance of GES under the MSFD, that have been adopted under other policies and implemented; ***Category 1.b:*** Measures relevant for the achievement and maintenance of GES under the MSFD that have been adopted under other policies but that have not yet been implemented or fully implemented.
MSFD measures are: ***Category 2.a***: Additional measures to achieve and maintain GES which build upon existing implementation processes regarding other EU legislation and international agreements but go beyond what is already required under these; ***Category 2.b:*** Additional measures to achieve and maintain GES which do not build on existing EU legislation or international

Measure per overarching environmental target (UZ)[33] **Bold: MSFD measure** *Italic: Measures of the 2nd cycle or revised measures of the 1st cycle*	Cata-logue of Mea-sures No.[34]	KTM under WFD and MSFD[35]	Consistency with selected EU Directives and international agreements	Mode of action	Spatial coverage[36]	Region North Sea (N) Baltic Sea (B)		EU measure category[37]			
								Other policies		MSFD	
						N	B	1a	1b	2a	2b
Construction or upgrades of wastewater treatment plants	1-7	1	WFD	Technical	Terrestrial Transitional waters Coastal waters	X	X		X		
Reduction of nutrient pollution from agriculture, including implementation of the 2020 amendment to Fertiliser Ordinance	27, 30, 31, 41, 100	2	Nitrates Directive, WFD	Technical	Terrestrial	X	X		X		
Advisory services for agriculture	504, 506, 507	12	Nitrates Directive, WFD	Technical Policy driven	Terrestrial	X	X	X			
Drinking water protection measures	33	13	Nitrates Directive, WFD	Technical Policy driven	Terrestrial	X		X			
Research and improvement of knowledge base to reduce uncertainty	501, 503, 508	14	WFD	Technical	Terrestrial Transitional waters Coastal waters	X	X		X		
Upgrades or improvements of industrial wastewater treatment plants (including agricultural sector)	13, 14, 15	16	WFD	Technical	Terrestrial Transitional waters Coastal waters	X	X		X		
Measures to reduce soil erosion and surface run-off	28, 29	17	WFD	Technical	Terrestrial	X	X		X		
Natural water retention measures	65, 93	23	WFD, Floods Directive	Technical	Terrestrial Transitional waters Coastal waters	X	X		X		
Implementation of the MARPOL Convention (Annexes IV and VI) (901)		33	MARPOL Convention	Legislative Technical	Terrestrial Transitional waters Coastal waters EEZ	X	X	X			

agreements. Source: EU MSFD CIS Guidance 10, Programmes of Measures under the Marine Strategy Framework Directive – Recommendations for implementation and reporting (June 2020); Guidance 12, EU MSFD CIS Reporting on Programmes of Measures (Art. 13) and on exceptions (Art. 14) for the Marine Strategy Framework Directive (July 2018) (currently undergoing revision).

Measure per overarching environmental target (UZ)[33] **Bold: MSFD measure** *Italic: Measures of the 2nd cycle or revised measures of the 1st cycle*	Cata-logue of Mea-sures No.[34]	KTM under WFD and MSFD[35]	Consistency with selected EU Directives and international agreements	Mode of action	Spatial coverage[36]	Region North Sea (N) Baltic Sea (B)		EU measure category[37]			
								Other policies		MSFD	
						N	B	1a	1b	2a	2b
					Beyond MS marine waters						
Implementation of the Geneva Convention on Long-Range Transboundary Air Pollution (LRTAP) (Gothenburg Protocol) (902)		33	NEC Directive OSPAR, HELCOM	Legislative Technical	Terrestrial Transitional waters Coastal waters EEZ	X	X	X			
Agricultural cooperation project on reducing direct inputs into coastal waters via drainage systems (UZ1-01)	401	33, 39	Nitrates Directive, WFD, NEC Directive, Habitats Directive OSPAR, CBD	Technical Economic	Terrestrial (Lower Saxony) Coastal waters (Lower Saxony)	X				X	
Strengthening the assimilative capacity of estuaries, using the example of the river Ems (UZ1-02)	402	31, **33**, 37, 39	WFD, Habitats Directive, Nitrates Directive OSPAR	Technical	Transitional waters (Ems estuary, Lower Saxony) Coastal waters (Ems estuary, Lower Saxony)	X					X
Promoting sustainable measures to reduce NO_x inputs from shipping *(UZ1-03)*	403	33	NEC Directive HELCOM Baltic Sea Action Plan MARPOL	Legislative Technical Policy driven Economic	Terrestrial Transitional waters Coastal waters EEZ Beyond MS marine waters	X	X			X	
Supporting the designation of a Nitrogen Emission Control Area (NECA) in the North and Baltic Seas (UZ1-04)	404	33	NEC Directive HELCOM Baltic Sea Action Plan	Legislative Technical Policy driven Economic	Terrestrial Transitional waters Coastal waters EEZ Beyond MS marine waters	X	X			X	
Revision of the Gothenburg Protocol to the Convention on Long-range Transboundary Air Pollution (CLRTAP)		33	CLRTAP NEC Directive	Legislative Policy driven	Terrestrial	X	X			X	

Measure per overarching environmental target (UZ)[33] **Bold: MSFD measure** *Italic: Measures of the 2nd cycle or revised measures of the 1st cycle*	Cata-logue of Mea-sures No.[34]	KTM under WFD and MSFD[35]	Consistency with selected EU Directives and international agreements	Mode of action	Spatial coverage[36]	Region North Sea (N) Baltic Sea (B)		EU measure category[37]			
								Other policies		MSFD	
						N	B	1a	1b	2a	2b
as it relates to the seas, in particular with a view to reducing atmospheric inputs of NOx and ammonia (UZ1-05)											
Implementation of Germany's National Air Pollution Control Programme as it relates to the seas (UZ1-06)		33	NEC Directive	Legislative Technical Policy driven	Terrestrial	X	X			X	
Development of ocean-related target values for reductions in inputs of phosphorus, contaminants and plastics (incl. microplastics) at the limnic-marine transition point, as a basis for the management of river basin districts in accordance with the WFD (UZ1-07)		29, 31, 33	WFD HELCOM, OSPAR MSFD CIS (waste-related targets)	Legislative Technical	Terrestrial Transitional waters Coastal waters	X	X			X	
Restoration and conservation of seagrass beds (UZ1-08)		33, 37		Technical	Terrestrial Coastal waters	X					X
Pilot study of environmentally friendly ways of handling fertilisers in ports (UZ1-09)		33	Baltic Sea Action Plan EU Directive 2019/883	Legislative Technical	Terrestrial	X	X				X
Criteria, conditions and procedures for sustainable mariculture systems (UZ1-10)		31, **33**, 34	Reg. (EU) 708/2007 Reg. (EU) 1380/2013 Baltic Sea Action Plan HELCOM Rec 37/3	Legislative Technical	Coastal waters EEZ	X	X			X	
UZ2 Seas not polluted by contaminants											
Reduce pesticides pollution from agriculture	32	3	WFD	Legislative	Terrestrial	X	X	X			

Measure per overarching environmental target (UZ)[33] **Bold: MSFD measure** *Italic: Measures of the 2nd cycle or revised measures of the 1st cycle*	Cata-logue of Mea-sures No.[34]	KTM under WFD and MSFD [35]	Consistency with selected EU Directives and international agreements	Mode of action	Spatial coverage [36]	Region North Sea (N) Baltic Sea (B)		EU measure category [37]			
								Other policies		MSFD	
						N	B	1a	1b	2a	2b
				Technical							
Research and improvement of knowledge base to reduce uncertainty	501, 502, 503, 508	14	WFD	Technical	Terrestrial Transitional waters Coastal waters	X	X		X		
Measures for the phasing-out of emissions, discharges and losses of priority hazardous substances or for the reduction of emissions, discharges and losses of priority substances	18, 36	15	WFD HELCOM Baltic Sea Action Plan	Technical	Terrestrial Transitional waters Coastal waters EEZ	X	X		X		
Measures to prevent or control the input of pollution from urban areas, transport and built infrastructure	8, 9, 10, 11, 12, 26, 35	21	WFD	Technical	Terrestrial	X	X	X			
Measures to prevent or control the input of pollution from mining	16, 24	36	WFD	Technical	Terrestrial	X	X	X			
Measures to reduce unregulated, diffuse inputs of substances, e.g. from sediment removal, potentially including subsequent treatment, recovery and disposal	101	4	WFD	Technical	Terrestrial Transitional waters Coastal waters	X	X	X			
Ongoing process of prioritisation of substances by the EU Commission (903)		15	WFD	Legislative Technical	Terrestrial Transitional waters Coastal waters EEZ	X	X		X		
Ban on TBT and other substances hazardous to the marine environment (904)		31	EU chemicals regulations AFS Convention	Legislative Technical	Terrestrial Transitional waters Coastal waters EEZ Beyond MS marine waters	X	X	X			
Phase-out of mercury cells in the chloralkali industry (by 2010) and reduction in mercury		31	OSPAR (Decision 90/3), HELCOM	Legislative Technical	Terrestrial Transitional waters	X	X	X			

Measure per overarching environmental target (UZ)[33] **Bold: MSFD measure** *Italic: Measures of the 2nd cycle or revised measures of the 1st cycle*	Cata-logue of Mea-sures No.[34]	KTM under WFD and MSFD [35]	Consistency with selected EU Directives and international agreements	Mode of action	Spatial coverage [36]	Region North Sea (N) Baltic Sea (B)		EU measure category [37]			
								Other policies		MSFD	
						N	B	1a	1b	2a	2b
discharges and emissions from chloralkali production (905).			(Recommendation 23/6)								
Measures as part of the implementation of the Industrial Emissions Directive (906)		31	Industrial Emissions Directive	Technical	Terrestrial	X	X	X			
Implementation of the Geneva Convention on Long-Range Transboundary Air Pollution (LRTAP) (Gothenburg Protocol, Aarhus Protocol) (907)		31	NEC Directive OSPAR, HELCOM	Legislative Technical	Terrestrial Transitional waters Coastal waters EEZ	X	X	X			
Implementation of the MARPOL Convention (Annexes I, II, III, V and VI) (908)		31	MARPOL Convention	Legislative Technical	Terrestrial Transitional waters Coastal waters EEZ Beyond MS marine waters	X	X	X			
PSSA Wadden Sea and Baltic Sea (909)		32	IMO	Legislative Technical	Coastal waters EEZ	X	X	X			
Criteria and incentive systems for environmentally friendly ships *(UZ2-01)*	405	28, 29, 31, 33, 34	HELCOM, MARPOL Convention Reg. (EU) 2015/757	Legislative Policy driven Technical Economic	Terrestrial Transitional waters Coastal waters EEZ Beyond MS marine waters	X	X			X	
Requirements for the discharge and disposal of scrubbing waters from exhaust treatment on board ships (UZ2-02)	406	31	WFD, Sulphur Directive, HELCOM, OSPAR CDNI, MARPOL Convention	Legislative Technical Policy driven	Terrestrial Transitional waters Coastal waters EEZ Beyond MS marine waters	X	X			X	
Preventing and combating marine pollution – improving maritime	407	32	Bonn Convention (North Sea),	Legislative	Terrestrial	X	X			X	

Measure per overarching environmental target (UZ)[33] **Bold: MSFD measure** *Italic: Measures of the 2nd cycle or revised measures of the 1st cycle*	Cata-logue of Mea-sures No.[34]	KTM under WFD and MSFD [35]	Consistency with selected EU Directives and international agreements	Mode of action	Spatial coverage [36]	Region North Sea (N) Baltic Sea (B)		EU measure category [37]			
								Other policies		MSFD	
						N	B	1a	1b	2a	2b
emergency preparedness and response (UZ2-03)			HELCOM (Baltic); IMO OPRC, OPRC HNS	Technical	Transitional waters Coastal waters EEZ						
Management of dumped munitions *(UZ2-04)*	408	28, 31, 37	OSPAR, HELCOM	Legislative Technical Policy driven Economic	Terrestrial Transitional waters Coastal waters EEZ	X	X			X	
Information campaign: Proper disposal of pharmaceuticals – focus: seagoing ships (UZ2-05)		31		Policy driven	Coastal waters EEZ	X	X				X
Information campaign: Raising awareness on the environmental impacts of UV filters in sunscreen lotions (UZ2-06)		31		Policy driven	Terrestrial	X	X				X
Working towards reducing the discharge of cargo residues from solid bulk cargoes into the sea (UZ2-07)		31, 33	MARPOL, EU Directive 2019/883	Legislative Technisch	Terrestrial Coastal waters EEZ Beyond MS marine waters	X	X			X	
Examination of the possibilities of a scheme for using the German Bight Western Approach traffic separation area for large container ships (UZ2-08)		29, 31, **32**	IMO Resolution	Legislative	Coastal waters	X				X	
Improving traceability and tackling of marine pollution by procuring a survey vessel for the German North Sea (UZ2-10)		31	Bonn Convention, IMO OPRC	Technical	Coastal waters EEZ	X				X	
UZ3	Seas with marine species and habitats unaffected by impacts of human activities										

Measure per overarching environmental target (UZ)[33] **Bold: MSFD measure** **Italic: Measures of the 2nd cycle or revised measures of the 1st cycle**	**Cata-logue of Mea-sures No.[34]**	**KTM under WFD and MSFD [35]**	**Consistency with selected EU Directives and international agreements**	**Mode of action**	**Spatial coverage [36]**	**Region North Sea (N) Baltic Sea (B)**		**EU measure category [37]**			
								Other policies		**MSFD**	
						N	**B**	**1a**	**1b**	**2a**	**2b**
WFD measures to restore longitudinal continuity, as well as removal of barriers to migration and creation of functional fish migration aids, for upstream and downstream migration (910)	68, 69, 76	5, 37	WFD, Habitats Directive	Technical	Terrestrial	X	X		X		
Improving the structure of waters	70 – 75, 77, 82	6	WFD	Technical	Terrestrial Transitional waters Coastal waters	X	X		X		
Measures to reduce peak flows due to land use	64	7	WFD	Technical	Terrestrial	X	X	X			
Research and improvement of knowledge base to reduce uncertainty	501, 503	14	WFD	Technical	Terrestrial Transitional waters Coastal waters	X	X		X		
Measures to reduce or control adverse impacts resulting from other anthropogenic activities (support programmes)	505	40	WFD	Policy driven Economic	Terrestrial Transitional waters Coastal waters	X	X		X		
Ballast water treatment systems and management (911)		34	IMO BWM Convention, OSPAR, HELCOM, TWSC	Legislative Technical	Terrestrial Transitional waters Coastal waters EEZ	X	X	X			
Implementation of Reg. (EU) No. 708/2007 concerning use of alien and locally absent species in aquaculture (912)		34	Reg. (EU) No. 708/2007	Legislative	Terrestrial Transitional waters Coastal waters EEZ	X	X	X			
Implementation of Reg. (EU) No. 1143/2014 on the prevention and management of the introduction and spread of invasive alien species (913)		34	Reg. (EU) No. 1143/2007	Legislative	Terrestrial Transitional waters Coastal waters EEZ	X	X	X			

Measure per overarching environmental target (UZ)[33] **Bold: MSFD measure** **Italic: Measures of the 2nd cycle or revised measures of the 1st cycle**	**Cata-logue of Mea-sures No.[34]**	**KTM under WFD and MSFD [35]**	**Consistency with selected EU Directives and international agreements**	**Mode of action**	**Spatial coverage [36]**	**Region North Sea (N) Baltic Sea (B)**		**EU measure category [37]**			
								Other policies		**MSFD**	
						N	**B**	**1a**	**1b**	**2a**	**2b**
Measures to prevent or control the adverse impacts of invasive alien species	94	18	WFD	Technical	Terrestrial Transitional waters Coastal waters		X		X		
Marine protected areas in the EEZ of the German North and Baltic Seas (914)		37	Habitats Directive, Birds Directive OSPAR, HELCOM, CBD	Legislative	EEZ	X	X	X			
Marine protected areas in the coastal waters of the German North and Baltic Seas (915)		37	Habitats Directive, Birds Directive OSPAR, HELCOM, TWSC, CBD	Legislative	Transitional waters Coastal waters	X	X	X			
Species and habitat protection (916)		27, 28, 37	Habitats Directive, Birds Directive, EIA Directive, CBD	Legislative Technical	Terrestrial Transitional waters Coastal waters EEZ	X	X	X			
Fisheries regulations as part of protected area ordinances and *Länder* fisheries acts (917)		27, 37	Habitats Directive, Birds Directive, OSPAR, HELCOM	Legislative	Transitional waters Coastal waters	X	X	X			
Voluntary agreements for the protection of habitats and species (918)		37	Habitats Directive, Birds Directive, OSPAR, HELCOM	Policy driven	Terrestrial Transitional waters Coastal waters	X	X	X			
Fisheries management measures in Natura 2000 sites in the EEZ (919)		27, 37	Habitats Directive, Birds Directive	Legislative	EEZ	X	X		X		
National action plan for sturgeon / Reintroduction of sturgeon (*Acipenser sturio*) (920)		37	Habitats Directive, OSPAR, HELCOM CBD	Technical Policy driven	Terrestrial Transitional waters Coastal waters	X	X		X		
Reintroduction of lobster (*Homarus gammarus*) (921)		37	CBD	Technical	Coastal waters (Schleswig-Holstein)	X		X			

Measure per overarching environmental target (UZ)[33] **Bold: MSFD measure** *Italic: Measures of the 2nd cycle or revised measures of the 1st cycle*	Cata-logue of Mea-sures No.[34]	KTM under WFD and MSFD [35]	Consistency with selected EU Directives and international agreements	Mode of action	Spatial coverage [36]	Region North Sea (N) Baltic Sea (B)		EU measure category [37]			
								Other policies		MSFD	
						N	B	1a	1b	2a	2b
Position paper by the Federal Environment Ministry on the cumulative assessment of loon habitat loss due to offshore wind farms in the German EEZ of the North and Baltic Seas as a basis for an agreement between the Federal Agency for Nature Conservation and the Federal Maritime and Hydrographic Agency; Introduction of a new technically reasoned assessment method (922)		37	Birds Directive, OSPAR	Legislative Technical	EEZ	X		X			
Approval process for developments (923)		27	Habitats Directive, Birds Directive, EIA Directive, WFD Federal Mining Act (BBergG), Offshore Installations Ordinance (SeeAnlV), Federal Waterways Act (WaStrG)	Legislative Technical	Terrestrial Transitional waters Coastal waters EEZ	X	X	X			
Maritime spatial plans at the federal (EEZ) and *Länder* levels (coastal waters) (924)		39	Marine Spatial Planning Directive, Federal Spatial Planning Act, Ordinance on Spatial Planning in the EEZ, *Länder* spatial planning acts, *Länder* spatial planning programmes	Legislative Technical Policy driven	Terrestrial Transitional waters Coastal waters EEZ	X	X	X			
Strategy for the protection from noise pollution of harbour porpoises during the construction of offshore wind farms in the German North Sea (Noise Abatement Strategy) (925)		28	Habitats Directive OSPAR, ASCOBANS	Legislative Technical	EEZ	X		X			

Measure per overarching environmental target (UZ)[33] **Bold: MSFD measure** *Italic: Measures of the 2nd cycle or revised measures of the 1st cycle*	Cata-logue of Mea-sures No.[34]	KTM under WFD and MSFD [35]	Consistency with selected EU Directives and international agreements	Mode of action	Spatial coverage [36]	Region North Sea (N) Baltic Sea (B)		EU measure category [37]			
								Other policies		MSFD	
						N	B	1a	1b	2a	2b
Implementation of Reg. (EU) 1100/2007 establishing measures for the recovery of the stock of European eel and Reg. (EU) 2020/123 fixing the 2020 fishing opportunities for certain fish stocks and groups of fish stocks, applicable in Union waters and, for Union vessels, in certain non-Union waters (9xx)		37	Reg. (EC) 1100/2007, Reg. (EU) 2020/123	Legislative	Transitional waters Coastal waters	X	X	X			
Inclusion of species and biotopes that define the value of an ecosystem in national MPA ordinances (UZ3-01)	409	26, 27, 37	EU Biodiversity Strategy, Habitats Directive, Birds Directive, MSP-Directive OSPAR, HELCOM CBD	Legislative	Coastal waters (except Mecklenburg-Western Pomerania) EEZ	X	X			X	
Measures to protect migratory species in marine areas (UZ3-02)	410	36, 37, 38	EU Biodiversity Strategy, Habitats Directive, Birds Directive, MSP-Directive OSPAR, HELCOM CBD, Bern and Bonn Conventions	Legislative Technical Policy driven	Coastal waters (except Mecklenburg-Western Pomerania) EEZ	X	X			X	
Refuges and resting areas for benthic habitats, fish, marine mammals, sea and coastal birds to protect against anthropogenic disturbance (UZ3-03)		37, **38**	Habitats Directive, Birds Directive, OSPAR, HELCOM CBD, ASCOBANS, AEWA, Trilateral Seal Agreement	Legislative Technical Policy driven Economic	Coastal waters EEZ	X	X			X	
Fostering Sabellaria reefs (UZ3-04)		35, 37		Legislative Technical	Coastal waters	X					X

Measure per overarching environmental target (UZ)[33] **Bold: MSFD measure** *Italic: Measures of the 2nd cycle or revised measures of the 1st cycle*	Cata-logue of Mea-sures No.[34]	KTM under WFD and MSFD [35]	Consistency with selected EU Directives and international agreements	Mode of action	Spatial coverage [36]	Region North Sea (N) Baltic Sea (B)		EU measure category [37]			
								Other policies		MSFD	
						N	B	1a	1b	2a	2b
Reef reconstruction, reintroduction of hard sediment substrates (UZ3-05)		37	Habitats Directive, EU Biodiversity Strategy, OSPAR, HELCOM CBD	Technical	Coastal waters EEZ	X	X			X	
Measures to implement the IMO Biofouling Guidelines (UZ3-06)		34	IMO Biofouling Guidelines and Guidance, Baltic Sea Action Plan	Technical Policy driven	Terrestrial Coastal waters EEZ	X	X			X	
Development and establishment of an early warning system for neobiota and decision support for immediate measures (UZ3-07)		34, 36	Reg. (EU) 1143/2014, Reg. (EU) 708/2007 OSPAR, TWSC, HELCOM	Technical Policy driven	Coastal waters EEZ	X	X			X	
UZ4	Seas with sustainable and environmentally sound use of resources										
Implementation of the new Common Fisheries Policy (CFP) (926)		35	EU Common Fisheries Policy	Legislative	Coastal waters EEZ	X	X		X		
Implementation of the provisions of the *Länder* Fisheries Acts (927)		35	*Länder* Fisheries Acts	Legislative	Terrestrial Transitional waters Coastal waters	X	X	X			
Approval process for developments (923)		27	Habitats Directive, Birds Directive, EIA Directive, WFD, Federal Mining Act (BBergG), Offshore Installations Ordinance (SeeAnlV), Federal	Legislative Technical	Terrestrial Transitional waters Coastal waters EEZ	X	X	X			

Measure per overarching environmental target (UZ)[33] **Bold: MSFD measure** *Italic: Measures of the 2nd cycle or revised measures of the 1st cycle*	Cata-logue of Mea-sures No.[34]	KTM under WFD and MSFD[35]	Consistency with selected EU Directives and international agreements	Mode of action	Spatial coverage[36]	Region North Sea (N) Baltic Sea (B)		EU measure category[37]			
								Other policies		MSFD	
						N	B	1a	1b	2a	2b
			Waterways Act (WaStrG)								
Provisions under the Federal Nature Conservation Act and *Länder* Nature Conservation Acts, esp. Habitats Directive assessments of implications for Natura 2000 sites, species and habitat protection, and provisions for mitigation of and compensation for impacts (928)		27, 37	Habitats Directive, Birds Directive, EIA Directive, EU Eel Regulation (1100/2007), OSPAR, HELCOM	Legislative Technical	Terrestrial Transitional waters Coastal waters EEZ	X	X	X			
Strategy for the protection from noise pollution of harbour porpoises during the construction of offshore wind farms in the German North Sea (Noise Abatement Strategy) (925)		28	Habitats Directive, OSPAR, ASCOBANS	Legislative Technical	EEZ	X		X			
Maritime spatial plans at the federal (EEZ) and *Länder* levels (coastal waters) (924)		39	Marine Spatial Planning Directive, Federal Spatial Planning Act, Ordinance on Spatial Planning in the EEZ, *Länder* spatial planning acts, *Länder* spatial planning programmes	Legislative Technical Policy driven	Terrestrial Transitional waters Coastal waters EEZ	X	X	X			
Integrated Coastal Zone Management (929)		39	EU ICZM Recommendation	Technical Policy driven	Terrestrial Transitional waters Coastal waters	X	X		X		
Wadden Sea Strategy 2100 (Schleswig-Holstein) (9xx)		26, 27, 27	TWSC, Floods Directive, WFD, Habitats Directive, Birds Directive	Technical Policy driven	Coastal waters	X		X			

Measure per overarching environmental target (UZ)[33] **Bold: MSFD measure** *Italic: Measures of the 2nd cycle or revised measures of the 1st cycle*	Catalogue of Measures No.[34]	KTM under WFD and MSFD[35]	Consistency with selected EU Directives and international agreements	Mode of action	Spatial coverage[36]	Region North Sea (N) Baltic Sea (B)		EU measure category[37]			
								Other policies		MSFD	
						N	B	1a	1b	2a	2b
Continue to raise public awareness of sustainable, ecosystem-compatible fisheries (UZ4-01)	411	20, 27, 35		Policy driven Economic	Terrestrial	X	X				X
Fisheries measures (UZ4-02)	412	20, 26, 27, 35, 37, 38	EU Biodiversity Strategy, Habitats Directive, Birds Directive, CFP HELCOM, OSPAR	Legislative Technical Policy driven Economic	Coastal waters (except Mecklenburg-Western Pomerania) EEZ	X	X			X	
Blue mussel management plan in the Wadden Sea National Park of Lower Saxony (UZ4-03)	413	27, 34, 35, 38		Legislative Technical	Coastal waters (Lower Saxony)	X					X
Sustainable and sound use of non-living sublittoral resources for coastal protection (North Sea) (UZ4-04)	414	27	Habitats Directive, Birds Directive, Floods Directive, EIA Directive, OSPAR, TWSC	Technical Policy driven	Coastal waters (Lower Saxony and Schleswig-Holstein)	X					X
Environmentally sound management of marine sand and gravel resources for coastal protection in Mecklenburg-Western Pomerania (Baltic Sea) (UZ4-05)	415	26, **27**	Habitats Directive, Birds Directive, Floods Directive, MSP Directive, EIA Directive, HELCOM	Technical	Coastal waters (Mecklenburg-Western Pomerania)		X			X	
Reviewing conformity of the mining law regime and MSFD requirements; should the need arise, development of technical and policy proposals (UZ4-06)		26, **27**, 31	HELCOM, OSPAR	Technical Policy driven	Coastal waters EEZ	X	X				X
UZ5	Seas without pressures from litter[38]										

[38] The UZ5-03 (catalogue No. 418) and UZ5-09 (catalogue No. 424) measures of the 2016–2021 programme of measures were combined in the course of updating the programme in the new measure UZ5-10 (catalogue No. 4xx) and replaced by it.

Measure per overarching environmental target (UZ)[33] **Bold: MSFD measure** *Italic: Measures of the 2nd cycle or revised measures of the 1st cycle*	Cata-logue of Mea-sures No.[34]	KTM under WFD and MSFD[35]	Consistency with selected EU Directives and international agreements	Mode of action	Spatial coverage[36]	Region North Sea (N) Baltic Sea (B)		EU measure category[37]			
								Other policies		MSFD	
						N	B	1a	1b	2a	2b
Waste management (refund systems and recovery quotas for packaging, ban on landfilling of plastics, waste avoidance) (930)		29	Waste Framework Directive	Legislative Technical Economic	Terrestrial	X	X	X			
Measures against single-use plastic products (9xx)		29	Directive (EU) 2019/904	Legislative Technical Economic	Terrestrial Coastal waters EEZ	X	X		X		
More stringent wastewater treatment	4	1	WFD	Technical	Terrestrial Transitional waters Coastal waters	X	X		X		
Ban on dumping of waste on the high seas (931)		29	MARPOL Annex V High Seas Dumping Act	Legislative	EEZ Beyond MS marine waters	X	X	X			
Specifications for port reception facilities, waste diaries and waste management plans (932)		29	Directive (EU) 2019/883, HELCOM	Legislative Technical	Terrestrial Transitional waters Coastal waters EEZ	X	X		X		
Provisions on ship-generated waste: Port State Control, Special Areas pursuant to MARPOL Annex V (933)		29	MARPOL Convention	Legislative Technical	Terrestrial Transitional waters Coastal waters EEZ	X	X	X			
OSPAR and HELCOM Regional Action Plans on Marine Litter (9xx)		29	UNEP, OSPAR, HELCOM	Legislative Technical Policy driven Economic	Terrestrial Coastal waters EEZ	X	X		X		
Including the topic "marine litter" in learning goals, teaching plans and materials (UZ5-01)	416	29	OSPAR, HELCOM	Technical Policy driven	Terrestrial	X	X			X	

Measure per overarching environmental target (UZ)[33] **Bold: MSFD measure** **Italic: Measures of the 2nd cycle or revised measures of the 1st cycle**	Cata-logue of Mea-sures No.[34]	KTM under WFD and MSFD [35]	Consistency with selected EU Directives and international agreements	Mode of action	Spatial coverage [36]	Region North Sea (N) Baltic Sea (B)		EU measure category [37]			
								Other policies		MSFD	
						N	B	1a	1b	2a	2b
Modification/substitution of products in a comprehensive life-cycle approach *(UZ5-02)*	417	29	Directive (EU) 2019/904 OSPAR, HELCOM	Legislative Technical Policy driven Economic	Terrestrial	X	X			X	
Reducing inputs of plastic litter, e.g. plastic packaging, into the marine environment *(UZ5-04)*	419	29	Directive (EU) 2019/904 OSPAR, HELCOM	Legislative Economic	Terrestrial	X	X			X	
Waste-related measures concerning fishing gear, including lost and abandoned nets (so called "ghost nets") *(UZ5-05)*	420	29, 37	Directive (EU) 2019/904, Directive (EU) 2019/883 OSPAR, HELCOM FAO, UNEP recommendations	Legislative Policy driven Economic	Terrestrial Transitional waters Coastal waters EEZ	X	X			X	
Establishing the "Fishing for litter" approach (UZ5-06)	421	29, 37	Directive (EU) 2019/904 OSPAR, HELCOM	Policy driven	Terrestrial Transitional waters Coastal waters EEZ	X	X			X	
Removing existing marine litter *(UZ5-07)*	422	29, 37	Directive (EU) 2019/904 OSPAR, HELCOM	Legislative Technical Policy driven Economic	Terrestrial Transitional waters Coastal waters EEZ	X	X			X	
Reducing amounts of plastic through local provisions *(UZ5-08)*	423	29	Directive (EU) 2019/904	Legislative Technical Policy driven	Terrestrial	X	X			X	
Avoiding and reducing inputs of microplastic particles into the marine environment (UZ5-10)		29	Directive (EU) 2019/904 OSPAR, HELCOM	Legislative Technical Policy driven Economic	Terrestrial	X	X			X	

Measure per overarching environmental target (UZ)[33] **Bold: MSFD measure** *Italic: Measures of the 2nd cycle or revised measures of the 1st cycle*	Cata-logue of Mea-sures No.[34]	KTM under WFD and MSFD[35]	Consistency with selected EU Directives and international agreements	Mode of action	Spatial coverage[36]	Region North Sea (N) Baltic Sea (B)		EU measure category[37]			
								Other policies		MSFD	
						N	B	1a	1b	2a	2b
Waste-related measures in commercial and recreational shipping (UZ5-11)		29, 37	Directive (EU) 2019/904, Directive (EU) 2019/883 OSPAR, HELCOM	Legislative Technical Policy driven Economic	Terrestrial Transitional waters Coastal waters EEZ	X	X			X	
UZ6	Seas not impacted by the introduction of anthropogenic energy										
Approval process for developments (923)		28	EIA Directive, Habitats Directive, Birds Directive Federal Mining Act (BBergG), Offshore Installations Ordinance (SeeAnlV), Federal Waterways Act (WaStrG)	Legislative Technical	Terrestrial Transitional waters Coastal waters EEZ	X	X	X			
Strategy for the protection from noise pollution of harbour porpoises during the construction of offshore wind farms in the German North Sea (Noise Abatement Strategy) (925)		28	Habitats Directive OSPAR, ASCOBANS	Legislative Technical	EEZ	X		X			
Thermal load plans	17	10, 28	WFD	Technical Legislative Economic	Terrestrial Transitional waters Coastal waters	X	X	X			
Development and application of biological limit values for the impact of underwater noise on relevant species (UZ6-01)	425	28, 37	Habitats Directive Bern and Bonn Conventions incl. ASCOBANS	Legislative Technical Policy driven	Transitional waters Coastal waters EEZ	X	X			X	
Establishment of a registry for relevant sound sources and shock waves and of	426	28	OSPAR, TWSC, HELCOM	Technical	Transitional waters Coastal waters EEZ	X	X				X

Measure per overarching environmental target (UZ)[33] **Bold: MSFD measure** *Italic: Measures of the 2nd cycle or revised measures of the 1st cycle*	Cata-logue of Mea-sures No.[34]	KTM under WFD and MSFD [35]	Consistency with selected EU Directives and international agreements	Mode of action	Spatial coverage [36]	Region North Sea (N) Baltic Sea (B)		EU measure category [37]			
								Other policies		MSFD	
						N	B	1a	1b	2a	2b
standardised mandatory reporting requirements (UZ6-02)											
Noise mapping of German marine areas (UZ6-03)	427	28	OSPAR, TWSC, HELCOM	Technical	Transitional waters Coastal waters EEZ	X	X				X
Development and application of noise mitigation measures for the North and Baltic Seas *(UZ6-04)*	428	28, 37, 38	EU Biodiversity Strategy, Habitats Directive, OSPAR, HELCOM Bonn Convention incl. ASCOBANS	Legislative Technical Policy driven	Transitional waters Coastal waters EEZ	X	X			X	
Application of threshold values for the introduction of heat (UZ6-05)	429	28, 34	WFD, TWSC	Legislative	Transitional waters Coastal waters EEZ	X	X			X	
Development and application of environmentally sound lighting of offshore installations and accompanying measures (UZ6-06)	430	28	Habitats Directive, Birds Directive	Legislative Technical	Coastal waters EEZ	X	X				X
UZ7	Seas with natural hydromorphological characteristics										
Approval process for developments (923)		26, 27, 37	EIA Directive, Habitats Directive, Birds Directive	Legislative Technical	Transitional waters Coastal waters EEZ	X	X	X			
Studies on climate change	509	24	WFD	Technical	Terrestrial Transitional waters Coastal waters	X	X		X		
System for hydromorphological and sedimentological information and analysis for the North and Baltic Seas (UZ7-01)	431	26, 27, 37	EIA Directive, WFD, Habitats Directive OSPAR, HELCOM	Technical	Transitional waters Coastal waters EEZ	X	X				X

Measure per overarching environmental target (UZ)[33] **Bold: MSFD measure** *Italic: Measures of the 2nd cycle or revised measures of the 1st cycle*	Cata-logue of Mea-sures No.[34]	KTM under WFD and MSFD[35]	Consistency with selected EU Directives and international agreements	Mode of action	Spatial coverage[36]	Region North Sea (N) Baltic Sea (B)		EU measure category[37]			
								Other policies		MSFD	
						N	B	1a	1b	2a	2b
Ecological strategy for sediment management in the Lower Saxony Wadden Sea and offshore islands (with reference to the catchments of the Harle and Blauer Balje gats) (UZ7-02)		26, 27, 30, 37	OSPAR	Technical Policy driven	Coastal waters (Lower Saxony)	X					X

Annex 3 – Summary of planned MSFD measures to achieve the environmental targets

(Excerpts from the fact sheets for the individual measures in Attachment 1 to the Summary Report[39])

[39] https://www.meeresschutz.info/oeffentlichkeitsbeteiligung.html?file=files/meeresschutz/beteiligung/art13-massnahmen/zyklus22/MSRL_Art13_Massnahmenprogramm_Anl_1_Massnahmenkennblaetter.pdf

Part I: MSFD measures of the second cycle 2022–2027

Reporting year 2022, for consultation

I.1 Additional MSFD measures

Target 1 – Seas unaffected by eutrophication	
UZ1-05	**Revision of the Gothenburg Protocol to the Convention on Long-range Transboundary Air Pollution (CLRTAP) as it relates to the seas, in particular with a view to reducing atmospheric inputs of NO_x and ammonia**
	The Geneva Convention on Long-range Transboundary Air Pollution (CLRTAP) is an international treaty on air pollution control. It was adopted in 1979 and entered into force in 1983. There are currently 51 parties. Compliance is monitored by the CLRTAP Executive Body (UNECE). This air pollution control treaty formed the basis for the adoption in 1999 of the Gothenburg Protocol to Abate Acidification, Eutrophication and Ground-level Ozone. The Protocol entered into force in 2005 and more stringent commitments were introduced in 2012. For all signatory states (almost all European countries and the USA and Canada) it imposes limits on their annual emissions of the regulated pollutants (SO_2, NO_x, NH_3, $PM_{2.5}$ and VOC). The limits apply from 2020 and the baseline year for the calculation of percentage reductions is 2005. Because the reduction commitments are not tightened further after 2020, the Protocol is currently being reviewed with the aim of defining further reductions in atmospheric pollutants. The reduction commitments are currently based solely on the extent of effects on health and on semi-natural terrestrial ecosystems. For semi-natural, terrestrial ecosystems, critical loads have been identified. These are ecosystem-specific values that define the level below which no adverse impacts as a result of eutrophication or acidification are to be expected in the foreseeable future. It is proposed that, as part of this measure, the forthcoming revision process should for the first time include the requirements of marine protection. How this can actually be achieved is currently under discussion. Effect-based values analogous to the critical loads for terrestrial ecosystems would have to be used or, if necessary (as with OSPAR), defined: these could, for example, take the form of the “maximum allowable inputs” (MAI) in the Baltic Sea Action Plan. A possible first step is to define the reduction commitments of individual states on the basis of the polluter pays principle. This would involve using quantification of each country’s water-based and air-based shares in inputs (which is already partially available in OSPAR and HELCOM) to define the reduction commitments for the revised Gothenburg Protocol on the basis of the atmospheric share. An essential requirement for use of this approach is that the maximum permitted nitrogen inputs are known. For HELCOM this is already the case (see the “maximum allowable inputs” (MAI) in the Baltic Sea Action Plan), while OSPAR will probably specify “maximum inputs of nutrients” in 2022 at the earliest. Both HELCOM (in the Baltic Sea Action Plan) and OSPAR (in the North-East Atlantic Environment Strategy) refer to the need for cooperation with CLRTAP and active inclusion of the regional marine conservation conventions in this process is envisaged. *Mode of action:* • Legal • Political
UZ1-06	**Implementation of Germany’s National Air Pollution Control Programme as it relates to the seas**
	Germany’s National Air Pollution Control Programme (*nationales Luftreinhalteprogramm*, NLRP) describes the additional measures necessary for compliance with the emission

	reduction commitments of the NEC Directive 2016/2284 for the pollutants NO_X, SO_2, NH_3, $PM_{2.5}$ and NMVOC until 2030. Germany's NO_X and NH_3 emissions and those of other countries are making a significant contribution to the eutrophication of the North Sea and the Baltic. Around 20-30% of nutrient inputs to the North Sea and the Baltic are received from the atmosphere. Implementation of the NLRP in relation to the seas means specifying or implementing the NLRP measures in such a way that they not only focus on terrestrial ecosystems but also cover the pathway into the oceans. The aim is to ensure that the impact of the measures on the oceans is maximised. With regard to ocean-related design of the NLRP, there are in principle two options. Firstly, measures already specified in the existing NLRP could be made more relevant to the oceans, for example by bringing forward the implementation of coastal emissions reduction measures that are already planned or by specifying ocean-related measures as part of further regulations and support options. Secondly, the regular updates of the NLRP that are due from 2023 onwards could include additional ocean-related measures. For example, the present state of knowledge indicates that measures to prioritise the reduction of ammonia emissions in parts of northern Germany in which livestock density is high are particularly effective in terms of reducing nitrogen inputs to the oceans. However, it should be borne in mind that the NLRP is a national programme; supplementary ammonia emissions programmes may be necessary in the relevant *Länder*. Other effective measures in the agricultural sector could be identified on the basis of the recommendation on reducing ammonia emissions in agriculture that is being drafted in HELCOM. *Mode of action:* • Legal • Technical • Political
UZ1-07	**Development of ocean-related target values for reductions in inputs of phosphorus, contaminants and plastics (incl. microplastics) at the limnic-marine transition point, as a basis for the management of river basin districts in accordance with the WFD**
	Background: In relation to eutrophication, contaminants and marine litter (especially plastics), the good environmental status of marine waters in accordance with the MSFD is not being met. A significant proportion of these substances comes from land-based sources and is carried by rivers into the sea, which acts as a substance sink. The environmental targets for the MSFD defined in accordance with Section 45e of the Federal Water Act (*Wasserhaushaltsgesetz*, WHG) specify that inputs, including inputs from rivers, must be reduced. On the basis of the nutrient and chlorophyll concentrations permissible in the sea if good status is to be achieved, target values for total nitrogen at the limnic-marine transition point were defined (2.8 mg/l in North Sea tributaries, 2.6 mg/l in Baltic tributaries) and enshrined in the Surface Waters Ordinance (*Oberflächengewässerverordnung*, OGewV). The target concentration at the limnic-marine transition point provides a basis for calculation of the need to reduce the nutrient load at the transition point, from which it is then possible to calculate the terrestrial reduction requirements as a whole and identify any additional measures that may be necessary for the ocean-related input reductions. There are no target values at the limnic-marine transition point for (total) phosphorus, contaminants and plastic inputs (including microplastics). Total phosphorus at the limnic-marine transition point is currently covered, firstly, by guidance values for specific river types set out in the conceptual framework for the establishment of monitoring programmes and assessment of the status of surface waters (*Rahmenkonzeption zur Aufstellung von Monitoringprogrammen und zur Bewertung des Zustands von Oberflächengewässern*, RaKon) published by the Joint Working Group of the Federal Government and the *Länder* (LAWA) and, secondly, by criteria for good ecological status and good ecological potential in accordance with the WFD in support of the biological quality components of the OGewV (Annex 7). For contaminant concentrations in water, suspended matter and/or biota, binding requirements are the environmental quality standards (chemical status) for priority substances (UQN, Annex 8 OGewV) and (ecological status) for river-basin-specific pollutants (Annex 6 OGewV) in surface waters. However, concrete targets at the limnic-

marine transition point provide a basis for formulating and implementing inland measures for ocean-related input reductions that are necessary for achievement of good environmental status in marine waters under the MSFD. Such measures can, for example, be implemented as part of the management plans for the river basin districts under the WFD.

Reducing the pollutant load in rivers is an important water management issue in the context of the WFD.

To prevent inputs and remobilisation, measures within river basin districts should wherever possible tackle the potential inputs at source or close to the point of origin and should include removal of polluted sediments and soils in floodplains, with the aim of minimising the input of pollutants. Reducing river-borne inputs of plastics or retaining them at the input source within the river basin districts is an important lever for achieving good environmental status in the oceans.

Description of the measure:

Overall, the following steps are necessary.

The measure to be reported formally as part of the reporting required under Article 13 of the MSFD should focus mainly on steps 1 and 2.

1. Identification/selection of the relevant/important substances and matrices
2. Derivation of target values at the limnic-marine transition point
3. Identification of the reduction required in the interior of the catchment area in order to achieve the above target values at the limnic-marine transition point
4. Comparison of the maximum pollutant loads with the actual loads and identification of the reduction in the interior of the catchment area that is still required
5. Steps 1 to 4 should provide a sufficient basis for the identification and implementation of measures in the context of the WFD management plans in the river basin districts or the MSFD programmes of measures in the subsequent management cycles to achieve the ocean-related reduction requirements.
6. Development and subsequent establishment of a monitoring scheme at the limnic-marine transition point to monitor the reduction in pollutant loads

The basis for implementing steps 1-4 and the monitoring scheme under step 6 should be financed through federal government research programmes. It should be worked out in close collaboration with federal and *Länder* authorities at the specialist LAWA and BLANO level and then submitted to the BLANO or LAWA decision-making bodies for approval. Existing monitoring schemes and data from existing measuring sites should serve as a starting point. To enable the target values to be compared with the existing measurement values, the existing measurement values should be standardised in an appropriate way.

During the project (as part of steps 1 and 2), existing national and regional target values and (where present) reduction requirements, together with the available data on all parameters, should be inspected and evaluated. This will provide a basis for making a selection for which – applying the precautionary approach – target values can realistically be developed. In the above step 1 of the project, not only the target concentrations but also target loads at the limnic-marine transition point should be identified and proposed. By comparison with target concentrations, target loads have an advantage in that the annual fluctuation in river discharge, which is increasing as a result of climate change, is taken into account, thereby enabling better quantification of achievement of the target. Long-distance transport is also taken into account when calculating the reduction requirements.

Implementation of the measure follows various timelines that are geared to the current state of knowledge (in descending order from short-term to longer term):

- (total) phosphorus
- contaminants (including those that are particulate-bound)
- plastics (including microplastics)

Mode of action:

- Legal
- Technical

UZ1-08	**Restoration and conservation of seagrass beds**
	Restoration of seagrass populations, restoration and conservation of these natural habitats in the vicinity of transitional and coastal waters. Seagrass beds in estuaries perform an important ecological function as a filter for the nutrients from surrounding water basins discharged with the upstream water or from adjacent coastal water – especially nitrogen (N). Seagrass beds potentially help to improve the water quality by transferring nitrogen into the sediment and by denitrification. An important seagrass population in the Hund and Paapsand protected area in the outer Ems estuary has been almost entirely lost in recent years, probably as a result of anthropogenic influences. The occurrence of seagrass depends heavily on the substrate, energy input, extensive sediment shifts and properties of the water body. It's sensitivity to changes in environmental conditions is well known, but the dynamics of this are not yet sufficiently understood. Since there is some likelihood that the loss of seagrass beds is due to a lowering of the sea floor as a result of gas extraction, the pilot measure will also cover adaptation to the possible consequences of an accelerated rise in sea level. *Mode of action:* • Technical
UZ1-09	**Pilot study of environmentally friendly ways of handling fertilisers in ports**
	When fertilisers are loaded, significant quantities of nutrients enter the marine environment via the ports. The CCB estimated that in 2013 this amounted to 16,700 tonnes per year for the ports of the Baltic area.[40] Although the 16,700 tonnes represent only about 2% of the maximum permitted nitrogen input into the Baltic, they account for 25% of the remaining nutrient reduction requirement for nitrogen in the Baltic Sea Action Plan (67,122 tonnes as at 2017[41]). As part of the measure, efforts will be made to deploy best available techniques and best environmental practice (BAT/BEP) in model ports on the North Sea and Baltic coast. The aim is to produce recommendations on optimising port procedures relating to the proper handling of bulk fertiliser cargoes in order to prevent losses entering the water. The CCB reports describe numerous opportunities for improving handling techniques. After the trial phase the tested improvements in handling techniques and corresponding management practices (BAT/BEP) will be documented in a study and where possible utilised in other ports. In a first step, a survey will be conducted after unloading in the selected model ports which will help identify and document the type and extent of inputs and the reasons for them. The measure is actively related to the proposed HELCOM action in the new Baltic Sea Action Plan "Reduce nutrient losses to zero from dry bulk fertiliser storage and handling in Baltic ports". This measure could therefore be used as a German contribution to the HELCOM action and a means of participating in it. *Mode of action:* • Legal • Technical
UZ1-10	**Criteria, conditions and procedures for sustainable mariculture systems**
	There are two aspects to the measure:

[40] Coalition Clean Baltic (CCB), 2019, CCB-Report – Concept Best Available Technologies & Techniques: Bulk Fertilizer Handling, https://ccb.se/wp-content/uploads/2019/03/ccb_concept-bat-fertilizer_report-final.pdf.

[41] HELCOM, 2017, Progress towards Maximum Allowable Inputs, https://helcom.fi/baltic-sea-action-plan/nutrient-reduction-scheme/progress-towards-maximum-allowable-inputs/.

1) The development of criteria, conditions and procedures on the basis of best available techniques and best environmental practice (BAT/BEP) that provide guidance for forward-looking environmentally friendly mariculture and for approval practice;
2) To support implementation of the guidance referred to under 1) and the development and application of BAT/BEP, the development of environmentally sound and innovative methods in mariculture (BAT/BEP) should be promoted.

Re 1)

The objective of the measure is

- to develop criteria, conditions and procedures for the establishment and operation of marine aquaculture systems (maricultures) that comply with the objectives of the MSFD, including MSFD-related aspects of nature conservation,
- to combine these in national guidelines on environmentally friendly mariculture and
- make the guidelines available for national application in approval practice, thus implementing a standardised approach to mariculture in German North Sea and Baltic waters.

The current recommendations on sustainable aquaculture (HELCOM BAT/BEP; Recommendation 37/3[42]) were used as a basis for this measure fact sheet. These recommendations led to identification of the following key points for the guidelines on the establishment and operation of marine aquaculture facilities (maricultures) that are to be developed:

a) Principles

- In the development of marine aquaculture and the establishment of mariculture facilities, the functions and services of ecosystems are to be considered, emissions and inputs are to be prevented or minimised in accordance with state-of-the-art technology, and adverse environmental impacts are to be minimised.
- With regard to the evaluation of aquaculture facilities in protected areas from the point of view of nature conservation law, reference is made to the responsible protected area authorities.
- With regard to the establishment and operation of maricultures in the protected areas of the Exclusive Economic Zone, the regulations on the designation of protected areas in general and the rules on mariculture in particular contained therein are to be observed.
- Mariculture systems within protected areas in coastal waters can only be approved if significant impairment of the area's protection and conservation goals can be ruled out. The decision is taken by the responsible protected area authority.
- For mariculture facilities outside protected areas, possible significant adverse impacts on the protected areas and their marine ecosystems must also be considered.
- Risks to wild fish stocks and ecosystems (including genetic mixing of farmed and wild stocks) and the spread of parasites and diseases, especially as a result of accidental release or escape, must be prevented or minimised. In this connection, the use of suitable native species and species that are established in aquaculture will be investigated, as will the choice of breeding techniques.
- With regard to possible nutrient inputs and associated eutrophication effects as a result of maricultures, the approval procedure under water law takes account of the relevant criteria, including compliance with the non-deterioration and target achievement requirements of the WFD/MSFD. The production of nutrient balances for the specific operation is a useful tool for assessing and minimising the possible nutrient outputs of a particular facility.
- Waste and wastewater should be treated, disposed of and/or utilised to prevent or minimise adverse impacts on the marine environment, including in relation to microplastics.
- Closed aquaculture systems on land that discharge wastewater directly into coastal waters must also comply with water-law regulations, especially the non-deterioration and target achievement requirements of the WFD/MSFD.
- Guidelines and standards, and opportunities for utilising innovative techniques, are to be developed in dialogue with environmental and aquaculture experts.

[42] HELCOM, 2016, Helcom Recommendations 37/3 Sustainable aquaculture in the Baltic Sea region, https://helcom.fi/wp-content/uploads/2019/06/Rec-37-3.pdf

b) Approval procedures

- Approval procedures for marine aquaculture facilities within and outside protected areas in the territorial waters and the Exclusive Economic Zone will comply with the relevant fields of law. In both the territorial waters and the Exclusive Economic Zone the nature conservation and water-law provisions for the application are to be observed and the full application documents for each mariculture facility are to be submitted. In this connection the following aspects are to be covered:
  - Prevention/minimisation of adverse environmental impacts through selection of suitable sites, with due consideration of the hydrographic and hydrological conditions and biological features (species and habitats) of the particular marine area
  - Examination of compliance with the non-deterioration and target achievement requirements in terms of the relevant parameters/descriptors of the MSFD/WFD; i.e. evaluation of the predicted impacts in relation to achievement of good environmental status and the environmental targets in accordance with the MSFD or good ecological/chemical status in accordance with the WFD including definition of appropriate prevention and minimisation measures (incl. nutrient inputs, inputs of pollutants (e.g. pharmaceuticals, anti-fouling agents, cleaning agents and disinfectants), non-native species, inputs of plastic waste)
  - Assessment of compliance with relevant requirements of nature conservation law (BNatSchG, state nature conservation laws, protected area ordinances, national park legislation)
- A permit should contain provisions on the monitoring and documentation of compliance with the conditions laid down in connection with the approval; this should account for potential impacts of the substance outputs (such as, where used, nutrients, pollutants, pharmaceuticals) on relevant parameters such as the oxygen budget, sediments and settlement in the area concerned.

These key points apply on the basis of the above-mentioned HELCOM recommendation in particular to mariculture facilities in the Baltic.

Specification of the BAT/BEP in the context of HELCOM is currently in development. The national guidelines that are to be drawn up can be incorporated into this process; conversely, the BAT/BEP that are developed further at HELCOM level – where they are applicable and appropriate to Germany's Baltic Sea waters – can be fed into the national process.

The applicability of the guidelines to the German North Sea waters is initially to be examined in the context of the measure and in relation to the mariculture species that occur in the North Sea. Existing area-related specifications are to be taken into account in this process. For example, in the Schleswig-Holstein Wadden Sea National Park, an expansion of aquaculture that goes beyond the existing mussel farming schemes is not consistent with the national park's development objectives and is therefore ruled out. The examination of potentials in the offshore area of the North Sea beyond the national park boundary is not affected by this. The above-mentioned criteria and aspects from an environmental and nature conservation perspective also apply to this examination.

In the context of OSPAR, a first step will involve reporting in 2021 on the existing OSPAR recommendation PARCOM 94/6 "Potentially toxic chemicals from aquaculture use".[43] In a next step a decision will need to be taken on whether the recommendation will be revised and expanded in line with the HELCOM recommendation so that nutrient inputs from maricultures are also addressed. The national guidelines that are to be drawn up can be incorporated into this process; conversely, the BAT/BEP that are developed at OSPAR level – where they are applicable and appropriate to Germany's North Sea waters – can be fed into the national process.

Re 2)

To support implementation of the guidance referred to under 1) and the development and application of BAT/BEP, the development of environmentally sound and innovative methods in mariculture will be promoted. The objective of this aspect of the measure is not to promote the expansion of mariculture (which should take place in accordance with the EU and national aquaculture strategies and the aquaculture strategies of the coastal *Länder*)

	but – in line with the precautionary approach – to promote the development and use of environmentally friendly procedures and techniques so that these are available and can be used in the event that mariculture becomes established. This should occur in dialogue between environmental protection specialists on the one hand and aquaculture experts on the other. The action areas here are e.g.: • Promotion of the use of environmentally friendly methods and means in order to reduce the use of chemicals • Promotion of a sustainable composition of fish food to reduce the pressure on wild fish and prevent additional nutrient inputs by optimising the nutrient content • Exploring the potentials of innovative approaches such as integrated multitrophic maricultures and, if appropriate, promotion of use • Stepping up the dialogue between environmental and aquaculture experts Examination of the ecological advantages, disadvantages and environmental impacts of different mariculture systems and aquaculture systems on land *Mode of action:* • Legal • Political
Target 2 Seas not polluted by contaminants	
UZ2-05	**Information campaign: proper disposal of pharmaceuticals – focus: seagoing ships**
	If pharmaceuticals enter the environment, this can have harmful effects on organisms. Studies have found various active pharmaceutical substances in the marine environment. Their presence is partly due to improper disposal of unused pharmaceuticals via the toilet or drain, because effluent treatment plants in Germany are not currently able to remove these substances in full.[44] It can be assumed that pharmaceuticals are also disposed of in this way on seagoing ships, especially cruise ships and RoPax ferries, and may enter the marine environment with the ships' effluent. An information campaign on seagoing ships, especially cruise ships and RoPax ferries, involving methods such as leaflets, explanatory films or stickers, will aim to highlight the resulting risks to the marine environment and educate people about the proper disposal of unwanted pharmaceuticals on board, and in consequence also on land. Both flag state and port state actors will be encouraged to participate in the information campaigns. As an adjunct to the information campaign, on-board doctors and pharmacists shall be given background information to enable them to provide comprehensive advice to interested pharmaceutical users on the proper disposal of drugs on board. The information material shall also be supplied in English. Consideration is to be given to whether further translations into languages such as Chinese, Spanish or Russian would be worthwhile. *Mode of action:* • Political

[43] PARCOM Recommendation 94/6 on Best Environmental Practice (BEP) for the Reduction of Inputs of Potentially Toxic Chemicals from Aquaculture Use, https://www.ospar.org/documents?d=32475

[44] BMU/UBA (publ.), 2019, *Ergebnispapier – Ergebnisse der Phase 2 des StakeholderDialogs "Spurenstoffstrategie des Bundes" zur Umsetzung von Maßnahmen für die Reduktion von Spurenstoffeinträgen in die Gewässer*. Eds.: Hillenbrand, T.; Tettenborn, F.; Bloser, M.; Bonn: German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety / Dessau: German Federal Environment Agency, https://www.bmu.de/fileadmin/Daten_BMU/Download_PDF/Binnengewaesser/ergebnispapier_stakeholder_dialog_phase2_bf.pdf

UZ2-06	**Information campaign: raising awareness of the environmental impacts of UV filters in sunscreen lotions**
	UV filters are organic and inorganic substances that are used in sunscreen products to protect the skin from UV radiation. They can cause environmental problems, because in some cases they are endocrine disruptors and they can be toxic to aquatic organisms; some are also persistent. Research has shown, for example, that in holiday resort areas these substances enter the ocean directly. An information campaign will aim to provide information on the risks that UV filters pose to the marine environment and encourage people to be more thoughtful in their use of sunscreen products. The campaign will also highlight other ways in which people can protect themselves from excessive UV exposure and thus reduce the risk of skin cancer caused by excessive UV radiation (such as by seeking out shade, especially in the middle of the day, or by wearing clothes that incorporate UV protection). The risks that UV radiation poses to human health will definitely be covered, not only in relation to personal protection but also in relation to the protection of vulnerable groups such as children and older people who are not able to protect themselves adequately. The information campaigns will therefore also emphasise the importance for human health of using sunscreen products when exposed to the sun. Sunscreen products protect against harmful UV radiation that can cause numerous health problems. It is particularly important to ensure that children avoid sunburn and high levels of UV exposure. The information can be provided via leaflets, postcards, posters or explanatory films, primarily in coastal holiday resorts. The information materials produced in this context can serve as a model or basis for similar campaigns in inland areas. *Mode of action:* • Political
UZ2-07	**Working towards a reduction in the discharge of cargo residues of solid bulk goods into the sea**
	The discharge of cargo residues from ships is covered by Regulations 4 and 6 of MARPOL Annex V. The discharge of cargo residues that are harmful to the marine environment (HME, according to the criteria in Appendix I to Annex V of MARPOL) is prohibited in all marine areas. The discharge of cargo residues that are not classified as harmful to the environment (non-HME) is permitted outside Special Areas under Regulation 4 and within Special Areas only in the exceptional situations described in Regulation 6. The revised Directive (EU) 2019/883 on port reception facilities for the delivery of waste from ships requires EU Member States to maintain port reception facilities for the waste arising on the ships that normally use the port. The revised Directive (EU) 2019/883 needs to be transposed into German law by 28 June 2021. It does not specify the substances or cargo residues for which reception facilities must be maintained. The measure aims to reduce the discharge of cargo residues of solid bulk goods and ensure that waste is managed in the ports. The measure comprises three components. **Component 1:** The need to specify and amend MARPOL Annex V • Identification of the existing reception facilities for cargo residues of solid bulk goods (IMSBC and MARPOL Annex V), including wash water that contains these cargo residues, • Identification of any existing obstacles to the disposal of cargo residues both on the part of ports and on the part of ships, • Identification of corresponding measures and options for action. In this context, particular attention should be paid to the existing IMO regulations, and the need for specification and amendment should be identified. Because all German ports are adjacent to MARPOL V Special Areas, it is necessary to ensure that port reception facilities in German ports in which bulk goods are transhipped can accept cargo residues of these goods. As part of the measure, efforts should also be

	directed towards ensuring that the relevant ports that are usually used by bulk cargo ships can also accept cargo residues of other bulk goods for disposal. Where this is not yet the case, the reasons should be identified and appropriate measures put in place. **Component 2:** Investigating the feasibility of a study on extending the categories for HME substances Most of the usual fertilisers are not currently covered by the criteria listed in Appendix I to Annex V for cargoes that are classed as harmful to the marine environment (HME). In order to reach a decision on a scheme for adding to Appendix I, a solid data base must be produced (research project). However, it is clear from Grote et al. (2016)[45] that assessing the volume of actual discharges for individual marine areas is very difficult. In addition, it is likely that the degree of harm posed by the discharged quantities of fertiliser varies widely in different areas and regions. Steps should therefore be taken to investigate whether and within what framework a study of the extension of HME substances to include fertilisers is feasible and a practicable means of achieving supplementation of Appendix I with regard to fertilisers at IMO level. **Component 3:** IMO work programme item As part of the measure and after the completion of Component 1, the responsible representatives of Germany (possibly with representatives of other countries) are urged – when the necessary information is available – to submit to the IMO a proposal for a new work programme item for the Marine Environment Protection Committee (MEPC) in order to open up discussion of the need for specification and amendment identified in Component 1. *Mode of action:* • Legal • Technical
UZ2-08	**Examination of the possibilities of a scheme for using the German Bight Western Approach traffic separation area for large container ships**
	"Under the Conditions of Access Ordinance (*Anlaufbedingungsverordnung*, AnlBV), laden tankers and gas tankers of a certain size must use the German Bight Western Approach traffic separation area off the German coast with a greater depth of water. To avoid coastal marine accidents such as that involving the MSC Zoe, a tightening of marine routing regulations should be considered internationally."[46] Initiative for a legal act (ordinance with legal force) to enforce the usage scheme for certain other ships (large container ships). Consultation on the measure is currently under way in the federal-*Länder* working group on the routing and loading of the MSC Zoe and further investigations are being conducted by the Dutch and German institutions (MARIN and BSH) in order to justify changes to the existing routing measures in the IMO. Inclusion in the MSFD programme of measures depends partly on the outcomes of these investigations and consultations. From the point of view of preventing maritime disasters there is an important aspect that supports the diversion of large container shipping to the traffic separation area away from the coast: the risk of a large container ship drifting uncontrollably as a result of engine failure and running aground. This consideration was arrived at during evaluation of the emergency towing plan. The report of the independent environmental group of experts (UEG) that advises the Central Command for Maritime Emergencies on the consequences of pollutant accidents points out "that in the majority of cases the biggest risk arises from the fuel of damaged

[45] Grote et al., 2016, Dry bulk cargo shipping – An overlooked threat to the environment? Marine Pollution Bulletin 110, 511 – 519.

[46] Bundesrat Drucksache 68/19, 06.02.19.

	container ships. Because of the size of the ships, the volume of fuel that they contain can be equivalent to the full cargo of a small oil tanker."[47] *Mode of action:* • Legal
UZ2-10	**Improving traceability and tackling marine pollution by procuring a survey vessel for the German North Sea**
	To further improve the traceability of marine pollution and help combat it, Lower Saxony plans to commission a new water pollution control vessel for the coastal waters of Lower Saxony (North Sea). It is envisaged that the ship would be used for multiple purposes and that it would be actively deployed to tackle marine pollution. It would also undertake surveillance tasks and in particular it would enable marine pollution to be traced. Its deployment would thus be in line with Annex VI of the Marine Strategy Framework Directive: *5.) Measures to improve the traceability, where feasible, of marine pollution, and 7.) Mitigation and remediation tools: Management tools which guide human activities to restore damaged components of marine ecosystems.* The planned measure serves both purposes. The vessel will support the monitoring programme introduced by the federal government and the coastal *Länder* to identify the impacts of pollutant accidents and hold the polluters liable for costs; it will also assist in the detection and prosecution of marine pollution. It thus directly meets the requirements of Annex VI (5) of the Directive. In addition, the measure can provide a deterrent against the deliberate discharge of unwanted substances and it thus constitutes a management tool within the meaning of Annex VI (7) of the Directive. Efforts will be made, via voluntary measures, to fit out the ship in a more environmentally friendly way than is statutorily required: the Blue Angel ecolabel criteria will be used for guidance in this respect. *Mode of action:* • Technical
Target 3 Seas with marine species and habitats unaffected by impacts of human activities	
UZ3-03	**Refuges and resting areas for benthic habitats, fish, marine mammals, sea and coastal birds to protect against anthropogenic disturbance**
	The measure is aimed at protecting the species, habitats and functions listed below by creating refuges and resting areas, if this is indicated by the analyses below. Depending on the analyses mentioned below, this may primarily require spatial and/or temporal regulation and remediation of anthropogenic pressures and human activities in accordance with Annex III MSFD, which impact the individual protected assets to varying degrees. The starting point for the analysis is the existing suite of protected areas (especially areas protected under nature conservation or fisheries law), their management plans and measures, and their effectiveness, which is to be considered. The existing suite of protected areas is evaluated with regard to their function as refuges and their protective effects on the above-mentioned features. Protection measures outside of protected areas are considered in greater detail and, where necessary, implemented if the requirements cannot be met in existing protected areas. The aim is to identify areas in the coastal sea and in the EEZ that integrate as many protected assets as possible. Any protection measures required outside the protected areas are further specified in consideration of the relevant uses of the sea and recommended for implementation if the requirements of the MSFD, Habitats Directive and Birds Directive cannot otherwise be met in existing protected areas. In addition, spatial planning specifications must be observed and taken into account. In the territorial waters,

[47] Unabhängige Umweltexpertengruppe "Folgen von Schadstoffunfällen" (UEG) beim Havariekommando, *Havarien mit Containerfrachtern: Herausforderungen an das Havariekommando aus Umweltsicht* (Report of the UEG of 5 February 2017, updated version of 25 June 2019 following the accident of the MSC Zoe)

the analysis (1-3) will include the entire 12 nm zone, based on the existing protected areas and the current state of knowledge.

The multi-stage measure provides for:

1. Technical analysis of the need for refuges and resting areas necessary to meet the requirements and objectives of the MSFD and the Habitats and Birds Directives. These needs are identified for the ecosystem components and by surveying the specific relevant pressures pursuant to Annex III MSFD.
2. Spatial analysis to determine where the identified needs can be met in an ecologically meaningful way (localisation). Analysis of what is already covered by existing measures (e.g. protected areas and management plans), identification of deficits (already existing refuges and resting areas, level of deficit within and outside of existing protected areas, existing spatial and sectoral planning specifications, areas in which there is the most overlap between conservation needs and existing protections, areas where there are conflicting acquired rights due to specific permits), prioritisation of required actions and leveraging of potential synergies. In this step, the results of current research projects are also taken into account.
3. Analysis of which instruments are available to implement specific measures and which ones might need to be adapted, taking into consideration official competences and socio-economic impacts.
4. Presentation of technical proposals for refuges and resting areas and suitable instruments based on the analyses under 1-3 in preparation of decisions.
5. Decision on the further course of action and implementation or establishment of refuges and resting areas by the competent Federal and *Länder* authorities.
6. Success monitoring
    a) Implementation control: Monitoring as to whether specific measures have been implemented and refuges and resting areas have been established and whether the regulations in force there are being complied with.
    b) Effectiveness monitoring: Monitoring as to whether disturbances caused by uses have been reduced or whether refuges and resting areas have a persistent effect, e.g. by means of monitoring regeneration, recolonisation, distribution patterns. If effectiveness is low, an assessment of alternatives is carried out on the basis of the above-mentioned assessment steps.

The measure is targeted primarily at the following species/habitats and functionalities:

- Spatially and temporally sufficient refuges and resting areas for flora and fauna in their habitats
- Regulation of physical disturbances of benthic habitats in refuges and resting areas. The focus here is on the characteristic flora and fauna of the benthic broad habitat types pursuant to COM Decision 848/2017 (BHT) and the other habitat types pursuant to COM Decision 848/2017 (OHT) or areas with above-average species-rich or rare benthic communities pursuant to the German Federal Nature Conservation Act (BNatschG).

Recolonisation by species that do not currently have stable populations in the German North Sea and Baltic Sea, but for which there is scientific evidence that historically they did occur over wide areas and at higher abundances, and whose occurrence corresponds to the prevailing physiographic, geographic and climatic conditions, and the decline of which cannot be attributed to current changes in the climate.

Mode of action:

- Legal
- Political
- Technical
- Economic

UZ3-04	**Fostering Sabellaria reefs**
	The Sabellaria reefs that existed in the German North Sea until the 20th century in the form of aggregations of the tubes of polychaetes of the species *Sabellaria spinulosa* have disappeared, bar some isolated recorded occurrences. Sabellaria reefs fulfil an important ecological function by stabilising the sediment, increasing seafloor structural diversity and providing a habitat for a large number of epibenthic faunal species. Prerequisites for supporting the species or reefs are the occurrence of suitable substrate for colonisation in areas without physical disturbances. The measure comprises a number of sequential stages that are implemented as part of an R&D project: 1. Identification of known former sites and investigation with regard to the substrate currently present at these sites and any relict populations that may still occur. 2. For the sites identified as being suitable, conditions for possible protection measures or the support of potential reintroductions are to be investigated. Disturbance-free/low-disturbance zones must be established or protection ensured at sites potentially suitable for protection or reintroduction. This will be done in communication and tangible coordination between those involved in the measure and with potentially affected users of the areas in question. Mode of action: • Legal • Technical
UZ3-05	**Reef reconstruction, reintroduction of hard sediment substrates**
	The measure is aimed at restoring geogenic or biogenic reef structures on sites where they can or did occur naturally and where conditions are favourable for their development. The most suitable sites are those where restoration of degraded/former reefs or enhancement can be achieved, e.g. by connecting to or establishing connectivity between existing reef structures. The varying conditions in coastal waters and in the EEZ of the North Sea and Baltic Sea must be taken into account. When identifying suitable sites, morphodynamic and geological conditions must be taken into consideration, among other factors. This measure does not involve the creation of artificial reefs on sites to which reefs are not native. The content and objective of this measure is the restoration of both biogenic and geogenic reefs (Habitats Directive habitat type 1170 / Article 30(2) No. 6 BNatSchG). This is mainly done at sites where these reefs occurred or can occur naturally, but have disappeared or severely deteriorated as a result of human activities. With regard to geogenic reefs, these include areas in the Baltic Sea where intensive “stone fishing” (the removal of rocks and boulders from the littoral zone) was carried out from the beginning of the 19th century until the end of the 1970s (primarily in the territorial waters), but also areas where reefs have been damaged by bottom trawling and where renewed damage can be ruled out, e.g. due to fisheries management measures (EEZ). For reefs (Habitats Directive habitat type 1170 / Article 30(2) No. 6 BNatSchG) in the Baltic Sea, the large-scale removal of hard substrate still represents a significant burden today, which has led to a significant loss of this habitat type over large areas. Sites where reefs are to be restored must meet certain technical requirements. The same applies to the implementation of restoration, enhancement or connectivity measures. a) Requirements applicable to the sites (the application of the criteria listed is decided in detail by the authorities responsible in the EEZ and the coastal waters respectively, depending on the technical and legal boundary conditions and the target habitat) • Existing conservation enhancement potential and ecological suitability • Sites that can be upgraded in the context of existing reef structures and/or • sites that can be upgraded (e.g. in terms of habitat value) and serve to establish connectivity between existing reef structures and/or

	• natural reef sites with coarse sediment and/or hard substrate, where the density of rocks or boulders is reduced or where rocks or boulders are no longer present. Preference should be given to sites where former occurrences have been historically documented or where their suitability has already been established in the course of habitat mapping or management planning. • Sufficiently load-bearing substrate • Low risk of site getting covered by sediments • Location in the coastal sea at depth of between (5) / 10 and 15 m, in the EEZ also at greater depths • Consideration of the safety and ease of shipping traffic (the risk of emergency anchorages), coastal protection and fisheries, and regional planning specifications. b) Requirements for the design of the reef structures and the material used • Use of natural rocks or boulders of different sizes • Proof of provenance in compliance with protection standards for habitats and geotopes • No changes to the subsoil (e.g. insertion of nets, geotextiles or similar). • Existing rocks must not be covered • Production monitoring and post-implementation success monitoring Based on the knowledge-based experiences gained in completed projects, the requirements will be iteratively adapted. Implementation can also take place in the form of measures compensating for interventions under conservation law insofar as this is not contraindicated by other regulations or obligations (e.g. arising from the Habitats Directive). Mode of action: • Technical
UZ3-06	**Measures to implement the IMO Biofouling Guidelines**
	Ships' biofouling is a key pathway for the introduction and spread of non-indigenous and potentially invasive species. It is estimated that more than 30% of the species introduced into the North Sea are due to ships' fouling[48], and 25-33% of the non-indigenous species in the Baltic Sea[49]. In order to address measures to prevent the introduction and spread of non- indigenous species through ships' fouling, the Biofouling Guidelines (MEPC.207(62)) were adopted at IMO level in 2011 and are currently being revised by the IMO's Sub-Committee on Pollution Prevention and Response (PPR). For the recreational craft sector, biofouling guidance (MEPC.1/Circ. 792) has been available since 2012. Preventing the introduction of potentially invasive species by means of effective biofouling management can be instrumental in achieving the environmental target related to MSFD Descriptor 2 (UZ3). However, biofouling management is not only relevant for preventing the introduction of non-indigenous species but also in terms of fuel consumption, ships' emissions, microplastics inputs, pollutants and noise. Effective biofouling management can help reduce the environmental burdens contributed by these outputs. In order to support the implementation of the IMO Biofouling Guidelines (both the guidelines for shipping and guidance for recreational craft) while taking into account the regional conditions in the Baltic Sea region, a proposal for a Biofouling Management Roadmap was developed as part of the EU Interreg project COMPLETE. This roadmap was submitted to HELCOM and is expected to be used as an information basis for the implementation of the Biofouling Guidelines as part of the future Baltic Sea Action Plan. It contains tools and

[48] Galil, B.S., McKenzie, C., Bailey, S., Campbell, M., Davidson, I., Drake, L., Hewitt, C., Occhipinti-Ambrogi, A. and Piola, R., 2019, ICES Viewpoint background document: Evaluating and mitigating introduction of marine non-native species via vessel biofouling, ICES Ad Hoc Report 2019.

[49] AquaNIS, 2021, http://www.corpi.ku.lt/databases/index.php/aquanis

information developed on the basis of the IMO Biofouling Guidelines for a regionally harmonised implementation of the guidelines and the guidance and includes proposals for the commercial shipping and recreational boating sectors as well as for shore-based service providers and other stakeholders in the industry on all aspects of biofouling management. Among others these include:

- guidance on the preparation of a ship-specific biofouling management plan and on maintaining a biofouling management record book;
- guidance and decision-making systems for the selection of a suitable antifouling system;
- guidance on assessing fouling levels;
- guidance on underwater hull cleaning;
- guidance on the handling of biofouling waste arising from hull cleaning.

The measure proposed here addresses the national implementation of the IMO Biofouling Guidelines and Guidance in the German coastal and marine areas, in a manner that is coherent with developments at the regional and international levels and with the Draft Roadmap Biofouling Management as a basis.

By taking the Draft Roadmap into account, regional harmonisation is taken into consideration and supported in the implementation of the IMO Biofouling Guidelines. A central platform for the implementation of the Guidelines and Guidance in Germany is the National Round Table on Biofouling Management established in 2019 by the Federal Maritime and Hydrographic Agency of Germany (*Bundesamt für Seeschifffahrt und Hydrographie, BSH*) and the German Ship-owners' Association (*Verband Deutscher Reeder, VDR*).

This platform brings together all stakeholders involved in biofouling management issues: Federal and *Länder* authorities, Ship Safety Division, ports, shipping industry and shipping associations, recreational boating and its associations, ship classification organisation, shipyards, cleaning companies, environmental associations, the maritime police (*Wasserschutzpolizei, WSP*), paint manufacturers, research institutions, consultants, and others.

In addition to disseminating information on new tools and techniques, Best Available Technique (BAT) and Best Environmental Practice (BEP), which are reviewed and developed as part of the regional and international processes, the Round Table serves to exchange experiences and to advance, at the national level, processes and practices for effective biofouling management. Among other things, the aim is to develop a risk assessment process as a basis for the approval of in-water cleaning of the underwater sections of hulls.

Topics addressed by the roundtable included:

- Antifouling systems and materials
- Management techniques for niche areas
- Existing rules and regulations and their implementation
- Best practices from all these areas worldwide and their application
- Basic principles/risk assessment/approval process for underwater cleaning and disposal of waste arising in the process
- Public relations/information for recreational and commercial shipping on effective biofouling management

The Round Table meets at least once a year at the BSH. Selected results are made publicly available to support the roadmap's implementation.

Mode of action:

- Technical
- Political

UZ3-07	**Development and establishment of an early warning system for neobiota and decision support for immediate measures**
	The measure provides for two components: 1) Early warning system Newly emerging species, their location and possible entry pathways should immediately be reported to a central point (early warning system) in order to inform other monitoring programmes, the IMO GISIS database and other relevant databases such as AQUANIS and, where necessary, issue a transboundary notification about the arrival of a new species. The early warning system should be linked to existing data management systems, establish a reporting chain from the initial discovery and develop and provide recommendations for control monitoring. Moreover, new detection methods are to be integrated. These include, for example, the use of DNA metabarcoding for the identification of species in environmental samples. These methods are currently being developed and tested. A future enhanced integration into the ongoing monitoring is being examined. This will require, among other things, the establishment of genetic databases and the development of field sampling and genetic analysis of these samples. 2) Decision support for the implementation of emergency measures Options for emergency measures are to be assessed in advance as to their environmental risks. Consideration is to be given to the relative merits of emergency measures specifically targeted at individual species and larger taxonomic units respectively. To this end, a decision support tool is to be developed. This is intended as a "living document" and should contain, among other things, proposals for possible emergency measures, a consideration of their pre-assessed environmental risks and a decision tree for taking emergency measures. Mode of action: • Political • Technical
Target 4 Seas with sustainable and environmentally sound use of resources	
UZ4-06	**Reviewing conformity of the mining law regime and MSFD requirements; should the need arise, development of technical proposals and action recommendations**
	The measure aims to review the conformity of legislative frameworks (e.g. the Federal Mining Act (*Bundesberggesetz* – BBergG) and Offshore Mining Ordinance (*Offshore-Bergverordnung*)) and administrative procedures applicable to the approval, operation and good-practice closure of mineral resource prospecting, extraction and treatment projects in coastal waters and the EEZ, as well as the associated direct/substantial impacts on these areas and the marine (sub)regions (Art. 4 MSFD) concerned, and the current requirements of the MSFD. These requirements relate to the achievement of good environmental status, inter alia as regards the natural seabed, diversity of benthic habits and species, and chemical pollution (particularly contaminants). The measure is multi-stage in structure: **1. Deficit analysis** The subject of the measure is an analysis of whether and, if relevant, where federal mining law in particular and other provisions pertaining to the approval and operation of mining projects pose obstacles to the achievement of the MSFD's objectives, and how the matters addressed in the MSFD can be taken into account in this context in order to safeguard sustainable and MSFD-compliant use of German coastal and marine waters by the mining

	industry. Components include a review by legal scholars, focusing on possible regulatory deficits, and an analysis based on practical examples. For marine waters, the 2016 Offshore Mining Ordinance (*Offshore-Bergverordnung*) is of particular relevance. Among other things, it transposes the European Union's Directive 2013/30/EU on safety of offshore oil and gas operations into German law. The Directive is now due for review with a view to its subsequent revision. The analysis should cover all aspects of significance for the achievement of the MSFD's objectives. From a marine protection perspective, it should, for example, also include a review of the current legal position under the Federal Water Act (*Wasserhaushaltsgesetz* – WHG) regarding the permits required under water law, e.g. for the discharge of wastewater contaminated with heavy metals. The analysis should be based on practical examples that are suitable for study. Reference may also be made to marine conservation, maritime spatial planning, transboundary EIAs and Integrated Coastal Zone Management. In the review, account will be taken of the stipulation in operational environmental target 4.5 that "the public interests in coastal protection [must be] considered in the extraction of non-living resources, and alternatives may be considered only after a detailed assessment". Any proposed amendments should, as far as possible, undergo a technical appraisal to determine their effectiveness in achieving MSFD objectives. **2. Recommendation for actions** Proceeding from the analysis, which should be produced with due regard for technical feedback from practitioners, specialist policy recommendations should be developed if required. The Recommendation for actions may focus on the further development of legal instruments or on implementation aids or technical/procedural guidance for project agencies, or propose ways to optimise implementation at state (*Land*) level. **3. Communication** The recommendation for actions will be published and communicated in an appropriate form and will feed into relevant development and decision-making processes. The authorities responsible for the Federal Mining Act (BBergG) and for nature conservation and water law will be involved in producing the deficit analysis and recommendation for actions as appropriate (e.g. via a project support body). *Mode of action:* • Legal • Political
Target 5 Seas without pressures from litter	
UZ5-10	**Avoiding and reducing inputs of microplastic particles into the marine environment**
	The measure merges and replaces Measures UZ5-03 and UZ5-09, which were notified in the 2016–2021 programme of measures. A three-part workshop series on "Microplastics in the Marine Environment" was held within the framework of the Microplastics Sub-Group of the Round Table Against Marine Litter. With the involvement of additional external experts, the aim was to gain an initial overview of the current state of knowledge regarding the sources of microplastic inputs and their pathways into the marine environment, their spread and quantities in marine compartments, and their impacts on marine life and habitats. Appropriate options for measures were then developed on this basis. In a final step, a test of the relevance of these options in terms of their potential to avoid and reduce microplastics in the marine environment was developed and voted on in the Sub-Group. The workshop findings are currently being integrated into an issue paper, which forms part of an R&D project to support the work of the Round Table Against Marine Litter and will be published at a later date. The following options for action should be pursued; alternatively, where relevant, it should be determined whether current processes are already working on solutions and therefore merely require support, and where there are gaps that must be addressed within the framework of the Round Table Against Marine Litter or as part of MFSD implementation, requiring practical measures to be developed:

	• Cosmetic, detergent and cleaning products: Labelling of products containing plastic, manufacturers' voluntary phase-out of products containing plastic, legislation on the deliberate addition of microplastic • Tyre abrasion: Improved street cleaning, adaptation of transport strategies, awareness-raising on the impacts of the choice of tyre quality and driving behaviour, inputs into combined sewage networks (no separation system), reducing abrasion through the use of new tyre materials • Play and sports facilities (artificial grass and plastic granulate): Retention measures, better management of existing facilities, microplastic-free infills, technical containment measures and alternative materials, amendment of funding guidelines, legislation on the deliberate addition of microplastic • Biodegradable plastics: Development and implementation of standards/norms to determine biodegradability under diverse marine conditions as a basis for developing legal provisions • Textile fibres: Development of new manufacturing technologies and materials, pre-washing of textiles, filters for washing machines • Pellet loss: Enhancement of the existing strategy on optical control systems (OCS) with externally validated certification • Building materials and coatings: Reduced use of polystyrene foams and plastics in applications that are open to the environment (while simultaneously avoiding substitution of polymer-based marine paints by antifouling paints containing biocides), reduction of microplastic inputs from dyes in applications that are open to the environment, improved handling of ship coatings in shipyards, reduction/avoidance of polymer inputs from coatings/antifouling coatings in commercial and recreational shipping (mainly through technical measures in shipyards, e.g. in docks). • Residential areas – wastewater treatment technology: Installation of post-filtration, treatment of combined sewage, rainwater treatment • Residential areas – compost, fermentation residues: Reduction of the plastics fraction in biowaste More detailed information on the identified options for measures can be found in the following table: https://www.meeresschutz.info/berichte-art13.html?file=files/meeresschutz/berichte/art13-massnahmen/zyklu22/doks/UZ5-10_zusaetzliche_Datei_Mikroplastik_Loesungsoptionen.pdf *Mode of action:* • Legal • Political • Technical • Economic
UZ5-11	**Waste-related measures in commercial and recreational shipping**
	This measure focuses on the types of waste according to the grouping set forth in Annex V to the MARPOL Convention and concerns plastics (A), food waste (B), domestic waste (C) and cooking oil (D). Fishing gear (H) and awareness-raising in the fisheries sector continue to be addressed under Measure UZ5-05. It should also be noted that the inclusion of the topic of marine litter in learning goals, teaching plans and materials, e.g. in schools and non-school establishments, will continue to be dealt with under Measure UZ5-01. Reducing waste inputs from commercial and recreational shipping can encompass a range of activities aimed at prevention and avoidance and comprises the following components in particular: 1. Harmonising and optimising disposal facilities in ports; optimising the implementation of MARPOL Annex V at national level 1.1 Stringent implementation, in German ports, of Directive (EU) 2019/883 on port reception facilities for the delivery of waste from ships. This includes a harmonised cost recovery system (known as the "no special fee" system for the reception of

	MARPOL V waste up to the maritime vessel's maximum dedicated storage capacity in accordance with the definition set forth in Article 8 of Directive (EU) 2019/883), the provision of adequate and appropriate disposal facilities, and arrangements for separation of materials with subsequent integration into the circular economy, with due regard for disease control legislation. 1.2 Examination of opportunities for more robust enforcement of sanctions for violations in waters under national jurisdiction 1.3 Assessment of the extent to which the Netherlands' Green Deal for ship-generated waste[50] may be applied to German ports and its application if appropriate 2. Optimising awareness-raising in commercial and recreational shipping 2.1 Raising awareness of the impacts of marine litter, including, in particular, codes of conduct and potential solutions for workers in the maritime sector. To that end, educational formats targeted at individual groups (e.g. crew, on-board command personnel such as captains/officers, students on nautical and port logistics courses, workers in the offshore maritime sector) should be developed. The topic should be embedded as part of the training provided at relevant educational establishments, such as naval academies 2.2 General awareness-raising in commercial shipping of the problem of marine litter, including the importance of separating waste for recycling, e.g. via information materials (comics, flyers, brochures, etc.) or review of ecolabels' potential as an incentive for commercial shipping (e.g. Blue Angel) General awareness-raising in recreational shipping of the problem of marine litter, e.g. via information materials (comics, flyers, brochures, etc.) or review of ecolabels' potential as an incentive for marinas (e.g. Blue Flag scheme) *Mode of action:* • Legal • Political • Technical • Economic
Target 7 Seas with natural hydromorphological characteristics	
UZ7-02	**Ecological strategy for sediment management in the Lower Saxony Wadden Sea and offshore islands (with reference to the catchments of the Harle and Blauer Balje gats)**
	Given the anticipated accelerated sea-level rise, the capability of the tidal flats and forelands to increase at the same rate must be viewed critically.[51] The resulting higher water levels on the tidal flats and reefs will result in increased energy input in the protected areas of the tidal flats and will further limit sedimentation (feedback). The ensuing change in morphology and sediment composition has implications for local habitats and their biodiversity. A sediment deficit can already be observed in some beach areas on the islands. Simultaneously, dredging is required in adjacent channels, where a surplus is thus available in principle to balance out the sediment deficit. As a strategy, in line with the definition applied here, serves as the basis for target-oriented joint action, the sediment management measure pursued in this context is intended to identify practical examples of solutions/options for action. The objective defined in Phase 1 of the sediment management strategy is to identify options for action aimed at creating balanced sediment dynamics through the use of natural transportation and sorting processes with, overall, positive ecological effects. With that aim in mind, and building on the wealth of qualitative baseline data available, tools for the quantitative assessment of key processes must be developed. The required technical

[50] GD 166-Scheepsafvalketen: https://www.greendeals.nl/green-deals/scheepsafvalketen, https://www.noordzeeloket.nl/en/functions-and-use/zwerfvuil-noordzee/@166903/green-deal-ship/

[51] NB: In Schleswig-Holstein, work is under way on sediment management for the Wadden Sea as part of the implementation of the 1b measure "Strategy for the Wadden Sea 2100".

	models and assessment/analytical processes can be aligned with corresponding projects from the Ems estuary and ported across to the target area. In Phase 1, in addition to sediment transport forecasting (for various scenarios), which must be as robust as possible, what is required is a quantitative and situational resource analysis (i.e. allowing for the utilisation of potential surpluses from extraction/maintenance). If possible, the findings should be verified by smaller pilot projects. In Phase 2, alternative options for action whose effects can be quantitatively demonstrated should be compared with a BAU approach in order to obtain objective and, as far as possible, practical bases for a decision-making process that will withstand the subsequent intensive discussion with stakeholders. Phase 3 consists of the (stepwise) implementation of the options for action selected in Phase 2. *Mode of action:* • Technical • Political

I.2 Modified first-cycle MSFD measures

Target 1 – Seas unaffected by eutrophication	
UZ1-03	**Promoting sustainable measures to reduce NO_x inputs from shipping**
	This measure comprises the following components: 1) Boosting demand for NO_x abatement technologies 2) Promoting demand for sustainable alternative fuels and propulsion technologies 3) External power supply for seagoing ships when in port 4) Schemes for emission-dependent port fees In international law, Rule 13 of Annex VI to the MARPOL Convention regulates reductions of nitrogen oxide (NO_x) emissions from maritime shipping. From 2021 onwards the strictest reduction level (tier III) applies only to new-built ships in designated Nitrogen Emission Control Areas (cf. measure UZ01-04 "Support the designation of a NECA in the North and Baltic Seas" in the 2016 programme of measures). More far-reaching NO_x reductions at EU or national level are to be initiated by means of voluntary activities and promoted by public funding and infrastructure development; suitable port fees shall provide financial incentives. At the same time, adverse effects upon other protected assets, notably the climate, are to be reduced or prevented. *Mode of action:* • Legal • Technical • Political • Economic *Modification of measure:* Title of measures adjusted ("sustainable" added) • New component 1 (NO_x abatement technologies) • Revision of component 2 (alternative fuels/propulsion technologies) • Former component 4 (NO_x fund) deleted due to lack of support at EU level • Climate change mitigation taken into account in various aspects
Target 2 – Seas not polluted by contaminants	
UZ2-01	**Criteria and incentive systems for environmentally friendly ships**
	Due account of environmental criteria such as those of the *Blauer Engel* (Blue Angel) ecolabel scheme for seagoing ships owned or financed by public authorities and establishment of incentive systems for environmentally friendly ships. The measure is composed of two components: **Component 1**: It is possible on board ships to implement measures which go beyond legal requirements and to contribute to the reduction of environmental impacts (e.g. less air pollutants, less waste and effluent, reduction of the introduction of non-indigenous species, less release of contaminants to water, e.g. by means of environmentally sound antifouling coatings). The implementation of such voluntary measures can be promoted by granting a label (e.g. *Blauer Engel*). The *Blauer Engel* for environmentally friendly ship design (D-UZ 141) is based on a comprehensive catalogue of criteria developed by the Federal Environment Agency jointly with experts and approved by the Environment Label Jury. Since a number of years this label is known on the market and in the sector.

	Measure: The environmental criteria (of the *Blauer Engel* or other ambitious ecolabel schemes) should be taken into account, as far as possible, in the purchase of new ships and the operation of ships owned by public authorities or financed by them, e.g. research vessels. The vessels should serve as a role model which is used to promote environmental protection measures. **Component 2**: Incentive systems for the construction and the operation of environmentally friendly ships could provide additional incentives for ship owners to invest more in environmental protection on board. Various incentive systems already exist which, however, have only local effect or are introduced at international level with a limited number of selected parameters, e.g. focussed on NO_x, SO_x or CO_2 emissions. **Measure**: Development of an integrative, internationally deployable incentive system which addresses requirements for environmentally friendly ship traffic, is applicable to all ship types of maritime transport and contributes to internalising external costs of the ship owner. An option could be to link up the incentive system with the *Blauer Engel* ecolabel so that more use is made of the ecolabel in other ship segments (beyond those stated under component 1). *Mode of action:* • Legal • Technical • Political • Economic *Modification of measure*: • Adjustments following-up the revision of the criteria for the Blue Angel for ship design and the phase-out of the Blue Angel for environmentally friendly ship operation. • Blue Angel criteria updated to include deployment of alternatives to galvanic anodes (e.g. zinc anodes) for corrosion prevention.
UZ2-04	**Management of dumped munitions**
	Current knowledge indicates that approx. 1.6 million tonnes of conventional munitions and approx. 5,000 tonnes of chemical weapons have been dumped and are still present in German marine waters. The available knowledge about munitions-contaminated sites, and especially the survey of their types and extents in a munitions register, has not reached a satisfactory level. The findings of archival research conducted to date and images of the seafloor need to be combined with further archival research and recent, high-resolution images of the seafloor (surface and sediment) in order to gain a comprehensive and detailed picture of the situation. To allow – building upon such a survey – an appropriate risk analysis in addition to immediate hazard appraisal, further actions need to be integrated that also cover the chemical pollution of the marine environment and the toxicological impacts of dumped munitions. Further necessary steps can then be derived as appropriate. The measure comprises the following aspects: • Measures to handle hazard situations: – Comprehensive and site-specific surveys of the state of dumped munitions in order to prioritise required actions in the North and Baltic Seas (determination of the positions of munitions and of the corrosion state of their casings). – Development of guidelines agreed upon and accepted among the relevant departments on ways to dispose of dumped munitions that have the lowest possible impact on the marine environment and of the application of suitable measures to minimise noise and pollutant inputs to the marine environment that may result from detonations; this aspect also has a bearing on measures to reduce underwater noise – Development and application of new management methods (incl. retrieval and disposal) with lower levels of environmental impact, in the context of research projects and with the goal of involving the private sector, based upon the outcomes

of concluded and ongoing research projects (e.g. RoBEMM[52]), taking the entire management chain into consideration; this aspect also has a bearing on measures to reduce underwater noise

- Measures to complete the situation picture, which at present is still patchy:
  - Intensification of archival research; initiative to carry out corresponding projects in cooperation with universities, research institutions and private-sector partners
  - In-depth studies of known munitions dumpsites and suspected areas
  - Establishment and continuous updating of a munitions register
  - Development and application of suitable monitoring methods (e.g. Greinert (Ed.) 2019: Practical Guide for Environmental Monitoring of Conventional Munitions in the Seas[53]; Bełdowski et al. 2019[54]: DAIMON Toolbox[55]) incl. initiation of studies on environmental pollution by compounds typical of warfare materials (screening) within and outside of munitions-contaminated sites and development of a scheme for the monitoring of relevant substances and environmental impacts (sediments, waters, biota)
  - Representative studies of the impacts on fishery resources (edible fish and shellfish), and elaboration of toxicologically founded threshold values that could trigger a further need for action
  - Study of the transformation and decomposition processes of compounds typical of explosives, e.g. in plant and animal metabolisms, and of accumulation processes across the food chain and of the mechanisms affecting the health of biota
- Measures for forward-looking assessment:
  - In concert with the above-mentioned measures to complete the situation picture: development of a systematic procedure for risk assessment and for prioritising munitions-contaminated sites
  - In concert with the above-mentioned measures: collection of statistically representative data – also outside of munitions-contaminated areas – to build and validate risk assessment models

While ongoing activities to avert hazards to shipping are continued in the well-proven manner in cooperation among the responsible hazard control authorities of the *Länder* and the federal waterways and shipping administration, in future more attention is to be paid to environmental pollution aspects and to potential impacts on the marine food chain, which are similarly relevant and in the public interest.

In the context of this measure, activities are also envisaged to develop a joint financing scheme or funding instruments (incl. e.g. of the EU) to cover the costs arising in connection with the search for and retrieval and disposal of warfare agents.

Mode of action:

- Technical
- Political
- Economic
- Legal

Modification of measure:

At fact sheet level 2 the description of the measure has retained the basic structure according to

[52] Projekt RoBEMM: Abbondanzieri et al., 2018, RoBEMM – Entwicklung und Erprobung eines robotischen Unterwasser-Bergungs- und Entsorgungsverfahrens inklusive Technik zur Delaboration von Munition im Meer im Küsten- und Flachwasserbereich, https://www.researchgate.net/publication/330764080_RoBEMM_-_Entwicklung_und_Erprobung_eines_robotischen_Unterwasser-Bergungs-_und_Entsorgungsverfahrens_inklusive_Technik_zur_Delaboration_von_Munition_im_Meer_im_Kusten-_und_Flachwasserbereich

[53] Greinert, J., 2019, Practical Guide for Environmental Monitoring of Conventional Munitions in the Seas – Results from the BMBF funded project UDEMM “Umweltmonitoring für die Delaboration von Munition im Meer” Version 1.1, https://oceanrep.geomar.de/48842/1/geomar_rep_ns_54_2019.pdf

[54] Beldowski et al., 2019, Seadumped ammunition as a possible source of mercury to the Baltic Sea sediments, Sci. Total Environ. 674, https://doi.org/10.1016/j.scitotenv.2019.04.058

[55] DAIMON-Toolbox, 2021, https://www.daimonproject.com/ecotox-toolbox.html

	• Measures to handle hazard situations • Measures to complete the situation picture, which at present is still patchy • Measures for forward-looking assessment The individual aspects within this structure were modified in that the activities already completed in the first cycle (e.g. establishment of a central registration office, publication of uniform technical guidance documents) were replaced by new activities (e.g. comprehensive and site-specific surveys of the state of dumped munitions in order to prioritise required actions in the North and Baltic Seas). Overall the new aspects reflect the key elements of the decision of the 93rd Conference of Environment Ministers, agenda item 27, and lead from problem characterisation to assessment and potential solutions. Activities not yet fully completed will be continued, and will be targeted more precisely in some cases.
Target 4 – Seas with sustainable and environmentally sound use of resources	
UZ4-02	**Fisheries measures**
	The following measures are planned: **A) Fisheries management measures in Natura 2000 sites in the EEZ of the North and Baltic Seas** The establishment of fisheries management measures in Natura 2000 sites follows the process set out in the Regulation on the Common Fisheries Policy (CFP Regulation). To this end, the Federal Government, in consultation with the state governments of the coastal *Länder*, the fisheries affected and nature conservancy organisations, will draw up draft "joint recommendations" for necessary fisheries restrictions and surveillance in the EEZ and coordinate these with neighbouring countries whose fisheries may be affected. The requisite fisheries management measures in Natura 2000 sites in the EEZ are expected to have been implemented fully by the time of submission of the 2022 report on MSFD measures. The fisheries management measures required for the Natura 2000 sites in coastal waters are developed by the *Land* governments concerned; where other Member States have a direct fisheries management interest that is affected by such measures, the German Federal Government will consult with the affected neighbouring states. **B) Common Fisheries Policy** Under the Common Fisheries Policy, the Federal Government will take into consideration the achievement of the objectives of the Marine Strategy Framework Directive. **C) Support for the development and use of ecosystem-compatible and sustainable fishing gear** The Federal Ministries of Food and Agriculture (BMEL) and the Environment (BMU), together with the *Länder* in charge of the coastal waters, and taking into account the duty under EU law to meet the landing obligations, will develop a joint programme to support and develop alternative/modified and economically viable fishing techniques designed to reduce bycatches of marine mammals and seabirds, and will use the opportunities to support the fishing industry in converting to these techniques. *Mode of action:* • A, B and C: Legal • C: Technical, possibly political and economical *Modification of measure:* • The spatial scope of the measure is extended to cover the EEZ and coastal waters. • Due to a changed setting of the MSFD programme of measures, former Component B of the 2016 measure ("Considering the establishment of fisheries and aquaculture exclusion zones in offshore wind farms") is no longer pursued.

Target 5 – Seas without pressures from litter	
UZ5-02	**Modification/substitution of products in a comprehensive life-cycle approach**
	The aim is to identify items of particular concern with regard to risks to the marine environment in the German parts of the North and Baltic Seas by assessing the findings of beach litter monitoring, contents of fulmar stomachs as well as results from pilot monitoring of other marine compartments and potential indicator species (e.g. investigations of stomach contents of pelagic and benthic fish; assessment of nests in seabird breeding colonies with regard to the presence of plastic litter and associated mortality from strangling). There are three phases to this measure: • Knowledge generation and feasibility studies • Assessment of findings and deduction of measures • Detailed specification of measures Starting with the most frequently found items and those that are found in relevant quantities and are potentially particularly damaging for the marine environment of the North and Baltic Seas, an assessment is to be made as to the type and magnitude of threats associated with these items and as to whether changes (e.g. of materials used) or modifications (e.g. product characteristics) to the items concerned may be required to eliminate further threats to the marine environment. This also includes knowledge generation on the impacts of plastic waste containing, in particular, substances that are toxic or act as endocrine disruptors (e.g. additives such as plasticisers, or stabilisers containing heavy metals). Building on the findings, and working in conjunction with the manufacturing industry, the most economical alternative is to be identified for each of the products concerned. Moreover, an assessment should be made as to what other instruments might be suited to instigate necessary changes to products. In this context, newly emerging aspects should also be addressed in the regional action plans to combat marine litter and their review processes. Such aspects include measures relating to new finds such as cartridge cases or plastic small shot, and measures complementing existing provisions such as phasing out the use of thin-film bags or prohibiting mass balloon releases. *Mode of action:* • Legal • Technical • Political • Economic *Modification of measure:* Measure UZ5-02 presented in 2016 aims to identify, in concert with manufacturing industry, the most cost-effective alternatives to existing products in order to minimise plastic waste and the hazards arising to marine biota (ingesting waste remnants, entanglement in waste). For reporting in 2022, the measure has been updated to reflect the EU Single-Use Plastics Directive adopted in 2019, the progress made in implementation by the marine litter round table, and the revisions to the regional actions plans.
UZ5-04	**Reducing inputs of plastic litter, e.g. plastic packaging, into the marine environment**
	In Germany there are functioning collection systems (incl. deposit-refund systems) as well as sophisticated standards for return and recovery of packaging waste. These measures are to be further developed. At the European level there appears to be a need both for an expansion of recycling requirements for packaging waste and for the rigorous implementation of waste management law. In addition, potential measures and regulations for improvements to sustainable product and packaging design are to be examined with a view to facilitating and extending the use of ecologically appropriate packaging that is reusable and/or has a long service life.

	Mode of action: • Legal • Economic *Modification of measure:* Implementation of this measure was extended to comprise awareness-building activities, specifically an information campaign about what should not be flushed down the toilet. This ensures linkage with HELCOM Regional Action Plan Marine Litter, for which similar activities have currently commenced in the context of its revision.
UZ5-05	**Waste-related measures concerning fishing gear, including lost and abandoned nets (so called "ghost nets")**
	A reduction in fisheries waste may be achieved by a range of activities aimed at preventing, avoiding and managing lost or abandoned fishing nets and other fisching gear: **Prevention:** 1. Assessment of the frequency of and reasons for loss of fishing gear. 2. Development of systems and processes to avoid the loss at sea of nets and other fishing gear as well as of waste generated in the process of using and repairing nets and other fishing gear. 3. Development of alternative nets/materials or modifications to gear resulting in a reduction of marine pollution with plastics and lowering the risk of long-term "ghost fishing" by lost nets (e.g. alternatives to or abstaining from use of dolly ropes). 4. Exploration of alternatives to lead as a material used in fishing gear, and identification of possible actions (commercial and recreational fisheries). **Collection and disposal:** 5. Practical establishment of suitable waste management systems for fishing gear (harmonised waste management for end-of-life, passively caught and actively retrieved fishing gear) - Expand port infrastructure such that all types of fishing gear waste (see above) can be received - Ensure manual pre-sorting and processing - Explore possible recovery paths, as well as deposit and return systems - Develop waste transport logistics - Implement extended producer responsibility 6. Further development of recovery techniques: To minimise over the long term the costly processing of passively caught and actively retrieved fishing gear, provision of support for research on alternative thermal recovery processes such as oil extraction or steam reforming. Development should be given financial support and solutions for lost and abandoned fishing gear tested in a targeted manner. 7. Elaboration of a strategy paper on the handling of end-of-life fishing gear and control of ghost nets, to be submitted to national and regional policy-makers with the goal of enshrining a systemic solution in national and regional law. **Search and recovery in the event of net losses:** 8. Trialling and application of technical options to tag fishing gear in order to facilitate retrieval. 9. Testing in practice the optimisation of the tagging of nets and their components by means of radio-frequency identification tags (RFID tags) to identify owners or manufacturers. This makes it possible upon retrieval of lost or abandoned fishing gear to check whether the loss was notified by the owner in accordance with legal provisions. 10. Linking the various available types on information on marine areas where the probability of finding lost fishing gear is particularly high, in order to facilitate targeted search operations (e.g. wreck maps, expert knowledge) 11. Expansion of the available drift models to reflect the geometry of different types of nets in order to facilitate the search for them when losses or sightings are notified (notified

	coordinates, date/time and type of net should permit determination of the potential fate of the net as a basis for targeted and prompt retrieval). 12. Optimisation and mainstreaming of suitable methods for finding, verifying and recovering ghost nets, weighing up economic and ecological aspects (e.g. sonar search, diving for verification, retrieval methods). 13. Optimisation of reporting channels for lost fishing gear, improving communication about such channels, and raising fishers' awareness of them (fisheries-specific awareness-raising activities). 14. Nature-conservation assessment, and actions to ensure minimal environmental impact when searching and recovering lost fishing gear in the North and Baltic Seas. 15. Recovery of lost nets and other fishing gear (taking economic and ecological aspects into account) **Education:** Educational work in relevant circles, e.g. fishers and fisheries associations, producer cooperatives and fishery cooperatives in order to create an awareness of the issue (also see measure UZ5-01). *Mode of action:* • Technical • Legal • Political • Economic *Modification of measure:* Content of measure defined in more detail and supplemented.
UZ5-07	**Removing existing marine litter**
	In addition to the indispensable preventive measures to prevent further marine litter from entering the marine environment, clean-up campaigns in rivers and marine compartments, e.g. beaches, coastlines, the water column and water surface, are to be undertaken where ecologically appropriate, with a view to removing litter from the marine environment and preventing further inputs from rivers. In this context, environmentally friendly methods and instructions will be developed for future clean-ups. Areas that are particularly affected by litter are cleaned regularly, e.g. by setting up beach litter boxes. To regularly remove the waste swimming on the surface in port waters, the deployment of "seabins" should be tested in practice. Coastal municipalities should in future receive support after accidents from a fund for beach waste collection and disposal. It would be desirable to expand and intensify the existing European and international marine litter action days. Voluntary waste cleaning campaigns on rivers and coasts should be supported, e.g. by setting up a dedicated fund. It should be reviewed whether this fund could be financed in part from resources generated through extended producer responsibility schemes. Moreover, where possible and meaningful in quantitative terms, the litter found should be assessed in terms of its quantities and composition, in keeping with established monitoring protocols (e.g. OSPAR marine beach litter survey guideline and ICES IBTS survey manual). It is to be noted in this context that waste removal from the seas continues to take place in the context of the Fishing for Litter initiative. In addition, ghost nets are recovered by diving campaigns. These two aspects are treated in fact sheets UZ5-05 and UZ5-06. *Mode of action:* • Legal • Technical • Political • Economic

	Modification of measure: To promote implementation of the measure, its individual aspects were grouped in two sub-components. The first component aims to expand and support clean-up activities and was supplemented by • "Establishment of seabins", and "Establishment of a fund to provide financial support for volunteer beach clean-up campaigns" • "Establishment of a fund to financially support coastal municipalities in beach waste collection and disposal after accidents". The second sub-component is concerned with "Harmonisation of the protocols of Citizen Science and OSPAR/HELCOM" and remains unchanged (as per 2016).
UZ5-08	**Reducing amounts of plastic through local provisions**
	Review of introduction pathways and reduction of inputs of plastic litter (e.g. single-use plastic) from rivers, near-shore areas and beaches by way of redefining or intensifying municipal provisions and taking practical action, taking into account the polluter-pays principle. This includes practical approaches on-site; regulatory provisions in combination with awareness-raising, e.g. a tightening of conditions attached to permissions granted for events; conditions attached to leases on beaches; requirements for the organisation of and infrastructure for waste management (beach management), and fines imposed for infringements. These provisions should also include rules on shore and beach clean-ups, e.g. after (large-scale) events. The measure focuses on making the above regulatory options available, and on practical measures. It is generally underpinned by regularly updated guidance and intensive networking via the "plastic-free coasts" hub, involving, for instance: direct provision of advice to local stakeholders; active presentations at workshops, conferences, etc.; circulation of new findings; publication of articles in specialist journals; exchange with other stakeholders; public awareness-raising work. *Mode of action:* • Legal • Technical • Political *Modification of measure:* Greater focus on regulatory options to reduce the use of single-use plastic at large-scale events. It thereby promotes proposed actions in the context of the revision of the HELCOM Baltic Sea Action Plan and the HELCOM Regional Action Plan Marine Litter.
Target 6 – Seas not impacted by the introduction of anthropogenic energy	
UZ6-04	**Development and application of noise mitigation measures for the North and Baltic Seas**
	A: Impulsive sound Comprehensive noise mitigation measures will be developed with a view to reducing adverse anthropogenic impacts resulting from impulsive sound on relevant marine species in the North and Baltic Seas, and their implementation will be examined. Differences in protection requirements between the various marine species and their populations will be taken into consideration. The measures are to be applied to all regions of the German marine areas. The special protection requirements of the various protected areas will be taken into account. The measures include the assessment of all impulsive anthropogenic marine noise sources, such as shipping, resource exploration and exploitation, construction and operation of offshore installations, especially for energy generation, fisheries, military, munitions-contaminated site clean-up, and tourism.

	National or military security concerns as well as the full operational capability of the Federal Armed Forces must be taken into account. For Habitats Directive Annex species in particular, the measure will implement threshold values for the determination by competent authorities or applicants of what constitutes an offence (injury, killing, disturbance). The measures also include the creation of low noise areas for marine species. The limit values developed as part of Measure UZ6-01 and the knowledge gained as part of the Federal Environment Ministry's Concept for the Protection of Harbour Porpoises from Sound Exposures in the German North Sea form the basis for the specific noise mitigation measures to be developed under this measure. Validated noise mitigation measures should also be implemented at the international level or at least at European level. **B: Continuous sound** As there are still many knowledge gaps in our understanding of the fundamentals of the physics of continuous sound and its impacts on the biotic marine environment, the measure comprises an initial phase of intensified research. In conjunction with the limit values developed in Measure UZ6-01, this research phase will be followed by the development and application of noise mitigation measures for anthropogenic underwater noise emissions (continuous sound emissions) aimed at preventing adverse impacts on relevant species. Ancillary research is to be carried out in order to analyse and improve, where necessary, the effectiveness of those measures. Continuous and cumulative sources of noise can cause disturbance (displacement), changes in behaviour, and masking of biologically important signals and thus restrict the species' acoustic environment. Furthermore, depending on the sound level, frequency range, and duration of exposure, continuous sound can cause stress and even chronic impairment. Noise mitigation measures can be designed to change sound levels, frequency ranges or the duration of exposure. While behavioural changes, such as avoidance or cessation of critical activities (e.g. hunting behaviour, migration, reproduction) can be triggered by received sound pressure levels above certain thresholds, another important determinant of stress is the duration of exposure. The received sound level and its frequency content determine whether a signal stands out against the ambient noise level of the sea. This is relevant for masking, amongst other impacts. The aim is to reduce marine sound emissions of anthropogenic origin and to effectively protect relevant species, based on the findings gained under Measure UZ6-01 and other scientific knowledge. Possible concrete measures also include the creation of low-noise areas for marine species in accordance with UZ3-01. Differences in protection requirements between the various marine species and their populations will be taken into consideration. The measures are to be applied to all regions of the German marine areas. The special protection requirements of the various protected areas will be taken into account. The measures include the assessment of all continuous anthropogenic marine noise sources, such as shipping, resource exploration and exploitation, construction and operation of offshore installations, especially for energy generation, fisheries, military, minitions-contaminated site clean-up, and tourism. National or military security concerns as well as the full operational capability of the Federal Armed Forces must be taken into account. A targeted research focus includes the identification of the group of noisiest emitters. This can be achieved, for example, by providing a technical description of the noisiest polluters. It is important to document the most significant noise contributions in order to take measures to mitigate noise emissions from individual sources and thus to effectively reduce underwater noise pressure. For Habitats Directive Annex species in particular, the measure will implement threshold values for the determination by competent authorities or applicants of what constitutes an offence (injury, killing, disturbance). Insofar as international shipping is affected, Germany will not strive for individual national solutions but may draw up an application to the IMO, should the need arise.

	However, given current knowledge gaps, the development and establishment of limit values for continuous sound (see UZ6-01), which is to be undertaken prior to implementing noise mitigation measures, still requires intensive fundamental research. Tourism concerns will be taken into account in the implementation of this measure. *Mode of action:* • Legal • Technical • Political *Modification of measure:* At the implementation level, the measure was extended and concretised in substantive terms to include the components: • Elaboration of conservation-oriented, binding rules on the removal of dumped munitions from the North and Baltic Seas • Determination of BAT/BEP for mitigation of impulsive sound sources • Design and deployment of acoustic repellents • Reduction of shipping impacts, incl. those of rapidly moving motor boats, recreational boats etc., upon biological diversity in the sea

Part II: MSFD measures of the first cycle 2016–2021

Reporting year 2016; for information

A description of these measures, which remain unchanged compared to reporting in 2016, can be found in the English Summary of the Programme of Measures 2016–2021: https://www.meeresschutz.info/berichte-art13.html?file=files/meeresschutz/berichte/art13-massnahmen/MSFD_Art13_Programme_of_Measures_English-Summary.pdf

UZ1-01	Agricultural cooperation project on reducing direct inputs into coastal waters via drainage systems (implemented)
UZ1-02	Strengthening the assimilative capacity of estuaries, using the example of the river Ems
UZ1-04	Support the designation of a NECA in the North and Baltic Seas (implemented)
UZ2-02	Requirements for the discharge and disposal of scrubbing waters from exhaust treatment on board ships
UZ2-03	Preventing and combating marine pollution – improving maritime emergency preparedness and response
UZ3-01	Inclusion of species and biotopes that define the value of an ecosystem in national MPA ordinances
UZ3-02	Measures to protect migratory species in marine areas
UZ4-01	Continue to raise public awareness of sustainable, ecosystem-compatible fisheries
UZ4-03	Blue mussel management plan in the Wadden Sea National Park of Lower Saxony
UZ4-04	Sustainable and sound use of non-living sublittoral resources for coastal protection (North Sea)
UZ4-05	Environmentally sound management of marine sand and gravel resources for coastal protection in Mecklenburg-Western Pomerania (Baltic Sea)
UZ5-01	Including the topic “marine litter” in learning goals, teaching plans and materials
UZ5-03	Avoiding the use of primary microplastic particles (withdrawn, replaced by UZ5-10, additional MSFD measure of second cycle)
UZ5-06	Establishing the “Fishing for Litter” approach
UZ5-09	Reducing emissions and inputs of microplastic particles (withdrawn, replaced by UZ5-10, additional MSFD measure of second cycle)
UZ6-01	Development and application of biological limit values for the impact of underwater noise on relevant species
UZ6-02	Establishment of a registry for impulsive noise and shock waves and of standardised mandatory reporting requirements
UZ6-03	Noise mapping of German marine areas
UZ6-05	Application of threshold values for the introduction of heat
UZ6-06	Development and application of environmentally sound lighting of offshore installations and accompanying measures
UZ7-01	System for hydromorphological and sedimentological information and analysis