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REPORT FROM THE COMMISSION TO THE COUNCIL AND THE EUROPEAN PARLIAMENT

on the Commission's assessment of the Member States' programmes of measures as updated under Article 17 of the Marine Strategy Framework Directive (2008/56/EC)

{SWD(2025) 1 final}

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1. INTRODUCTION

The seas and ocean are vital to the quality of our – and future generations' – lives, livelihoods and economies. They also perform a significant function in carbon sequestration, regulating the climate and helping reduce the impact of climate change. Ocean health can make a difference to our resilience to the triple planetary crisis, namely climate change, biodiversity collapse and pollution. The current use of Europe's seas, however, is not sustainable. Unabated pressure on and the deterioration of the marine ecosystems are making it difficult to achieve our overarching objective of clean, healthy and productive seas.

Over the past 12 years, EU Member States have developed marine strategies to comply with the Marine Strategy Framework Directive (MSFD) ([1]). The Directive requires them to assess the status of their marine environment, draw up monitoring programmes, set environmental targets and implement measures to achieve the Directive's key goal of securing the 'good environmental status' (GES) of all EU marine waters. This was to be achieved by 2020. The Directive sets out specific descriptors ([2]) that define the concept of GES, such as conserving biodiversity or tackling anthropogenic pressure such as underwater noise, eutrophication, seabed damage, marine litter and contaminants.

A Commission Decision ([3]) in force since June 2017 requires Member States to meet common criteria and methodological standards when determining 'good environmental status' in quantitative terms for their marine waters. Importantly, the MSFD explicitly requires Member States to cooperate with their neighbours in each marine region or sub-region, preferably through existing regional institutional cooperation structures ([4]), to ensure that the measures implemented are coherent and coordinated ([5]).

The European Green Deal ([6]) sets overarching priorities including protecting our biodiversity and ecosystems, therefore bolstering this work by pursuing the ambition to:

- reduce air, water and soil pollution;
- move to a circular economy;
- improve waste management; and
- ensure the sustainability of our blue economy and fisheries sectors.

([1]) 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). See EUR-Lex - 32008L0056 - EN - EUR-Lex (europa.eu).

[2] The 11 qualitative descriptors are defined in Annex I to the Marine Strategy Framework Directive and further specified in Commission Decision 2017/848/EU. They include D1– Biodiversity, D2 – Non indigenous species (NIS), D3 – Commercial fish and shellfish, D4 – Food webs, D5 – Eutrophication, D6 – Sea-floor integrity, D7 – Hydrographical changes, D8 – Contaminants, D9 – Contaminants in seafood, D10 – Litter, D11 – Energy, including underwater noise.

([3]) Commission Decision (EU) 2017/848 laying down criteria and methodological standards on good environmental status of marine waters and specifications and standardised methods for monitoring and assessment. See: EUR-Lex - 32017D0848 - EN - EUR-Lex (europa.eu).

([4]) Including the structures set up under Regional Sea Conventions.

([5]) Article 4 of Directive 2008/56/EC lists the EU marine regions and subregions. The four EU marine regions are the Baltic Sea, North-East Atlantic Ocean, the Mediterranean Sea and the Black Sea.

([6]) A European Green Deal (europa.eu).

The EU's biodiversity strategy ([7]), the zero pollution action plan ([8]) and the marine action plan ([9]) are the key policy instruments adopted to pursue these aims.

The MSFD is part of a broader agenda on water resilience. The 2024-2029 Political Guidelines for the next College announced the adoption of a new European Water Resilience Strategy to strengthen Europe's water security by preserving water quality and quantity in the EU and beyond, enhancing the competitive innovative edge of our water industry, and addressing the root causes of water challenges, including pollution, biodiversity loss, and the impacts of climate change. Clean, healthy and productive seas and oceans are central to our green and digital transition and for the EU's long-term prosperity. The MSFD can also make a direct contribution to achieve the objectives of the forthcoming 'Ocean pact' announced by President von der Leyen in her Political Guidelines for the next Commission mandate to *'boost the blue economy and ensure the good governance and sustainability of our oceans in all of their dimensions'*.

This is the first time under the new policy framework that the Commission assesses the second programmes of measures under the MSFD. The assessment is performed in close coordination with the assessments of the third river basin management plans (RBMPs) and the second flood risk management plans under the Water Framework Directive (WFD) and the Floods Directive (FD) ([10]). To accelerate effective implementation, the Commission aims to encourage a more integrated and coherent approach in implementing freshwater and marine water legislation, in line with a 'source-to-sea' approach ([11]).

The assessment therefore focuses in particular on ensuring that implementation of the MSFD is consistent with the WFD. It should be noted, however, that the requirements of the two directives differ. The WFD/FD report thoroughly assesses the state of EU freshwater bodies based on data reported by the Member States and the measures they have taken to improve. The MSFD report, required by Article 16 of the MSFD, by contrast only assesses the Member States' programmes of measures. The two reports therefore differ slightly in scope so the comparisons are made on the common elements.

Although the programmes of measures were developed before the Nature Restoration Law was adopted ([12]), the implementation of the latter will certainly influence the third cycle of implementing the MSFD.

([7]) Biodiversity strategy for 2030 (europa.eu).

([8]) Communication from the Commission, Pathway to a Healthy Planet for All EU Action Plan: 'Towards Zero Pollution for Air, Water and Soil', COM/2021/400 final. Available at: https://environment.ec.europa.eu/strategy/zero-pollution-action-plan_en.

([9]) Communication from the Commission, EU Action Plan: Protecting and restoring marine ecosystems for sustainable and resilient fisheries, COM/2023/102 final. Available at: EUR-Lex - 52023DC0102 - EN - EUR-Lex (europa.eu)

([10]) Report from the Commission to the Council and the European Parliament on the implementation of the Water Framework Directive (2000/60/EC) and the Floods Directive (2007/60/EC) Third river basin management plans Second flood risk management plans, COM(2025) 2

([11]) Source-to-sea approach refers to the establishment of governance that increases collaboration and coherence across the source-to-sea system and reduces alteration of key flows (water, pollution, sediment, materials, biota, ecosystem services) resulting in measurable economic, social and environmental improvement across freshwater, coastal, nearshore, transitional and marine environments. It considers the entire source-to-sea system – stressing upstream and downstream environmental, social, and economic linkages and stimulating coordination across sectors and segments.

([12]) Regulation (EU) 2024/1991 of the European Parliament and of the Council of 24 June 2024 on nature restoration and amending Regulation (EU) 2022/869, OJ L, 2024/1991, 29.7.2024.

Purpose and structure

This report presents the main outcomes from the Commission's assessment of the second programmes of measures, which all Member States had to report by 31 March 2022 ([13]). These programmes are an update since the first implementation cycle and take account of the latest assessment of the state of marine waters and the Commission's 2018 recommendations on the measures ([14]). A more detailed analysis of the Member States' programmes of measures, the degree of regional coherence, country-specific conclusions and recommendations are provided in the accompanying staff working document ([15]).

The analysis is structured along the triple planetary crisis of pollution, biodiversity loss and climate change ([16]). The aim is to assess whether the measures put forward by the Member States are sufficient to tackle the specific forms of pressure in their marine waters and to contribute to achieving GES. It also makes a set of key recommendations to guide further improvements. Some of the key messages and recommendations presented in the conclusions complement those presented in the WFD/FD report.

Only five Member States reported by the deadline of March 2022. A further nine reported with up to one year of delay and three reported with over a year of delay but still in time to be included in this assessment ([17]). In total, the Commission was able to assess the programmes of measures from 17 (out of 22) coastal Member States: Belgium, Germany, Ireland, Spain, Estonia, France, Italy, Cyprus, Latvia, Lithuania, Netherlands, Poland, Portugal, Romania, Slovenia, Finland and Sweden. Delays and failures to report limited the Commission's ability to perform comprehensive regional coherence assessments.

The programmes of measures for the five remaining Member States (Bulgaria, Croatia, Denmark, Greece and Malta) will be published on the EEA WISE-Marine Platform ([18]). The Commission will also prepare country-specific assessments and recommendations, which will be shared with the Member States directly. The assessment of Member States' programmes will also feed into the 2024 Zero Pollution Monitoring and Outlook Report, the ongoing review of the MSFD ([19]), and other work to implement the EU's biodiversity and climate adaptation strategies.

2. STATE OF THE SEAS IN EUROPE

Approximately 40% of the EU's population lives in coastal areas. For these communities, the seas and ocean are directly linked to culture, identity and their sense of belonging ([20]).

([13]) See Article 13(9) of Directive 2008/56/EC.
([14]) Report from the Commission assessing Member States' programmes of measures under the Marine Strategy Framework Directive, Brussels, 31.7.2018 COM(2018) 562 final.
([15]) Commission Staff Working Document accompanying the document Report from the Commission to the Council and the European Parliament on the Commission's assessment of the Member States' programmes of measures as updated under Article 17 of the Marine Strategy Framework Directive (2008/56/EC), SWD(2025) 1.
([16]) See What is the Triple Planetary Crisis? | UNFCCC.
([17]) On time – BE, IT, RO, SE, FI; up to 6 months delay – NL, DE, FR, PL, ES; up to 1 year delay – IE, PT, SI, EE; by 1 September 2023 – CY, LT, LV.
([18]) MSFD reports and assessments (europa.eu).
([19]) Protecting the marine environment – review of EU rules (europa.eu).
([20]) Marine (europa.eu).

Decades of overfishing, discharges of nutrients, contaminants and litter, intense maritime traffic and several other forms of anthropogenic pressure, combined with the growing impacts of climate change, have severely degraded the condition of marine ecosystems.

These increasing pressures jeopardise the benefits from Europe's seas and ocean that future generations are entitled to and will need for their lives, livelihoods and economies.

In 2018, Member States carried out the first assessment of the state of their marine waters under the MSFD, analysing the extent to which pressures from human activities are impacting marine life and ecosystems and progress towards achieving GES ([21]). This together with other sources of information gave the Commission a comprehensive picture of the state of the marine environment in 2020, the deadline for achieving GES.

Despite improvements in some areas, the conclusion then was clear: GES had not been achieved in all European marine waters ([22]). On the positive side, however, the ever-increasing trends in certain types of pressures across Europe's seas can still be reversed. In particular, they can be reversed by implementing effective measures under the MSFD, some of which build on other long-standing policy and legal frameworks (e.g. the Birds and Habitats Directive, Maritime Spatial Planning Directive, the Water Framework Directive and the common fisheries policy).

A striking example is the estimated 29% reduction of beach litter between 2015-2021 across all EU sea basins ([23]), with an even more significant 45% reduction in the Baltic Sea. Although most sea basins have yet to reach GES, this scale of reduction in 5 years is a success story, demonstrating that joint action works. There are a number of factors explaining this result, including very strong public support for action, high level political commitments to reverse the trend (e.g. the 2018 plastics strategy, the 2021 zero pollution action plan under the European Green Deal) and a solid legal basis for authorities to take action (along with the MSFD, the 2019 Single Use Plastic (SUP) Directive and the 2019 Port Reception Facilities Directive). The added value of the MSFD in this process is clear:

- the public and political campaigns to act against litter and plastic used MSFD data to back up their messages;
- the same data was used in the impact assessment and the adoption of the Single Use Plastics Directive, and helped raise public awareness;
- given that the 29% reduction took place even before the SUP Directive was in force, at least part can be attributed to the measures planned under the first MSFD implementation cycle;
- the 29% reduction can be assessed and communicated clearly due to the collective efforts of Member States, EU institutions and agencies ([24]) and civil society to collect and produce high quality, comparable data.

([21]) See the Commission Communication, Commission Notice on recommendations per Member State and region on the 2018 updated reports for Articles 8, 9 and 10 of the Marine Strategy Framework Directive (2008/56/EC) 2022/C 118/01. See: EUR-Lex - 52022XC0314(01) - EN - EUR-Lex (europa.eu).

([22]) Report from the Commission on the implementation of the Marine Strategy Framework Directive (Directive 2008/56/EC), COM/2020/259 final, EUR-Lex - 52020DC0259 - EN - EUR-Lex (europa.eu).

([23]) European Commission, Joint Research Centre, MSFD Technical Group on Marine Litter, Hanke, G., Walvoort, D., Ruiz-Orejón, L. F., van Loon, W. M. G. M., Giorgetti, A., Molina-Jack, M. E., Vinci, M., *European Coastline Litter Trends 2015–2021 – Methodology development and trend results for the Marine Strategy Framework Directive,* Publications Office of the European Union, Luxembourg, 2024, JRC138907.

([24]) E.g. the European Environment Agency (EEA), the European Maritime Safety Agency (EMSA), and the European Marine Observation and Data Network (EMODnet).

The analysis of the second programmes of measures for marine litter shows that Member States are taking further action to tackle the problem of beach litter: this should support the positive trend of continuous reductions (see Section 3.1).

For other topics, such as marine pollution or biodiversity loss, progress towards GES since 2018 will be assessed after the Member States report their third assessment of the state of marine waters in October 2024. In the meantime, the regional assessments produced by the four Regional Sea Conventions (RSCs) - i.e. the Helsinki ([25]), the OSPAR ([26]), the Barcelona ([27]) and the Bucharest Conventions ([28]) - provide a wealth of recent information about the state of EU seas.

- *Baltic Sea Basin*

The third HELCOM holistic assessment ([29]) published in October 2023 provides a comprehensive overview of the state of the Baltic Sea's ecosystem from 2016-2021. It shows little to no improvement over that period, highlighting the need for continued and improved coordinated measures.

- **Pollution** pressures remain at a high level. Eutrophication is still a major problem, affecting different levels of the food web and contributing to ecosystem degradation. There are signs of improvements in some areas, particularly in the south-western sub-basins, but there has been an alarming further deterioration in central parts of the Baltic Sea. Pressure from hazardous substances remains high in most areas across the region, with high concentrations of certain contaminants ([30]) predominantly found in fish and mussels. There are indications of some improvements, with reductions seen in chemical concentrations in animals in a number of areas. For beach litter, 11 out of 16 sub-basins are above the threshold value of 20 litter items per 100 m of beach ([31]) and therefore are not in good environmental status. One of the main drivers of underwater noise is ship noise, where there are considerable variations in space (shipping lanes are the most affected) and time (ship noise is more widespread in winter than in summer).
- In terms of **biodiversity**, several marine species (including mammals and birds) and habitats are not in a good status across the whole Baltic Sea and at all levels of the food web. Three commercial fish stocks have declined since the last assessment and only one has improved. However, action on biodiversity conservation has increased and the region is on track to reach the global target to protect 30% of areas by 2030.
- The effects of **climate change** are already evident with the forecasted warming expected to soon lead to further harmful impacts, accelerating the urgent need to take measures to build ecosystem resilience and to mitigate the negative impacts.

Despite the overall conclusion that the Baltic Sea state has not improved, the assessment shows that, when well designed and effectively implemented, coordinated measures to

([25]) See https://helcom.fi/.
([26]) See https://oap.ospar.org/en/.
([27]) See https://www.unep.org/unepmap/who-we-are/barcelona-convention-and-protocols?%2Ffr%2Fwho-we-are%2Fbarcelona-convention-and-protocols=.
([28]) See http://www.blacksea-commission.org/_convention.asp.
([29]) See State of the Baltic Sea 2023 – HELCOM.
([30]) Polybrominated diphenyl ethers (PBDEs), Tributyltin (TBT), Mercury and Copper.
([31]) EU Member States agree on threshold value to keep Europe's beaches clean - European Commission (europa.eu).

reduce pressure do deliver tangible results. The progress report on the commitments taken under 'Our Baltic declaration', published for the second 'Our Baltic' conference in September 2023 ([32]), confirms that these are fundamental steps.

- *Mediterranean Sea Basin*

In December 2023, the Barcelona Convention produced a comprehensive assessment of the state of the Mediterranean Sea ([33]) based on data collected since the last quality status report in 2017. Although many topics could not be assessed due to uneven data availability, the available indicator assessments show a mixed picture.

- In terms of **pollution**, notably contaminants and eutrophication, although there are no clear messages applicable to the whole Mediterranean, detailed results are available for specific assessment areas and indicators ([34]). Only 16% of monitored Mediterranean beaches have achieved GES for litter. The Aegean-Levantine sub-region is the most affected by acute pollution events, in particular oil spills, reflecting the fact that it is one of the busiest Mediterranean maritime routes. The whole Mediterranean Sea seems to be in GES in terms of impulsive noise levels impacting selected cetaceans, but not for continuous noise, particularly in the Western Mediterranean and Aegean-Levantine Sea.
- In terms of **biodiversity**, the overexploitation of fish stocks has decreased over the past decade encouragingly, with action accelerating over the last two years, reaching its lowest level since 2003. This trend is consistent in all sub-regions ([35]). However, most commercial species are still overexploited, and fishing pressure is still double the level considered to be sustainable. Habitat destruction remains one of the most pervasive threats to the structure and functioning of Mediterranean coastal ecosystems. Down to depths of 1 000 m, the most extensive damage to seabed habitats is caused by bottom fishing using trawls and dredges. Many populations of seabird species have reached GES, with some exceptions. Most cetaceans are still listed as significantly threatened on the IUCN Red List Assessment, though the status of widespread species such as the common bottlenose and striped dolphins has improved since mid-2000.
- **Climate change** is one of the most critical challenges that the Mediterranean region faces. Over the last three decades, marine heatwaves have caused mass-mortality events across various marine species and critical losses for the seafood industry. The rise in seawater temperature is accelerating the spread of non-indigenous species. Hydrographic changes cause Mediterranean marine habitats to be increasingly endangered, with some at risk of complete extinction. The central and eastern Mediterranean areas are considered more vulnerable to climate change due to

([32]) https://op.europa.eu/en/publication-detail/-/publication/2e76afa1-5695-11ee-9220-01aa75ed71a1.
([33]) 2023 Mediterranean Quality Status Report, 23rd Meeting of the Contracting Parties to the Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean and its Protocols, Portorož, Slovenia, 5-8 December 2023, UNEP/MED IG.26/Inf.10.
([34]) For instance, the Adriatic Sea sub-region is in GES for nitrogen, phosphorous and chlorophyll-a and 80% of sub-regions are in GES for metals, Polycyclic Aromatic Hydrocarbons (PAHs) and Polychlorinated Biphenyls (PCBs) in sediments.
([35]) Communication from the Commission to the European Parliament and the Council, Sustainable fishing in the EU: state of play and orientations for 2025, Brussels, 7.6.2024, COM(2024) 235 final.

increased pressure from invasive species, higher water temperatures and less ocean circulation, which leads to lower levels of dissolved oxygen ([36]).

- *North-East Atlantic Basin*

The quality status report, released in June 2023 by OSPAR ([37]) and based on data spanning the 2009-2021 period, is the most authoritative assessment of the state of the whole North-East Atlantic Sea. Significant advances have been made to better understand and limit the negative impacts of human activity. Despite some improvements, trends indicate that biodiversity is declining and habitats are being degraded across many parts of the OSPAR maritime area.

- **Pollution** from a wide range of hazardous substances, excessive nutrients (leading to eutrophication) and marine litter have not been fully addressed. Reductions have been recorded in discharges of hazardous substances from the oil and gas sector and of radioactive substances from the nuclear sector. Concentrations of many of the most serious hazardous substances (e.g. PAHs and PCBs originating from run-offs, industrial discharges and old building sites, and certain insecticides) have decreased substantially since the 1980s and 1990s. However, most sub-regions are in a poor status for hazardous substances in marine species, caused mainly by mercury and PCBs, while the situation is somewhat better for sediment pollution. There has been a significant reduction in the nutrients reaching the marine environment, particularly from agricultural sources, wastewater and industrial and atmospheric sources. However, pollution persists in river plumes and in some coastal areas. The results for marine litter are similarly mixed: the volume of marine litter remains high but it has fallen. The volume of litter on beaches is also falling but seafloor litter remains widespread, mainly litter from fisheries and plastic materials. Noise pollution is a growing concern.
- Despite undeniable progress in reducing overfishing since 2003 ([38]), the impacts of fisheries and other human activities on **biodiversity** are still deeply concerning. All assessments of the main components (marine birds, mammals, fish, benthic and pelagic habitats) and food webs show declines in biodiversity, despite progress made in identifying and addressing pressures. In particular, the condition of marine birds has deteriorated since the last assessment in 2017.
- **Climate change** and ocean acidification are driving major changes that imperil much of the North-East Atlantic's marine biodiversity. Due also to other ongoing forms of human pressures, overall, marine ecosystems are losing resilience to climate change.

The conclusions of the Quality Status Report make two findings clear:

1) additional measures are needed to change the current trajectory;
2) the measures taken so far need to be implemented more effectively.

([36]) As above.
([37]) See https://oap.ospar.org/en/ospar-assessments/quality-status-reports/qsr-2023/.
([38]) "In 2003, average fishing mortality in the North-East Atlantic was 53% above the FMSY target. The latest assessment shows that the mortality rate has progressively fallen to reach 42% below the FMSY in 2022" Commission Communication on Sustainable fishing in the EU: state of play and orientations for 2025, as above.

- *Black Sea Basin*

No regional assessment is available for the Black Sea but there is some data available, mainly covering the 2016-2021 period, from the EU-funded EMBLAS project ([39]), supplemented by analyses carried out by the Commission's Joint Research Centre.

- On **pollution**, observations confirm that all Black Sea areas contain marine litter, mostly plastic and microplastic litter. The data indicate that Black Sea beaches are the most littered in Europe and have the highest rate of single use plastics (652 litter items per 100 m). The sea remains contaminated by heavy metals, PAHs and certain pesticides and the PFOS concentration exceeds the safe limit. Indeed a 2021 scientific survey revealed that the cumulative pollution of the Black Sea with chemical contaminants was approximately 3 to 8 times higher compared to the Mediterranean Sea and 2 to 7 times higher than in the North-East Atlantic ([40]). Some coastal regions appear to be in GES for eutrophication, but most of the central eastern deep-water parts were not in GES in 2019 due to phytoplankton bloom and high concentrations of pollutants.
- On **biodiversity**, the biomass levels of several fish and shellfish species has clearly fallen between 1995 and 2021, some quite dramatically (e.g. whiting, picked dogfish, anchovy or the gastropod *Rapana venosa*). Coastal and shelf waters were assessed to be in GES for phytoplankton biodiversity, but open waters were not. In addition, environmental conditions deteriorated between 2016 and 2019 in the 'Zernov's Phyllophora Field' marine reserve, which is the Black Sea's largest marine protected area located in Ukrainian waters. Recent surveys have also noted possible invasive species migrating into the Black Sea ([41]).
- On **climate change**, scenarios show an increase in water temperature and other changes that will alter the transport and dispersion of nutrients and pollutants in the Black Sea ([42]) and increase pollutant accumulation in the eastern basin ([43]).

The environmental effects of Russia's war of aggression towards Ukraine have had far-reaching and transboundary impacts on the Black Sea. These impacts stem from mines and other explosives, oil spills and emissions of toxic substances, pollutants, and plastics due to the destruction of ports and ships, as well as pollution carried by rivers into the sea. Although long-term monitoring is very difficult because of the ongoing hostilities, there is clear evidence that these damages have negative impacts on biodiversity, habitats and species including marine mammals and fish stocks.

The breach of the Kakhovka Dam in June 2023, in particular, has had unprecedented environmental consequences for the South of Ukraine, extending to the larger Black Sea region. All chemical pollutants were at significantly higher concentrations at all sampling

([39]) Slobodnik, J., Arabidze, M., Mgeladze, M., Korshenko, A., Mikaelyan, A., Komorin, V., Minicheva, G., 2020, EMBLAS Final Scientific Report– Joint Black Sea Surveys 2016-2019.

([40]) 2021 scientific survey of the North-East Atlantic, Mediterranean and Black seas titled "The Cruise of Three European Seas carried out in the framework of the EU4EMBLAS project with JRC support.

([41]) 2021 scientific survey of the North-East Atlantic, Mediterranean and Black seas.

([42]) Miladinova, Svetla, et al., 2020, 'Seasonal and Inter-Annual Variability of the Phytoplankton Dynamics in the Black Sea Inner Basin' Oceans 1, No 4: 251-273. https://doi.org/10.3390/oceans1040018; Macias, D., et al., 2022, Water/marine zero pollution outlook: a forward-looking, model-based analysis of water pollution in the EU. Luxembourg. https://doi.org/10.2760/681817.

([43]) Miladinova, S., et. al., E. 2020 'Identifying distribution and accumulation patterns of floating marine debris in the Black Sea', Marine Pollution Bulletin, 153, 110964, doi:10.1016/j.marpolbul.2020.110964; Macias, D., et al., 2022. as above.

points after the dam destruction in 2023 compared to 2020. In addition, the 2000-fold increase in blue-green algae phytoplankton led to the death of 40% of one of the Black Sea mussel populations ([44]). Although recovery is already happening, the long-term impacts of this pollution on human and ecosystem health will need to be further investigated.

3. TACKLING THE TRIPLE PLANETARY CRISIS

Since the marine waters in the European Union did not achieve good environmental status (GES) in 2020, Member States were expected to update their first MSFD programmes of measures to further tackle pressures and achieve GES as soon as possible.

In their update, the 17 Member States assessed reported 2046 measures covering all marine regions, descriptors and pressures ([45]). Of these, only a third are new measures specifically included in this second update, the vast majority merely extending the measures reported previously, with some modifications. Since GES was not achieved by 2020, more new measures could have been expected.

Almost half of the measures reported are designed to achieve or maintain GES specifically under the MSFD. This is a substantial increase since the first programmes of measures, where only a quarter of the measures were 'MSFD-specific' ([46]). The remaining measures stem from requirements under other pieces of EU law, RSCs, international agreements or national legislation.

In the second programmes of measures, almost 50% of the measures are designed to *directly* prevent further pressures, reduce existing pressures or restore species or habitats. Over 35% of the measures are designed to *indirectly* contribute to those objectives (e.g. through governance mechanisms, financial incentives or awareness campaigns). Measures linked to knowledge improvement make up approximately 15% of the total.

The measures reported cover all the different types of pressures relevant to the EU marine environment ([47]). Litter and contaminants are the most frequently tackled pressures, each the subject of almost 30% of the measures. Over 20% of the measures tackle disturbance and extraction of species and eutrophication. Over 10% tackle noise, seabed disturbance

([44]) Consequences of the Kakhovka hydropower plant dike explosion for the Black Sea: new data – EMBLAS project

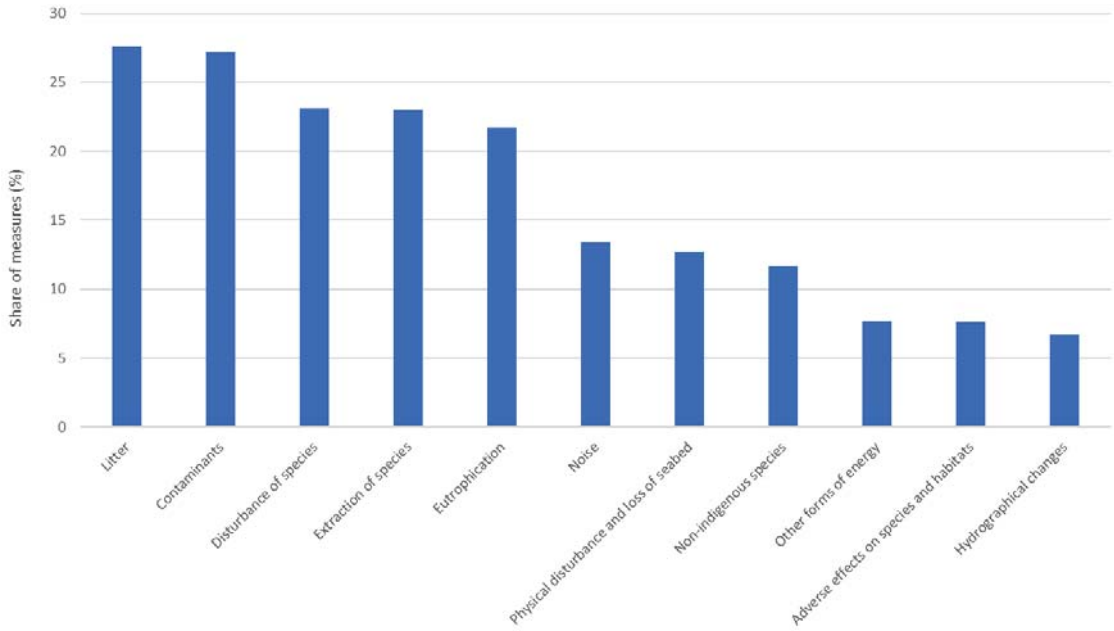
([45]) For an in-depth analysis of the information on the updated programmes of measures that has been electronically reported by the 17 Member States, see: European Commission, Joint Research Centre: Louropoulou, E., Alonso Aller, E., Cardoso, A.C., Carravieri, A., Druon, J., Magliozzi, C., Martini, E., Mendes, C., Palma, M., Piroddi, C., Ruiz-Orejón, L.F., Zupan, M. and Hanke, G., Programmes of Measures under the Marine Strategy Framework Directive to achieve or maintain Good Environmental Status, Publications Office of the European Union, Luxembourg, 2024, JRC139180.

([46]) Report from the Commission to the European Parliament and the Council assessing Member States' programmes of measures under the Marine Strategy Framework Directive, Brussels, 31.7.2018 COM(2018) 562 final.

([47]) Measures also cover all the descriptors of Good Environmental Status of Annex I to the MSFD. Over 30% of measures are related to biodiversity (Descriptor 1), 28% to seafloor integrity (Descriptor 6), 24% to contaminants (Descriptor 8) and 22% to marine litter (Descriptor 10). The descriptors least frequently associated to measures are hydrographical conditions (Descriptor 7 – 8%), contaminants in seafood (Descriptor 9 – 9%), non-indigenous species (Descriptor 2) and underwater noise (Descriptor 11) at 10% each. Biodiversity descriptors (1-4-6) are best covered because any measure taken to reduce a certain category of pressure, for instance eutrophication or contaminants, will also have an impact on the state of marine biodiversity.

and non-indigenous species and less than 10% of the measures tackle other forms of energy, adverse effects on species and habitats and hydrographical changes (Figure 1).

Figure 1. Share of measures in the second programmes of measures tackling pressures on marine ecosystems



However, this statistical analysis does not give an insight into how effective the proposed measures are. Despite many measures being taken to tackle chemical and nutrient contamination, Member States action still falls short of what is needed to substantially reduce pollution and ultimately to achieve good environmental status.

3.1 TOWARDS ZERO POLLUTION IN THE SEAS AND OCEAN

Reducing water pollution is a key dimension of the EU Green Deal and the zero pollution action plan. Pollution is one of the five main threats to biodiversity ([48]).

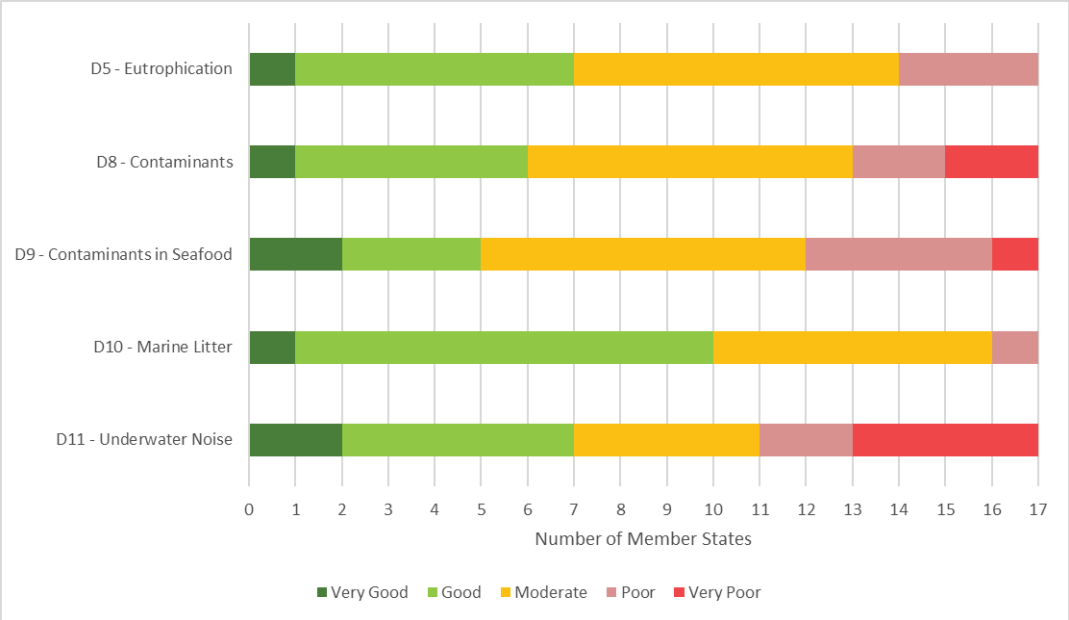
Based on the data reported by the Member States under Article 8 of the MSFD in 2018 ([49]), 80% of the EU's sea area failed to meet GES for contamination by ubiquitous, persistent, bio-accumulative and toxic substances, such as mercury. 87% failed to achieve GES for eutrophication, 90% for litter and 97% for continuous underwater noise.

Over the past few years, the Commission has tabled several proposals to tackle water pollution, most recently to revise the Urban Wastewater Treatment Directive, the Industrial Emissions Directive and to update the list of water pollutants under the Water Framework Directive. The adoption in 2020 and 2022 of threshold values under the MSFD for litter ([50]) and noise ([51]) is also an important step towards better management of ocean pollution.

([48]) Report from the Commission, First 'zero pollution' monitoring and outlook, 'Pathways towards cleaner air, water and soil for Europe', COM(2022) 674 final, Brussels, 8.12.2022.
([49]) WISE Marine: https://water.europa.eu/marine.
([50]) EU Member States agree on threshold value to keep Europe's beaches clean - European Commission (europa.eu).
([51]) Zero pollution and Biodiversity: First ever EU-wide limits for underwater noise - European Commission (europa.eu).

This section covers the four major categories of pollution affecting the marine environment: marine litter (Descriptor 10), eutrophication (Descriptor 5), harmful contaminants (Descriptors 8 & 9) and underwater noise (Descriptor 11).

Figure 2. Adequacy of Member States' second programmes of measures to tackle pollution



On average, Member States' measures only partly tackle the issues needed to reduce pollution (Figure 2). While the measures put in place to reduce marine litter go in the right direction, the measures to tackle eutrophication, chemical contamination and underwater noise are still insufficient.

Marine litter (Descriptor 10)

Overall, the quality of the measures to tackle marine litter improved between the two cycles.

An analysis confirms the positive trend seen over the past few years on action to tackle marine litter. 22% of all the measures reported by Member States are related to Descriptor 10 – marine litter – and a quarter are additional to existing legal obligations.

The measures cover the main sources of litter input, starting with activities related to sewage from urban areas and other land-based sources (e.g. industry and agriculture). Riverine input is also identified as one of the main sources of pollution. Measures also cover sea-based sources. Several measures directly tackle litter from fisheries (including ghost nets), including clean-up actions and actions to prevent further input (based on the requirements of the Port Reception Facilities Directive and the Single Use Plastics Directive). Shipping, recreational activities and tourism are also major sources of litter, and aquaculture to a lesser extent. Litter from maritime transport is mainly tackled by initiatives related to the IMO, MARPOL and the Port Reception Facilities Directive.

Only a few Member States have identified marine pollution hotspots, despite the Commission's recommendation to do so in its 2018 assessment ([52]). Gaps remain in tackling micro-litter, litter on the seafloor and in the water column and impacts on marine life. Although Mediterranean Member States have clear targets related to litter impacts on *Caretta caretta* turtles, none have yet reported measures to directly tackle the problem. Almost all Member States recognise the value of regional cooperation and the work done in the context of the RSCs.

Good examples

Some Member States have taken specific measures to tackle micro-litter, including developing containment systems, purification plants or treatment of stormwater and wastewater specifically targeting micro-litter and microplastics.

Eutrophication and contaminants (Descriptors 5, 8 and 9)

Overall, there has been progress in developing measures to further reduce both organic and chemical pollution, but more action is needed.

Action to combat eutrophication and contamination by hazardous substances remains insufficient ([53]). Member States have included many measures related to Descriptor 8 – contaminants (24%), Descriptor 5 – eutrophication (18%) and, to a lesser extent, Descriptor 9 – contaminants in seafood (9%). They often link these measures to the updated RBMPs, though make a limited assessment of their effectiveness in achieving GES.

There is less consistent action planned to tackle pollution from airborne emissions, despite a wealth of legislation on air quality and emissions, notably under EU law governing the energy, industry and transport sectors, the Ambient Air Quality and the National Emission Reduction Commitments Directives. However, Member States have included measures to further regulate contamination from shipping linked to implementation of MARPOL or IMO agreements (e.g. environmentally friendly anti-fouling, emission controls, cleaner ship concepts), with expected positive impacts, notably in offshore areas.

Member States still find it challenging to tackle pollution from emerging substances (e.g. pharmaceuticals) and to remedy the legacy impacts from persistent contaminants (e.g. mercury). However, there are good practices to tackle contamination from sea-based sources (e.g. managing contaminants from wrecks, phasing out the use of lead in fishing gear, tracking and recovering lost containers) and eutrophication (e.g. by using recycled manure in biogas production). Finally, as EU rules on maximum levels of contaminants in foodstuffs were updated in 2023 to cover a broader range of heavy metals and persistent organic substances ([54]), achieving GES for seafood contamination is likely to require additional measures in future.

([52]) Commission staff working document accompanying the document *Report from the Commission to the European Parliament and the Council assessing Member States' programmes of measures under the Marine Strategy Framework Directive*, Brussels, SWD(2018) 393 final, 31.7.2018, p33.
([53]) On average, measures for Descriptors 5, 8 and 9 are considered to be moderately adequate.
([54]) Commission Regulation (EU) 2023/915 of 25 April 2023 on maximum levels for certain contaminants in food and repealing Regulation (EC) No 1881/2006.

Good examples

Healthy marine habitats can play a crucial role in reducing the adverse effects of eutrophication. Some Member States are increasingly using nature-based restoration measures for habitats such as blue mussel beds, seagrass beds and saltmarshes to tackle eutrophication.

Underwater noise (Descriptor 11)

Overall, Member States' measures to reduce underwater noise have improved, but they are still focused on knowledge gathering rather than on reducing pressures.

Due to the lack of legal frameworks covering underwater noise, the MSFD has generated many new measures to tackle this form of pressure but they are still insufficient to reach GES and the set targets ([55]), both in quantity (only 10% of all measures) and in quality.

Compared to the first programmes, the measures give a better coverage of sources and types of pressure, but remain mostly focused on knowledge gathering rather than on having a direct impact on reducing the pressure.

To improve their knowledge on underwater noise, Member States mainly base their action on regional level frameworks and on EU-funded projects. Only a few Member States have designed specific measures based on the outcomes of these projects, such as setting speed limits near sensitive areas or during sensitive times. The most targeted measures tackle offshore and coastal infrastructure construction, either by limiting noise levels or by including underwater noise in environmental impact assessment studies. Setting threshold values for maximum levels of impulsive and continuous noise in October 2022 should support the design of more and better measures in the next cycle.

Other forms of energy (e.g. electromagnetic, light and heat) are still not well addressed, except for a few ad hoc measures looking into the potential effects of electromagnetic fields on vulnerable habitats or monitoring light pollution.

Good example

One Member State optimises shipping approach routes during the construction or maintenance of offshore wind farms or other offshore infrastructure to avoid high levels of continuous noise in vulnerable areas functioning as biodiversity hotspots.

3.2 BRINGING MARINE NATURE BACK INTO OUR LIVES

Europe's seas host a wide and highly diverse range of coastal and marine ecosystems with a great variety of habitats and species ([56]). If in good condition, they provide our societies with vital services, including food, energy, clean air and climate change mitigation ([57]). Pressures that impact marine biodiversity and ecosystems weaken the planet's ability to function healthily and to provide the essential services we rely on for survival and

([55]) On average, measures for Descriptor 11 are considered to have a moderate level of adequacy.
([56]) State of Europe's seas – European Environment Agency (europa.eu).
([57]) Europe's marine biodiversity remains under pressure – European Environment Agency (europa.eu).

prosperity. As demands on the ocean increase, ensuring the continued availability of these services becomes even more crucial.

The EU has stepped up its commitment to protect marine biodiversity. The EU biodiversity strategy for 2030 ([58]) requires to legally and effectively protect 30% of our seas, a third of which under strict protection. Through its Mission "Restore our Ocean and Waters by 2030" ([59]), the EU is aiming to bring concrete solutions to the challenges faced by our seas and ocean today, by putting research and innovation into a new role, combined with new forms of governance and collaboration, as well as by engaging citizens. At global level, these commitments are echoed by the adoption of two historic agreements: the 2022 Global Biodiversity Framework at the Convention on Biological Diversity COP 15 ([60]) and the 2023 Treaty on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction (BBNJ Treaty) ([61]).

The 2023 adoption of the marine action plan ([62]) also contributes to the work to meet these objectives by calling on Member States to take action to reconcile fishing with environmental protection objectives, notably by improving gear selectivity, tackling bycatch of sensitive species, protecting the seabed and action to support the transition and knowledge exchange.

The threshold values set under the MSFD in 2023 for seabed loss and damage ([63]) are also an important step towards better management of ocean natural resources.

Nonetheless, GES is far from being achieved for the biodiversity descriptors. For example, only 3% of cetaceans (such as dolphins and porpoise), only 15% of whales and seabed habitats and just 29% of pelagic-feeding birds in European marine waters were assessed by Member States as being in GES at the start of the Directive's second cycle of implementation.

This section covers the measures taken to protect species, habitats and food webs against non-pollution forms of pressure such as disturbance, extraction and non-indigenous species. It is linked to Descriptors 1 (biodiversity), 2 (non-indigenous species), 3 (commercial fish and shellfish), 4 (food webs), 6 (seafloor integrity) and 7 (hydrographical conditions).

Overall, progress in designing and implementing effective MSFD measures to protect and restore biodiversity has been rather limited since the first programmes of measures (Figure 3). However, the measures taken to protect the seafloor have improved, mainly by better tackling mobile bottom-contact fishing, and progress has also been made in tackling non-indigenous species and changes to hydrographical conditions.

The lack of a comprehensive gap analysis has limited the Commission's assessment of the biodiversity measures. Strong gap analyses give a better understanding of how existing measures contribute to achieving GES and what additional measures are needed.

([58]) Communication from the Commission, EU Biodiversity Strategy for 2030 Bringing nature back into our lives, COM(2020) 380 final

([59]) https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe/eu-missions-horizon-europe/restore-our-ocean-and-waters_en

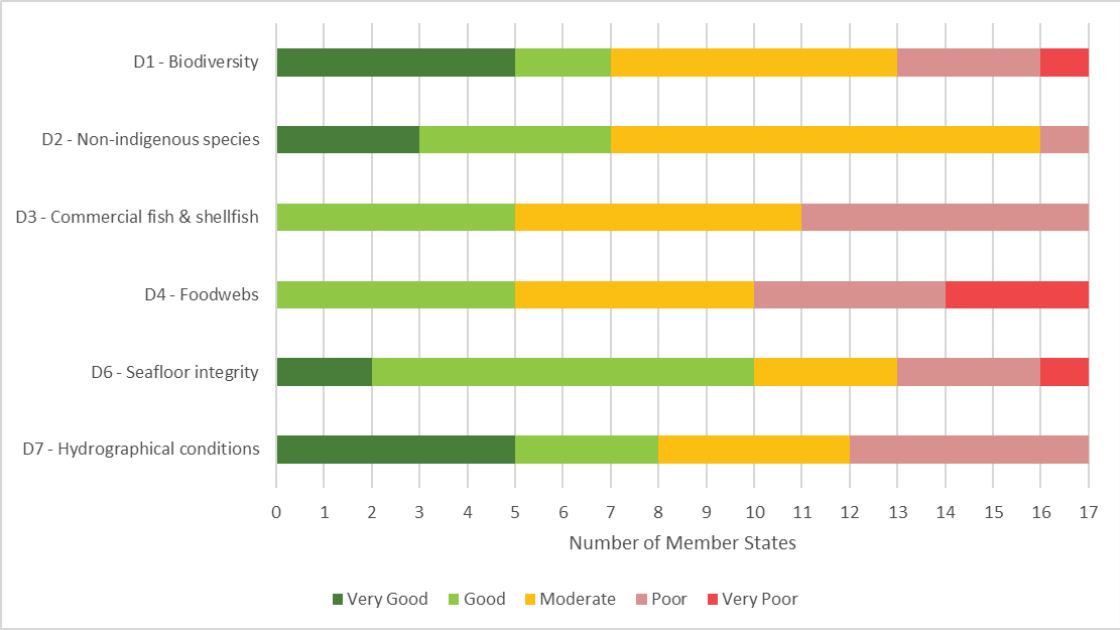
([60])Kunming-Montreal Global Biodiversity Framework (cbd.int).

([61]) Intergovernmental Conference on Marine Biodiversity of Areas Beyond National Jurisdiction | (un.org).

([62]) Communication from the Commission, EU Action Plan: Protecting and restoring marine ecosystems for sustainable and resilient fisheries, COM(2023) 102 final

([63])EU Green Week: first ever EU-wide criteria for seabed protection - European Commission (europa.eu)

Figure 3. Adequacy of Member States' second programmes of measures to tackle biodiversity issues



General measures for biodiversity (Descriptors 1, 4 and 6)

Overall, there has been only limited progress in the measures for biodiversity.

Most if not all of the measures taken by Member States are likely to have an effect on the state of marine biodiversity, which is why the biodiversity descriptors are generally well covered by the programmes of measures ([64]). Measures to reduce pressures ([65]) will have direct positive effects on species and habitats and indirectly on the whole ecosystem and food webs. Additional measures can be taken specifically for the purpose of protecting and restoring biodiversity.

The most common measure is to designate marine protected areas (MPAs), either to protect specific habitats and species (often under the regime of the Birds and Habitats Directives) or to restore certain ecosystem functions (e.g. seafloor integrity, food web health). The aim of MPAs is often to reduce levels of pollution, extraction or disturbance by regulating activities that have a negative impact on species and habitats. These can include tourism activities (recreational boating and water sports), fishing, particularly with bottom-trawling gear and polluting activities either within or in the surrounding area. MPAs can have a significant impact on pressures, depending on their size, the degree of human activity restrictions and on whether effective management measures are in place.

The information provided by Member States often contain scant detail on the type of management measures and the size and the location of the MPAs, making it difficult to ascertain how they contribute to the targets of the EU biodiversity strategy.

([64]) 31% of all measures are linked to Descriptor 1 – biodiversity, which is the highest share among all descriptors; 28% are linked to Descriptor 6 – seafloor integrity, and 19% to Descriptor 4 – food webs.
([65]) Such as those designed for the purpose of the MSFD pressure descriptors.

Good example

Currently, MPAs cover only 12% of European waters; they range from 'multi-use MPAs', where most human activities are allowed and the level of effective protection is low, to 'strictly protected' MPAs which allow very few, if any, human activities. Where active restoration of habitats is planned such as reef reconstruction or the recovery of oyster beds, Member States also restrict or even ban human activities that are damaging to these habitats.

Measures for species, including commercial species (Descriptors 1 and 3)

Overall, there has been only limited progress in the measures planned to tackle species, including commercial fish and shellfish species.

Species-specific measures tend to focus on fish, marine mammals and seabirds, while measures for cephalopods (e.g. octopus and squids), marine reptiles (e.g. turtles) and pelagic species (e.g. plankton) are rarer. The activity reported by Member States as causing most pressure on marine species, especially from incidental bycatch for seabirds and mammals, is commercial fishing. Measures to reduce bycatch focus on adapting fishing gear, training fishers to improve recording and avoidance of bycatch incidents, and increased monitoring of fishing activities. These measures typically fall in the scope of the Technical Measures Regulation ([66]), which supports the objective of the MSFD in terms of species and habitats protection. Some Member States also regulate bycatch inside MPAs by making use of the scope under the common fisheries policy to propose joint recommendations with neighbouring countries for spatial fisheries measures ([67]).

Measures for turtles are rare, except for a few direct measures involving the training of fishers to avoid bycatch and the risk of vessel collision. Measures for cephalopods are non-existent; they are commonly bundled together with fish species.

Commercial and non-commercial fish and shellfish are covered by measures to reduce fishing pressure. Most measures are linked to the CFP to ensure that populations are fished at levels that are sustainable over the long term. Some Member States also cover nationally managed local/in-shore stocks. To some extent, they cover recreational fishing, but not sufficiently. Half of the Member States have also reported measures to tackle the requirement for healthy age and size distribution of fish populations ([68]), for example by reducing the catch of juvenile fish or updating regulations on mesh sizes. Obstacles in the migratory corridors of fish are also reported as major threats to the health of fish populations.

Good example

One country has taken a measure to reduce blockages to fish migratory corridors by using acoustic monitoring, removing old barriers or re-opening migratory pathways and stimulating fish populations in estuarine/coastal areas.

([66]) The Technical Measures Regulation (EU) 2019/1241 on the conservation of fisheries resources and the protection of marine ecosystems through technical measures.
([67]) Common Fisheries Policy Regulation (EU) 1380/2013, Article 11 on 'Conservation measures necessary for compliance with obligations under Union environmental legislation'.
([68]) As per criterion D3C3 of Commission Decision (EU) 2017/848.

Measures for habitats (Descriptors 1 and 6)

Overall, some progress has been made on measures for seabed habitats, in particular by reducing the seabed harm caused by mobile bottom-contact fishing methods, but action on water column habitats remains overlooked.

By nature, all forms of biological, physical, and substance input pressures have an impact on seabed habitats and seafloor integrity, whether directly or indirectly. In addition to all the measures taken under other descriptors, Member States have taken measures clearly focused on the physical preservation of the seafloor, including reducing pressure from human activities on seabed habitats, designating seabed-focused MPAs and actively restoring habitats and the biological communities associated with them (e.g. restoring oyster reefs and Posidonia meadows and planting *Zostera* beds).

Most Member States identified mobile bottom-contact fishing as the main threat to the health of seabed habitats. Some have adopted measures to reduce its harmful impacts, either covering large areas or specifically for vulnerable habitats.

The Member States also regulate other activities causing physical pressure on the seabed, such as anchoring in the Mediterranean, which is a particular threat to Posidonia meadows, lost fishing gear and sand dredging. Despite growing pressure from offshore wind energy infrastructure, including cables, only a few Member States tackle the pressure caused by wind energy installation. Measures include mapping vulnerable seabed habitat types, for example. The adoption in March 2023 of EU-wide threshold values for the maximum extent of adverse effects and loss on seabed habitats should support the design of even more effective measures for seafloor integrity in the next cycle.

Water column habitats are still largely overlooked under the biodiversity descriptors but they are covered by measures to reduce pollution levels in the water column.

Good example

Reducing the trawl-swept area in national waters and promoting lower impact and more selective gear for the whole fleet are examples of the measures taken by some Member States to help protect seabed habitats outside of MPAs.

Measures for food webs (Descriptor 4)

Overall, no noticeable progress has been made on measures for marine food webs; action on species and seabed integrity would drive improvements to food webs.

The MSFD requires that marine food webs are healthy, meaning that all living organisms in the given marine environment are in balance and capable of achieving long-term abundance and reproductive capacity. Human activities can affect the balance of this intricate relationship, for example by removing too many forage fish and making it more difficult for their predators to find food.

There are very few examples of practical direct measures taken by Member States to safeguard the health of marine food webs. Most measures linked to food webs aim to protect biodiversity in general, such as designating or expanding MPAs, or species-specific measures such as preventing bycatch. While these measures are important for

maintaining populations of certain species, and thus the local food web, they have only an indirect impact on the overall food web health.

Good example

Examples of measures taken by some Member States for food webs include restricting fishing of a certain trophic group (e.g. of all predatory or forage fish) or of certain commercial species that play a particularly important role in the food web, or reducing fishing levels overall.

Measures to reduce other non-pollution pressures on biodiversity (Descriptors 2 and 7)

Overall, progress has been made in identifying suitable measures to tackle non-indigenous species. However, few Member States have made progress in tackling changes to hydrographical conditions.

Most of the measures to reduce the threats to biodiversity stemming from non-indigenous species relate to implementation of the IMO Ballast Water Convention, as shipping is widely recognised by Member States as the main introduction pathway. Aquaculture is also identified as a growing introduction pathway, and some Member States have taken early detection measures by monitoring aquaculture hotspots. Recreational boating and angling are also increasingly covered by preventive measures.

Permanent changes of hydrographical conditions, such as water temperature or salinity, can also impact marine biodiversity by disturbing water column habitats and the environmental conditions in which marine species live, feed and reproduce. The main direct measures taken by Member States to prevent some of these changes, in particular in coastal areas, are linked to the WFD RBMPs. They include, for instance, controlling the freshwater and sediment flow from rivers into the sea. Indirect measures include ensuring that strategic environmental assessments and environmental impact assessments cover these impacts or using maritime spatial planning to better plan and control cumulative effects potentially leading to alterations of hydrographical conditions. Climate change is also significantly affecting hydrographical conditions (see details below).

Good example

Innovative measures taken by certain Member States include developing a forward-looking vision to develop large-scale activities (e.g. offshore energy production sites and aquaculture). Based on these future scenarios, spatial planning of human activities at sea can be designed to manage future cumulative impacts and ensure they do not prevent the achievement of GES.

3.3 TACKLING THE CLIMATE CRISIS

2023 was the warmest year ever recorded in many parts of the northern hemisphere ([69]). As a result, most basins in the Atlantic Ocean have been warmer than average, especially

([69]) State of the Global Climate 2023.

in Europe ([70]). The European Climate Risk Assessment report ([71]) confirms that all European seas are heavily affected by climate risks and anthropogenic pressure.

The latest Intergovernmental Panel on Climate Change report on the ocean and cryosphere in a changing climate ([72]) indicates that the ocean is warming, acidifying and suffering from deoxygenation. The growing trajectory of this 'deadly trio' will reduce the ocean's ability to absorb carbon dioxide and preserve life on the planet.

In a recent ruling, the International Tribunal for the Law of the Sea under the UN Convention on the Law of the Sea clarified that '*anthropogenic GHG emissions into the atmosphere constitute pollution of the marine environment within the meaning of Article 1, paragraph 1, subparagraph 4 of the UN Convention' ([73])*. With this ruling, the Tribunal directly links countries' efforts to reduce greenhouse gas emissions in the atmosphere (and thus fight climate change) with action to tackle pollution of the marine environment, in the UNCLOS context. This decision should also be read in the MSFD context, requiring Member States to tackle pollution of the marine environment.

It is therefore necessary to act and take measures to support the ocean-climate nexus. In particular, the ocean can help mitigate climate change by:

- Preserving the capacity of the oceans to act as carbon sinks. Healthy coastal and marine ecosystems ensure the oceans maintain their capacity to store carbon.
- Reducing greenhouse gases emissions by developing ocean renewable energy and greening blue economy sectors.

Addressing climate change through the MSFD

Overall, although the MSFD does not directly tackle it, many Member States have taken climate adaptation measures, e.g. supporting coastal communities, and some have taken climate mitigation measures, e.g. restoring blue carbon ecosystems.

To date, climate change is neither explicitly covered by an MSFD descriptor nor listed as a form of pressure. Climate change is however mentioned in the Directive and the holistic marine strategies provide a good framework to monitor climate change impacts and explore climate change mitigation. This approach was confirmed by the assessment made for the previous cycle, where Member States highlighted that the impacts caused by climate change and ocean acidification are important transboundary issues tackled under MSFD monitoring programmes ([74]).

As climate change is a concern for all marine regions and a growing pressure on the marine environment, several Member States now consider it a frontline issue: 4% of all measures (84 measures from 15 Member States) are directly related to climate change.

Most climate-related measures concern adaptation or resilience, i.e. reducing climate change impacts or supporting communities in addressing and recovering from future deteriorations. One third is related to mitigation, i.e. reducing and preventing greenhouse gas emissions, including action to restore blue carbon ecosystems.

Many important measures stem from work under the RSCs, others from the Member States' national energy and climate plans or national climate adaptation strategies.

([70]) The European heatwave of July 2023 in a longer-term context | Copernicus.
([71]) European Climate Risk Assessment – European Environment Agency (europa.eu).
([72]) AR6 Synthesis Report: Climate Change 2023 – IPCC.
([73]) https://www.itlos.org/fileadmin/itlos/documents/press_releases_english/PR_350_EN.pdf.
([74]) Report on the implementation of the Marine Strategy Framework Directive (europa.eu).

Good example

By quantifying the carbon sequestered by seagrass meadows and macroalgae forests, some Member States identify carbon hotspots in their waters and ensure that economic activities do not threaten them or, on the contrary, contribute to their restoration.

4. ENSURING SOCIO-ECONOMIC SOUNDNESS

Overall, Member States now have a greater understanding of the socio-economic impacts of MSFD measures. Still, fewer than half indicate the level of investment needed and very few look into the social acceptability of the measures proposed.

Almost all Member States performed a cost-benefit and/or a cost-effectiveness analysis on their measures, and some followed up with a categorisation of the least cost-effective measures. Only a few explained how these analyses influenced the selection of measures, for instance by prioritising certain measures over others. A few Member States from the Baltic region made a quantitative comparison between the costs of their programmes of measures and the benefits (achieved or potential) of improving the state of the marine environment.

Fishing and shipping are the two activities/sectors reported as being most impacted by MSFD measures. Only two Member States also looked at how their programmes of measures would affect social issues and human well-being. One Member State investigated whether each individual new measure could be expected to have a positive, negative or no impact on local communities, traditions, cultural heritage, employment and health.

The proposed MSFD measures covering the 2022-2027 period have been estimated at an average cost of EUR 724 per km^2 of marine area per year. Based on this data, the cost of MSFD measures for all EU marine waters can be estimated at EUR 5.8 billion per year ([75]). Based on Member States' reporting of the share of their measures that are specific to the MSFD (42%), the cost of MSFD-specific measures for all EU marine waters is estimated at EUR 2.4 billion per year.

Almost all Member States mobilise a mix of national and EU funds, with some Member States listing EU funds for 50-80% of their measures. EU funds most often mentioned are EMFF/EMFAF, LIFE and Horizon Europe. Over half of the Member States also mention mobilising private finance, either as costs to the private sector to follow the measures that are implemented (e.g. as a capital investment) or as funding provided by environmental foundations to implement the MSFD measures.

5. GOVERNANCE AND REGIONAL COOPERATION

Designing a suitable programme under the MSFD requires not only identifying the right measures to help achieve GES but also putting in place a governance framework to support their implementation.

([75]) Total km2 of marine waters of 22 EU Member States (7 958 556) * average cost of measures per km2 (724) = EUR 5 764 104 242.96. Calculations are included in EUR. See more detailed calculations in the SWD accompanying this communication.

The Commission assessed four main aspects of the Member States' governance mechanisms: involving the public, coordinating across related policy fields, regional cooperation and likelihood of implementation.

Member States have put governance mechanisms in place to support implementation of the programme of measures but coordination with other authorities and with neighbouring Member States is not always sufficient. Since the first programmes of measures, more Member States have expressed a clear commitment to the full implementation of their programmes of measures.

The obstacles identified by Member States include financing and issues related to implementation at national level, reported by just a few Member States. Member States did not report any obstacles to implementation for almost half of their measures (48%) ([76]).

Involving the public

Overall, processes for involving the public seem adequate but the extent to which they use feedback to amend the programmes of measures is much less clear.

Only two Member States did not mention conducting public consultations on their programmes of measures. Of the other 15, a quarter reported only very limited information on how they take on board the input from the public in selecting and designing the measures. The level of engagement was higher where the information about the consultation was provided using both traditional and social media.

Feedback could be provided through different means including direct contact with the public through workshops, seminars and stakeholder meetings in addition to online consultations. Only four Member States reported setting aside time to handle public feedback using a comprehensive methodology and amending their programmes where appropriate.

Cooperation with other authorities, policies and Member States

Overall, all countries cooperate across policy areas and with other authorities, although it is not always clear what the outcome of this cooperation is. Some countries cooperate more closely with WFD and MSP authorities, including by taking a joint approach to the design of measures. Regional cooperation plays an important role in the development of Member States's programmes of measures in some regions, but the level of regional coherence of the measures remains moderate.

All Member States make very clear links between their MSFD programmes of measures and the measures taken under other pieces of EU law, in particular the Habitats Directive, the Water Framework Directive and the common fisheries policy.

This is in line with the finding that 58% of the measures included in these second programmes of measures are derived from other legal instruments ([77]). Most are linked to pollution-related frameworks (e.g. the WFD, the urban wastewater treatment directive, the waste, chemicals and agricultural law, the Minamata Convention on mercury),

([76]) See European Commission, Joint Research Centre: Louropoulou, E., et al., Programmes of Measures under the Marine Strategy Framework Directive to achieve or maintain Good Environmental Status, as above.

([77]) For a more detailed analysis, see Figure 2 in SWD(2025) 1.

biodiversity-related frameworks (such as the Birds and Habitats Directives, the EU biodiversity strategy, the Convention on Biological Diversity) and fisheries and maritime-related policies (e.g. maritime spatial planning, the common fisheries policy, International Maritime Organization, etc.). Most Member States also refer to the objectives of the biodiversity strategy, but rarely to the 30% and 10% targets set in the strategy. There are even fewer references to the zero pollution action plan, although the measures adopted under the MSFD to fight pollution are fully aligned with its objectives.

Coordination with authorities in charge of implementing the Water Framework Directive and the maritime spatial planning processes are most often mentioned in the MSFD reports; less so in the WFD RBMPs. Only a few Member States elaborated on how they govern and coordinate between different policies and the outcomes of this coordination. For instance, one Member State explained that the authorities responsible for the MSFD and those responsible for WFD had drawn up a catalogue of measures common to the objectives of both laws and that they update the catalogue in line with the MSFD and WFD implementation cycles (see also WFD report) ([78]).

Regional coordination, in particular through the RSCs, is cited frequently throughout the programmes of measures and mentioned by all 17 Member States. They also describe coordination mechanisms with neighbouring countries within the RSCs and make frequent references to action plans (e.g. the OSPAR regional action plan for marine litter or the Baltic Sea action plan), joint initiatives or projects in the individual descriptor sections. Some Member States complemented this with further contacts at subregional level, for instance holding trilateral meetings to identify common issues related to the management of MPAs, marine litter and underwater noise in the Bay of Biscay.

Despite intense and time-consuming coordination within the different regions, it is unsatisfactory to see that, on average, there is only a moderate degree of regional coherence of the programmes of measures. Coherence is particularly poor in action to tackle contaminants in seafood (D9), hydrographical conditions (D7) and food webs (D4) in all three regions. Confirming the positive results achieved over this period, coherence is highest (moderate to high) in all three regions on marine litter (D10).

Good example

Support from the RSCs in developing the measures can play an important role. In the Baltic Sea, HELCOM's Sufficiency of Measures tool ([79]), used by most Baltic Member States, has led not only to a higher level of regional coherence but also to a higher level of quality of the measures put forward by the individual Member States.

Member States' likelihood of implementing their programmes of measures

Looking at a number of criteria (including how the Member State takes account of socio-economic impacts, whether it has identified sources of financing, the level of coordination with key EU policies and the level of detail of implementation mechanisms) it is possible

([78]) Report from the Commission to the Council and the European Parliament on the implementation of the Water Framework Directive (2000/60/EC) and the Floods Directive (2007/60/EC) Third river basin management plans Second flood risk managment plans, COM(2025) 2

([79]) https://helcom.fi/baltic-sea-action-plan/som/#:~:text=The%20aim%20of%20the%20sufficiency,GES)%20in%20the%20Baltic%20Sea.

to group Member States according to the likelihood of implementing their programmes of measures ([80]) (Table 1).

Table 1. Likelihood of implementation of Member States' second programmes of measures

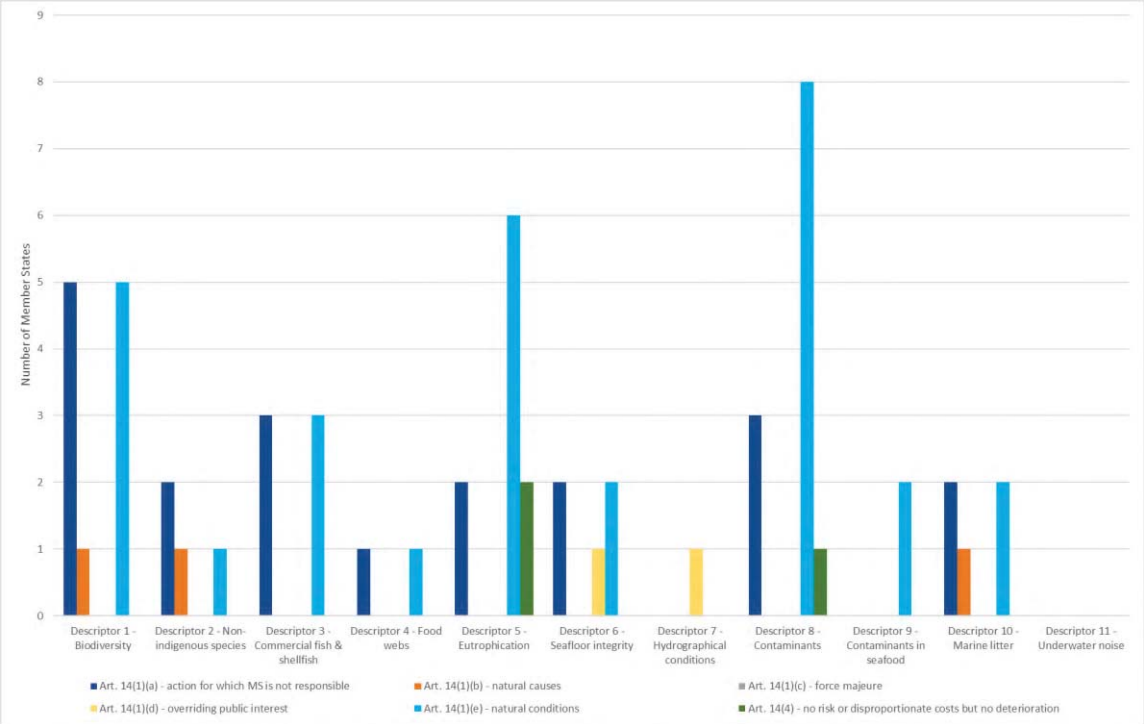
Likelihood of implementation	Member States	Justification
Highly likely or likely	EE, LV, SE, PT, FI, FR, LT, ES, PL, IE, SI, DE and BE	These Member States made a sound socio-economic analysis of the impacts of their programmes of measures, clearly identified sources of funding and appear to have actively coordinated across different authorities involved in implementing the measures. Importantly, it is clear how, where and when the new measures they proposed will be implemented.
Moderately likely	NL, RO and CY	These Member States made a partial analysis of the socio-economic benefits of their measures and investigated social issues to a limited extent. They listed sources of funding but did not allocate specific amounts to specific measures. Coordination with authorities appears more limited or superficial and it is also less clear where, how and when new measures will be implemented.
Not likely	IT	This Member State provided little information on sources of funding and reported only a superficial socio-economic analysis of its measures. There is no sign of coordination between the MSFD and other EU laws or it has not been reported. It is also not clear where, when and how new measures will be implemented.

The Directive also enables Member States, in well-defined circumstances, to apply exceptions to achieving GES (Article 14). These circumstances include the fact that achieving such goals is related to action or inaction beyond their responsibility, *force majeure* events, or the fact that natural conditions do not enable them to achieve a timely improvement in the status of their marine waters.

As shown in Figure 4, 12 of the 17 Member States reported exceptions for all these possible reasons, except *force majeure*. Contaminants and eutrophication are the topics for which most Member States requested an exception, citing natural conditions that do not enable the timely improvement in the status of marine waters. Underwater noise is the only topic for which no exception was requested, and few exceptions were requested for food webs, hydrographical conditions and seafood contaminants, all topics that are currently not very well developed under the MSFD.

([80]) A more detailed explanation of the methodology used for this assessment is provided in the SWD accompanying this report.

Figure 4. Exceptions to the non-achievement of GES as reported under the second programmes of measures



6. CONCLUSIONS AND OUTLOOK

Member States have done an impressive work in identifying and tackling the highly complex and diverse nature of marine pressures needed to achieve GES. The share of **measures specifically designed for the MSFD** – and not adopted under other frameworks – has **increased from 25% to 42%,** showing that the MSFD is a key driver of new measures to protect the marine environment and to use it sustainably.

Despite this, further work is required to harmonise the development of measures as there are **clear disparities across descriptors and Member States**. On average across all 17 Member States, only measures for marine litter and non-indigenous species are considered to tackle to some extent the issues needed to remedy the problems ([81]). Measures to tackle other forms of pollution, biodiversity loss and climate change are still considered insufficient, although progress has been made in some areas such as seabed protection and alterations to hydrographical conditions.

Many measures stem from other legislative frameworks, such as EU law governing water, nitrates and chemicals, the common fisheries policy or the Birds and Habitats Directives. These frameworks do not have the same scope, however, and the MSFD sets out requirements for additional forms of environmental pressures (for instance, marine pollution in offshore areas, e.g. from fossil fuel production). **This shows the need for more work to cover these gaps when designing MSFD measures**.

([81]) Detailed explanations on the methodology and scoring of the adequacy assessment are included in SWD(2025) 1.

In contrast, Member States have taken better measures to tackle pressures or impacts that are less well covered by other policies and legislation, with the exception of underwater noise and food webs. In the absence of a 'safety net' of targeted long-standing legislation regulating the issue at EU level, overall Member States have been more innovative in identifying measures for non-indigenous species, hydrographical conditions, seafloor integrity and marine litter. They still use existing frameworks but achieving GES for these topics requires Member States to think collectively about new approaches to tackle these problems.

Measures on marine litter are a good illustration of how the MSFD can make a difference while working in synergy with other legislative frameworks. As a starting point, several Member States have been able to assess how far they are from achieving the GES objective, quantified through the recently agreed threshold value ([82]). Based on this, they designed suitable measures to close the gap, including references to other frameworks. Not only are the measures for marine litter of better quality than the measures for other topics, but they are also more regionally coherent. By contrast, measures on underwater noise still fall short of expectations. It shows that success depends on many factors, including high public awareness and a solid data and knowledge basis, both of which are still lacking to some extent for underwater noise.

For the main part, the **measures are moderately coherent within a marine region**. The degree of coherence is higher where tools have been developed to support the assessment of how far Member States are from GES and the measures needed to close the gap, for example through the work of HELCOM in the Baltic Sea. Of the seven Member States considered to have a good quality programme of measures, five share waters in the Baltic Sea region and have worked together in the framework of HELCOM.

In general, the approach to taking measures under the MSFD still requires work and effort. In particular, **it remains difficult to gauge by how much and by when the measures will reduce the impact on the marine environment and help achieve GES**. This is partly due to the lack of clearly quantified GES, and partly to a lack of suitable tools and methodologies, including modelling, to better assess the action needed to achieve GES. Recent developments in this field are encouraging and should continue. These issues will also be analysed further in the upcoming MSFD evaluation.

7. RECOMMENDATIONS

Country-specific recommendations are provided in the staff working document accompanying this report ([83]). The following recommendations are applicable to all EU Member States:

1. Member States should **increase the level of ambition** and **accelerate action to achieve the objectives of the Directive**. This involves:
    a. developing more robust programmes of measures based on a clearer assessment of the gap to be bridged to reach good environmental status;
    b. designing quantitative measures that bridge the gap between the current status and good environmental status, as quantified by the threshold values set at

([82]) https://publications.jrc.ec.europa.eu/repository/handle/JRC121707
([83]) SWD(2025) 1

EU, regional and subregional level and integrated into Member States' marine strategies ([84]);

c. ensuring that measures taken under other legislation and policies have the right ambition level to contribute to the achievement of GES, or complementing them to cover issues that are needed for GES but are not part of existing frameworks.

2. Member States should identify and put in place, as appropriate**, additional measures to reduce persistent environmental challenges** (pressure) that prevent the achievement of good environmental status.

   a. On **pollution**, this involves:
      i. stepping up action to reduce underwater noise pollution, including by tackling the main sources of continuous noise – such as shipping – and by setting up low-noise areas for marine species;
      ii. stepping up action to reduce nutrient pollution to achieve the objectives of the MSFD, WFD and the Nitrates Directive;
      iii. reducing chemical pollution from sea-based sources, in particular hydrocarbon extraction, and from novel substances, including PFAS, pharmaceuticals or microplastics;
      iv. continuing action to reduce the impact of litter on marine life, while reducing the inputs at source.

   b. On **biodiversity**, this involves:
      i. completing the network of coherent, representative, effectively managed MPAs to reach the 2030 target set in the biodiversity strategy to protect 30% of waters, including 10% strictly, in line with the ambition set in the marine action plan and the obligations under the Kunming-Montreal Global Biodiversity Framework;
      ii. stepping up action to reduce the bycatch of sensitive species, starting with the priority species as recommended in the marine action plan;
      iii. implementing without delay the obligations under the Nature Restoration Regulation as critical contributions to achieving GES under the MSFD;
      iv. tackling the risks to marine ecosystems linked to the projected expansion of offshore renewable energy production, together with the cumulative impacts of existing activities at sea, through forward-looking ecosystem-based maritime spatial planning.

   c. Regarding **climate change**, all Member States should seek to factor climate change in the design and selection of their measures and in particular:
      i. prioritise measures that help limit/reduce greenhouse gas emissions, including by restoring blue carbon ecosystems;
      ii. ensure that other measures or groups of measures do not increase greenhouse gas emissions;
      iii. take measures to strengthen the adaptive capacity of coastal communities to climate change, e.g. by restoring coastal ecosystems.

([84]) Communication from the Commission, Commission Notice on the threshold values set under the Marine Strategy Framework Directive 2008/56/EC and Commission Decision (EU) 2017/848 (C/2024/2078), 11.3.2024.

3. Member States should **increase investment and provide sufficient financing to implement the programme of measures** to reach the MSFD objectives. This involves in particular:
    a. developing a strategic outlook for investments to achieve good environmental status, avoiding a piecemeal approach to funding individual measures and reducing inefficiencies across different policy areas;
    b. clearly identifying the source of financing needed to implement all measures;
    c. making use of existing financial instruments and tools that support the development of measures for marine protection and sustainable use, including through research and innovation, such as the Cohesion, Recovery and Resilience Facility, regional funds, EMFAF, LIFE and Horizon Europe in its different clusters (e.g. Missions and Partnerships), among others.
4. Member States should put in **place governance mechanisms that support the design and implementation of ambitious, coherent, coordinated, fair and effective programmes of measures**. This involves:
    a. tackling decisively the obstacles to implementing the measures, such as insufficient financing;
    b. improving coordination across authorities to ensure that MSFD measures dependent on other policies are fully implemented by the authorities dealing with implementation of these policies, notably in relation to fisheries, agriculture and energy;
    c. involving the public and stakeholders at the planning stage, taking their contributions into account in the design of measures and ensuring social acceptability of the measures proposed, adopting accompanying measures to limit potential negative impacts if necessary;
    d. increasing early coordination of programmes of measures with neighbouring Member States to ensure coherence, synergies and the complementarity of measures in the region and planning joint action where necessary;
    e. operationalising the spatial aspects of MSFD programmes of measures through maritime spatial plans to ensure that the spatial protection measures and spatial pressure reduction measures planned are fully taken up in the MSP.
5. Lastly, Member States should provide **more up-to-date and complete electronic reporting** in order to give greater transparency to the public on the measures proposed and on how they are expected to support progress towards GES and the targets. This will also enable comparability across Member States and marine regions.