



JRC TECHNICAL REPORT

Outline of the dynamic baseline for the MSFD Impact Assessment analysis in the context of the Blue2 Modelling Framework initiative

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Abstract

As part of the support JRC is providing DG ENV on the coming review (impact assessment and potential revision) of the Marine Strategy Framework Directive (MSFD), it is necessary to develop a future scenario in which the Directive is not changed but that consider all other elements (policy and socio-economic developments) that are expected to happen in the next decades. This scenario is named the 'dynamic baseline' and it should provide (once simulated with the appropriate modelling tools) the likely environmental conditions of EU marine regions in 2050 in the case of 'no-revision' of the MSFD. The environmental conditions under this scenario should be compared against those derived from the different 'revision scenarios' in which different elements of the MSFD are changed. The difference between both scenarios should help quantify the impacts of the revision options.

As a first step towards the realization of the dynamic baseline, it is necessary to identify the main elements (e.g., drivers, trends and policies) that should be considered for the different descriptors of the Good Environmental Status included in the MSFD. This report contains, for each individual descriptor, the drivers (e.g., socio-economic developments, climate changes and international cooperation) and legislations (both at EU and international level) that could influence the condition of those descriptors in the next few decades.

The information contained in this report should provide the basis for the construction of the dynamic baseline scenario for the different descriptors covered by the Blue2 Modelling Framework to be simulated in the context of the Blue2.3 Administrative Arrangement.

Authors

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1 Introduction

As part of the Blue2.2 AA (Administrative Arrangement N °110661-070201/2019/818363/AA/ ENV.C.2), DG ENV has requested JRC to provide with an outline for the dynamic baseline to be used in the context of the Impact Assessment and potential revision of the MSFD in the coming years.

The dynamic baseline scenario is defined as the '*business as usual*' future scenario that includes driving forces (e.g., climate change or socio-economic developments) and new policy and legislative developments that may impact the MSFD implementation. Importantly, in this scenario, the MSFD itself is not reviewed but will continue to be implemented as it is today.

From the definition above, it is obvious that this dynamic baseline scenario is unique and constitutes our best guess on how pressures on marine ecosystems will develop in the future. However, the outline presented in this document discriminates and separates the scenario in the 11 descriptors considered in the MSFD separately. This is a choice driven by the characteristics of the Blue2 Modelling Framework (Blue2MF) that is made of separated (but interconnected) models targeting specific criteria or indicators within the individual MSFD descriptors.

In order to be able (in a later stage) to execute the necessary model runs to estimate the environmental changes for the different Descriptors/Criteria, the outline needs to identify, for each Descriptor, which are the relevant drivers/policies that need to be taken into account. This way, it would be possible to translate those elements into quantitative changes of the environmental pressures in the different models within the Blue2MF.

However, as the dynamic scenario is unique, there are complementary and indirect impacts that should be considered together. As an example, the environmental changes regarding eutrophication (D5) should have an impact and will be considered in the scenarios evaluating changes on biodiversity-related (i.e., D1, D4 or D6) criteria.

For each Descriptor, we followed the structure designed by Millieu and AcTheon on their background document by identifying:

- A) Drivers: long-term, exogenous driving forces and factors that will likely happen in the next decades. It includes:
 - a. Established socio-economic developments
 - b. Climate change
 - c. Developments in international cooperation
- B) Main policies: these are the main EU legislative proposals and actions that will influence the environmental conditions of EU marine regions in the following decades. It includes overarching initiatives (e.g., European Green Deal, Zero Pollution Action Plan, Farm to Fork Action plan, etc..) sectorial, dedicated policies, directives, regulations and conventions. For the identified policy elements, there is an indication of the specific provisions that should be taken into account for the dynamic baseline (when possible).

2 Descriptor 1. 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

2.1 Drivers

2.1.1 Established socio-economic developments

For D1, the identified socio-economic developments are:

- ***Population evolution:***

Europe maximum at 2025 then shrinking, Southern Europe already shrinking (Vollset et al., 2020) and EUROSTAT (https://ec.europa.eu/eurostat/databrowser/view/proj_19np/default/table?lang=en)

- ***Long term economic growth***

- ***Increasing demand for natural resources***

Expected to double by 2060

- ***Behavioural changes***

Increasing awareness, social changes in behaviour and innovation leading to a more circular economy

2.1.2 Climate change

For the dynamic baseline, results from the CMIP5 climate simulation exercise will be used (as the newer CMIP6 simulations are not yet downscaled for Europe and have no better quality than the previous simulations). Considering the actual world situation realistic, we assume that socio-economic factors follow their historical trends, with no significant change, consequently, progress toward sustainability is slow, with disparate development and income growth. The baseline simulation shall therefore be based on the SSP2 (Shared Socio Economic Pathway 2 = middle of road or BAU) (Riahi et al., 2017) in combination with RCP4.5 (Moss et al., 2008), using the MPI Global Circulation Model, downscaled by the European CORDEX initiative (COSMO-CLM).

For the short term (until 2030) there are no significant differences between the scenarios RCP2.6, RCP4.5 and RCP6.0, however thereafter (~2040) the trajectories for air temperature and other climate variables begin to deviate from each other.

Trends within SSP2-RCP4.5

- Ocean circulation pattern, water temperature, salinity and stratification are changing. (IPCC)
- Frequency of extreme weather events like storms, droughts, flooding is increasing. (IPCC)

2.1.3 Development in international cooperation

- Biodiversity Beyond National Jurisdiction
- International organizations
- Agreement on the conservation of cetaceans of the Black Sea and Mediterranean Sea and contiguous Atlantic area (ACCOBAMS) Annex 2 on Agreement: work out and implement measures to minimize the

fishing negative effects on the conservation of cetacean. Most particularly, no vessels will be authorized to keep on board or to use any drift nets. Introduce or amend regulations with a view to preventing fishing gear from being discarded or left adrift at sea, and to require the immediate release of cetaceans caught incidentally in fishing gear in conditions that assure their survival; regulate the discharge at sea of, and adopt within the framework of other appropriate legal instruments stricter standards for, pollutants believed to have adverse effects on cetaceans

- Agreement on the Conservation of Small Cetaceans of the Baltic, North East Atlantic, Irish and North Seas (ASCOBANS) Annex. Habitat conservation and management: Work towards (a) the prevention of the release of substances which are a potential threat to the health of the animals, (b) the development, in the light of available data indicating unacceptable interaction, of modifications of fishing gear and fishing practices in order to reduce by-catches and to prevent fishing gear from getting adrift or being discarded at sea, (c) the effective regulation, to reduce the impact on the animals, of activities which seriously affect their food resources, and (d) the prevention of other significant disturbance, especially of an acoustic nature.
- Convention on biological diversity (CBD) (UN environment programme). Target 11 states that by 2020, at least 10% of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes. Although there is progress, the realization of this target in 2020 is still far behind, see Marine Protected Areas (MPAs). The realization of other targets related to the marine environment (sustainable fisheries, ecosystem restoration and resilience and knowledge, science and technology) also falls short. Ecosystem protection and restoration are vital to mitigate the effects of climate change in marine biodiversity.
- Kunming-Montreal Global Biodiversity Framework (<https://www.cbd.int/article/cop15-final-text-kunming-montreal-gbf-221222>) Document CBD/COP/15/L25. TARGET 2. Ensure that by 2030 at least 30% of areas of degraded coastal and marine ecosystems are under effective restoration, in order to enhance biodiversity and ecosystem functions and services, ecological integrity and connectivity. TARGET 3. Ensure and enable that by 2030 at least 30% of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem functions and services, are effectively conserved and managed through ecologically representative, well-connected and equitably governed systems of protected areas and other effective area-based conservation measures. TARGET 5. Ensure that the use, harvesting and trade of wild species is sustainable, safe and legal, preventing overexploitation, minimizing impacts on non-target species and ecosystems, applying the ecosystem approach, while respecting and protecting customary sustainable use by indigenous peoples and local communities. TARGET 10. Ensure that areas under agriculture, aquaculture, fisheries and forestry are managed sustainably, in particular through the sustainable use of biodiversity, including through a substantial increase of the application of biodiversity friendly practices, such as sustainable intensification, agroecological and other innovative approaches contributing to the resilience and long-term efficiency and productivity of these production systems and to food security, conserving and restoring biodiversity and maintaining nature's contributions to people, including ecosystem functions and services. The Sustainable Development Goals (SDGs). SDG14. By 2020, conserve at least 10 per cent of coastal and marine areas, consistent with national and international law and based on the best available scientific information.
- Regional Sea Conventions:

OSPAR, HELCOM, Barcelona Convention and Bucharest Convention

2.2 Main policies

2.2.1 Habitat Directive (Council Directive 92/43/EEC)

Article 14:

1. Member States shall take measures to ensure that the taking in the wild of specimens of species of wild fauna and flora listed in Annex V as well as their exploitation is compatible with their being maintained at a favourable conservation status.

2. Where such measures are deemed necessary, they shall include continuation of the surveillance provided for in Article 11. Such measures may also include in particular:

- regulations regarding access to certain property,
- temporary or local prohibition of the taking of specimens in the wild and exploitation of certain populations,
- regulation of the periods and/or methods of taking specimens,
- application, when specimens are taken, of hunting and fishing rules which take account of the conservation of such populations,
- establishment of a system of licenses for taking specimens or of quotas,
- assessment of the effect of the measures adopted.

2.2.2 Birds Directive (Directive 2009/147/EC-Council Directive 79/409/EEC)

Article 2: Member States shall take the requisite measures to maintain the population of the species referred to in Article 1 at a level which corresponds in particular to ecological, scientific and cultural requirements, while taking account of economic and recreational requirements, or to adapt the population of these species to that level.

Article 3: Point 1. In the light of the requirements referred to in Article 2, Member States shall take the requisite measures to preserve, maintain or re-establish a sufficient diversity and area of habitats for all the species of birds referred to in Article 1. Point 2. The preservation, maintenance and re-establishment of biotopes and habitats shall include primarily the following measures: (a) creation of protected areas; (b) upkeep and management in accordance with the ecological needs of habitats inside and outside the protected zones; (c) re-establishment of destroyed biotopes; (d) creation of biotopes Point 4. Member States shall take similar measures for regularly occurring migratory species not listed in Annex I, bearing in mind their need for protection in the geographical sea and land area where this Directive applies, as regards their breeding, moulting and wintering areas and staging posts along their migration routes. To this end, Member States shall pay particular attention to the protection of wetlands and particularly to wetlands of international importance.

Article 5: Member States shall take the requisite measures to establish a general system of protection for all species of birds referred to in Article 1, prohibiting in particular: (a) deliberate killing or capture by any method; (b) deliberate destruction of, or damage to, their nests and eggs or removal of their nests; (c) taking their eggs in the wild and keeping these eggs even if empty; (d) deliberate disturbance of these birds particularly during the period of breeding and rearing, in so far as disturbance would be significant having regard to the objectives of this Directive; (e) keeping birds of species the hunting and capture of which is prohibited

2.2.3 Biodiversity Strategy (COM/2020/380)

Article 2.1. A coherent network of protected areas: At least one third of protected areas – representing 10% of EU Seas – should be strictly protected and at least 30% of the sea should be protected in the EU.

2.2.4 Natural Restoration Law (on the way)

Not yet a regulation, but aiming at:

- Safeguard 20% of 'EU nature' by 2030 + all 'necessary ecosystems' by 2050

- In particular for C-capture and storage:
 - Seagrass beds
 - Sediment bottoms
 - Habitats for key species (dolphins, porpoises, nursery & spawning grounds) in good conditions:
 - 30% @ 2030
 - 60% @ 2040
 - 90% @ 2050

2.2.5 Action Plan to Conserve Fisheries Resources and Protect Marine Species (on the way)

- By end of 2023, develop threshold values for the maximum allowable mortality rate from incidental catches of the species selected by Member States (34), as part of the implementation of the Marine Strategy Framework Directive (MSFD) (35).
- Adopt fisheries management measures to implement these threshold values without delay through national measures or, where relevant, by submission of joint recommendations.
- Adopt national measures or submit joint recommendations to the Commission to minimise by-catch (or reduce it to the level that enables the full recovery of the populations) of:
 - by the end of 2023: harbour porpoise in the Baltic Proper and the Black Sea, the Iberian Atlantic and the common dolphin in the Bay of Biscay (36);
 - by the end of 2024: angel sharks, common skate, guitarfish, Maltese skate, great white shark, sand tiger shark, smalltooth sand tiger shark, spiny butterfly ray, sturgeons, marine turtles, Balearic shearwater and Mediterranean monk seal;
 - by 2030: the remaining sensitive marine species that are at risk of incidental catches (37), prioritising those in 'unfavourable conservation status' or threatened by extinction.-
- By 2030, based on the work by the Scientific Technical and Economic Committee for Fisheries (STECF), the GFCM and other scientific institutions, such as the International Council for the Exploration of the Seas (ICES), present and implement additional measures to boost selectivity, starting with the fish stocks with the highest expected biological gains. The measures should include:
 - new and innovative gear techniques to reduce catches of small fish;
 - location or time-specific measures where there is clear evidence of high concentrations of fish below the minimum conservation reference size.
- -Gradually phasing out bottom fishing in all MPAs (including Natura 2000) by 2030, in view of their key role in restoration of marine biodiversity and the importance of the seabed for healthy marine ecosystems and climate change mitigation.

All the dynamic-baseline policies related and/associated to other pressure descriptors (e.g., eutrophication, litter, noise) would be considered in the specific pressure descriptor and indirectly will be considered in the scenarios evaluating changes on biodiversity-related descriptors/criteria (i.e., D1, D3 and D4, D6).

3 Descriptor 2. Non-indigenous species introduced by human activities are at levels that do not adversely alter the ecosystems

3.1 Drivers

3.1.1 Established socio-economic developments

For D2, the identified socio-economic developments are:

- Global trade is increasing
- Transport and tourism are increasing
- Growth of the aquaculture sector (increasing food (and protein) demand associated to depletion of natural resources)

3.1.2 Climate change

Impacts on non-indigenous species population, distribution and habitat extent. Other impacts include: (i) enabling the establishment of new species and (ii) propagule pressure, both for already established and new species could increase based on increased frequency of certain climatic events such as storms. Same climate scenario as for D1 will be considered.

3.1.3 Development in international cooperation

- Convention on biological diversity (CBD) (UN environment programme):

CBD (2020¹) is recognizing that invasive alien species represent one of the primary threats to biodiversity, especially in geographically and evolutionary isolated ecosystems, such as Small Island Developing States, and that risks may be increasing due to increased global trade, transport, tourism and climate change. CBD is stating that full and effective implementation of Article 8(h)² is a priority. The identification and categorisation of pathways follows the CBD classification as interpreted by the IUCN (2017)³. The main pathways, in which a non-indigenous species arrive, is subdivided into the following categories: 'corridor'; 'escape from confinement'; 'release in nature'; 'transport- contaminant'; 'transport – stowaway', 'unaided'. Its application in Europe has been implemented through the European Alien Species Information Network (EASIN⁴) and it is presented and discussed in Pergl et al. (2020).

- International Convention on the Control and Management of Ships' Ballast Water and Sediments (BWM Convention):

It was adopted in 2004 and aims to prevent the potentially devastating effects of the introduction and spread of invasive alien species carried by ships' ballast water and sediments from one region to another. This is to be done through the strict control and management of ships' ballast water and sediments.

- The ballast waters convention implementation (IMP, 2017; IUCN, 2017)

The convention entered into force in 8 September 2017, meaning that ships must manage their ballast water so that aquatic organisms and pathogens are removed or rendered harmless before the ballast water is

¹ Secretariat of the Convention on Biological Diversity (2020) Global Biodiversity Outlook 5 – Summary for Policy Makers. Montréal.

² <https://www.cbd.int/convention/articles?a=cbd-08>

³ <https://www.cbd.int/doc/c/9d85/3bc5/d640f059d03acd717602cd76/sbstta-22-inf-09-en.pdf>

⁴ <https://easin.jrc.ec.europa.eu/easin/>

released to a new location. This will help prevent the introduction and spread of invasive alien species as well as potentially harmful pathogens (International Maritime Organization⁵ (IMO)).

— International Union for Conservation of Nature's Red List of Threatened Species:

The IUCN Red List is a critical indicator of the health of the world's biodiversity. It is a powerful tool to inform and catalyse action for biodiversity conservation and policy change, critical to protecting the natural resources we need to survive. It provides information about range, population size, habitat and ecology, use and/or trade, threats, and conservation actions that will help inform necessary conservation decisions. IUCN has revised, under a contract with ENV, IAS impacting native species. The output constitute a baseline which could be used to measure achievement of the Biodiversity Strategy IAS target.

— Food and Agriculture Organization of the United Nation:

Carried out studies and reviews of non-indigenous species status, origins and introduction pathways in the Mediterranean and the Black sea.

— Regional Seas Conventions OSPAR, HELCOM, Barcelona Convention and Bucharest Convention:

They help prevent the spread of invasive alien species through supporting the ratification and implementation of BWM Convention.

— Kunming-Montreal Global Biodiversity Framework (<https://www.cbd.int/article/cop15-final-text-kunming-montreal-gbf-221222>) Document CBD/COP/15/L25:

TARGET 6. Eliminate, minimize, reduce and or mitigate the impacts of invasive alien species on biodiversity and ecosystem services by identifying and managing pathways of the introduction of alien species, preventing the introduction and establishment of priority invasive alien species, reducing the rates of introduction and establishment of other known or potential invasive alien species by at least 50 per cent, by 2030, eradicating or controlling invasive alien species especially in priority sites, such as islands.

3.2 Main policies

3.2.1 EU Biodiversity Strategy for 2030 (COM/2020/380)

Section 2.2.10 (Addressing invasive alien species): 'The rate of release of invasive alien species has increased in recent years. Of the 1,872 species now considered threatened in Europe, 354 are under threat from invasive alien species. Without effective control measures, the rate of invasion and the risks it brings to our nature and health will continue to rise'.

It advocates for stepping up the implementation of the EU Invasive Alien Species Regulation and other relevant legislation and international agreements. It aims to minimise and eliminate (when feasible) the introduction and establishment of alien species in the environment, manage established invasive alien species and decrease the number of Red List species they threaten by 50%.

3.2.2 Regulation (EU) No 1143/2014 of the European Parliament and of the Council of 22 October 2014 on the prevention and management of the introduction and spread of invasive alien species)

As invasive alien species are numerous, it is important to ensure that priority is given to addressing the subset of invasive alien species considered to be of Union concern. A list of such invasive alien species considered to be of Union concern ("the Union list") should therefore be established and regularly updated.

The criteria for inclusion on the Union list are the core instrument of application of this Regulation. To ensure the effective use of resources, those criteria should ensure that among the potential invasive alien species currently known, those that have the most significant adverse impact will be listed.

It is crucial to manage the pathways of unintentional introduction more effectively.

⁵ [https://www.imo.org/en/About/Conventions/Pages/International-Convention-for-the-Control-and-Management-of-Ships%27-Ballast-Water-and-Sediments-\(BWM\).aspx](https://www.imo.org/en/About/Conventions/Pages/International-Convention-for-the-Control-and-Management-of-Ships%27-Ballast-Water-and-Sediments-(BWM).aspx)

The EU Regulation (EU, 2014) addresses exclusively invasive alien species and aims to increase coordination among existing legal instruments. It includes innovative pathway-related measures, aiming to provide a holistic framework for the assessment, management and prevention of non-indigenous species.

The regulation is underpinned by an information support mechanism (Art. 25⁶): the European Alien Species Information Network (<https://easin.jrc.ec.europa.eu/easin/>).

3.2.3 Council regulation (EC) No 708/2007 of 11 June 2007 concerning use of alien and locally absent species in aquaculture

Applying to any non-routine intentional introduction of alien or locally absent aquaculture species. Publicly available register on all introductions and translocations of alien or locally absent aquaculture species (applications, permits, monitoring). Monitoring for all alien or locally absent aquaculture species after their release (2 years or full generation cycle or longer). Contingency plans for non-routine introductions or pilot releases of alien or locally absent aquaculture species, to be implemented in case of negative effects on the environment or on native populations

3.2.4 Council Directive 2000/29/EC of 8 May 2000 on protective measures against the introduction into the Community of organisms harmful to plants or plant products and against their spread within the Community (OJ L 169, 10.7.2000, p. 1).

Establishes protective measures against the introduction of organisms harmful to plants or plant products and against their spread within the Community.

3.2.5 Directive 2001/18/EC of the European Parliament and of the Council of 12 March 2001 on the deliberate release into the environment of genetically modified organisms and repealing Council Directive 90/220/EEC (OJ L 106, 17.4.2001, p. 1).

Aims to ensure a harmonised framework for traceability and labelling of genetically modified organisms (GMOs) and traceability of food and feed produced from GMOs at all stages of their introduction in the market.

3.2.6 Regulation (EC) No 1107/2009 of the European Parliament and of the Council of 21 October 2009 concerning the placing of plant protection products on the market and repealing Council Directives 79/117/EEC and 91/414/EEC (OJ L 309, 24.11.2009, p. 1).

This regulation lays down rules for the authorisation of plant protection products in commercial form and for their introduction in the market, use and control within the EC.

3.2.7 Water Framework Directive (2000/60/EC)

The Directive aims to achieve 'good ecological status' by 2027 in all EU surface water bodies (freshwater and coastal). The ecological status is an integrated measure of aquatic ecosystem conditions, defined in five classes based on biological, hydromorphological, and physico-chemical elements. Invasive alien species are considered a pressure on WFD water bodies (Vanderkerkhove et al., 2012; Magliozzi et al, 2020).

All the dynamic-baseline policies related and/associated to other pressure descriptors (e.g., eutrophication, litter, noise) would be considered in the specific pressure descriptor and indirectly will be considered in the scenarios evaluating changes on non-indigenous species (D2).

⁶ https://ec.europa.eu/commission/presscorner/detail/en/IP_13_818; https://ec.europa.eu/commission/presscorner/detail/en/IP_12_952

4 Descriptor 3. 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

4.1 Drivers

4.1.1 Established socio-economic developments

For D3, the identified socio-economic developments are:

- ***Population evolution:***

Europe maximum at 2025 then shrinking, Southern Europe already shrinking (Vollset et al., 2020) and EUROSTAT (https://ec.europa.eu/eurostat/databrowser/view/proj_19np/default/table?lang=en)

- ***Long term economic growth***

- ***Increasing demand for natural resources***

Expected to double by 2060

- ***Behavioural changes***

Increasing awareness, social changes in behaviour and innovation leading to a more circular economy

4.1.2 Climate change

Impacts on fisheries resources population, distribution, habitat extent and accessibility to fisheries. Same climate scenario as for D1 will be considered.

4.1.3 Development in international cooperation

- WTO agreement on fisheries subsidies:

Eliminate subsidies that contribute to Illegal, Unreported and Unregulated (IUU) fishing, overfishing and fishing in the unregulated high seas.

- Food and Agriculture Organization of the United Nations (FAO)/ General Fisheries Commission for the Mediterranean (GFCM):

E.g. MultiAnnual Management Plan aiming at reducing fishing effort in the Mediterranean Sea; Banning of bottom trawling in areas beyond 1000m in the Mediterranean Sea.

- Kunming-Montreal Global Biodiversity Framework (<https://www.cbd.int/article/cop15-final-text-kunming-montreal-gbf-221222>) Document CBD/COP/15/L25:

TARGET 5: Ensure that the use, harvesting and trade of wild species is sustainable, safe and legal, preventing overexploitation, minimizing impacts on non-target species and ecosystems, applying the ecosystem approach, while respecting and protecting customary sustainable use by indigenous peoples and local communities.

TARGET 10: Ensure that areas under agriculture, aquaculture, fisheries and forestry are managed sustainably, in particular through the sustainable use of biodiversity, including through a substantial increase of the application of biodiversity friendly practices, such as sustainable intensification, agroecological and other innovative approaches contributing to the resilience and long-term efficiency and productivity of these production systems and to food security, conserving and restoring biodiversity and maintaining nature's contributions to people, including ecosystem functions and services.

— The Sustainable Development Goals (SDGs):

SDG14: By 2020, effectively regulate harvesting and end overfishing, illegal, unreported and unregulated fishing and destructive fishing practices and implement science-based management plans, in order to restore fish stocks in the shortest time feasible, at least to levels that can produce maximum sustainable yield as determined by their biological characteristics. By 2020, prohibit certain forms of fisheries subsidies which contribute to overcapacity and overfishing, eliminate subsidies that contribute to illegal, unreported and unregulated fishing and refrain from introducing new such subsidies, recognizing that appropriate and effective special and differential treatment for developing and least developed countries should be an integral part of the World Trade Organization fisheries subsidies negotiation.

— Regional Sea conventions: OSPAR, HELCOM, Barcelona Convention and Bucharest Convention

4.2 Main policies

4.2.1 Common Fisheries Policy (No 1380/2013) particularly its Article 2 (2)

The CFP shall apply the precautionary approach to fisheries management, and shall aim to ensure that exploitation of living marine biological resources restores and maintains populations of harvested species above levels which can produce the maximum sustainable yield. In order to reach the objective of progressively restoring and maintaining populations of fish stocks above biomass levels capable of producing maximum sustainable yield, the maximum sustainable yield exploitation rate shall be achieved by 2015 where possible and, on a progressive, incremental basis at the latest by 2020 for all stocks.

4.2.2 Within the Integrated Maritime Policy

The Maritime Spatial Planning (Directive 2014/89/EU) Art 5: that states "Through their maritime spatial plans, Member States shall aim to contribute to the sustainable development of energy sectors at sea, of maritime transport, and of the fisheries and aquaculture sectors, and to the preservation, protection and improvement of the environment, including resilience to climate change impacts".

4.2.3 Biodiversity Strategy (COM/2020/380)

Article 2.1: A coherent network of protected areas: At least one third of protected areas – representing 10% of EU Seas – should be strictly protected and at least 30% of the sea should be protected in the EU. Reduce negative impacts of fishing/extraction.

4.2.4 Habitat Directive (Council Directive 92/43/EEC)

Article 14: 1. Member States shall take measures to ensure that the taking in the wild of specimens of species of wild fauna and flora listed in Annex V as well as their exploitation is compatible with their being maintained at a favourable conservation status. 2. Where such measures are deemed necessary, they shall include continuation of the surveillance provided for in Article 11. Such measures may also include in particular:

- regulations regarding access to certain property,
- temporary or local prohibition of the taking of specimens in the wild and exploitation of certain populations,
- regulation of the periods and/or methods of taking specimens,

- application, when specimens are taken, of hunting and fishing rules which take account of the conservation of such populations,
- establishment of a system of licenses for taking specimens or of quotas,
- assessment of the effect of the measures adopted.

4.2.5 Action Plan to Conserve Fisheries Resources and Protect Marine Species (on the way)

- By end of 2023, develop threshold values for the maximum allowable mortality rate from incidental catches of the species selected by Member States, as part of the implementation of the Marine Strategy Framework Directive (MSFD).
- Adopt fisheries management measures to implement these threshold values without delay through national measures or, where relevant, by submission of joint recommendations.
- Adopt national measures or submit joint recommendations to the Commission to minimise by-catch (or reduce it to the level that enables the full recovery of the populations) of:
 - by the end of 2023: harbour porpoise in the Baltic Proper and the Black Sea, the Iberian Atlantic and the common dolphin in the Bay of Biscay;
 - by the end of 2024: angel sharks, common skate, guitarfish, Maltese skate, great white shark, sand tiger shark, smalltooth sand tiger shark, spiny butterfly ray, sturgeons, marine turtles, Balearic shearwater and Mediterranean monk seal;
 - by 2030: the remaining sensitive marine species that are at risk of incidental catches, prioritising those in 'unfavourable conservation status' or threatened by extinction.-
- By 2030, based on the work by the Scientific Technical and Economic Committee for Fisheries (STECF), the GFCM and other scientific institutions, such as the International Council for the Exploration of the Seas (ICES), present and implement additional measures to boost selectivity, starting with the fish stocks with the highest expected biological gains. The measures should include:
 - new and innovative gear techniques to reduce catches of small fish;
 - location or time-specific measures where there is clear evidence of high concentrations of fish below the minimum conservation reference size.
- -Gradually phasing out bottom fishing in all MPAs (including Natura 2000) by 2030, in view of their key role in restoration of marine biodiversity and the importance of the seabed for healthy marine ecosystems and climate change mitigation.

4.2.6 Natural Restoration Law (on the way)

Not yet a regulation, but aiming at:

- Safeguard 20% of 'EU nature' by 2030 + all 'necessary ecosystems' by 2050
- In particular for C-capture and storage:
 - Seagrass beds
 - Sediment bottoms
 - Habitats for key species (dolphins, porpoises, nursery & spawning grounds) in good conditions:
 - 30% @ 2030
 - 60% @ 2040
 - 90% @ 2050

All the dynamic-baseline policies related and/associated to other pressure descriptors (e.g., eutrophication, litter, noise) would be considered in the specific descriptors and indirectly they will have an impact and evaluated in the other descriptors (mainly biodiversity descriptors).

5 Descriptor 4. 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

5.1 Drivers

5.1.1 Established socio-economic developments

For D4, the identified socio-economic developments are:

- ***Population evolution:***

Europe maximum at 2025 then shrinking, Southern Europe already shrinking (Vollset et al., 2020) and EUROSTAT (https://ec.europa.eu/eurostat/databrowser/view/proj_19np/default/table?lang=en)

- ***Long term economic growth***

- ***Increasing demand for natural resources***

Expected to double by 2060

- ***Behavioural changes***

Increasing awareness, social changes in behaviour and innovation leading to a more circular economy

5.1.2 Climate change

Impacts on marine resources/habitats: reduction in abundance, distribution and extent. Same climate scenario as for D1 will be considered.

5.1.3 Development in international cooperation

- Biodiversity Beyond National Jurisdiction

- Agreement on the conservation of cetaceans of the Black Sea and Mediterranean Sea and contiguous Atlantic area (ACCOBAMS):

Annex 2 on Agreement: work out and implement measures to minimize the fishing negative effects on the conservation of cetacean. Most particularly, no vessels will be authorized to keep on board or to use any drift nets. Introduce or amend regulations with a view to preventing fishing gear from being discarded or left adrift at sea, and to require the immediate release of cetaceans caught incidentally in fishing gear in conditions that assure their survival; regulate the discharge at sea of, and adopt within the framework of other appropriate legal instruments stricter standards for, pollutants believed to have adverse effects on cetaceans

- Agreement on the Conservation of Small Cetaceans of the Baltic, North East Atlantic, Irish and North Seas (ASCOBANS):

Annex. Habitat conservation and management: Work towards (a) the prevention of the release of substances which are a potential threat to the health of the animals, (b) the development, in the light of available data indicating unacceptable interaction, of modifications of fishing gear and fishing practices in order to reduce by-catches and to prevent fishing gear from getting adrift or being discarded at sea, (c) the effective regulation, to reduce the impact on the animals, of activities which seriously affect their food resources, and (d) the prevention of other significant disturbance, especially of an acoustic nature.

- Convention on biological diversity (CBD) (UN environment programme):

Target 11 states that by 2020, at least 10% of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes. Although there is progress, the realization of this target in 2020 is still far behind, see Marine Protected Areas (MPAs). The realization of other targets related to the marine environment (sustainable fisheries, ecosystem restoration and resilience and knowledge, science and technology) also falls short. Ecosystem protection and restoration are vital to mitigate the effects of climate change in marine biodiversity.

- Kunming-Montreal Global Biodiversity Framework (<https://www.cbd.int/article/cop15-final-text-kunming-montreal-gbf-221222>) Document CBD/COP/15/L25:

TARGET 2. Ensure that by 2030 at least 30% of areas of degraded coastal and marine ecosystems are under effective restoration, in order to enhance biodiversity and ecosystem functions and services, ecological integrity and connectivity.

TARGET 3. Ensure and enable that by 2030 at least 30% of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem functions and services, are effectively conserved and managed through ecologically representative, well-connected and equitably governed systems of protected areas and other effective area-based conservation measures.

TARGET 5. Ensure that the use, harvesting and trade of wild species is sustainable, safe and legal, preventing overexploitation, minimizing impacts on non-target species and ecosystems, applying the ecosystem approach, while respecting and protecting customary sustainable use by indigenous peoples and local communities.

TARGET 10. Ensure that areas under agriculture, aquaculture, fisheries and forestry are managed sustainably, in particular through the sustainable use of biodiversity, including through a substantial increase of the application of biodiversity friendly practices, such as sustainable intensification, agroecological and other innovative approaches contributing to the resilience and long-term efficiency and productivity of these production systems and to food security, conserving and restoring biodiversity and maintaining nature's contributions to people, including ecosystem functions and services. The Sustainable Development Goals (SDGs). SDG14. By 2020, conserve at least 10 per cent of coastal and marine areas, consistent with national and international law and based on the best available scientific information

- Regional Sea conventions: OSPAR, HELCOM, Barcelona Convention and Bucharest Convention

5.2 Main policies

5.2.1 Habitat Directive (Council Directive 92/43/EEC)

Article 14: 1. Member States shall take measures to ensure that the taking in the wild of specimens of species of wild fauna and flora listed in Annex V as well as their exploitation is compatible with their being maintained at a favourable conservation status. 2. where such measures are deemed necessary, they shall include continuation of the surveillance provided for in Article 11. Such measures may also include in particular:

- regulations regarding access to certain property,

- temporary or local prohibition of the taking of specimens in the wild and exploitation of certain populations,
- regulation of the periods and/or methods of taking specimens,
- application, when specimens are taken, of hunting and fishing rules which take account of the conservation of such populations,
- establishment of a system of licenses for taking specimens or of quotas,
- assessment of the effect of the measures adopted.

5.2.2 Birds Directive (Directive 2009/147/EC-Council Directive 79/409/EEC)

Article 2: Member States shall take the requisite measures to maintain the population of the species referred to in Article 1 at a level which corresponds in particular to ecological, scientific and cultural requirements, while taking account of economic and recreational requirements, or to adapt the population of these species to that level.

Article 3: Point 1. In the light of the requirements referred to in Article 2, Member States shall take the requisite measures to preserve, maintain or re-establish a sufficient diversity and area of habitats for all the species of birds referred to in Article 1. Point 2. The preservation, maintenance and re-establishment of biotopes and habitats shall include primarily the following measures: (a) creation of protected areas; (b) upkeep and management in accordance with the ecological needs of habitats inside and outside the protected zones; (c) re-establishment of destroyed biotopes; (d) creation of biotopes Point 4. Member States shall take similar measures for regularly occurring migratory species not listed in Annex I, bearing in mind their need for protection in the geographical sea and land area where this Directive applies, as regards their breeding, moulting and wintering areas and staging posts along their migration routes. To this end, Member States shall pay particular attention to the protection of wetlands and particularly to wetlands of international importance.

Article 5: Member States shall take the requisite measures to establish a general system of protection for all species of birds referred to in Article 1, prohibiting in particular: (a) deliberate killing or capture by any method; (b) deliberate destruction of, or damage to, their nests and eggs or removal of their nests; (c) taking their eggs in the wild and keeping these eggs even if empty; (d) deliberate disturbance of these birds particularly during the period of breeding and rearing, in so far as disturbance would be significant having regard to the objectives of this Directive; (e) keeping birds of species the hunting and capture of which is prohibited.

5.2.3 Biodiversity Strategy (COM/2020/380)

Article 2.1. A coherent network of protected areas: At least one third of protected areas – representing 10% of EU Seas – should be strictly protected and at least 30% of the sea should be protected in the EU.

5.2.4 Natural Restoration Law (on the way)

Not yet a regulation, but aiming at:

- Safeguard 20% of 'EU nature' by 2030 + all 'necessary ecosystems' by 2050
- In particular for C-capture and storage
 - Seagrass beds
 - Sediment bottoms
 - Habitats for key species (dolphins, porpoises, nursery & spawning grounds) in good conditions:
 - 30% @ 2030
 - 60% @ 2040

- 90% @ 2050

5.2.5 Action Plan to Conserve Fisheries Resources and Protect Marine Species (on the way)

- By end of 2023, develop threshold values for the maximum allowable mortality rate from incidental catches of the species selected by Member States, as part of the implementation of the Marine Strategy Framework Directive (MSFD).
- Adopt fisheries management measures to implement these threshold values without delay through national measures or, where relevant, by submission of joint recommendations.
- Adopt national measures or submit joint recommendations to the Commission to minimise by-catch (or reduce it to the level that enables the full recovery of the populations) of:
 - by the end of 2023: harbour porpoise in the Baltic Proper and the Black Sea, the Iberian Atlantic and the common dolphin in the Bay of Biscay;
 - by the end of 2024: angel sharks, common skate, guitarfish, Maltese skate, great white shark, sand tiger shark, smalltooth sand tiger shark, spiny butterfly ray, sturgeons, marine turtles, Balearic shearwater and Mediterranean monk seal;
 - by 2030: the remaining sensitive marine species that are at risk of incidental catches, prioritising those in 'unfavourable conservation status' or threatened by extinction.-
- By 2030, based on the work by the Scientific Technical and Economic Committee for Fisheries (STECF), the GFCM and other scientific institutions, such as the International Council for the Exploration of the Seas (ICES), present and implement additional measures to boost selectivity, starting with the fish stocks with the highest expected biological gains. The measures should include:
 - new and innovative gear techniques to reduce catches of small fish;
 - location or time-specific measures where there is clear evidence of high concentrations of fish below the minimum conservation reference size.
- -Gradually phasing out bottom fishing in all MPAs (including Natura 2000) by 2030, in view of their key role in restoration of marine biodiversity and the importance of the seabed for healthy marine ecosystems and climate change mitigation.

All the dynamic-baseline policies related and/associated to other pressure descriptors (e.g., eutrophication, litter, noise) would be considered in the specific pressure descriptor and indirectly will be considered in the scenarios evaluating changes on biodiversity-related descriptors/criteria (i.e., D1, D3 and D4, D6).

6 Descriptor 5. 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.

6.1 Drivers

6.1.1 Established socio-economic developments

For D5, the identified socio-economic developments are:

— ***Population evolution:***

Europe maximum at 2025 then shrinking, Southern Europe already shrinking (Vollset et al., 2020) and EUROSTAT (https://ec.europa.eu/eurostat/databrowser/view/proj_19np/default/table?lang=en)

Food production and agricultural activity are predicted to increase in the following 20 years, requiring more water usage and retention in dams, resulting in controlled flow of water reaching coastal seas from land and increased amount of wastewater. This results in more wasted food and fertilization of farmlands, which might increase the spillover of nutrients to the environment and consequently to coastal waters.

— ***Long term economic growth***

— ***Increasing demand for natural resources***

Expected to double by 2060

— ***Behavioural changes***

Increasing awareness, social changes in behaviour and innovation leading to a more circular economy

6.1.2 Climate change

Extreme weather, drought, flooding and other disasters influences riverine nutrient loads and atmospheric deposition. In turn, those changes will affect the nutrient loads into marine ecosystems.

The mean ocean circulation pattern, stratification and mean water temperature are changing. The transport of nutrients in the ocean and the conditions for algal growth are affected by these changes. Additionally, increased CO₂ in the atmosphere affects the carbonate chemistry of the ocean contributing to its acidification, while the rising temperatures contribute to lower the dissolved oxygen levels in the water.

Same climate scenario as for D1 will be considered.

6.1.3 Development in international cooperation

— Regional Sea conventions: OSPAR, HELCOM, Barcelona Convention and Bucharest Convention:

OSPAR: reduce inputs of phosphorus and nitrogen into areas where these are likely to cause pollution, in the order of 50 % compared with 1985

HELCOM:

- By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality.
- By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally
- By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate
- By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution

— International River Basin Districts Management Plans:

The ICPDR Danube Declaration 2022 (https://www.icpdr.org/main/sites/default/files/nodes/documents/danube_declaration_2022.pdf), serves as a coordinating mechanism for transboundary water management within the basin; The Agreement on the International Commission for the Protection of the Elbe River (ICPER), The International Scheldt Commission (ISC), International Sava River Basin Commission (Sava Commission), Joint water management of the Finnish-Norwegian river basin district.):

— Kunming-Montreal Global Biodiversity Framework (<https://www.cbd.int/article/cop15-final-text-kunming-montreal-gbf-221222>) Document CBD/COP/15/L25:

TARGET 7 - Reduce pollution risks and the negative impact of pollution from all sources, by 2030, to levels that are not harmful to biodiversity and ecosystem functions and services, considering cumulative effects, including: reducing excess nutrients lost to the environment by at least half including through more efficient nutrient cycling and use; reducing the overall risk from pesticides and highly hazardous chemicals by at least half including through integrated pest management, based on science, taking into account food security and livelihoods; and also preventing, reducing, and working towards eliminating plastic pollution”.

— The Sustainable Development Goals (SDGs):

SDG14. By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution.

6.2 Main policies

6.2.1 The Water Framework Directive (2000/60/EC)

The WFD is an eutrophication directive that defines environmental objectives. The aim of European water policy is to achieve good ecological status in all rivers, lakes, coastal and transitional waters by 2027. The Directive covers water pollutants in two ways: by identifying and regulating those of greatest concern across the EU (the priority substances listed in Annex X to the WFD) and by requiring Member States to identify substances of national or local concern (river basin specific pollutants included by Member States in their River Basin Management Plans).

Member States have defined water-type specific environmental standards to support the achievement of good ecological status. As natural and background concentrations of nutrients vary between and within the subregional seas, nutrient targets or thresholds for achieving good ecological status have to be determined while taking into account local conditions.

6.2.2 The Nitrates Directive (91/676/EEC)

Council Directive concerning the protection of waters against pollution caused by nitrates from agricultural sources.

The Nitrates Directive requires EU Member States to monitor the quality of waters and to identify areas that drain into polluted waters or at risk of pollution. These concern waters that due to agricultural activities are eutrophic or could contain a concentration of more than 50 mg/l of nitrates. Those areas are defined as Nitrate Vulnerable Zones (NVZs).

The Nitrates Directive forms an integral part of the overarching Water Framework Directive and is one of the key laws protecting waters against agricultural pressures.

6.2.3 The Urban Waste Water Treatment Directive (UWWT) (Council Directive 91/271/EEC)

The regulations have obligations for Member States in respect of the collection, treatment and monitoring of urban waste water:

- Establish systems of prior regulation or authorization for all urban and industrial waste water discharges into urban sewage collecting systems.
- Establish systems of prior regulation and / or specific authorization and permits for food processing industries.
- All urban waste water generated in agglomerations > 2000 p.e. must be supplied with collecting systems.
- Member States should take measures to limit pollution of receiving waters from storm water overflows via collecting systems.
- Waste water treatment is provided for all agglomerations at the level specified by the Directive.
- Maintain the technical requirements for the design, construction, operation and maintenance of (urban) wastewater treatment plants.
- Protect the environment from adverse effects of the discharge of wastewater.
- Member States ensure that monitoring programs of discharges from urban waste water treatment plants and receiving waters are in place and that they correspond to the requirements in terms of parameters monitored, analytical method and sampling frequency.

6.2.4 The Surface Water for Drinking Directive (75/440/EEC)

The sampling stations representative of surface waters of Member States (Article 6.1.a.i). These stations are used to identify polluted waters based on exceedance or potential exceedance of 50 mg/l nitrate (Annex I.A.1). Annex 1.A.3 also gives "eutrophic" or "may become eutrophic" as other criteria for identifying polluted waters. Though not strictly relevant to the eutrophication criteria (phosphorus is often the limiting nutrient for algal growth in freshwaters), monthly sampling of nitrate at those stations described in Article 6.1.a.i would in practice be useful in the assessment of eutrophication.

6.2.5 The Industrial Emissions Directive (2010/75/EU)

The Industrial Emissions Directive -IED- (2010/75/EU) is the main EU instrument regulating pollutant emissions to air, water and land (including NH₃, NO_x, N₂O, total N, total P) from industrial installations. The IED aims to achieve a high level of protection of human health and the environment taken as a whole by reducing harmful industrial emissions across the EU, in particular through better application of Best Available Techniques (BAT).

6.2.6 National Emission of Certain Atmospheric Pollutants Directive (2016/2284 /EU)

The National Emission reduction Commitments Directive -NECD- (2016/2284/EU) limits the maximum national emission of five main pollutants in the air (NO_x, NMVOCs, SO₂, NH₃ and PM_{2.5}) to move towards achieving levels of air quality that do not give rise to significant negative impacts on and risks to human health and the environment (acidification, eutrophication and ground-level ozone pollution).

6.2.7 Bathing Water Directive (2006/7/EC)

6.2.8 Habitats Directive (92/43/EEC)

6.2.9 Common Agricultural policy

Financially supports environmentally friendly farming

6.2.10 Biodiversity Strategy for 2030

Nutrient losses reduced by 50%.

6.2.11 Zero Pollution Action Plan

Nutrient losses (from agriculture) reduced by 50%.

25% of organic farming (Biodiversity Strategy and Farm to Fork Strategy)

6.2.12 Decision (EU) 2022/591 of the European Parliament and of the Council of 6 April 2022 on a General Union Environment Action Programme to 2030.

Marine and coastal ecosystems are being degraded and negatively impacted through harmful practices, pollution and processes such as eutrophication and acidification, impacting the biodiversity they sustain and the ecosystem services and functions they provide, as well as their capacity to act as carbon sinks. Urgent action is required to protect and restore marine and coastal ecosystems, including the ocean floor.

6.2.13 The Strategic Innovation Agenda of the European Institute of Innovation and Technology (EIT) 2021-2027: Boosting the Innovation Talent and Capacity of Europe and repealing Decision No 1312/2013/EU.

Appendix 2.2: Marine and freshwater ecosystem degradation. Innovation that can enhance, restore and recover marine, coastal and freshwater capital.

Appendix 2.3: Non-fed aquaculture is able to recycle the excess nutrients that would otherwise cause eutrophication. The reuse of wastewater prevents shortages that may be exacerbated by a changing climate.

6.2.14 Directive (EU) 2015/2193, the limitation of emissions of certain pollutants into the air from medium combustion plants.

The Union's international obligations in relation to air pollution, which are designed to abate acidification, eutrophication, ground-level ozone and emissions of particulate matter, are agreed under the Gothenburg Protocol to the Convention on Long-range Transboundary Air Pollution, which was amended in 2012 to strengthen the existing reduction commitments for sulphur dioxide, nitrogen oxides, ammonia and volatile organic compounds.

6.2.15 Directive 2009/126/EC, Stage II petrol vapour recovery during refuelling of motor vehicles at service stations.

The Geneva Protocol on the control of emissions of volatile organic compounds or their transboundary fluxes sets emission reduction targets for volatile organic compounds (VOCs) and the Gothenburg Protocol to abate acidification, eutrophication and ground-level ozone (4) sets emission ceilings for four pollutants — sulphur

dioxide, nitrogen oxides, VOCs and ammonia — and requires best available techniques to be used to keep emissions down.

7 Descriptor 6. 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.

7.1 Drivers

7.1.1 Established socio-economic developments

For D6, the identified socio-economic developments are:

- ***Population evolution:***

Europe maximum at 2025 then shrinking, Southern Europe already shrinking (Vollset et al., 2020) and EUROSTAT (https://ec.europa.eu/eurostat/databrowser/view/proj_19np/default/table?lang=en)

- ***Long term economic growth***

- ***Increasing demand for natural resources***

Expected to double by 2060

- ***Behavioural changes***

Increasing awareness, social changes in behaviour and innovation leading to a more circular economy

7.1.2 Climate change

Impacts on marine resources and their habitats: reduction in abundance, distribution and extent. Same climate scenario as for D1 will be considered.

7.1.3 Development in international cooperation

- Biodiversity Beyond National Jurisdiction

- Convention on biological diversity (CBD) (UN environment programme):

Target 11 states that by 2020, at least 10% of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes. Although there is progress, the realization of this target in 2020 is still far behind, see Marine Protected Areas (MPAs). The realization of other targets related to the marine environment (sustainable fisheries, ecosystem restoration and resilience and knowledge, science and technology) also falls short. Ecosystem protection and restoration are vital to mitigate the effects of climate change in marine biodiversity.

- Kunming-Montreal Global Biodiversity Framework (<https://www.cbd.int/article/cop15-final-text-kunming-montreal-gbf-221222>) Document CBD/COP/15/L25:

TARGET 2: Ensure that by 2030 at least 30% of areas of degraded coastal and marine ecosystems are under effective restoration, in order to enhance biodiversity and ecosystem functions and services, ecological integrity and connectivity.

TARGET 3: Ensure and enable that by 2030 at least 30% of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem functions and services, are effectively conserved and managed through ecologically representative, well-connected and equitably governed systems of protected areas and other effective area-based conservation measures.

TARGET 5: Ensure that the use, harvesting and trade of wild species is sustainable, safe and legal, preventing overexploitation, minimizing impacts on non-target species and ecosystems, applying the ecosystem approach, while respecting and protecting customary sustainable use by indigenous peoples and local communities.

TARGET 10: Ensure that areas under agriculture, aquaculture, fisheries and forestry are managed sustainably, in particular through the sustainable use of biodiversity, including through a substantial increase of the application of biodiversity friendly practices, such as sustainable intensification, agroecological and other innovative approaches contributing to the resilience and long-term efficiency and productivity of these production systems and to food security, conserving and restoring biodiversity and maintaining nature's contributions to people, including ecosystem functions and services:

- The Sustainable Development Goals (SDGs):

SDG14. By 2020, conserve at least 10 per cent of coastal and marine areas, consistent with national and international law and based on the best available scientific information

- Regional Sea conventions: OSPAR, HELCOM, Barcelona Convention and Bucharest Convention

7.2 Main policies

7.2.1 Habitat Directive (Council Directive 92/43/EEC)

Article 14: 1. Member States shall take measures to ensure that the taking in the wild of specimens of species of wild fauna and flora listed in Annex V as well as their exploitation is compatible with their being maintained at a favourable conservation status. 2. Where such measures are deemed necessary, they shall include continuation of the surveillance provided for in Article 11. Such measures may also include in particular:

- regulations regarding access to certain property,
- temporary or local prohibition of the taking of specimens in the wild and exploitation of certain populations,
- regulation of the periods and/or methods of taking specimens,
- application, when specimens are taken, of hunting and fishing rules which take account of the conservation of such populations,
- establishment of a system of licenses for taking specimens or of quotas,
- assessment of the effect of the measures adopted.

7.2.2 Biodiversity Strategy (COM/2020/380)

Article 2.1. A coherent network of protected areas: At least one third of protected areas – representing 10% of EU Seas – should be strictly protected and at least 30% of the sea should be protected in the EU.

7.2.3 Natural Restoration Law (on the way)

Not yet a regulation, but aiming at:

- Safeguard 20% of 'EU nature' by 2030 + all 'necessary ecosystems' by 2050
- In particular for C-capture and storage
 - Seagrass beds

- Sediment bottoms
- Habitats for key species (dolphins, porpoises, nursery & spawning grounds) in good conditions:
 - 30% @ 2030
 - 60% @ 2040
 - 90% @ 2050

7.2.4 Action Plan to Conserve Fisheries Resources and Protect Marine Species (on the way)

- By end of 2023, develop threshold values for the maximum allowable mortality rate from incidental catches of the species selected by Member States, as part of the implementation of the Marine Strategy Framework Directive (MSFD).
- Adopt fisheries management measures to implement these threshold values without delay through national measures or, where relevant, by submission of joint recommendations.
- Adopt national measures or submit joint recommendations to the Commission to minimise by-catch (or reduce it to the level that enables the full recovery of the populations) of:
 - by the end of 2023: harbour porpoise in the Baltic Proper and the Black Sea, the Iberian Atlantic and the common dolphin in the Bay of Biscay;
 - by the end of 2024: angel sharks, common skate, guitarfish, Maltese skate, great white shark, sand tiger shark, smalltooth sand tiger shark, spiny butterfly ray, sturgeons, marine turtles, Balearic shearwater and Mediterranean monk seal;
 - by 2030: the remaining sensitive marine species that are at risk of incidental catches, prioritising those in 'unfavourable conservation status' or threatened by extinction.-
- By 2030, based on the work by the Scientific Technical and Economic Committee for Fisheries (STECF), the GFCM and other scientific institutions, such as the International Council for the Exploration of the Seas (ICES), present and implement additional measures to boost selectivity, starting with the fish stocks with the highest expected biological gains. The measures should include:
 - new and innovative gear techniques to reduce catches of small fish;
 - location or time-specific measures where there is clear evidence of high concentrations of fish below the minimum conservation reference size.
- -Gradually phasing out bottom fishing in all MPAs (including Natura 2000) by 2030, in view of their key role in restoration of marine biodiversity and the importance of the seabed for healthy marine ecosystems and climate change mitigation.

All the dynamic-baseline policies related and/associated to other pressure descriptors (e.g., eutrophication, litter, noise) would be considered in the specific pressure descriptor and indirectly will be considered in the scenarios evaluating changes on biodiversity-related descriptors/criteria (i.e., D1, D3 and D4, D6).

8 Descriptor 7. Permanent alteration of hydrographical conditions does not adversely affect marine ecosystems.

Descriptor 7 is primarily a 'pressure' descriptor (with a minor "status" component) that focuses on permanently altered hydrographical conditions (often at a localized scale), which predominantly arise from pressures causing structural alteration of the coast or seabed: coastal activities causing topographical changes (e.g., land claim, barrages, sea defences) and coastal and offshore infrastructures (e.g., ports, wind farms, oil rigs, pipelines, heat, and brine outfalls). Hence, the pressure is the change in morphology of the seabed/coast or change in habitat (e.g., from sediment to concrete/metal) that causes hydrographical changes. These changes of the hydrographical conditions consequently will act as a pressure that is impacting the habitat or even the ecosystem. Assessment for this descriptor should consider the cumulative 'impact' of all these 'localized activities' that act as pressures, linking them also to the associated physical loss and damage. In this sense the total pressure from D7 needs to be considered with other impacts in the assessments of each seabed and water column habitat under D1 and D6, and to a lesser extent also with impacts on D4.

8.1 Drivers

8.1.1 Established socio-economic developments

For D7, the identified socio-economic developments are:

— Population evolution:

Europe maximum at 2025 then shrinking, Southern Europe already shrinking (Vollset et al., 2020) and EUROSTAT (https://ec.europa.eu/eurostat/databrowser/view/proj_19np/default/table?lang=en)

— Energy

Long-term economic growth still requiring more energy, different scenarios for Europe forecast an increase between 5-10% until 2030 (<https://www.iea.org/reports/world-energy-outlook-2020>, EEA and EUROSTAT), with an increasing share of this generated by marine related renewables (wind, waves, tides).

The EU strategy for offshore renewable energy sets targets for an installed capacity of at least 60 GW of offshore wind and 1 GW of ocean energy by 2030, and 300 GW and 40 GW, respectively, by 2050. The actual situation and forecasts fall short of these numbers (e.g., installation of only 25GW offshore wind power until 2027, windeurope.org), actually only about 50% of the annual installations needed for meeting the targets are built.

— Natural resources

The demand for natural resources and raw materials is increasing and for many expected to double by 2060.

This especially concerns sand extraction/mining (which globally has tripled the last 2 decades reaching now 50 billion tonnes a year). Annually, approx. 40 million m³ of marine sand and gravel are extracted, alone, from the North European inner (<60m water depth) continental shelf (www.sandandgravel.com/extraction). The short-term forecast is that the extraction will increase significantly.

— Increasing maritime transport, shipping, and tourism

As demand for global freight increases, maritime trade volumes are set to triple by 2050 (OECD).

Each year, more than 400 million passengers embark and disembark at European ports.

8.1.2 Climate change

Same climate scenario as for D1 will be considered.

8.1.3 Development in international cooperation

To achieve GES the MSFD requires Member States to develop marine/maritime strategies that serve as an Action Plan applying the Ecosystem Approach and using existing regional cooperation structures (OSPAR, HELCOM, Barcelona Convention).

The OSPAR Commission published in 2012 an advice document on MSFD descriptor 7 in which it considered approaches for target setting (MSFD Advice document on Good environmental status - Descriptor 7: Hydrographical conditions. A living document - Version 17 January 2012 (OSPAR publication 583/2012).) However, in 2015 OSPAR changed their approach to the following statement “Under the condition that effects of the permanent changes of hydrographical conditions are restricted to the coastal waters, it was recommended that Descriptor 7 does not need further work in OSPAR”.

No other work specifically addressing D7 is known.

8.2 Main policies

8.2.1 Integrated Maritime Policy (2014/89/EC)

The Maritime Spatial Planning (Directive 2014/89/EU) Art 5: that states “Through their maritime spatial plans, Member States shall aim to contribute to the sustainable development of energy sectors at sea, of maritime transport, and of the fisheries and aquaculture sectors, and to the preservation, protection and improvement of the environment, including resilience to climate change impacts”.

8.2.2 Water Framework Directive (2000/60/EC)

Hydromorphological pressures (e.g., abstractions, damming, etc.) and their impacts on the type-specific hydromorphological conditions and the biological quality elements need to be evaluated. Hydromorphological functions and features (e.g., energy, channel morphology, sediments, tides) are key factors that need to be considered for determining Good Ecological Status in coastal and transitional waters

9 Descriptor 8. Concentrations of contaminants are at levels not giving rise to pollution effects.

9.1 Drivers

9.1.1 Established socio-economic developments

For D8, the identified socio-economic developments are:

- ***Population evolution:***

Europe maximum at 2025 then shrinking, Southern Europe already shrinking (Vollset et al., 2020) and EUROSTAT (https://ec.europa.eu/eurostat/databrowser/view/proj_19np/default/table?lang=en)

- ***Long term economic growth***

- ***Increasing demand for natural resources***

Expected to double by 2060

- ***Behavioural changes***

Increasing awareness, social changes in behaviour and innovation leading to a more circular economy

9.1.2 Climate change

The mean ocean circulation pattern, stratification, mean temperature are changing, affecting the distribution and fate of contaminants in the ocean.

Concentration and distribution of phytoplankton, zooplankton, bacteria and detritus are changing, affecting the fate of hydrophobic contaminants in the ocean.

Extreme weather conditions, drought, floods and other disasters affect the import of contaminants from land and air.

Same climate scenario as for D1 will be considered.

9.1.3 Development in international cooperation

- Agenda 2030 and the global sustainability goals (UN, 2015)

One of the targets in Agenda 2030 is to achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with the agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimise their adverse impacts on human health and the environment. This target is also related to the global chemicals strategy (SAICM).

SDG14: By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution.

- The global chemicals strategy – SAICM (Strategic Approach to International Chemicals Management)

— Globally harmonized system of classification and labelling of chemicals (GHS)

The United Nations decided in 2002 to adopt a globally harmonised system of classification and labelling of chemicals (GHS). The system aims at ensuring availability of information on the dangerous properties of chemicals to enhance the protection of human health and the environment during the handling, transport and use of chemicals. The part of GHS concerning safety data sheets have been implemented in the Reach Regulation (Regulation (EU) No 1907/2006 concerns the registration, evaluation, authorisation and restriction of chemical substances).

— Stockholm Convention on Persistent Organic Pollutants (POPs)

The objective of the Stockholm Convention is a global phase out of substances that are persistent in the environment, are being absorbed by plants and animals, and have negative effects on human health or the environment. The Stockholm Convention contains a list of persistent organic pollutants (POPs) that are banned or restricted.

— POPs Regulation

The EU POPs Regulation is implementing the Stockholm Convention by banning or restricting the use of the POPs substances in both chemical products and articles within the EU. The POPs Regulation is also implementing the POPs Protocol to the Convention on Long-range Transboundary Air Pollution (CLRTAP).

— Rotterdam Convention - Prior Informed Consent (PIC)

The Rotterdam Convention makes it possible for countries to in advance receive information about import and export of certain dangerous chemicals and pesticides that are banned or severely restricted in other countries. The countries can then choose to approve or reject the import in accordance with their national rules.

— Minamata Convention on mercury

The Minamata Convention on mercury regulates mercury in a life cycle perspective, from primary mining to final disposal. It is banning or restricting mercury in different products and industrial processes as of 2020 and 2025. The convention entered into force in 2017. The Mercury Regulation implements the parts of the Minamata Convention previously lacking common regulations within the EU. Regulation (EU) 2017/852 of the European Parliament and of the Council of 17 May 2017 on mercury, and repealing Regulation (EC) No 1102/2008

- Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal
- Convention on the Ban on the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa (Bamako Convention)
- Convention on Long-Range Transboundary Air Pollution (LRTAP Convention)
- Convention on the Prevention of Dumping of Wastes and Other Matter (London Convention)
- International Convention on Oil Pollution Preparedness, Response and Co-Operation (OPRC Convention)
- Montreal Protocol on Substances that Deplete the Ozone Layer
- Kunming-Montreal Global Biodiversity Framework (<https://www.cbd.int/article/cop15-final-text-kunming-montreal-gbf-221222>) Document CBD/COP/15/L25:

TARGET 7: Reduce pollution risks and the negative impact of pollution from all sources, by 2030, to levels that are not harmful to biodiversity and ecosystem functions and services, considering cumulative effects, including: reducing excess nutrients lost to the environment by at least half including through more efficient nutrient cycling and use; reducing the overall risk from pesticides and highly hazardous chemicals by at least half including through integrated pest management, based on science, taking into account food security and livelihoods; and also preventing, reducing, and working towards eliminating plastic pollution”.

9.2 Main policies

9.2.1 Directive 2008/105/EC setting environmental quality standards in the field of water policies)

It sets out environmental quality standards (EQSs) for the presence in surface water of certain substances or groups of substances identified as priority pollutants because of the significant risk, they pose to or via the aquatic environment. These standards are in line with the strategy and objectives of the European Union (EU)'s water framework directive (Directive 2000/60/EC). It repeals Directives 82/176/EEC, 83/513/EEC, 84/156/EEC, 84/491/EEC and 86/280/EEC with effect from 22 December 2012.

The EQSs in Directive 2008/105/EC are limits on the concentration of the priority substances and eight other pollutants in water (or biota), i.e. thresholds which must not be exceeded if a good chemical status is to be met. There are two types of water standard.

- A threshold for the average concentration of the substance concerned calculated from measurements over a 1-year period. The purpose of this standard is to ensure protection against long-term exposure to pollutants in the aquatic environment.
- A maximum allowable concentration of the substance concerned, i.e. the maximum for any single measurement. The purpose of this standard is to ensure protection against short-term exposure, i.e. pollution peaks.

The EQSs are different for:

- inland surface waters (rivers and lakes);
- other surface waters (transitional, coastal and territorial waters).

9.2.2 Water Framework Directive 2000/60/EC (WFD)

The provisions outlined in the WFD are pivotal. It covers surface water pollutants in two ways. First, identifying and regulating those of greatest concern across the EU (the priority substances listed in Annex X to the Directive). Second, by requiring Member States to identify substances of national or local concern (river basin specific pollutants included by Member States in their River Basin Management Plans).

A Watch List mechanism was established to improve the available information on identifying the substances of greatest concern. Member States have to monitor the substances on the list at least once per year for up to four years. The watch list was established in 2015, updated in 2018 and 2020 and again in 2022.

December 2019, a Fitness Check concluded that water legislation is broadly fit for purpose, with room for improvement related to investments, implementation, integrating water into other policies, chemical pollution, administrative simplification and digitalization.

Based on the findings, progress towards good status can be expected to be slow but steady.

The slow rate of progress can be attributed to the long-time lags for nature to respond to measures. It is also more difficult to make progress visible due to the 'one-out-all-out' principle underpinning comprehensive protection of water bodies and ecosystems, under which good status is not granted if any of the relevant parameters are less than good.

As for future challenges, this fitness check finds that the Water Framework Directive is sufficiently prescriptive with regard to the pressures to be addressed, and yet flexible enough to accommodate emerging challenges such as climate change, water scarcity and pollutants of emerging concern (e.g. micro-plastics and pharmaceuticals).

A key area where there is room to improve and to achieve better results is on chemicals.

In 2022 the Commission adopted a proposal to revise the list of priority substances in surface water. 24 substances are proposed for addition as well as a standard for total pesticides. The proposed substances pose well-documented risks to nature and human health. They include PFAS – a large group of “forever chemicals” used in cookware, clothing and furniture, fire-fighting foams and personal care products; a range of pesticides; bisphenol A, a plasticiser and a component of plastic packaging; and a number of pharmaceuticals used as painkillers, anti-convulsants or antibiotics.

The Commission has also proposed to update quality standards for a range of substances already on the list, mainly to make standards stricter because of evidence indicating a higher risk than originally identified. Among the substances with stricter standards are some metals and industrial chemicals. Four other existing priority substances are proposed for removal from the list, and another for integration into the new PFAS group, and eight already-regulated “other pollutants” have been re-designated as priority substances, resulting in a total of 73.

In the EU only 40% of surface waters are in good status

There is growing concern that the objective of good status, or higher, in all EU waters by 2027 is a long way from being achieved in many countries.

Links between WFD and MSFD:

While keeping the link between the WFD and the MSFD is crucial, this is a separate process and with different objectives. There is a need to identify which WFD PS are important for MSFD monitoring beyond territorial waters. Key properties that control the substance’s transport and fate behaviour and that should be considered when evaluating the relevance of PS for the marine environment, and thus for MSFD monitoring, include:

- Solubility in water
- Long-range-transport potential
- Volatilization
- Hydrophobicity
- Persistence
- Bioaccumulation potential
- Toxicity

9.2.3 The Urban Waste Water Treatment Directive (UWWT) (Council Directive 91/271/EEC)

In the EU:

- Over 90% of urban wastewater is dealt with in line with EU standards
- 92% of toxic pollutants in wastewater come from the pharmaceutical and cosmetics sectors
- 10 million Europeans still lack access to basic sanitation services

Indicators to assess discharges of pollutants to European surface waters are:

- the percentage of the national population connected to wastewater treatment facilities;
- the percentage of the national population connected to tertiary wastewater treatment facilities.

In 2017, most European countries collected and treated sewage to tertiary level from most of their population. In EU-27 countries (EEA 2020), 69 % of the population were connected to tertiary level treatment and 13 % to secondary level treatment.

Countries where less than 80 % of the population were connected to public urban wastewater treatment systems were Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Ireland, Italy, Lithuania, Poland, Romania, Serbia, Slovakia and Slovenia.

9.2.4 Zero Pollution Action Plan COM(2021)

Among the main targets for 2030, the ZPAP lists the following:

- Reduce the use and risk of chemical pesticides by 50 %
- Reduce the use of the more hazardous chemical pesticides by 50 %
- Reduce the sale of antimicrobials for farmed animals and in aquaculture by 50 %

9.2.5 Regulation (EU) 2019/1021 implements the EU's international commitments under the Stockholm Convention on persistent organic pollutants (chemical substances).

The manufacture, placing on the market, and use of substances listed in Annex I either on their own, in mixtures, or in articles is prohibited (e.g. Perfluorooctane sulfonic acid and its derivatives (PFOS))

The manufacturing, placing on the market, and use of substances listed in Annex II either on their own, in mixtures, or in articles is restricted. The conditions of restrictions for each listed substance are detailed in the Annex.

9.2.6 REACH Regulation

Following a new restriction under the REACH Regulation, adopted on 10 October 2018, 33 chemicals that are Carcinogenic, Mutagenic or Toxic for reproduction (CMR) can no longer be used in everyday clothing, textiles and footwear above a certain concentration limit. The restriction was became applicable within 24 months.

9.2.7 Chemicals strategy for sustainability (published on 14 October 2020)

It is part of the EU's zero pollution ambition, which is a key commitment of the European Green Deal:

- banning the most harmful chemicals in consumer products - allowing their use only where essential
- account for the cocktail effect of chemicals when assessing risks from chemicals
- phasing out the use of per- and polyfluoroalkyl substances (PFAS) in the EU, unless their use is essential
- boosting the investment and innovative capacity for production and use of chemicals that are safe and sustainable by design, and throughout their life cycle
- promoting the EU's resilience of supply and sustainability of critical chemicals
- establishing a simpler "one substance one assessment" process for the risk and hazard assessment of chemicals
- playing a leading role globally by championing and promoting high standards and not exporting chemicals banned in the EU

9.2.8 Industrial Emission Directive (IED) (revised in 2022)

Installations regulated by the IED account for about 20% of the EU's overall pollutant emissions by mass into the air, around 20% of pollutant emissions into water and approximately 40% of greenhouse gas (GHG) emissions.

Room for improvement: currently, 80% of industrial plant permits set the least ambitious levels of pollutants that are legally allowed.

All the dynamic-baseline policies related and/associated to eutrophication descriptor would be considered in the specific pressure descriptor and indirectly will be considered in the scenarios evaluating changes on contaminant-related descriptors/criteria.

10 Descriptor 9. Contaminants in fish and other seafood for human consumption do not exceed levels established by Community legislation or other relevant standards.

10.1 Drivers

10.1.1 Established socio-economic developments

For D9, the identified socio-economic developments are:

- ***Population evolution:***

Europe maximum at 2025 then shrinking, Southern Europe already shrinking (Vollset et al., 2020) and EUROSTAT (https://ec.europa.eu/eurostat/databrowser/view/proj_19np/default/table?lang=en)

- ***Long term economic growth***

- ***Increasing demand for natural resources***

Expected to double by 2060

- ***Behavioural changes***

Increasing awareness, social changes in behaviour and innovation leading to a more circular economy

10.1.2 Climate change

The mean ocean circulation pattern, stratification, mean temperature are changing, affecting the distribution and fate of contaminants in the ocean.

Concentration and distribution of phytoplankton, zooplankton, bacteria and detritus are changing, affecting the fate of hydrophobic contaminants in the ocean.

Extreme weather conditions, drought, floods and other disasters affect the import of contaminants from land and air.

Same climate scenario as for D1 will be considered.

10.1.3 Development in international cooperation

- Agenda 2030 and the global sustainability goals (UN, 2015)

One of the targets in Agenda 2030 is to achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with the agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimise their adverse impacts on human health and the environment. This target is also related to the global chemicals strategy (SAICM).

SDG14: By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution.

- The global chemicals strategy – SAICM (Strategic Approach to International Chemicals Management)
- Globally harmonized system of classification and labelling of chemicals (GHS)

The United Nations decided in 2002 to adopt a globally harmonised system of classification and labelling of chemicals (GHS). The system aims at ensuring availability of information on the dangerous properties of chemicals to enhance the protection of human health and the environment during the handling, transport and use of chemicals. The part of GHS concerning safety data sheets have been implemented in the Reach Regulation (Regulation (EU) No 1907/2006 concerns the registration, evaluation, authorisation and restriction of chemical substances).

- Stockholm Convention on Persistent Organic Pollutants (POPs)

The objective of the Stockholm Convention is a global phase out of substances that are persistent in the environment, are being absorbed by plants and animals, and have negative effects on human health or the environment. The Stockholm Convention contains a list of persistent organic pollutants (POPs) that are banned or restricted.

- POPs Regulation

The EU POPs Regulation is implementing the Stockholm Convention by banning or restricting the use of the POPs substances in both chemical products and articles within the EU. The POPs Regulation is also implementing the POPs Protocol to the Convention on Long-range Transboundary Air Pollution (CLRTAP).

- Rotterdam Convention - Prior Informed Consent (PIC)

The Rotterdam Convention makes it possible for countries to in advance receive information about import and export of certain dangerous chemicals and pesticides that are banned or severely restricted in other countries. The countries can then choose to approve or reject the import in accordance with their national rules.

- Minamata Convention on mercury

The Minamata Convention on mercury regulates mercury in a life cycle perspective, from primary mining to final disposal. It is banning or restricting mercury in different products and industrial processes as of 2020 and 2025. The convention entered into force in 2017. The Mercury Regulation implements the parts of the Minamata Convention previously lacking common regulations within the EU. Regulation (EU) 2017/852 of the European Parliament and of the Council of 17 May 2017 on mercury, and repealing Regulation (EC) No 1102/2008

- Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal
- Convention on the Ban on the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa (Bamako Convention)
- Convention on Long-Range Transboundary Air Pollution (LRTAP Convention)
- Convention on the Prevention of Dumping of Wastes and Other Matter (London Convention)
- International Convention on Oil Pollution Preparedness, Response and Co-Operation (OPRC Convention)
- Montreal Protocol on Substances that Deplete the Ozone Layer
- Kunming-Montreal Global Biodiversity Framework (<https://www.cbd.int/article/cop15-final-text-kunming-montreal-gbf-221222>) Document CBD/COP/15/L25:

TARGET 7: Reduce pollution risks and the negative impact of pollution from all sources, by 2030, to levels that are not harmful to biodiversity and ecosystem functions and services, considering cumulative effects, including: reducing excess nutrients lost to the environment by at least half including through more efficient nutrient cycling and use; reducing the overall risk from pesticides and highly hazardous chemicals by at least half including through integrated pest management, based on science, taking into account food security and livelihoods; and also preventing, reducing, and working towards eliminating plastic pollution”.

10.2 Main policies

10.2.1 Council Regulation 315/93/EEC

It sets out the basic principles of EU legislation on contaminants in food.

Food containing a contaminant to an amount unacceptable from the public health viewpoint and in particular at a toxicological level, shall not be placed on the market;

Contaminant levels shall be kept as low as can reasonably be achieved following recommended good working practices;

Maximum levels must be set for certain contaminants in order to protect public health;

10.2.2 Commission Regulation (EC) No 1881/2006

Maximum levels in certain foods are set for the following contaminants:

- nitrate
- mycotoxins (aflatoxins, ochratoxin A, patulin, deoxynivalenol, zearalenone, fumonisins and citrinine)
- metals (lead, cadmium, mercury, inorganic tin, arsenic)
- 3-MCPD
- dioxins
- dioxin-like PCBs
- non dioxin-like PCBs
- Polycyclic Aromatic Hydrocarbons (PAH) (benzo(a)pyrene) and sum of 4 PAHs)
- melamine and
- erucic acid.

10.2.3 Farm to Fork Strategy COM(2020)

A sustainable food system that ensures sufficient and varied supply of safe, nutritious, affordable and sustainable food to people at all times

10.2.4 Zero Pollution Action Plan COM(2021)

Reduction of pesticides in water, soil and air and the “Mission in the area of Soil Health and Food”

11 Descriptor 10. Properties and quantities of marine litter do not cause harm to the coastal and marine environment.

11.1 Drivers

11.1.1 Established socio-economic developments

At a global scale, from 2016 to 2040, the annual rate of macro and microplastic entering aquatic systems from land is projected to (linearly) increase 2.6-fold (Lau et al, 2020). Causes of this increase include: 1) continued population growth; 2) rising per capita plastic use; 3) shifts to low-value/non-recyclable materials; and 4) the growing share of plastic consumption occurring in countries with low rates of collection (Lau et al., 2020; also: <https://www.pewtrusts.org/en/research-and-analysis/articles/2020/07/23/breaking-the-plastic-wave-top-findings>)

For D10, the identified socio-economic developments are:

— ***Population evolution:***

Europe maximum at 2025 then shrinking, Southern Europe already shrinking (Vollset et al., 2020) and EUROSTAT (https://ec.europa.eu/eurostat/databrowser/view/proj_19np/default/table?lang=en)

— ***Long term economic growth***

— ***Behavioural changes***

Increasing awareness, social changes in behaviour and innovation leading to a more circular economy reducing plastic consumption (e.g. reduction or potential elimination of single-use plastics (SUP)) could lead to a reduction up to 60% of plastic leakage into the marine environment.

11.1.2 Climate change

Extreme weather (strong wind, heavy rain, typhoon, floods) associated with climate change is expected to exacerbate the spread of plastic in the natural environment (Ford et al., 2022). Same climate scenario as for D1 will be considered.

11.1.3 Development in international cooperation

— UNEP/MAP - Regional Plan on Marine Litter Management in the Mediterranean (RPML)

— OSPAR Regional Action Plan:

RAP ML 2: contributes to delivering the marine litter objectives of the North-East Atlantic Environment Strategy 2030 (Actions to reduce Land and sea-based litter leakages)

— HELCOM marine litter action plan

— Black Sea

— Litter Regional Action Plan

- International Maritime Organization (IMO) action plan (meant to address marine plastic litter from ships) – MARPOL V
- The Sustainable Development Goal 14: By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution
- UNEA-5 “Strengthening Actions for Nature to Achieve the Sustainable Development Goals” – launched the Global Plastic Pollution Treaty
- Global Partnership on Marine Litter (GPML)
- UN Oceans and the Law of the Sea (e.g. A/74/19)
- Basel Convention: on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal
- Arctic strategic plan (AMSP)
- Antarctic Treaty
- Kunming-Montreal Global Biodiversity Framework (<https://www.cbd.int/article/cop15-final-text-kunming-montreal-gbf-221222>) Document CBD/COP/15/L25:

TARGET 7: Reduce pollution risks and the negative impact of pollution from all sources, by 2030, to levels that are not harmful to biodiversity and ecosystem functions and services, considering cumulative effects, including: reducing excess nutrients lost to the environment by at least half including through more efficient nutrient cycling and use; reducing the overall risk from pesticides and highly hazardous chemicals by at least half including through integrated pest management, based on science, taking into account food security and livelihoods; and also preventing, reducing, and working towards eliminating plastic pollution”.

11.2 Main policies

11.2.1 Regulation (EU) 2021/1139 of the European Parliament and of the Council of 7 July 2021 establishing the European Maritime, Fisheries and Aquaculture Fund and amending Regulation (EU) 2017/1004

Article 8: the contribution of the programme to the reduction of marine litter, in accordance with Directive (EU) 2019/904 of the European Parliament and of the Council (29). It sets out the basic principles of EU legislation on contaminants in food.

11.2.2 Regulation (EU) 2021/783 of the European Parliament and of the Council of 29 April 2021 establishing a Programme for the Environment and Climate Action (LIFE), and repealing Regulation (EU) No 1293/2013

The LIFE Programme should support the following: (...) the promotion of clean and healthy seas; the implementation of the communication of the Commission of 16 January 2018 on a European Strategy for Plastics in a Circular Economy, addressing in particular the problem of lost fishing gear and marine litter”.

11.2.3 Directive (EU) 2019/904 of the European Parliament and of the Council of 5 June 2019 on the reduction of the impact of certain plastic products on the environment (SUP directive)

Marine litter is transboundary in nature and is recognised as a growing global problem. Reducing marine litter is a key action for the achievement of UN Sustainable Development Goal 14 which calls to conserve and sustainably use the oceans, seas and marine resources for sustainable development. The Union must play its part in preventing and tackling marine litter and aim to be a standard setter for the world. In that context, the Union is working with partners in many international fora such as G20, G7 and the UN to promote concerted action and this Directive is part of the Union’s efforts in that regard. In order for those efforts to be effective, it is also important that exports of plastic waste from the Union do not result in increased marine litter elsewhere.

The goal of the Single-Use Plastics (SUP) Directive is to prevent and reduce the impact on the environment of certain plastic products and to promote a transition to a circular economy. In particular, the Directive aims to tackle marine littering and plastic waste through a harmonised legislative framework across the EU

The directive sets a collection target of 90% recycling for SUP plastic bottles by 2029 (with an interim target of 77% by 2025)

11.2.4 Directive (EU) 2019/883 of the European Parliament and of the Council of 17 April 2019 on port reception facilities for the delivery of waste from ships, amending Directive 2010/65/EU and repealing Directive 2000/59/EC

Article 1: This Directive aims to protect the marine environment against the negative effects from discharges of waste from ships using ports located in the Union, while ensuring the smooth operation of maritime traffic, by improving the availability and use of adequate port reception facilities and the delivery of waste to those facilities.

11.2.5 Directive (EU) 2018/851 of the European Parliament and of the Council of 30 May 2018 amending Directive 2008/98/EC on waste

Article 9: (...) (k) identify products that are the main sources of littering, notably in natural and marine environments, and take appropriate measures to prevent and reduce litter from such products (...) (l) aim to halt the generation of marine litter as a contribution towards the United Nations Sustainable Development Goal to prevent and significantly reduce marine pollution of all kinds.

11.2.6 Zero Pollution Action Plan

Under EU law, Green Deal ambitions and in synergy with other initiatives, by 2030 the EU should reduce: (...) by 50% plastic litter at sea and by 30% microplastics released into the environment;

11.2.7 A European Strategy for Plastics in a Circular Economy

To reduce discharges of waste by ships, the Commission is presenting together with this strategy a legislative proposal on port reception facilities. This presents measures to ensure that waste generated on ships or gathered at sea is delivered on land and adequately managed. Building on this, the Commission will also develop targeted measures for reducing the loss or abandonment of fishing gear at sea (...) The Commission will also further study the contribution of aquaculture to marine litter and examine a range of measures to minimise plastic loss from aquaculture. Finally, it will continue its work to improve understanding and measurement of marine litter, an essential but often neglected way to support effective prevention and recovery measures

Initiatives for microplastics (under REACH for intentional and under Circular Economy for unintentional microplastics)

12 Descriptor 11. Introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment.

12.1 Drivers

12.1.1 Established socio-economic developments

For D10, the identified socio-economic developments are:

- ***Population evolution:***

Europe maximum at 2025 then shrinking, Southern Europe already shrinking (Vollset et al., 2020) and EUROSTAT (https://ec.europa.eu/eurostat/databrowser/view/proj_19np/default/table?lang=en)

- ***Long term economic growth***

- ***Behavioural changes***

Increasing awareness, social changes in behaviour and innovation leading to a more circular economy reducing plastic consumption (e.g. preferring paper) could lead to a reduction up to one-sixth of plastic leakage into the marine environment.

12.1.2 Climate change

The reduction of shipping/traffic has a direct impact on the reduction of CO₂ emissions/ocean warming/acidification with consequences on species distribution and in few instances also abundances. Same climate scenario as for D1 will be considered.

12.1.3 Development in international cooperation

- International Maritime organization conventions (IMO)

In 2014, IMO's Marine Environment Protection Committee (MEPC) approved a series of guidelines focusing mainly on propellers, hull form, on-board machinery, and various operational and maintenance recommendations such as hull cleaning but also on speed reductions or routing decisions to avoid sensitive marine areas including well-known habitats or migratory pathways when in transit will help to reduce adverse impacts on marine life. Following instruction from the MEPC in 2021, the IMO Sub-Committee on Ship Design and Construction (SDC) in January 2023 agreed the revised guidelines, for submission to the Marine Environment Protection Committee (MEPC 80) in July 2023.

- Regional Sea conventions: OSPAR, HELCOM, Barcelona Convention and Bucharest Convention

12.2 Main policies

12.2.1 Zero Pollution Action Plan COM(2021)

No more than 20% of a given marine area, can be exposed to continuous underwater noise over a year. Similarly, no more than 20% of a marine habitat can be exposed to impulsive noise over a given day, and no more than 10% over a year. These underwater noise pollution limits deliver on the Zero Pollution Action Plan and are the first of this kind at global level.

12.2.2 Guidelines by the IMO (International Maritime Organization) MEPC.1/Circ.833. 7 April 2014

No associated targets

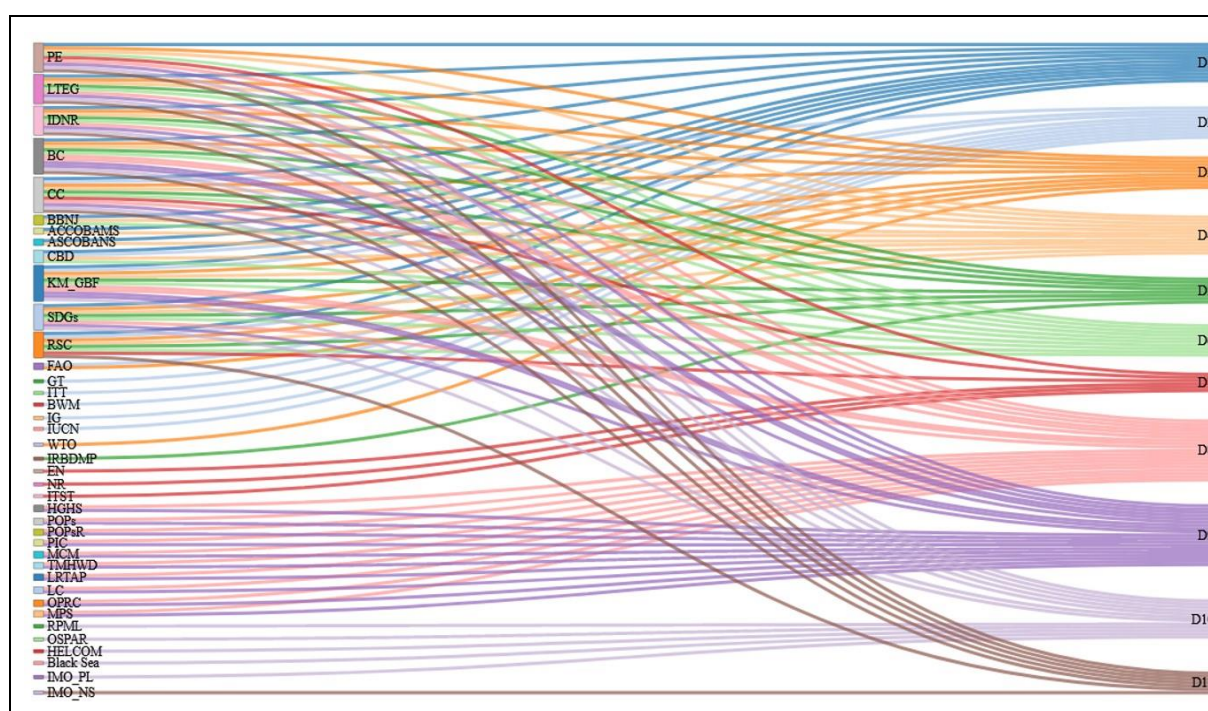
All the dynamic-baseline policies related and/associated to other pressure descriptors (e.g., eutrophication, litter, noise) would be considered in the specific descriptors and indirectly they will have an impact and evaluated in the other descriptors (mainly biodiversity descriptors).

Conclusions

This technical report compiles the main drivers and policies that will influence the 11 descriptors of the Marine Strategy Framework Directive in the next few decades. This mapping exercise is a pre-requisite for the definition of the 'dynamic baseline' needed for the impact assessment of the MSFD as it allows to clearly identify the elements to consider in a future where the MSFD is not revised.

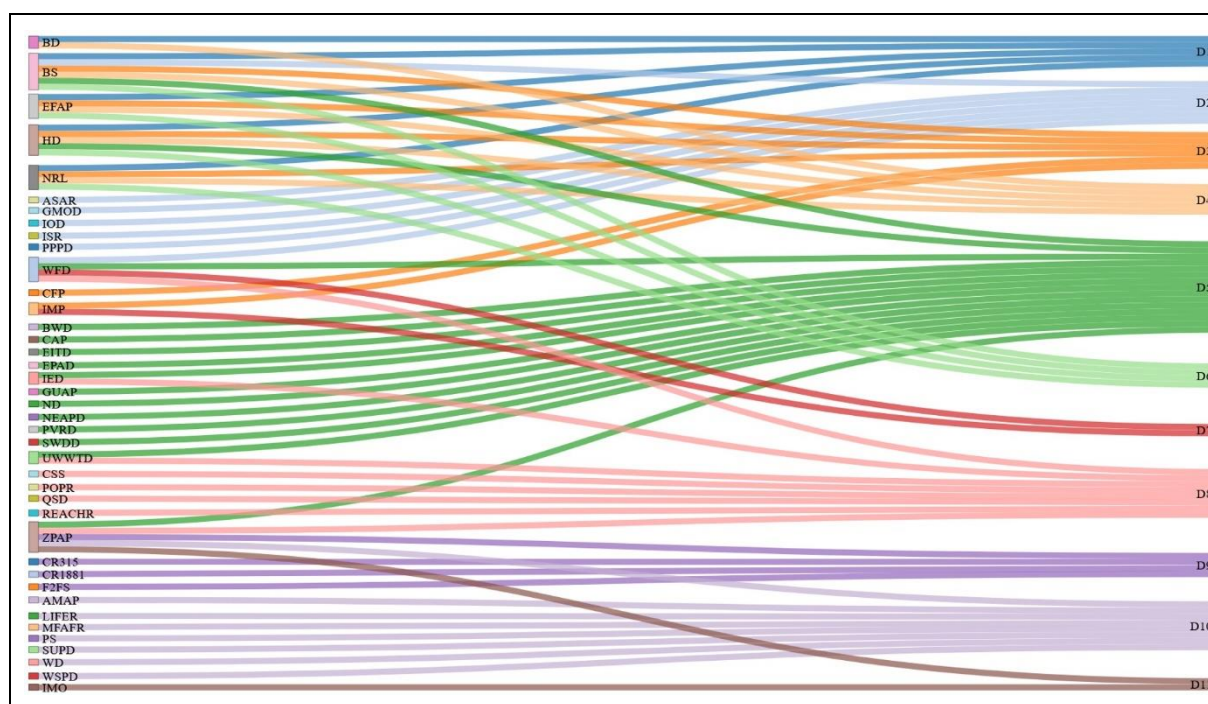
Drivers concerns socio-economic, climatic and international developments that will change the intensity of anthropogenic pressure onto marine ecosystems. The cross-map of the relationships between drivers and descriptors is shown in Fig. 1 and clearly show how some drivers (e.g., climate change, population evolution or behavioural changes) affect almost all MSFD descriptors, marking them as priority elements to consider in the building of the dynamic baseline scenario.

Figure 1. Drivers and MSFD descriptors. The lines connect the policies with the descriptors they influence. The meaning of the acronyms are indicated in the appropriated section further down



The number of EU policies that can influence the status and pressure of marine ecosystems is very large (over 38) and the level of complexity and inter-relationship with the MSFD descriptors is high (Fig. 2). Not all the policies are equally important for the evolution of marine ecosystems status and not all of them can be properly assessed with the Blue2 Modelling Framework. For the building of the scenario, only provisions related with pressure reduction in a quantitative manner will be taken into account (due to the nature of the used models in the Blue2MF).

Figure 2. EU policies and MSFD descriptors. The lines connect the policies with the descriptors they influence. The meaning of the acronyms are indicated in the appropriated section further down



This mapping exercise should provide a wide overview of the complex and multiple interplays between current drivers and planned policies at EU level with the likely evolution of ecosystem indicators for EU marine basins. It should represent the main source of information for the building of the scenarios for the descriptors covered by the Blue2MF feeding into the Impact Assessment of the MSFD expected in the coming years.

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List of abbreviations and definitions

Drivers:

PE	Population evolution
LTEG	Long term economic growth
IDNR	Increasing demand for natural resources
BC	Behavioural changes
CC	Climate change
BBNJ	Biodiversity Beyond National Jurisdiction
ACCOBAMS	Agreement on the conservation of cetaceans of the Black Sea and Mediterranean Sea and contiguous Atlantic area (ACCOBAMS)
ASCOBANS	Agreement on the Conservation of Small Cetaceans of the Baltic, North East Atlantic, Irish and North Seas (ASCOBANS)
CBD	Convention on biological diversity (CBD)
KM_GBF	Kunming-Montreal Global Biodiversity Framework
SDGs	The Sustainable Development Goals (SDGs)
RSC	Regional Sea Conventions
IG	Increasing globalization
GT	Global trade is increasing
ITT	Transport and tourism are increasing
BWM	International Convention on the Control and Management of Ships' Ballast Water and Sediments (BWM Convention)
IUCN	International Union for Conservation of Nature's Red List of Threatened Species:
FAO	Food and Agriculture Organization of the United Nation
WTO	WTO agreement on fisheries subsidies
IRBDMP	International River Basin Districts Management Plans
EN	Energy
NR	Natural Resources
ITST	Increasing maritime transport, shipping, and tourism
SAICM	The global chemicals strategy – SAICM (Strategic Approach to International Chemicals Management)
GHS	Globally harmonized system of classification and labelling of chemicals (GHS)
POPs	Stockholm Convention on Persistent Organic Pollutants (POPs)
POPsR	POPs Regulation
PIC	Rotterdam Convention - Prior Informed Consent (PIC)
MCM	Minamata Convention on mercury
TMHWD	Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal
BC	Convention on the Ban on the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa (Bamako Convention)
LRTAP	Convention on Long-Range Transboundary Air Pollution (LRTAP Convention)
LC	Convention on the Prevention of Dumping of Wastes and Other Matter (London Convention)
OPRC	International Convention on Oil Pollution Preparedness, Response and Co-Operation (OPRC Convention)
MPS	Montreal Protocol on Substances that Deplete the Ozone Layer
RPML	Regional Plan on Marine Litter Management in the Mediterranean (RPML)
OSPAR	OSPAR Regional Action Plan:
HELCOM	HELCOM marine litter action plan
BLACKSEA	Black Sea Marine Litter Regional Action Plan
IMO_PL	International Maritime Organization (IMO) action plan (meant to address marine plastic litter from ships).
IMO_NS	International Maritime organization conventions (IMO)

Policies:

HD	Habitat Directive
BD	Bird Directive
BS	Biodiversity Strategy
NRL	Nature Restoration Law
EFAP	Action plan: Protecting and restoring marine ecosystems for sustainable and resilient fisheries
ISR	Regulation (EU) No 1143/2014 of the European Parliament and of the Council of 22 October 2014 on the prevention and management of the introduction and spread of invasive alien species)
ASAR	Council regulation (EC) No 708/2007 of 11 June 2007 concerning use of alien and locally absent species in aquaculture
IOD	Council Directive 2000/29/EC of 8 May 2000 on protective measures against the introduction into the Community of organisms harmful to plants or plant products and against their spread within the Community
GMOD	Directive 2001/18/EC of the European Parliament and of the Council of 12 March 2001 on the deliberate release into the environment of genetically modified organisms and repealing Council Directive 90/220/EEC
PPPD	Regulation (EC) No 1107/2009 of the European Parliament and of the Council of 21 October 2009 concerning the placing of plant protection products on the market and repealing Council Directives 79/117/EEC and 91/414/EEC
WFD	Water Framework Directive
CFP	Common Fisheries Policy
IMP	Integrated Maritime Policy
ND	Nitrates Directive
UWWTD	Urban Waste Water Treatment Directive
SWDD	Surface Water for Drinking Directive
IED	Industrial Emissions Directive
NEAPD	National Emission of Certain Atmospheric Pollutants Directive
BWD	Bathing Water Directive
CAP	Common Agricultural policy
ZPAP	Zero Pollution Action Plan
GUAP	Decision (EU) 2022/591 of the European Parliament and of the Council of 6 April 2022 on a General Union Environment Action Programme to 2030
EPAD	Directive (EU) 2015/2193, the limitation of emissions of certain pollutants into the air from medium combustion plants
EITD	The Strategic Innovation Agenda of the European Institute of Innovation and Technology (EIT) 2021-2027: Boosting the Innovation Talent and Capacity of Europe and repealing Decision No 1312/2013/EU
PVRD	Directive 2009/126/EC, Stage II petrol vapour recovery during refuelling of motor vehicles at service stations.
QSD	Directive 2008/105/EC setting environmental quality standards in the field of water policies
POPR	Regulation (EU) 2019/1021 implements the EU's international commitments under the Stockholm Convention on persistent organic pollutants (chemical substances)
REACHR	REACH Regulation
CSS	Chemicals strategy for sustainability
CR315	Council Regulation 315/93/EEC on Community procedures for contaminants in food
CR1881	Commission Regulation No 1881/2006 on setting maximum levels for certain contaminants in foodstuffs
F2FS	Farm to Fork Strategy

MFAFR	Regulation (EU) 2021/1139 of the European Parliament and of the Council of 7 July 2021 establishing the European Maritime, Fisheries and Aquaculture Fund and amending Regulation (EU) 2017/1004
LIFER	Regulation (EU) 2021/783 of the European Parliament and of the Council of 29 April 2021 establishing a Programme for the Environment and Climate Action (LIFE), and repealing Regulation (EU) No 1293/2013
SUPD	Directive (EU) 2019/904 of the European Parliament and of the Council of 5 June 2019 on the reduction of the impact of certain plastic products on the environment
WSPD	Directive (EU) 2019/883 of the European Parliament and of the Council of 17 April 2019 on port reception facilities for the delivery of waste from ships,
WD	Directive (EU) 2018/851 of the European Parliament and of the Council of 30 May 2018 amending Directive 2008/98/EC on waste
PS	A European Strategy for Plastics in a Circular Economy
AMAP	A new approach to the Atlantic maritime strategy – Atlantic action plan 2.0
IMO	Guidelines by the IMO (International Maritime Organization)

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