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## Review

## Is existing legislation fit-for-purpose to achieve Good Environmental Status in European seas?

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## ABSTRACT

Recent additions to marine environmental legislation are usually designed to fill gaps in protection and management, build on existing practices or correct deficiencies in previous instruments. Article 13 of the European Marine Strategy Framework Directive (MSFD) requires Member States to develop a Programme of Measures (PoM) by 2015, to meet the objective of Good Environmental Status (GES) for their waters by 2020. This review explores key maritime-related policies with the aim to identify the opportunities and threats that they pose for the achievement of GES. It specifically examines how Member States have relied on and will integrate existing legislation and policies to implement their PoM and the potential opportunities and difficulties associated with this. Using case studies of three Member States, other external impediments to achieving GES are discussed including uses and users of the marine environment who are not governed by the MSFD, and gives recommendations for overcoming barriers.

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## 1. Introduction

Europe has a long history of implementing legislation to protect the marine environment (Boyes & Elliott, 2014) and currently has over 200 directives, regulations and other forms of policy developed for the sustainable use of marine resources and for their conservation and protection (Beunen et al., 2009). The Marine Strategy Framework Directive (MSFD, Directive 2008/56/EC) was approved in 2008, by the European Parliament and the European Council, for 'establishing a framework for community action in the field of marine environmental policy' (European Commission, 2008). The Directive requires European Union (EU) Member States to join together in their commitment to protect, preserve and where practicable, restore the quality of the marine environment across Europe. The MSFD requires Member States to 'take the necessary measures to achieve or maintain Good Environmental Status (GES) in the marine environment by the year 2020 at the latest'.

The MSFD was developed in response to concerns that although existing legal instruments aim to protect the sea from some specific impacts, they are often sectoral, fragmented and spatially limited (Boyes and Elliott, 2014). Policies and legislation such as the Water Framework Directive (WFD, 2000/60/EC) and the Common Fisheries Policy (CFP, Reg (EU) No 1380/2013) are crucial to the management and protection of European seas. However policies such as the CFP only target specific pressures (e.g. effects of gear types in fisheries) resulting in a fragmented and sectoral approach (European Commission, 2016a). The MSFD is the most encompassing directive when dealing with the protection of the marine environment across Europe by combining a top-down prescriptive approach with a bottom-up approach (Borja et al., 2010). The former requires all Member States to establish mechanisms to achieve GES within a set of 11 key descriptors within their marine waters. The bottom-up approach reflects the framework directive, which allows all Member States the flexibility in how they create and deliver this protection. This is underpinned by the core EU principle of subsidiarity which allows decisions to be taken at the lowest level possible and closest to the citizen. The MSFD seeks to establish an integrated framework for the management of marine spaces, and enshrines in a legal framework the ecosystem-based approach for the management of human activities having an impact on the marine environment, integrating the concepts of environmental protection and sustainable use (Ounanian et al., 2012; Elliott, 2014). Hence, the MSFD is a unique directive in being the first piece of legislation applied across European regional seas that requires assessing the range of issues encompassing overall marine environmental sustainability (European Commission, 2008; Borja et al., 2010; Long, 2011; van Leeuwen and Kern, 2013; van Leeuwen et al., 2014).

The MSFD builds upon a range of mechanisms already implemented within estuarine, coastal and offshore systems across Europe (Borja et al., 2010). Mechanisms include the Regional Sea Conventions and European directives (e.g. the Habitats Directive, WFD), as well as international law such as the Convention for Biological Diversity. European policies such as the EU Biodiversity Strategy to 2020 (Article 5) requires Member States to undertake the Mapping and Assessment of Ecosystems and their Services (MAES) which builds upon the requirements of the MSFD (EEA, 2015). Like the MSFD, the main objective for all of these mechanisms is to achieve and maintain a good status for marine waters, habitats and resources, using an integrated ecosystem-based approach (Browman et al., 2004; Apitz et al., 2006; Elliott, 2011).

Despite a common obligation to implement the MSFD, there are numerous potential conflicting objectives between government departments within and between Member States sharing a regional sea (e.g. Borja et al., 2013; Cavallo et al., 2016). Several studies have highlighted the inherent barriers in the MSFD legal text to achieving GES. These include its nature as a framework directive, which allows Member States the freedom and power to interpret GES and its descriptor indicators in their own way thus satisfying subsidiarity while paradoxically creating differences in implementation (van Hoof, 2010; Rätz et al., 2010;

Breen et al., 2012; Long, 2012; van Leeuwen and Kern, 2013; van Leeuwen et al., 2014). It contains the vague wording of key definitions in the directive such as 'good environmental status' (Long, 2011, 2012; Breen et al., 2012; Thiel, 2013) which also, confusingly, uses the same acronym as Good Ecological Status in the WFD (Mee et al., 2008; Borja et al., 2010). It focusses on 'applying an ecosystem-based approach' (Atkins et al., 2013; van Hoof, 2015) which may lead to confusion by Member States, and the legal status and tight time-lines associated with implementation place demands on scientists and on decision makers to put in practice a multidisciplinary approach, and test the abilities of existing institutions to collaborate on delivering multi-sectoral objectives (Boyes et al., 2015). The efficacy of the directive allows many exceptions to not achieving GES (Article 14) (Long, 2011; Brennan et al., 2014; Boyes et al., 2015; Elliott et al., 2015) and there is confusion regarding the means of aggregating outputs to provide a holistic assessment of status (Borja et al., 2016). The lack of common interpretations may foster confusion and conflict between Member States, adversely affecting users of the marine waters (Morris et al., 2011; Breen et al., 2012; Ounanian et al., 2012). While differences in the implementation of directives can be accommodated if the whole implementation is within a Member State border, for example the EU Nitrates Directive, non-coherence across international and transnational boundaries can create difficulties. Some of the key legislative challenges of the MSFD are further detailed in Patrício et al. (2014a).

Boyes and Elliott (2014) illustrate the plethora of European marine legislation and the linkages between different instruments, the need for each sector to be covered and the potential for overlap. In taking this further, this review explores key maritime-related policies with the aim to identify the opportunities and threats that they pose for the achievement of GES in the context of the MSFD. It specifically examines how Member States have relied on and will integrate existing legislation and policies to implement the MSFD and the potential opportunities and difficulties associated with this. It also considers the activities outside the control of European legislation which may have an adverse impact on achieving GES (see also Elliott et al., 2015) and gives recommendations for overcoming these barriers.

## 2. Reliance on existing directives to achieve GES

Even though the MSFD is considered to be the most encompassing directive when dealing with the marine environment, its effectiveness of achieving GES seems to be directly related to the success of other EU legislation (van Leeuwen et al., 2012; Ounanian et al., 2012). The MSFD preamble states that Member States should establish and implement a Programme of Measures (PoM) which should accommodate existing Community and international requirements including the Common Fisheries Policy. Article 1(4) states that the MSFD 'shall contribute to coherence between, and aim to ensure the integration of environmental concerns into the different policies, agreements and legislative measures which have an impact on the marine environment' with additional text to ensure MSFD environmental targets are compatible with existing targets (Article 10). In particular monitoring programmes should build upon, and be compatible with existing monitoring requirements in the Habitats and Birds Directives (Article 11(1) & Article 13(4)), WFD, the Urban Waste-water Treatment Directive (UWWTD, 91/271/EEC) and the Bathing Water Directive (BWD, 2006/7/EC) (Article 13(2)). Article 13 states that the PoM should encompass relevant measures required under existing and planned EU legislation and other international agreements (e.g. the recently adopted Maritime Spatial Planning Directive (MSP, 2014/89/EU)). The Directive also states that Member States should 'ensure, as far as possible, compatibility with existing programmes developed at regional and international level with a view to fostering consistency between these programmes and avoiding duplication of effort, making use of those monitoring guidelines that are the most relevant for the marine region or subregion concerned' (Annex V(10)).

GES should be defined according to a set of 11 descriptors, although as yet there is no agreement whether GES for a sea area will, or should be decided according to the combined or individual descriptors (Borja et al., 2014). Despite this, for each descriptor, the Member State needs to assess what existing or proposed EU policy instrument can be used to measure GES. If there is no European legislation suitable, then Member States should defer to their national legislation. Should a new measure be required to achieve GES for a descriptor, then the Member State should ensure that the proposed measure is cost-effective and technically feasible, and should carry out impact assessments, including cost-benefit analyses, prior to its introduction (Article 13(3)). Given that some of those descriptors relate to pressures (e.g. eutrophication), some relate to activities (e.g. fisheries), some relate to background supporting physico-chemical variables (e.g. seabed integrity) and some to status (e.g. contamination), then it is unlikely that a common legal framework can be found for assessing them.

More specific recommendations on how Member States should implement the MSFD are given in COM Decision 2010/477/EU (European Commission, 2010) which lists criteria and indicators to assess GES for each descriptor of the MSFD Annex I. This is based, in particular, on the scientific and technical assessment prepared by the Task Groups set by the Joint Research Centre (JRC) and the International Council on the Exploration of the Seas (ICES) (European Commission, 2010; Cardoso et al., 2010). As various statutory and national bodies undertake marine monitoring to serve legislative requirements, for example for the WFD and Habitats Directive (Shephard et al., 2015), Brennan et al. (2014) question how the requirements of the MSFD can be synchronised with existing environmental requirements. Monitoring to meet any EU directive, and particularly the MSFD is often a complex, time and resource-consuming process (Loizidou et al., 2016), not least during a period of economic stringency (Borja and Elliott, 2013). Hence it is necessary to review several important directives and policies to identify the opportunities and threats that they pose for the achievement of GES.

### 2.1. Water Framework Directive (WFD)

There are differences and overlaps between the MSFD and the WFD (Borja et al., 2010; Altvater et al., 2011; HM Government, 2012a). The MSFD covers all 'marine waters' defined as the water, seabed and subsoil from the baseline out to the EEZ limit of 200 nm (Fig. 1), but does not include WFD transitional waters (e.g. estuaries, coastal lagoons and sea lochs).<sup>1</sup> In comparison, the WFD covers surface waters throughout a 'river basin' from rivers, lakes and groundwaters through transitional and coastal waters to 1 nm out to sea (3 nm in Scotland) and out to 12 nm for chemical status. For estuaries, the boundary between the two directives is the 'bay closing line' which is the seaward limit of 'transitional waters' as defined under the WFD and, in the UK, the EU Urban Waste-water Treatment Directive. This gives a spatial overlap of at least 1 nm between the two directives, and has a 12 nm overlap with the MSFD coastal waters for chemical status.

Article 3(1) of the MSFD states that, GES should be applied to all marine waters except where the environmental status of the marine environment is already addressed through the WFD. The WFD focusses on achieving good ecological status, according to a set of biological quality elements (BQE) (phytoplankton, macroalgae, macrophytes, macrobenthos and fish) and chemical status. Out to 1 nm, achieving good ecological status of the waters under the parameters of the WFD has precedence over the MSFD, although the MSFD must also be applied for particular aspects of the environmental status that are not addressed through the WFD (for instance noise and litter). Even though they are designed for the BQE, the WFD assessment tools may also be used in relation to contaminants, eutrophication and the assessment of certain

seafloor habitats, and applied more widely to the marine environment where appropriate (Defra, 2012a; Shephard et al., 2015).

Whilst some of the MSFD descriptors are consistent with the WFD quality elements with indicators and methodologies already developed and applied in the 1 nm area (e.g. (D5) Human-induced eutrophication; (D8) Concentrations of contaminants), the key difference between the directives is that the scope of GES under the MSFD is broader, covering a greater range of biological diversity components and pressures which are not included for coastal water bodies under the WFD. Several descriptors included in the MSFD are not considered by any of the quality elements of the WFD (e.g. noise, litter, most commercial fish species and some other biological diversity components such as marine birds, mammals or reptiles) and therefore the MSFD takes a more integrative approach and these elements are included in the definition of GES (Borja et al., 2010, 2013; Altvater et al., 2011). It is arguable that whereas the WFD focuses on structural attributes, such as the abundance or cover of organisms, the MSFD is more functional in covering rate processes (such as (D4) Food webs), and pressures instead of just responses (e.g. (D11) energy including noise) (Borja et al., 2010). It is still unclear how at the European level some of the existing overlaps are being addressed. Despite the prime aim of the WFD to tackle water quality, Member States will still depend on other water quality directives such as the Nitrates Directive and the Urban Waste-water Treatment Directive (see below) to achieve GES for pressures such as (D5) Eutrophication and (D8) Contaminants. In essence, if a measure is aimed to ensure the BQE reach Good Ecological Status, if the BQE cover the most important ecological elements and if the health of the BQE is intimately affected by the physico-chemical environment, then Good Ecological Status of the WFD should equate to Good Environmental Status of the MSFD.

### 2.2. Urban Waste-water Treatment Directive (UWWTD)

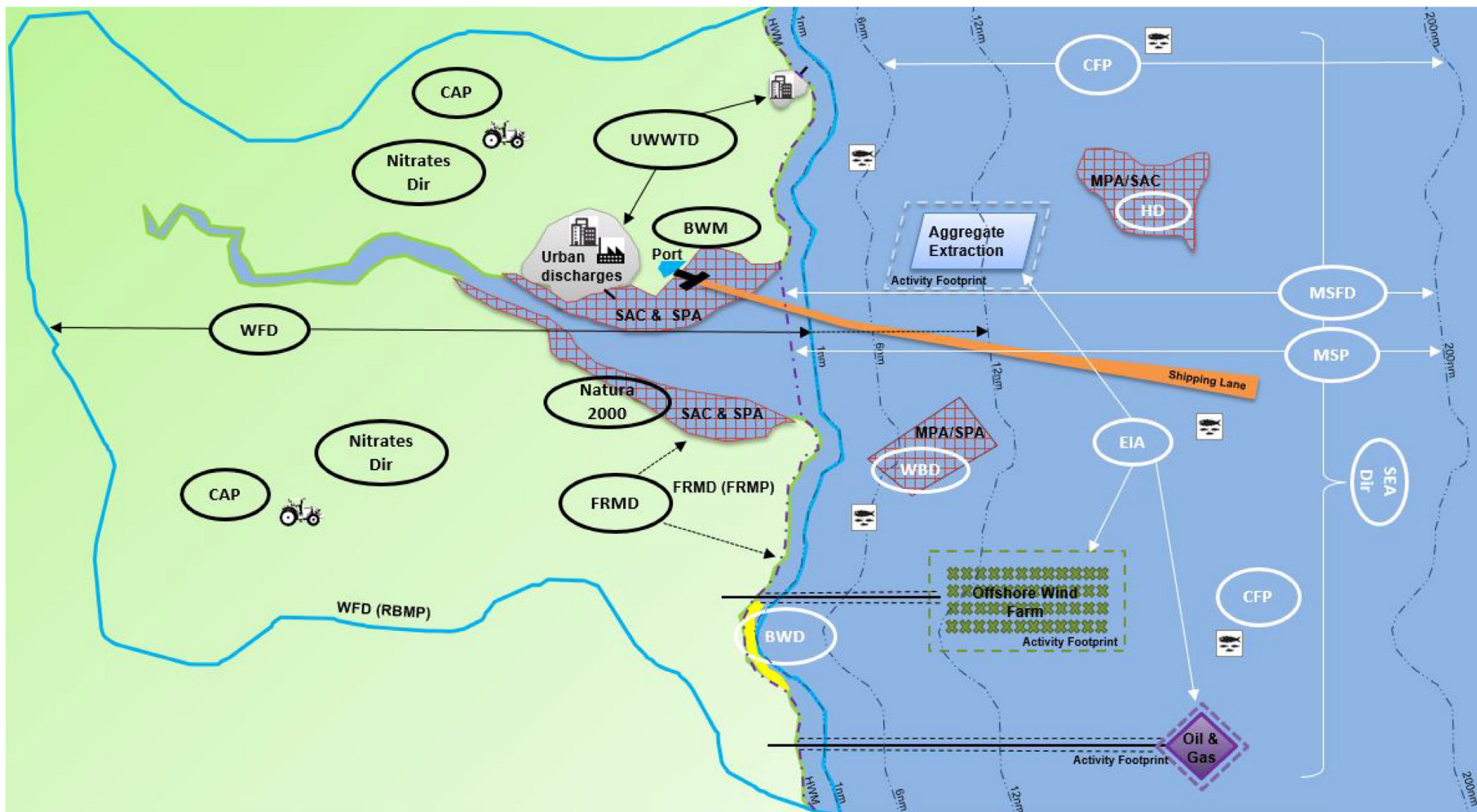
The UWWTD was one of the many 'sectoral' policies implemented by the European Commission in the 1990s (Boyes and Elliott, 2006, 2014). Protecting inland surface waters, ground waters, estuaries and coastal waters from the adverse effects of sewage discharges from towns and cities and industrial waste water, the Directive sets the maximum emission limit values for the major pollutants (organic load and nutrients). Full implementation of this Directive is a pre-requisite for meeting the environmental objectives set out in the MSFD (and also the WFD) (COM (2013) 574 final) and the targets set within the UWWTD are expected to help achieve GES under the descriptors (D5) Eutrophication and (D8) Pollution. However, the directive relates the required level of treatment to the dispersing characteristics of the receiving waters and given that the MSFD relates to open coasts and higher energy waters, it is questioned whether dispersing effluent to minimise effects is sufficient for GES. Similarly, although Member States have made great improvements in the treatment of waste water and water quality has improved (Ferreira et al., 2011), implementation is far from being complete and pollution problems still persist (COM (2013) 574 final).

### 2.3. Natura 2000 Directives

The Natura 2000 Directives (Habitats Directive (92/43/EEC) and Wild Birds Directive (2009/147/EC)) protect specified birds, marine species and habitats, thus benefitting associated biodiversity components and ecosystems linked to (D1) Biological diversity, (D4) Food webs and (D6) Sea-floor integrity. Due to their strong inter-linkages, it is hoped that the management measures to achieve the objectives of these directives will play a significant role in achieving GES; however, it will not be possible to reach GES based on these directives alone. Data collected under the Natura 2000 Directives (at species level) are difficult to compare with data collected under the WFD and MSFD (at the higher level of functional groups) and so need to be better aligned

<sup>1</sup> In some countries (e.g. Spain), in order to give a smoothed line for the 200 nm limit, the coastal baseline has been adopted from straight lines across headlands.





**Fig. 1.** Geographical scope and competencies of European legislation upon which measures the MSFD relies. Abbreviations: BWD = Bathing Water Directive; BWM = Ballast Water Management Convention; CAP = Common Agricultural Policy; CFP = Common Fisheries Policy; EIA = Environmental Impact Assessment Directive; FRMD = Flood Risk Management Directive; FRMD (FRMP) = Flood Risk Management Directive (Flood Risk Management Plan); HD = Habitats Directive; MSP = Maritime Spatial Planning Directive; MSFD = Marine Strategy Framework Directive; Natura 2000 = Habitats and Wild Birds directives; Nitrates Dir = Nitrates Directive; SAC = Special Area of Conservation; SEA Dir = Strategic Environmental Assessment Directive; SPA = Special Protection Area; UWWTD = Urban Wastewater Treatment Directive; WBD = Bathing Water Directive; WFD = Water Framework Directive (with extension out to 12 nm for chemical status); WFD (RBMP) = Water Framework Directive (River Basin Management Plan).

(Milieu Ltd. et al., 2015). As they only focus on a few species and features and a small part of the marine environment, additional measures are needed to achieve GES targets in relation to the remaining species, habitats and features.

The Natura 2000 Directives only relate to designated features and areas (e.g. Marine Protected Areas, Special Areas of Conservation and Special Protected Areas). While these may be protected from certain anthropogenic activities, they are still open and vulnerable to diffuse pressures, bio-invasions and climate change. However, the Natura Directives are not designed to prevent activities (plans or projects) if it can be demonstrated that they are not affecting the designated features, hence the importance of demonstrating the presence and effects of pressures.

Direct unintentional species introductions by corridors provide an example of a pressure which challenges both the MSFD and the Natura 2000 Directives. For example, the Suez Canal accounts for most introduced species in the Mediterranean but may be a cause of failure for GES for (D2) Alien Species despite being outside the control of a Member State (Elliott et al., 2015). They are not explicitly considered in the Regional Seas Conventions (RSC) Action Plans (UNEP(DEPI)/MED IG.22/L/3/Add.7) or National Member State MSFD assessment criteria (i.e. are decoupled from national GES targets determinations as depending on international efforts). Despite this, there is secondary spread and rapid range expansion and MPAs are not immune to alien introductions (e.g. Zakynthos Natura 2000-MPA, Katsanevakis et al., 2014). The EU invasive alien species Regulation (No 1143/2014) focusses on a subset of invasive alien species 'the Union list'. For these species, if the damage caused in affected Member States is so significant, then the adoption of dedicated measures are justified and could be even applicable to not yet affected Member States. Despite this, there are limited methods of tackling this problem (Olenin et al., 2011).

#### 2.4. Integrated Maritime Policy (IMP)

The Integrated Maritime Policy (IMP, COM (2007) 575 final) aims to provide a more coherent, holistic approach to all maritime related issues, by increasing the coordination between different marine policy areas. However, a potential weakness to achieving GES is identified by the different coverage of maritime activities within the many directives. The IMP has been regarded as a conflicting legislative instrument to the MSFD (Qiu and Jones, 2013), with the IMP favouring economic development over environmental concerns. The IMP requires addressing the challenges from the increasing competing uses of the sea, ranging from maritime transport, fishing, aquaculture, leisure activities, off-shore energy production to other forms of seabed use (see below). The MSP Directive allows Member States to identify the extent and duration of relevant existing and future activities in their marine waters (Article 8), with relevant activities including for example oil and gas extraction, maritime transport, submarine cable and pipeline routes, fishing and aquaculture and natural conservation sites. However, the MSFD does not specify which maritime activities have to be considered, but addresses the potential pressures and impacts that should be assessed (Annex III of the MSFD). Patrício et al. (2014a) suggest how the MSFD should consider maritime activities (e.g. carbon sequestration) and the pressures these activities cause on the marine environment (e.g. pressures from storage, exploration, construction and operation). This is of special relevance in the context of developing the initial assessment of the pressures and impacts including human activities, established by the MSFD (Article 8).

#### 2.5. Maritime Spatial Planning Directive (MSP)

To address the competition for maritime space and provide greater coherence to planning in the marine environment (Douve, 2008; European Commission, 2013), in 2014 the EU adopted the Maritime Spatial Planning Directive (MSP) (European Commission, 2014a). This

Directive aims to manage and give greater coherence to all uses and users, aimed at reducing the existing over-regulation and administrative complexity within the marine environment (European Commission, 2013). It aims to ensure a coordinated approach to MSP throughout Europe, to enable the efficient and smooth application of MSP in cross-border marine areas, to favour the development of maritime activities and the protection of the marine environment based on a common framework, all with similar legislative implications (European Commission, 2011a,b). The European Commission position is that MSP would also be developed in full coordination with, and in support of, current and future policies and initiatives within the field of maritime policy. Any further action on MSP at EU level should indirectly apply the ecosystem-based approach, as referred to in Article 1(3) of the MSFD, to ensure that the collective pressure of all activities is kept within levels that are compatible with the achievement of GES (Douve, 2008). Cinnirella et al. (2014) state that the monitoring of indicators of GES in both the MSFD and MSP is a key factor when it comes to assessing the effectiveness of the programmes and achieving the anticipated objectives within the regional seas.

While the MSFD aims mainly at marine environmental protection, the MSP promotes sustainable growth and maritime economies. Despite this, Schaefer and Barale (2011) and Maccarrone et al. (2015) both feel the two directives aim to achieving GES. However, Jones et al. (2013) indicate that significant tensions exist in the EU policy framework, particularly between the MSP Directive and the MSFD. The MSFD suggests the ecosystem-based approach as a means for achieving GES and requires different sectoral activities to be managed adequately to achieve GES (Suárez de Vivero and Rodríguez Mateos, 2012). In contrast, the MSP Directive is envisaged as the main instrument for cross-sectoral management, in addition to implementing the ecosystem-based approach, which can provide predictability for future investments (Qiu and Jones, 2013). Jones et al. (2013) compare the 'soft sustainability' of the MSP Directive where the needs of different maritime sectors are balanced, with the 'hard' sustainability of the MSFD in which ecosystem conservation is the foundation of the ecosystem-based approach. Qiu and Jones (2013) believe that the MSP Directive is likely to increase 'tensions and conflicts in an already crowded and fractured European policy landscape', where Blue Growth (aquaculture, coastal tourism, marine biotechnology, ocean energy and sea bed mining) appear prioritised over the framework nature of the MSFD and achieving GES, which ultimately supports the maintenance of conservation objectives and provision of ecosystem services.

Non-Governmental Organisations (NGOs) have recently argued that the Blue Growth strategy that implements the Integrated Maritime Policy (IMP) must be consistent with the requirements of the MSFD and therefore be ecosystem-based (ESEC, 2010). Jones et al. (2014) feel that the MSP Directive is negligent in its contribution towards achieving GES under MSFD, such as cross-border assessments of cumulative impacts and the efficient planning of infrastructure in an integrated manner between Member States is neglected or omitted. Hence, a greater integration is required between Blue Growth and environmental protection for GES to be achieved.

#### 2.6. Common Fisheries Policy (CFP)

The reform of the CFP started in 2011 and an agreement between the European Parliament, the Council of Ministers and the European Commission was reached in May 2013. This resulted in a new regulation under the CFP which came into force on the 1st January 2014. It is of note that whereas a Directive passes immediately into the law of a Member State, an EC Regulation does not and so gives latitude in its implementation. The effectiveness of the MSFD in achieving GES is directly influenced by the new CFP. Fishing creates some of the greatest marine pressures and therefore the CFP and the MSFD are interrelated. Appropriate fisheries management measures adopted within the CFP will be required to achieve the GES targets (Borja et al., 2010). This is especially

related to descriptors (D3) Commercially exploited fish and shellfish, but also (D1) Biological diversity, (D4) Food webs and (D6) Sea floor integrity.

One of the key pillars of the CFP is the adoption of the Maximum Sustainable Yield (MSY) for fish stocks. This will help the MSFD aim of achieving GES by ensuring the sustainable exploitation of a species/stock consistent with high long-term yields. However, the CFP does not define clear operative targets to reach the MSY (Jones et al., 2013; Qiu and Jones, 2013). The European Commission states that 'by 2015, stocks must be exploited at sustainable levels that produce the *maximum sustainable yield*'. These difficulties to define and estimate the MSY could hinder the success of this management measure and therefore, limit the CFP contribution to the GES objective. In particular, the indicators for the MSFD Descriptors and Criteria need to be harmonised with instruments such as the CFP.

Furthermore, the reform of the CFP does not provide fishing management measures to reach the Habitats Directive objective of avoiding the deterioration of natural habitats (as fishing may impact in natural habitats through different fishing gears). The lack of integration between the CFP and the Habitats and Birds Directives, in relation to the fishing impacts on habitats, limits the contribution of this policy to reach the GES. Aanesen et al. (2012) believe that the new environmentally-focussed policies and directives reflect environmental concerns in international and European politics and the increasing pressure from environmental interests on fisheries. van Hoof and van Tatenhove (2009) also query which policy (CFP or MSFD) will take the lead when it comes to weighting environmental impacts of fisheries versus the social and economic effects of fisheries. Resolving this issue of mixed competencies and the question of primacy between the CFP and the environmental directives will be crucial to ensure the efficient and effective implementation of either strategy and ultimately achieve GES (Sissenwine and Symes, 2007; Aanesen et al., 2012).

Qiu and Jones (2013) conclude that better integration is required to strengthen the link between environmental legislation and fisheries regulations. However, it will be several years before all measures will be fully implemented (Anderson, 2013), requiring much work before the implications of the reforms are fully understood and whether they go any way to achieving GES. The current CFP, as recent and future reforms, need to include the environmental impacts of fishing and the objectives of the MSFD for GES to be met; they also need harmonised quantitative objectives and indicators.

## 2.7. Data Collection Framework

A key pillar of the CFP is the ambitious Data Collection Framework Regulation (DCF) (COM REG (EC) No 665/2008), established under the original CFP, which assists the MSFD implementation, especially in relation to (D1) Biological diversity, (D3) Commercially exploited fish and shellfish and (D4) Food webs. The DCF establishes rules on (a) the collection and management, in the framework of multiannual programmes, of biological, technical, environmental and socio-economic data concerning the fisheries sector, and (b) the use of data for scientific analysis in the fisheries sector under the CFP. This in principle would highly support the implementation of the MSFD and the achievement of GES. However, the implementation of the DCF is costly and several countries have not complied, which hinders achieving the established target within the MSFD.

The EU has been failing to deliver on the ecosystem-based approach to fisheries management due to the lack of systematic and coordinated data collection on the impacts of fisheries on marine ecosystems, across different directives. They all require Member States to collect the best available data and exchange information necessary for maritime spatial plans. An integrated data programme is promoted within EU policies, in particular, the European Commission promoted the implementation of a Data Collection Regulation (DCR) in 2001 to coordinate collection and management of fisheries data within the European Union. In 2008

the DCR was substituted by the DCF which provides data to estimate some MSFD indicators, mainly related to (D3) commercially exploited fish and shellfish. This initiative meshed with others; for example the Integrated Maritime Policy is based on the so-called European Marine Observation and Data Network (EMODnet) tool (EMODnet, 2016). The implementation of EMODnet is a challenge and will be extremely useful, but issues such as the sharing of data by Member States and technical difficulties to obtain data from the database, can limit its use (EMODnet Impact Assessment SEC (2010) 998 final). The Natura 2000 directives also contain data requirements but there does not appear to be any co-ordination with the DCR/DCF and the CFP. EU policies fail to provide measures/tools to improve an EU integrated and coordinated data strategy, which represent an important gap and the most important barrier to provide provisions from different directives to achieve the GES objective of the MSFD.

In 2014, the updates on the first phase of MSFD implementation (European Commission, 2014b,c) identified several shortcomings that Member States should, as soon as possible and by 2018 at the latest, significantly address to ensure that the second round of MSFD implementation achieves greater benefits. In particular, the European Commission recommends implementing a modern and effective data and information sharing system between the European Environmental Agency (EEA) and the RSCs. This requires taking full advantage of the ongoing developments to improve accessibility and interoperability of marine data through the 'Marine Knowledge 2020' initiative.

## 2.8. Spatial and sectoral barriers

With Member States relying on existing legislation in supporting the achievement of GES, many other barriers have been identified. A barrier to achieving GES can be seen from the general non-compatibility of the different directives to use the same boundaries for the different marine regions or subregions. Borja et al. (2013) report several spatial anomalies in EU legislation including the problems created by the overlap or mismatch in geographical extent of the MSFD with the WFD, Habitats Directive, the MSP Directive and the CFP (e.g. causing problems with reporting stock assessments by geographical sub-areas (GSA) in the Mediterranean Sea) (STECF, 2014). As a further example, there is the challenge of the WFD extending out to 1 nm from the baseline (and 12 nm for chemical status) compared to the MSFD extending out from the high water mark and across the mouth of estuaries, whereas the MSP extends seaward from the mean low water mark.

Consideration also needs to be given as to which piece of legislation takes precedence – for example, the WFD takes precedence over the MSFD in the 1 nm overlap area although as yet the repercussions of this are unknown. This lack of consistency to define the marine regions and subregions is critical to contribute to the GES due to the trans-boundary character of the sea in terms of its use, protection, impacts and effects of management measures. These spatial anomalies may cause marine areas to fail under GES and yet still be given the status as Special Protection Areas (SPAs) under the Wild Birds Directive and Special Areas of Conservation (SACs) under the Habitats Directive. These spatial scales also determine the assessment criteria of the MSFD and the WFD with the former requiring GES to be achieved at the relevant subregions (e.g. the Greater North Sea), whereas the latter, requires chemical and ecological status at the individual coastal water body. Similarly, whereas the MPA designations under the Natura 2000 Directives are to ensure environmental (conservation-objective) quality for a small area, the MSP and MSFD are for larger areas. Similarly, the EIA Directive and subsequent compliance marine licence monitoring requires an assessment for the spatial and temporal footprint of an activity, perhaps also a small area, whereas as yet there are no indications of how such a control, including cumulative and strategic impact assessment, can be weighted in implementing the MSFD. These spatial anomalies are illustrated in Fig. 1.



There are repercussions for this spatial separation not least in monitoring to determine whether an area is in GES or whether measures are having an effect. For example, if the MSFD monitoring relies on that for the other directives then the overall assessment will be biased towards either pressure footprints (as in EIA and marine licensing), and thus indicate a poor status area, or conservation condition for a given conservation feature (as in Natura 2000) and thus indicate a conservation status. Conversely, if monitoring and measures avoid all other such areas then the net result will be an area by definition in GES.

EU directives have previously been implemented in a sectoral manner, usually in a reactive nature to an environmental problem (e.g. Bathing Water Directive enacted to safeguard public health and ensure clean bathing waters). The timescales associated with achieving their different environmental standards and requirements can cause anomalies when the MSFD relies on previous standards to achieve GES. Lag problems in the tool application or developments for other directives could present an important barrier, which affects both the implementation of future directives as well as existing implemented ones. These may be difficult to amend and procedures updated retrospectively (e.g. the EMODnet tool applications) (Boyes et al., 2015).

Better coordination between the MSFD and the WFD, but also the Natura 2000 Directives and the reformed CFP is needed since they are clearly interrelated, and particular concepts can be mutually supportive. NGOs in a Joint Position Paper (ANON, 2013) support MSP as a good tool to deliver further goals, as the MSFD provides the framework for the sustainable use of European seas and oceans. The NGOs consider it includes a specific requirement for the use of spatial measures, and that ecosystem considerations are at the heart of all sector-based planning decisions. Other directives such as the Nitrates, the IPPC, the WFD, the UWWTD and EIA directives will still be required to achieve GES for pressures such as (D8) Contaminants and (D5) Eutrophication.

Many EC policy instruments are needed to help achieve GES, in line with the provisions of the MSFD, although a more coordinated effort is required in establishing common definitions, targets and data collection. Taking into account the above issues with the reliance and integration with other EU directives and policies, Table 1 summarises the main gaps across the different EU policies and the potential barriers to achieving GES. Given the above information, and following Cavallo et al. (2016), it is also possible to indicate which descriptors rely on which existing instruments and to add the examples of barriers and limitations (Table 2).

### 3. Programme of measures – case studies

By 2015, Member States were required to produce a Programme of Measures (PoM) for each of the 11 MSFD descriptors. The EU working groups identified two types of measures: (i) *existing measures* which have already been identified and defined under the framework of other environmental policies, and (ii) *new measures* which are proposed after identifying those needed to reach the GES. This gap between existing and required measures should be determined by individual MSFD descriptor and Member State. This gap will be greater or less depending on the reliance on existing Directives to achieve GES and on the MS implementation of other directives. Thus, the PoM depends on the previous phases in the application of the MSFD and on the existing Directives. For example, below we review how three Member States have addressed their PoM and the reliance they have placed on existing directives.

#### 3.1. UK

Various authors have expressed concerns on the proposed implementation plan of the MSFD in the UK and how it relies on existing environmental legislation (Liquete et al., 2011; Brennan et al., 2014; Shephard et al., 2015). The UK proposed PoM underwent consultation in early 2015 (Defra, 2015a), with the consultation response (Defra,

2015b) and the final UK PoM (Marine Strategy Part Three) published in December 2015 (Defra, 2015c). At an early stage, the UK government made it clear their intention to use existing mechanisms to achieve GES (HM Government, 2012b) and as required by the directive, the UK final PoM identifies measures under existing EU and international agreements. This includes those measures planned under EU, international and national instruments that have been agreed (but which in some cases not yet been implemented – for example the MSP Directive) to address the MSFD targets (Defra, 2015c), and measures under existing national policies that contribute to the UK targets and to achieving GES. One such national policy is the UK marine planning system which was established under the UK Marine and Coastal Access Act 2009, the Marine (Scotland) Act 2010 and the Marine Act (Northern Ireland) 2013 to enable the sustainable development of marine resources. This includes applying the ecosystem approach to the management of human activities (Elliott, 2014). However other than the additional measures which are planned, but which have not yet been implemented, no new measures or targets have been recommended in the UK PoM.

The UK PoM does acknowledge that as new standards are adopted by the EU, this may lead to a reconsideration of measures for some descriptors. For example EU food legislation may change the measure for (D9) contaminants in fish and other seafood, and the latest revision of the Packaging and Packaging Waste Directive (EU/2015/720) which amended 94/62/EC as regards the consumption of lightweight plastic carrier bags may prevent marine litter. Also, as part of the revision of the River Basin Management Plans (RBMPs) under the WFD and the second assessment cycle for the WFD, a current UK consultation may indicate possible new measures to achieve the objectives required, which in turn will enhance achieving GES under descriptors (D5) Eutrophication and (D8) Contaminants. There are currently two EU technical sub-groups, one on (D10) Marine litter and the second on (D11) Noise, which aim to review monitoring methodologies and develop proposals for new monitoring. It is of note that the UK measure for (D10) Marine litter has the notable features in that it refers to a long-standing monitoring scheme – it is argued that monitoring should not be a measure per se but rather only the means to check if a measure is effective. Furthermore, this measure is unlike all others in the UK PoM in that it is carried out by an NGO (the Marine Conservation Society) rather than a statutory body.

Defra (2015c) concluded that based on the inventory of 'existing and planned measures' the UK PoM is 'sufficient to meet our targets and to help achieve or maintain GES'. Where previous directives such as the Habitats Directive and the WFD were considered to be 'gold plated' (Mee et al., 2008; Morris, 2011), the PoM has avoided going beyond what is required by the legislation, adopting a proportionate approach. Defra (2015b) believes the PoM 'is comparable to those being proposed by other Member States' and the existing and planned activities represent an ambitious range of measures to achieve GES in UK marine waters. Despite this, the Chancellor of the Exchequer (Chief Finance Minister) has commented that in these economically difficult times then the implementation should not be a burden on industry (The Guardian, 2011).

From the feedback received to the UK PoM, the marine industries supported the approach set out in the consultation and did not think that there was a need for additional measures. However greater clarity was needed on the implications of the MSFD on marine developments (Defra, 2015b). Despite this, the UK considers that the early adoption (pre-2016) of the Marine and Coastal Access Act (2009) gives it a thorough basis for adopting both the MSFD and the MSP Directive. Although environmental NGOs agreed that existing initiatives and programmes should form the basis for most measures, they felt that the proposals were not sufficiently precautionary and lacked the ambition needed to secure a healthy marine environment (Defra, 2015b; Wildlife and Countryside Link et al., 2015). A potential barrier was raised on the way the UK PoM was relying on existing programmes and targets to monitor marine habitats and species, and exactly how the existing

**Table 1**

Gaps across different EU policies &amp; potential barriers to achieving GES.

Directive	Linkages with other policies	Specific barrier	Gaps: notes
MSFD	WFD, UWWTD, Natura 2000 Directives, IMP, MSP, CFP and DCF	<ul style="list-style-type: none"> <li>- <i>A framework Directive</i>. This Directive only defines a plan of action, but gives no clear operative for implementation.</li> <li>- <i>Little joint efforts</i> with other directives (CFP, DCF, MSP, IMP, WFD) with respect to spatial issues, data collection, definition of common indicators, targets or definition of maritime activities, among others.</li> <li>- <i>Ambiguity</i> about the role and contribution of each Directive.</li> <li>- <i>Institutional ambiguity</i> (across sectorial policies, across several hierarchical levels, ...)</li> <li>- <i>Geographical overlaps</i> of the MSFD with WFD, Natura 2000 directives and CFP.</li> </ul>	<ul style="list-style-type: none"> <li>- Difficulties in developing the action plan (preparation and programme of measures including, among others, the initial assessment according to the Art. 8). The Directive requests the action plan but gives no direction of how to do it. This contributes to implementation differences found across Member States.</li> <li>- Lack of consistency with WFD of some descriptors included in the MSFD.</li> <li>- The MSFD establishes the obligation of developing an initial assessment of the economic activities without specifying a list of them. The MSP establishes a minimum number of economic activities to take into account. The IMP also mentions a list of maritime activities. Little joint effort has been made to list a common set of economic activities across these directives.</li> <li>- No specific links are made to the CFP in relation to (D3) Population of commercial fish/shellfish.</li> <li>- There is no specific link to achieving an effective data collection process mentioned in any of the European policies (e.g. CFP, DCF, IMP).</li> <li>- Lack of consistency with other directives to define marine regions and subregions (e.g. WFD, CFP).</li> <li>- Lack of agreed, transparent and consistent (where relevant) rules to species and spatial area integration, although work is currently under way (ICES WKD1Agg report 2016)</li> <li>- No joint effort to define the classification values for the quality elements of ecological status for each surface water category.</li> <li>- Some descriptors are included in the MSFD that are not consistent with any WFD quality element which produce a consistency weakness.</li> <li>- Spatial overlap with the MSFD</li> <li>- Little joint effort in relation to the data collection process (CFP, DCF, IMP...)</li> <li>- Full implementation is far from being complete in some Member States.</li> <li>- Achieving GES for descriptors (D5) Eutrophication and (D8) Pollution relies on the management measures set in the UWWTD.</li> <li>- Conceptual clarity is required about key terms, scientific tools and procedures to measure the relevant variables in the Directive.</li> <li>- Although the Habitats Directive is not strongly linked to the MSFD, considering its much narrower focus, some aspects are considered, which are of interest to the MSFD (e.g. information for (D1) Biodiversity indicators and various Article 17 species assessments). Nevertheless, no direct mention is made to the Habitats Directive, nor to the criteria that it establishes, within the MSFD.</li> <li>- Lack of integration with the reform of the CFP with respect to the impact of fishing on natural habitats.</li> <li>- The Wild Birds Directive (2009 codified) and Habitats Directive are rather old (1992), and therefore, the time lag with the MSFD primarily affects to the changes that have been produced in terms of approaches to managing the environments and seas. Most work has been carried out on land, but former works in the marine environment have focused on complying with this policy without consideration of most recent approaches and policies. Newer Member States have the advantage of implementing the Natura 2000, WFD and MSFD at closer time lines.</li> <li>- The main text contains a lot of proposals and initiatives the Commission will promote to achieve the IMP objectives. In some cases, these proposals are not completely operative on the date of implementation of the linked Directives. Thus, this lag could represent an important barrier to get the objective of the IMP to contribute to the CFP, MSP etc.</li> <li>- MSP uses the IMP tools which facilitates the implementation of the MSFD, and the CFP. However, operational problems could appear due to the huge amount of proposals to develop in the future.</li> <li>- Assembling a coherent picture of the data needed represents an important problem. That is, a lot of barriers can be identified to obtain the data required when using the IMP proposed tool (the European Marine Observation and Data Network).</li> <li>- MSP specifies a minimum number of maritime activities, however other directives do not list these (e.g. MSFD). Probably different degree of maritime activities coverage across directives.</li> <li>- MSP considers the positive contributions to the different policies and directives, including the Natura 2000 Directives. However, it does not specify how Natura 2000 sites should be considered in the MSP.</li> </ul>
WFD	MSFD, Natura 2000 Directives	<ul style="list-style-type: none"> <li>- <i>Little joint efforts</i> between directives (MSFD, WFD, DCF) to define the marine regions or subregions, to collect data, to define indicators and targets</li> <li>- <i>Overlap in space</i> with the MSFD</li> </ul>	
UWWTD	MSFD, WFD	<ul style="list-style-type: none"> <li>- <i>Incomplete implementation</i> of the UWWTD will hamper its effectiveness to achieve the environmental objectives of other directives (MSFD, WFD)</li> </ul>	
Natura 2000	MSFD, MSP, CFP	<ul style="list-style-type: none"> <li>- <i>Time lag barrier</i> between the directives proposals.</li> <li>- <i>Evolution of concepts</i>, which are only integrated in most recent policies (e.g. Ecosystem-based approach)</li> </ul>	
IMP	MSFD, MSP, CFP	<ul style="list-style-type: none"> <li>- <i>Time lag barrier</i> between the Directives proposals.</li> <li>- Very general text with few already developed tools. Text mainly based on proposals.</li> </ul>	
MSP	MSFD, Natura 2000 Directives, IMP, CFP	<ul style="list-style-type: none"> <li>- <i>Time lag barrier</i></li> <li>- <i>Little joint efforts</i> between directives in relation to the identification of maritime activities.</li> </ul>	



Table 1 (continued)

Directive	Linkages with other policies	Specific barrier	Gaps: notes
CFP	MSFD, Natura 2000 Directives, DCF	<ul style="list-style-type: none"> <li>- <i>Little joint efforts</i> between Directives (MSFD, CFP) to define operative objectives, to collect data, to define the same marine regions, etc.</li> <li>- <i>Lag problems</i> (due to directives appearing at different times and old-ones not being adapted immediately)</li> <li>- <i>Few successful results from the current CFP</i></li> </ul>	<ul style="list-style-type: none"> <li>- Reform of the CFP contributes to achieving the objectives of the MSFD. However very few or very general references to the CFP are found in the MSFD text.</li> <li>- The CFP also contributes to the MSFD by means of the adopted Maximum Sustainable Yield (MSY) for fish stock, but difficulties in estimating the MSY may form a barrier to successfully contributing to the MSFD objectives.</li> <li>- Few successful results from the management measures under the current CFP.</li> <li>- No integration with the Natura 2000 Directives in relation to the fishing impacts on the natural habitats.</li> <li>- No integration with other directives to reach common integrated data.</li> <li>- Lack of consistency to define the same marine regions and sub-regions as the MSFD.</li> <li>- Lag problems.</li> </ul>
DCF	MSFD, CFP	<ul style="list-style-type: none"> <li>- <i>Little joint efforts</i> between directives (MSFD, DCF) in relation to the data collection common framework.</li> <li>- <i>Very ambitious framework</i> given the financial help</li> <li>- <i>Lack of compliance</i> with the DCF by some countries</li> </ul>	<ul style="list-style-type: none"> <li>- The DCF contributes to achieving the objectives of the MSFD. However, no references in the MSFD text to the DCF are found (only little references to the CFP).</li> <li>- No joint efforts in relation to the data collection process (DCF with other Directives e.g. IMP).</li> <li>- Very restricted use of effort and Vessel Monitoring System (VMS) data beyond CFP (e.g. to serve as pressure level maps for MSFD or MSP).</li> <li>- Economically unfeasible to achieve the DCF objectives. DCF very ambitious with respect to the data collection given the available financial support.</li> <li>- Lack of compliance in the case of some countries making difficult its global implementation.</li> <li>- Lack of consistency to define the same marine regions and sub-regions that the MSFD</li> </ul>

Abbreviations: CFP = Common Fisheries Policy; DCF = Data Collection Framework Regulation; HD = Habitats Directive; IMP = Integrated Maritime Policy; MSFD = Marine Strategy Framework Directive; MSP = Maritime Spatial Planning Directive; Natura 2000 = Habitats and Wild Birds directives; UWWTD = Urban Wastewater Treatment Directive; WFD = Water Framework Directive.

measures currently used for the WFD and Natura 2000 Directives would be scaled up to MSFD sub-Regional level (NRW, 2015). A statutory consultee also believed that if new measures were to be developed, there needs to be greater resources for the competent authorities to meet these targets (NRW, 2015). Again despite this, during economic austerity measures, the competent authorities have had their budgets reduced (Borja and Elliott, 2013). In summary, it was highlighted that the contribution of existing and planned measures to achieve GES needed to be understood more fully before the development of any new substantive measures is considered.

### 3.2. Spain

The Spanish PoM proposal document has been prepared by the Spanish Ministry of Agriculture, Food and Environment (MAGRAMA, 2015). This emanates from a detailed analysis of the information available at the national and local public administration, expert focus groups and stakeholder consultation. In addition, the document has been opened twice for public consultation, having been opened for the last time from 23rd of December 2015 to the 9th of April 2016. The proposal catalogues existing measures and identifies new ones to cover main gaps, as well as providing details on the administrative and regional co-ordination needed to carry out this process. A thorough revision of the RBMPs, management measures established in the context of international agreements and national legislation, and stakeholder consultation (through questionnaire surveys), allowed the identification of >5000 MSFD-related measures that are currently in place; these are the existing measures. These, in turn, have been grouped into 315 groups of management measures and assigned to nine themes, mostly but not solely related to the MSFD descriptors. These themes are: Biodiversity (D1, 4 & 6), Alien species (D2), Commercially exploited species (D3), Contaminants and their effects (D5, 8 & 9), Hydrographical

conditions (D7), Marine litter (D10), Underwater noise (D11), marine protected areas and other horizontal measures. 95 new measures have been proposed as a result of an active consultation process with public administrations. These are felt to be needed to overcome shortcomings in the existing PoM and achieve marine GES.

Both existing and new management measures have been analysed against a set of quantitative and qualitative (based on expert knowledge and focus groups) economic criteria: public costs, effectiveness to mitigate human pressures and the potential benefits to the main maritime economic sectors in Spain. Most measures (56.2%) are related to marine litter and biodiversity. The latter attempts to reduce the impact of human derived pressures affecting biological communities and ecosystems and is complemented with other measures aimed at improving the Marine Protected Area network (in terms of their geographical cover and representivity). Overall, the higher number of existing and new measures combined rely on biodiversity (almost 140), followed by contaminants and their effects, marine litter and marine protected areas (with >40 management measures each). In contrast, few management measures are placed on underwater noise and hydrological conditions (<10).

The measures related to commercially exploited species integrate the main strategic issues covered by the recently approved European Maritime and Fisheries Fund (EMFF) (2014–2020). Few new management measures are proposed in relation to contaminants and their effects and hydrography conditions, as many of them are already included in the WFD. The proposal for a new underwater noise measure aims to advance tools for regulating 'impulsive noise' generating activities. Finally, a set of horizontal crossing measures, which affect a large number of themes and descriptors have been proposed. These horizontal measures are aimed at improving awareness, training, and to ensure the sustainability of human activities, and control of the compatibility of these activities with marine strategies.

**Table 2**

MSFD descriptors which rely on existing instruments and examples of barriers.

(Adapted from Cavallo et al., 2016).

Descriptor(s)	Existing European Legislation	Examples of barriers/limitations
D1 – biodiversity D4 – marine food webs D6 – sea floor integrity	Natura 2000 Directives (HD & WB), WFD; CFP; EIA; SEA; EUBS; MSP; OSPAR Rec. 2011/4–6; EC Reg. 812/2004 (International Conventions: ASCOBANS; CITES; Bern Convention; Bonn Convention; Ramsar Convention; CBD; IMO Convention e.g. BWM & MARPOL; International Whaling Commission)	<i>BWM</i> – The management of ship's ballast water is still waiting to be ratified by 30 States, representing 35% of world merchant shipping tonnage (currently at 49 States representing 34.82% tonnage) <i>CFP</i> – a reduction in overall fishing pressure, which will reduce fishing impacts on both target and non-target species and sensitive species (but only between 12 nm and 200 nm)
D2 – Non-indigenous species	HD; WFD; OSPAR QSR 2010a; EUBS; Phytosanitary Directive; Regulation on wild species trade; Regulation for use of alien and locally absent species in aquaculture. (International Conventions: Bern Convention; Bonn Convention; Ramsar Convention; CBD; IMO Convention e.g. BWM)	<i>Natura 2000 directives</i> – MPAs will contribute to reducing pressure on sensitive species, on community size structure and on the seabed. However they only give specific protection to designated areas and species. Also not all conservation objectives are applicable to be applied to the marine environment e.g. measures for wading birds and saltmarsh extent.
D3 – commercially exploited fish and shellfish	CFP; EC Regulation 850/98 on technical measures for managing fish stocks (International Organisations: ICES)	<i>ND</i> – protect water quality by preventing nitrates from agricultural sources polluting ground and surface waters. However this only governs transitional and coastal waters.
D5 – eutrophication D7 – hydrographical conditions D8 – contaminants	UWWTD; WFD; ND; OSPAR Convention WFD; EIA; MSP WFD; PSD; OSPAR Convention; IED; REACH Reg. (International Conventions: London Protocol; Stockholm Convention; MARPOL)	<i>UWWTD</i> – protects the environment from the adverse effects of urban waste water discharges and discharges from certain industrial sectors. However this only regulates inputs to transitional and coastal waters.
D9 – contaminants in fish	PSD; OSPAR JAMP; Regulations No 333/2007; Regulation No 1883/2006. (International Conventions: ICES TIMES; MARPOL)	<i>WFD</i> – Achieve good qualitative and quantitative status of all water bodies (including marine waters up to one nautical mile from shore) by 2015. Also includes the classification and monitoring of shellfish waters and sets limits on dangerous substances. However only covers area out to 1 nm.
D10 – marine litter	Waste Framework Directive; HD; WFD; UWWTD; BWD; MSP; PRF Directive; Agenda 21; OSPAR Convention; Directive 1999/31/EC. (International Conventions: UNCLOS; London Protocol; IMO Conventions e.g. MARPOL; Basel Convention; CBD)	
D11 – underwater noise	HD (for Article 12); OSPAR Convention (International Conventions & Organisations: Bonn Convention; IMO Convention; the International Whaling Commission; IUCN)	

Abbreviations: BWD = Bathing Water Directive; BWM = Ballast Water Management Convention; CBD = Convention of Biological Diversity; CFP = Common Fisheries Policy; CITES = Convention on International Trade in Endangered Species of Wild Fauna and Flora;

EIA = Environmental Impact Assessment Directive; EUBS = European Biodiversity Strategy; HD = Habitats Directive; IED = Industrial Emissions Directive; ICES = International Council for the Exploration of the Seas; IUCN = International Union for Conservation of Nature; OSPAR QSR = OSPAR Quality Status Report; MARPOL = International Convention for the Prevention of Pollution from Ships; MSP = Maritime Spatial Planning Directive; ND = Nitrates Directive; PRF = Port Reception Facilities Directive; PSD = Priority Substance Directive; REACH = Registration, Evaluation, Authorisation and Restriction of Chemicals; Stockholm Convention = on Persistent Organic Pollutants; UNCLOS = United Nations Convention on the Law of the Sea; UNEP = United Nations Environment Programme; UWWTD = Urban Wastewater Treatment Directive; WB = Birds Directive; WFD = Water Framework Directive.

### 3.3. Greece

At the time of this analysis, Greece was the only Member State failing to adhere to the MSFD timeline as clearly highlighted in red in the EU scoreboard (European Commission, 2016b). Greece has failed to submit its plans for MSFD monitoring and is currently under pressure, and under threat of infraction proceedings, to remedy this as soon as possible. Proposals for MSFD monitoring plans do exist but these are neither agreed or publically available as the process had to go through an open tender process, which to date has failed twice for mainly technical reasons (e.g. incomplete tender applications). The Greek monitoring programme is expected to rely on existing monitoring schemes with few additions (e.g. spatial extension of sampling or parameters added). Discussions started early within the scientific and NGO communities (for example at an MSFD open day in early 2013) on both content (e.g. sharing data gathering per descriptor) and possible ways to finance the MSFD monitoring. This included relying on existing data collection programmes such as for WFD or the fisheries DCF, using NGOs for mammals, reptiles and litter, or exploring the use of citizen science schemes (e.g. jellyfish and aliens). Despite this, progress on MSFD implementation is still very slow. A notable exception is the co-financing (by 85% through the European Economic Area and Norway Grants) of large infrastructure and equipment to be used for data collection for monitoring programmes and assessments for the MSFD (EFSPED, 2015). For a country facing numerous fiscal and societal challenges, failing to deliver on time and lagging behind in compliance is perhaps not surprising, and this is also the case for designing and publicising the Greek PoM.

Greece is not the only Member State to have failed to meet the deadline. Out of eight Member States in the Mediterranean region, only four (Cyprus, France, Slovenia and Spain) have met the timeframe of the MSFD implementation and complied with the requirements of Article

19 to organise a public consultation on their proposed PoM (EU MED, 2016). Although the content of the proposed Greek PoM is not yet publicly available, it is expected that measures will not go far beyond existing obligations and environmental measures arising from current EU and other policies. It is likely that studies will be undertaken to fill in the gaps in protection and spatial conservation measures. Moreover, several biodiversity GES targets under D1 and D6 are intrinsically linked with threatened species and with priority species and habitats under the Natura 2000 directives, as well as the Mediterranean Regulation and other regional and national protection schemes.

### 4. Other challenges to achieving GES – Blue Growth

There are several activities regulated by other measures outside the MSFD (e.g. shipping, renewable energy) which may affect Member States achieving GES. Current and developing policies, in particular Blue Growth initiatives (COM(2012) 494 final) that aim to develop social and economic growth within European seas, although generally perceived as a positive opportunity, may conflict with the objectives of the MSFD or pose governance risks (European Union, 2012; Freire-Gibb et al., 2014; Piante and Ody, 2015). The BLUEMED initiative, a Mediterranean initiative supported by nine Member States with the support of the European Commission, is a recent strategic framework for working towards a healthy, productive and resilient sea that is better known and valued. It is linked to Blue Growth and it is designed to fully exploit the marine and maritime sectors, structuring transnational co-operation for the creation of blue jobs and the improvement of social wellbeing, sustainable prosperity and the environmental status of the region (BLUEMED SRIA, 2015). The Mediterranean Sea is currently facing a 'blue gold rush', driven among others by an increasing growth of trade between Europe and Asia, energy demands linked to oil-gas

exploration contracts, as well as traditional (except fisheries) maritime sectors which are all expected to expand to 2030 (Piante and Ody, 2015).

Key sectoral Blue Growth-enabling maritime industries include shipping (particularly yachting and the cruise industry, sustainable tourism and green maritime transport), renewable energy, large-scale offshore aquaculture, seabed mining and blue biotechnology. These have been highlighted as rapidly developing sectors for which there is currently limited regulation (Boyes and Elliott, 2014) and relatively little is known about the offshore ecosystems where they occur. Article 13(5) of the MSFD states that where Member States consider that an activity regulated at a Community or international level is likely to have a

significant impact on the marine environment, the competent authority or international organisation should be approached to adopt a measure in order to achieve GES (European Commission, 2014d). However, given that many international instruments and agreements are legally non-binding, enforcement may be a challenge.

The shipping sector is regulated by standard setting at the international level by the International Maritime Organisation (IMO), which aims to improve safety and security of shipping and prevent marine pollution from ships, and through national implementation of shipping legislation through flag states. IMO establishes legal instruments, with IMO signatories responsible for implementing them. Conventions become binding upon governments who have ratified them and who should

**Table 3**

Current evidence concerning legislative, policy and regulatory barriers to achieving GES.

Topic	Specific barrier	Gaps/issues	Current Initiatives (CI) & Recommendations (Rec)
Weaknesses in the Directive	It is a 'framework' directive.  A 'watering down' of the Directive text.    Com Decision 2010/477/EU provides little clarification.	<ul style="list-style-type: none"> <li>Allows different interpretations of the text by Member States</li> <li>'Aim' – provides no binding commitment</li> <li>'GES' – not well defined and no quantitative description provided</li> <li>No clear definition between GES and targets</li> <li>Give 'due consideration' to sustainable development</li> <li>Legitimate 'get out clauses' for not achieving GES e.g. Imperative Reasons of Overriding Public Interest (IROPI)</li> <li>Economically unfeasible</li> <li>Very few standards included</li> <li>Some indicators still left open to interpretation by Member States</li> <li>Criteria and methodology for determining GES unclear</li> </ul>	<p>CI: The Common Implementation Structure (CIS) has been developed to ensure EU coordination and facilitate the implementation of the MSFD by Member States (European Commission, 2014d) (however see below).</p> <p>Rec: To continue the clarification and harmonisation of concepts within and between Member States and regional seas.</p> <p>Rec: Terms need to be clearly and unambiguously defined and subsequently used consistently throughout the EU Commission Decision (Berg et al., 2015)</p> <p>Rec: To use the proposed GES definition and recommendations for clarifying the text of the MSFD (Borja et al., 2015; Patrício et al., 2014a)</p> <p>Rec: To continue the coordination through the Regional Sea Conventions</p>
Reliance and Integration of current policies to achieve GES	Failure to achieve GES if MSFD is not consolidated with other directives	<ul style="list-style-type: none"> <li>Need to ensure the indicators of GES are compatible with the indicators suggested in other directives e.g. FCS in the Natura 2000 directives and Good Ecological Status in the WFD</li> <li>There is little or no reference in the MSFD text to the CFP, particularly in relation to (D3) Commercial fish.</li> <li>The DCF Regulation contributes to achieving the objectives of the MSFD. However, little/no references in the MSFD text to the DCF are found.</li> <li>There is little joint effort stated between MSFD, WFD and CFP with respect to the definition of the indicators, targets, etc., which are needed to evaluate the GES.</li> <li>There is no joint effort between the MSFD, WFD, DCF, MSP, IMP and the Natura 2000 directives in relation to the data collection process.</li> <li>Time lag problems between directives targets represents an additional barrier, which affects both the implementation of future directives as well existing implemented ones, which may be difficult to amend and update procedures.</li> <li>Habitats Directive is an older directive and although not strongly linked to the MSFD, some aspects are considered, which are of interest to the MSFD: Nevertheless, there is no direct mention of the criteria the Habitats Directive establishes within the MSFD.</li> </ul>	<p>Rec: Ensure the aims of other directives are utilised as a starting point for GES</p> <p>Rec: To emphasise coordination across stakeholders involved in the implementation of the different directives within/between countries.</p> <p>Rec: To establish a minimum implementation programme feasible in bio-economic terms and according the Action Plans (MSFD, IMP). This implies, the necessity of harmonising concepts and methods across Member States and Regional Seas.</p> <p>Rec: To try to cover lags between directives themselves or proposed directives.</p> <p>Rec: To ensure existing directives are included in future/upcoming directives, and when necessary to amend existing ones.</p> <p>Rec: To encourage Member States to systematically use standards already used within other EU legislation (e.g. the CFP, WFD, the Habitats Directive) as minimum requirements.</p>
Reliance and Integration of current policies to achieve GES	How to ensure seamless integration with other directives	<ul style="list-style-type: none"> <li>Spatial considerations and anomalies in EU legislation including the problems created by the overlap in space of the WFD, MSFD, Natura 2000 Directives and the MSP Directive, as well as the CFP.</li> <li>Consideration of which piece of legislation takes precedence in an area and so whether the definitions of 'Good Status', GES (MSFD), GECs (WFD) or FCS (Habitats Directive), are in agreement.</li> <li>Spatial anomalies in the proposed system whereby marine areas may fail under GES and yet still be given the status as SPAs and SACs under the Habitats and Wild Birds Directives.</li> </ul>	<p>Rec: It is recommended that the WFD takes precedence over the MSFD in the near-shore area and the Habitats Directive in designated areas of conservation.</p> <p>Rec: For components which are not included in the WFD (e.g. noise, alien species), the MSFD should take precedence for these descriptors.</p>

Abbreviations: CFP = Common Fisheries Policy; DCF = Data Collection Framework Regulation; FCS = Favourable Conservation Status under the Habitats Directive; GES = Good Environmental Status under the MSFD; GECs = Good Ecological Status under the WFD; IMP = Integrated Maritime Policy; MSFD = Marine Strategy Framework Directive; MSP = Maritime Spatial Planning Directive; Natura 2000 = Habitats and Wild Birds directives; SAC = Special Area of Conservation under the Habitats Directive; SPA = Special Protection Area under the Wild Birds Directive; WFD = Water Framework Directive.



incorporate them in national law. The conventions regulating commercial shipping will be influential to achieving GES (Knights et al., 2011; Salomon and Dross, 2013), particularly when resulting pressures include introducing alien species, marine noise, pathogens, abrasion, marine litter and synthetic and non-synthetic compounds (Boudouresque et al., 2012; Boteler et al., 2014). Two important IMO Conventions which should help to achieve GES are the as yet unratified International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWM) 2004, which is relevant to (D2) Non-indigenous species, (D1) Biological diversity and (D6) Sea-floor integrity (Katsanevakis et al., 2014), and the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto and by the Protocol of 1997 (MARPOL) concerning various forms of pollution, including sewage and garbage. This creates measures primarily relevant to (D5) Eutrophication, (D10) Marine litter and (D8 & D9) Pollution and Contaminants respectively. For GES to be achieved, shipping activities will have to be managed in a complementary way, with International Conventions and Agreements helping to achieve GES, for example the Agreement on the Conservation of Cetaceans in the Black Sea Mediterranean Sea and Contiguous Atlantic Area (ACCOBAMS) and the Agreement on the Conservation of Small Cetaceans in the Baltic, North East Atlantic, Irish and North Seas (ASCOBANS).

The Renewable Energy Directive (2009/28/EC) requires Member States to obtain 20% of its energy from renewable sources by 2020. This requires a substantial expansion in offshore renewable activity which may affect the ecological characteristics of predominant habitats, increasing the risk of failing to achieve GES for (D6) Seafloor integrity (DECC, 2009; Knights et al., 2011; Boyes et al., 2015). Similarly, the Carbon Capture and Storage Directive (CCS) (2009/31/EC) aims to reduce atmospheric CO<sub>2</sub> through geological subsurface storage. Bigagli (2015) argues that trade-offs could be accepted in this view, which may damage the seafloor and hamper the achievement of GES (D6) Seafloor integrity. Other offshore construction works, including physical barriers and engineering works to prevent or limit coastal erosion and flooding, could adversely affect (D6) Seafloor integrity and, more generally, (D7) Hydrographical conditions.

## 5. Summary and recommendations

Fig. 1 highlights the difficulty of balancing Blue Growth and the implementation of the different EU directives. Directives have different geographical limits and competencies; for example, planning at the EIA stage, conservation by the Natura 2000 directives, multiple footprints by Cumulative Impacts and Strategic Environmental Assessment. It is not yet clear if the combined measures can account for the spatial and temporal footprints of the various activities. Zampoukas et al. (2013) and Bigagli (2015) concluded there were many gaps such as the protection afforded to specific species and habitats under the Natura 2000 directives, the 1 nm of coastal waters covered by the WFD, and the CFP only protecting certain fish stocks.

While Member States were required to produce a PoM by 2015, as shown here, they are clearly at differing stages. The UK consulted on and finalised its PoM in December 2015 with a heavy reliance on existing policy meeting the needs of the MSFD to reduce the administrative burden for the competent authorities, although these existing measures may be insufficient to achieve GES. The UK PoM includes monitoring under its list of measures when in reality this is only a tool which can identify a measure being effective. The Spanish PoM closed its public consultation process in spring 2016, with the PoM identifying existing measures from current EU and national legislation and including new measures required to fill in the gaps. At the other end of the scale, by spring 2016 Greece currently had no proposed PoM. This highlights the difficulties for certain countries to implement this directive within the tight deadlines, not only in documenting the measures but also enacting them.

The MSFD has to compete with the Blue Growth agenda and the seeming promotion of these initiatives through the MSP Directive. The prevailing economic/political interests in Europe may prevent achieving environmental objectives, for example finance ministers suggesting that environmental constraints should be loosened given the industry current financial difficulties, hence the emphasis of Blue Growth over environmental protection. The developing marine sectors may also require additional governance if amendments to existing legislation are unfeasible. Cross (2015) considered that Blue Growth initiatives directly conflict with the precautionary principle which is at the core of the MSFD, opposing the environmental ethos and targets required under the MSFD. For GES to be achieved, maritime and other shipping activities will have to be managed in a complementary way, with International Conventions and Agreements helping to achieve GES. A fundamental challenge is the balance between growth (Blue Growth agenda) and environmental protection (MSFD).

Table 3 summarises the legislative, policy and regulatory barriers to achieving GES, identifies the gaps, lists current initiatives and provides recommendations. These include:

- The aims of other directives should be a starting point for GES, with time lags between directives or proposed directives minimised. A Regulatory Impact Assessment should include clear mention of existing directives in future directives, and as necessary to amend existing ones.
- Member States should be required to systematically use current standards from other EU legislation (e.g. CFP, WFD, Natura 2000 directives) as minimum requirements.
- Links between the MSFD and other directives require support by operative tools to ease the implementation of the directives.
- Transparency and comparability in assessments will be required for transboundary issues, and data usage and flow of information will require open access.
- Coherence within and between the Member State legislation will be required.
- Coherence between the MSP Directive and the MSFD would help to achieve the sustainable aims of both while balancing this with development objectives, for example, renewable energy targets and good practice in shipping routes.
- The involvement of citizen scientists and NGOs through dedicated networks can be rewarding in producing further data (Zenetos et al., 2013; Patrício et al., 2014b).
- COM Decision 2010/477/EU (European Commission, 2010) on criteria and methodological standards on good environmental status of marine waters (GES Decision) recommends how Member States should integrate other policies, together with clarification and harmonisation of definitions and methodologies within and between Member States. This requires a Common Implementation Strategy (CIS) to ensure co-ordination in implementation of the MSFD (European Commission, 2014d; Patrício et al., 2014a). It is of note that a first draft proposal of the COM Decision was presented in January 2016 for a revised GES Decision. If adopted, this could help Member States in assessing progress in the implementation of the PoM.
- The CIS requires continual adaptation to cope with new challenges through consultation with Member States, RSCs and other relevant actors such as the Joint Research Centre (JRC), the International Council for the Exploration of the Sea (ICES) and JPI Oceans. The Commission Staff Working Document (CSWD, 2014) which dedicates most of its recommendations to improve adequacy and coherence of defining GES and its targets should also be widely used.

## 6. Is existing legislation fit-for-purpose to achieve GES?

This paper has reviewed the barriers and opportunities existing legislation provides for achieving GES. Article 13 of the MSFD lists EU directives and policies which Member States are encouraged to integrate, or

whose existing measures should be taken into account of, when developing their PoM. The requirements to meet any EU directive, and particularly the MSFD, is often a complex, time and resource-consuming process. However the overreliance and 'shoehorning' of measures provided by existing legislation may be to the detriment of environmental protection and achieving GES when considering their geographical extent, policy timelines and existing measures. Salomon and Dross (2013) and van Leeuwen et al. (2014) consider the MSFD has a limited capacity to overcome this fragmentation and coordinate with existing legislation. The Marine Strategy Coordination Group have discussed the use of existing European and international policies to help implement the MSFD, although coordinating different Directorates-General to harmonise different pieces of legislation remains a challenge (van Leeuwen et al., 2014; Cavallo et al., 2016).

All areas of the marine environment are currently being managed by some piece of legislation (Boyes and Elliott, 2014), and these existing EU and national legislation form a good platform for the development and implementation of the PoM. However relying on existing measures and monitoring is likely to lead to anomalies and gaps, and Member States should consider new measures where necessary to achieve GES under the MSFD. Creating new measures and increasing the coordination across the existing legislative instruments and between competent authorities will be central to fully implement the MSFD. It is acknowledged that extending the existing monitoring and in some cases creating new measures to cover all marine waters and encompassing ecosystems will definitely be a challenge for EU Member States.

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