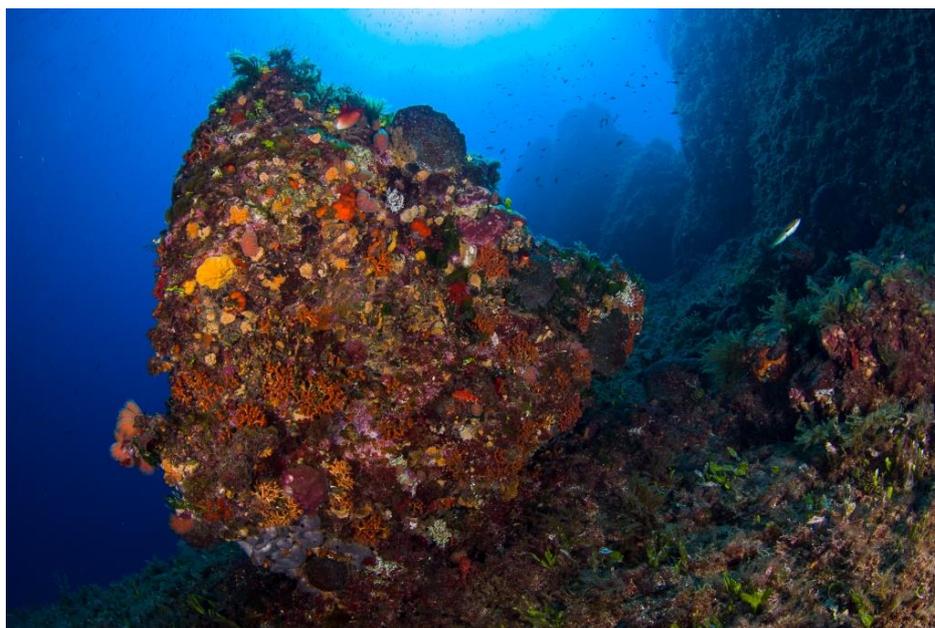


JRC TECHNICAL REPORT



Review of the Commission Decision 2010/477/EU concerning MSFD criteria for assessing Good Environmental Status

Descriptor 1

Biological diversity is maintained. The quality and occurrence of habitats and the distribution and abundance of species are in line with the prevailing physiographic, geographic and climate conditions.

Ed.: Andreas Palialexis
2015

Abstract

This report represents the result of the scientific and technical review of Commission Decision 2010/477/EU in relation to Descriptor 1. The review has been carried out by the EC JRC together with experts nominated by EU Member States, and has considered contributions from the GES Working Group in accordance with the roadmap set out in the MSFD implementation strategy (agreed on at the 11th CIS MSCG meeting).

The report is one of a series of reports (review manuals) including Descriptors 1, 2, 5, 7, 8, 9, 10 that conclude phase 1 of the review process and, as agreed within the MSFD Common Implementation Strategy, are the basis for review phase 2, towards an eventual revision of the Commission Decision 2010/477/EU.

The report presents the state of the technical discussions as of 30 April 2015 (document version 6.0); as some discussions are ongoing, it does not contain agreed conclusions on all issues.

The views expressed in the document do not necessarily represent the views of the European Commission.

The cover image has been kindly provided by Yiannis Issaris.

Foreword

The MSFD Committee (Art. 25 of the MSFD) discussed and concluded an approach and an outline for the review and possible revision of the Commission Decision 2010/477/EU on criteria and methodological standards Good Environmental Status (GES) of marine waters and of MSFD Annex III (see Committee/07/2013/03rev for details). Based on the template in the annex to the mandate of the MSFD Committee, a more detailed manual for the technical phase relating to the review of Commission Decision 2010/477/EC has been developed to guide the parallel preparatory process and discussions per descriptor. The review will aim to define GES criteria more precisely, including setting quantifiable boundaries where possible and specifications and standardised methods for GES assessment, in particular as regards temporal and spatial aggregation. The review of Annex III will be carried out as a parallel process. The review of the Common Understanding Document is also being carried out alongside these two processes. Close coordination between these three processes should be ensured.

This report represents the result of the scientific and technical review of Commission Decision 2010/477/EU in relation to Descriptor 1. The review has been carried out by the EC JRC together with experts nominated by EU Member States, and has considered contributions from the GES Working Group in accordance with the roadmap set out in the MSFD implementation strategy (agreed on at the 11th CIS MSCG meeting).

The report is one of a series of reports (review manuals) including Descriptors 1, 2, 5, 7, 8, 9, 10 that conclude phase 1 of the review process and, as agreed within the MSFD Common Implementation Strategy, are the basis for review phase 2, towards an eventual revision of the Commission Decision 2010/477/EU. The report presents the state of the technical discussions as of 30 April 2015 (document version 6.0); as some discussions are ongoing, it does not contain agreed conclusions on all issues. The views expressed in the document do not necessarily represent the views of the European Commission.

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Contents

- 1. *Approach* 1
 - 1.1 General guiding principles for the review 1
 - 1.2 Overall reflection on the type of descriptor, its criteria (e.g. state/pressure, quantitative/qualitative) and its relationship with Article 3(5) 3
 - 1.3 Linkages with existing relevant EU legal requirements, standards and limit values, such as the WFD, and the identification of potential incoherence 4
 - 1.4 Linkages with international and RSC norms and standards 8
 - 1.5 Clarification of the relevant scientific, technical and policy terminology in relation to the descriptor 10
 - 1.6 Descriptor specificities should be highlighted and justified (e.g. if it is recommended to combine several descriptors) 10
 - 1.7 An analysis of whether the criteria and/or indicators and/or methodological standards for the particular descriptor are likely to be common across the EU or need aspects to be specific at region or other scales..... 13
 - 1.8 The "climate sensitivity" for D1 (or criteria/indicators) 14
 - 1.9 An indication of whether a quantitative GES definition for the descriptor will be possible or whether a only qualitative/normative definition should be used (on the basis of Article 3(5)) 15
- 2. *Analysis of the implementation process*..... 15
 - 2.1 Based on the Commission/Milieu Article 12 reports and the JRC’s in-depth assessments, a detailed summary of the findings of Article 12 relating to the determination of GES, and specifically the use of the Decision criteria and indicators, should be made 15
 - 2.2 Identification of any questions arising from the application of the current Decision, including those identified by the Article 12 assessment 18
 - 2.3 Relevant data from other sources that are specific to every descriptor and recent findings from MSs should also be considered 19
 - 2.4 Good examples and approaches applied by MSs, especially if used by multiple MSs, and shortcomings should be listed systematically 24
 - 2.5 Differences and similarities between regions 24
- 3. *Analysis of the current text of the Decision*..... 24
 - 3.1 Analysis of the current text of the Decision, identifying in particular those parts which are best placed for guidance, those parts which are interpretative or explicative, and those parts which need to be kept in the Decision in accordance with the mandate provided by the Directive. 24
 - 3.2 Identification of needs for guidance 26
 - 3.3 An analysis of what to keep should take place, including specification on what may be out dated or may need to be aligned with other or new legislation, etc..... 27
- 4. *Identification of issues*..... 28

4.1 Main findings and information that will be used in the next step of the revision process	28
5. <i>GES criteria (in accordance with Art. 9.3)</i>	30
5.1 Conclude on the use of the existing Decision criteria and indicators, in the light of the "refined" common understanding, the findings of the Article 12 assessment and relevant international, EU and RSC legislation and approaches	30
5.2 Recommendation as to which criteria to retain, amend or remove.....	31
5.3 Proposals for new criteria	40
5.4 Rationale and proposals, where appropriate, for defining GES threshold values and reference points, based on established and agreed scientific methods for quantifying and applying GES boundaries, or for a normative definition of GES	41
6. <i>GES methodological standards (in accordance with Art. 9.3)</i>	42
6.1 Proposals for (new) methodological standards to be applied to the criteria in order to assess whether GES has been achieved for the descriptor (e.g. aggregation/integration methods across the criteria and across the quality elements, e.g. across contaminants, species, habitats), using JRC / ICES / RSC protocols, Article 12 findings and guidance from the Scales project, as appropriate.....	42
7. <i>Specifications and standardised methods for monitoring and assessment (in accordance with Art. 11(4))</i>	45
7.1 Proposals for specifications of methods for monitoring (i.e. the collection of data needed to assess each criterion, including parameters, units of measurement and data quality requirements), which aim to ensure the comparability of monitoring results, on the basis of existing survey protocols and relevant European/international standards (e.g. ISO/CEN).....	45
7.2 Proposals for specifications on methods for assessment, which aim to ensure comparability of assessment results, including aggregation of monitoring data within an assessment area for a particular criterion and, if necessary, aggregation across assessment areas up to larger areas (e.g. (sub) regional scales), based on general guidance prepared on scales and aggregation rules ²³ and taking account of JRC / ICES / RSC inventories and Article 12 findings	47
8. <i>Rational and technical background for proposed revision</i>	47
8.1 Justification and technical background justifying the abovementioned proposals.....	47
9. <i>Other related products (e.g. technical guidance, reference in the common understanding document)</i>	47
9.1 Where aspects are identified which should be usefully laid down but not as part of the decision, these elements should be specified and a proposal should be made in which way they should be laid down, e.g. interpretative guide for the application of the future Decision or Common Understanding guidance document or technical background document.....	47
10. <i>Reference Documents</i>	49

1. Approach

1.1 General guiding principles for the review

This review aims to analyse the results of the first MSFD reporting round on Articles 8, 9, and 10 with a view to updating and simplifying the Commission Decision (COM DEC) 2010/477/EU. Based on the Information in the Art 12 assessment reports (COM 2014/97) and the in-depth assessments carried out by the JRC (Palialexis et al., 2014¹), a template has been prepared by Milieu for DG ENV, commented on by DG ENV and completed by the JRC which should enable the experts group to analyse current shortcomings, propose ways forward (such as e.g. needs for further guidance and development), and also to develop proposals for amending the COM DEC 2010/477/EU, based on scientific knowledge and experience gained through the implementation process.

The current review should lead to a new GES Decision which is:

- Simpler
- Clearer
- Introducing minimum requirements (to be enhanced by regions and MS, if necessary)
- Self-explanatory
- Coherent with other EU legislation
- Coherent with regional assessment methods (where EU-wide assessment methods do not exist)
- Have a clear and minimum common list of criteria and methodological standards and related characteristics (Table 1, Annex III), at least at a sub-regional scale
- Ensure that proposed criteria and methodological standards adequately address the MSFD Descriptors, in order to facilitate complete assessments
- Coherent with the MSFD terminology

¹ Palialexis A., Tornero A. V., Barbone E., Gonzalez D., Hanke G., Cardoso A. C., Hoepffner N., Katsanevakis S., Somma F., Zampoukas N., 2014. In-Depth Assessment of the EU Member States' Submissions for the Marine Strategy Framework Directive under articles 8, 9 and 10. EUR – Scientific and Technical Research series. Luxembourg: Publications Office of the European Union. EUR 26473 EN, 149 pp. doi: 10.2788/64014.

This review should lead to a more coherent approach to the definition of GES based on agreed criteria and methodological standards that help determine the distance of the current state from GES. Figure 1 shows an example of the link between MSFD terminology and the current approach taken by EU legislations. This can be used as guideline for the characteristics/elements to be addressed under Annex III and the revised Decision, and to streamline the discussion to be held through the review process.

MSFD provision	Role/contents	Applied example
Art. 3 (5) GES definition	Goal	GES by 2020: "the environmental status of marine waters where ..."
Annex I GES descriptor	Quality objective	D1: "Biological diversity is maintained. The quality and occurrence of ..."
Annex III GES elements	Assessment elements	Birds, mammals , reptiles, fish, seabed habitats, water column habitats
Art. 9(3) GES criteria and methodological standards	EU-wide minimum specifications: Criteria: a. Assessment elements b. Assessment parameters c. Reference points (baseline and GES boundary values) Methodological standards: d. Assessment tools and procedures e. Assessment scale (generic)	Example: Mammals a. List of mammal functional groups (e.g. seals, small cetaceans) b. Distribution, population size, health condition c. Reference condition and acceptable deviation values (cf FCS target levels of Habitats Directive) d. FCS aggregation procedures/methods e. Cetaceans at subregional scale; seals at subdivision scale (nested approach)
Art. 9(1) Determination of GES	Sub(regional) specification by MS: a. Further specify criteria and methodological standards (e.g. RSC region/subregion-specific assessment elements, common indicators and assessment tools) b. Additional characteristics for region/subregion	Example: North-East Atlantic a. Harbour seal, grey seal b. OSPAR common indicators: • M-1 Distribution of seals • M-3 Abundance of seals • M-5 Seal pup production c. OSPAR-defined subdivisions of subregions (nested approach)
Art. 11(4) – Specifications and standardised methods for monitoring and assessment: e.g. EU-wide minimum specifications for spatial and temporal resolution of monitoring, monitoring methods (sampling, analysis, QA/QC), scaling, aggregation rules		

Figure 1. Interpretation of Art. 9 of the MSFD for Descriptor 1²

The following points summarise the role of GES in the MSFD. According to the Directive, GES is:

- the starting and end point of the MSFD
- the reference point for the other MSFD provisions
- determined at the level of marine (sub)regions
- specified by common criteria and methodological standards
- subject to a legal deadline (2020) and to legally defined exceptions where this is not feasible

GES needs to ideally be quantified/quantifiable or measurable in order to determine how far the current state is from GES, and targets need to monitor the progress towards attaining GES³.

² Cross-cutting meeting Copenhagen 21-22 January 2015. https://circabc.europa.eu/d/a/workspace/SpacesStore/c47780cf-3fd6-4807-92c1-15a78a3ee29b/1501_GES_CCworkshop_Session%201.ppt

³ From DG ENV's presentation in the WG GES group held in March 2014: https://circabc.europa.eu/d/a/workspace/SpacesStore/2e3f1f2f-c1ef-407f-a433-12cf73e9e61b/GES_11-2014-13_CommonUnderstanding.ppt

According to COM DEC 2010/477/EU GES Art. 9(1), MS should determine GES at the level of criteria for each assessed element at a certain scale. This is the lowest quantifiable assessment block, which will be aggregated to provide the overall GES for the marine ecosystem (see section 6.2 for aggregation rules).

1.2 Overall reflection on the type of descriptor, its criteria (e.g. state/pressure, quantitative/qualitative) and its relationship with Article 3(5)

According to MSFD Annex I for the biological diversity descriptor D1, GES means the environmental status of marine waters, where “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 climate conditions”. An ICES-JRC expert Task Group (TG1), established in 2009, prepared the scientific basis for developing the COM DEC 2010/477/EC and has in this context addressed the definition/interpretation of key terms included in the descriptor of biodiversity, i.e. the concepts of the terms ‘biological diversity’ and ‘maintained’.

For the purpose of its mission, TG1 adopted the definition of the Convention on Biological Diversity (CBD) for **‘biological diversity’**: “the variability among living organisms from all sources including, *inter alia*, [terrestrial,] marine [and other aquatic ecosystems] and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems”⁴. Table 1 in Annex III of the MSFD lists biodiversity-related features that should be considered in the implementation.

The term **‘maintained’** is key to the quantification of GES for Descriptor 1 and thus for the elaboration of recommendations on criteria and methodological standards. The TG1 has associated the condition (‘maintained’) to three determining factors: “a) no further loss of the diversity within species, between species and of habitats/communities and ecosystems at ecologically relevant scales, b) any deteriorated attributes of biological diversity are restored to and maintained at or above target levels, where intrinsic conditions allow (cf. Art. 1.2 a) and c) where the use of the marine environment is sustainable”.

The term **‘habitat’** in this Descriptor addresses both the abiotic characteristics and the associated biological community, treating both elements together in the sense of the term biotope (COM DEC 2010/477/EU), whereas ‘quality’, ‘occurrence’, ‘distribution’, ‘extent’ and ‘abundance’ form the basis of the criteria standards used to assess GES.

Descriptor 1 (D1) has a broad scope, requiring assessment at several ecological levels: species, habitats (addressing both the abiotic characteristics and the associated biological community, treating both elements together) and ecosystems. At the species level, GES shall be defined for the full range of functional and taxonomic groups occurring in the marine environment, including the native angiosperms, macro-algae and invertebrate bottom fauna, phytoplankton, zooplankton, fish, mammals, reptiles, seabirds and cephalopods (Annex III, Table 1 of the MSFD).

⁴ Task Group 1 Report Biological diversity (2010) – the symbol [...] is used to replace text which is less relevant to the marine environment.

The MSFD requires Member States to understand and assess the condition of the typical species associated with the seabed and the pelagic habitats and the representative species of the functional groups (MSFD, TG1, SEC 2011/1255). Special attention is given to the listed species under EU Directives (the Birds Directive, the Habitats Directive) (MSFD paragraph 6; COM DEC 2010/477/EU paragraph 5) and international conventions (Helsinki, OSPAR, Barcelona, Bucharest) - also referred to Annex III, Table I of the MSFD.

At the habitat level, the determination of GES is required for the predominant habitat types (as defined in Annex III, Table 1 of the MSFD, in TG1 report and in the SEC 2011/1255) and the special habitat types listed under EU legislation or international conventions.

The determination of GES for biological diversity at the ecosystem level shall be based on an evaluation of the structure (composition and proportion) and interaction between the ecosystem components, and of the processes and functioning, connectivity and resilience of the ecosystem. This would be the level for biological traits and ecosystem services. Some of the aforementioned ecosystem attributes are also tackled by other descriptors (e.g. 4 and 6); one of the major tasks of the review process is to specify and clarify these links.

It is recognised that there are strong links between D1 (biodiversity per se), D4 (food webs) and D6 (sea-floor integrity), which are frequently addressed together as the “biodiversity theme” as the requirements for monitoring and assessing these descriptors partially overlap (e.g. Zampoukas et al., 2012⁵, Table 1). Thus, it is necessary to ensure that a coherent approach is taken to all the descriptors in order to avoid overlapping, contradictory and double assessments. Besides, all other descriptors include, more or less explicitly, effects on the “state” of various biodiversity components in at least one criterion (except implicitly for D11). Thus, the GES of “pressure” descriptors should be defined and assessed in line with the GES of “biodiversity” descriptors, in order to optimise: i) integrated indicators/monitoring standards (across criteria within and/or between Descriptors), ii) associated monitoring, and iii) efficient guidance for measures (pressure/state relationships).

Overall, for the MSFD, assessments of status focus on the following groups of highly mobile marine species: birds, mammals, reptiles, fish and cephalopods, and on the predominant habitat types of the water column and seabed together with their associated biological communities (SWD 2014/49). In addition to these broad categories, attention is also directed to specific species and habitat types that are listed for protection under the Birds and Habitats Directives and international agreements. Genetic- and ecosystem-level aspects are also important for the status characterisation.

1.3 Linkages with existing relevant EU legal requirements, standards and limit values, such as the WFD, and the identification of potential incoherence

The Habitats Directive (92/43/EEC)

⁵ Zampoukas N, Piha H, Bigagli E, Hoepffner N, Hanke G, Cardoso AC. 2012. Monitoring for the Marine Strategy Framework Directive: Requirements and options. JRC Scientific and Technical Reports. <http://publications.jrc.ec.europa.eu/repository/bitstream/11111111/23169/1/lbna25187enn.pdf>

The main aim of the Habitats Directive is to contribute towards ensuring biodiversity through the conservation of natural habitats and of wild fauna and flora. It requires that EU Member States take measures to ensure that the species and habitats “of community interest” listed in its annexes are protected so as to be in “favourable conservation status” (FCS).

The Habitats Directive specifically establishes the network of Special Areas of Conservation (SACs), which, together with the Special Protection Areas (SPAs) under the Birds Directive, form the Natura 2000 network of protected areas, including marine areas, as a mean to achieving FCS for the listed species and habitats. Each site in the network contributes to the attainment of FCS, but this objective is to be attained at the scale of the natural range of species or habitat type. The site level conservation objectives are based on identification of the contribution of the particular site to the Member States’ achievement of FCS for the habitats and species present in the whole area of the Member States.

Site objectives should be established for SACs under the Habitats Directive and also for special protected areas (SPAs) under the Birds Directive. The conservation objectives at the site level must take into consideration the following elements (COM Note on establishing conservation objectives for the Natura 2000 sites 23/11/2012):

- the ecological requirements of the species and habitat types listed in the Natura 2000 Standard Data Form and which have a significant presence
- the local, regional, national conservation status of the habitats and species
- the overall coherence of the Natura 2000 network
- the higher level conservation objectives at national/biogeographical level and how the site contributes to these.

Every six years, Member States are required to report on the status of the species and habitats, including their distribution within the territory of the Member State, and on the measures taken and their impact on the conservation status of concerned habitats and species. The assessment of whether a species or habitat is in FCS is based on specified criteria with principle threshold values⁶, with failure of any one criterion leading to a ‘below-FCS’ outcome (the ‘one-out-all-out’ principle). The assessment of FCS is carried out by biogeographic region. Where a Member State's territories lie in several biogeographic regions, separate assessments are required for the territory within each region. There is then an aggregation of assessments across the Member States to give the overall status per species and habitat at the level of the biogeographic region.

The Birds Directive (2009/147/EC)

The Birds Directive (BD) refers to the need for a sufficient diversity and area of habitats for listed bird species (Annex I of the BD) and migratory species that are not listed. It requires the establishment of measures to maintain the populations of these species, including the designation of

⁶ Annexes C and E of the following report:
http://www.bfn.de/fileadmin/MDB/documents/themen/monitoring/Art_17_Reporting_Formats.pdf

protected areas (Special Protection Areas)⁷. These measures should be reported every six years. The establishment of conservation measures should take into account trends and variations in populations. In 2007, bird species were assessed for the first time using the same FCS criteria and methodology as under the Habitats Directive. However, no threshold values had to be submitted in the 2007 report.

The Water Framework Directive (2000/60/EC)

In the marine environment, the Water Framework Directive (WFD) spatially covers 'transitional waters' and 'coastal waters' (coastal waters are also covered by the MSFD). The Directive aims to achieve good water status, which is assessed at the 'water body' scale. It considers both the good chemical status (whose specifications are relevant for other descriptors, but not for D1) and the good ecological status (GECS), which is defined in terms of the quality of the biological communities, the hydrological characteristics and the chemical characteristics (WFD, Annex V). The WFD does not explicitly mention biodiversity. However, taxonomic composition of phytoplankton, macrophytes and zoobenthos and their abundance/biomass are assessed as quality elements for the classification of ecological status⁸.

Specifying linkages across EU legislations

Even though the assessment classifications (FCS and GES) are different, the criteria for species and habitats in the MSFD and the Habitats Directive (HD) are very similar (Table 1), and offer good opportunities for optimising assessments (i.e. coherent methods based on common criteria). These criteria provide a 'framework' whereby only relevant criteria should be allocated for each species or habitat (e.g. habitat distributional range is not suitable for physically defined habitats).

⁷ Special Areas of Conservation (HD) and Special Protection Areas (BD) together comprise the **Natura 2000** network of protected areas.

⁸ JRC, 2014. In-depth Assessment of MS' submissions for MSFD Art. 8, 9 & 10

Table 1. Pairing MSFD species and habitats criteria with the Nature Directive’s criteria (from the cross-cutting workshop’s presentation⁹).

	MSFD (D1, 3, 4, 6)	BD & HD	IUCN Red List
Species	Distribution (1.1)	Range	Range (EEO, AOO)
	Population size (1.2); reproductive capacity (3.2)	Population	Population size Small population
	Population condition (1.3); age & size distribution (3.3)		Mature individuals incl. above
		Habitat for species	Habitat quality incl. in Range
		Future prospects	Included above
Habitats	Distribution (1.4)	Range	Quantity (extent of occurrence; area of occupancy)
	Extent (1.5)	Area covered	
	Condition (1.6, 6.2)	Structures & functions	Quality (biotic, abiotic)
		Future prospects	Included above

According to the “Links between MSFD and the Nature Directives¹⁰”, if FCS is not achieved at a particular level (Member State territory/region), and given that FCS and GES objectives are mutually supportive and assessed at similar scales, it could influence whether GES for biodiversity components is achieved for that level. Consequently, it should be acknowledged that the achievement of FCS for the relevant marine species and habitats is likely to be a key aspect in assessing the achievement of GES for the biodiversity component of the MSFD. Equally, measures taken under the Habitats Directive outside Natura 2000 sites to avoid deterioration of the features within SACs are likely to contribute to achieving GES. Despite the different objectives of these Directives, their assessments on habitats and species are comparable and MSFD has to consider existing assessments.

⁹ https://circabc.europa.eu/d/a/workspace/SpacesStore/b91483a7-e849-4664-b391-6bb6a667d39e/1501_GES_CCworkshop_Session%202-3.ppt

¹⁰ <https://circabc.europa.eu/d/a/workspace/SpacesStore/e67df5e9-21e0-4dbd-9778-ac4fb08fe1f7/Doc%209%20Links%20MSFD%20HBD%20FAQ.doc>

The Common Understanding document¹¹ encourages Member States to follow the classification of the relevant Directives as presented in Figure 2. In waters with overlapping regimes, the boundary for Good Environmental Status should preferably coincide with the boundaries/thresholds of “favourable conservation status” for the Habitats Directive and “good ecological status” and “good chemical status” for the Water Framework Directive. This is illustrated in relation to the degree of pressures and impacts from human activities. It should be noted, however, that these regimes are applied at differing scales and there may be cases where good status under the MSFD and WFD may not be sufficient to meet the specific objectives of the Birds and Habitats Directives¹⁰, and vice versa.

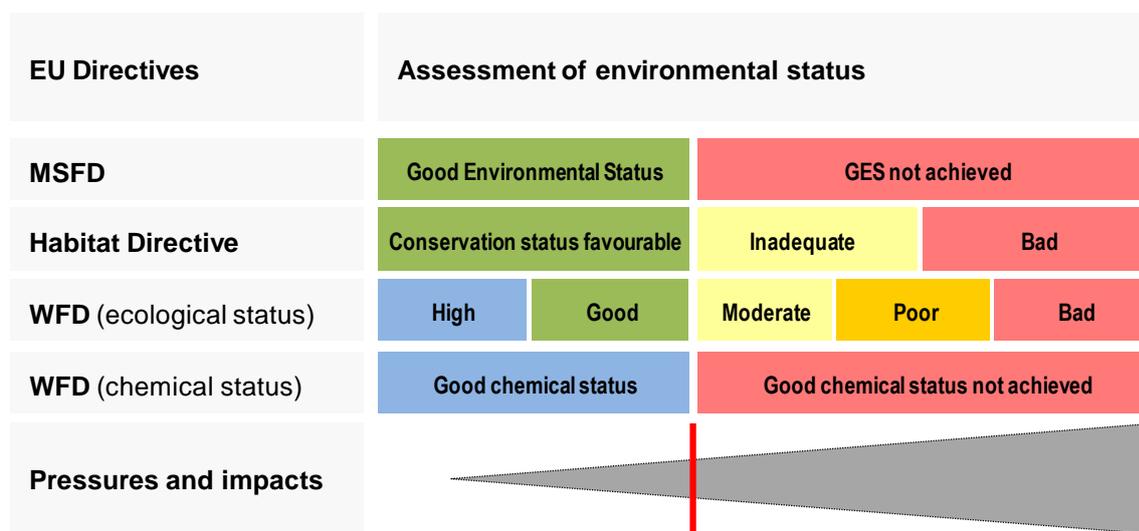


Figure 2: Classifications of the assessment of the environmental status under EU Directives. In waters with overlapping regimes, the boundary for Good Environmental Status should coincide with the boundaries for “Favourable Conservation Status” of the Habitats Directive and “Good Ecological Status” and “Good Chemical Status” of the Water Framework Directive (from the MSFD CIS document¹¹).

1.4 Linkages with international and RSC norms and standards

The **HELCOM CORESET** project developed initial proposals for core indicators. The CORESET II project (2013-2015) continues to develop these core indicators, and will potentially develop additional indicators to strengthen for example, the coverage of plankton. The core indicators were developed using the common principles agreed by HELCOM (HOD 35/2011). Currently, 20 core indicators are being developed for biological diversity: five core indicators cover benthic habitats and communities¹², four indicators cover mammals, five cover birds (one shared with mammals) and five cover fish. The pelagic or planktonic features have a weaker representation - with only one zooplankton indicator. The 20 biodiversity indicators relate to three MSFD descriptors, D1, D4 and

¹¹ MSFD CIS, Common Understanding of (Initial) Assessment, Determination of Good Environmental Status (GES) & Establishment of Environmental Targets. https://circabc.europa.eu/d/a/workspace/SpacesStore/ae13d0d6-8787-4d62-b2b6-1718cf760fe8/CommonUnderstandingArt.8-9-10_Nov2011.doc

¹² The HELCOM biodiversity CORESET indicators final report, 2013. An updated list of indicators will be found in the HELCOM Meeting Portal (<https://portal.helcom.fi/meetings/STATE-CONSERVATION%202015-232/default.aspx>) by the end of May 2015.

D6 (i.e. not just to D1). As a separate exercise, HELCOM has recently assessed the status of its species and habitats according to modified IUCN criteria and leading to Red Lists of species and habitats for the Baltic (HELCOM 2013).

The Intersessional Correspondence Group on the Coordination of Biodiversity Assessment and Monitoring (ICG-COBAM) is responsible for the coordination of **OSPAR's** biodiversity assessment and monitoring work under the guidance of the Biodiversity Committee, with a particular focus on the requirements of the MSFD in relation to biodiversity aspects. In March 2015, ICG COBAM adopted 15 common biodiversity indicators (3 for mammals, 2 for Birds, none for turtles, 2 for fish, 2 for benthic habitats, 2 for pelagic habitats, 2 for food webs, 1 common to pelagic and food webs, and 1 for non-indigenous species), all relevant for D1, but some also for D2, D4 or D6. These common indicators were tested in the 2014/2015 meeting cycle. Relevant common indicators will deliver to OSPAR's Intermediate Assessment in 2017, which will be recommended to EU Members States, to be considered for the 2018 reporting of MSFD Article 8, 9 and, where feasible, article 10. Further, several candidate biodiversity indicators may be promoted to common indicators in the future. The ICG COBAM continues to work on improving regional coordination for assessing and monitoring biodiversity descriptors under OSPAR.

The Contracting parties to the **Barcelona Convention** will gradually implement the Ecosystem Approach (EcAp) to the management of human activities in the Mediterranean, aiming to attain "A healthy Mediterranean with marine and coastal ecosystems that are productive and biologically diverse for the benefit of present and future generations"¹³ by May 2015. One of the three main goals of this approach is to preserve and restore marine biodiversity in the region. Indicators and monitoring programmes to support the 11 Ecological Objectives of the EcAp, including biodiversity objectives similar to those of the MSFD, are currently being developed; the process follows a similar approach to that of HELCOM and OSPAR, notably through the Integrated Correspondence Groups of GES and Targets (CORGEST) and the Correspondence Group on Monitoring (CORMON) Biodiversity and Fisheries. These recent groups work on issues relating to D1, D2, D3, D4 and D6.

With regard to the **Black Sea**, the policy on biodiversity is outlined in two key legally binding documents: the Black Sea Biodiversity and Landscape Conservation Protocol 2002 (BSBLCP), which entered into force in 2011, and the Black Sea Strategic Action Plan (BSSAP, 2009) for the environmental protection and rehabilitation of the Black Sea. The purpose of the BSBLCP is "to maintain the Black Sea ecosystem in good ecological state and its landscape in favourable conditions, to protect, to preserve and to sustainably manage the biological and landscape diversity of the Black Sea in order to enrich the biological resources". This Protocol stipulates a number of regional measures that are consistent with D1 "biodiversity is maintained". Towards this goal, in 2014, the contracting states were required to "adopt a list of species of Black Sea importance that may be threatened or important by reason of their role in ecosystem functioning or other significance for the region". The listed species "will be subject to special measures". The regional states "shall adopt a list of important landscapes and habitats of the Black Sea that may be threatened of destruction, or important by their nature, cultural or historical value, which constitute the natural, historical and cultural heritage or present other significance for the Black Sea region". In

¹³ Decision IG.17/6, Spain, 2008.

addition to BSBLCP provisions, the BSSAP determines the “Conservation of Black Sea Biodiversity and Habitats” as the second of four Ecosystem quality objectives (ECOQOs) towards achieving the overall long-term desired ecosystem state called “Vision for the Black Sea”. A couple of sub-objectives are formulated with regard to native biodiversity: EcoQO 2a - Reduce the risk of extinction of threatened species, and EcoQO 2b - Conserve coastal and marine habitats and landscapes. The management targets defined to achieve the EcoQOs of BSSAP are conceptually equivalent to the “operational targets” sensu MSFD for GES achievement¹⁴.

1.5 Clarification of the relevant scientific, technical and policy terminology in relation to the descriptor

The revision of the Common Understanding document is taken forward through the drafting group GES (WG GES 12/2014)¹⁵. The revision includes a new section on ‘Basic understandings’, which aims to provide a common interpretation of MSFD concepts and terminology. Annex 1 of the document is an expanded glossary of MSFD terms. The TG1 report provides a definition of key terms for D1 (see also section 1.2 of this document) and an analytical glossary of relevant terms to biological diversity and MSFD implementation. An agreed definitive glossary of terms based on existing practices and documents would be required to enhance common understanding. Biodiversity glossaries for the MSFD and D1 implementation are also included in documents prepared by the RSCs (e.g. OSPAR’s MSFD Advice Manual and Background Document on Biodiversity 2012¹⁶, annex 8.2) and the deliverables of research projects (e.g. DEVOTES recommendations for the implementation of the Marine Strategy Framework Directive, annex¹⁷; HARMONY’s glossary of terms commonly used in the Marine Strategy Framework Directive¹⁸).

The GES definition for D1 is split into three ecological levels in the Commission Decision (2010) addressing GES at species, habitat and ecosystem levels. The elements to be addressed under these three levels should take into account Annex III of the MSFD and be coherent with the requirements laid down in Directives 92/43/EEC and 2009/147/EC. The indicative lists of characteristics in Annex III of the MSFD (Table 1) can, however, be improved upon in order to promote consistency in their use by Member States (Patricio et al., 2014¹⁷).

1.6 Descriptor specificities should be highlighted and justified (e.g. if it is recommended to combine several descriptors)

Assessments at ecosystem level can be considered to have links to the assessment of food webs (Descriptor 4). The assessment of seabed habitats has links to Descriptor 6 on sea-floor integrity and

¹⁴ KnowSeas, Knowledge-based Sustainable Management for Europe’s Seas, 2013.

¹⁵ https://circabc.europa.eu/d/a/workspace/SpacesStore/d0c8db99-676b-4e79-937f-4bee634e8daf/GES_12_2014_06_Common_Understanding_final.doc

¹⁶ OSPAR (2012). MSFD Advice Manual and Background Document on Biodiversity. London, Publication Number: 581/2012, 141 pp. (available at: http://www.ospar.org/v_publications/download.asp?v1=p00581)

¹⁷ Patricio et al., 2014. DEVOTES recommendations for the implementation of the Marine Strategy Framework Directive. http://www.devotes-project.eu/wp-content/uploads/2014/10/DEVOTES_Deliverable-1-5.pdf

¹⁸ Andersen, J.H., Hansen, J.W., Mannerla, M., Korpinen, S. & Reker, J. 2013: A glossary of terms commonly used in the Marine Strategy Framework Directive. Aarhus University, DCE – Danish Centre for Environment and Energy, 32 pp. Technical Report from DCE – Danish Centre for Environment and Energy No. 16. <http://www.dmu.dk/Pub/TR16.pdf>,

also to Descriptor 7 (criteria on habitats affected by permanent hydrological changes). The status of commercial fish and shellfish under Descriptor 3, as part of fish and benthic community's biodiversity (but only for commercial species), may have input and linkages to the assessment of fish and seabed habitats under this descriptor (SWD 2014/49). Descriptor 1 has links to all the pressure-related descriptors (i.e. Descriptors 2, 3, 5, 6, 7, 8, 9, 10 and 11), due to the range of threats related to it. The selected elements (species, habitats, functional groups) in D1 should, where possible, be directly linked with the pressure descriptors, as the pressures and impacts have to be linked with specific ecosystem elements, to the extent that current knowledge allows.

Attention should be drawn on the fact that a clear separation between state and pressure descriptors is somewhat artificial, as the current Commission Decision stands. Several descriptors include both criteria of state and pressure, and there are even examples of criteria that mix types of indicators, state and pressure (Berg et al., 2015¹⁹).

Table 2 presents the overlapping/similar state criteria (or state indicators included in pressure criteria) and the level of the commonly assessed elements under those criteria. These overlaps have to be clarified, either by merging or synchronising the assessments or by simply eliminating the overlapped attributes. The review process and the directions given after the cross-cutting workshop²⁰ in respect of the integration of assessments contribute to tackling the aforementioned issues.

¹⁹ Berg T, Fürhaupter K, Teixeira H, Uusitalo L, Zampoukas N. 2015. The Marine Strategy Framework Directive and the ecosystem-based approach - pitfalls and solutions. *Mar. Pollut. Bull.*, <http://dx.doi.org/10.1016/j.marpolbul.2015.04.050>

²⁰ https://circabc.europa.eu/d/a/workspace/SpacesStore/9daafb84-fe4f-42ad-864f-21b338c8269b/CCWorkshop_Summary%20Notes_20022015_Final.docx

Table 2²¹. Descriptors that share common assessment elements, criteria and indicators. The review process needs to avoid overlaps, streamline the state descriptors towards an ecosystem-based management of human activities.

Descriptors	Elements → common lists	Overlapping Criteria
D1, D4 (ecosystem scale)	Species, Functional groups, Ecosystems	1.1, 1.2 + 4.2 & 1.7 + 4.2
D1, D6 (seabed habitats)	Habitats (predominant, special)	1.5, 1.6 + 6.1 & 1.7 + 6.2
D1, D3 (species groups)	Species, Functional groups	1.2 + 3.2 (3.2.2) 1.3 + 3.3
D1, D2 (species groups)	Species	2.1+1.2
D1, D5 (species groups)	Species, Functional groups	1.2 + 5.2 (5.2.3), 5.3 (5.3.1)
D1, D7 (habitats)	Habitats (predominant, special)	1.5, 1.6 + 7.2

Not only the overlaps presented in Table 2, but also the links across the Descriptors' criteria should be clarified to support a holistic assessment based on the ecosystem approach, which is further discussed in section 6. Annex V of the SEC 2011/1255 provides a comprehensive description that links pressure-impact and state indicators of the COM DEC 2010/477/EU with the MSFD's Annex III (Table 1) attributes. This table must be updated accordingly to support the review process and to be in line with the proposed changes. At the level of criteria, Figure 3 allocates the main pressures (P), to main state elements (S) through the main impacts criteria. The distinction between pressure and state at the criterion level is not so clear, e.g. D6 is more pressure/impact, while D7 is more an impact descriptor than a pressure descriptor (hydrological changes typically stem from physical infrastructures (i.e. a consequent impact). Assessments of impacts from pressures need to be clearly related to state components (i.e. at similar resolution to the state elements being assessed).

			Physical damage	Hydrological	Energy, incl. UW noise	Nutrients	Contam-inants	Litter	Fishing/ by-catch	Non Indigenous Species	
		P S	6.1	7.1	11.1, 11.2	5.1	8.1, 9.1	10.1	3.1	2.1	
Ecosystem 1.7, 4.1-4.3	Birds	1.1-1.3					8.2	10.2		2.2	
	Mammals	1.1-1.3									
	Reptiles	1.1-1.3									
	Fish	1.1-1.3							3.2, 3.3		
	Water	1.4-1.6				5.2, 5.3					
	Seabed	1.4-1.6	6.2	7.2			8.2	3.2			

Figure 3: 2010/477/EU Decision criteria allocated to main pressures (P) and main state elements (S) through the main impacts (modified from the cross-cutting workshop presentation²¹).

More effort is needed for the identification of particular impacts on the assessed state elements, which can be better facilitated at a level lower than that of the criteria, such as through particular methodological standards that can quantify the level of the impact.

1.7 An analysis of whether the criteria and/or indicators and/or methodological standards for the particular descriptor are likely to be common across the EU or need aspects to be specific at region or other scales

The criteria for D1 - also considering Member State reports from 2012 (COM(2014)97; Palialexis et al. 2014²²) - have and should have an EU-wide implementation, since they are general enough to cover all biodiversity aspects and there are no particular regional specificities that would require an alternative approach under another criterion. On the other hand, the elements to be assessed (species, functional groups, habitats, ecosystems) have a strong regional character, and their

²¹ https://circabc.europa.eu/d/a/workspace/SpacesStore/b91483a7-e849-4664-b391-6bb6a667d39e/1501_GES_CCworkshop_Session%202-3.ppt.

²² Palialexis A., Tornero A. V., Barbone E., Gonzalez D., Hanke G., Cardoso A. C., Hoepffner N., Katsanevakis S., Somma F., Zampoukas N., 2014. In-Depth Assessment of the EU Member States' Submissions for the Marine Strategy Framework Directive under articles 8, 9 and 10. EUR – Scientific and Technical Research series. Luxembourg: Publications Office of the European Union. EUR 26473 EN, 149 pp. doi: 10.2788/64014.

selection should consider the existing lists of either EU legislations (e.g. CFP, HD, BD) or RSCs. The list of characteristics in Table 1 of the Annex III of the MSFD should therefore be revised to set the guidelines and regional requirements in support of a coherent approach to the selection of such elements across Member States (Patrício et al., 2014¹⁷). The use of EU-wide lists (such as EUNIS for habitat classification, and SWD 2011/1255 for functional group classification) would facilitate a coherent and comparable assessment. RSCs have started working on the implementation of MSFD criteria and methodological standards, optimising them on their regional specificities and taking stock of the work they have previously carried out on their marine waters. Their experiences will be used for generating basic regional lists of the various components, taking account of existing lists. Section 2.3 includes existing lists of species, habitat types and functional groups that should be considered in the selection of assessment elements, e.g. representative (sub)regional species and habitat community to be assessed for practical issues (monitoring, indicators), according to relevant and commonly agreed selection criteria. Further work is required to reach an agreement on selection and de-selection criteria of elements included in those lists, as well as generating EU-wide or regional lists of elements that are already assessed under other assessment frames (EU legislation, RSCs' agreements).

Agreement on the reporting should be made at the level of the functional groups and habitat types (predominant/special/particular), and lists of representative species/habitat communities should be used as living documents and tools to enhance cooperation and joint monitoring (e.g. through RSCs where works on such lists have been, and are still, in progress).

1.8 The "climate sensitivity" for D1 (or criteria/indicators)

Descriptor 1 is highly sensitive to climate change; hence the Annex I descriptor text states that the quality and occurrence of habitats and the distribution and abundance of species should be in line with the prevailing climatic conditions. Due to climatic changes, the prevailing conditions will potentially change, which can also affect the distribution and ranges of habitats and species as well as other attributes. Therefore, where biological diversity targets have been set that do not take into account changing prevailing conditions, some biological diversity objectives might not be achievable in the long term or should be adapted over time to take into account changing conditions. An explicit analysis on the effects of climate change on GES determination for D1 is included in Elliott et al. (2015)²³.

Consideration should also be given to the combined effects of changing prevailing conditions and the effects of human pressures. Climate change is a pressure in its own right and will exacerbate the effects of other pressures, thus it should be considered when GES boundaries and thresholds are established to avoid "shifting baselines". This has particular relevance as climate change is regarded as an exogenic unmanaged pressure, i.e. operating outside the control of management measures employed in a regional sea and where the management measures can only address the consequences rather than the causes (for more details, see Patrício et al., 2014²⁴). Making the distinction between changes due to climatic changes and other pressures is likely to pose a challenge

²³ Elliott M., A. Borja, A. McQuatters-Gollop, K. Mazik, S. Birchenough, J. H. Andersen, S. Paintin, M. Peck, 2015. Force majeure: Will climate change affect our ability to attain Good Environmental Status for marine biodiversity? *Marine Pollution Bulletin*, <http://dx.doi.org/10.1016/j.marpolbul.2015.03.015>

²⁴ Patrício J, Teixeira H, Borja A, Elliott M, Berg T, Papadopoulou N, Smith C, Luisetti T, Uusitalo L, Wilson C, Mazik K, Niquil N, Cochrane S, Andersen JH, Boyes S, Burdon D, Carugati L, Danovaro R, Hoepffner N. 2014. DEVOTES recommendations for the implementation of the Marine Strategy Framework Directive. Deliverable 1.5, 71 pp. DEVOTES project. JRC92131

in the delimitation of their synergistic and cumulative effects. Environmental status should therefore be considered at the slightly broader level of functional groups of species, functional habitats and their relationships, within which a suitable degree of fluctuation in species composition and relative abundance can be anticipated (OSPAR's ICG-COBAM Advice Manual²⁵).

A European "network" of reference populations (e.g. mobile species) and habitats developed along biogeographic gradients could provide useful information to help comprehend/estimate the effects of climate/global change at a broad scale and interpret other changes at more or less finer scale.

1.9 An indication of whether a quantitative GES definition for the descriptor will be possible or whether a only qualitative/normative definition should be used (on the basis of Article 3(5))

It is envisaged that a quantitative definition of GES at the criterion level for each assessment element is feasible, considering the definitions of Favourable Conservation Status - Favourable Reference Values - provided by the HD. Generally, it seems to be difficult to quantitatively define GES for biological diversity, considering the variety of the elements to be assessed which cannot be homogeneously captured by a single quantitative description. A potential conceptual approach for a quantitative GES can be framed in such a way that the resilience of the ecosystem is suited to accommodate the quantified biodiversity, or in other words, it will be accounted in the determination of the GES boundaries as the "naturally" allowed deviation from the reference point. Where GES cannot be quantified, it could, as a first step, be qualitatively defined, notably according to the level of knowledge available for many species or habitats. For example, benthic habitat conditions can be defined qualitatively (based on species composition and proportions) and the presence or lack of GES could be expressed as a deviation (qualitative or semi-quantitative-range) around this qualitatively defined reference point. Considering the dynamic nature of ecosystems and the naturally varying environmental conditions, GES can only be directly quantified for certain scales, species and habitats. To that end, lists of elements and common classification systems of elements can facilitate a coherent and comparable quantitative determination of GES, at least regionally. Qualitative definitions of GES may deviate from the FCS provided by HD. There may be species that are not in FCS for (coastal and/or) marine waters, but are in FCS on a national level. In such a case the Member State is not obliged to undertake action to change the status of its marine waters (e.g. gulls, terns, waders that are breeding in coastal and further inland habitats).

2. Analysis of the implementation process

2.1 Based on the Commission/Milieu Article 12 reports and the JRC's in-depth assessments, a detailed summary of the findings of Article 12 relating to the

25

http://www.ospar.org/documents/dbase/publications/p00581/p00581_advice%20document%20d1_d2_d4_d6_biodiversity.pdf

determination of GES, and specifically the use of the Decision criteria and indicators, should be made

All Member States (MSs) of the four marine regions have defined GES for Descriptor 1, but none have defined it in the same way (or even similarly); the levels of detail vary enormously, GES definitions are not comparable nor linked with boundaries, and the degree to which GES is achieved is not measurable (COM 2014/97; Palialexis et al. 2014). More than half of the MSs defined GES on the basis of criteria that were often in agreement with the Commission Decision specifications, although not all the Commission Decision criteria were always used. The majority of MSs covered species, habitats and ecosystems, but at varying levels of detail. Habitat criteria (1.4-1.6) were reported less often than species criteria, and the ecosystem structure criterion 1.7 was applied the least (Palialexis et al., 2014¹).

The level of integration between MSFD D1 and other EU legislation (i.e. HD, BD, WFD), other international agreements (e.g. conventions – Bern, CITES, Bonn) and RSC agreements was assessed, and was found to be characterised by a wide variation (Palialexis et al., 2014). The HD was more often taken into account compared to other legislation, but the general overview of the level of integration is relatively low, despite the overlap between the MSFD and other assessed legislation and agreements and the associated data availability (Palialexis et al., 2014). Regarding the RSC, the MSs indicated that they intend to follow the corresponding agreements, especially in the RSCs that are more advanced in assessing biodiversity.

Palialexis et al. (2014) assessed the coherence of the reported characteristics e.g. list of species, habitats, ecosystems, functional groups within and between the RSC and against the list in SEC 2011/1255²⁶. The discrepancy across the reported lists and groups did not allow for conclusive comparison, increasing the incoherence and inability to adequately assess GES at any spatial level.

An additional element of complexity in the assessment of the reports is the different allocation of methodological standards either to an indicator, criterion or descriptor. MSs should, ideally, report GES at the same level (criterion according to MSFD and COM DEC 477/2010/EU) in order to reduce the heterogeneity in reporting and the different interpretations of the COM DEC 477/2010/EU by the MSs (Palialexis et al., 2014). The inclusion of generic indicators in the COM DEC 477/2010/EU instead of specific methodological standards gave room for several interpretations of the criteria and a vast number of non-comparable methodological standards for D1. The lack of a common list of characteristics associated with common GES boundaries impeded the attainment of the MSFD's goal of establishing comparable and coherent assessments of GES.

Three MSs use functional groups, in addition to species groups, in their GES definition. One MS covers both cephalopods and reptiles in its GES definition, and two MSs have included shellfish in the scope of their GES definition. Seven MSs have included a specific reference to listed/protected species and habitats. These include species covered by the Habitats and Birds Directives, and species protected by the OSPAR Convention, the Barcelona Convention, the IUCN list of endangered species

²⁶ Relationship between the initial assessment of marine waters and the criteria for good environmental status. Commission Staff Working Paper. SEC(2011) 1255 final.
http://ec.europa.eu/environment/marine/pdf/SEC_2011_1255_F_DTS.pdf

and the ASCOBANS and ACCOBAMS agreements. Six MSs have defined quantitative threshold values with their GES definition, but often using different thresholds for different biological features. Three MSs have included the notion of 'restoration' of biodiversity in their GES definition. Two MSs have acknowledged natural/climatic variations and ecosystem dynamics, and have not sought a rigid state for particular biodiversity components. Finally, while one MS has clearly stated that it will tend towards achieving FCS for all ecosystem features, this is not considered realistic within the timeframe of the MSFD.

Species (Criteria 1.1 Species distribution, 1.2 Population size, 1.3 Population condition)

There is a large variation in the approaches of GES definitions for species. Some MSs have defined GES using species groups, functional groups, species with specific life history traits (e.g. long-lived, slowly reproducing), and/or individual species, while others apply GES on species with no further specifications. A few MSs also refer to protected species; these included references to species covered by the Habitats and Birds Directives, those protected by the OSPAR Convention and IUCN lists of endangered species, and those covered by ASCOBANS and ACCOBAMS agreements.

Habitat (Criteria 1.4 Habitat distribution, 1.5 Habitat extent, 1.6 Habitat condition)

The approach to defining GES for habitats is heterogeneous and there is little coherence within regions. Many MSs were not specific with regard to the habitats covered by the definition, which in most cases implies that all habitats are covered equally. In a few cases it was clear that only benthic habitats were covered, thus excluding those of the water column. Less than half of the MSs have included a specific reference to listed/protected habitats. Some of these references specifically referred to those covered from the Habitats Directive and/or relevant RSC lists, while others referred to protected habitats in general. A few MSs have included specific habitats in their definition of GES, including protected habitats. For example, in the Mediterranean three MSs refer specifically to *Posidonia oceanica* sea-grass habitats. Finally, a number of countries also used WFD type-specific Good Ecological Status boundaries to assess GES.

Ecosystem (Criterion 1.7 Ecosystem structure)

Only ten MSs have defined GES for Criterion 1.7 in a way that either covers the whole ecosystem structure or some specific ecosystem aspects, such as the fish community.

For Art.9, the wide variance of the reported approaches for GES determination led to low levels of coherence within each of the four regional seas (COM 2014/97). For Art. 8, and regarding the highly mobile species groups (birds, mammals, reptiles, fish, cephalopods), MS reports varied, from species group assessments to single species. MSs had the option of reporting species assessments under BD and HD, thereby also fulfilling their legal obligation for the MSFD reporting, however this option increased the incoherence in assessing D1 and hindered any effort towards making comparable assessments. RSC's lists of species are considered by some of their contracted parties. The required information for assessment appeared to be most readily available for species, in particular for species specifically listed for protection, or commercially exploited species. MSs also reported the most frequently associated pressures on these species groups; the extraction of species and the physical loss of habitat in the Baltic Sea, and the extraction of species and biological disturbance in the North East Atlantic and Mediterranean Sea (COM 2014/97).

2.2 Identification of any questions arising from the application of the current Decision, including those identified by the Article 12 assessment

The main issues highlighted by the MSFD Article 12 assessment and the JRC's in-depth assessment (Palialexis et al. 2014) are the following:

- a. many GES characteristics have not been set in a measurable way, in some cases not going beyond what Annex I and the GES Decision already describes; and in other cases revealing an apparent confusion between the definition of GES and the setting of targets (MSFD Art. 9 and 10 respectively);
- b. a large diversity in understanding and approaches amongst Member States reflects differences in the interpretation and application of Article 9;
- c. MSs have not built adequately upon other EU legislation and have adopted a "pick-and-choose" approach from the work undertaken (and agreed) in the RSCs to which they are Parties.

A common and minimum level of determined characteristics (Art, 9(1)) should be established to ensure an adequate assessment for biodiversity and comparable and coherent implementation of the MSFD, at least at the regional level, while those lists of characteristics that are already included in other legislation (e.g. list of habitats and species in HD and BD, SEC 2011/1255) must be considered, recognising that there may be differences in implementing BHD on national level. MSs should be encouraged to further support the RSC actions for a harmonised biodiversity assessment on a regional scale, since there is still room for improving the level of integration in this perspective (COM 2014/97; Palialexis et al., 2014).

Adequacy and coherence of D1 can be improved by following the specifications laid down by the Habitats and Birds Directives (potentially also the WFD) for an agreed list of species and habitats covering each Directive (and taking into account Annex III of the MSFD) that would constitute a consistent standard for assessments across the biodiversity criteria. The RSCs can play an important role in this process, since the HD and BD do not have a requirement for regional cooperation (COM 2014/97; Palialexis et al., 2014).

A common concept for the determination of GES boundary values, which accommodates sustainable use, should be applied, following the 'acceptable deviation from a reference' approach (if possible) already encompassed within the standards for the WFD and the Nature Directives. This common concept should, however, avoid differences between regionally defined GES boundaries and national objectives of the WFD and Natura Directives.

The definition of GES should clearly address all biodiversity components, although its assessment can be based on selected representative species and habitats (COM 2014/97). The specific elements to be addressed should reflect the different biodiversity characteristics of each region, but should be selected in such a way as to maintain consistency within (sub)regions. Regarding predominantly seabed habitats, the determination of GES and its assessment should be fully aligned with Descriptor 6 (with reference to the different substrates of the seabed). For ecosystem-level assessments, the approaches should be aligned with Descriptor 4 requirements on food webs, aiming to address the overall balance of components in the ecosystem and their functioning (COM 2014/97). This

alignment between D1, D4 and D6 should be also be guaranteed by making use of the work of the RSCs.

2.3 Relevant data from other sources that are specific to every descriptor and recent findings from MSs should also be considered

Sources of information and data for the D1 assessment can include other EU legislation and agreements, as well as, for example, research programmes, monitoring programmes or existing databases. Such sources can guide the adoption of common methodological standards for MSFD purposes, namely regarding: 1) data and parameters surveyed or sampled across Europe; 2) lists of relevant species or groups and lists of habitats compiled for several purposes; and 3) operational indicators available and in use within and across marine regions. Below we highlight some of the most relevant sources for D1.

2.3.1 Sources of monitoring data

The main data source for GES assessment is the national/regional monitoring activities that MS have to implement for the WFD, HD, BD and MSFD. MS monitoring programmes reported for the MSFD are currently under evaluation according to the MSFD Art. 12.

Regional Sea Conventions:

Data and parameters for D1 derived from RSCs are comprehensively listed in the report “Development of a shared data and information system between the EU and the Regional Sea Conventions²⁷” (presented in WG DIKE, CIRCABC), which examines the data and information within each of the four Regional Sea Conventions (RSCs) as well as the European Environment Agency (EEA), with the aim of characterising the present data and information storage and flow processes in place across Europe. This report covers methodological standards and parameters that are linked with criteria and monitoring programmes. Most RSCs do not yet have an operational information system to compile data or compute indicators at regional scales for most of MSFD issues on biodiversity (D1, D4 and part of D6). These standards and further developments should be taken into account and included in this section.

Other sources:

The DEVOTES FP7 project has produced an in-depth analysis of marine monitoring networks in Europe that aimed to assess the status of marine biodiversity monitoring for D1, D2, D4 and D6 (Patrício et al., 2014b)²⁸. The **Catalogue of Monitoring Networks** provides an initial overview of the potential for effective implementation of the MSFD assessment of GES. This DEVOTES survey has facilitated 1) the critical evaluation the European marine monitoring activities related to biodiversity (i.e. what monitoring is currently being carried out, why it is being carried out, which biodiversity

²⁷ https://circabc.europa.eu/d/a/workspace/SpacesStore/aff9880d-df5e-44ec-854e-8f098fcff2e5/DIKE_10-2014-05b_RSCDataReporting_Report.pdf

²⁸ Patrício J, Little S, Mazik K, Thomson S, Zampoukas N, Teixeira H, Solaun O, Uyarra MC, Papadopoulou N, Kaboglu G, Bucas M, Churilova T, Kryvenko O, Moncheva S, Stefanova K, Borja A, Alvarez M, Zenetos A, Smith C, Zaiko A, Danovaro R, Carugati L, Elliott M (2014b) Report on SWOT analysis of monitoring. Deliverable 1.4 100pp + 4 Annexes. DEVOTES FP7 Project. JRC89561 <http://www.devotes-project.eu/report-on-swot-analysis-of-monitoring/>

descriptors, biological components and habitats are addressed and to what pressures it is linked); 2) the identification of potential gaps in monitoring based in the information compiled; 3) the identification of needs for further development for marine biodiversity monitoring to improve and optimise the MSFD implementation, and 4) the promotion or fostering of harmonisation among countries sharing marine regions for joint GES assessments.

The catalogue includes 285 monitoring programmes reported by 15 EU MSs and 14 countries that share European Regional Sea boundaries. There are details at the European, regional and sub-regional sea levels, as well as the four biodiversity descriptors, 11 biodiversity components, 22 habitats and the 37 pressures addressed. A recent version of this catalogue (June 2014) is publically available on the DEVOTES website²⁹.

Importantly, the catalogue includes details on key contacts, data sources and timescales for data collection associated with each monitoring activity. This information should enable MSs to optimise their sampling scheme by collating details on the spatial coverage, measured parameters and sampling frequency associated with other monitoring programmes, thus producing an optimal sampling design to complement (rather than duplicate) existing monitoring efforts. Potentially this could also help MSs, through the RSCs, to coordinate their monitoring activities in terms of timing of their sampling exercises, the parameters/data being collected and the geographical location, resulting in large, coordinated datasets for the (sub)regions of each Regional Sea. It is important that this contributes to the implementation of the biodiversity indicators of the RSCs.

2.3.2 Sources of species and habitat lists

MSFD supporting documents

SEC 2011/1255 includes lists of predominant habitat types and functional groups that should be considered by the MSs. The categories adopted for habitat types in this Commission document were agreed so that their use could provide "*a direct link between the habitats assessed under Descriptor 1 and the substrate types to be assessed for Descriptor 6 (indicator 6.1.2 – different substrate types affected by physical damage) and to the European EUNIS habitat classification scheme*" (SEC 2011/1255, p 18).

Other EU pieces of legislation

Species and habitat types compiled within the framework of the **Habitats and Birds Directives** are available through the European Nature Information System (EUNIS)³⁰ databases - an additional useful tool to be taken into consideration. The MSFD CIS document on "Links between MSFD and the Nature Directives"³¹ identifies lists of:

- Marine species for Article 17 reporting of the HD;

²⁹ <http://www.devotes-project.eu/devotool/>

³⁰ <http://eunis.eea.europa.eu/about>

³¹ <https://circabc.europa.eu/d/a/workspace/SpacesStore/e67df5e9-21e0-4dbd-9778-ac4fb08fe1f7/Doc%209%20Links%20MSFD%20HBD%20FAQ.doc>

- Seabirds and waterbird species for which SPAs should be considered under the Birds Directive (Annex I and migratory species)³²;
- Potential overlap between MSFD predominant habitats and habitat types listed in Annex 1 of the HD and considered 'marine' for Article 17 reporting;

The EUNIS pan-European classification system for habitats could be the basis for a coherent assessment across MSFD marine regions. However, adjustments to the current EUNIS classification scheme may be needed to better fit the needs of the MSFD assessments (Patricio et al., 2014a)³³. The marine section of EUNIS has been restructured and is expected to become available in 2015.

Under the **Common Fisheries Policy** and the Community framework for the collection, management and use of data in the fisheries sector, the Commission Decision 2010/93/EC³⁴ in Appendix VII provides a list of Biological variables with species sampling specification that broadly covers marine species and monitoring parameters that can directly be assessed for the MSFD D1 criteria.

Non-Indigenous Species (NIS) are part of the ecosystems and habitats, and therefore must also be considered and assessed. NIS inventories, such as the **European Alien Species Information Network** (EASIN³⁵) can be the basis on which to provide information on the presence/distribution of NIS within particular ecosystems and habitats.

Other international initiatives:

The **IUCN Red List of Threatened Species**³⁶ is widely recognised as the most comprehensive, objective global database for evaluating the conservation status of plant and animal species, and can provide a source of information regarding threatened marine species in European waters. However, it should be recognised that the MSFD aims to achieve GES and is not focused on protecting individual species. In other words, selected rare species (e.g. Roseate Tern) should in general not be used to indicate the environmental status. Species protection should be guaranteed through the nature directives.

Other databases:

The DEVOTES FP7 Project listed the potential European Keystone Species (Smith et al., 2014) as well as indicator species, taxa or groups frequently included in indicators (Teixeira et al., 2014). This information is available through two catalogues that can support MS during the MSFD implementation process. The catalogue's potential application in the context of supporting the

³² Reference: Table 3: Seabirds and waterbird species for which SPAs should be considered. Guidelines for the establishment of the Natura 2000 network in the marine environment. Application of the Habitats and Birds Directives, Appendix 2: Lists of existing marine Habitat types and Species for different Member States, European Commission 2007, http://ec.europa.eu/environment/nature/natura2000/marine/index_en.htm

³³ see discussion in Patricio et al. 2014a, pp 4-9

³⁴ http://datacollection.jrc.ec.europa.eu/c/document_library/get_file?uuid=296dff3-9c81-4759-b691-9b1654ea66b9&groupId=10213

³⁵ <http://easin.jrc.ec.europa.eu/>

³⁶ <http://www.iucnredlist.org/>

selection of relevant biological features is explained below. We stress, however, that these catalogues cannot replace or overcome the lack of clear and agreed general guidance on how MS should select biological features.

The **DEVOTES Catalogue of Indicators** (Teixeira et al., 2014³⁷; freely available as software DEVOTool³⁸) includes 557 indicator entries to date with respective metadata information, including the biodiversity components (sensu SEC 2011/1255) to which the indicators apply or on which they focus. This catalogue provides a good insight into the most relevant biological features usually considered in marine biodiversity assessments. It shows that most of the indicators available have been developed specifically for assessing the state change of biodiversity components, subcomponents or specific taxa (using categories for biological features as indicated in Table 1 of Annex III of the MSFD and in SEC 2011/1255). However, some indicators have defined groups independently of biodiversity components, such as functional groups, keystone species or non-indigenous species. The later categories reflect more closely those considered in some of the Commission Decision criteria (e.g. of indicators reported in the catalogue: 'Abundance of functional groups', 'Number of bioceonosis/facies' or 'Rate of new introduction of non-indigenous species (per defined period)'). The information in this catalogue can facilitate knowledge transfer across countries and marine regions. For example, it can be used to identify operational indicators within neighbouring countries that focus on the same biodiversity components, enhancing comparability and broader scale assessments of relevant species or groups of species within marine regions. It can also highlight indicators that could be potentially adapted to other areas or applied at a higher EU scale, for example, by identifying relevant species or groups of species widely surveyed by all MSs.

The **DEVOTES Catalogue of Keystone Species** and associated report is a review of potential keystone species in European marine habitats (Smith et al., 2014³⁹). The catalogue includes 210 distinct species and 19 groups classified by major habitat in the EU Regional Seas and the Norwegian Sea. The keystone species in the catalogue are identified from several sources, such as published work, expert opinion and models (high 'keystoneness index' values in Ecopath with Ecosim models). The keystone species originate from a wide range of faunal/floral groups and trophic levels, and many are invasive species. Gaps exist partially from a lack of expertise in specific areas (for certain groups or certain habitats), but also due to the very limited information available on keystone species in general.

Although the scientific community is aware that significant difficulties remain in the definition of keystone species (Smith et al., 2014), for example, at what point does a species become keystone?, are keystone species promoters or reducers (through primary or secondary impacts)?, can a prey species be a keystone?, can a keystone species be a species group (e.g. a genus, a family), functional group or even a habitat? and what is the scale (primarily spatial but also temporal) over which the

³⁷ Teixeira et al., 2014. Existing biodiversity, non-indigenous species, food-web and seafloor integrity GENs indicators. DEVOTES FP7 Project; 2014. JRC89170. DEVOTES public Deliverable 3.1 http://www.devotes-project.eu/wp-content/uploads/2014/02/D3-1_Existing-biodiversity-indicators.pdf

³⁸ <http://www.devotes-project.eu/devotool/>

³⁹ Smith C, Papadopoulou N, Sevastou K, Franco A, Teixeira H, Piroddi C, Katsanevakis S, Furhaupter K, Beauchard O, Cochrane S, Ramsvatn S, Feral J, Chenuil A, David R, Kiriakopoulou N, Zaiko A, Moncheva S, Stefanova K, Churilova T, Kryvenko O (2014) Report on the identification of keystone species and processes across regional seas. Deliverable 6.1 105pp + 1 Annex. Devotes FP7 Project. JRC91370 <http://www.devotes-project.eu/wp-content/uploads/2014/07/DEVOTES-D6-1-Keystones.pdf>

keystone works?. Many of these species are already considered to some extent as key/important species, and DEVOTES noted an overlap between species included in the indicator and keystone catalogues. A number of keystone species were also reported in the MS Initial Assessments. Specifically for keystone habitat species, many operational indicators already exist (Teixeira et al., 2014) and have long been applied in the context of environmental assessment and conservation initiatives such that these species can be tracked as indicators for GES. These are, however, mostly structural indicators that provide little information on the interaction or the role of the species in the ecosystem. DEVOTES discussed the possibility of using keystone species as indicators in monitoring programmes, and suggested that keystone species can provide relevant information for the future consequences of environmental changes in the entire ecosystem (Smith et al., 2014). In supporting the MSFD functional approach, the Catalogue of Keystone Species promotes keystone functional groups where a group of species/taxa may have a keystone function, for example, rich coralligenous communities or mixed coral and sponge fields. This catalogue can be used to help select relevant biological features for assessment.

2.3.3 Sources of indicators

Regional Sea Conventions:

Core and candidate indicators for D1 derived from RSCs are comprehensively listed in the report “Development of a shared data and information system between the EU and the Regional Sea Conventions⁴⁰” (presented in WG DIKE, CIRCABC). Links of these indicators with monitoring frameworks and technical specifications are also provided.

Other databases:

DEVOTES has compiled two databases as an inventory of existing methods to support the choice of methodological standards in the scope of the MSFD. These scientific indicators are potential tools that can be used to assess the environmental status of European seas within the MSFD. The list of available indicators and indices that are potentially valuable for the implementation of the four biodiversity-related descriptors, including D1 Biological Diversity, can be found in the **DEVOTES Catalogue of Indicators** (Teixeira et al., 2014; freely available as software **DEVOTool**³⁸) and in the **Catalogue of Model-derived Indicators** (Piroddi et al., in prep). The DEVOTool software allows for the navigation of a database of indicators of marine biodiversity, within all European Regional Seas but also from other seas. Currently, the catalogue includes 557 entries (version 6) which have been collected from Member States, Regional Sea Conventions and scientific literature. One of the aims of the catalogue is to foster transfer of know-how across countries and marine regions, so that indicators operational in one area could be potentially adapted to other areas and used in the environmental assessment. The catalogue contains information on metadata ranging from indicator descriptions, data requirements, developmental status, reference values and quality thresholds, to geographical coverage and applicable habitats, biodiversity components and related human pressures.

⁴⁰ https://circabc.europa.eu/d/a/workspace/SpacesStore/aff9880d-df5e-44ec-854e-8f098fcff2e5/DIKE_10-2014-05b_RSCDataReporting_Report.pdf

Specifically for D1, a search of the DEVOTool Catalogue of Indicators showed that, except for indicator 1.3.2 ‘Population genetic structure’, all other criteria and associated indicators could be addressed by at least 30 operational indicators. The Catalogue of Model-derived Indicators (Piroddi et al., in prep) also revealed that, again except for indicator 1.3.2, all D1 criteria and associated indicators could potentially be addressed by existing modelling approaches.

2.4 Good examples and approaches applied by MSs, especially if used by multiple MSs, and shortcomings should be listed systematically

RSCs are developing initiatives towards common monitoring and assessment on a regional scale. For example, OSPAR ICG COBAM is working on assessments for indicators on a (sub)regional scale. ICG COBAM has set up seven expert groups on the relevant biodiversity elements (e.g. birds, mammals, benthic habitats, etc.). Over 100 experts in ten Member States are involved in this work. The HELCOM CORESET is also considered to be a good example. The ECAP process in the Barcelona convention has also created an expert group on biodiversity and fisheries, for the development of the monitoring and assessment guidance, to make operational the biodiversity indicators that were approved in the CoP meeting in Istanbul (2015). Within MSs it is useful to gather all national experts concerned with the MSFD in working groups to achieve coherence across ecosystem components, criteria and descriptors. Expert consultation is critical for policy decisions.

2.5 Differences and similarities between regions

Flora and fauna change enormously not only due to the latitudinal gradient⁴¹ but also within areas at the same latitude. These changes are mainly driven by the different local water mass characteristics and other factors such as human activities.

3. Analysis of the current text of the Decision

3.1 Analysis of the current text of the Decision, identifying in particular those parts which are best placed for guidance, those parts which are interpretative or explicative, and those parts which need to be kept in the Decision in accordance with the mandate provided by the Directive

In Part B of the Commission Decision, the first paragraph as well as the paragraphs introducing the criteria and standards for the species and habitats level could be considered for integration within the criteria and standards as they relate to the definition of the scope of these criteria (in terms of the biological features to consider for D1). The assessment criteria and methodological standards associated with the legislative instruments listed in point 2 of Part A, which are relevant for biological diversity, should also be considered for potential input in the criteria and standards for

⁴¹ Fisher, J., Frank, K. T., and Leggett, W. C. 2010. Global variation in marine fish body size and its role in biodiversity–ecosystem functioning. *Marine Ecology Progress Series*, 405: 1–13

clarification, or instead include reference to the relevant document in which these are established. It should be noted that similar information about the scope of the criteria has not been included for criterion 1.7.

The paragraphs below from the Commission Decision include proposed changes.

~~“Assessment is required at several ecological levels: ecosystems, habitats (including their associated communities, in the sense of biotopes) and species, which are reflected in the structure of this section, taking into account point 2 of Part A. For certain aspects of this descriptor, additional scientific and technical support is required (5). To address the broad scope of the descriptor, it is necessary, having regard to Annex III to Directive 2008/56/EC (MSFD), to prioritise among biodiversity features at the level of species, habitats and ecosystems. This enables the identification of those biological features and those areas where impacts and threats arise and also supports the identification of appropriate indicators among the selected criteria, adequate to the areas and the features concerned (6). The obligation of regional cooperation contained in Articles 5 and 6 of Directive 2008/56/EC (MSFD) is directly relevant to the process of selection of biological features within regions, sub-regions and subdivisions, including for the establishment, where appropriate, of reference conditions pursuant to Annex IV to Directive 2008/56/EC. Modelling using a geographic information system platform may provide a useful basis for mapping a range of biodiversity features and human activities and their pressures, provided that any errors involved are properly assessed and described when applying the results. This type of data is a prerequisite for ecosystem based management of human activities and for developing related spatial tools (7).”~~ Assessment methods and standards, to address each criterion should reflect the actual knowledge, and should evolve according to scientific and technical improvements.

Species Level

~~“For each region, sub-region or subdivision, taking into account the different species and communities (e.g. for phyto-plankton and zooplankton) contained in the indicative list in Table 1 of Annex III to Directive 2008/56/EC, it is necessary to assess all functional groups (SEC 2011/1255) by a selection of representative sets of species or population to cover actual MSFD requirements, having regard to point 2 of Part A of the COM Dec 2010/477/EU. The identification of the “relevant species” should be based on harmonized methodology applied to a common agreed list of species or group of species, in accordance to other EU legislations and RSCs agreements.⁴² The three criteria for the assessment of any species are species distribution, population size and population condition. As to the later, there are cases where it also entails an understanding of population health and inter- and intra-specific relationships. It is also necessary to assess separately subspecies and populations where the initial assessment, or new information available, identifies impacts and potential threats to the status of some of them. The assessment of species also requires an integrated understanding of the distribution, extent and condition of their habitats, coherent with the requirements laid down in Directive 92/43/EEC (8) and Directive 2009/147/EC, to make sure that there is a sufficiently large habitat to maintain its population, taking into consideration any threat of deterioration or loss of such habitats. In relation to biological diversity at the level of species, the three criteria for assessing~~

⁴² Functional groups and rules to select species/populations should be discussed, agreed and described here.

progress towards good environmental status, as well as the indicators methodological standards related respectively to them, are the following:...

Habitat level

“For the purpose of Directive 2008/56/EC, the term habitat addresses both the abiotic characteristics and the associated biological community, treating both elements together in the sense of the term biotope. For each region, sub-region or subdivision, taking into account the different habitats types contained in the indicative list in Table 1 of Annex III to Directive 2008/56/EC, it is necessary to assess all habitat types, by a selection of representative habitats, to cover the MSFD requirements.⁴³ A set of habitat types needs to be drawn up for each region, sub-region or subdivision, taking into account the different habitats contained in the indicative list in Table 1 of Annex III and having regard to the instruments mentioned in point 2 of Part A. Such instruments also refer to a number of habitat complexes (which means assessing, where appropriate, the composition, extent and relative proportions of habitats within such complexes) and to functional habitats (such as spawning, breeding and feeding areas and migration routes). Additional efforts for a coherent classification of marine habitats, supported by adequate mapping, are essential for assessment at habitat level, taking also into account variations along the gradient of distance from the coast and depth (e.g. coastal, shelf and deep sea). The three criteria for the assessment of habitats are their distribution, extent and condition (for the latter, in particular the condition of typical species and communities), accompanied with the indicators related respectively to them. The assessment of habitat condition requires an integrated understanding of the status of associated communities and species, coherent with the requirements laid down in Directive 92/43/EEC (9) and Directive 2009/147/EC, including where appropriate an assessment of their functional traits. In relation to biological diversity at the level of habitats, the criteria for assessing progress towards good environmental status, as well as the methodological standards related respectively to them, are the following.”

Ecosystem level [This level might change after adopting the proposals in chapter 5]

“In addition, the interactions between the structural components of the ecosystem are fundamental for assessing ecosystem processes and functions for the purpose of the overall determination of good environmental status, having regard, inter alia, to Articles 1, 3(5) and 9(1) of Directive 2008/56/EC. Other functional aspects addressed through other descriptors of good environmental status (such as descriptors 4 and 6), as well as connectivity and resilience considerations, are also important for addressing ecosystem processes and functions.” [Need to be updated after defining and agreeing on the content of the current 1.7 criterion and on the integration approach amongst the state descriptors].

3.2 Identification of needs for guidance

⁴³ Predominant habitats (e.g. level EUNIS 3-4) and rules to select habitats (community level, e.g. level EUNIS 5-6) should be discussed, agreed and described here.

To summarise the previous conclusions, guidelines are needed on the following issues to support the scope of the review process and of the overall MSFD implementation:

- How the habitat assessment criteria should be related to the species criteria. The Commission Decision mentions, in relation to the species level, the need for ‘an integrated understanding of the distribution, extent and condition of their habitats’; however, habitat assessment criteria are not clearly related to the species criteria. Whilst there is some consideration of the species level within the habitat level (criterion 1.6), the two assessments are likely to be carried out by different people which may make cross-over problematic. It should either be made clearer that the two should be further assessed, or that some replication should be carried out to ensure that habitat types are adequately linked to species, where possible, according to the MSFD objectives. On the other hand, species should be assessed in association with particular habitats – essential species habitats – related to their GES status (spawning, nursery, feeding grounds).
- How the assessment at the ecosystem level should be made, including how to handle the connections with other descriptors (e.g. D3, D4, D5, D6). The assessments of the implementation of the MSFD’s Article 12 showed that Member States used criterion 1.7 “ecosystem structure” the least. Clarification is needed as to what is an ecosystem as an assessment unit for the MSFD and what should be the content of 1.7. To this end, the ecosystem approach to management must be interpreted and raised to the level of state Descriptors –including the current state criteria and indicators from all Descriptors.
- How to adopt existing habitat classification systems for MSFD purposes. The EEA’s EUNIS habitat classification system for the marine environment is currently being revised. Alignment between the Commission Decision and EUNIS revisions should be made to allow for comparisons and exchange of data in order to ensure that predominant habitat types of the MSFD equate clearly to those of EUNIS. The issue will be to specify the need to use EUNIS and the resolution of the habitat types to be assessed (i.e. the predominant types). The ‘different substrate types’ of D6 also need to be equated to D1 predominant habitats.

3.3 An analysis of what to keep should take place, including specification on what may be out dated or may need to be aligned with other or new legislation, etc.

The review of the current Commission Decision (and associated methodological standards), which is foreseen in its paragraph 4, would guarantee the exploitation and adoption of the scientific knowledge, technical improvements and evolution in environmental management. Examples, criteria and selecting or deselecting methods of assessment elements (species, habitats, and functional groups) should be specified to improve the clarity and coherence of the COM DEC 2010/477/EU.

Specifications on the integration of the state descriptors and their links with the impact and pressure aspects of the others should be included in the decision, with the aim to streamline the assessment across the descriptors. The state-impact-pressure definition of the criteria in the revised COM Decisions can be linked with the targets to enhance the associations and clarity amongst articles 8, 9 and 10 of the MSFD. Additionally, guidelines on the exploitation of existing legislations (mostly HD and BD for D1) and convergence of their status classifications can improve the implementation of the MSFD, thereby avoiding double assessments and leading to a cost-effective and simpler implementation.

4. Identification of issues

4.1 Main findings and information that will be used in the next step of the revision process

The recent MSFD assessment carried out in relation to Article 12 concluded the following:

- Low integration with the WFD and BD, relatively good integration with the HD. **MSs can exploit methods, data and characteristics derived from other legislations more efficiently** (see Evans and Arvela, 2011 for HD⁴⁴). Besides, MSFD has specific issues. Optimisation of monitoring (methods and spatial/temporal designs) and data management should be enhanced, but some aspects are new in the MSFD and require additional specific and coherent assessments. This can be reflected in the GES determination and in the computation of statistical indicators (optimised common data and additional ones), which can lead to (slightly) different thresholds and targets (and characteristics).
- Low/Moderate integration with the RSC. An **active involvement of the MSs on the regional level is required** for the establishment of coherent and comparable approaches to the assessment. This could be feasible after establishing coherent objectives and assessments between MSFD-RSC-WFD and other relevant legislations.
- The assessment of biodiversity (from species to ecosystems) should **ensure a coherent list of characteristics (species, habitats and ecosystems levels)** that highlight characteristics common to neighbouring MSs.
- Reduction of the heterogeneity in the definition of GES at both European level and regional level. **MSFD terminology should be clarified and commonly interpreted**. GES should be defined on a criterion level, and criteria should be quantifiable and linked with specific methodological standards and boundaries to provide measurable, comparable and operational GES definitions.
- A gap in biodiversity knowledge was reported by most of the MSs. Bilateral and regional cooperation through RSCs should be encouraged to set a more comprehensive background on biodiversity, taking into account the environmental similarities. Scientific and pilot projects at regional and sub-regional level could facilitate this.
- MS reports showed high heterogeneity in the number and type of methodological approaches, thresholds and limits. **Common agreed and comparable (pragmatic and fully operational) methodological standards and relevant boundaries on a regional or EU scale** should be established. The most frequently used methods could be the starting point for defining a coherent list of methodological approaches. Besides, it should be kept in mind that the most frequently used methods are used for specific issues (and scales). (Sub)regional specificities may also require the adaptation of possible methods (e.g. observation by imagery or divers depends of water clarity). Finally, some new issues (and/or

⁴⁴ Evans D. and M. Arvela (2011): Assessment and reporting under Article 17 of the Habitats Directive. Explanatory Notes & Guidelines for the period 2007-2012. ETC, Paris

cost-efficiency) require new methods or adaptation of existing ones, and should take into account (and facilitate) scientific and technical Research & Development (e.g. molecular tools applied to non-indigenous species detection).

- Specific issues include **the risk of double counting** (Teixeira et al., 2014⁴⁵), i.e. the accounting of the same ecosystem feature in different contexts **within and across descriptors**. This needs to be considered in a subsequent step of the process.
- The ecosystem is ambiguous, as much as criterion 1.7. According to the apparent increasing biological level, this criterion should assess biodiversity and the functional links between previous levels: (mobile) species and habitats. Function can be trophic but also connectivity (notably between “species habitats” sensus the HD and implied under MSFD indicator D7.2.2) or material flow (e.g. calcareous).

Recommendations (from Berg et al., 2015⁴⁶): The Berg et al. (2015) manuscript from the DEVOTES public Deliverable 3.1 provides specific evidence and recommendations that can complement and support many of the findings of the “In-depth Assessment” (Palialexis et al., 2014):

- a) Clearly define terms and use them consistently. An updated Common Understanding document will greatly contribute to that end. In this case, ‘area’ is only meaningful for immobile components and mainly associated to the habitat level and as such it is covered in the Decision by parameter 1.5.1 (Habitat area). This would help resolve the issue of the ambiguous use of the term ‘distribution’ between species and habitat level;
- b) Criteria of Descriptor 1 should be specified following an approach to avoid overlaps and guidelines should be provided along with the criteria. It could be suggested that the **species level** criteria (1.1-1.3) are used only on mobile species that are wide-ranging and typically not associated to a single habitat, as already suggested by (Cochrane *et al.*, 2010⁴⁷), and the habitat level criteria (1.4–1.6) would be used for the (often immobile) components tightly associated to a single or a few related habitats.
- c) Since the term ‘habitat’ is used in the sense of ‘biotope’ (Olenin and Ducrotoy, 2006) in Commission Decision, criteria 1.4–1.6 would assess the combination of the physical habitat and its associated communities. As such ‘Habitat extent’ should relate to the whole community [and its abiotic characteristics]. Some habitats (e.g. biogenic reefs as seagrasses, *Sabellaria* reefs, oyster beds, *Crepidula* banks, etc.) may require an assessment at this “engineering” species level, as this structures the whole habitat (abiotic and biotic structure). Also, this would result in removing parameter 1.1.3 completely since it is superfluous under this definition.

⁴⁵ Teixeira *et al.*, 2014. Existing biodiversity, non-indigenous species, food-web and seafloor integrity GEnS indicators. DEVOTES FP7 Project; 2014. JRC89170. DEVOTES public Deliverable 3.1 http://www.devotes-project.eu/wp-content/uploads/2014/02/D3-1_Existing-biodiversity-indicators.pdf

⁴⁶ Berg T, FÜRHAUPTER K, TEIXEIRA H, UUSITALO L, ZAMPOUKAS N. 2015. The Marine Strategy Framework Directive and the ecosystem-based approach - pitfalls and solutions. *Mar. Pollut. Bull.*, <http://dx.doi.org/10.1016/j.marpolbul.2015.04.050>

⁴⁷ Cochrane S.K.J., D.W. Connor, P. Nilsson, I. Mitchell, J. Reker, J. Franco, V. Valavanis, S. Moncheva, J. Ekebom, K. Nygaard, R. Serrão Santos, I. Narberhaus, T. Packeiser, W. van de Bund & A.C. Cardoso, 2010. Marine Strategy Framework Directive Task Group 1 Report Biological diversity EUR 24337 EN – 2010. <http://ec.europa.eu/environment/marine/pdf/1-Task-group-1-Report-on-Biological-Diversity.pdf>

d) A clear differentiation is needed on which aspects are assessed within descriptors 1, 4 and 6, respectively, in order to avoid **double counting (over-weighting of assessments) across descriptors**. The criteria/indicators in other descriptors that contribute to a risk of **'double counting'** are:

- (in relation to D4 Food web) 4.3 Abundance/distribution of key trophic groups/species / 4.3.1 Abundance trends of functionally important selected groups/species;

“The assessment of abundance/area of key trophic groups like habitat-defining species may not have a high indicator value for D4 food web” since it “does not target the processes and linkages within and between the food webs but is restricted to the state of a particular node of that web, much like the indicators already in place for Descriptor 1”.

- (in relation to D6 Sea floor integrity) 6.2 Condition of benthic community / 6.2.2 Multi-metric indexes assessing benthic community condition and functionality;

There is a great opportunity that “indicators addressing criterion 6.2 (Condition of benthic community) are also used under criterion 1.6 Habitat condition / 1.6.1 Condition of the typical species and communities of Descriptor 1, because the benthic communities are also regarded as being the biotic components of benthic habitats”.

- e) It is recommended to integrate all criteria and parameters relating to the condition or state of the benthic communities and species into the habitat level of D1 (this was a common approach across MSs for the Art. 8 assessments in the first phase of the MSFD implementation). Alternatively, the scope and aim of each criterion should be re-defined in order to reflect the specificities in relation to each descriptor.
- f) RSCs have gathered, and are still gathering, various practical experiences in developing, testing, assessing and implementing biodiversity indicators, e.g. data flows (access to governmental and privately owned data), reporting, gap analysis, practical issues (e.g. division of tasks amongst Member States, financial consequences), etc. It is recommended to use these practical experiences.

5. GES criteria (in accordance with Art. 9.3)

5.1 Conclude on the use of the existing Decision criteria and indicators, in the light of the "refined" common understanding, the findings of the Article 12 assessment and relevant international, EU and RSC legislation and approaches

Clarification of the GES concept:

- D1 covers all biodiversity – how to measure this in practice (currently via functional groups and predominant habitat types) needs to be clearer. The lists of functional groups and predominant habitats in SEC 2011/1255 aim to cover all biodiversity, but would benefit from

a review to ensure they are a suitable practical set. Which (sets of) species to be assessed should be defined to represent each group (including also threatened/sensitive species or groups).

- Key terms and concepts (e.g. links across the state descriptors, aggregation of descriptors to the overall ecosystem assessment, etc.) used in GES definitions are often insufficiently clear, so guidelines and agreements are needed for the specification of their exact meaning.

Regional coherence:

- Guidelines specifying the EU desired level of ambition are necessary to ensure that implementation requires a comparable level of GES while taking into account regional and sub-regional differences. The aim should be for EU-wide coherence on the assessment criteria, high-level thresholds and baselines, whilst expecting the specific species/habitats/values to be defined at regional - through RSCs - or national level to reflect ecological variation and the species and habitats that are most suitable for assessment, considering the differences in pressures.
- Within and across the RSCs (in particular HELCOM and OSPAR), the work to develop and agree upon a core set of indicators is currently ongoing, increasing coherence within these regions, especially on setting boundaries for GES.
- Criteria based on HBD, RSCs, and European Red List assessments (ongoing) can be broadly aligned/centred on quantity and quality. These criteria for habitats and the Member States' monitoring and reporting obligations should be aligned between neighbouring Member States and, if possible, standardised to be coherent and comparable. While quantifying the attributes for species and habitats can be costly and technically difficult, these need to be considered when designing and monitoring the protected areas network. However, patterns can be determined/modelled on the basis of presence data.

5.2 Recommendation as to which criteria to retain, amend or remove

Species Level

The biodiversity components and species groups to be considered, at species biological level, are listed in Table 3 (from SEC 2011/1255).

Table 3: Functional groups of highly mobile and widely dispersed species of marine birds, mammals, reptiles, fish and cephalopods (Table 3 of SEC 2011/1255).

Biodiversity components	Species group
Birds	Intertidal benthic-feeding birds
	Inshore surface-feeding birds
	Inshore pelagic-feeding birds
	Inshore benthic-feeding birds
	Inshore herbivorous-feeding birds
	Offshore surface-feeding birds
	Offshore pelagic-feeding birds
	Ice-associated birds
Mammals	Toothed whales
	Baleen whales
	Seals
	Ice-associated mammals
Reptiles	Turtles
Fish	Diadromous fish
	Coastal fish
	Pelagic fish
	Pelagic elasmobranchs
	Demersal fish
	Demersal elasmobranchs
	Deep-sea fish
	Deep-sea elasmobranchs
	Ice-associated fish
Cephalopods	Coastal/shelf pelagic cephalopods
	Deep-sea pelagic cephalopods

These elements should be defined and be in line with all Descriptors and criteria that assess the state of or impacts on species (cf. 1.6). These elements must be updated after the review process and be harmonised with potential changes in the content of aforementioned MSFD Descriptors, criteria and indicators. Standards for inclusion or exclusion of assessment elements for the needs of the MSFD should be developed in accordance with HD criteria (Appendix III of the HD).

Relevant species allocated to the species groups and functional groups of SEC 2011/1255 Table 3 include, inter alia:

- a) species listed under EU Directives and international agreements⁴⁸;
- b) Key species (as representatives of key structural components or functions of the ecosystem);
- c) commercially exploited species (in relation to Descriptor 3);

⁴⁸ For an indicative list of elements see: Tables on page 23 of the following LIFE III document: http://ec.europa.eu/environment/nature/natura2000/marine/docs/appendix_4_life.pdf & Annexes in N. Zampoukas, A. Palialexis, A. Duffek, J. Graveland, G. Giorgi, C. Hagebro, G. Hanke, S. Korpinen, M. Tasker, V. Tornero, V. Abaza, P. Battaglia, M. Caparis, R. Dekeling, M. Frias Vega, M. Haarich, S. Katsanevakis, H. Klein, W. Krzyminski, M. Laamanen, J.C. Le Gac, J.M. Leppanen, U. Lips, T. Maes, E. Magaletti, S. Malcolm, J.M. Marques, O. Mihail, R. Moxon, C. O'Brien, P. Panagiotidis, M. Penna, C. Piroddi, W.N. Probst, S. Raicevich, B. Trabucco, L. Tunesi, S. van der Graaf, A. Weiss, A.S. Wernersson, W. Zevenboom, (2014). Technical guidance on monitoring for the Marine Strategy Framework Directive. EUR – Scientific and Technical Research series. Luxembourg: Publications Office of the European Union 166pp, doi: 10.2788/70344.

- d) genetically distinct forms of indigenous species;
- e) non-indigenous species, particularly those which are invasive.

The RSCs can play an important role by defining the species to be assessed on regional or sub-regional level. In particular, species with populations that are well characterised by survey data should be considered in this process.

Section 2.3 refers to lists of marine species that are included in other legislations. Their assessments must be adapted to the MSFD D1 assessment.

1.1. Species ~~distribution~~ geographic distribution

GES determination: the geographic distribution of species should be in line with the assessments conducted for the HD, BD and RSCs agreements and not deteriorated significantly by human activities. For species distribution where specific thresholds have been set, these should be considered (e.g. a threshold of Y% of the natural range).

GES for the species listed in the HD can be assessed based on criteria similar to the “favourable conservation status” assessment defined by the HD and discussed in section 1.3⁴⁹. In addition to typical and endangered species, GES is required for the commercially exploited species addressed by the Common Fisheries Policy (EC 2008b); the criteria and indicators for healthy commercial stocks are detailed in Descriptor 3.

The methodological standards to support criterion 1.1 could to include the approach from the HD. The conservation status for the species (Directive provisions, Art. 1) will be taken as 'favourable' when (the second bullet is relevant to MSFD criterion 1.1):

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

Proposed methodological standards could include:

- distributional range
- distributional pattern, where relevant
- area covered by species, where relevant
- species distribution models
- ...

⁴⁹ It should be noted that qualitative definitions of GES may deviate from the FSCs provided by the HD. There may be species that are not in FCS for (coastal and/or) marine waters, but that are in FSC on a national level. In this case the Member State is not obligated to undertake action to change the status in marine waters (e.g. gulls, terns, waders that are breeding in coastal and further inland habitats). Further, differences have to be avoided between regionally defined GES boundaries and national objectives of the WFD and Natura Directives.

Depending on the species and the monitoring programmes, several types of data can be generated including occurrence data, presence-absence data and abundance per sampling station. Species distribution models can link species distributions with preferable environmental conditions bridging this criterion to the habitat condition criterion (1.6), in line also with the HD criterion for natural habitats and the conservation status of its typical species (Directives provisions, Art.1). RSCs should play an important role in coordinating these monitoring and modelling programmes.

The most common methodological standards reported for D1.1, according to Palialexis et al. (2014), were:

- Location and distribution of species or species groups
- Distributional range of species or species groups
- Area covered by species or species groups

These were reported for specific species or species groups.

Boundaries associated with these methodological standards and links with GES:

GES boundaries for species' geographic distribution should be in line with the boundaries defined by other legislations and agreements and with the GES determination. Due to the variety of elements and species, only general rules for GES boundaries can be defined according to the Common Understanding document and the cross-cutting workshop conclusions. Species distribution is subject to natural processes (e.g. intra-, inter-species competition) that cannot always be distinguished from the effects of anthropogenic activities that hinder any attempt to include deterioration of species distribution into the general GES definition or into boundaries. However, endangered and vulnerable species should be treated more strictly if they are to be included in the assessment, due to the direct threat they face. A similar approach should also be applied to relevant habitats. For such elements it is suggested to include the maintenance of distributional range in their GES assessment. In any case, endangered and vulnerable species are assessed by the nature Directives.

Distributional range (1.1.1)

Distributional pattern within the latter, where appropriate (1.1.2)

Area covered by the species (for sessile/benthic species) (1.1.3)

1.2. Population size

GES determination: species population abundance and/or biomass should be in line with the assessments conducted for the HD, BD and RSCs agreements, and should not be deteriorated significantly by human activities. Where abundance and/or biomass-specific thresholds have been or can be set, these should be considered.

Methodological standards:

In line with criterion 1.1, the methodological standards to support criterion 1.2 could derive (to include) from the approach of the HD, as is presented above.

Proposed methodological standards could include:

- population abundance and/or biomass, as appropriate

The Data Collection Framework of the Common Fisheries Policy provides data for the assessment of biomass and abundance for a number of marine species (see also section 2.3).

The most common methodological standard reported for D 1.2, according to Palialexis et al. (2014), was:

- the size (biomass, number, coverage) of the population of individual species or species groups

Boundaries associated with these methodological standards and links with GES:

GES boundaries for population size should be in line with boundaries defined for other legislation and agreements and with the GES determination. Due to the variety of elements/species, only general rules for GES boundaries can be defined according to the Common Understanding document and the cross-cutting workshop conclusions.

Good practices for GES determination for 1.2: A MS determined GES for MSFD Art. 9 considering existing assessments: "Good conditions according to the Water Framework Directive (i.e. good ecological status), Habitats and Birds Directives (i.e. favourable conservation status) and OSPAR (i.e. ecological quality objectives) are attained. Rare and threatened habitat types and species, included in existing legislation and conventions, are protected to the level envisaged by that legislation or convention". Another good practice for a quantitative determination of GES coming from the 2012 reporting exercise includes: "GES is achieved when values of abundance and biomass in the assessment area of the species X, Y and Z, which have been selected as suitable indicators for the status of coastal fish communities, are equal to or exceed the threshold value (quantitatively expressed)".

1.3. Population condition

GES determination: species population condition should be in line with the assessments conducted for the HD, BD and RSCs agreements and not be significantly and adversely affected by human activities. The population's structure and health status can safeguard reproduction and genetic variation to such an extent that the viability of the population can be maintained.

Methodological standards:

— Population demographic characteristics (e.g. body size or age class structure, sex ratio, fecundity rates, survival/ mortality rates)

— Population genetic structure, where appropriate

Proposed methodological standards:

- Productivity
- Survival rate,
- Breeding success

-

The most common methodological standards reported for D 1.2, according to Palialexis et al. (2014), were:

- Productivity
- Survival rate,
- Breeding success
- Genetic structure of the population

Boundaries associated with these methodological standards and links with GES:

GES boundaries for species population conditions should be in line with boundaries defined for other legislation and agreements and with the GES determination. Due to the variety of elements/species, only general rules for GES boundaries can be defined according to the Common Understanding document and the cross-cutting workshop conclusions.

Good practices for GES determination for 1.3: A MS determined GES as: "The population's structure and health status can safeguard reproduction and genetic variation to such an extent that the viability of the population can be maintained". Several MSs referred to assessments from other EU legislations (BD, HD) for the particular criterion.

Habitat level⁵⁰

For a consistent and coherent assessment of habitats it is proposed to follow specific classification schemes. Table 7 of the SEC 2011/1255 lists predominant habitats. The criteria for selecting sites eligible for identification as sites of community importance and designation as special areas of conservation (Appendix III of the HD) should be considered to extend the proposed list of habitats. Additionally, the EUNIS classification system may facilitate a consistent assessment, especially because of its pan-EU coverage. To that end, direct links between the SEC 2011/1255 predominant habitats and the 2015 EUNIS classes must be adjusted. Regional-sea-specific habitat/biotope classifications based on EUNIS can further improve a regionally coherent assessment taking into account particular spatial specificities (see HELCOM HUB as good practice⁵¹).

(scope) A set of habitats needs to be drawn up (based on EUNIS and considering the SEC 2011/1255 predominant habitats) for each region, sub-region or subdivision, taking into account the different habitats contained in the indicative list in Table 1 of Annex III and having regard to the instruments mentioned in point 2 of Part A. Such instruments also refer to a number of habitat complexes (which means assessing, where appropriate, the composition, extent and relative proportions of habitats within such complexes) and to functional habitats.

1.4. Habitat geographic distribution and extent

⁵⁰ Marine habitat types included in Annex I of the HD should be considered.

⁵¹ <http://helcom.fi/baltic-sea-trends/biodiversity/helcom-hub>

GES determination: Habitat geographic distribution and extent *should be in line with the assessments conducted for the HD and RSCs agreements, and shall not be significantly and adversely affected by human activities. For habitats' distribution and extent where specific thresholds have been set, these should be considered (e.g. maintain a threshold of Y% of natural range not affected or Y% of natural range able to provide sustainable services).*

Methodological standards to assess habitats distribution:

The approach to methodological standards to support criteria 1.4 & 1.5 could encompass the HD approach. In the case of natural habitats, favourable conservation status (ref Article 1e) is achieved when:

- *its natural range and the areas it covers within that range are stable⁵² or increasing⁵³, and*
- *the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and*
- *the conservation status of its typical species is favourable as defined in Article 1(i).*

The last two points are more relevant to the MSFD D1 habitat condition criterion.

Proposed Methodological standards

- *Distributional range: Habitat distributional range* is the geographical region where occurrences of a habitat can be found within the waters of each MS. They should be typically bound by habitat range limits, defined as the spatial boundaries beyond which there is no occurrence of a habitat in a Member State. Range is the actual distribution of a habitat and not the potential distribution delineated by environmental limitations and reflected in the habitat extent.
- *Distributional pattern: Habitat distributional pattern* is the manner in which a habitat is spatially arranged. Random, regular/uniform and clumped are the three traditional patterns considered. The pattern of habitat distribution may not be permanent. Seasons influence environmental conditions and resource availability (e.g. position of pelagic features), thereby influencing the location and even existence of certain habitats. As they may depend of the scale at which the pattern is analysed, occurrences need to reflect on defined harmonised resolution to ensure comparability of results between countries and throughout MSFD regions and sub-regions. The particular methodological standard is more relevant to specific habitats (e.g. coral reefs), but can potentially indicate fragmented habitats resulting from anthropogenic activities that can threaten biodiversity.
- *Habitat extent (area and volume): Habitat extent* refers to the area or volume effectively occupied by the habitat within its range. Typically, accurate habitat extent delimitation results from the analysis of ground-truth remote sensing images (aerial, satellite or acoustic). Alternatively, habitat extent may result from validated statistical models. An effort should be made to report on the current habitat extent as well as on that prior to anthropogenic impacts. Anthropogenic pressures typically related to major habitat losses or damage include construction of coastal infrastructures and aggregate dredging. Other

⁵² MSFD doesn't require conservation towards achievement of a pristine habitat, but achievement of sustainable use. To that end, 'stable' refers to habitats sensitive to human impacts.

⁵³ According to the MSFD objectives "increasing" refers to heavily impacted habitats that are under a restoration framework, towards natural extent.

pressures that affect both habitat extent and condition include sediment disposal, non-indigenous species invasions, opportunistic species development, global warming, ocean acidification and changes in the predator-prey balance. Despite aiming to prevent any further deterioration of the habitat extent, the two latter approaches provide less scope for recovery of the populations, as deterioration of habitat extent has already occurred (adapted from WG GES 2011⁵⁴).

The most common methodological standards reported for D1.4 & D1.5, according to Palialexis et al. (2014), were:

- Distributional range of habitats
- Distributional pattern of habitats
- Area occupied by habitat
- Sites or volume occupied by certain species (e.g. *Posidonia* meadows)

GES boundaries for the geographic distribution and extent of a habitat should be in line with boundaries defined by other legislation and agreements, while greater effort is needed to streamline the existing boundaries towards consistent ones for all habitats. Due to the variety of elements/habitats only general rules for GES boundaries can be defined according to the Common Understanding document and the cross-cutting workshop conclusions. Such rules have been already set by the HD, IUCN and RSCs (i.e. OSPAR). Habitats subject to natural variation cannot always be distinguished from the effects of anthropogenic activities, hindering any attempt to include maintenance and reduction of habitat areas into the general GES definition or into boundaries. However, habitats that are threatened and sensitive to pressures should be treated more strictly, due to their direct danger of degradation and when their sustainability of services is not maintained. A similar approach should also be applied for relevant habitats. For such elements, it is suggested to include the maintenance of the distributional extent and range in their GES assessment.

Good practices for GES determination for 1.4 & 1.5: A MS determined GES including the followings: GES is achieved when good conditions according to the Water Framework Directive (i.e. good ecological status), Habitats and Birds Directives (i.e. favourable conservation status) and RSC's (i.e. ecological quality objectives) are attained. Rare and threatened habitat types and species, included in existing legislation and conventions, are protected to the level envisaged by that legislation or convention". Another MS determined GES for particular species reporting: "GES is achieved when no significant reduction of the area occupied by the maerl-type sediments and other coralligenous habitats". Unfortunately, no GES determination for 1.4 & 1.5 included a quantifiable parameter, other than the maintenance of the area (trend-based quantification).

1.5. Habitat condition

GES determination: Habitat conditions should be in line with the assessments conducted for the HD (in terms of structure and functions), the BD (in terms of quality-biotic & abiotic elements) and RSC agreements, and should not be significantly and adversely affected by human activities.

⁵⁴ WG GES 2011. Draft Common Understanding of (Initial) Assessment, Determination of Good Environmental Status (GES) and Establishment of Environmental Targets (Art.s 8, 9 & 10 MSFD). Version 5.

Methodological *standards to assess habitat conditions*:

'Condition' means the actual environmental state of a habitat in a given geographical area. The assessment of state can be derived by taking direct measurements of the particular biodiversity component, such as a typical species or communities. In practice, it is nearly impossible to measure the condition of all habitats in a given marine region by field sampling. A risk-based approach is therefore suggested, including, inter alia, a selection of representative habitats affected by each pressure.

In line with criterion 1.4, the methodological standards to support criterion 1.5 could derive (to include) the approach from the HD, as is presented above.

Proposed methodological standards:

- *Condition of the typical species and communities*
- *Relative abundance and/or biomass, as appropriate*

The most common methodological standards reported for D1.6, according to Palialexis et al. (2014), were:

- Diversity indices (e.g. Shannon-Wiener)
- Benthic Quality Index (BQI)
- Species ratios
- Abundance or biomass of species or groups of species
- Oxygen saturation (under the "physical, hydrological and chemical conditions)

BQI was also reported under D 5.2. Some MSs reported habitat extent (1.4) as an indication of 1.5 habitat condition. Specific abiotic parameters of the habitats must be assessed through the pressure descriptors reflecting the level of certain pressures to habitats.

GES boundaries for habitat condition should be in line with boundaries defined for other legislation and agreements, while further efforts are needed to streamline the existing boundaries towards consistent ones for all habitats. Due to the variety of elements-habitats, only general rules for GES boundaries can be defined according to the Common Understanding document and the cross-cutting workshop conclusions. Habitats are subject to natural variation, which cannot always be distinguished from the effects of anthropogenic activities, hindering any attempt to include maintenance and reduction of habitat areas into the general GES definition or into boundaries. However, habitats that are threatened and sensitive to pressures should be treated more strictly, due to their direct danger of degradation. A similar approach should be applied to relevant habitats. For such elements, it is suggested to include condition maintenance in their GES assessment.

Good practices for GES determination for 1.4 & 1.5: A MS determined GES using a diversity index for specific group of species, providing a quantitative definition for habitat condition.

Typical species and communities should be defined and listed, at least regionally.

1.6. Ecosystem structure

The Ecosystem structure criterion was not reported by all MSs. The lack of specification in its content, which is also reflected in the lack of an introductory note in the COM DEC 2010/477/EU in contrast to the other two levels, led to different interpretations and assessments.

Currently there are two prevailing approaches:

The ecosystem assessment refers to the ultimate goal of the MSFD and need not be included in D1. This will be achieved by a global assessment of the state descriptors, including the impacts of the pressure Descriptors, in line with the ecosystem approach dictated by the MSFD (Figure in 6.1). Under this perspective, it is suggested by some MSs to eliminate this level. The fact that some ecosystems' attributes (e.g. functions and resilience) are assessed under other Descriptors (D4 and D6) makes a stronger case for the elimination of the particular criterion for the sake of simplicity and to avoid duplicated assessments. In addition, difficulties in assessing this criterion were obvious in the JRC's In-depth Assessment (Palialexis et al., 2014) and in the RSCs core indicator work (see table 3.1 & 3.6 of the "Development of a shared data and information system between the EU and the Regional Sea Conventions⁵⁵" where the lack of indicators for 1.7 is highlighted across the RSCs). Another argument states that "ecosystem processes and functions" are a high-level consideration for assessment (e.g. under Art. 8), rather than a criterion under D1. This high-level consideration receives its input from a set of descriptors (e.g. D4, D6). Finally, monitoring programmes for biodiversity have not been designed to adequately cover ecosystem processes and functions.

[The second approach is presented in section 5.3 as a proposal for a criterion to substitute and clarify criterion 1.7].

Methodological standards to assess ecosystem structure:

- *Composition and relative proportions of ecosystem components (habitats and species)*

The most common methodological standards reported for D1.7, according to Palialexis et al. (2014), were:

- Ecological Evaluation Index (EEI)
- BENTIX
- PREI
- Species diversity indices (e.g. Hill's N1)

These methods are also reported under other Descriptors (4, 6, 5) or criteria of D1 (1.6).

5.3 Proposals for new criteria

In an effort to cover aspects related to *Ecosystem processes and functions*, the current EC Decision 2010/477/EU includes the following text:

⁵⁵ https://circabc.europa.eu/d/a/workspace/SpacesStore/aff9880d-df5e-44ec-854e-8f098fcff2e5/DIKE_10-2014-05b_RSCDataReporting_Report.pdf

“In addition, the interactions between the structural components of the ecosystem are fundamental for assessing ecosystem processes and functions for the purpose of the overall determination of good environmental status, having regard, inter alia, to Articles 1, 3(5) and 9(1) of Directive 2008/56/EC. Other functional aspects addressed through other descriptors of good environmental status (such as descriptors 4 and 6), as well as connectivity and resilience considerations, are also important for addressing ecosystem processes and functions.”

Given the importance of this level and the continued progress in the field, it is possible that more specific criteria can be identified to address these aspects. The proposals presented by the TG1 report (Cochrane et al., 2010⁵⁶) are listed below. Operational indicators and methodological standards that address, for instance, the estimation of connectivity, patchiness, fragmentation, integrity and resilience between habitat occurrences and species meta-populations at MSFD regional and sub-regional levels could be included at the ecosystem level. Note that these indicators should be complementary (rather than overlapping) to ecosystem functioning elements already addressed in Descriptors 4 (food webs) and 6 (sea-floor integrity). In addition, these should complement the indicator work of the RSCs.

1.6. Ecosystem processes and functions

- Interactions between the structural components of the ecosystem (1.6.1)
- Services provided by biological diversity within ecosystems (1.6.2)

Services provided by biological diversity within ecosystems could be linked with the implementation of the EU Biodiversity Strategy and more specifically with ecosystem assessments under Action 5 of the EU Biodiversity Strategy by 2020. According to this “Member States, with the assistance of the Commission, will map and assess the state of ecosystems and their services in their national territory by 2014, assess the economic value of such services, and promote the integration of these values into accounting and reporting systems at EU and national level by 2020”.

Proposed Methodological standards

- Conservation Status of Species by numbers⁵⁷
- Mean Maximum Length of fish community⁵⁸
- Large Fish Indicator (LFI)^{59,60}
-

5.4 Rationale and proposals, where appropriate, for defining GES threshold values and reference points, based on established and agreed scientific methods for quantifying and applying GES boundaries, or for a normative definition of GES

⁵⁶ Cochrane S.K.J., D.W. Connor, P. Nilsson, I. Mitchell, J. Reker, J. Franco, V. Valavanis, S. Moncheva, J. Ekebom, K. Nygaard, R. Serrão Santos, I. Narberhaus, T. Packeiser, W. van de Bund & A.C. Cardoso, 2010. Marine Strategy Framework Directive Task Group 1 Report Biological diversity EUR 24337 EN – 2010. <http://ec.europa.eu/environment/marine/pdf/1-Task-group-1-Report-on-Biological-Diversity.pdf>

⁵⁷ Dulvy, N., Jennings, S., Rogers, S.I., Maxwell, J.D., 2006. Threat and decline in fishes: an indicator of marine biodiversity. Canadian Journal of Fisheries and Aquatic Sciences 63, 1267

⁵⁸ Jennings, S., Greenstreet, S. P. R., and Reynolds, J. D. 1999. Structural change in an exploited fish community: a consequence of differential fishing effects on species with contrasting life histories. Journal of Animal Ecology, 68: 617-627

⁵⁹ Greenstreet, S.P.R., Rogers, S.I., Rice, J.C., Piet, G.J., Guirey, E.J., Fraser, H.M., Fryer, R.J., 2011. Development of the EcoQO for the North Sea fish community. ICES Journal of Marine Science: Journal du Conseil 68, 1–11.

⁶⁰ Modica, L., Velasco, F., Preciado, I., Soto, M., and Greenstreet, S. P. R. Development of the large fish indicator and associated target for a Northeast Atlantic fish community. – ICES Journal of Marine Science, doi: 10.1093/icesjms/fsu101.

Experts' input on defining reference points (after clarification of quantifying GES): At least for marine benthos, the high percentile method is the standard used in the intercalibration process to estimate reference values for biotic indicators such as species richness, Shannon index and AMBI. Percentile values in the range of 95 to 99 percentiles of a sufficiently large dataset (>10 years) are used. The 99 percentile seems to be used increasingly, and appears (at least for marine benthos) NOT to overestimate reference values. Expert judgment remains necessary to evaluate the estimated reference values and resulting EQR values. For example, it appears that the estimates of reference values given by this percentile method are too low, if a benthic community is in a poor or low-to-moderate state. In this case, suitable simple and pragmatic correction methods of these reference values must be designed and used.

HELCOM CORESET and HOLAS II are working towards the quantification of indicators which are strongly dependent on the type of indicator, while for some types the determination of reference points might not be feasible.

Agreed and established references and thresholds from other legislation and RSCs should be considered for the MSFD assessments. D1 elements should be linked with pressure Descriptors and pressure thresholds that affect GES of the state elements. Annex V of the SEC 2011/1255 can guide such links between pressure and state criteria, through impacts.

Despite the complexity involved in providing a general qualitative definition of GES at the level of the criterion, due to the heterogeneity of the elements, it is much easier to determine a quantitative GES for specific selected species, groups of species and habitats, as shown in the good practices provided in 5.2.

6. GES methodological standards (in accordance with Art. 9.3)

6.1 Proposals for (new) methodological standards to be applied to the criteria in order to assess whether GES has been achieved for the descriptor (e.g. aggregation/integration methods across the criteria and across the quality elements, e.g. across contaminants, species, habitats), using JRC / ICES / RSC protocols, Article 12 findings and guidance from the Scales project, as appropriate

With regard to aggregation methods and scales, the recent report by Deltares⁶¹ has given a good overview of the key questions that need to be addressed, including examples and the advantages and disadvantages of the different approaches. The One-Out-All-Out (OOAO) approach is not suitable for D1, due to the large number of assessment elements under each criterion. It could be useful for certain groups of elements (e.g. endangered species, sensitive habitats, engineering species) either within each relevant criterion or across the species/habitats criteria. For large groups of elements, a percentage of elements to be in GES could be a useful approach to provide quantitative GES and monitor the progress towards its achievement through the targets and programmes of measures.

⁶¹ Prins, T.C., Borja, A., Simboura, N., Tsanagaris, C., Van der Meulen, M.D., Boon, A.R., Menchaca, I., & Gilbert, A.J. 2014 in prep. Coherent scales and aggregation rules for environmental status assessment with the Marine Strategy Framework Directive. Towards a draft guidance. Deltares/AZTI/HCMR, Report 1207879-000-ZKS-0014 to the European Commission, Delft, 47pp.

The outcome⁶² of the cross-cutting workshop on assessment scales, in relation to elements, is that multiple scales would need to be selected so that data being collected ensures appropriate coverage of the needs and no data gaps are observed. Overall, one scale does not fit all elements, and there is a need for a system that address the different levels.

⁶² https://circabc.europa.eu/d/a/workspace/SpacesStore/9daafb84-fe4f-42ad-864f-21b338c8269b/CCWorkshop_Summary%20Notes_20022015_Final.docx

Define scales at each stage of the process⁴⁶:

	Process	Scale
1	Define GES	(sub)Region
2	Define 'indicators' for assessment	(sub)Region and possibly EU level
3	Collect the data (monitoring)	National, considering WFD for coastal waters and MSFD offshore
4	Process the data for use in indicator assessment	National, considering WFD for coastal waters and MSFD offshore
5	Aggregate the data and assess the indicator	Sub(Regional) ('national' sub-basins)

Scales are an important aspect for the MSFD implementation process that should be defined in several processes. Generally, these are already embedded in the assessment elements (species, habitats and ecosystems), which can potentially direct the determination of scales for several steps (assessment, monitoring, measures). In any case, scales must be representative of all ecosystem elements and reflect the spatial extent of the pressures. For the sake of coherence and consistent/comparable implementation, a common approach can be suggested. As a starting point, the "nested approach" (as developed and applied in HELCOM) should be introduced to all marine regions, as is already being attempted by OSPAR.

For the D1, the specified elements for assessment (species, habitats) can generally guide the definition of the assessment scales. For instance, large cetaceans should be assessed regionally, pelagic and demersal fish species on a sub-regional level, and seabed habitats on a sub-division level. Following the agreed lists of elements to be assessed under D1, a corresponding scale assessment can be predefined.

Integration across descriptors and the ecosystem-based approach of the MSFD

The artificial distinction of pressures, state and impact attributes of the 11 MSFD descriptors led unavoidably to overlaps between them in terms of assessments. For a holistic state assessment of the ecosystem in line with the ecosystem-based approach to management (Art. 1(3)), the state descriptors and the state criteria of some pressure descriptors should be bridged. The review process, although organised on a descriptor level following the structure of the COM DEC 2010/477/EU, provided the basis for a discussion on cross-cutting issues in a workshop held in Copenhagen on 21-22 January 2015. The ecosystem-based approach to MSFD implementation (Fig. 4) can be framed by integrating the GES criteria for the state-based descriptors (overall state assessment), where the impact of the pressure-based descriptors will feed the state assessment. An essential part of this process is the definition of the state elements to be assessed (internal cycle) and their links, functions and structure (external cycle) that bridge D4 and D6 with D1.

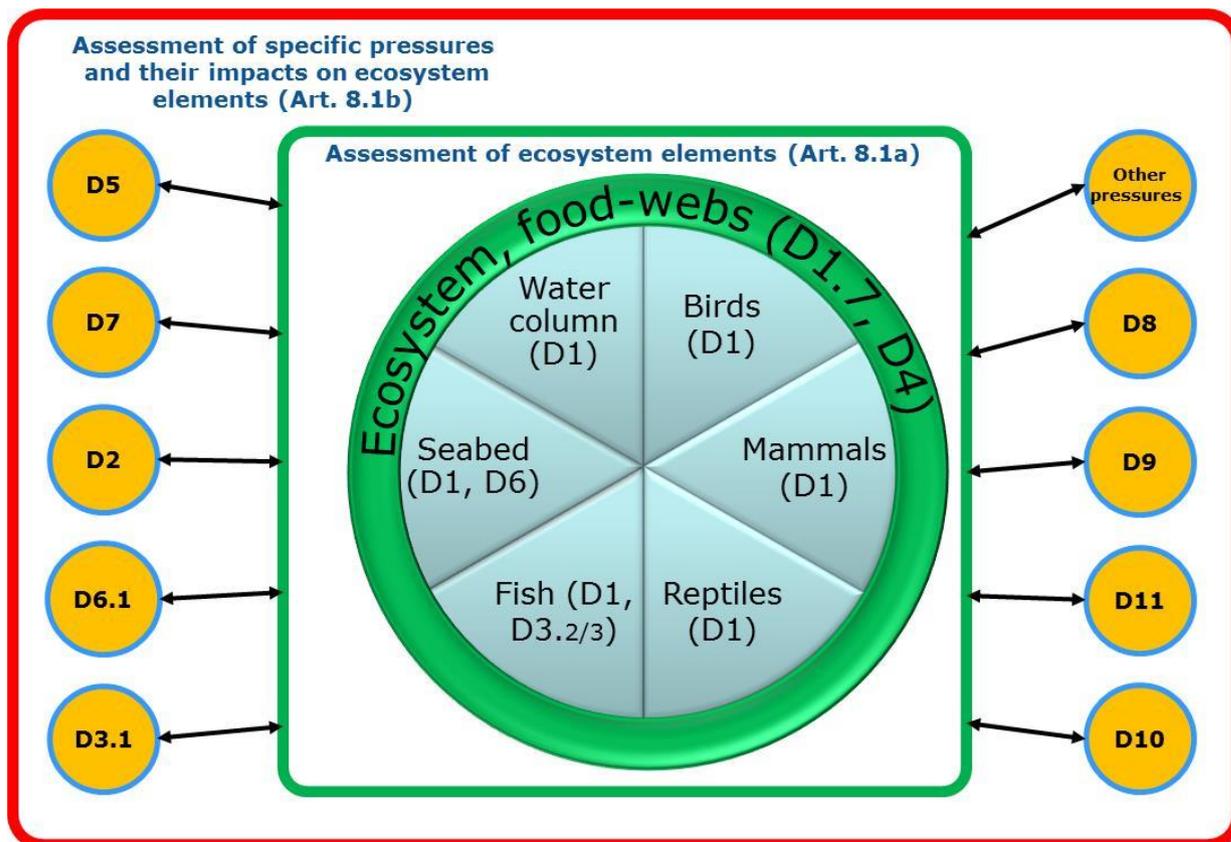


Figure 4⁶³: An ecosystem-based approach to determining and assessing GES follows the main elements of the ecosystem (state-based descriptors, centre) and is closely linked to the effects of pressures from human activities (pressure-based descriptors, satellite circles). Note that descriptors D2, D3, D5, D6, D7, D8, D9 and D10 include both a pressure criterion and an impact criterion in the COM DEC 2010/477/EU; the impact criteria should be closely linked to the state-based assessments.

7. Specifications and standardised methods for monitoring and assessment (in accordance with Art. 11(4))

7.1 Proposals for specifications of methods for monitoring (i.e. the collection of data needed to assess each criterion, including parameters, units of measurement and data quality requirements), which aim to ensure the comparability of monitoring results, on the basis of existing survey protocols and relevant European/international standards (e.g. ISO/CEN)

⁶³ https://circabc.europa.eu/d/a/workspace/SpacesStore/b391ea98-1dbb-4080-8c4a-a0e2d661f4ea/CCworkshop_conclusions_final%20revised%2030032015.ppt

The report “Development of a shared data and information system between the EU and the Regional Sea Conventions⁶⁴” (presented in WG DIKE, CIRCABC) examines the data and information of each of the four Regional Sea Conventions (RSCs) as well as the European Environment Agency (EEA), with the aim of characterising them and the flow processes in place across Europe. The aim is to evaluate how these data could be used to support the reporting objectives of the MSFD and other related EU Directives. Table 3.6 of the report provides a comprehensive list of the parameters used or proposed by the RSCs for assessment of their biodiversity indicators in relation to the MSFD indicators for D1. This exercise is an important step for taking stock of the ongoing assessments and their parameters and aligning these parameters with the requirements of the MSFD.

In 2013, three pilot projects (BALSAM in the Baltic, IRIS-SES in the Mediterranean and Black Sea, JMP NS/CS in the North Sea) were launched as part of a DG ENV initiative to coordinate and support the coherent and comparable implementation of the MSFD, with a focus on monitoring programmes. The objectives are to show the benefits and challenges of joint monitoring networks and multi-use of existing platforms in increasing efficiency and reducing costs, and to promote cooperation among research institutions within selected regions. A specific objective (e.g. IRIS-SES) is to elaborate guidelines for sampling across the various disciplines in order to meet MSFD requirements. It is expected that these projects (ending in May 2015) will provide recommendations for the better harmonisation and coordination of monitoring efforts and data collection, to support the implementation of the MSFD.

In principle, the set-up of the methodological standards for monitoring and assessing D1 components should be developed according to the following steps, in conjunction with the coordinated work of MSs through RSCs:

- 1) Identify representative, threatened and functional groups for predominant and special habitats and species according to Table 1 of Annex III of the MSFD (plankton, macrophytes, invertebrates, fish, reptiles, mammals, birds and other regional important species groups).
- 2) Establish a distribution and abundance sampling system for different groups, where not existing.
- 3) Establish sampling stations to analyse the impact of local relevant pressures (by-catch, extraction, toxicities, etc. using Table 2 of Annex III).
- 4) Develop thresholds or trends for each habitat or species category of the measured local analyses (assuming that the GES quantification has been adequately developed).
- 5) Develop models for the effect of important pressures.
- 6) Model the distribution of pressures and their effects on the relevant marine regions.
- 7) Define GES or at least describe a range for a good and a bad ecological state or trend for each marine region.
- 8) If appropriate, develop areal analyses of the distribution of good and bad ecological states in each marine region.

These steps are indicative and may be adapted to the specific biodiversity elements.

⁶⁴ https://circabc.europa.eu/d/a/workspace/SpacesStore/aff9880d-df5e-44ec-854e-8f098fcff2e5/DIKE_10-2014-05b_RSCDataReporting_Report.pdf

Generally, standardised methods are relevant to monitoring programmes. The WFD works on the standardisation of such methods, which should be also considered for the MSFD, where relevant. The use of ISO method 16665 (2005): (Water quality — Guidelines for quantitative sampling and sample processing of marine soft-bottom macrofauna) can be proposed for the MSFD.

For the monitoring of phytoplankton, zooplankton, macroalgae, benthic invertebrates and coastal fish there are joint monitoring guidelines in the HELCOM COMBINE manual, and MSs are currently working towards joint documentation of the monitoring guidelines for other biological components such as birds, mammals, non-indigenous species and benthic habitats in the HELCOM Monitoring Manual. The review manual aims to support MSFD Article 11 reporting for Contracting Parties that are EU Member States.

7.2 Proposals for specifications on methods for assessment, which aim to ensure comparability of assessment results, including aggregation of monitoring data within an assessment area for a particular criterion and, if necessary, aggregation across assessment areas up to larger areas (e.g. (sub) regional scales), based on general guidance prepared on scales and aggregation rules²³ and taking account of JRC / ICES / RSC inventories and Article 12 findings

In the Baltic Sea, HELCOM assessment units are used to support spatial aggregation by dividing the Baltic Sea into four assessment levels; 1) the whole Baltic Sea 2) 17 sub basins, 3) sub-basins divided into coastal and offshore areas, 4) further division of coastal areas into WFD water types or water bodies. Methods for aggregating monitoring data within an assessment unit will be developed as part of the development of HELCOM core indicators in the CORESET II project. Aggregation of assessment units to larger areas, as well as several different local assessments towards an holistic assessments will be elaborated under the planned HELCOM HOLAS II project. However, scaling up is in general only considered to be useful when ecologically relevant, e.g. for populations that are distributed over larger areas.

8. Rational and technical background for proposed revision

8.1 Justification and technical background justifying the abovementioned proposals

Covered in previous sections

9. Other related products (e.g. technical guidance, reference in the common understanding document)

9.1 Where aspects are identified which should be usefully laid down but not as part of the decision, these elements should be specified and a proposal should be made in which way they should be laid down, e.g. interpretative guide for the application of the future Decision or Common Understanding guidance document or technical background document.

- **Outstanding issues identified during the review process of D1 in phase I that were not completely addressed in this document:**

1. Changes in criteria and indicators

Issue: Criterion 1.7 “ecosystem structure” should be eliminated or re-defined more clearly

Issue: Identification of criteria and indicators overlaps across Descriptors

Expected outcome: To eliminate overlaps in the assessments by better clarifying the content of "state" sides of the "pressure" descriptors and D4 and D6. Interaction with experts in other Descriptors will be required.

2. Common lists of elements for the biodiversity assessments

Issue: Agreement on the compilation of existing lists from other legislations, MSFD documents and RSCs. Specification of elements to be assessed under the three levels. Link with monitoring parameters. Proposal for using EU-wide classifications for Habitats (EUNIS).

3. Habitat/Bird Directives, Common Fisheries Policy and D1

Issues: Practical use of the HD and BD assessments by the MSFD; links of their status classification; Streamlining of assessments, “indicators” and directives’ objectives

4. Proposal for changes in the COM Decision text regarding D1 implementation

Issue: Clarification of biodiversity terms, proposal for a common GES determination and GES boundaries, proposal for common methodological standards under each criterion.

- **Lists of elements and selection/deselection criteria to be considered for the generation of lists of habitats and species, to support a coherent implementation between neighbouring Member States**

For species (e.g. selection criteria from Texel-Faial):

- Listed elements in Directives and Conventions, etc. & section 2.3 of this document
- Vulnerable species (exposed to pressures which impact (or could impact) them at a level that could lead, in the short or longer term, to no GES)
- Links to pressure Descriptors, notably D2, D3
- Rare, declining, natural heritage value
- Functional role: (i) common (= widely occurring, at low abundances AND/OR high abundances, even if less widely distributed); Trophic (important link in the food chain) - Link to D4

For habitats:

- Listed (Directives, Conventions, etc.) = special habitats
- Vulnerable habitats (exposed to pressures which impact (or could impact) them at a level that could lead, in the short or longer term, to no GES). = "particular" area habitats: Links to pressure Descriptors, notably D2, D5, D6
- Rare, declining, natural heritage value
- Functional role:
 - * Common (= widely occurring, at low abundances AND/OR high abundances, even if less widely distributed)
 - * Trophic (important link in the food chain). Link to D4
 - * High biodiversity (e.g. biogenic reefs. Link to D6.)

These issues could be tackled and used to compile a guidance document, in parallel with phase II of the review process of the COM DEC 2010/477/EU to further support the implementation of the MSFD.

10. Reference Documents

- Review of the GES Decision 2010/477/EU and MSFD Annex III Approach and outline for the process, (EC- Committee/07/2013/03rev, 2013);
- First steps in the implementation of the Marine Strategy Framework Directive - Assessment in accordance with Article 12 of Directive 2008/56/EC, (CSWD, 2014);
- Article 12 Technical Assessment, (Milieu ltd, 2014);
- Marine Strategy Framework Directive - Descriptor 3, (ICES, 2012);
- Common Understanding of (Initial) Assessment, Determination of Good Environmental Status (GES) & Establishment of Environmental Targets (Articles 8, 9 & 10 MSFD), (DG GES, 2014);
- Coherent geographic scales and aggregation rules in assessment and monitoring of Good Environmental Status – analysis and conceptual phase, (Deltares, 2014);
- In-depth assessment of the EU Member States' Submissions for the MSFD under articles 8,9 and 10, EUR26473EN (JRC 2014)
- Review of Methodological Standards Related to the Marine Strategy Framework Directive Criteria on Good Environmental Status (JRC, 2011)
- Guidance / Terms of Reference for the task groups 'criteria and methodological standards for the Good Ecological Status (GES) descriptors' (JRC, 2010)
- CSWP (2011) on the Relationship between the initial assessment of marine waters and the criteria for good environmental status.
- OSPAR (2012b). MSFD Advice Manual and Background Document on Biodiversity. London, Publication Number: 581/2012, 141 pp. (available at: http://www.ospar.org/v_publications/download.asp?v1=p00581)



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