European Commission

JRC TECHNICAL REPORT

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

Descriptor 2

Non-indigenous species introduced by human activities are at levels that do not adversely alter the ecosystem.

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Joint Research Centre

Abstract

This report represents the result of the scientific and technical review of Commission Decision 2010/477/EU in relation to Descriptor 2. 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.

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Contents

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., 2014[1]), 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 does not exist)
- Have a clear and minimum list of criteria and methodological standards and related characteristics (Table 1, Annex III)
- Ensure that criteria and methodological standards are adequately addressing the Descriptors and these are covered by the proposed criteria, to lead to complete assessments
- Coherent with the MSFD terminology

The Figure 1[2] show an example based on descriptor 2 to test the proposed architecture of the MSFD. This can be used as guide for the characteristics/ elements to be addressed under Annex III and the revised Decision and to streamline the discussion to be carried out through the review process.

[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.

[2] Modified from DG ENV's presentation in June's 2014 DG GES group: https://circabc.europa.eu/w/browse/f3953f48-f965-43d4-93a5-075f82cc1f12

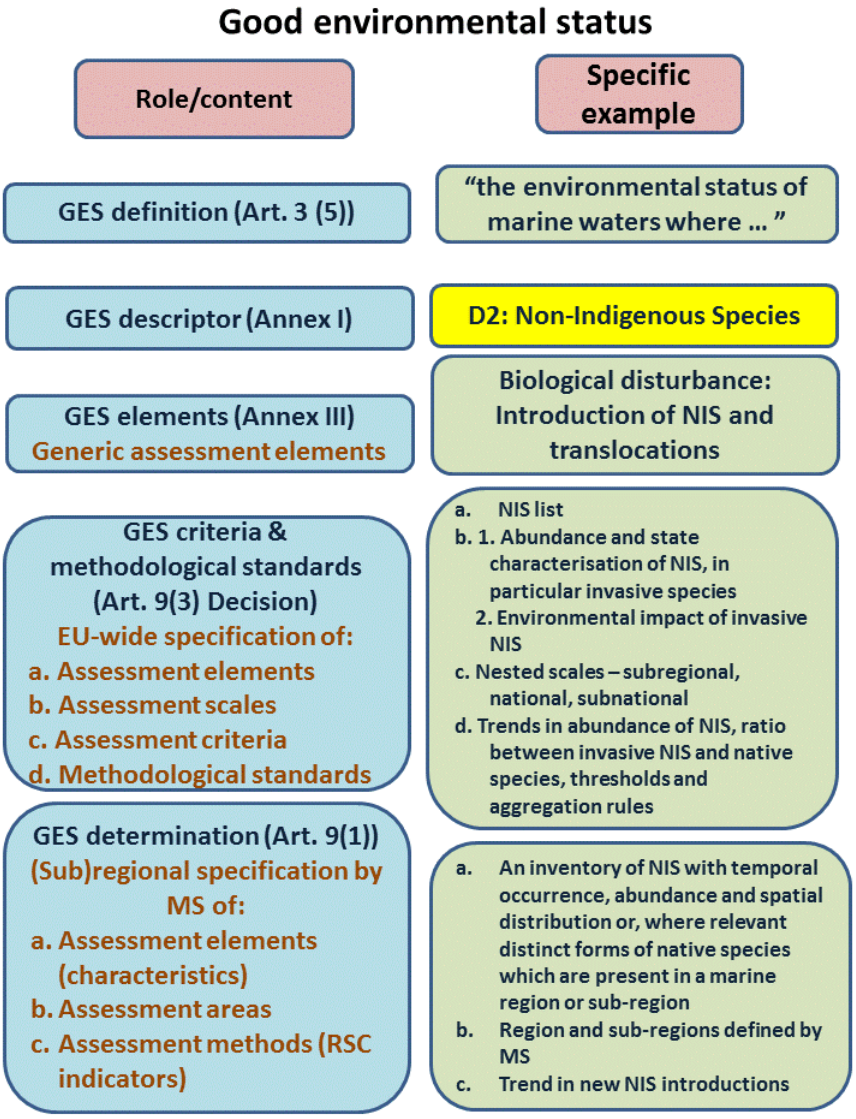

Figure 1. Relationship of MSFD provisions for determining GES. The specificity of the requirements increase from Art. 3(5) through to Art. 9(1) MSFD. The generic role for D2 is outlined.

The role of GES in MSFD can be summarised as the following:

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

Furthermore, GES needs to be established in a way as to allow determining the distance of the current state from GES and for defining targets to guide progress towards GES[3].

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

1.2 Overall reflection of the type of descriptor and descriptor criteria and its relationship with Article 3(5).

There are currently over 1 300 non-indigenous marine species in the European seas (Katsanevakis et al. 2013[4]). About 6% of these species have been documented to have high impact on marine ecosystem services and biodiversity; in many cases non-indigenous marine species impact keystone/protected species and habitats and substantially modify ecosystem processes or wider ecosystem functioning (Katsanevakis et al. 2014[5]).

Invasive non-indigenous species (synonym to invasive alien species, IAS) cause adverse effects on environmental quality resulting in changes in biological, chemical and physical properties of aquatic ecosystems. They can displace native species, cause the loss of native genotypes, modify habitats, change community structure, affect food-web properties and ecosystem processes, impede the provision of ecosystem services, impact human health, and cause substantial economic losses (Grosholz, 2002[6]; Wallentinus and Nyberg, 2007[7]; Molnar et al., 2008[8]; Vilà et al., 2010[9]; Katsanevakis et al., 2013[4]). The magnitude of impacts may vary from low to massive and they can be sporadic, short-term, mid-term or permanent.

According to Art.3 (5) of the MSFD, D2 is referring to the environmental status of marine waters where non-indigenous species (NIS) introduced by human activities are at levels that do not adversely alter the ecosystem. Thus, D2 pressure level should be accompanied by measurable criteria. However, this could be difficult to accomplish due to e.g. lack of linear correlation between the numbers/ abundance of NIS and their impacts.

Invasive non-indigenous species don't pollute the marine environment in the same way as occurs with chemical pollution or eutrophication[10]. The latter can be effectively tackled provided that appropriate measures are taken. For IAS, prevention by identification and risk analysis of different pathways and vectors for species introductions is by far more cost-effective and environmentally desirable than post-introduction measures, such as eradication or long-term containment (recital (15) of IAS Regulation 1143/2014/EU). In the marine environment, prevention seems to be in most cases the only feasible alternative, as with current understanding eradication is unfeasible with established species, but there has been some successes in the early stages of introduction (e.g. the eradication of *Caulerpa taxifolia* in California, Anderson, 2005[11], which was a success according to Final *Caulerpa taxifolia* Eradication Report, May 2006[12]). The risk of new biological invasions could be

[4] Katsanevakis S, Gatto F, Zenetos A, Cardoso AC, 2013. How many marine aliens in Europe? Management of Biological Invasions 4(1): 37–42.

[5] Katsanevakis S, Wallentinus I, Zenetos A, Leppäkoski E, Çinar ME, Oztürk B, Grabowski M, Golani D, Cardoso AC, 2014. Impacts of marine invasive alien species on ecosystem services and biodiversity: a pan-European critical review. Aquatic Invasions 9(4): 391–423.

[6] Grosholz, E, 2002. Ecological and evolutionary consequences of coastal invasions. *Trends Ecol. Evol.* 17, 22-27.

[7] Wallentinus I, Nyberg CD, 2007. Introduced marine organisms as habitat modifiers. *Mar. Pollut. Bull.* 55, 323–332.

[8] Molnar JL,Gamboa RL, Revenga C, Spalding MD, 2008. Assessing the global threat of invasive species to marine biodiversity. *Front. Ecol. Environ*. 6, 458–492.

[9] Vilà M, Basnou C, Pysek P, Josefsson M, Genovesi P, Gollasch S, et al.,2010. How well do we understand the impacts of alien species on ecosystem services? A pan-European, crosstaxa assessment. Front. Ecol. Environ. 8, 135–144.

[10] Task Group 2 Report Non-indigenous species JOINT REPORT, 2010.

[11] Anderson LWJ, 2005. California's reaction to *Caulerpa taxifolia*: a model for invasive species rapid response. Biol. Invasions 7, 1003-1016.

[12] Merkel & Associates. 2006. Final report on eradication of the invasive seaweed *Caulerpa taxifolia* from Agua Hedionda Lagoon and Huntington Harbour, California. Prepared for Steering Committee of the Southern California *Caulerpa* Team.

effectively minimized by precautionary measures such as the IMO Convention on ballast water management.

The Descriptor 2 (MSFD, 2008/56/EU) is a pressure descriptor that focuses on assessing the scale of the pressure and the scale of the impacts of marine non- indigenous species. New introductions of NIS and increases in the abundance and spatial distribution of established NIS should be prevented. Descriptor 2 interacts with several other GES pressure Descriptors (D3, 5, 6 7, 8, 9, 10) which have impact on native biodiversity, ecosystem functioning and seabed habitats as well as commercial marine resources (seafood). Indeed, perturbations induced by pressure on ecosystem state, may facilitate installation and/or spread of NIS, which are often opportunistic. In particular, impacts that result from NIS should be managed, where feasible, so that the achievement of GES for the biodiversity Descriptors 1, 4 and in part 3 and 6 is not compromised.

1.3 Linkages with existing relevant EU legal requirements, standards and limit values and identification of potential incoherence.

With the exception of the EU Regulation concerning the use of alien and locally absent species in aquaculture (EU, 2007[13]) and its implementing rules (EU, 2008[14]), no comprehensive instrument existed on EU level to tackle alien species until recently. The EC Communication 'Towards an EU Strategy on Invasive Species'[15], published in 2008, addressed the need for coordinated action to tackle the spread of invasive NIS. In 2013 the European Commission published a proposal for an EU Regulation[16] designed to respond to the increasing problems caused by the impacts of IAS on the environment and the economy and as a follow up an EU regulation has been recently published (Regulation No 1143/2014/EU [17]).

The Regulation No 708/2007/EU establishes a framework for the management of aquaculture practices in relation to NIS, to assess and minimise their potential impact and that of any associated non-target species on aquatic habitats. The information collected under this Regulation, e.g. introduced species, location of aquaculture facility, species risk assessment and monitoring results should be considered in relation to the MSFD D2. Furthermore, this Regulation could be an instrument to tackle identified pressure from NIS in relation to the MSFD.

The Regulation No 1143/2014/EU establishes rules to prevent, minimise and mitigate the adverse impact on biodiversity of the intentional and unintentional introduction and spread within the EU of IAS. It indicates three types of interventions; prevention, early warning and rapid response, and management to tackle the problem. It is expected that a list of invasive non-indigenous species of EU concern will be developed, so as to guide implementation of the Regulation. With this aim, the Regulation on IAS specifically requests action plans on the main pathways of invasive non-indigenous

[13] EU, 2007. Council Regulation Concerning Use of Alien and Locally Absent Species in Aquaculture. Regulation 708/2007, OJ L 168.
[14] EU, 2008. Commission Regulation Laying Down Detailed Rules for the Implementation of Council Regulation (EC) No 708/2007 Concerning Use of Alien and Locally Absent Species in Aquaculture. Regulation 535/2008, OJ L 156.
[15] Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions 'Towards an EU Strategy on Invasive Species', COM(2008) 789 final.
[16] Proposal for a Regulation on the prevention and management of the introduction and spread of invasive alien species, (COM(2013) 620).
[17] Regulation (EU) No 1143/2014 OF THE European Parliament and of the Council of 22 October 2014 on the prevention and management of the introduction and spread of invasive alien species. OJ:L317/35/2014 .

species (Article 13). Member States can also take emergency measures when there is evidence concerning the presence, or imminent risk of introduction into its territory of an invasive non-indigenous species, which is not included on the Union list (Art. 10 of IAS Regulation 1143/2014/EU) but were found during surveillance or monitoring. Furthermore, the Member State has the obligation to build a surveillance system for IAS of Union concern or include it in their existing systems (Art. 14 of IAS Regulation 1143/2014/EU); in fact, such systems offer the most appropriate means for early detection and rapid eradication at an early stage of invasion as is stipulated in articles 16 and 17 of the IAS Regulation 1143/2014/EU to prevent the spread of IAS into or within the Union.

It is yet not known which marine species or if marine species will be included in the list of species as "of Union concern" to be developed by the Commission in cooperation with the Member States. The list derived by evidence-based risk assessments will be of dynamic nature and will potentially include species (Art. 4, Regulation 1143/2014 on IAS) across all environments and taxonomic groups. Species of Union concern will be the ones whose negative impact requires concerted action at Union level.

Also, as with EU Regulation concerning the use of alien and locally absent species in aquaculture, the information collected under the Regulation 1143/2014 e.g. species risk assessment and monitoring results should be considered in relation to the MSFD D2 for the assessment of non-indigenous species impacts. Furthermore, the efficient implementation of both the Regulation and the MSFD for D2 would require the coordination of the respective monitoring programs and programme of measures.

Other relevant EU legislations are: (i) the Birds Directive (2009/147/EC), (ii) the Habitats Directive (92/43/EC), (iii) the Phytosanitary Directive (2000/29/EC), (iv) the Regulation on wild species trade (1997/338/EC),(v) the Water Framework Directive (2000/60/EC) and the Directive on animal health requirements for aquaculture animals and products thereof (2006/88/EC). These six legislative instruments are not focused on NIS but partly cover the issue by requiring their consideration in the frame of restoration of biodiversity conservation status, ecological conditions and animal health.

In the context of the Water Framework Directive (WFD), EU Member States have developed pressure-based assessments of the ecological status of their water bodies, including coastal water bodies. Invasive non-indigenous species are recognised to constitute a major pressure in many aquatic ecosystems, yet they are not explicitly accounted for by the majority of WFD assessment methods. Most Member States argue that no explicit assessment of IAS is required, assuming that significant IAS pressures will affect the WFD biological quality elements (BQEs), and be detected by generic WFD status assessments. Thus, these are in most cases not specifically targeted in the WFD monitoring and assessment; no specific ecological quality ratio have been agreed for non-indigenous species.

1.4 Linkages with international and RSC norms and standards

At the **international level**, the United Nation Convention on the Law of the Sea (UNCLOS, 1982[18]) explicitly places a general requirement on Parties to take measures *"to prevent, reduce and control*

[18] United Nations Convention on the Law of the Sea, 1982. United Nations Treaty Series.

pollution of the marine environment resulting from…the intentional or accidental introduction of species alien or new, to a particular part of the marine environment, which may cause significant and harmful changes thereto" (Article 196). The Convention on the Conservation of European Wildlife and Native Habitats (Bern Convention, 1979[19]) recommends a European strategy on IAS. Furthermore, the Convention on Wetlands (Ramsar Convention, 1994[20]) and the Bonn Convention on Migratory Species (1979[21]) have both adopted resolutions regarding alien species. The Convention on Biological Diversity (CBD) recognised the need for the "compilation and dissemination of information on alien species that threaten ecosystems, habitats, or species, to be used in the context of any prevention, introduction and mitigation activities", and calls for "further research on the impact of alien invasive species on biological diversity" (CBD 2000[22]). In its Strategic Plan for Biodiversity 2011–2020 CBD agreed on a set of targets (Aichi targets), including Target 9 on alien species: 'By 2020, invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment.' Target 9 has been widely adopted, e.g. by the EU in its 'EU Biodiversity Strategy 2020' (COM (2011) 244[23]).

The "International Convention on the Control and Management of Ships' Ballast Water and Sediments" (Ballast Water Management Convention – BWMC, 2004[24]) aims to prevent, minimize and ultimately eliminate the transfer of harmful aquatic organisms and pathogens through the control and management of ships' ballast water and sediments. The Convention will enter into force 12 months after ratification by 30 States, representing 35 per cent of world merchant shipping tonnage. To-date, the Convention is not in force, as the current ratifications do not represent yet 35 per cent of the world merchant shipping tonnage.

Although the best strategy is to prevent introduction of NIS, this is extremely difficult, as ships move constantly in and out of an area, especially for species introduced through growth on the ship's hull (hull fouling or biofouling) that is open to the environment. Recently, voluntary guidelines have been adopted by the International Maritime Organisation (IMO) to avoid the introduction of NIS through the ship's hull for commercial and recreational ships (IMO Hull Fouling guidelines. MEPC.1/Circ.792 12 November 2012[25]).

The **Regional Sea Conventions** have taken various initiatives in relation to NIS.

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[19] Convention on the Conservation of European Wildlife and Natural Habitats, 1979. http://conventions.coe.int/Treaty/en/Treaties/Html/104.htm

[20] Convention on Wetlands of International Importance especially as Waterfowl Habitat, 1994. Ramsar, Iran, 2.2.1971 as amended by the Protocol of 3.12.1982 and the amendments of 28.5.1987. http://www.ramsar.org/library/field_date/%5B1971-01-01T00%3A00%3A00Z%20TO%201972-01-01T00%3A00%3A00Z%5D/field_tag_body_event/establishing-the-convention-566

[21] Convention on the Conservation of Migratory Species of Wild Animals (CMS), 1979. http://www.cms.int/en/node/3916

[22] CBD, 2000. Executive Secretariat to the CBD, Climate Change and Biological Diversity: Cooperation between the Convention on Biological Diversity and the United Nations Framework Convention on Climate Change (UNEP/CBD/SBSTTA/6/11), available at <http://www.biodiv.org>

[23] EU, 2011. Communication from the Commission to the European Parliament, the Council, the Economic and Social Committee and the Committee of the regions. Our life insurance, our natural capital: an EU biodiversity strategy to 2020. COM (2011) 244.

[24] Available at the following link: http://www.imo.org/About/Conventions/ListOfConventions/Pages/International-Convention-for-the-Control-and-Management-of-Ships%27-Ballast-Water-and-Sediments-%28BWM%29.aspx

[25] IMO Hull Fouling guidelines, 2012. Guidance for minimising the transfer of invasive aquatic species as biofouling (hull fouling) for recreational craft [MEPC.1/Circ.792 12 November 2012].

HELCOM parties have agreed to ratify the BWMC following the adoption of a HELCOM Ballast Water Road Map by the HELCOM Ministerial Meeting (2007) in Krakow. A Joint HELCOM/OSPAR Task Group on NIS is working to develop a common framework on the specific issue of exemptions for the BWMC, for both the Baltic Sea and the North-East Atlantic regions (HELCOM, 2013[26]). A list of non-indigenous, cryptogenic and harmful native species in the Baltic Sea was compiled for the needs of HELCOM Ballast Water Road Map, HELCOM HABITAT and MONAS and is continuously edited and updated by various HELCOM subsidiary bodies, expert workshops and projects (list of taxa identified from ports surveyed within HELCOM ALIENS- projects in HELCOM, 2014[27]). Since 2008 the list has been modified by HELCOM HABITAT (11/2009 and 12/2010), HELCOM MONAS (12/2009), the HELCOM HOLAS project and, most recently, by the HELCOM CORESET project. HELCOM ALIENS projects focused on NIS (ALIENS 3 was the most recent project that ended in 2013 and aimed to support the ratification of BWMC by developing NIS monitoring in ports and the risk assessment methods) (HELCOM; 2014[27, 28]). HELCOM CORESET stated that in 2012 there were 118 NIS reported in the Baltic Sea and 90 of those were considered to be established (Rolke et al., 2013[29]). In addition, the HELCOM CORESET project developed a set of core indicators in the Baltic Sea. Currently, 20 core indicators are established for biodiversity, covering the needs of MSFD including NIS (HELCOM, 2013[30]).

NIS introductions are identified as a relevant pressure from human activities in the **OSPAR** Maritime Area (OSPAR, 2009 (draft)[31]). Recently the OSPAR Intercessional (OSPAR ICG COBAM) has proposed a D2 indicator which will be likely promoted by the Environmental Impacts of Human Activities Committee (EIHA) from a candidate to a common indicator for OSPAR Regions II, III, and IV. The OSPAR Quality Status Report (QSR, 2010[32]) states that over 160 NIS have been identified in the OSPAR area, acknowledging ships' ballast water as the main vector of introduction. Other main vectors are aquaculture and fouling on ships. The QSR provides a detailed list of NIS (taxonomic group, common names, regions affected, vector, first reported and probable impacts) and highlights the necessity of the OSPAR countries to ratify and implement the IMO BWMC. At the last update (03/09/2014), there are 38 biodiversity indicators under development by OSPAR, one is dedicated to NIS or invasive NIS (D2): trends in the arrival of new non-indigenous species (adopted as common indicator in February 2015).

The **Barcelona Convention'**s Action Plan on Invasive Species deals with the growing number of IAS in the Mediterranean (2005) and aims at strengthening the capacities of the Mediterranean countries with regards to the prevention and control of introductions of non-indigenous species into the Mediterranean Sea. About 1000 non-indigenous species have been identified in the Mediterranean

[26] HELCOM, 2013. Joint HELCOM/ OSPAR Guidelines on the granting of exemptions under the International Convention for the Control and Management of Ships' Ballast Water and Sediments Regulation A-4. This document is a part of the 2013 HELCOM Ministerial Declaration and was adopted by the 2013 HELCOM Ministerial Meeting.
[27] HELCOM, 2014, HELCOM ALIENS 3 – Tests of the harmonized approach to ballast water management exemptions in the Baltic Sea. 56 pp.
[28] HELCOM, 2014. HELCOM guide to Alien Species and Ballast Water Management in the Baltic Sea.
[29] Rolke M, Michalek M, Werner M, Lehtiniemi M, Strake S, Antsulevich A, Zaiko A, 2013. Trends in arrival of new non-indigenous species. HELCOM Core Indicator of Biodiversity. Online, viewed on 09/03/2015, http://www.helcom.fi/Core%20Indicators/HELCOM-CoreIndicator-Trends_in_arrival_of_new_non-indigenous_species.pdf
[30] HELCOM, 2013. HELCOM core indicators: Final report of the HELCOM CORESET project. BALT. Sea Environ Proc. No. 136.
[31] OSPAR, 2009 (draft). Trend analysis of maritime human activities and their collective impact on the OSPAR maritime area. Prepared by the Intersessional Correspondence Groups for the BA6 Assessment and the Cumulative Effects Assessment.
[32] OSPAR, 2010. Quality Status Report 2010. OSPAR Commission. London. 176 pp.

Sea, of which 500 are well established, with a new species being introduced roughly every ten days (UNEP/ MAP, 2012[33]). A large portion has been introduced through the Suez Canal (47% according to UNEP/MAP, 2009[34]). The Ecosystem Approach (EcAp) in the Mediterranean will gradually implement such an approach for management and is expected to include an integrated monitoring programme on non-indigenous species. 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 in line with D1, D2, D3, D4 and D6.

The **Black Sea Commission (BSC)** has committed to the Black Sea Strategic Action Plan (BSSAP, 2009[35]) adopted in Sofia. The action plan set out four Ecosystem Quality Objectives (ECOQs) in relation to the MSFD descriptors of Good Environmental Status. The BSSAP ECOQs encompass several MSFD descriptors: ECOQ 2 covers MSFD descriptors 1, 2, 4, 6 and 11 together. Finally, a Memorandum of Understanding to increase mutual support between IMO and BSC, was signed in 2010 to cover several environmental aspects of shipping, including ballast water management.

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

A discussion on general policy terminology in the frame of the MSFD WG GES is on-going in parallel to the review exercise. Regarding D2 terminology, specific definitions can be found in scientific literature, legal documents and associated reports and in RSC reports. A variety of definitions of the term "non-indigenous species" exists both in scientific literature (e.g. Leppäkoski et al., 2002[36]; Occhipinti Ambrogi and Galil, 2004[37]; Carlton, 2009[38]) and legislative/administrative (e.g. IAS Regulation 1143/2014/ EU) documents.

The following definition of non-indigenous species (NIS) was proposed by TG2[39]: "Non-indigenous species (NIS; synonyms: alien, exotic, non-native, allochthonous) are species, subspecies or lower taxa introduced outside of their natural range (past or present) and outside of their natural dispersal potential. This includes any part, gamete or propagule of such species that might survive and subsequently reproduce. Their presence in the given region is due to intentional or unintentional introduction resulting from human activities. Natural shifts in distribution ranges (e.g. due to climate change or dispersal by ocean currents) do not qualify a species as a NIS. However, secondary introductions of NIS from the area(s) of their first arrival could occur without human involvement

[33] UNEP/MAP, 2012. State of the Mediterranean marine and coastal environment, UNEP/ MAP- Barcelona Convention, Athens, 2012.
[34] UNEP/MAP/BP/RAC, 2009. The State of the Environment and Development in the Mediterranean 2009. United Nations Environment Programme, Mediterranean Action Plan, Blue Plan Regional Activity Centre, Vallbone.
[35] http://www.blacksea-commission.org/_bssap2009.asp#_Toc222222324 (accessed on 09/03/2015)
[36] Leppäkoski E, Gollasch S, Olenin S, 2002. Introduction: alien species in European waters, in: Leppäkoski E et al. (Ed) (2002). Invasive aquatic species of Europe: distribution, impacts and management 1-6.
[37] Occhipinti A and Galil B, 2004. A uniform terminology on bioinvasions: a chimera or an operative tool? Marine Pollution Bulletin 49:688–694.
[38] Carlton JT, 2009. Deep invasion Ecology and the assembly of communities in historical time, in: Rilov G et al. (Ed) (2009). Biological invasions in marine ecosystems. Ecological, management and geographic perspectives. Ecological studies 204: 13-48
[39] Task Group 2 Report Non-indigenous species JOINT REPORT, 2010

due to spread by natural means." A subset of NIS are **invasive NIS** (synonym '**invasive alien species' (IAS)**), which are defined by TG2 as "a subset of established NIS which have spread, are spreading or have demonstrated their potential to spread elsewhere, and have an adverse effect on biological diversity, ecosystem functioning, socio-economic values and/or human health in invaded regions". These definitions are equivalent to the concept of 'invasive non-indigenous species' underlining the Com Decision 2010/477/EU.

In addition, TG2 described the key terms "…**levels that do not adversely alter the ecosystems**" as the absence or minimal level of "biological pollution". **Biological pollution** is defined by TG2 as the impact of IAS at a **level that disturbs environmental quality** by effects on: an individual (internal biological pollution by parasites or pathogens), a population, a community, a habitat or an ecosystem. It means that impacts can be observed at different levels, but it does not mean that any impact is produced directly and exclusively at a given level. Thus, the sum of a given impact at individual level will result in an impact at population level, which in its turn can produce changes in the community and finally affect the ecosystem functioning. Conceptually, any impact in the lower levels would produce, in larger or lesser degree, some change at ecosystem level. Therefore, biological pollution can be defined by impacts at different levels, but GES according to MSFD could be considered as not achieved only when the effects are observable at ecosystem level. However, to be coherent with Descriptor 1 and other relevant policies it is necessary to establish how to define GES in cases when the impact on ecosystem as a whole apparently is minimal but e.g. there is a strong impact on e.g. a protected species.

In the new IAS Regulation on the prevention and management of the introduction and spread of invasive alien species the following definitions are given:

'alien species' means any live specimens of a species, subspecies or lower taxon of animals, plants, fungi or micro-organisms introduced outside its natural range; it includes any part, gametes, seeds, eggs, or propagules of such species, as well as any hybrids, varieties or breeds that might survive and subsequently reproduce;

'invasive alien species' means an alien species whose introduction or spread has been found to threaten or adversely impact upon biodiversity and related ecosystem services;

'invasive alien species of Union concern' means an invasive alien species whose adverse impact has been deemed such as to require concerted action at Union level pursuant to Article 4(3);

'invasive alien species of Member State concern' means an invasive alien species other than an invasive alien species of Union concern, for which a Member State considers on the basis of scientific evidence that the adverse impact of its release and spread, even where not fully ascertained, is of significance for its territory, or part of it, and requires action at the level of that Member State.

'pathways' means the routes and mechanisms of the introduction and spread of invasive alien species;

The definition of 'alien species' given in the EU Regulation on IAS is similar to the one by TG2, although less complete. Including aspects of intentional/unintentional introduction, natural shifts and secondary introductions would be useful. Also, it could also be completed by including genetically modified organisms, according to definition in the Regulation (EC) 708/2007 concerning

use of alien and locally absent species in aquaculture (http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32007R0708&from=EN).

A definition including these different aspect would be: 'alien species' means any live specimens of species, subspecies or lower taxon of animals, plants, fungi or micro-organisms introduced outside its natural past or present distribution; it includes any part, gametes, seeds, eggs, or propagules of such species, as well as any genetically modified organisms, hybrids, varieties or breeds that might survive and subsequently reproduce. Their presence in the given region is due to intentional or unintentional introduction resulting from human activities. Natural shifts in distribution ranges (e.g. due to climate change or dispersal by ocean currents) do not qualify a species as a NIS. However, secondary introductions of NIS from the area(s) of their first arrival could occur without human involvement due to spread by natural means.

There is the necessity to agree on a single (MSFD) definition per term to avoid confusion. This requires taking into consideration definitions underlining the Com Decision 2010/477/EU with those in the IAS Regulation (see above) to ensure expected coherence across the two policies. Terminology should be carefully taken into account and harmonized across MS. Among other, this requires that issues arising from translations to the official languages of the MS for publication in the EU Official Journal must be addressed (e.g. the term "invasive" became invasivo/a, when translated to Portuguese but it should be invasor/a/es/s). It is recommended that official translations be reviewed by scientific experts of every MS. Also, the relationships between certain management and scientific terminologies are required to reduce the level of discrepancies between scientists, ecosystem managers and policy makers in the EU Member States: some relevant terminologies to be revisited under this vision include: normal ecosystem quality and functioning, and an impacted ecosystem function and quality. For definitions not yet covered by policy or the MSFD GES Common Understanding Document, definitions established in the context of relevant initiatives should be considered, e.g. the background document produced by OSPAR[40] including definitions on biodiversity issues.

1.6 Descriptor specificities should be highlighted and justified.

The main specificity of this descriptor, already highlighted in many documents, is that non-indigenous species constitute a pressure on the ecosystems, which should be evaluated through pressure indicators; at the same time, non-indigenous species, once established, become a new element of the bioceonosis of the invaded ecosystems, and their impact on state could potentially be evaluated with indicators applied for assessing other descriptors, e.g. via multi-metric indicators for plankton and benthos.

The descriptor requires the development of specific and independent criteria and indicators, and hence monitoring systems, to evaluate what has been defined as "propagules pressure" in relation to the diverse introduction and spreading pathways; but the monitoring and evaluation of their impacts when they are already established should be integrated with those of the biodiversity

[40] 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)

descriptors, so as to get more sound and reliable conclusions and also coherent evaluations, (see table 1).

Table 1. Relationship of broad ecosystem elements to main pressures, indicating which criteria from the 2010 Decision are relevant to each state (S) and pressure (P) element, and which are associated to impacts from pressures upon particular state components (orange cells). A question mark indicates most likely gaps in impact criteria compared with the 2010 Decision. The blank boxes have no impact criteria in the 2010 Decision but impacts may still occur (e.g. physical loss and/or damage leading to loss of breeding grounds for birds, reptiles and fish)[41].

			Assessments of pressures for Article 8(1b)							
			Physical loss	Physical damage	Energy, incl. UW noise	Nutrients	Contam-inants	Litter	Fishing/ by-catch	NIS
		S \ P	6.1	6.1	11.1, 11.2	5.1	8.1, 9.1	10.1	3.1	2.1
Assessments of state for Article 8(1a)	Ecosystem 1.7, 4.1-4.3	Birds	1.1-1.3						?	
		Mammals	1.1-1.3		?				?	
		Reptiles	1.1-1.3		?			10.2	?	
		Fish	1.1-1.3		?		8.2		3.2, 3.3	2.2
		Water	1.4-1.6	7.1						
		Seabed	1.4-1.6	7.2	6.2	5.2, 5.3		?	3.2	

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 problem of NIS is a trans-regional one, and therefore needs common standards for assessing, monitoring, prevention and management of targeted species. However, some specific standards need to reflect specific regional risks associated to exposure to vectors, pathways and sensitivity of ecosystems to the species introductions, and the ecosystem characteristics; for example, in the Baltic Sea with its salinity gradient, these standards need to be adapted to a differing set of freshwater invaders in the eastern and northern parts.

An analysis of the coherence amongst MS, especially amongst those sharing the same region, was performed for the needs of the Art. 12 in-depth assessment (Palialexis et al., 2014). This work provides crucial information for the feasibility of having common criteria and methodological

[41] Refer to 2010 Decision for details about the criteria (from GesDecision Review _Cross-cuttingIssues_V4, can be accessed at the following link: https://circabc.europa.eu/faces/jsp/extension/wai/navigation/container.jsp?FormPrincipal:_idcl=FormPrincipal:_id3&FormPrincipal_SUBMIT=1&id=be6cb95f-0d58-401e-a89d-7dc4b0b19a3d&javax.faces.ViewState=rO0ABXVyABNbTGphdmEubGFuZy5PYmplY3Q7kM5YnxBzKWwCAAB4cAAAAAN0AAIxMnB0ACsvanNwL2V4dGVuc2lvbi93YWkvbmF2aWdhdGlvbi9jb250YWluZXIuanNw).

standards across EU and the identification of areas requiring regional approaches. The results of this analysis are summarised in a chapter 2 (analysis of the implementation process).

1.8 The "climate sensitivity" for D2

Descriptor 2 has a range of climate sensitivities that can increase the risk of NIS secondary spreading and the level of this pressure. Changes such as increased sea temperature can make conditions more suitable for NIS from specific geographic areas resulting in an increased that those NIS can more easily establish and spread in European waters. In addition, some native species will naturally migrate into new areas due to the changing climatic conditions and consequently change their potential spatial habitats, which might be difficult to differentiate from human-induced introductions. Thus, efforts are required to develop knowledge needed to distinguish between climate-change mediated alterations to species distributions and human introduced NIS. The ability to distinguish between these two processes and categories of species enhances the formulation of cost-effective management measures directed at achieving the desired GES levels.

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

In theory it should be possible to determine quantitatively the status of NIS in a given ecosystem, but as indicated above this presents particularly challenges. Abundance may be difficult to assess quantitatively due to difficulties associated to e.g. account for species with different life form strategies (e.g. single or colony forming) and low abundances in early stages of invasion. It must be considered that the GES will depend ultimately of the direct impacts of NIS on local biota, which is not necessarily related, at least linearly, with their abundance. Because of that, taking into account the variety of NIS and the variability of their potential impacts in different ecosystems, it will be difficult to define proper and widely accepted definitions of GES in relation to NIS presence merely fixing a unique and common abundance threshold. More accurate and cost-effective is to perform species presence inventories or number of species encountered in widely spread locations in a subregion, e.g. Port of Rotterdam, Wadden Sea. These assessments of species spatial occurrence/ distributions could be considered as surrogates of species abundance and of the level of invasiveness.

For other indicators, as Biopollution Level index (BPL), qualitative definitions could be easier to agree, but even so it is difficult to evaluate the GES in relation to NIS, since their mere presence may represent a potential threat to local biota. However, The BPL is not applicable in some MSs' waters (e.g. in France, according to French experts), due to the high level of uncertainty of this index at cost-effective effort for acquisition of required data. This is limiting its validity to a few well studied places, or to some taxa and, thus it would not have any ecological meaning.

One option could be to use ADR (abundance and distribution range), which is the basis for the BPL but would be easier to assess as it does not need the impact information. An alternative, or complement, to this approach would be to put the focus on the impacts, on the effects of the presence of NIS instead of their abundance. In this way, to evaluate the GES in relation to NIS results

of the application of the indicators developed for the "biodiversity" descriptors, 1, 4 and 6. This would ensure the coherence of the evaluations from the point of view of the biodiversity conservation. Thus, any definition of GES referred to Descriptor 2 should be linked to the achievement of the GES in the biodiversity descriptors, in such a way that the environmental status in relation to NIS would be defined as negative if it is also negative for these other descriptors, and vice-versa.

GES could be at a first step defined qualitatively, notably according to the actual lacks of knowledge for many species or habitats. For example, impacts on habitats or broader ecosystems condition and functions could be defined qualitatively (e.g. based on community structure changes) and the GES/no GES could be a deviation (qualitative or semi-quantitative=range) around this qualitatively defined reference. Ideally, this biological pressure (extent, intensity, frequency) should be estimate at least semi-quantitatively.

In parallel, taking into account the irreversibility of most of marine bio-invasions, a more dynamic and operative approach for GES definition could be adopted. Thus, any increasing trend in the presence and abundance of NIS in a given ecosystem, independently of their real impact, should be qualified as negative, whereas negative trends or stable situations, even if the environmental status cannot be defined as positive could be considered at least acceptable. Due to lack of data and a full understanding everywhere of how NIS are introduced, where they occur, how abundant they are and factors influencing their survival, establishing baseline information for trend comparisons may be difficult.

2. Analysis of the implementation process

2.1 Based on the Commission / 'Milieu' Art.12 reports and the JRC in-depth assessments, a detailed summary of Art.12 findings related to the determination of GES and, specifically, the use of the Decision criteria and indicators, should be made.

All MS have defined GES for Descriptor 2. Most MS defined GES either at Descriptor and/or Criterion level. Only six MS have also defined GES at indicator level, of which four defined GES only at indicator level. For a large proportion of MS the definitions were vague, with some MS reproducing the description provided in Annex I of the MSFD verbatim or very close to it and did not provide measurable definition of GES and relative thresholds. There were significant differences on the level of detail and focus of the approach reported by MS, i.e. some focused on NIS, others on invasive NIS and others on both categories; several adopted a risk-based approach, and some referred to impacts of NIS. According to the Commission's SWD (2014/49), no MS was judged to have an adequate definition of GES. Eleven Member States were considered to have a partially adequate definition of GES, while nine were considered inadequate.

Criterion 2.1 was used more frequently than criterion 2.2. Several MS explicitly adopted a risk-based approach, primarily addressing vectors and pathways for introductions of NIS. The MS have in most cases indicated that GES could be achieved when the introduction of NIS does not adversely affect

the ecosystem but very few relate this to trends in abundance of NIS introductions in order to achieve GES.

Criterion 2.2 (Environmental impact of invasive non-indigenous species). Ten MS referred to impacts of NIS. The types of adverse effects are generally not clarified. The initial assessment (Art. 8) for Descriptor 2 was mostly based on existing literature, supplemented in some instances by expert judgment. All MS provided an inventory of NIS present, and generally the main vectors and pathways were described. Great variation was observed in the number of NIS reported even between neighboring MS, and across regions (Palialexis et al., 2014[42]), reflecting partly differences in the monitoring systems. Other potential reasons are: 1) variable number of specific studies on NIS carried out in each country and 2) the amount of resources invested by each country in compiling information for the initial evaluation, since much information on this issue does not came from regular monitoring systems carried out by the Administrations, but from sparse scientific, peer reviewed or grey, literature.

It is suggested that to facilitate and harmonize the D2 implementation, regional and national NIS inventories should be linked. The European Alien Species Information Network (EASIN, http://easin.jrc.ec.europa.eu/) could serve for this purpose. EASIN was established with the scope of facilitating the exploration of existing alien species information in Europe to assist the implementation of European policies on alien species, including marine species.

Art. 9 implementation assessments concluded that the level of coherence in the definition of GES for Descriptor 2 within each of the four regional seas is considered to be low. That said there are exceptions at sub-regional level, with a moderate level of coherence between the three Member States in the Western Mediterranean Sea. Coherence in the Celtic Seas is also assessed as moderate. Clear links should be made between Art. 8, 9, 10, 11 and 13 of MSFD. Specific assessment methods and associated boundaries or thresholds should be reported to facilitate the evaluation of GES achievement, of targets' efficiency and the implementation of MSFD in general (Palialexis et al., 2014). Explicit guidelines for indicator development should be developed aiming to ensure harmonisation of assessments. As there has been very little information gathered on marine NIS from many MS, the recent established monitoring programmes have gathered for the first time gathered national information on the current state of NIS. This will form a baseline from which further changes in relation to GES will be measured.

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

Mediterranean and North East Atlantic Member States on the whole described knowledge and data gaps in some detail and in some cases even (limited) plans to address them. This was not the case in the Baltic where only two MS analyzed knowledge gaps in any detail (SWD 2014/49/EU). Just three MS provided (or tend to establish) baseline and thresholds in their initial assessment. Palialexis et al.

[42] 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.

(2014) highlighted the need to link initial assessment (Art. 8) and definition of GES (Art. 9) with specific trends, boundaries and thresholds (Table 2). D2 reports are poor in detailing the methodological approaches applied by the MS. MS focused on listing NIS and addressing the important vectors related to NIS, and less on assessing their impact in particular ecosystems (Palialexis et al., 2014). Some MS associated BPL (Olenin et al., 2007[43]) to GES definition, indicating its applicability in some regions but also the need for better indicators and methodological standards related to NIS.

Table 2. MS reported baselines and indicators thresholds for non-indigenous species (Palialexis et al., 2014)

Belgium
2.1.1 Introduction of new human induced non-indigenous species of macrofauna and macroflora (>1 mm) in relation to the 2012 baseline is prevented.
Estonia
2.1.1 80% of cases in time series abundance significantly higher than absolute minimum registered abundance
2.2.1 no increase in abundance
2.2.2 BPL index < 1
Greece
2.1.1 No increase in proportion of NIS in the abundance or biomass of the respective community
2.2.1 all NIS spp include <5% of biomass or space coverage
No algal blooms due to NIS

2.3 Relevant data from other sources, specific to every descriptor and recent findings from MS should also be considered

The data gaps and inherent uncertainties existing information from sources prohibit to address all three existing D2 indicators even partially and this despite the largely availability of existing information through open access information systems such as the European Commission's European Alien Species Information System (EASIN; http://easin.jrc.ec.europa.eu/), AquaNIS (http://www.corpi.ku.lt/databases/index.php/aquanis/), DAISIE (http://www.europe-aliens.org/), MAMIAS (http://www.mamias.org/) and NOBANIS (http://www.nobanis.org/). These information systems should be linked or unified to facilitate data access for MS and properly address D2. However, their usefulness is strongly dependent on MS data input to regional databases. This should be highly recommended and regional organizations like OSPAR or HELCOM can have a major role.

[43] Olenin, S., Minchin, D., Daunys, D., 2007. Assessment of biopollution in aquatic ecosystems. Mar. Pollut. Bull. 55, 379–394.

Other issue that should be further discussed and analysed include the inclusion of pathogens in D2. The comments received express different opinions, but given that non-indigenous pathogens may strongly impact marine ecosystems the issue should be further discussed to be able to conclude.

2.4 Good examples and approaches applied by MS, especially if used by multiple Member States, and shortcomings should be listed systematically.

On a regional level, HELCOM is highlighted for good practice in the way the Convention adopted the MSFD and for the progress achieved in developing relevant indicators (HELCOM, 2013[35]).

HELCOM member countries applied the BPL for estimating the magnitude of the non-indigenous phytoplankton species effects on the native phytoplankton community, pelagic habitat and ecosystem functioning in the Baltic Sea (Olenina et al., 2009[44]). BPL was reported by most of the HELCOM member countries (where it is already operational) and from a few non-HELCOM members that are going to evaluate BPL's utility in other regions. BPL was linked to all reported MSFD Articles (8, 9 and 10) at least once and to Criteria 2.2 of the COM DEC (2010/477/EC).

Estonia's approach could be considered as a good practice for linking well-defined metrics with indicators accompanied by specific thresholds. In addition, they presented high level of consistency in the way they reported for the three MSFD Articles (8, 9 and 10). However, this approach should be considered with caution, since GES and targets are defined similarly and that raises some doubts as to what exactly is the GES definition.

The Finish report on Art. 9 could be considered as an example of good practice, since they provided a variety of GES statements covering pressures, impacts on the basis of number, frequency and ratio of NIS, as well as species vectors.

The Greek and Portuguese's approaches are considered as a good practice for their implementation of Art 8. in respect to the NIS reported, because of the detailed information provided including NIS recorded in national waters, year of the first record, origin of NIS, pathways of introduction, population status (e.g. established, occasional, unknown) and NIS' taxonomic groups.

More working relationships are encouraged between MS and also development of new working relationships between Regional Convections.

2.5 Differences and similarities between the regions should be highlighted, where applicable.

The regional coherence between the GES definitions is low in all sub-regions (SWD (2014) 47; Palialexis et al., 2014). In respect to the methodologies listed in MS reports, BPL is referred by some HELCOM members but not all contracting parties accepted to use the indicator. Non-HELCOM MS reported that careful studies are required to prove and advise on the applicability of the BPL in their areas of interest. An OSPAR wide common indicator on NIS is being developed in relation to criterion 2.1.1. – 'Risk management of key pathways and vectors of introduction of NIS' (OSPAR, 2013[45]).

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[44] Olenina, I., Hajdu, S., Wasmund N., Jurgensone, I., Gromisz, S., Kownacka, J., Toming, K., and Olenin, S. 2009. Impacts of invasive phytoplankton species on the Baltic Sea ecosystem in 1980-2008. http://www.helcom.fi/BSAP_assessment/ifs/ifs2009/en_GB/InvasivePhytoplanktonSpecies

[45] OSPAR, 2013. Report of the EIHA Common indicator Workshop. (Accessed 11/03/2015).

The OSPAR common indicator NIS3, developed by UK and Germany, has been adopted in subregions II, III and IV and its merging to the HELCOM Trend indicator is at the moment discussed by HELCOM CORESET II. Collaboration is planned to be opened up to other RSCs and it was proposed to develop a network of experts to connect the communities in the different convention areas (back-to-back meeting of CORESETII and ICG-COBAM, October 2014[46]). The HELCOM core indicator is expected to be adopted in June 2015.

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 in guidance, those parts which are interpretative or explicative information and those parts which need to be kept in the Decision in accordance with the mandate provided by the Directive.

- **To be kept in the Decision, in accordance with the mandate provided by the Directive but revised**

The following part of the Decision forms the core of the criteria and methodological standards. Revised text appears in bold. Explanations in parentheses are provided for all suggested changes. In general, there is agreement on the proposed modifications to criterion 2.1 but there is still some debate regarding the criterion 2.2. This will require to be further considered to decide if it is needed to adequately assess D2 and to agree on the revised version.

COM Decision PART B- 'Criteria for good environmental status relevant to the descriptors of Annex I to Directive 2008/56/EC'

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

2.1. Abundance ~~***and state***~~ *and characterization of* ***non-indigenous species****, in particular invasive species* (As D2 is a pressure and not a state descriptor, the 'state' in Criterion 2.1 is confusing and is better to be deleted. Other state descriptors by which the environments need to be assessed should reflect the state with consideration of pressures including alien species pressure).

— Trends in ***new introductions,*** *abundance, temporal occurrence****,*** *and spatial distribution in the wild of* ***non-indigenous species****, notably in risk areas, in relation to the main vectors and pathways (2.1.1).* (Trends in new introductions of alien species by pathway is an indicator closely related to the management of pathways as requested by the new Regulation 'on the prevention and management of the introduction and spread of invasive alien species'; such an indicator can reflect the effectiveness of measures to manage pathways)

2.2. Environmental impact of [invasive] ***non-indigenous species***

[46] HELCOM and OSPAR Commissions, 2014. Communication paper resulting from the joint meeting of HELCOM CORESET II and OSPAR ICG-COBAM. Back to back meeting of CORESET II and ICG-COBAM, 1 October 2014. (Accessed 11/03/2015)

*— Ratio between [**invasive] non-indigenous species** and native species [in some well-studied taxonomic groups (e.g. fish, macroalgae, molluscs)] that may provide a measure of change in species composition (e.g. further to the displacement of native species) (2.2.1)* (If only IAS are included in the estimation of alien/native ratio then this is not a measure of community change)

— Impacts of non-indigenous invasive species at the level of species, habitats and ecosystem, where feasible (2.2.2)

Summary of comments received:

- criterion 2.2 could be maintained, stating that GES could be evaluated through other biodiversity indicators. Thus, criteria 2.1 would consider potential impact from "internal pressure" of introduced NIS, taking into account presence and relative abundance of these NIS, providing a sort of risk assessment, whereas 2.2 would deal with demonstrated impacts, measured through state indicators related to other descriptors. However, 2.1, as mentioned before, deals with already established NIS, when in many cases too late to do something. A new criteria could be considered, dealing with the "external" pressure to a given ecosystem, it is the "propagules" pressure.
- Remove criterion 2.2 based on the reasoning that the impact of non-indigenous species should be considered in the status descriptors. The pressure level is measured by criterion 2.1 and should be such as to ensure GES for those descriptors.
- Remove the indicator ratio between alien and native species. This will only consider community changes rather than full ecosystem impact. Also, monitoring for all alien species will be operationally difficult to achieve and the cost would be disproportionate taking account that not all present an important risk to the marine environment. Furthermore, change of species composition is unlikely to be controllable and thus to relate to the programme of measures.
- 2.2.1 and 2.2.2 overlap; both measure impact from non-indigenous species. Suggest to remove 2.2.1.
- Change 2.2.1 to 'Impacts of alien species, where feasible'

➢ **To be taken out of the Decision and included in guidance**

The following part of the Decision provides guidance on assessment and monitoring methodologies and would be better placed (after substantial revision) in a separate guidance document. In addition, it should be updated to reflect the content of new Regulation 1143/2014 and the latest research and the progress made at RSC-level and by IMO. Finally, it should also be updated with the findings from the first initial assessment of the MSFD.

"The identification and assessment of pathways and vectors of spreading of non-indigenous species as a result of human activities is necessary to prioritize actions for the management of pathways and the prevention of new invasions. The initial assessment has to take into account that some introductions due to human activities are already regulated at Union level to assess and minimise their possible impact on aquatic ecosystems and that some non-indigenous species have commonly been used in aquaculture for a long time and are already subject to specific permit treatment within

the existing Regulations. There is still only limited knowledge about the effects of the non-indigenous species on the marine environment. Additional scientific and technical development is required for developing potentially useful indicators especially of impacts of invasive non-indigenous species, which remain the main concern for achieving good environmental status. The priority in relation to assessment and monitoring relates to state characterisation, which is a prerequisite for assessment of the magnitude of impacts but does not determine in itself the achievement of good environmental status for this descriptor." However, the amended Decision would need to make reference to the guidance were this background information would be included.

3.2 The analysis should then include an overall identification of needs for guidance.

Guidance might be needed to clarify and harmonize descriptors' definitions, methodological standards under each criterion and their links. In particular, detailed guidance for harmonized methodologies on how to assess particular impacts at ecosystem level is needed.

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 following criterion and indicator should be kept with suggested modifications:

2.1. Abundance ***~~and state~~*** *and characterization of non-indigenous species*.

— Trends in ***new introductions,*** *abundance, temporal occurrence****,*** *and spatial distribution in the wild of non-indigenous species, notably in risk areas, in relation to the main vectors and pathways of spreading of such species (2.1.1).*

This could be decomposed in two methodological standards (indicators) taking in consideration the already included NIS metrics.

Criterion 2.2 needs further consideration to agree if needed to enable an adequate assessment of D2 and if needed to agree on revised version (see section 3.1).

4. Identification of issues

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

There is still lack of information and understanding of NIS impact on marine ecosystems, therefore its inclusion as a criterion in GES definition is difficult. In fact, types of impacts occurring due to NIS are hardly specified in the related GES definitions; it could be useful to create a stronger link between Descriptor 2 and the biodiversity Descriptors (see table 1 and e.g. Katsanevakis et al. 2014[5]).

Clarify and review inter-Descriptor links is definitively a task to further progress, notably through links between Art.8, 9, 10 and 11, and taking into account the "cross-cutting issues" workshop (21-23/01/2015, Copenhagen).

The link with D1 and D4 could be made by 2.2 (see table 1): Impacts of this biological pressure could be assessed by assessing D1.7 (impacted ecosystem structure and functions); D1.6 (impacted habitat condition); D6.2 (for benthic habitats, when IAS become an engineering species sensus Crooks, 2002[47], 2009[48]); D1.3 (Impacted population condition) and D1.1 (distribution); D4.1 (productivity of key species impacted by invasive non-indigenous species) and D4.3 (abundance/distribution of key species, for invasive non-indigenous species which impact trophic webs).

The regional coherence amongst countries when defining GES for D2 is low in regions and sub-regions; the relatively low level of operational approaches for D2 provides an opportunity to work for regional coherence through joint development of methodological standards and indicators. OSPAR and HELCOM (see above) have made initial plans towards a common indicator.

Although the transitional waters are beyond the scope of the MSFD (i.e. under remit of the WFD), NIS and notably IAS in transitional waters should be assessed as these constitute a potential biological pressure to surrounding marine waters. Coordination of the MSFD with other relevant legislations, in particular with the new IAS Regulation is required to avoid duplication of work and ensure through coordination of activities the achievement of GES and prevention and management of NIS.

The observed inconsistencies and uncertainties in the NIS lists included in the national reports may lead to inefficient management and it could be improved by linking regional and national species inventories. The European Alien Species Information Network (EASIN) is developing towards an information exchange mechanism to facilitate the EU policy on invasive alien species, thus, it could play a role linking all EU NIS databases. It is strongly recommended to keep updating national NIS lists and the regional databases.

The guidance to prepare in association to the Commission Decision should include a table of synonyms were terms such as NIS should be included.

It should be clarified that the reduction of the existing pressure (distribution and/or abundance of NIS) is often only possible in a few specific cases. This assertion leads to the following suggestions:

- The criteria trend in new introductions per vector should be kept. It allows to show clearly if the pressure from non-indigenous species has changed and it is also possible to relate to success/failure of management.
- Criterion 2.2 needs further consideration to agree if needed to enable an adequate assessment of D2 and if needed to agree on revised version (see section 3.1)

More information on ecosystem impacts of IAS, along with economic impacts, should be collected, in particular if criterion 2.2 is retained.

[47] Crooks JA, 2009. The role of exotic marine ecosystem engineers. In Riloy G, Crooks JA (Eds). Biological Invasions in Marine Ecosystems: Ecological management, and Geographic Perspectives, Ecological Studies, vol. 204 (XXVI). Springer-Verlag, pp. 215-238.

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.

COM DEC Criteria have to be defined in a way to allow for a direct GES assessment that is related to the Descriptor (Art. 6). However, for D2 this requirement is currently not achieved. The lack of guidelines may lead to different interpretations to define GES in different levels (descriptor, criterion or indicator). Several Regional Sea Conventions are developing indicators, both in line with criteria 2.1, and coherent between Regions:

HELCOM: Trends in arrival of new non-indigenous species (adopted as core indicator)

OSPAR: Trends in the arrival of new non-indigenous species (adopted as common indicator)

Barcelona: Trends in the abundance, temporal occurrence and spatial distribution of non-indigenous species, particularly invasive, non-indigenous species, notably in risk areas in relation to the main vectors and pathways of spreading of such species (adopted as common indicator).

Guidelines and methodological standards associated with these indicators should thus be integrated on a revised Decision.

5.2 Recommendation on which criteria to retain, which to amend and any to remove;

Criterion 2.1, once amended as **"**Trends in new introductions, abundance, temporal occurrence and spatial distribution in the wild of non-indigenous species notably in risk areas, in relation to the main vectors and pathways of spreading of such species" should be retained, as it addresses the minimum information requirements for any risk assessment and rough evaluation of GES in relation to this descriptor. Criterion 2.2 needs to be further considered to agree if it is needed to enable an adequate assessment of D2 and if needed to agree on revised version (see section 3.1)

5.3Proposals for new criteria, if needed.

The current criteria address the pressure and impact exerted by the already established IAS. However, except in cases in which the bio-invasions have been detected in very early phases, little can be done with this information from the management point of view. As already stated, most of management actions should be taken in the field of prevention of primary and secondary spreading of NIS, acting on vectors.

Therefore, a new criteria dealing directly with "propagules pressure", could be considered, developing indicators and related monitoring systems in relation to the different vectors (fouling, ballast waters, aquaculture...), which would allow to evaluate the effectiveness of preventive management measures.

The rate of new introductions can be used as a proxy of this external pressure, but it is not a direct and reliable measure. Instead "Pathways management measures", at present an OSPAR candidate indicator, could possibly be considered as criterion.

5.4 Rationale and proposal, 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

See section 1.9. It will require further discussion.

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

To further discuss and complete when other paragraphs clarified.

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

7.1 Proposals for specifications on methods for monitoring (i.e. the collection of data needed for assessment of each criterion, including parameters, units of measurement and data quality requirements), which aim at ensuring the comparability of monitoring results, on the basis of JRC / ICES / RSC survey protocols, relevant European/international standards (e.g. ISO/CEN) and Article 12 findings.

It is important to agree on a feasible and cost-effective monitoring standard that will provide results which are comparable between MS.

Monitoring of everything everywhere is not feasible. Focus on dedicated monitoring in selected areas, habitats or species groups (either taxonomy or trait based) in relation to risk of new introduction through the various pathways (including, but not limited to ports)[49]. Use the regular monitoring for the different biodiversity elements to cover other areas/habitats/species groups. When needed, amended with something like rapid assessment surveys.

Monitoring should use the standard methods for biological monitoring (e.g. HELCOM COMBINE guidelines for the Baltic Sea). HELCOM and OSPAR monitoring methods, e.g. port sampling protocol and RAS could be considered for use in other areas than those of their original applicability and in other European seas.

http://helcom.fi/Documents/Ministerial2013/Ministerial%20declaration/Adopted_endorsed%20documents/Joint%20HELCOM_OSPAR%20Guidelines.pdf#search=Helcom%2DOspar%20guidelines

[49] Lehtiniemi M, Ojaveer H, David M, Galil B, Gollasch S, McKenzie C, Minchin D, Occhipinti-Ambrogi A, Olenin S, Pederson J 2015: Dose of truth - Monitoring marine non-indigenous species to serve legislative requirements. Marine Policy, 54: 26–35.

Another bottleneck in NIS monitoring is the lack of taxonomic expertise. New molecular methods are being developed (e.g. by Cefas in the UK and by Denmark) on the use of molecular tools to get around this issue.

7.2 Proposals for specifications on methods for assessment, which aim at ensuring 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) region scales), and based on general guidance prepared on scales and aggregation rules[50] and taking account of JRC / ICES / RSC inventories and Article 12 findings.

Links should be established between MS and EASIN database, which is the Commission's NIS inventory and can promote a coherent approach in the reporting of NIS. EASIN (European Alien Species Information Network; http://easin.jrc.ec.europa.eu/) aims to facilitate the exploration of existing alien species information in Europe from distributed sources, and to assist the implementation of European policies on biological invasions. This is planned to be the information support mechanism in relation to the new regulation on IAS.

Monitoring, methodological standards and assessment methodologies should also be linked with the specifications of the regulation for alien species (1143/2014). The alien species database should be fulfilling the following conditions: Be regularly updated by all MS, compatible with early warning and rapid response tools.

More NIS databases that could contribute to harmonize MS' reporting are listed in Palialexis et al. (2014).

See also: Ojaveer H, Eero M (2011) Methodological Challenges in Assessing the Environmental Status of a Marine Ecosystem: Case Study of the Baltic Sea. PLoS ONE 6(4): e19231. doi:10.1371/journal.pone.0019231

8. Rational and technical background for proposed revision

8.1 Justification and technical background justifying the above proposals.

Covered in previous sections

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

[50] Deltares SCALES project is developing guidance for WG GES.

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 CU guidance document or technical background document.

- **Outstanding issues identified during the review process of D2 in phase I and were not completely tackled in this document:**

1. Changes in Criterion 2.2

Issue: Needs to be further considered, i.e. is it needed? If yes, agree on a revised version. This requires considering links with other descriptors, in particular D1, D4 and D6

2. Exchange of information on indicators/ methodological standards

Issue: Discuss and evaluate national and regional on-going work to develop indicators for D2

3. New criteria dealing directly with "propagules pressure"?

Issues: Current criteria address pressure and impact exerted by the already established IAS

4. GES threshold values

Issue: Proposal for a coherent GES determination and GES threshold values

These issues could be tackled and feed 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. Background 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 (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)

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