Policy Papers

A preliminary assessment of the indicators for Sustainable Development Goal (SDG) 14 "Conserve and sustainably use the oceans, seas and marine resources for sustainable development"

Laura Recuero Virto

PP 2018-03

Suggested citation:

L. Recuero Virto *(2018*). A preliminary assessment of the indicators for Sustainable Development Goal (SDG) 14 "Conserve and sustainably use the oceans, seas and marine resources for sustainable development". *FAERE Policy Paper, 2018-03.*

A preliminary assessment of the indicators for Sustainable Development Goal (SDG) 14 "Conserve and sustainably use the oceans, seas and marine resources for sustainable development"[1]

Laura Recuero Virto
National Museum of Natural History &
Regulatory Authority of Railway and Road Activities
33 avenue du Maine, 75015 Paris, France
laura.recuero-virto@arafer.fr

Abstract

The SDGs are intended to address sustainable development processes in both developed and developing countries, and to facilitate action at all levels and with all actors, including government, civil society, the private sector and the science community to strengthen the capacity of the State to achieve the desired outcomes. The SDG 14 "Conserve and sustainably use the oceans, seas and marine resources for sustainable development" covers, among other features, economic pressures on the marine environment, as well as the Small Island Developing States (SIDS) and coastal communities since they are particularly impacted by the economic pressures and dependent on the oceans in socio-economic terms. This paper reviews the rational for the SDG 14, as well as the framework for the SDG 14 indicators including (i) the basic concepts, i.e. the role of uncertainty, irreversibility and thresholds in the marine context, the multidimensionality of the SDG 14 indicators, and how to ensure effective SDG 14 monitoring and implementation through SMART SDG 14 targets; (ii) synergies and trade-offs among the SDG 14 targets and between SDG 14 and other SDGs targets, and how to track progress on policy coherence at the national level; (iii) synergies between SDG 14 indicators, and ocean-related Millennium Development Goals (MDGs) 7 and Multilateral Environmental Agreements (MEAs) targets and indicators; and (iv) the role of non-traditional sources of data such as big data. In addition, some preliminary indicators for the SDG 14 at the global and national scales (France) are also explored. As a result of this analysis, some areas for future research in the framework of SDG 14 indicators are proposed, i.e. building on the frontiers of ocean science, the development of innovative approaches for data collection, the development of common approaches in valuing marine ecosystem services and national accounting, the provision of incentives for best practice and peer-learning, the harmonisation of measurement methodologies and the selection of SDG 14 indicators according to the geographical level of intervention.

JEL-codes: Q01, Q20, Q30

Key-words: Oceans, sustainable development goals, indicators

February 2018

[1] This paper builds over the issue note that was prepared for the 2017 GGSD Forum on Greening the Ocean Economy to steer discussions during the conference, in particular around the theme of Parallel Session A: "Monitoring progress of the SDG 14 implementation". I would like to thank for insightful comments an anonymous referee, Kumi Kitamori, Jaco Tavenier, Katia Karousakis, Myriam Linster, Ivan Haščič, Frank Jesus, Roger Martini, Antonia Leroy, Claire Jolly, Nora Takrouri-Jolly, Bob Diderich, Takahiro Hasegawa, Gérard Bonnis, Laurent Daniel, Olaf Merk, Renske Schuitmaker, Claire Delpeuch, Fabiana Cerasa, Catherine Gamper, Xavier Leflaive and Sébastien Miroudot. The work has benefitted also from comments from Anne-France Didier, Fred Vey, Claire Plateau, Yves Henocque, Elisabetta Bonotto, Wendy Watson-Wright, Roland Cormier, Mike Elliot, Martin Visbeck, Mark Dickey-Collas, Jean-Louis Weber, Philippe Cury, Didier Gascuel, Alain Bisseau, Yann Kervinio, Victor Raynaud, Catherine Piante and David Le Blanc. The opinions expressed herein do not necessarily reflect the official views of the OECD member states, or of the Regulatory Authority of Railway and Road Activities.

1 Introduction

The SDGs are intended to address sustainable development processes in both developed and developing countries, and to facilitate action at all levels and with all actors, including government, civil society, the private sector and the science community to strengthen the capacity of the State to achieve the desired outcomes. The SDG 14 "Conserve and sustainably use the oceans, seas and marine resources for sustainable development" covers, among other features, economic pressures on the marine environment, as well as the Small Island Developing States (SIDS) and coastal communities since they are particularly impacted by the economic pressures and dependent on the oceans in socio-economic terms. In section 2, the paper reviews the rational for the SDG to highlight the importance of monitoring the oceans in a context where key pressures are compromising the ability of the oceans to deliver economic, social and environmental benefits. In section 3, the paper analyses the framework for the SDG 14 indicators as a means to understand the different concepts and processes than should be integrated when developing the indicators. This section addresses the conceptual framework of SDG 14 indicators, i.e. the role of uncertainty, irreversibility and thresholds in the marine context, the multidimensionality of the SDG 14 indicators, and how to ensure effective SDG 14 monitoring and implementation through SMART SDG 14 targets; (ii) synergies and trade-offs among the SDG 14 targets and between SDG 14 and other SDGs targets, and how to track progress on policy coherence at the national level; (iii) synergies between SDG 14 indicators, and ocean-related Millennium Development Goals (MDGs) 7 and Multilateral Environmental Agreements (MEAs) targets and indicators; and (iv) the role of non-traditional sources of data such as big data to have access to more reliable, frequent and cost-effective information. In section 4, some preliminary indicators for the SDG 14 at the global and national scales (France) are explored. As a result of these analyses, some areas for future research in the framework of SDG 14 indicators are proposed in section 5.

2 The rational for the SDG 14

2.1 The 2030 Agenda for Sustainable Development and the SDGs indicators

On the 25th September 2015, the 193 Member States of the United Nations General Assembly adopted the 2030 Agenda for Sustainable Development. The 2030 Agenda is the world's first global agreement to provide a comprehensive agenda for action to support transformations towards social, economic and environmental sustainability (Unger *et al*. 2017). Its 17 SDGs and 169 targets will guide the activities of diverse actors over the next 14 years (UN, 2015a). The SDGs are intended to address sustainable development processes in both developed and developing countries, and to facilitate action at all levels and with all actors, including civil society, the private sector and the science community to strengthen the capacity of the State to achieve the desired outcomes (Houghton, 2014).

A comprehensive framework of indicators is needed for implementation of the 2030 Agenda in order to monitor progress, inform policy and ensure accountability of every the stakeholders. The Inter-Agency and Expert Group on SDG indicators (IAEG-SDGs) proposed a global indicator framework that the United Nations General Assembly adopted in March 2016 and revised in March 2017 to track progress at the global level and for collective action towards achieving the 17 SDGs (UN, 2016a; UN, 2017a). The United Nations Statistical Commission agreed in its 48th session that this global indicator framework would include annual refinements of the indicators, and two in-depth revisions in 2020 and 2025 (UNSC, 2017a). Global monitoring should be based, as much as possible, on comparable national data that countries should report to the international statistical system (UN, 2016a). Member States should also develop more detailed indicators at the regional and national levels to track success at those scales (UNSC, 2017a). Depending on local demand and pre-existing reviews, Member States could set revisions at regional and national levels, and report the outcomes of these reviews to the United Nations' annual High-Level Political Forum on Sustainable Development (SDSN, 2015a).

2.2 The policy relevance of the SDG 14

The oceans provide services that are of direct economic relevance for fisheries, aquaculture, offshore oil and gas, shipping, tourism and offshore wind energy (Visbeck *et al*., 2014). The oceans economy's value stands at US 1.5 trillion dollars in 2010 (or 2.5% of the world gross value added) and should double its contribution by 2030, with the fastest growth in offshore wind energy, marine aquaculture, fish processing and port activities (OECD, 2016a). More broadly, coastal areas within 100 kilometres of the oceans account for 61% of the global gross national product (UNEP, 2006). The oceans play a significant role in social terms as well, accounting for 31 million direct full-time jobs in 2010, mainly in industrial capture fisheries and tourism (OECD, 2016a). Moreover, 350 million jobs are linked to the oceans through fishing, aquaculture, tourism and research (UNCTAD, 2014).

Aggregate income figures do not adequately reflect how the ocean contributes to well-being, particularly at the local level through food security, nutrition and income, as sources of poverty alleviation and livelihood opportunities (Mills *et al*., 2011). Regarding human health, 4.3 billion people obtain about 15% of their intake of animal protein through fish consumption and about one billion people depend on fish for their primary source of protein (FAO, 2000; UNDESA, 2014). The livelihoods of 10-12% of the world population depend on fisheries and aquaculture; over 90% of capture fisheries' employees work in small-scale operations in developing countries (FAO, 2014). These services are particularly relevant for 54 coastal and island countries, the majority of them developing nations, given that the oceans constitute up to two thirds of their total national territory (Islam, 2015).

The oceans are also a critical component of the essential life support systems of the Earth (Rockström *et al*., 2009; UNCSD, 2012). The oceans are the primary regulator of the global climate, cycling about 93% of the total carbon dioxide and absorbing around 30% of anthropogenic carbon dioxide emissions (IOC/UNESCO, IMO, FAO, UNDP, 2011). In addition, the oceans have absorbed about 90% of the warming of the Earth in the last few decades (Turley *et al*., 2013). Healthy marine ecosystems provide services such as water filtration, nutrient cycling, recreational areas and support for biodiversity, which is worth around US 250 000 billion dollars per year (Nelleman *et al*., 2009). The oceans also provide us with more than half of the oxygen we breathe (UNCSD, 2012).

While ensuring healthy oceans is vital for achieving sustainable development, the impacts of key pressures are compromising the ability of the oceans to deliver economic, social and environmental benefits (UNCSD, 2012). These key pressures include over-fishing and over-exploitation of marine resources, pollution, invasive alien species, habitat destruction and climate change (UNDESA, 2014; OECD, 2017a). For instance, 85% of the world's fisheries are fully exploited, overexploited, depleted or recovering from depletion (FAO, 2016). Overfishing has resulted in lost benefits to fishing countries of almost US 50 billion dollars per year (World Bank and FAO, 2009)[2]. The worldwide value of catch from Illegal, Unregulated and Unreported (IUU) fishing has doubled between 2004 and 2011, resulting in losses of between US 10-23 billion dollars per year (Pew Environmental Group, 2011; UNCSD, 2012).

Concerning pollution in the oceans, 80% comes from land-based sources (Diaz and Rosenberg, 2008). Marine pollution mainly results from direct discharge, land run-off, ship pollution, atmospheric pollution and deep sea mining (OECD, 2017a). Moreover, up to 80% of all litter in our oceans is made of plastic. By 2050, it is estimated that oceans will carry more plastic than fish and that almost every seabird will have ingested plastic (UNEP and GRID-Arendal, 2016). Excess nutrients lead to eutrophication which can lead, in turn to hypoxic dead zones, the latter having increased 10 times between 1969 and 2010 (UNCSD, 2012). In addition, marine pollution moves marine species which can impact marine industries and human health (OECD, 2017a). For instance, 7 000 marine species are carried around the world in ballast water every day (WWF, 2009). It is

[2] This estimate does not take account of several important factors and is hence a conservative estimate of the potential losses.

estimated that 80% of the world's 232 marine ecoregions have invasive alien species (IOC/UNESCO, IMO, FAO, UNDP, 2011).

Habitat destruction in the coastline and in the oceans is due, among other factors, to harmful fishing practices, poor agricultural practices, coastal development, forestry sectors, mining, dredging and anchoring, and tourism (OECD, 2017a). Such destruction significantly challenges the survival of plants and animals. Concerning climate change, with the absorption of the carbon dioxide from the atmosphere, the oceans are becoming increasingly acidic at a rate that is 10 times faster nowadays than in the last 65 million years leading to decreased survival, calcification, growth and abundance of marine organisms (Noone *et al*., 2012; Kroeker *et al*., 2013). The negative effects of climate change also include increased frequency and intensity of weather and climate extremes, ocean warming, sea-level rise, as well as changes in ocean circulation and salinity (UNDESA, 2014).

By 2100, the impacts of climate change on the oceans including sea level rise, storms, and impacts on fisheries, are estimated to cost in the range of US 600 million to US 2 trillion dollars (Noone *et al*., 2012). Climate change is threatening both the survival and well-being of SIDS and coastal communities in developing countries (Cicin-Sain *et al*., 2011). For instance, increase in frequency and intensity of extreme events such as hurricanes and floods due to climate change, should further raise the damage already over 20% of the gross domestic product in many SIDS (Payet, 2008). These states are particularly vulnerable since at least 20% are still categorized as Least Developed Countries (LDCs) (Cicin-Sain *et al*., 2011). To summarise, the SDG 14 targets cover the aforementioned economic pressures on the marine environment (targets 14.1–14.6, 14.a and 14.c), as well as the SIDS and coastal communities since they are particularly impacted by the economic pressures and dependent on the oceans in socio-economic terms (targets 14.3, 14.6, 14.7, 14.a and 14.b) (Table 1).

3. The framework for the SDG 14 indicators

3.1 Conceptual framework: Uncertainty, irreversibility and thresholds in the marine context

From a regulatory standpoint, an indicator should address a policy question (UNECE, 2017). Most countries have chosen indicators in order to match national sustainable development strategy requirements, regardless underlying conceptual frameworks (UNECE, 2009). Where expressed explicitly, the conceptual framework can rely on the Pressure-State-Response approach developed by the OECD as well as on the Driver-Pressure-State-Impact-Response (DPSIR) approach which makes all the components of the Pressure-State-Response model apparent, and which was adopted by the United Nations Development Programme in 1997 and used by European Environmental Agency (OECD, 1993; UNECE, 2009).[3] The DPSIR framework is consistent with the ecosystem approach in the marine context and can be applied to the SDG 14 (Weber, 2010; de Jonge *et al*., 2012; Cooper *et al*., 2013; Loewe and Rippin, 2015).[4]

These frameworks should integrate the multiple activities and the continuum between adjacent ecosystems in the oceans (Elliott *et al*., 2007).[5] The complexity of the marine system will probably result on a range of unintended consequences, some of which not apparent until some

[3] The Pressure-State-Response model was initially developed to assess ecosystems. This model and its derived versions are not fully appropriate for monitoring all sustainable development dimensions. The risk assessment framework of the Intergovernmental Oceanographic Commission, risk - exposure - vulnerability, would be equally useful in the SDG 14 discussion, with identification of the cluster of countries at risk (UNEP, 2014a).

[4] The DPSIR can be extended to the DAPSI(W)R(M) approach in which Drivers of basic human needs require Activities which lead to Pressures (Elliott *et al*., 2007; Borja *et al*., 2016). The Pressures are the mechanisms of State change on the natural system which then leads to Impacts (on human Welfare). Those then require Responses (as Measures).

[5] Risk assessment and risk management frameworks to account for natural and anthropogenic hazards would complete a unifying framework for integrated marine management. Given the uncertainties and lack of data availability in human-ocean systems and internal ocean interactions, these analytical frameworks should be kept as simple as possible, however (MEEM, 2017).

threshold state has been attained (Tett *et al*., 2013). The SDG 14 indicators should be developed together with the definition of safe minimum standards for interventions into the human-ocean system (Visbeck *et al*., 2013).

Table 1. SDG 14 targets

SDG 14 targets
14.1 By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution
14.2 By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans
14.3 Minimize and address the impacts of ocean acidification, including through enhanced scientific cooperation at all levels
14.4 By 2020, effectively regulate harvesting and end overfishing, illegal, unreported and unregulated fishing and destructive fishing practices and implement science-based management plans, in order to restore fish stocks in the shortest time feasible, at least to levels that can produce maximum sustainable yield as determined by their biological characteristics
14.5 By 2020, conserve at least 10 per cent of coastal and marine areas, consistent with national and international law and based on the best available scientific information
14.6 By 2020, prohibit certain forms of fisheries subsidies which contribute to overcapacity and overfishing, eliminate subsidies that contribute to illegal, unreported and unregulated fishing and refrain from introducing new such subsidies, recognizing that appropriate and effective special and differential treatment for developing and least developed countries should be an integral part of the World Trade Organization fisheries subsidies negotiation[6]
14.7 By 2030, increase the economic benefits to small island developing States and least developed countries from the sustainable use of marine resources, including through sustainable management of fisheries, aquaculture and tourism
14.a Increase scientific knowledge, develop research capacity and transfer marine technology, taking into account the Intergovernmental Oceanographic Commission Criteria and Guidelines on the Transfer of Marine Technology, in order to improve ocean health and to enhance the contribution of marine biodiversity to the development of developing countries, in particular small island developing States and least developed countries
14.b Provide access for small-scale artisanal fishers to marine resources and markets
14.c Enhance the conservation and sustainable use of oceans and their resources by implementing international law as reflected in the United Nations Convention on the Law of the Sea, which provides the legal framework for the conservation and sustainable use of oceans and their resources, as recalled in paragraph 158 of "The future we want"

Source: UN (2015a).

The capital-accounting approach is an alternative sustainable development indicator framework to the Pressure-State-Response approach (UNECE, 2009).[7] Sustainable development can be measured by analysing whether the productive capacity of the economy is constant or increasing such that the wealth of future generations will is preserved (Rickels *et al*., 2016). Under this approach, it is possible to interpret the SDG 14 indicators within a comprehensive framework that is compatible with macro-economic indicators and the budgeting process. It is also possible to define requirements on possible pathways for increasing economic activities, in the same vein as the safe minimum standards (Visbeck *et al*., 2014). However, the value of the oceans under this approach is a research topic (Visbeck *et al*., 2014).

3.2 The multidimensionality of the SDG 14 indicators

In order to achieve action-oriented SDG 14 indicators, transboundary and terrestrial-marine spatial considerations should be considered (Houghton, 2014). The main spatial scales of intervention for each of the SDG 14 targets determine the most relevant geographical spans for the development of indicators: Subnational, national, transnational, regional or global (Table 2). There are different

[6] Taking into account ongoing World Trade Organization negotiations, the Doha Development Agenda and the Hong Kong ministerial mandate.

[7] A limitation of the Pressure-State-Response approach is that it does not work if there is missing evidence of causal linkages. In addition, there may be multiple pressures for most states, and multiple states arising from pressures, which create difficulties in identifying indicators (Pintér *et al*., 2005).

approaches to integrate these spatial considerations. For instance, the Global Environmental Fund's Global Water Partnership - Mediterranean experience and guidelines for an "Integrative methodological framework for coastal, river basin and aquifer management" brings together the integrated water resources management (including surface water and groundwater management), spatial planning, climate change adaptation and integrated coastal management, instead of preparing them separately (UNEP/MAP - PAP/RAC *et al*., 2015). Further into the sea, Marine Spatial Planning (MSP) can also be a means for integrating these spatial considerations (Visbeck *et al*., 2013).

Table 2. SDG 14 targets: Main spatial scales of intervention

Target	Main spatial scales of intervention
14.1	Subnational, national, transnational
14.2	Subnational, national, regional
14.3	National, regional, global
14.4	Subnational, national, regional
14.5	Subnational, national, transnational, global
14.6	National
14.7	Subnational, national, regional
14.a	National, regional, global
14.b	Sub-national, national, regional
14.c	Regional, global

Notes: The transnational intervention level applies when the watershed or the marine protected area are shared between two or more countries.
Source: Author's elaboration.

3.3 Effective SDG 14 monitoring and implementation through SMART SDG 14 targets

Effective SDG 14 monitoring and implementation requires SMART SDG 14 targets (Specific, Measurable, Attainable, Relevant -for all countries-, and Time-bound) (OECD, 2015a). While some of the targets are fairly SMART (e.g. 14.5), others such as targets 14.1, 14.2, 14.3, 14.7 and 14.b are not sufficiently precise. For instance, the IAEG-SDGs could have reformulated target 14.3 to "ensure that the pH level of the uppermost ocean layer does not fall by more than 0.2 units compared to pre-industrial figures" (Loewe and Rippin, 2015). Moreover, targets 14.3, 14.4 and 14.b should include a timeframe (Loewe and Rippin, 2015). In addition, it appears that the IAEG-SDGs chose starting points for individual SDG 14 targets as the "here and now", without accounting for a scientifically verifiable baseline (Houghton, 2014).

Most SDG 14 targets are not measurable in quantitative terms, particularly at the global level. According to OECD (2015a), among outcome targets, only target 14.5 is quantifiable, while targets 14.1, 14.3 and 14.7 are partly quantifiable. Target 14.2, in particular, involves the measurement of a poorly quantifiable subject. Some targets are not sufficiently ambitious according to scientific understanding. According to ICSU, ISSC (2015) and Loewe and Rippin (2015), for example, the IAEG-SDGs could have reformulated target 14.5 to "conserve at least 20-30% of the area of marine ecosystems through an ecologically representative and effectively managed system of marine protection areas and halt, by 2050, the anthropogenic drivers of biodiversity loss". Targets 14.3 and 14.b would require clarification of the institutional framework that would host such developments (Houghton, 2014).

3.4 Links among the SDG 14 targets and between SDG 14 and other SDGs targets

Before developing context-specific regional and national indicators, it is important to understand the nature of interdependencies among the SDG 14 targets and between SDG 14 and other SDGs targets, since some targets can reinforce each other, while others may have offsetting effects (Unger *et al*., 2017). Concerning the SDG 14 targets, there are potential trade-offs between targets 14.7 and 14.b that promote economic activities, and targets 14.2, 14.4 and 14.6 that seek to conserve

oceans' ecosystems. Target 14.a on scientific knowledge and technology transfer has the potential to benefit many of the other SDG 14 targets (Le Blanc *et al*., 2017). Targets 14.2 (integrated policy and management) and 14.c (rule of law) have a pivotal role among the SDG 14 targets (Table 3). There are a large number of interdependencies between SDG 14 targets and other SDGs targets. This highlights the need to identify the interdependencies that are most relevant at the different geographical levels (an illustration is provided in bold text in Table 3).

Table 3. Main links among SDG 14 targets and between SDG 14 targets and other SDGs

SDG 14 target	Links with SDG 14 targets	Links with other SDGs
14.1	**14.2** 14.7 14.b	SDGs 1 2* 3 **6** 8* 9* 11* 12 13 **15*** 16
14.2	14.4 **14.5** 14.6 14.7* 14.a 14.b* 14.c	SDGs 1 **2*** 3 4 5 7* 8* 9* **11*** **12** 13* 15* 16 17
14.3	**14.a** 14.c	SDGs 1 2 4 7 8* 9* 11* **13***
14.4	14.6 14.7* 14.a **14.c**	SDGs 1* **2*** 3 5 8* 12* 13* 16 17
14.5	**14.2** 14.a 14.b* 14.c	SDGs 1* 2* 3 4 5 7* 8* 9* 10* 11* 13* 15 **16**
14.6	14.4 14.7* **14.c**	SDGs 1* 2* 4 **8*** 10* 12 13* 16 17
14.7	14.2* 14.4* 14.a **14.b**	SDGs **1** 2 3 4 5 6 **7*** 8* 9 10 11 12 16
14.a	14.2 **14.c**	SDGs 2 **3** 4 5 7 **9** 13
14.b	14.2* 14.4* **14.7**	SDGs 1 2 4 5* 8 9 **10** 11 16 17
14.c	**14.2** 14.4 14.6	SDGs 1 2 5 8 13 16 **17**

Notes: Illustration of the potentially strong links between SDG 14 targets (first and second columns), and between SDG 14 targets and the other SDGs (first and third columns). *: Indicates potential for trade-offs. The text in bold indicates an illustration of the SDG targets with strongest links.
Source: Author's elaboration based on ICSU, ISSC (2015), ICSU (2017), FAO (2017) and Le Blanc *et al*., (2017).

In terms of these interdependencies between SDG 14 and other SDGs targets, we can broadly identify the links according to the ecosystem services provided by the oceans such as food and energy provision, climate stability, and terrestrial and coastal ecosystems, i.e. SDGs 2, 3, 6, 7, 11, 12, 13 and 15 (ICSU, ISSC, 2015). Some links may involve trade-offs. For instance, there is potential for trade-offs between healthy oceans, i.e. SDG 14, food security, i.e. SDG 2 and economic growth and job creation, i.e. SDG 8 (OECD, 2015a). The links from economic activity, i.e. SDGs 8, 9 and 11, to SDG 14 are in the form of pollution, ocean acidification, and pressure on marine resources (Le Blanc *et al*., 2017).

Some impacts of climate change such as sea level rise, ocean warming, and changes in ocean circulation and salinity are not included among the SDG 14 targets, but should be incorporated in local discussions (ESCAP, 2016). In addition, potential synergies such as those between SDG 14 and SDG 12 on sustainable production and consumption, e.g. through seafood certification systems, may not be exploited if they are not identified (Unger *et al*. 2017).

One way to integrate context-specific trade-offs and synergies between SDG 14 and other SDGs, is to add the relevant ocean-related data as part of the other SDGs indicators. The Baltic Marine Environment Protection Commission (HELCOM) has reported how its indicators can be useful to monitor SDGs 2, 6, 9, 11 and 12 (HELCOM, 2017). These complex links between SDG 14 and other SDGs are useful to identify all the relevant stakeholders when exchanging on the local nature of SDGs targets (Le Blanc *et al*., 2017). Besides, they reveal that there should be a stronger collaboration between the scientific and policy communities to appropriately identify the most important local trade-offs (Rice and Garcia, 2011).

3.5 Tracking progress on policy coherence at the national level

The SDG 17 on means of implementation includes the target 17.14 to "enhance policy coherence for sustainable development". Within the SDG framework, Policy Coherence for Sustainable Development (PCSD) is an approach and policy tool to integrate the economic, social and

environmental governance dimensions of sustainable development in policy-making (OECD, 2015a). PCSD aims to increase the capacities of governments and stakeholders to identify synergies and trade-offs between multiple and sometimes conflicting objectives, and address domestic policies' spill-over effects (OECD, 2016b).

Even though indicators for tracking PCSD vary from country to country depending on the local objectives and needs, two broad priority areas are food security and illicit financial flows (OECD, 2015b; OECD, 2016b). These two topics concern, among other goals, the SDG 14 (OECD, 2015c; Rasul, 2016). Concerning food security, the sustainable exploitation of marine resources can contribute to the availability of this type of food supply source. The long-term conservation of marine areas may impose though, temporary restrictions in the short-term. Policy areas to consider in conjunction with the design and implementation of food security policies include fisheries, e.g. IUU fishing and input subsidies (targets 14.4 and 14.6) (OECD, 2016c). Besides, the share of aquaculture in human consumption will reach 56% by 2024, with 96 million tonnes (OECD/FAO, 2015; OECD, 2017b).

In terms of illegal financial flows, joint progress on SDG 12 (responsible production and consumption), 14 and 15 (life on land) could be mutually reinforcing. The exploitation of natural resources can be one of the drivers of corruption and a source of illicit funds (UNODC/OECD, 2016). Since laundering of illicit flows is an essential enabler for many of these activities, the restriction of these flows should be given priority (OECD, 2015a). This topic is associated with the SDG target 16.4 whereby countries should "by 2030 significantly reduce illicit financial and arms flows, strengthen recovery and return of stolen assets, and combat all forms of organized crime".

3.6 Ocean-related MDGs 7 targets and indicators

These SDGs built and expand on the MDGs, a global-goal setting process with a series of time-bound and quantified targets for the period 2000-2015 (UN, 2000). MDGs sought to act as a policy lever to direct development cooperation on poverty related issues (Houghton, 2014). The emphasis of the MDGs was on the human dimensions of poverty such as hunger, education, child mortality and maternal health. These goals included MDG 7 on ensuring environmental sustainability contain ocean-related elements, including three indicators, i.e. the proportion of fish stocks within safe biological limits (MDG indicator 7.4), the proportion of terrestrial and marine areas protected (MDG indicator 7.6) and the proportion of species threatened with extinction (MDG indicator 7.7).[8]

While the MDGs mobilised action on critical development issues, it is currently acknowledged that addressing poverty requires a much broader focus (UN, 2013). Among other factors, the MDGs failed to integrate the economic, social and environmental aspects of sustainable development as envisaged in the Millennium Declaration (UN, 2000). As a result, environment and development were not sufficiently addressed together, practitioners often devoting separate efforts to interlinked problems (UN, 2013). Nonetheless, the ocean-related targets and indicators in MDG 7 reflect the need to protect and preserve the natural resource base for sustainable development (Houghton, 2014). These ocean-related indicators are used to monitor SDG 14 targets within a broader framework that encompasses the different dimensions of sustainable development.

3.7 Synergies between MEAs and SDG 14 indicators

There are synergies between the SDG 14 targets and key MEAs such as the Convention on Biological Diversity (CBD) and its' 20 Aichi targets as well as the Ramsar Convention on wetlands (Table 4). Exploiting these synergies can be cost effective (Rockström, 2014). For example, it is possible to draw synergies between SDG 14 and the CBD Aichi targets at the level of indicators. Aichi target 4 is associated with SDG target 14.4, Aichi target 6 with SDG targets 14.4, 14.6 and 14.b,

[8] These indicators are associated to MDG targets 7.A (integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources) and 7.B (reduce biodiversity loss, achieving, by 2010, a significant reduction in the rate of loss).

Aichi target 8 with SDG target 14.1, Aichi target 10 with SDG target 14.3 and Aichi target 11 with SDG target 14.5 (CBD, 2016; Rockström, 2014; HELCOM, 2017).

Table 4. Synergies between some key MEAs and SDG 14 targets

MEAs	SDG 14 target
Convention on Biological Diversity	14.1 14.2 14.3 14.4 14.5 14.6 14.7 14.a 14.b 14.c
Convention on Wetlands	14.1 14.2 14.3 14.5 14.7 14.b 14.c
Convention on the Conservation of Migratory Species of Wild Animals	14.2 14.4 14.5
United Nations Framework Convention on Climate Change	14.2
Regional Seas Conventions and Action Plans	14.1 14.2 14.3 14.5 14.7 14.a 14.b 14.c
Chemicals conventions (Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade, Stockholm Convention on Persistent Organic Pollutants and others)	14.1
Convention on International Trade in Endangered Species of Wild Flora and Fauna	14.2 14.4

Notes: This table displays a non-exhaustive list of MEAs. For instance, the Port State Measures Agreement (PSMA) and various FAO standards of conduct are also relevant.
Source: Author's elaboration based on UNEP (2016) and Ramsar (2017).

3.8 Big data and SDG 14 indicators

Big data is particularly relevant for SDG 14, particularly regarding marine pollution, ocean acidification, marine protected areas and threats to biodiversity due to IUU fishing.[9] In the context of the SDG 14, earth observation (remote sensing, in-situ monitoring) is relevant for targets 14.1, 14.2, 14.3, 14.4, 14.6, 14.7 and 14.a, and can produce direct measures that can be relevant for the indicators 14.3, 14.5, 14.6 (GEO, 2017a). Salinity, sea-surface temperature and additional auxiliary satellite data enable to work out the pH of seawater and provide accurate information on ocean acidification (target 14.3).

Other indicators that can be useful for SDG 14 are the coverage of MPAs and their overlay with key biodiversity areas (target 14.5), the not yet available global mangrove watch (target 14.5) and the Red List Index (Anad, 2016; GEO, 2017a). The Marine Park Authority in Australia uses remotely-sensed water quality information of total suspended sediments and chlorophyll-a for compliance monitoring against guideline values in the Great Barrier Reef (target 14.1) (GEO, 2017b). Initiatives such as Google's Global Fishing Watch and Pew Charitable Trusts' Project Eyes on the Seas are using real-time data from vessel transponders and satellite imagery to spot illegal fishing and enable law enforcement (targets 14.4 and 14.5). Using Google's earth images, local and regional data on catch volumes, and data about types of fish caught, it is possible to find mismatches between officially reported catch data and estimates including fish catches using weirs (Al-Abdulrazzak and Pauly, 2013) (target 14.4).

4 Some preliminary indicators for the SDG 14 at the global and national scales

4.1 Global indicators[10]

During the development of the SDG 14 targets, a decision was made not to consider existing data availability to monitor progress towards these targets as the aim was to be policy relevant first and subsequently to pay attention to the measurement agenda. For this goal therefore, eight out of 10

[9] Although there is no fixed definition for big data, this data is characterised by the volume from various sources needing large storage, the speed at which it is generated, the variety of unstructured formats needing additional processing, and the value or meaning not being immediately apparent (Maaroof, 2015; UNESCAP, 2015).
[10] Building on the United Nations global indicator framework, regional indicators should better reflect regional challenges. For an illustration of regional available indicators, see OECD (2017c). Such analysis will evolve as additional indicators are produced (UNEP, 2014b; Makarenko, 2016; Giraud, 2017; HELCOM, 2017).

Table 5. SDG 14 global indicators

Target	Global indicator	Source	Availability	Disaggregation	Type
14.1	14.1.1 Index of coastal eutrophication (i) and floating plastic debris density (ii)	MEA – UNEP in co-operation with IOC-UNESCO	From 2021	National	State(i) Pressure(ii)
14.2	14.2.1 Proportion of national exclusive economic zones managed using ecosystem-based approaches	MEA – UNEP in co-operation with IOC-UNESCO	From 2021	National	Response
14.3	14.3.1 Average marine acidity (pH) measured at agreed suite of representative sampling stations	MEA – IOC-UNESCO in co-operation with UNEP	After 2020	Global, regional	State
14.4	14.4.1 Proportion of fish stocks within biologically sustainable levels*	MEA – FAO***	1974 - 2013	Global	State
14.5	14.5.1 Coverage of protected areas in relation to marine areas	MEA - UNEP's World Conservation Monitoring Centre, BirdLife Index, UICN***	2000 - 2014	National	Response
14.6	14.6.1 Progress by countries in the degree of implementation of international instruments aiming to combat illegal, unreported and unregulated fishing	MEA - FAO	After 2017	National	Response
14.7	14.7.1 Sustainable fisheries as a proportion of gross domestic product in small island developing States, least developed countries and all countries**	FAO	No set date	National	State
14.a	14.a.1 Proportion of total research budget allocated to research in the field of marine technology	IOC-UNESCO in co-operation with UNEP	From 2018	National	Response
14.b	14.b.1 Progress by countries in the degree of application of a legal/regulatory/policy/institutional framework which recognizes and protects access rights for small-scale fisheries	MEA - FAO	From 2016	National	Response
14.c	14.c.1 Number of countries making progress in ratifying, accepting and implementing through legal, policy and institutional frameworks, ocean-related instruments that implement international law, as reflected in the United Nation Convention on the Law of the Sea, for the conservation and sustainable use of the oceans and their resources	United Nations Division for Ocean Affairs and the Law of the Sea, Office for Legal Affairs	No set date	National	Response

Notes: The IAEG-SDGs will revise this list of indicators in 2020. The acronym "MEA" in the data sources signals that the SDG 14 indicators are also used for reporting in at least one key MEA. The type is defined according to the DPSIR framework. *: "IUU fishing" is a possible additional indicator (UNSC, 2017a). **: "The economic impact of sustainable fisheries, aquaculture, tourism and other coastal and marine resources uses" and "the productivity of aquaculture" are possible additional indicators (UNSC, 2017a). ***: Data available at: https://unstats.un.org/sdgs/indicators/database/.

Source: Author's elaboration based on IAEG-SDG (2016) and UNSC (2017a; 2017b; 2017c).

indicators are currently not available compared to 58% for all SDGs indicators (Table 5). The indicators should in fact meet the following criteria: (i) relevant; (ii) methodologically sound; (iii) measurable; (iv) easy to communicate and access; (v) limited in number; and (vi) outcome focused at the global level (UN, 2015b).

The IAEG-SDGs has classified the global indicators into three categories based on the soundness of methodology and the availability of data (UNSC, 2017c). While the SDG 14 was the only goal with no publicly available data by mid-2016, the United Nations Statistics Division currently provides open access to the two SDG 14 available indicators, namely 14.4.1 (proportion of fish stocks within biologically sustainable levels) and 14.5.1 (coverage of protected areas in relation to marine areas) (Dunning and Kalow, 2016). Without publicly accessible data, citizens and external groups cannot keep United Nation Member States accountable for their progress in implementing the SDG 14 (OECD, 2016d).

The indicator for the target 14.4 is the "proportion of fish stocks within biologically sustainable levels" (FAO, 2011).[11] It is a global indicator, covering about 57% of the global catch. There is currently no data available at country level because (i) fish migrates across areas beyond national jurisdictions; (ii) there can be political sensitivities; and (iii) it is data intensive and technically demanding as it needs stock assessment (IAEG-SDG, 2016; UNSC, 2017c). Beyond the SDG framework, there are several targets for this indicator. For instance, the World Summit on Sustainable Development proposed reaching 100% by 2015 and the CBD (Aichi Target 6) implicitly proposes attaining 100% by 2020 (IAEG-SDG, 2016). These targets are proposed in a context where global reported commercial catches have risen over time and are about 80 million tons annually, with large amounts of artisanal and IUU fishing catches unreported (UN, 2017b). Despite these challenges, developed countries consider that this target 14.4 is the most clearly applicable and implementable among SDG 14 targets (Osborn *et al*., 2015).

The indicator for the target 14.5 is the "coverage of protected areas in relation to marine areas". This indicator could be complemented with an additional indicator that aims to recognise the variation of biodiversity importance (benefits) over space (see, e.g. Brander et al., 2015). This would help to inform the siting of MPAs to ensure that adequate attention is given to areas that have highest biodiversity benefits and are under most threat (OECD, 2017a). In addition, a complementary indicator could also measure the effectiveness of protected areas in achieving their objectives, which ultimately depends on a range of management and enforcement factors (OECD, 2017a; MEEM, 2017). Management effectiveness is one of the most important problems of MPAs due to insufficient resources, multiple jurisdictions, conflict between different activities and users, and lack of awareness (UNGA, 2017). In 2017, protected areas cover 13.2% of the marine environment under national jurisdiction (up to 200 nautical miles from shore), 0.25% of the marine environment beyond national jurisdiction and 5.3% of the total global ocean area.

4.2 National indicators: France

We report on SDG 14 indicators in France since this country has made some progressed on this topic. The selection of national SDG 14 indicators is based on the available global and regional indicators complemented when necessary by national indicators relevant for national policies or for national stakeholders. According to the French National Statistical Office, the SDG national indicators should be (i) political relevant; (ii) of high statistical quality according to the Code of

[11] Target 14.4 can be also quantified through the maximum sustainable yield weighted by the catch in a given country. Whenever available, this indicator is usually preferred to the safe biological limits statistic since under the latter fish stock renewal is not warranted (EC, 2013; MEEM, 2017). The maximum economic yield is a more conservative measure than the maximum sustainable yield, and is used in countries such as United States, Australia and South Africa (MEEM, 2017). Besides, there is a close relationship between targets 14.2 and 14.4 since there is a need to have an ecosystem approach to fisheries to integrate exploitation and conservation (Worm *et al*., 2009). The technical interactions, e.g. bycatch in mixed species fisheries, and the biological interactions, e.g. predator-prey relationships, should be ideally integrated when providing advice on fisheries stock (Cury *et al*., 2011; Pikitch *et al*., 2012).

Practice; (ii) easy to communicate; (iii) already available or available in medium-term; and (iv) limited in number (around 100 in total to facilitate the communication), but contribute to a well-balanced dashboard on the different themes (Plateau, 2017). The French National Statistical Office shared in March 2017 a first data base of 110 SDGs indicators.

The full set of the SDG 14 indicators fall under the responsibility of the French Ministry of Ecology, Energy and Sea (CGDD, 2016a). In contrast, the indicators for each of the other SDGs fall under the jurisdiction of several authorities. Concerning the SDG 14, there are a number of scoreboards for tracking public policies on sustainable development in France. These scoreboards can provide indicators which can be integrated with, or complementary to, SDG 14 indicators since they reflect the implementation of sustainable development in the oceans in France (Table 6).

Table 6. (Non-exhaustive) list of French scoreboards for tracking public policies on sustainable development associated with the SDG 14

Scoreboard	Characteristics of indicators
National Strategy on the Ecological Transition for Sustainable Development 2015-2020	72 indicators Annual report to Parliament
National Biodiversity Strategy 2011-2020	80-90 indicators National Observatory on Biodiversity
Climate Change indicators	24 indicators National Observatory on the Effects of Global Warming
Strategy on Management and Creation of MPAs	Scoreboard at the French Biodiversity Agency

Source: CGDD (2016a).

Table 7. SDG 14 national indicators in France (March 2017)

Global indicator	National indicator		
	Type	Name	Source
14.1.1	Statistical indicator- Non-available		
14.2.1	Statistical indicator -Proxy	**Coverage of protected areas in relation to marine areas: France**	MEA - French Biodiversity Agency*
		Sites under European (Natura 2000) or international (Ramsar) engagements	MEA - National Museum of Natural History**
		Ramsar Convention sites : Marine area	
		Natura 2000 sites : Marine area	
14.3.1	Statistical indicator- Non-available		
14.4.1	Statistical indicator -Available	**State of fish stocks in the north-east Atlantic and the Mediterranean (with respect to safe biological limits)**	MEA - European Environmental Agency (EEA), data from the International Council for the Exploration of the Sea (ICES)***
		Stocks within safe biological limits	
		Stocks outside safe biological limits	
		Stocks for which the state is unknown	
14.5.1	Statistical indicator -Available	**Coverage of protected areas in relation to marine areas: France**	MEA - French Biodiversity Agency****
14.6.1	Public policy assessment		
14.7.1	Statistical indicator- Non-available		
14.a.1	Statistical indicator- Non-available		
14.b.1	Public policy assessment		
14.c.1	Public policy assessment		

Notes: The acronym "MEA" in the data sources signals that the SDG 14 indicators are also used for reporting in at least one key MEA. *: Data available at : SOeS : Indicateurs SNTEDD 2015-2020 : Part des eaux marines françaises en aires marines protégées. ** : Data available at : Base de données EIDER. *** : Data available at : SOeS : L'essentiel sur pêche et agriculture - Les ressources halieutiques. **** : Data available at : SOeS : Indicateurs SNTEDD 2015-2020 : Part des eaux marines françaises en aires marines protégées.
Source: CGDD (2016a) and INSEE (2017).

The SDG 14 national indicators can be classified as "statistical indicators" (corresponding to the global indicators 14.1.1-14.5.1, 14.7.1 and 14.a.1) or "public policy assessments" (corresponding to the global indicators 14.6.1, 14.b.1 and 14.c.1) (Table 7). To enable public policy assessments, evaluation matrices should be completed and the resulting information should be aggregated. Statistical indicators can be further classified as "available" (corresponding to the global indicators 14.4.1 and 14.5.1), "proxy" (corresponding to the global indicator 14.2.1), or "non-available" (corresponding to the global indicators 14.1.1, 14.3.1, 14.7.1 and 14.a.1).

The available indicators are identical to the SDG 14 global indicators requested by the IAEG-SDGs. The proxy indicators are close to the SDG 14 global indicators, while being more adapted to the French context. Resources have to be invested to produce the SDG 14 indicators that are not available at the national level. International institutions can provide statistical support for the estimation of certain of these indicators.

In 2010, France already subscribed to an objective of zero subsidies harmful to sustainable fishing (Aichi target 3). France carried out an evaluation of harmful fishing subsidies for the year 2008 (Sainteny, 2012). According to this evaluation, there are seven types of harmful subsidies at a total cost of 253.4 million euros; 55% of public aid to professional fishing is harmful to biodiversity. The achievement of a zero subsidy harmful to biodiversity in the fisheries sector by 2020 poses a real challenge (Hege *et al*., 2014).

The French SDG 14 indicators in Table 7 should evolve over time (INSEE, 2017). In particular, the SDG 14 national indicators corresponding to the global indicator 14.2.1 should include proxy data on the effectiveness of MPAs in terms of the management and the ecological status. The SDG 14 national indicator corresponding to the global indicator 14.4.1 should include proxy data on the maximum sustainable yield (MEEM, 2017). In addition, SDG 14 indicators could account for sub-national specificities (Table 8).

Table 8. The differentiated impact of different factors on biodiversity in French ecosystems

	Habitat fragmentation and destruction	Pollution	Over-exploitation of biotic resources	Climate change	Alien species
Marine environment – Channel, North Sea, Atlantic	↗	→	↘	↗	↗
Marine environment – Mediterranean	↗	→	→	↗	↗
Marine environment - Overseas	→	↗	→	↗	↗
Coasts	↗	→	→	↗	↗

Notes: Current impacts are reported through colours (red: strong; orange: intermediate; yellow: moderate) and current trends are reported through arrows (increasing, decreasing and constant). The table reflects the point of view of experts based, as much as possible, on available data.
Source: CGDD (2016b).

The IAEG-SDGs have raised the need for disaggregated data at global and national levels according to age, gender, migration status, income level, ethnical group, handicap and other features. Such a level of disaggregation has to be integrated into the data collection, which requires additional investments. In France, the processing of personal data including information on ethnical or racial origins is prohibited (INSEE, 2015). If United Nations organisations estimated such data directly, this could raise issues about data quality (CGDD, 2016a).

5 Future research areas in the framework of SDG 14 indicators

5.1 Building on the frontiers of ocean science to develop the most appropriate SDG 14 indicators

All of the SDG 14 targets have a strong science dimension. The ability to monitor human impacts on the oceans is limited but growing (Barbier, 2016). There are knowledge and data gaps concerning pollution, including the life cycle of marine debris, plastics and micro-plastics, heavy metals and other hazardous substances (UNGA, 2017). Air pollutants, for instance, can accumulate in the food chain through the contamination of water (UNEP, 2014a). While scientists have analysed quite thoroughly how air pollution impacts human health and the terrestrial biosphere, the impact of air pollution on the oceans is less well understood (Strode *et al*., 2008). Furthermore, knowledge of many aspects of ocean acidification is very limited (UN, 2017b).

There is limited scientific understanding of the effectiveness of conservation measures, including the associated socio-economic benefits and the role of ocean and land-based activities (UNGA, 2017). Many aspects of integrated coastal management still present important knowledge gaps. Moreover, there is lack of consensus on the definition ecosystem-based management (Bianchi and Skjoldal, 2008). Additional research to consider, within such framework, cumulative impacts, the precautionary approach and explicitly acknowledged trade-offs, can contribute to a successful application in the management of marine activities. Whatever the target, baselines should be established and further research on safe minimum standards and critical versus non critical indicators would be timely. The heterogeneity in starting positions across both goals and targets in OECD countries suggests that national priorities for implementing the SDG agenda should be set at target level (OECD, 2016f).

5.2 The development of innovative approaches for SDG 14 data collection

Data should be more reliable, frequent, cost-effective and disaggregated enabling more effective, targeted and innovative public policies (OECD, 2015d; SDSN, 2015a). Numerous developing countries' statistical offices were unable to collect, analyse and disseminate data for reporting on the 48 MDGs indicators (Loewe and Rippin, 2015). Since the number of SDGs indicators in much higher at 244, there is a risk of focusing on less critical or easier to achieve targets (Rickels *et al*., 2016).

Accountability discussions on SDGs should call for the need to support a data revolution. Earth observations, for instance, are relevant for SDG 14.1, 14.3 and 14.5 indicators. Technologies like blockchain, which facilitates secure online transactions, show promise for tracing fish from the boat to the supermarket (target 14.4). Initiatives like Google's Global Fishing Watch and Pew Charitable Trusts' Project Eyes on the Seas are using real-time data from vessel transponders and satellite imagery to spot illegal fishing and enable law enforcement (targets 14.4 and 14.5). Drones offer timely data on ocean conditions and fish stocks at a small fraction of existing costs. Such non-traditional sources of data, especially big data, have been underutilized in producing official statistics (Maaroof, 2015).

5.3 The development of common approaches in valuing marine ecosystem services and national accounting to implement SDG 14, in synergy with other goals

The concept of ecosystem services can support the implementation of the SDG 14 in synergy with other goals (Ntona and Morgera, 2017). It can serve as an organising principle to consider multi-

scale and cross-sectoral synergies and trade-offs (van der Belt *et al*., 2016). The normative goal underpinning ecosystem services is to ensure both long-term sustainability and the enhancement of human well-being in the short-run within the carrying capacity of the biophysical system (UN, 2016b). This relationship between environmental change and human welfare should be further scrutinised through the lens of equity (Lele, 2013).

The poor quantification of the value of marine ecosystems restricts the capacity of SIDS and coastal communities to be financially rewarded for their efforts towards ecosystems' sustainable management and conservation (Rustomjee, 2016). Inter-generational equity and the recognition of the intrinsic value of biodiversity are relevant for target 14.4; the equitable management of MPAs is relevant for target 14.5 (CBD, 2011; Wolfrum and Matz, 2000). Besides, the services provided by coastal and marine ecosystems should be linked to a number of SDGs, e.g. SDG 1 (no poverty), SDG 2 (zero hunger), SDG 3 (good wealth and well-being) and SDG 6 (clean water and sanitation) (Wood and DeClerck, 2015). The use of common approaches, methodologies and conceptualizations vis-à-vis ecosystem services and their integration in national accounts should be fostered.

5.4 The provision of incentives for best practice and peer-learning on SDG 14 indicators

The SDGs indicators should inform a review process that takes stock of progress, and provides incentives for best practice and peer learning (SDSN, 2015a). There should be a multi-layered accountability framework between actors (the United Nations system, governments, the private sector and civil society), between levels of governance (international, regional, national and sub-national), and between the 2030 Agenda and third parties, including thematic fora (for the SDG 14, for instance, the Food and Agriculture Organisation, the World Trade Organisation, the OECD, and the Regional Sea Conventions) (UN, 2014; Loewe and Rippin, 2015). Regional and thematic reviews can take the form of peer review mechanisms among countries with common characteristics such as the OECD Environmental Performance Review and the African Peer Review Mechanism (Pagani, 2002; Espey *et al*., 2015). Accountability requirements should not result on the provision of selective indicators on behalf of countries since this may impair overall efforts to achieve a full understanding of the cases (Lehtonen, 2005).

5.5 The harmonisation of measurement methodologies

The provision of incentives for best practice and peer-learning on SDG 14 indicators is particularly relevant when considering the harmonisation of measurement methodologies. A lack of international harmonisation of measurement methodologies can have implications both in terms of interpretation and comparability of the data. Marine ecosystem-based indicators in Regional Seas entities are disparate regarding the levels of specificity, the rationales for indicator selection, the degree of sophistication and the use of qualitative information (UNEP, 2014a). Different methodologies have been used by Regional Seas entities, for instance, to develop indicators for target 14.1 on marine pollution (chlorophyll-a and beach litter), and target 14.2 (integrated coastal zone management). Inter-calibration shall be, at least, necessary for inter-regional comparison (Makarenko, 2016).

5.6 The selection of SDG 14 indicators according to the geographical level of intervention

Given that few global indicators are currently available, existing regional and national indicators are key for the implementation of the SDG targets. In addition, disaggregated indicator data should allow drawing causal inferences, particularly concerning links within SDG 14 targets, and between SDG 14 targets and other SDGs targets (Scheerens *et al*., 2011). There is a need to match the main geographical levels of intervention with the scale of the indicator, national and subnational scales being particularly relevant.

6 References

Al-Abdulrazzak, D. and Pauly, D., 2013. Managing fisheries from space: Google Earth improves

estimates of distant fish catches. *ICES Journal of Marine Science*, published online, 25 November 2013.

Anand, A., 2016. The big data revolution for sustainable development. Independent Evaluation Office, Global Environmental Facility. XI Meeting of the Latin America and the Caribbean monitoring and evaluation network. Santiago de Chile, June 28th -30th.

Barbier, J., 2016. SDG 14 and the role of science and capacity development. 18th Global Meeting of Regional Seas Conventions and Action plans. September, Incheon, Korea.

Bianchi, G. and Skjoldal, H.R. (eds.), 2008. *The ecosystem approach to fisheries*. Oxfordshire: CABI.

Borja, A., Elliott, M., Uyarra, M. C., Carstensen, J., Mea, M., (eds.), 2016. *Bridging the gap between policy and science in assessing the health status of marine ecosystems*. Lausanne: Frontiers Media.

Brander, L., Baulcomb, C., van der Lelij, J. A. C., Eppink, F., McVittie, A., Nijsten, L., van Beukering, P., 2015. *The benefits to people of expanding Marine Protected Areas*. Report R-15/05 Institute for Environmental Studies, VU University Amsterdam.

CBD, 2011. Quick guide to Aichi Biodiversity Target 11 – Protected areas increased and improved. Strategic Plan for Biodiversity 2011-2020. Montreal: CDB.

CBD, 2016. *Indicators for the Strategic Plan for Biodiversity 2011-2020 and the Aichi Biodiversity Targets*. CBD/COP/DEC/XIII/28. Montreal: CDB.

CGDD, 2016a. *Objectifs de développement durable*. *Contribution au suivi des indicateurs*. Service de l'observation et des statistiques, Commissariat général au développement durable. Document de travail n. 28. Paris: Ministère de l'Environnement, de l'Énergie et de la Mer.

CGDD, 2016b. *L'évaluation française des écosystèmes et des services écosystémiques (EFESE): rapport intermédiaire - 12/2016*. Service de l'économie, de l'évaluation et de l'integration du développement durable, Commissariat général au développement durable. Paris: Ministère de l'Environnement, de l'Énergie et de la Mer.

Cicin-Sain, B., Balgos, M., Appiott, J., Wowk, K. and Hamon, G., 2011. Oceans at Rio+20: How well are we doing in meeting the commitments from the 1992 Earth Summit and the 2002 World Summit on Sustainable Development? Summary for decision makers. Newark, DE, US: Global Ocean Forum.

Cooper, K., Burdon, D., Atkins, J.P.,Weiss, L., Somerfield, P., Elliott, M., Turner, K.,Ware, S., Vivian, C., 2013. Can the benefits of physical seabed restoration justify the costs? An assessment of a disused aggregate extraction site off the Thames Estuary, UK. *Marine Pollution Bulletin*. 75, 33–45.

Cury, P.M. *et al*., 2011. Global seabird response to forage fish depletion: One-third for birds. *Science* 334, 1730.

de Jonge, V.N., Pinto, R., Turner, R.K., 2012. Integrating ecological, economic and social aspects to generate useful management information under the EU Directives' 'ecosystem approach'. *Ocean and Coastal Management*. 68, 169–188.

Diaz, R.J. and Rosenberg, R., 2008. Spreading dead zones and consequences for marine ecosystems. *Sciences,* 321(5891), pp.926-929.

Dunning, C. and Kalow, J., 2016. SDG indicators: Serious gaps abound in data availability. Views from de Centre for Global Development. Washington: Centre for Global Development.

EC, 2013. Communication from the Commission to the Council concerning a consultation on Fishing Opportunities for 2014. COM(2013) 319 final. Brussels: EC.

Elliott, M., Burdon, D., Atkins, J.A., Borja, A., Cormier, R., de Jonge, V.D. and Turner, R.K., 2007. "And DPSIR begat DAPSI(W)R(M)!" - A unifying framework for marine environmental management. *Marine Pollution Bulletin* 118, 27-40.

ESCAP, 2016. *Transformations for sustainable development: Promoting environmental sustainability in Asia and the Pacific*. Bangkok: United Nations.

Espey, J., Walęcik, C. and Kühner, M., 2015. Follow-up and review of the SDGs: Fulfilling our commitments. Sustainable Development Solutions Network Working Paper, 30 November 2015). New York: SDSN.

FAO, 2000. *The state of world fisheries and aquaculture 2000*. Rome: FAO.

FAO, 2011. FAO Review of the state of world marine fishery resources. *FAO Fisheries and Aquaculture Technical Paper* No. 569. Rome: FAO.

FAO, 2014. *The state of world fisheries and aquaculture: opportunities and challenges*. Rome: FAO.

FAO, 2016. *The state of world fisheries and aquaculture 2016*. Rome: FAO.

FAO, 2017. FAO's input to the Secretary- General's background note for the preparatory meeting of the UN conference in support of the SDG 14 to be held in New York in February 2017. Rome: FAO.

GEO, 2017a. *Earth observations and geospatial information: Supporting official statistics in monitoring and achieving the 2030 Agenda*. Geneva: GEO.

GEO, 2017b. *Earth observations: 2030 Agenda for Sustainable Development*. Geneva: GEO.

Giraud, J.P., 2017. Mediterranean Strategy for Sustainable Development indicators. Mediterranean Commission on Sustainable Development Steering Committee. 18th – 19th January, Athens.

Hege, E., Vaillé, J., Demailly, D. and Brimont, L., 2017. L*a France passera-t-elle le test des Objectifs du développement durable (ODD) ? Une évaluation des nouveautés et des défis des ODD pour la France*. Study n. 2. Paris : IDDRI.

HELCOM, 2017. *Measuring progress for the same targets in the Baltic Sea*. Helsinki: HELCOM.

Houghton, K., 2014. A sustainable development goal for the ocean: Moving from goal framing towards targets and indicators for implementation. 2014 Potsdam Ocean Governance Workshop - Background Document 1.

IAEG-SDG, 2016. Compilation of Metadata for the Proposed Global Indicators for the Review of the 2030 Agenda for Sustainable Development. New York: Inter-agency Expert Group on SDG Indicators.

ICSU, ISSC, 2015. *Review of the Sustainable Development Goals: The science perspective*. Paris: International Council for Science (ICSU).

ICSU, 2017. *A guide to SDG interactions: From science to implementation*. Paris: ICSU.

INSEE, 2015. Statistiques ethniques. Paris : INSEE.

INSEE, 2017. Objectif n°14: Vie aquatique marine. Indicateurs pour le suivi des objectifs de développement durable. Paris : INSEE.

IOC/UNESCO, IMO, FAO, UNDP, 2011. *A Blueprint for ocean and coastal sustainability*. Paris: IOC/UNESCO.

Islam, S. M., 2015. *A critical analysis of integrated coastal and ocean management in Bangladesh with lessons from global practices*. Malmö: World Maritime University Dissertations, 489.

Kroeker, K.J., Kordas, R.L., Crim, R., Hendriks, I.E., Ramajo, L., Singh, G. S., *et al*., 2013. Impacts of ocean acidification on marine organisms: Quantifying sensitivities and interaction with warming. *Global Change Biology* 19, pp.1884–1896.

Le Blanc, D.E., Freire, C. and Vierros, M., 2017. Mapping the linkages between oceans and other Sustainable Development Goals: A preliminary exploration. DESA Working Paper No. 149.

Lehtonen, M., 2005. OECD environmental performance review programme: Accountability (f)or learning?. *Evaluation* 11(2), pp.169-188.

Lele, S., 2013. Environmentalisms, justices and the limits of Ecosystem Services Frameworks. in: T. Sikor (Ed.), *The Justices and Injustices of Ecosystem Services*, London: Earthscan.

Loewe, M. and Rippin, N., 2015. The Sustainable Development Goals of the post-2015 agenda. Comments on the OWG and SDSN proposals. Bonn: German Development Institute.

Maaroof, A., 2015. *Big Data and the 2030 Agenda for Sustainable Development: Final draft report*. UNESCAP meeting (session 4), 14th -15th December, Bangkok, Thailand.

Makarenko, I. 2016. Regional Seas IndicatorsWorking Group. 18th Global meeting of the Regional Seas Conventions and Action Plans. 30th september - 1st October, Incheon, the Republic of Korea.

MEEM, 2017. Pêche et écosystèmes marins et côtiers. Séminaire du MEEM-DML, 11 mai 2017, Paris: Ministère de l'Environnement, de l'Énergie et de la Mer.

Mills, D.J., Westlund, L., Graaf, G., de Kura, Y., Willman, R., Kelleher, K., 2011. Under-reported and undervalued: Small-scale fisheries in the developing world. In R.S. Pomeroy and N.L. Andrew, eds. *Small-scale fisheries management: frameworks and approaches for the developing world*. Cambridge: CABI.

Nellemann, C., Corcoran, E., Duarte, C.M., Valdés, L., De Young, C., Fonseca, L., Grimsditch, G., eds, 2009. *Blue carbon. A rapid response assessment*. UNEP, GRID-Arendal.

Noone, K., Sumaila, R. and Diaz, R.J., 2012. Valuing the ocean: Draft executive summary. Stockholm: Stockholm Environmental Institute.

Ntona, M. and Morgera, E., 2017. Connecting the dots between SDG 14 and the other SDGs: the value added of the ecosystem services concept and the integration of equity through marine spatial planning. Working Paper 6, Centre for Environmental Law and Governance, University of Strathclyde.

OECD, 1993. *OECD core set of indicators for environmental performance reviews*. A synthesis report by the Group on the State of the Environment. Paris: OECD.

OECD, 2015a. *Policy coherence for sustainable development in the SDG framework: Shaping targets and monitoring progress*. Paris: OECD.

OECD, 2015b. *Better policies for development 2015: Policy coherence and green growth*. Paris: OECD.

OECD, 2015c. *Stakeholder engagement for inclusive water governance*. OCDE Studies of Water. Paris: OECD.

OECD, 2015d. *Data-driven innovation: Big data for growth and well-being*. Paris: OECD.OECD, 2016a. *The ocean economy in 2030*. Paris: OECD.OECD, 2016b. *Better policies for sustainable development 2016. A new framework for policy coherence*. Paris: OECD.

OECD, 2016a. *The ocean economy in 2030*. Paris: OECD.

OECD, 2016b. *Better policies for sustainable development 2016. A new framework for policy coherence*. Paris: OECD.

OECD, 2016c. *The framework for Policy Coherence for Sustainable Development. Thematic module - food security*. SG/PCD(2016)2. Paris: OECD.

OECD, 2016d. *Open government data: rebooting public service delivery*. Paris: OECD.

OECD, 2016e. *Improving the evidence base on the costs of disasters: Key findings from an OECD survey*. Joint expert meeting on disaster loss data, 26th-28th October, Paris.

OECD, 2016f. *Measuring distance to the SDGs targets: A pilot assessment of where OECD countries stand*. Paris: OECD.

OECD, 2017a. *Marine protected areas: Economics, management and effective policy mixes*. Paris: OECD.

OECD, 2017b. *Policy Coherence for Sustainable Development 2017: Eradicating poverty and promoting prosperity*. Paris: OECD.

OECD, 2017c. A Preliminary assessment of indicators for SDG 14 on "Oceans", and Annexes. Issue paper, Paris, OECD.

OECD/FAO, 2015. *OECD-FAO Agricultural Outlook 2015*. Paris: OECD.

Osborn, D., Cutter, A. and Ullah, F., 2015. *Universal sustainable development goals. Understanding the Transformational Challenge for Developed Countries*. Report of a study by Stakeholder Forum.

Pagani, F., 2002. Peer review: A tool for co-operation and change. Report SG/LEG(2002)1. Paris: OECD.

Payet, R., 2008. Policy brief: Small Island Developing States (SIDS) and implementation of the Mauritius Strategy. Global Forum on Oceans, Coasts, and Islands Working Group on SIDS and Implementation of the Mauritius Strategy.

Pew Environmental Group, 2011. Rio+20: Time to turn back the tide. Washington, DC: Pew Environmental Group.

Pikitch, E., Boersma, P.D., Boyd, I.L., Conover, D.O., Cury, P., Essington, T., Heppell, S.S., Houde, E.D., Mangel, M., Pauly, D., Plagányi, É., Sainsbury, K., and Steneck, R.S., 2012. *Little fish, big*

impact: Managing a crucial link in ocean food webs. Washington, DC: Lenfest Ocean Program.

Pintér, S., Hardi, P. and P. Bartelmus, 2005. *Sustainable development indicators: Proposals for a way forward*. IISD analysis prepared for the United Nations Division for Sustainable Development (UN-DSD). Expert Group Meeting on Indicators of Sustainable Development, New York, 13-15 December 2005.

Plateau, C., 2017. Establishing national SDG indicators. Paris: INSEE.

Ramsar, 2017. How the Ramsar Strategic Plan contributes to the Sustainable Development Goals (SDGs). Gland: RAMSAR.

Rasul, G., 2016. Managing the food, water, and energy nexus for achieving the Sustainable Development Goals in South Asia. *Environmental Development* 18, pp.14-25.

Rice, J.C. and Garcia, S. M., 2011. Fisheries, food security, climate change, and biodiversity: Characteristics of the sector and perspectives on emerging issues. *ICES Journal of Marine Science: Journal du Conseil*, 68(6), pp.1343-1353.

Rickels, W., Dovern, J., Hoffmann, J., Quaas, M.F., Schmidt, J.O. and Visbeck, M., 2016. Indicators for monitoring sustainable development goals: An application to oceanic development in the European Union. *Earth's Future*, 4(5), pp.252–267.

Rockström, J.W., Steffen, K., Noone, Å., Persson, F.S., Chapin, III, E., Lambin, T.M., Lenton, M., Scheffer, C., Folke, H., Schellnhuber, B., Nykvist, C.A., De Wit, T., Hughes, S., van der Leeuw, H., Rodhe, S., Sörlin, P.K., Snyder, R., Costanza, U., Svedin, M., Falkenmark, L., Karlberg, R.W., Corell, V.J., Fabry, J., Hansen, B., Walker, D., Liverman, K., Richardson, P., Crutzen and Foley, J., 2009. Planetary boundaries: Exploring the safe operating space for humanity. *Ecology and Society* 14(2), pp.32.

Rockström, J.W., 2014. Comments OWG SDG 2014-06-02. Stockholm: Stockholm Resilience Centre.

Rustomjee, C., 2016. Developing the blue economy in Caribbean and other small states. CIGI Policy Brief 75. Waterloo: Centre for Internationla Governance and Innovation.

Sainteny, G., 2012. *Les aides publiques dommageables à la biodiversité*. Rapports & Documents n°43. Paris : Centre d'analyse stratégique (CAS).

Scheerens, J., Luyten, H. and Van Ravens, J. (eds.), 2011. *Perspectives on educational quality: Illustrative outcomes on primary and secondary schooling in the Netherlands*. Dordrecht, Heidelberg, London, New York: SpringerBriefs in Education.

SDSN, 2015a. *Indicators and a monitoring framework for the Sustainable Development Goals: Launching a data revolution for the SDGs*. Paris: SDSN.

Strode, S.A., Jaeglé, L., Jaffe, D.A.. Swartzendruber, P.A., Selin, N.E., Holmes, C. and Yantosca, R.M., 2008. Trans-Pacific transport of mercury. *Journal of Geophysical Research* 113, D15305.

Tett, P., Gowen, R., Painting, S., Elliott, M., Forster, R., Mills, D., Bresnan, E., Capuzzo, E., Fernandes, T., Foden, J., Geider, R., Gilpin, L., Huxham, M., McQuatters-Gollop, A., Malcolm, S., Saux-Picart, S., Platt, T., Racault, M.-F., Sathyendranath, S., Molen, Jvd, Wilkinson, M., 2013. Framework for understanding marine ecosystem health. *Marine Ecology Progress Se*ries 494, 1–27 (inc. suppl. material).

Turley, C., Keizer, T., Williamson, P., Gattuso, J.P., Ziveri, P., Munroe, R., Boot, K. and Huelsenbeck, M., 2013. *Hot, sour and breathless - Ocean under stress*. Plymouth Marine Laboratory, UK Ocean Acidification Research Programme, European Project on Ocean Acidification, Mediterranean Sea Acidification in a Changing Climate project, Scripps Institution of Oceanography at UC San Diego, OCEANA.

UN, 2000. United Nations Millenium Declaration. Document A/RES/55/L.2, September 2000. New York: UN.

UN, 2013. A new global partnership: Eradicate poverty and transform economies through sustainable development. The Report of the High-Level Panel of Eminent Persons on the Post-2015 Development Agenda. New York: UN.

UN, 2014. *The road to dignity by 2030: Ending poverty, transforming all lives and protecting the planet*. Synthesis report of the Secretary-General on the post-2015 Agenda. New York: UN.

UN, 2015a. Draft outcome document of the United Nations summit for the adoption of the post-2015 development agenda. Draft resolution submitted by the President of the General Assembly, Sixty-ninth session, Agenda items 13 (a) and 115, A/69/L.85, August 12, 2015. New York: UN.

UN, 2015b. Expert group meeting on the indicator framework for the post-2015 development agenda, 25-26 February 2015, New York: UN.

UN, 2016a. *Report of the Inter-Agency and Expert Group on Sustainable Development Goal Indicators*. Document E/CN.3/2016/2/Rev.1, Annex IV. New York: UN.

UN, 2016b. *The first global integrated marine assessment: World ocean assessment I*. Group of Experts of the Regular Process (Innis, L. and Simcock, A., Joint Coordinators). United Nations Regular Process for Global Reporting and Assessment of the State of the Marine Environment, including Socioeconomic Aspects. New York: United Nations.

UN, 2017a. *Report of the Inter-agency and Expert Group on Sustainable Development Goal Indicators*. Document E/CN.3/2017/2, Annexe III, IV and V. New York: UN.

UN, 2017b. *Technical abstract of the first global integrated marine assessment on the ocean and the United Nations' Sustainable Development Goals under the Agenda 2030*. Regular Process for Global Reporting and Assessment of the State of the Marine Environment, including Socioeconomic Aspects. New York: United Nations.

UNCSD, 2012. Rio ocean declaration. Co-chairs' statement of The Oceans Day at Rio+20 - United Nations Conference on Sustainable Development. New York: UN.

UNCTAD, 2014. *The oceans economy: Opportunities and challenges for Small Island Developing States*. Geneva: UNCTAD.

UNDESA, 2014. *How oceans- and seas-related measures contribute to the economic, social and environmental dimensions of sustainable development: Local and regional experiences*. New York: UNDESA.

UNECE, 2009. *Measuring sustainable development*. Prepared in cooperation with the Organisation for Economic Co-operation and Development and the Statistical Office of the European Communities (Eurostat). New York and Geneva: UNECE.

UNECE, 2017. Approaches for managing risks in regulatory systems that would support member countries in moving forward on the SDG's of the United Nations while building upon the

ongoing work of the Group of Experts on Risk Management in Regulatory Systems (GRM). UNECE WP.6 GRM, 20 - 22 February 2017. Helmholtz-Zentrum Geesthacht (HZG): UNECE.

UNEP, 2006. *Marine and coastal ecosystems and human wellbeing: A synthesis report based on the findings of the Millennium Ecosystem Assessment*. Nairobi: UNEP.

UNEP, 2014a. *Design and development of integrated indicators for the Sustainable Development Goals*. Report: Senior Expert Meeting, 3-5 December 2014, Gland, Switzerland.

UNEP, 2014b. *Measuring success: Indicators for the Regional Seas Conventions and Action Plans*. Nairobi: UNEP.

UNEP, 2016. *Enhancing cooperation among the seven biodiversity related agreements and conventions at the national level using national biodiversity strategies and action plans*. Nairobi: UNEP.

UNEP and GRID-Arendal, 2016. *Marine Litter Vital Graphics*. Nairobi and Arendal: UNEP and GRID-Arendal.

UNEP/MAP – PAP/RAC, GWP-Med and UNESCO-IHP, 2015. *An integrative methodological framework for coastal, river basin and aquifer management*. Split: PAP/RAC.

UNESCAP, 2015. *Big Data and the 2030 Agenda for Sustainable Development: Achieving the Development Goals in the Asia and the Pacific Region*. Draft report of the meeting, 14th -15th December, Bangkok, Thailand.

UNGA, 2017. *Background note of the Secretary-General for the preparatory process of the United Nations Conference to support the Implementation of Sustainable Development Goal 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development*. Agenda item 19 and 74 (a). Seventy-first session. New York: UN.

Unger, S., Müller, A., Rochette, J., Schmidt, S., Shackeroff Theisen, J. and Wright, G., 2017. Achieving the Sustainable Development Goal for the oceans. *IASS Policy Brief* 1.

UNODC/OECD, 2016. *Coherent policies for combatting Illicit Financial Flows*. Issue Brief Series, Inter-Agency Task Force on Financing for Development.

UNSC, 2017a. Work of the UN Statistical Commission pertaining to the 2030 Agenda for Sustainable Development. Statistical Commission, 48th Session Draft Resolution as of 10 March 2017. New York: UNSC.

UNSC, 2017b. Work Plans for Tier III Indicators. Prepared by UNSD with inputs provided by international and regional entities responsible for global data compilation. Statistical Commission, 48th Session Draft Resolution as of 10 March 2017. New York: UNSC.

UNSC, 2017c. SDG 14 Metadata. New York: UNSC.

van den Belt, M. *et al*., 2016. Chapter 3. Scientific understanding of ecosystem services. in: UN, 2016. *The first global integrated marine assessment: World ocean assessment I*. Group of Experts of the Regular Process (Innis, L. and Simcock, A., Joint Coordinators). United Nations Regular Process for Global Reporting and Assessment of the State of the Marine Environment, including Socioeconomic Aspects. New York: United Nations.

Visbeck, M., Kronfeld-Goharani, U., Neumann, B., Rickels, W., Schmidt, J. and van Doorn, E., 2013. Establishing a sustainable development goal for oceans and coasts to face the challenges of our

future ocean. Kiel Working Papers 1847, Kiel Institute for the World Economy (IfW).

Visbeck, V.M., Kronfeld-Goharani, U., Neumann, B., Rickels, W., Schmidt, J., Van Doorn, E., Matz-Luck, N., Ott, K. and Quaas, M.F., 2014. Securing blue wealth: the need for a special sustainable development goal for the ocean and coasts. *Marine Policy* 48, pp.184-191.

Weber, J.L., 2010. Merging the ecosystem approach with the conventional PSR/DPSIR framework. Expert Group Meeting on the Revision of the Framework for the Development of Environment Statistics (FDES). New York, 8-10 November 2010. ESA/STATISTICS/AC.288, EGM-FDES/1/16.

Wolfrum, R. and Matz, N., 2000. The interplay between the United Nations Convention on the Law of the Sea and the Convention on Biological Diversity. *Max Planck Yearbook of United Nations Law*, vol. 4.

Wood, S.L.R. and DeClerck, F., 2015. Ecosystems and human well-being in the Sustainable Development Goals. *Frontiers in Ecology and the Environment* 13:3.

World Bank and FAO, 2009. *The sunken billions: The economic justification for fisheries reform*. Washington, DC: The World Bank.

Worm *et al*., 2009. Rebuilding global fisheries. *Science* 325 (5940): 578-585.

WWF, 2009. Silent invasion - The spread of marine invasive species via ships' ballast water. Gland: WWF International.