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Oceans and the law of the sea

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Report of the Secretary-General

Summary

The present report has been prepared pursuant to paragraph 324 of General Assembly resolution 70/235 of 23 December 2015, with a view to facilitating discussions on the topic of focus at the seventeenth meeting of the United Nations Open-ended Informal Consultative Process on Oceans and the Law of the Sea, on the theme entitled "Marine debris, plastics and microplastics". It constitutes the first part of the report of the Secretary-General on developments and issues relating to ocean affairs and the law of the sea for consideration by the Assembly at its seventy-first session. The report is also being submitted to the States parties to the United Nations Convention on the Law of the Sea, pursuant to article 319 of the Convention.

In the light of the multifaceted nature of the topic and the page limitations established by the General Assembly, the report does not purport to provide an exhaustive synthesis of available information. It builds on the information reported in 2005 by the Secretary-General on marine debris and takes into account the contributions received from States and intergovernmental organizations.

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Contents

I. Introduction

1. Marine debris, including plastics and microplastics (MDPMs), is considered "a global concern affecting all the oceans of the world".[1] It has been observed everywhere:[2] from coastal areas to remote areas far from any anthropogenic pollution sources; from surface waters throughout the water column to the deep water and ocean sediments; and from the equator to the poles, including trapped in sea ice.[3]

2. In 2004, the General Assembly addressed the issue of marine debris by selecting it as one of the topics of focus for the sixth meeting of the United Nations Open-ended Informal Consultative Process on Oceans and the Law of the Sea (the Informal Consultative Process) in 2005.[4] Since then, the issue of marine debris (or marine litter as it is also referred to) has been addressed annually by the Assembly in its resolutions on oceans and the law of the sea, and sustainable fisheries, with an emphasis on the role of plastics[5] added from 2012 onward to mirror the approach taken in the outcome document of the United Nations Conference on Sustainable Development, held in Rio de Janeiro, Brazil, from 20 to 22 June 2012, entitled "The future we want".[6]

3. In the intervening years, however, marine debris has not only increased exponentially, but also become characterized by the growing presence — and now prevalence — of non-organic and non-biodegradable components, in particular plastics. An estimated minimum of 5.25 trillion plastic particles weighing 268,940 tons are currently floating in the world's oceans.[7] These figures do not include plastics accumulating on beaches or the sea floor, trapped in sea ice or ingested by organisms, all of which may partly explain the tremendous loss of microplastics observed from the sea surface compared with expected rates of fragmentation.[8] Moreover, the quantity of such plastics in the marine environment is expected to further increase in view of their durability and resistance to natural biodegradation, as well as the continuous growth of global plastics production, also as a result of the emergence of new markets. While marine debris in general continues to present a considerable challenge, plastics and microplastics have gained prominence,[9] and increased attention from the scientific community has brought to the fore the real

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[1] See United Nations Environment Programme (UNEP), *Marine Litter: A Global Challenge* (Nairobi, 2009), p. 5.

[2] See Swedish Environmental Protection Agency and UNEP GPA Coordination Office, "Marine litter: trash that kills" (2003). Available at www.unep.org/regionaLseas/marinelitter/publications/docs/trash_that_kills.pdf.

[3] See François Galgani, Georg Hanke and Thomas Maes, "Global distribution, composition and abundance of marine litter", in *Marine Anthropogenic Litter*, Melanie Bergmann, Lars Gutow and Michael Klages, eds. (Heidelberg, Germany, Springer, 2015), pp. 29-56. Available at http://link.springer.com/book/10.1007%2F978-3-319-16510-3.

[4] See General Assembly resolution 59/24, para. 92 (b).

[5] See General Assembly resolution 67/78, para. 142.

[6] See General Assembly resolution 66/288, annex, para. 163.

[7] See Marcus Eriksen and others, "Plastic pollution in the world's oceans: more than 5 trillion plastic pieces weighing over 250,000 tons afloat at sea", *PLoS ONE*, vol. 9, No. 12) (10 December 2014), e111913. doi: 10.1371/journal.pone.0111913.

[8] Ibid.

[9] See "The First Global Integrated Marine Assessment: World Ocean Assessment I" (2016), chap. 25, entitled "Marine debris", p. 12, Available at www.un.org/depts/los/global_reporting/WOA_RPROC/Chapter_25.pdf. estimates plastics to represent 60-80 per cent of the total marine debris.

scale of their environmental, social and economic impacts. According to some estimates, by 2050, the quantity of plastics in the ocean will outweigh that of fish.[10]

4. Despite the acknowledged gaps in the understanding of the problem posed by MDPMs, it has become clear that immediate and resolute action is necessary. This awareness was reflected most recently in General Assembly resolution 70/1 of 25 September 2015, entitled "Transforming our world: the 2030 Agenda for Sustainable Development", where the commitment to take action by 2025 was expressed under Goal 14 of the new Sustainable Development Goals.[11] One of the central means of realizing this and other commitments remains the effective implementation of the United Nations Convention on the Law of the Sea,[12] as underscored in Goal 14. The Convention provides the legal framework within which all activities in the oceans and seas must be carried out and is, in turn, complemented by many other legal instruments whose effective implementation is also critical in addressing the issue of MDPMs.

5. Against this background, the Informal Consultative Process has been mandated by the General Assembly to address the theme of "marine debris, plastics and microplastics" at its seventeenth meeting (13-17 June 2016).[13] In order to facilitate the discussions on the topic of focus at that meeting, the present report builds on the overview of the issue of marine debris prepared by the Secretary-General in advance of the sixth meeting of the Informal Consultative Process,[14] and the extensive range of reports and scientific, technical and policy studies on this matter which have been published since then, including within the context of the recent First Global Integrated Marine Assessment.[9]

6. To that end, the present report complements the above-mentioned reports and others in the literature by focusing on the actions undertaken by Governments and international organizations to implement the relevant provisions contained in the resolutions of the General Assembly, as well as on further action necessary to prevent and significantly reduce MDPMs. For that purpose, the Secretary-General invited Governments and relevant organizations and bodies to contribute to this report. The Secretary-General wishes to express his appreciation for the contributions submitted by the Governments of Australia, the Congo, Monaco, New Zealand, Peru and Viet Nam and by the European Union, which included the separate contributions of Belgium, France, Germany and Sweden. The Secretary-General also wishes to express his appreciation for the contributions submitted by the secretariats of the following intergovernmental organizations and instruments: the Baltic Marine Environment Protection Commission (the Helsinki Commission); the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR); the Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR); the Convention on Biological Diversity (CBD); the Convention on the Conservation of Migratory Species of Wild Animals (CMS); the Food and Agriculture Organization of the United Nations (FAO); the Intergovernmental Oceanographic Commission of the United Nations Educational, Scientific and Cultural Organization (IOC-UNESCO); the International Atomic Energy Agency (IAEA); the International

[10] World Economic Forum (2016).
[11] See General Assembly resolution 70/1.
[12] United Nations, *Treaty Series*, vol. 1833, No. 31363.
[13] See General Assembly resolutions 69/245, para. 298, and 70/235, para. 312.
[14] A/60/63, sect. X.B.

Maritime Organization (IMO); the International Whaling Commission (IWC); the North Atlantic Salmon Conservation Organization (NASCO); the North East Atlantic Fisheries Commission (NEAFC); the Northwest Atlantic Fisheries Organization (NAFO); the North Pacific Anadromous Fish Commission (NPAFC); the Pacific Community; the Pacific Islands Forum; the Secretariat of the Pacific Regional Environment Programme (SPREP); the South East Atlantic Fisheries Organization (SEAFO); the Western and Central Pacific Fisheries Commission (WCPFC); and the World Meteorological Organization (WMO). The Department of Economic and Social Affairs of the United Nations Secretariat and the United Nations Environment Programme (UNEP) also submitted contributions.[15]

II. Sources and pathways of marine debris, including plastics and microplastics

7. Marine debris is defined as "any persistent, manufactured or processed solid material discarded, disposed of or abandoned in the marine and coastal environment".[16] As it encompasses a variety of different materials and sizes reflecting the variety of its various origins and sources, the composition and abundance of marine debris vary by region. Material types of marine debris that can be found across the oceans include plastics, metal, glass, processed timber, paper and cardboard, rubber and clothing and textiles,[17] with plastics being the major constituent by far of all marine debris.[18]

8. Depending on its size, plastic debris in the oceans is referred to as belonging to the category of macroplastics (above 5 millimetres (mm)), microplastics (less than 5 mm) or nanoplastics (less than 100 nanometres (nm)). Primary microplastics are plastic particles that were initially produced in that small size, while secondary microplastics result from the continued fragmentation of larger plastics, which occurs by design or through weathering degradation, mainly caused by solar ultraviolet (UV) radiation and physical abrasion by wind and waves.[19]

9. The origins of marine debris, including plastic litter, are diverse and include a variety of land- and sea-based sources. It has been determined that about 80 per cent of marine debris enters the oceans from land, with an estimated input of from 4.8 million 12.7 million metric tons per year,[20] which underlines the need for

[15] Contributions authorized by the authors to be posted online are available at www.un.org/Depts/los/general_assembly/general_assembly_reports.htm. A contribution is identified in the footnotes by the name of the Government or international organization that submitted it.

[16] UNEP, "Marine litter: an analytical overview" (Nairobi, 2005).

[17] See World Ocean Assessment (footnote 9).

[18] Global Environment Facility, "Marine debris as a global environmental problem: introducing a solutions based framework focused on plastic", STAP information document (Washington, D.C., 2011).

[19] See, e.g., Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP), "Sources, fate and effects of microplastics in the marine environment: a global assessment", Peter Kershaw, ed. *GESAMP Reports and Studies*, No. 90 (London, IMO, 2015). Available at www.gesamp.org/data/gesamp/files/media/Publications/Reports_and_studies_90/gallery_2230/object_2500_large.pdf.

[20] Jenna R. Jambeck and others, "Plastic waste inputs from land into the ocean", *Science*, vol. 347, No. 6223 (13 February 2015), pp. 768-771.

increased efforts to reduce impacts on the marine environment from land-based activities.[21]

10. Sources and pathways of marine debris are examined in the Secretary-General's report prepared in advance of the sixth meeting of the Informal Consultative Process,[14] as well as in the existing scientific literature and reports,[22] including the First Global Integrated Marine Assessment,[9] a study by the Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP)[19] and the report of the Executive Director of UNEP submitted to the United Nations Environment Assembly at its second meeting).[23] For the purposes of this overview, it may suffice to note that the sources of MDPMs are both land-based (e.g., waste from unprotected and poorly managed landfills and dumps; horticultural and agricultural materials; industrial sites; harbours; decommissioning of ships and oil rigs; painting and maintenance of buildings, constructions and roads; and coastal tourism and general public litter, as well as plastic products which through use shed smaller plastic particles; and discharges or overflow of untreated or insufficiently treated sewage and storm water into rivers or directly into the sea) and sea-based (e.g., commercial shipping; ferries and cruise liners; fishing vessels, especially entailing abandoned, lost or discarded fishing gear (ALDFG); naval and research vessels; recreational boating; offshore installations and aquaculture sites; and synthetic polymers from ship coatings[24]).

11. With regard to microplastics, it should be noted that, since the sixth meeting of the Informal Consultative Process, the use of primary microplastics in different industries, including industrial "scrubbers", micro-beads in cosmetics and microplastics used in medicines,[25] has attracted increased attention,[26] as many of these smaller plastic particles end up in the sea even though they passed through wastewater treatment plants.

12. As noted above, MDPMs can be found everywhere. They are transported from land to the marine environment along shorelines, and by rivers and industrial discharges and run-offs, or are blown into the oceans by winds. Extreme events such

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[21] See Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP) (IMO/FAO/IOC-UNESCO/WMO/World Health Organization (WHO)/IAEA/UN/UNEP) and Advisory Committee on Protection of the Sea, *Protecting the Oceans from Land-Based Activities: Land-Based Sources and Activities Affecting the Quality and Uses of the Marine, Coastal and Associated Freshwater Environment*, Reports and Studies, No. 71 (2001). Available from www.jodc.go.jp/info/ioc_doc/GESAMP/report71.pdf. See also McKinsey & Company and Ocean Conservancy, "Stemming the tide: land-based strategies for a plastic-free ocean" (2015). Available from www.oceanconservancy.org/our-work/marine-debris/mckinsey-report-files/full-report-stemming-the.pdf.

[22] See M. A. Browne, "Sources and pathways of microplastics to habitats, In *Marine Anthropogenic Litter* (pp. 29-56) (see footnote 3); GESAMP, *Protecting the Oceans from Land-based Activities* (see footnote 21); McKinsey & Company and Ocean Conservancy, "Stemming the tide" (see footnote 21); and Jambeck and others, "Plastic waste inputs" (see footnote 20).

[23] UNEP, "Marine plastic debris and microplastics: global lessons and research to inspire action and guide policy change" (Nairobi, forthcoming in 2016).

[24] Y. K. Song and others, "Large accumulation of micro-sized synthetic polymer particles in the sea surface microlayer", *Environmental Science and Technology*, vol. 48, No. 16, pp. 9014-9021. doi: 10.1021/es501757s.

[25] See GESAMP (footnote 19); and Browne (footnote 22).

[26] See, e.g., UNEP, *Plastic in Cosmetics* (2015), p. 7; K. Duis and A. Coors, "Microplastics in the aquatic and terrestrial environment: sources (with a specific focus on personal care products), fate and effects". *Environmental Sciences Europe*, vol. 28, No. 2. doi: 10.1186/s12302-015-0069-y.

as hurricanes, flooding events and tsunamis also transport significant amounts of debris into the sea, a problem which will become more prevalent with the increasing intensity of extreme weather events. In the oceans, floating marine debris can be transported over large distances by major ocean currents until it is washed ashore,[27] sinks to the bottom or accumulates in the major ocean circulation gyres,[3] where concentrations of marine debris can be even higher than in coastal areas close to the sources. Microplastic in the form of fibres has been found to be up to four orders of magnitude more abundant in deep-sea sediments than in contaminated sea surface waters, making them a likely sink for microplastics.[28] Another pathway for plastics and microplastics is through marine organisms, which can take up and retain particles for varying periods and can potentially transport them over significant distances. In the case of seabirds and seals, microplastics can even be carried back onto land.[17]

III. Environmental, economic and social impacts

13. The environmental, economic and social impacts of MDPMs have received increasing attention over the past decade in terms of research[29] and commitments from the international community to address those impacts (see sect. II). The present section will present a review of the main environmental, economic and social impacts of MDPMs.

A. Environmental impacts

14. Environmental effects of MDPMs have been documented in various studies and reports,[30] and with the growth in the body of research, more and more species have been found to be negatively affected. Adverse effects have been reported for 663 species,[31] including more than half of the marine mammal species listed in the

[27] In particular mid-ocean islands, which are generally characterized as having a low generation of waste compared with many mainland centres, receive a disproportionate burden of plastic marine litter as a result of long-distance transport by surface currents. See UNEP (footnote 21).

[28] Lucy C. Woodall and others, "The deep sea Is a major sink for microplastic debris", *Royal Society Open Science* 1: 140317. http://dx.doi.org/10.1098/rsos.140317. See also Christopher K. Pham and others, "Marine litter distribution and density in European seas, from the shelves to deep basins", *PLoS ONE*, vol. 9, No. 4 (30 April 2014), e95839. doi: 10.1371/journal.pone.0095839.

[29] See World Ocean Assessment (footnote 9); and the compilation contained in *Marine Anthropogenic Litter* (see footnote 3).

[30] For a more comprehensive discussion of impacts of MDPMs, see GESAMP, pp. 30-53 (footnote 19); Florian Thevenon, Chris Caroll and João Sousa, eds., *Plastic Debris in the Ocean: The Characterization of Marine Plastics and their Environmental Impacts, Situation Analysis Report* (Gland, Switzerland, IUCN, 2014). Available at https://portals.iucn.org/library/sites/library/files/documents/2014-067.pdf; Secretariat of the Convention on Biological Diversity and Scientific and Technical Advisory Panel — GEF, *Impacts of Marine Debris on Biodiversity: Current Status and Potential Solutions*, Technical Series, No. 67 (Montreal Canada, 2012). Available atwww.cbd.int/doc/publications/cbd-ts-67-en.pdf; various chapters in *Marine Anthropogenic Litter* (see footnote 3); Murray R. Gregory, "Environmental implications of plastic debris in marine settings: entanglement, ingestion, smothering, hangers-on, hitch-hiking and alien invasions", *Philosophical Transactions of the Royal Society B*, vol. 364 (14 June 2009). doi: 10.1098/rstb.2008.0265; and UNEP, "Marine plastic debris" (see footnote 23).

[31] See *Impacts of Marine Debris on Biodiversity* (footnote 30).

IUCN Red List of Threatened Species.[32] Since 1997, the number of species affected by entanglement in or ingestion of plastic debris has increased from 267 to 557 species among all groups of wildlife.[33]

15. Entanglement represents the most visible effect of plastic pollution on marine organisms, affecting a high proportion of species: e.g., 100 per cent of species of marine turtles, 67 per cent of seals, 31 per cent of whales and 25 per cent of seabirds.[34] This is often caused by ALDFG, resulting in so-called ghost fishing.[35] Entangled biota can immediately drown or be injured or hindered in their ability to move, feed and breathe.[9]

16. Intentional or accidental ingestion of MDPMs by marine organisms, which mistake it for food, occurs throughout the food web. It has been documented for 100 per cent of species of marine turtles, 59 per cent of whales, 36 per cent of seals and 40 per cent of seabirds. Studies on the ingestion of plastics by fish and invertebrates are a recent development.[33] As regards the threat of plastic pollution to seabirds, it is estimated that plastics ingestion will impact 99 per cent of all species by 2050.[36] There is evidence of microplastic ingestion by marine zooplankton, which indicates that species at lower trophic levels of the marine food web also mistake plastic for food, posing potential risks to species at higher trophic levels.[37] Secondary ingestion constitutes a form of unintentional plastic ingestion, which occurs when animals feed on prey that have already ingested debris. This raises concerns for human health as well, since plastic debris and fibres from textiles have been found in fish and bivalves sold for human consumption (see para. 24).[38] However, although there have been detectable levels of microplastics in fish species used for human consumption, the impacts on those species are not very well known.[39] Plastic ingestion by marine species may be a direct cause of mortality, limit optimal food intake or contribute to dehydration. Experimental studies indicate that eating plastic has a negative impact on an individual's body condition, which will translate into negative effects on average survival and reproductive success in populations.[33] By ingesting plastics, marine biota, in particular seabirds, accidentally facilitate and catalyse the global distribution of plastic through biotransportation.

17. Introduction and spread of invasive "alien species" which are able to outcompete original ecosystem components can occur when organisms colonize

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[32] See Global Environment Facility, *Marine Debris as a Global Environmental Problem* (2011) (footnote 18).

[33] See Susanne Kühn, Elisa L. Bravo Rebolledo and Jan A. van Franeker, "Deleterious effects of litter on marine life" in *Marine Anthropogenic Litter* (footnote 3), pp. 75-116.

[34] Ibid.

[35] See G. Macfadyen, T. Huntington and R. Cappell, *Abandoned, Lost or Otherwise Discarded Fishing Gear*, UNEP Regional Seas Reports and Studies, No. 185/FAO Fisheries and Aquaculture Technical Paper, No. 523 (Rome, 2009).

[36] See Chris Wilcox, Erik Van Sebille and Britta Denise Hardesty, "Threat of plastic pollution to seabirds is global, pervasive, and increasing", *Proceedings of the National Academy of Sciences of the United States of America (PNAS)*, vol. 112, No. 38 (2015), pp. 11899-11904.

[37] See Jean-Pierre W. Desforges, Moira Galbraith and Peter S. Ross, "Ingestion of Microplastics by Zooplankton in the Northeast Pacific Ocean", *Archives of Environmental Contamination and Toxicology*, vol. 69, No. 3 (2015), pp. 320-330.

[38] See Chelsea M. Rochman and others, "Anthropogenic debris in seafood: plastic debris and fibers from textiles in fish and bivalves sold for human consumption", *Scientific Reports* 5, No. 14340 (24 September 2015). doi: 10.1038/srep14340.

[39] FAO.

floating marine debris and are transported by the currents and winds to a new habitat. Oceanic plastics can also provide new or increased habitat opportunities.[40] That microplastics have been observed to also carry microbes and pathogenic bacteria raises concerns that the masses of microplastics accumulating and circulating in the oceans might promote the presence of harmful algal blooms and the spread of diseases.[9]

18. Smothering and habitat destruction occur when marine debris, including plastics and microplastics, sinks to the sea floor. For example, ALDFG may drag along the sea floor and damage sensitive environments like coral reefs. A plastic cover in shallow depths can inhibit the ability of plants to photosynthesize and may, at greater depths, limit the exchange of oxygen between water and sediments, thus hampering the life of bottom dwellers.[33]

19. Another form of habitat destruction may be the result of some forms of mechanical cleaning of littered beaches, for example, raking and the use of heavy vehicles, which can cause disturbances and impose stress on animals living in coastal zones.[2]

20. Accumulation of toxic chemical substances on marine debris and the presence of persistent organic pollutants (POPs) are an additional source of concern in terms of sub-lethal effects, as is the case with respect to chemical substances added during manufacture, and the adsorption of organic pollutants by plastics at sea. Owing to their large surface-to-volume ratio, microplastics have a high capacity to facilitate the transport of contaminants.[9] While nanoplastics may potentially be the most hazardous, currently they are still the subject of the least research.[41]

B. Economic and social impacts

21. While environmental impacts have been generally well documented, there is much less research material and data available on the economic and social impacts of marine debris, which include impacts on health, safety, navigation, fisheries, tourism and agriculture, as well as consequential loss of income and jobs[42] (see also paras. 23 and 28-30). In addition, as the available information is gathered mostly in developed States, there is a paucity of information with respect to developing ones.[43]

22. In particular, while the social and economic impacts of plastics in the oceans are only just beginning to be assessed, initial findings do indicate that plastics and microplastics will have profoundly negative effects not only on marine ecosystems, but also on the economic activities that depend on them.

23. MDPMs degrade marine and coastal ecosystem services and biodiversity and adversely affect, inter alia, activities of fisheries, aquaculture, maritime transportation and tourism. There is a cyclical nature to these impacts, as some sectors that are a main source of marine debris may then become negatively affected by it. For example, coastal communities that rely on tourism and fishing may also incur both increased expenditures for beach cleaning, public health and waste

[40] See Tim Kiessling, Lars Gutow and Martin Thiel, “Marine litter as a habitat and dispersal vector”, in *Marine Anthropogenic Litter* (footnote 3), pp. 141-181.

[41] See Albert A. Koelmans. Ellen Besseling and Won J. Shim, “Nanoplastics in the aquatic environment: critical review”, in *Marine Anthropogenic Litter* (footnote 3), pp. 329-344.

[42] See UNEP, “Marine plastic debris” (footnote 23), pp. 57-62.

[43] See *Impacts of Marine Debris* (footnote 30), p. 61.

disposal, and loss of income with regard to the very tourism and fishing activities that generated the marine debris.

24. Impacts on food security and human health are witnessed primarily through the consumption of fish and seafood. Fish play an important role in food security by providing a supply of protein, micronutrients and lipids.[44] Fish and seafood consumption generates concerns relating to human health with respect to the ingestion of microparticles of the plastic found in fish and seafood, which potentially can cause allergic reactions, endocrine disruption and diseases.[45] Another area of concern is the toxic poisoning caused by marine debris, including as a result of ingestion of microplastics and the associated additives used in their production, which may have toxic effects.[46]

25. Fisheries can also be economically impacted, for example, by ALDFG and other debris, resulting in damaged nets and other fishing gear as well as in contaminated, reduced or lost fish catch. While these impacts have not been estimated systematically, they include the incremental costs associated with fishing operations, compliance, accidents at sea, search and rescue and recovery.[47] According to the European Union, the cost to the fishing industry could amount to almost 60 million euros annually, which would represent approximately 1 per cent of the total revenues of its fishing fleet.[48] In a study of the fishing industry conducted in Scotland, it was estimated that marine litter cost 5 per cent of the fishing fleets' total annual income.[49] In an experimental study on ghost fishing of monkfish from lost nets in the Cantabrian Sea (northern Spain), it was estimated that 18.1 tons of monkfish are captured annually by abandoned nets, representing 1.46 per cent of the commercial landings of monkfish in the Cantabrian Sea. In the United States of America, it was estimated that US$ 250 million of marketable lobster is lost annually to ghost fishing.[50] However, the true cost may be difficult to assess owing to the fact that most incidences involving marine debris and vessels are not reported.[51]

26. Although aquaculture, which provides the majority of the world's supply of fish,[52] is considered to be less affected by marine debris than fisheries or agriculture,[53,54] it is still also affected by costs arising from the entanglement of propellers, the clogging of intake pipes and the disposal of marine debris.

27. The shipping and yachting industries also experience economic impacts as a result of marine debris. The main impact on navigation arises from collisions with marine debris and the entanglement of propellers, which pose a particular danger to smaller craft, such as fishing vessels, and during dangerous weather conditions or other critical circumstances.[23] Harbours and marinas incur the cost of removing marine

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[44] See A/69/71, paras 11-15.
[45] See GESAMP, *Protecting the Oceans* (footnote 21), pp. 49-54 and 71.
[46] See GESAMP, *Sources, Fate and Effects* (footnote 19), p. 52.
[47] FAO.
[48] European Union.
[49] See Bergman, Gutow and Klages, eds., *Marine Anthropogenic Litter* (footnote 3), p. 373.
[50] See Greenpeace, "Plastic debris in the world´s oceans" (Amsterdam, 2006). Available at www.greenpeace.org/international/en/publications/reports/plastic_ocean_report.
[51] See P. Ten Brink and others, *Guidelines on the Use of Market-based Instruments to Address the Problem of Marine Litter* (Brussels and Virginia Beach, Virginia, Institute for Environment Policy and Sheavly Consultants, 2009), p. 6.
[52] See A/69/71, paras. 19-24.
[53] See *Marine Anthropogenic Litter* (footnote 3), pp. 374-375.
[54] A/69/71, paras. 19-24.

debris from their facilities.[55] Clean-up may be costly. For example, marine debris removal in the United Kingdom of Great Britain and Northern Ireland from ports and harbours costs approximately 2.4 million euros annually.[56] Additional main costs for vessels are associated with the accidental loss of cargos, and indirect expenses related to operational costs and disruption of service. One estimate placed the total value of the damage inflicted by marine debris on shipping at US$ 279 million per year.[23] If rescue services are required, costs increase dramatically.[57]

28. Loss of income due to the impacts of marine debris on various economic sectors also has a social cost for individuals and communities. In particular, fishing communities and their way of life are impacted by damage to and loss of boats and fishing gear resulting from encounters with marine debris, with a consequent loss of earnings when time must be spent dealing with the problem of repairs and their cost.

29. Tourism is also affected, as marine debris detracts from the physical beauty of a location, which results in fewer visitors and necessitates expensive clean-up activities.[58] Areas with reefs are particularly vulnerable, as a variety of activities, such as sport fishing, submarine tours, turtle and whale watching trips, snorkelling, scuba-diving and spearfishing, depend upon the presence of healthy reefs.[59] These impacts can be quite significant where local economies are heavily dependent on tourism, for example, those of small island developing States.[23]

30. As tourism declines, local communities suffer from a loss of revenue and jobs, which will potentially create the need for alternative livelihoods.

31. Human safety is put at risk as well by the presence of marine debris in coastal areas, especially those where tourists are present. Entanglement of swimmers in nets or lines can result in injury or death. On shore, marine debris can cause cuts and punctures which, in the case of medical or sanitary debris, may become particularly serious.

32. While agriculture, like other sectors, is more frequently perceived as being a source of marine debris, it also becomes a target when such debris is found on farmland near the coast. Damage is caused to property and equipment and a risk is posed to livestock through their ingestion of or entanglement in that debris.[60]

IV. Action undertaken at the global, regional and national levels to prevent and significantly reduce marine debris, including plastics and microplastics

33. Following the discussion on marine debris at the sixth meeting of the Informal Consultative Process,[61] the General Assembly included a number of calls for action

[55] See *Marine Anthropogenic Litter* (footnote 3), pp. 371-372.
[56] Ibid., p. 372.
[57] Ibid., pp. 371-372.
[58] UNEP and National Oceanic and Atmospheric Administration (NOAA) Marine Debris Program, "The Honolulu strategy: a global framework for prevention and management of marine debris" (2011), p. 10.
[59] See Secretariat of the Convention on Biological Diversity and Scientific and Technical Advisory Panel-GEF, *Impacts of Marine Debris* (footnote 30), p. 25.
[60] See *Marine Anthropogenic Litter* (footnote 3), p. 14.
[61] A/60/99.

in its annual resolutions on oceans and the law of the sea,[62] and sustainable fisheries.[63] In particular, the Assembly urged States to integrate marine debris into national strategies dealing with waste management in the coastal zone, ports and maritime industries, to encourage the development of appropriate economic incentives and to cooperate regionally and subregionally to develop and implement joint prevention and recovery programmes. Further, the Assembly underscored the need to build the capacity of developing States, noting the particular vulnerability of small island developing States, and the need for further studies on the extent and nature of the problem, and for the development of partnerships between States, industry and civil society.[64]

34. The General Assembly also called for various actions by States, intergovernmental organizations and civil society, including the reduction or elimination of catch caused by lost or abandoned gear; data collection; close cooperation and coordination; raising awareness within the fishing sector and regional fisheries management organizations and arrangements (RFMO/As) of the issue of derelict fishing gear and related marine debris; and identifying options for action.[65] The Assembly has reaffirmed the importance of, and urged accelerated progress by States and such organizations and arrangements in, the implementation of those provisions.[66]

35. In the outcome document of the United Nations Conference on Sustainable Development, entitled “The future we want”, States committed to take action, by 2025, based on collected scientific data, to achieve significant reductions in marine debris so as to prevent harm to the coastal and marine environment.[6] This was reiterated in the 2030 Agenda for Sustainable Development, in which States, under Sustainable Development Goal 14, to conserve and sustainably use the oceans, seas and marine resources for sustainable development, committed, by 2025, to prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris.[11] The General Assembly, in its most recent resolutions, recalled the commitments to take action to reduce the incidence and impacts of pollution, including marine debris, especially plastic, on marine ecosystems, including through the effective implementation of relevant legal and policy instruments; and to take action, by 2025, to achieve significant reductions in marine debris so as to prevent harm to the coastal and marine environment. The importance of further increasing the understanding of the sources, amounts, pathways, distribution, trends, nature and impacts of marine debris, especially plastic, and of examining possible measures and best available techniques and environmental practices for preventing its accumulation and minimizing its levels in the marine environment was also reiterated.[67]

36. Preventing and significantly reducing marine debris by 2025[11] require an adequate enabling framework within which the issue is tackled both upstream at the source, and downstream in dealing with existing marine debris. The present section provides an overview of such an enabling framework, as well as examples of action taken by States, intergovernmental organizations and civil society in following up

[62] See General Assembly resolution 60/30 and subsequent resolutions.
[63] See General Assembly resolution 60/31 and subsequent resolutions.
[64] See General Assembly resolution 60/30, paras. 12, 65, 66.
[65] See General Assembly resolution 60/31, paras. 51 and 77-81.
[66] See General Assembly resolution 61/105, para. 94, and subsequent resolutions.
[67] See General Assembly resolution 70/235, paras. 170, 171, 188, 189, 191 and 192.

on the above-mentioned calls for action. Indeed, it has been recognized that sharing best practices, especially with developing countries, and encouraging similar calls for action in relevant international forums is beneficial.[68]

A. Best available scientific information

37. Recent efforts to enhance knowledge, most recently in the context of the First Global Integrated Marine Assessment,[9] have focused on marine debris,[69] including its impact on migratory species,[70] ALDFG,[35] and plastic and microplastics.[71] The limited knowledge base related to MDPMs, including as regards pathways and the scale, distribution and impacts of the problem, in particular the economic and social impacts, presents challenges to the development of appropriate responses and management measures.[72]

38. Examples on how to redress the situation were provided in the contributions to this report. The G7 ministers for science agreed upon a common interdisciplinary research and education programme. They intend to strengthen, based on existing initiatives, additional research efforts in order to better understand the extent and impacts of plastic waste in the oceans and seas.[73] France supports several research and studies programmes designed to improve knowledge in this area. For example, the aim of the MICROPLASTIC project is to fund research aimed at conceiving and designing tools for microplastic pollution detection, risk management and recycling in the land-sea interface.[74]

B. Targeted policies and legislation

39. Measures to prevent or reduce marine debris in the marine and coastal environment have to be taken in many areas, by many actors and with regard to many activities. For example, in addition to the management of human activities at sea, activities and practices on land, including waste management, recycling and packaging strategies, need to be taken into account.[75]

40. At the international level, while MDPMs are not always specifically mentioned in the various international instruments, a number of legally binding and soft law instruments provide a framework for the development of the required

[68] European Union (see sect. containing contribution of France). See also the G7 Action Plan to Combat Marine Litter: annex to the G-7 Leaders' Declaration, G7 Summit, 7-8 June 2015. Available at www.g7germany.de/Content/EN/_Anlagen/G7/2015-06-08-g7-abschluss-annex-eng_en.html?nn=1282190.

[69] See UNEP, *Marine Litter* (footnote 1); and secretariat of the Convention on Biological Diversity and Scientific and Technical Advisory Committee-GEF (footnote 30).

[70] Convention on Migratory Species (CMS). See also Report I: Migratory species, marine debris and its management (UNEP/CMS/COP11/Inf.27), prepared for the secretariat of the Convention on Migratory Species. Available at www.cms.int/sites/default/files/document/COP11_Inf_27_Report_I_Marine_Debris_Management_Eonly.pdf.

[71] See GESAMP, "Sources, fate and effects" (footnote 19); and UNEP, "Marine plastic debris and microplastics" (footnote 23).

[72] New Zealand.

[73] European Union (see sect. containing contribution of Germany).

[74] European Union (see sect. containing contribution of France).

[75] See A/60/99.

policies and legislation at the national level. For example, when these instruments call for integrated management,[76] or include requirements for decreasing or eliminating the discharge of ship-generated waste, measures aimed at stopping the discharge of solid waste from land-based sources, or action to prevent or reduce the loss of fishing gear from or its abandonment by fishing vessels, some dimensions of the issue of marine debris are thereby covered indirectly.

Legal framework and developments

41. A previous report of the Secretary-General provided information on a number of international instruments applicable to marine debris,[77] including the United Nations Convention on the Law of the Sea and various sectoral instruments such as the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL), the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972, (London Convention) and the 1996 Protocol thereto, the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, the Convention on Biological Diversity, and the Agreement on the Conservation of Albatrosses and Petrels, as well as soft law instruments, such as the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities, and regional instruments. In addition, given that plastic tends to absorb organic contaminants, and that POPs are found in plastic particles, the relevance of the Stockholm Convention on Persistent Organic Pollutants, which aims at protecting human health and the environment from POPs through prohibitions and restrictions on the production and release of certain POPs, cannot be underestimated.

42. The specific problem of lost or abandoned fishing gear and related marine debris has been addressed through international fisheries-related instruments, for example the FAO Code of Conduct for Responsible Fisheries and the Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (the Fish Stocks Agreement). In particular, the Agreement requires States to minimize pollution and catch by lost or abandoned gear, through measures including, to the extent practicable, the development and use of selective, environmentally safe and cost-effective fishing gear and techniques.[78] It also requires flag States to take measures concerning marking of fishing gear for identification in accordance with uniform and internationally recognizable vessel and gear marking systems.[79]

43. In response to the invitation of the General Assembly, the Marine Environment Protection Committee (MEPC) of the International Maritime Organization (IMO) reviewed and amended annex V to the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the 1978 Protocol thereto (MARPOL, annex V),[80] to prohibit the discharge of all garbage, including all plastics,[81] into the

[76] See A/70/74.
[77] See A/60/63, paras. 252-267.
[78] Article 5 (f).
[79] Article 18 (3) (d).
[80] See resolution MEPC.201(62) of 15 July 2011.
[81] Garbage under annex V includes all kinds of food, domestic and operational waste, all plastics, cargo residues, incinerator ashes, cooking oil, fishing gear, and animal carcasses generated during the normal operation of the ship and liable to be disposed of continuously or periodically.

sea, except as provided otherwise in regulations 4, 5, and 6 of the annex. Guidelines for the implementation of annex V and guidelines for the development of garbage management plans were also adopted.[82]

44. At the regional level, the conventions on the protection and preservation of the marine and coastal environment adopted under the UNEP Regional Seas Programme and partner programmes regulate various sources of pollution and thus generally support the prevention and reduction of marine debris, even when the issue is not addressed specifically. Some regions — for example, those encompassing the States bordering the Atlantic coast of the western, central and southern African region and the western Indian Ocean — have gone further and adopted specific protocols on the protection of the marine environment against pollution from land-based sources or dumping.[83]

45. The European Union Marine Strategy Framework Directive provides for the setting, assessment and monitoring of targets for reaching good environmental status by 2020, including in relation to marine litter. The European Union waste management legislation includes preventive measures and recycling targets for plastics, as well as measures for the reduction of consumption of plastic bags. The Port Reception Facilities Directive has contributed to the delivery of higher volumes of ship-generated waste and cargo residues to port reception facilities in European Union ports, as well as the management of the waste from ships in those facilities.[84]

46. The problem of ALDFG and related debris has been widely addressed by regional fisheries management organizations,[85] through measures concerning data collection,[86] gear marking,[87] reporting[88] and retrieval of ALDFG,[89] and restrictions on the use of particular types of gear.[90] Furthermore, NEAFC contracting parties which retrieve gear that has not been reported lost may recover the cost from the master of the vessel that lost the gear and have the right to remove and dispose of fixed gear that was not marked in accordance with the rules or which in any other way contravenes other recommendations adopted by NEAFC, as well as fish that was found in the gear.[91] The link between ghost fishing and illegal, unreported and unregulated (IUU) fishing was also highlighted.[92]

47. Several regional bodies shared concerns over the entanglements of marine species.[93] For example, CCAMLR has taken specific measures to address the risk

[82] See resolutions MEPC.219(63) and MEPC.220(63).
[83] UNEP.
[84] European Union.
[85] CCAMLR, NAFO, NEAFC and SEAFO reported that they had no measure in place for marine litter.
[86] CCAMLR and WCPFC.
[87] NEAFC.
[88] CCAMLR, NAFO and NEAFC.
[89] NAFO and NEAFC.
[90] CCAMLR, NEAFC and WCPFC.
[91] NEAFC.
[92] FAO and NPAFC.
[93] CCAMLR, Pacific Islands Forum secretariat-secretariat of the Pacific Community (PIFS-SPC) and WCPFC. WCPFC noted that in the Pacific purse seine fishery, the challenge posed by marine debris and plastics arose from the use of fish aggregating devices (FADS), as those devices may be constructed using synthetic materials, which, if lost or abandoned, may have an impact on the marine environment.

associated with entanglement of marine mammals in the plastic packaging bands used to secure bait boxes and the injury to seabirds caused by the discharge of hooks in offal.[94]

48. The contributions to this report indicate that at the national level, legislation spans a wide range of issues and sectors, from waste management to packaging and energy, as well as freshwater management and the protection and preservation of the marine environment;[95] and thus are not specifically dedicated to the issue of MDPMs. For example, France's law on Energy Transition for a Green Growth (2015) provides for time-bound bans on a variety of plastic packaging in use in various sectors.[96] The New Zealand Waste Minimization Act of 2008 provides for, inter alia, a levy on all waste disposed of in municipal landfills; product stewardship schemes; and the development of waste management and minimization plans. The Congo enhanced sea-based removal or collection systems for operational debris and/or cargo residue from ships and platforms or other residue and/or the pollution of the sea, resulting from the discharge of hydrocarbons and other debris into areas under its national jurisdiction.[97] Its General Inspectorate of Maritime and Harbour Affairs and the General Inspectorate of Environmental Affairs were established in 2008 and 2013, respectively, to tackle pollution in all its forms. In 2014, Viet Nam passed the Law of Environment Protection providing for the control of wastes[98] and in 2015, the Law on Marine Resources and Environment and Islands.

Policy framework and developments

49. A number of decisions and resolutions on marine debris were also adopted at the global level by the United Nations Environment Assembly[99] and in the context of the Convention on Biological Diversity[100] and CMS.[101] At its second meeting, the United Nations Environment Assembly, to be held in May 2016, will discuss the issue of marine plastic debris and microplastics and will have before it a report of the Executive Director on the subject.[23] Marine debris is also a focal area of the Global Partnership on Waste Management launched by UNEP in 2010.

50. The Review Conference on the United Nations Fish Stocks Agreement in 2006 recommended that States individually and collectively through regional fisheries management organizations inter alia, enhance efforts to address and mitigate the incidence and impacts of ALDFG, establish mechanisms for the regular retrieval of

[94] CCAMLR.

[95] See, e.g., European Union (including the annex containing the contribution of France) and New Zealand and Viet Nam. See, also, UNEP, *Marine Litter: An Analytical Overview* (footnote 16).

[96] European Union (see sect. containing the contribution of France).

[97] Order No. 19031 of 31 December 2013.

[98] Decree No. 38/2015/NĐ-CP.

[99] See resolution 1/6 on marine plastic debris and microplastics adopted by the United Nations Environment Assembly of UNEP at its first session on 27 June 2014.

[100] See decision XI/18 on marine and coastal biodiversity, adopted by the Conference of the Parties to the Convention on Biological Diversity at its eleventh meeting, held in Hyderabad, India, from 8 to 19 October 2012.

[101] See resolution 10.4, on marine debris, adopted by the Conference of the Parties to the Convention on Migratory Species at its tenth meeting, held in Bergen, Norway, from 20 to 25 November 2011; and resolution 11.30, on management of marine debris, adopted by the Conference of the Parties at its eleventh meeting, held in Quito from 4 to 9 November 2014.

derelict gear and adopt mechanisms to monitor and reduce discards.[102] States and regional fisheries management organizations and arrangements have taken action in response to this recommendation.[103]

51. The FAO Committee on Fisheries in 2014 expressed concern over the issue of ghost fishing caused by ALDFG and noted that greater attention should be paid by members and regional fisheries bodies to mitigating ALDFG impacts.[104] The development of international standards/guidelines was suggested by the Convention on Biological Diversity expert workshop in 2014 and at the third session of the Joint FAO/IMO Ad Hoc Working Group on Illegal, Unreported and Unregulated Fishing and Related Matters, in 2015.[105] In response, FAO will convene a Second Expert Consultation on the Marking of Fishing Gear in April 2016, to clarify the purpose and necessity of a system for the marking of fishing gear, with a view to developing best practice (standard) technical guidelines for gear marking.[106]

52. The Parties to the London Convention and the 1996 Protocol thereto have noted that source control and best practices are important elements in the effort to reduce abandoned or drifting fish aggregating devices (FADs), as well as polystyrene and Styrofoam buoys used in aquaculture.[107]

53. With the support of the UNEP Global Partnership on Marine Litter (GPML) (see para. 75), for which the Honolulu Strategy[58] provides the framework, some regional seas conventions have developed specific regional action plans on marine litter, some of which address the issue of plastics and microplastics.[108] For example, regional action plans on marine litter were developed in recent years in the Mediterranean, the Wider Caribbean Region, East Asia and the North-west Pacific.[109] Among the activities aimed at addressing the negative effects of marine debris implemented under these regional plans is the promotion of international coastal clean-up activities.[110]

54. An example of comprehensive measures are those developed for the Mediterranean which aim at developing and implementing solid waste and sewerage system management plans. These measures incorporate marine litter prevention and reduction measures; raise awareness through educational programmes; and ensure institutional coordination and close coordination and collaboration among national, regional and local authorities, as well as key prevention measures for land- and sea-based sources. Other initiatives include encouraging a fee system for port reception facilities; requiring manufacturers, brand owners and first importers to enhance their responsibility for the entire life cycle of the product; requiring

[102] See para. 18 (h) of the annex to the report of the Review Conference on the Fish Stocks Agreement, held in New York from 22 to 26 May 2006 (A/CONF.210/2006/15).

[103] See paras. 124-129 of the report of the Secretary-General submitted to the resumed Review Conference on the Fish Stocks Agreement (A/CONF.210/2010/1); and the report of the Secretary-General submitted to the resumed Review Conference to be held in New York from 23 to 27 May 2016 A/CONF.210/2016/1.

[104] FAO.

[105] FAO.

[106] FAO.

[107] IMO.

[108] UNEP.

[109] UNEP.

[110] UNEP. See, in particular, information on the Wider Caribbean and in the North-West Pacific regions.

prevention of any marine littering in the context of dredging activities by 2020; and enforcement measures to combat illegal dumping, including littering on the beach, and illegal sewage disposal in the sea, the coastal zone, and rivers in the area of the application of the plan.[111]

55. Other relevant regional programmes and action plans include the 2014 OSPAR Regional Action Plan, which sets out the policy context for the work of OSPAR on marine litter in support of the 2010-2020 Strategy for the Protection of the Marine Environment in the North-East Atlantic;[112] the Permanent Commission for the South Pacific (CPPS) Regional Programme for the Integrated Management of Marine Litter in the South-east Pacific, which includes regional and national actions for minimizing the discharge of persistent solid waste from land- and ocean-based sources;[113] and the 2015 Baltic Litter Action Plan, which aims to significantly reduce marine litter by 2025, compared with 2015, and to prevent harm to the coastal and marine environment.[114] In addition, the MARELITT BALTIC project addresses the issue of derelict fishing gear in the Baltic Sea and the BLASTIC project aims at identifying and prioritizing measures on how to reduce litter streams from land into the Baltic Sea.[115]

56. In response to the requirement for establishing a European Union-wide quantitative reduction target for marine litter, the European Commission announced in 2015 that it would take action to fulfil the objective of significantly reducing marine litter, thereby also implementing relevant targets under the 2030 Agenda for Sustainable Development.[116]

57. At the national level, a series of instruments are employed to support the implementation of relevant legislation, such as policies, codes of conduct, economic incentives and social tools. In their contribution to the report, States highlighted the measures that they have taken (see directly below).

58. Australia has been implementing the Threat Abatement Plan for the Impacts of Marine Debris on Vertebrate Marine Life (2009). A revised plan is due for completion in 2016 and will incorporate emerging issues, including microplastics. Australia committed to a range of activities aimed at supporting local communities in reducing the volume of debris generated or entering the marine environment. Data collected from annual Great Barrier Reef clean-ups is entered into the Australian Marine Debris database to serve as advice for future management and reduction plans.[117]

59. In the context of the implementation of the European Union Marine Strategy Framework directive, Belgium has implemented activities such as awareness-raising campaigns, clean beach actions, waste management plans, monitoring activities and "Fishing for Litter". France established an action plan for the prevention of waste for the period 2014-2020 and specific measures for the marine environment; and is encouraging companies to develop new markets and enhance innovative products,

[111] UNEP.
[112] OSPAR.
[113] Peru.
[114] See Baltic Marine Environment Protection Commission-Helsinki Commission (HELCOM) recommendation 36/1, adopted on 4 March 2015, on the Regional Action Plan on Marine Litter (annex 2 of the outcome of the thirty-sixth meeting of HELCOM (Helsinki, 3 and 4 March 2015).
[115] European Union (see sect. containing the contribution of Sweden).
[116] European Union.
[117] Australia.

such as eco-designs. Sweden has developed a strategy to achieve good environmental status of its marine areas by 2020, which includes measures addressing marine debris, such as promoting efficient and sustainable collection and reception of lost fishing gear and preventing the loss of new gear; developing a national public awareness campaign; supporting initiatives for beach cleaning; reducing marine debris in municipal waste management plans; and developing waste preventing programmes, including investigations of material flows of plastic. Further, Sweden will identify and reduce significant sources of plastics and microplastics in the marine environment and develop new measures for reducing waste both at the source and in the disbursal pathways. The Swedish Chemicals Agency has been commissioned to propose national measures for restricting the use of microplastics in cosmetic products and to ban the sale of cosmetic products in Sweden that are rinsed and that contain plastic microbeads.[118]

60. In Monaco, the Association Monégasque pour la Protection de la Nature regularly organizes clean-up campaigns for the seabed area on the shore.[119] Viet Nam has launched shoreline clean-up operations in coastal areas and disseminated information to local residents and tourists in order to raise public awareness of such activities.[120]

C. Adequate infrastructure

61. Inadequate management and disposal of plastic debris constitute a global challenge. While some progress has been made, 2 billion people still lack access to solid waste collection, while 3 billion people lack access to controlled waste disposal facilities.[121] The provision of adequate infrastructure is a critical element in the prevention and reduction of marine debris. This includes waste management infrastructure for land-generated waste, such as disposal, collection, wastewater treatment and recycling facilities, a particular challenge for some small island developing States.[122] It also includes reception facilities in all ports, including marinas and fishing harbours, for the mandatory discharge of ship-generated wastes. Indeed, the major obstacle to the implementation of MARPOL, in particular annex V, has been the lack or insufficient number of reception facilities in many ports worldwide, which, in some cases, has prevented the Special Area requirements from taking effect.[123] IMO adopted an action plan and developed a comprehensive manual and guidance for ensuring the adequacy of reception facilities. Notably, port reception facilities are a particularly acute problem for small island developing States,[124] whose ports are frequently visited by cruise ships of a capacity larger than their facilities can handle. As a result, IMO revised annex V in 2012 to enable small island developing

[118] European Union (see annexes for Belgium, France and Sweden).
[119] Monaco.
[120] Viet Nam.
[121] See UNEP, *Global Waste Management Outlook* (Nairobi, 2015). Available at http://unep.org/ietc/Portals/136/Publications/Waste%20Management/GWMO%20report/GWMO_report.pdf.
[122] See, e.g., the SIDS Accelerated Modalities of Action (SAMOA) Pathway (Samoa Pathway) (General Assembly resolution 69/15, annex), paras. 70-71.
[123] A list of Special Areas is available at www.imo.org. The Special Area requirements for the Black Sea and the Red Sea have not yet taken effect because of lack of notifications on the existence of adequate reception facilities, from parties to the International Convention for the Prevention of Pollution from Ships (MARPOL) whose coastlines border these Special Areas.
[124] See SPREP.

States to satisfy the relevant requirements of reception facilities through regional arrangements when, because of those States' unique circumstances, such arrangements are the only practical means to satisfy the action plan's requirements.[125]

62. Where adequate port waste reception facilities exist, high costs, complicated procedures, delays in ports, unnecessary paperwork, excessively stringent sanitary and customs regulations and other factors have sometimes acted as a deterrent for the discharge of waste by ships into port reception facilities (see paras. 91-92).

D. Awareness-raising, education and capacity-building

63. Marine debris is not only an environmental issue but also a socioeconomic one. Where harmful practices are entrenched, legislative or policy interventions alone are inefficient,[126] unless accompanied by punitive measures. Instead, preventive awareness-raising and incentives for changing individual behaviour and industry practices are suggested as an essential first step. Interventions will be most successful in situations where people and businesses subscribe to the goals and objectives of the measures, and understand the costs of continuing harmful practices.

64. A core component of prevention and reduction efforts is therefore the undertaking of education and awareness-raising programmes designed to discourage harmful practices and promote best practices and changes in production and consumption patterns. Policies and legislation can promote targeted education and awareness-raising (see para. 96).[127]

65. In their contributions to the report, States and intergovernmental organizations provided information on the activities that they are undertaking in that regard. For example, Peru has launched the REEDUCA-Océanos campaign, which highlights the importance of proper solid waste management on the beaches. A private-sector female-led initiative undertaken by the Peruvian social enterprise "Life Out of Plastic" has been organizing educational activities aimed at raising awareness of the negative impacts of plastic pollution, especially in marine and coastal ecosystems, and demonstrating the social, environmental and economic benefits of recycling.[128]

66. The European Union promoted a variety of activities for the prevention, reduction and removal of marine debris and awareness-raising campaigns, including training for fishermen and beach clean-up initiatives, which raise awareness and engage local communities. It also put in place the Marine LitterWatch, a citizen science-based tool which can help fill gaps in data relevant for policymaking.[129]

67. The International Whaling Commission entanglement programme was established in 2011 to enable the building of a global network of professionally trained and equipped entanglement responders. The training curriculum includes techniques and methodologies for investigating the causes, scope and impact of large-whale entanglements, including marine debris, as well as information on

[125] See resolution MEPC.216 (63).
[126] See GESAMP, "Sources, fate and effects of Microplastics" (footnote 19).
[127] See, e.g., European Commission decision 2014/893/EU of 9 December 2014 establishing the ecological criteria for the award of the EU Ecolabel for rinse-off cosmetic products. See also International Whaling Commission.
[128] Peru.
[129] European Union.

attempts to prevent it. Capacity-building is undertaken in partnership with countries and regional intergovernmental organizations.[130]

68. CCAMLR has also implemented initiatives to educate fishers and fishing vessel operators, entailing, for example, the production of posters in multiple languages for fishing vessels.[131]

69. SPREP awareness-raising activities include submission of its analysis on ocean-based marine pollution from fishing vessels to the Western and Central Pacific Fisheries Commission.[132]

70. In the context of the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region (Cartagena Convention), educational material was developed and disseminated, including an online interactive game on marine litter.[133] Additionally, a regional capacity-building workshop was organized in support of the implementation of MARPOL annex V.[134]

71. The need to build the capacity of small island developing States to address marine debris, including plastics and microplastics, has been widely recognized. For example, Australia provided technical support in the Asia-Pacific and Indian Ocean regions to encourage consistent implementation of international conventions related to shipping, including MARPOL annex V. It also assisted SPREP in the development of a Regional Reception Facilities Plan for small island developing States in the Pacific region and supported the update of the Pacific Ocean Pollution Prevention Programme strategy. Additionally, Australia provided financial support for the implementation of CMS resolutions 10.4 and 11.30 on marine debris.[135]

72. Sweden supported the Regional Programme for the Integrated Management of Marine Litter in the South-East Pacific in proposing regional and national actions for minimizing the discharge of persistent solid waste from land- and sea-based sources.[136]

73. A number of civil society organizations are also actively engaged in awareness-raising and education at the international level, including the Ocean Conservancy,[137] in particular through its Trash Free Sea Alliance,[138] as well as Race for Water,[139] Sustainable Coastlines[140] and World Animal Protection.[141]

E. Cooperation and coordination

74. Given the multiplicity of pathways and sources of MDPMs, and the multidimensional and transboundary nature of the problem, as well as the wide range

[130] IWC.
[131] CCAMLR.
[132] PIFS-SPC.
[133] See www.cep.unep.org/kids-corner.
[134] UNEP.
[135] Australia.
[136] European Union (see sect. containing the contribution of Sweden).
[137] See www.oceanconservancy.org. See the International Coastal Cleanup programme.
[138] See www.oceanconservancy.org/our-work/trash-free-seas-alliance.
[139] See www.raceforwater.com.
[140] See http://sustainablecoastlines.org/.
[141] See www.worldanimalprotection.org/sea-change-map.

of sectoral policies, legislation and regulations that are relevant, cooperation and coordination are essential in facilitating integrated management of the problem.[142]

75. Coordination among the relevant measures at local, national, regional and global levels is also an important dimension of addressing the issue effectively,[143] as is the need to ensure mutually supportiveness of the public and private sectors as regards their approaches.[144] A good example is the Global Partnership on Marine Litter (GPML), a global multi-stakeholder partnership bringing together Governments, international agencies, non-governmental organizations, academia, the private sector, civil society and individuals. Launched at the United Nations Conference on Sustainable Development, the aim of the Partnership is to protect human health and the environment by promoting the reduction and management of marine litter. Participants contribute to the development and implementation of GPML activities in the form of financial support, in-kind contributions and/or technical expertise.

76. Intergovernmental meetings or workshops can also provide an opportunity for coordination. For example, International Whaling Commission expert workshops on marine debris have provided opportunities for the Commission to work with other secretariats, including those of regional fisheries management organizations, FAO, IMO and biodiversity-related multilateral environmental agreements.[145]

77. Examples of regional cooperation include the Trash Free Waters partnership established under the Cartagena Convention in 2015, between the Governments of Jamaica, Panama, the United States of America and the Peace Corps.[146]

78. The OSPAR Regional Action Plan on Marine Litter is being implemented in close cooperation with other relevant regional and global organizations and initiatives, including UNEP and other regional seas conventions, IMO, the Convention on Biological Diversity, the European Union, regional fisheries advisory councils, NEAFC and river basin commissions. Partnerships with the private sector and with non-governmental organizations are also a part of the work approach.[147] Furthermore, the NEAFC 2014 marine litter initiative was aimed at gathering fisheries-related information which was then submitted to OSPAR with a view to enhancing the overall effort in this context.[148]

79. The European Union Joint Programming Initiative “Healthy and Productive Seas and Oceans” is a coordinating and integrating strategic platform directed towards harmonizing methods for monitoring, extracting and analysing microplastic particles, with a focus on the eco-toxicological effects of the particles on marine life.[149]

80. In 2015, in order to reduce the amount of microbeads in “rinse-off” products reaching the marine environment, Australia secured a voluntary agreement from the personal care industry to phase them out no later than 1 July 2018. Some major

[142] IWC.
[143] Peru.
[144] New Zealand and UNEP.
[145] IWC.
[146] UNEP.
[147] OSPAR.
[148] NEAFC. In 2016, the NEAFC Permanent Committee on Management and Science will make proposals for the next steps regarding its work on marine litter, including the form of its continued cooperation with OSPAR.
[149] Sweden.

Australian supermarkets have committed to stop using microbeads in their own products from 2017. The Government of Australia is also supporting the national phase-out of light-weight plastic bags through an industry-government partnership which seeks to change the culture of business in the direction of designing more sustainable packaging, increasing recycling rates and reducing packaging litter.[150]

81. The Monaco project entitled "Engaged commerce" promotes, through a public-private partnership, the reduction of packaging, waste and greenhouse gas consumption. As a result, single-use plastic bags were prohibited starting in 2016 and disposable kitchen utensils will be prohibited starting in 2020.[151]

82. The Plastics New Zealand's Operation Clean Sweep assists plastics manufacturers and distributors in preventing plastic pellets, manufactured or used in operations, from entering waterways whose eventual destination is the sea.[152]

V. Further action necessary to prevent and significantly reduce marine debris, including plastics and microplastics

83. Notwithstanding the examples of actions described above, much remains to be accomplished to strengthen enabling frameworks designed to prevent and significantly reduce MDPMS. The present section highlights what further action could support ongoing efforts.

A. Data and knowledge gaps

84. Both the breadth and depth of knowledge regarding MDPMs have increased in recent years. However, as noted in the First Global Integrated Marine Assessment, significant gaps remain[153] in knowledge and data which require research in, inter alia, sources, distribution, pathways and destinations; impacts on biota, including with regard to fisheries and aquaculture; and wider social and economic impacts, as well as the economic aspects of actions moving forward and assessments of risk if action is not taken.[154] There is also a gap in knowledge with respect to nanoparticles.

85. Data and knowledge gaps exist in respect of all aspects of the life cycle of MDPMs, in particular regarding whether alterations can be made so as to create products that are less damaging to the environment, based on an understanding of their effects once they have entered the environment. Research and development (R&D) is also required to encourage the reuse and recycling of plastics,[155] and to create commercially viable options for converting plastic waste into other materials or energy.[156]

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[150] Australia.
[151] Monaco.
[152] New Zealand.
[153] See World Ocean Assessment (footnote 9). See also document A/60/63, para. 282.
[154] See World Ocean Assessment (footnote 9); GESAMP, "Sources, fate and effects of microplastics"; (footnote 19); IOC-UNESCO; FAO, Australia; and New Zealand.
[155] Australia and New Zealand.
[156] Australia and McKinsey & Company and Ocean Conservancy, "Stemming the tide" (footnote 21).

86. A lack of reliable, consistent and long-term monitoring data[157] and the need for standardized protocols to ensure comparability of the representativeness of data have also been identified.[158] As modelled estimates of the concentration of plastics are also imperfect, additional data are required on sources[159] and quantities,[160] including on ALDFGs.[161] Improved understanding of ocean currents and circulation can also assist in such modelling, help identify migrating or local fish stocks that might be affected[162] and even help direct clean-up operations.

87. Research has been conducted on the impacts of larger marine debris, including ALDFGs, on marine life more generally[163] and on specific species in specific areas, for example, odontocetes, in the coastal waters of Maui,[164] salmon and steelhead in the North Pacific,[165] fin whales in the Mediterranean[166] and four fish species in Samoa.[167] Nevertheless, there is a lack of systematic research.[168] Additional research is also needed on the impacts of MDPMs on habitats in particularly sensitive areas, such as those with coral reefs and seagrasses.[169]

88. Very little is known on the effects of microplastics on marine life,[170] although it is suspected that the ingestion of microplastics establishes a pathway for the transport of harmful chemicals and organic pollutants into the food web, besides potentially acting as a vector for pathogens (see para. 24).[171] The impacts of microplastics on species that provide a source of food are not well known. Similarly, there is a limited understanding of the effects of microplastics on human health, and risk assessments in this regard have not been carried out.[172]

89. It has also been noted that, in addition to the specific research needs noted above, research on the cumulative effects of different environmental threats[173] on biota is required.

90. With regard to other uses of the oceans and seas, an apparent increase in the number of collisions between vessels and unknown objects suspected to be lost shipping containers requires further study.[174] The interaction between exploitation activities in the deep sea and settled microplastics has not been studied, as those activities have not yet commenced. However, once those activities do commence. in

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[157] See World Ocean Assessment (footnote 9). See also New Zealand, Department of Economic and Social Affairs of the Secretariat and IOC-UNESCO.
[158] See World Ocean Assessment (footnote 9), FAO, HELCOM and UNEP, in particular report I: Migratory species, marine debris and its management (UNEP/CMS/COP11/Inf.27), sect. E2.0.
[159] IOC-UNESCO.
[160] European Union.
[161] FAO.
[162] WMO.
[163] IOC-UNESO, SPC, IWC and New Zealand contributions.
[164] Pacific Whale Foundation, “Quantifying the risk that marine debris poses to odontocetes in coastal waters of the 4-island region of Maui”.
[165] NPFAC.
[166] IWC.
[167] SPREP.
[168] FAO.
[169] New Zealand and IWC.
[170] European Union, Peru, IOC-UNESO, IWC and SPC.
[171] New Zealand, Viet Nam, IAEA, FAO and OSPAR.
[172] European Union, New Zealand and FAO.
[173] IWC.
[174] SPC.

the near future, that interaction will constitute an important focus of study.[175] There are also limited studies on the biological effects of microplastics in deep-sea sediments.[176]

B. Regulatory, implementation and enforcement gaps

91. While some aspects of MDPMs are covered by several global, regional and national instruments, none, other than some regional action plans on marine litter, are specifically dedicated to MDPMs (see paras. 41-48). While the Convention on the Law of the Sea includes provisions that address pollution from the various sources that are also the generators of MDPMs, some of the international rules and standards that are called for remain of a non-legally binding nature, as in the case of land-based sources of pollution, the Global Programme of Action being the only global instrument that addresses the issue to date. In addition, the multiplicity of partial regulations has the potential to create not only overlaps but also gaps in the global regulation of the problem, from both a substantive and a geographical point of view. To facilitate implementation, synergies between international legal and policy instruments could be identified, as well as gaps.[177] While most coastal States are parties to the Convention and/or a regional sea convention, the fact that few landlocked States are parties to those instruments poses a challenge, given the significant input of MDPMs from land, including through riverine pollution. In addition, participation in activities under other relevant legally binding instruments is sometimes limited, as is the case for the London Convention and the 1996 Protocol thereto.

92. It is generally recognized that the implementation of existing applicable instruments needs to be strengthened so as to effectively prevent, reduce and control pollution of the marine environment by MDPMs.[178] However, this remains a challenge for a number of States, owing, inter alia, to inadequate enforcement capacity, lack of incentives for compliance and inadequate infrastructure and management practices.[179] For example, the effectiveness of the discharge requirements under MARPOL annex V largely depends upon the availability of adequate port reception facilities (see paras. 61-62).[180] In some cases, the development of guidance on the provisions of existing instruments can assist States in effecting their implementation. For example, it has been suggested that a review of the scope of annex V might be useful in establishing preventive measures, in particular the determination of what “reasonable precautions” would entail under the annex in cases of accidental loss constituting exceptions with respect to the discharge prohibitions.[181] In the context of fisheries, in spite of the obligations set out in the United Nations Fish Stocks Agreement and commitments under other global and

[175] See A/70/74, para. 4; and SPC.
[176] SPC.
[177] IWC.
[178] Department of Economic and Social Affairs of the Secretariat; European Union; and UNEP. See also Manila Declaration on Furthering the Implementation of the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (UNEP/GPA/IGR.3/5).
[179] IWC.
[180] IMO.
[181] Peru.

regional instruments, the marking of fishing gear calls for further action at the global and regional levels, including the possible development of international guidelines.[182]

93. Significant challenges exist in respect of compliance and of monitoring compliance. It has been noted, for example, within the context of MARPOL annex V, that, as a result of tonnage limits, 99 per cent of the global fishing fleet is excluded from the requirement that a garbage record book or garbage management plan should exist. There is therefore no mechanism through which to monitor compliance in that regard. Enforcement authorities have highlighted that violations are almost impossible to detect and prosecute successfully and that fines are often low compared with the potential cost saving generated through discarding waste illegally.[183] The variation in adequacy and cost of port waste reception facilities has been highlighted as constituting a particular disincentive to compliance.[184] In that regard, implementation of a no-special-fee system, where the costs of offloading waste are included in general port fees, may eliminate any incentive to dump waste illegally.[185] While the Convention on the Law of the Sea and a number of protocols on land-based activities include, within the context of the regional seas conventions, compliance and enforcement measures or mechanisms, those measures and mechanisms are often non-operational or too weak.[186] While non-legally binding approaches, such as the Global Programme of Action, offer flexibility, they do not provide a mechanism for follow-up on actions and for ensuring that measures are taken.

C. Development of measures, best practices and best available techniques

1. Integrated management

94. The effectiveness of interventions to address MDPMs depends on an integrated approach to the management of activities on land and at sea covering the different pathways through which MDPMs reach the oceans,[187] the integration of the economic, social and environmental dimensions,[188] coordinated actions among the various competent sectoral authorities at the national and international levels,[189] compatibility among the responses at the various levels,[190] and the involvement of all relevant stakeholders.[191] The full life cycle of products and materials would also need to be embraced.[192]

95. Integrated assessments such as the First Global Integrated Marine Assessment[9] can assist in identifying linkages among the different dimensions of the issue.[186] Best available scientific information and information-sharing can also support integrated

[182] European Union, FAO and PIFS-SPC.
[183] IWC document SC/65a/Rep06.
[184] Ibid.
[185] Report of the IWC Workshop on Mitigation and Management of the Threats Posed by Marine Debris in Cetaceans (IWC/65/CCRep04).
[186] UNEP/GPA Coordination Office, *Protecting Coastal and Marine Environments from Land-based Activities: A Guide for National Action* (The Hague, 2006). Available at http://coralreef.noaa.gov/aboutcrcp/strategy/reprioritization/wgroups/resources/lbsp/resources/06gpa_handbook.pdf.
[187] Ibid.
[188] A/70/74 and A/70/78.
[189] UNEP.
[190] Peru.
[191] New Zealand.
[192] See *Impacts of Marine Debris on Biodiversity* (footnote 30).

management. Continuous monitoring and assessments provide the necessary knowledge base, including lessons learned, to ensure adaptive management.

2. Addressing such materials at source

(a) "Cultural" measures

96. Public awareness-raising on plastic pollution and its negative impacts is essential for promoting responsible plastic consumption and demonstrating the social, environmental and economic benefits of recycling.[193] In particular, awareness-raising among manufacturers, distributors, consumers and others, coupled with the promotion of investment in infrastructure development in order to control, produce statistics on and categorize marine debris and land-based wastes and to build waste processing and recycling systems, is also crucial.[194] In addition, there is a need to educate fishers and fishing vessel operators.[195] An overall need to enhance public-private partnerships has also been identified.[196] States have been encouraged to further develop partnerships with industry and civil society so as to raise awareness of the extent of the impact of marine debris on the health and productivity of the marine environment and the consequent economic loss.[197]

97. Further action is also necessary to promote more responsible consumer behaviour, a critical factor in addressing the issue of MDPMs,[198] for example, by decreasing or eliminating single-use plastic bags, imposing further bans on non-biodegradable, non-compostable plastic packaging, and putting an end to the availability of disposable plastic plates and glasses, except bio-based ones.[199] Consumers can also be further sensitized through the use of apps for mobile devices and other easily accessible sources of information, which can help them make better choices.[200]

(b) Economic or market-based measures

98. Also of central importance is the need to encourage producers to take into account, during the design phase, the potential impacts on the natural environment of the ingredients and components contained in their products; to redesign products that are more environmentally friendly and less plastic-intensive; and use safer chemicals,[201] for example, radiation technologies for the preparation of novel biodegradable polymers in packaging materials.[202] Support has also been expressed

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[193] Peru.
[194] Viet Nam.
[195] CCAMLR.
[196] UNEP.
[197] SEAFO.
[198] HELCOM. It is estimated that 48 per cent of marine litter in the Baltic Sea originates from household-related waste, while waste generated by recreational or tourism activities would account for up to 33 per cent.
[199] The Energy Transition Law for a Green Growth, adopted by France in 2015, addresses this problem.
[200] European Union. The "Beat the Microbead" app allows users to determine whether personal care products contain microbeads by scanning a product's barcode. The app, which is available in seven languages, has been very popular, convincing a number of large multinationals such as Unilever, Johnson & Johnson and the Body Shop to announce their intention to stop using microbeads.
[201] UNEP, *Plastic in Cosmetics* (footnote 26), p. 7.
[202] IAEA.

for initiatives with time-bound targets that restrict or ban certain unsustainable uses of plastic materials,[203] such as single-use plastics, non-biodegradable or -compostable plastics, and the microbeads in "rinse-off" products (see paras. 48, 59, and 80);[204] industry-driven voluntary compliance mechanisms (see paras. 80-82); investment in eco-design of products (see para. 59);[205] and sharing of best practices on waste management.

99. Appropriate actions for food production systems could entail the development of guidelines or codes of practice for the use of plastic and the inclusion of considerations regarding microplastics in guidelines and international standards dealing with food safety, together with the setting of limits with respect to microplastics in food.[206] In the fisheries sector, fishing for litter/nets schemes, low-cost loans to enable replacement of gear more regularly, involvement of the seafood retail sector in meeting some of the costs of mitigation measures, and net deposit/net buy-back schemes and training for fishers on how to release entangled animals could be considered.[207]

100. It is also important to find ways to capture the economic value of plastic wastes in order to incentivize plastic waste treatments, such as conversion to materials or energy.[208] The commercial viability of existing technologies for the conversion of plastics into materials and energy also requires improvement.[209] It has been reported that 95 per cent of the value of plastic packaging material, almost exclusively destined for single-use, totalling US$ 80 billion-120 billion annually, is lost to the economy. In addition, only 14 per cent of plastic packaging is collected for recycling. The recycling rate for other plastics is even lower than that for plastic packaging, and both rates are far below the global recycling rates for paper (58 per cent) and iron and steel (70-90 per cent).[210] The recycling of plastic reportedly saves companies selling consumer goods US$ 4 billion per year, with over a quarter of these savings generated through initiatives in the food sector and 17 per cent in the soft drinks sector.[211] In order to facilitate industry accountability,[212] companies

[203] Australia, European Union and FAO.

[204] European Union (see sect. containing contribution of Sweden). See also UNEP (2015) (footnote 201), p. 6.

[205] European Union (see sect. containing contribution of France).

[206] FAO.

[207] IWC.

[208] Australia; and secretariat of the Convention on Biological Diversity. The Convention secretariat reported that at its meeting in 2014, the Expert Workshop to Prepare Practical Guidance on Preventing and Mitigating the Significant Adverse Impacts of Marine Debris on Marine and Coastal Biodiversity and Habitats addressed measures related to waste prevention, including potential redesign of products, reduction, reuse and recycling, as well as other waste management measures, private sector engagement and producer responsibility.

[209] Australia; and Ocean Conservancy, "Stemming the tide" (footnote 21. See also Future Market Insights, "Plastic-to-fuel market: U.S. industry analysis and opportunity assessment 2015-2020" — Available at www.futuremarketinsights.com/reports/us-plastic-to-fuel-market.

[210] World Economic Forum (footnote 10), p. 7.

[211] See UNEP, *Valuing Plastic: The Business Case for Measuring, Managing and Disclosing Plastic Use in the Consumer Goods Industry* (Nairobi, 2014), p. 13.

[212] Toy manufacturers reportedly have the highest plastic intensity in the consumer goods sector, at 48 tons of CO_2 equivalents per US$ 1 million in revenue, owing to their use of plastic in products. As a result, they have the highest value at risk at 3.9 per cent of annual revenue. This would wipe out the profits of several companies if they had to pay the full cost of environmental damage caused by plastic. See UNEP/GPA Coordination Office, *Protecting Coastal and Marine Environments* (footnote 186), p. 9.

could improve and increase the measurement, management and disclosure of their "plastic footprint".[213] Incentives for their doing so would include the desire to protect brand reputation, to cut the costs of excessive packaging and to turn plastic waste into a useful resource,[214] e.g., through using recycled plastic for clothing and development of biodegradable plastic and end-of-life management plans for all plastic products.[215] Other incentives could be promoted through the imposition of levies on all waste disposed of in municipal landfills in order to generate funding to help local government, communities and businesses minimize waste.[216]

101. Guidance on communication of potential hazards of microplastics contamination to seafood consumers and the general public could be developed through government and industry partnerships. Source control and best practices are important for reducing utilization of abandoned or drifting fish aggregating devices, as well as polystyrene and Styrofoam buoys used in aquaculture.[217] Engaging industry leaders at the highest level in discussions on how to influence thinking on marine litter and its impacts and promote a cultural shift in that regard could also be effective.

3. Improved waste management practices

102. When waste is not properly managed, it can enter the ocean through inland waterways and wastewater outflows and be transported by the wind or tides.[218] Of the leakage from land-based sources, 75 per cent is derived from uncollected waste and the remaining 25 per cent from within waste-management systems. Post-collection leakage can be caused by improper disposal, as well as through utilization of formal and informal dump sites that are inappropriately located or lack proper controls.[219] Two billion people are without access to solid waste collection, and 3 billion lack access to controlled waste disposal facilities.[220] The World Bank estimates that developing economies spend US$ 46 billion per year on waste management, while about double this amount is needed.[221]

103. The General Assembly and several intergovernmental organizations have advocated for improvement of waste management and prevention, including through the development of economic opportunities and incentives (see para. 33),[222] such as the use of waste as a resource, plastic recycling,[223] and cost-recovery systems to promote the use of port reception facilities and discourage ships from discharging marine debris at sea.[224] UNEP has called for public awareness campaigns on the negative impacts on oceans of improper waste disposal, targeting street litter, illegal

[213] See UNEP, *Valuing Plastic*, p. 17.
[214] Ibid.
[215] Ibid, pp. 41-47.
[216] New Zealand.
[217] FAO.
[218] SPC. See also Jambeck and others, "Plastic waste inputs" (footnote 20), pp. 768-771.
[219] McKinsey & Company and Ocean Conservancy (footnote 22).
[220] European Union.
[221] See International Solid Waste Association, "Sustainable solid waste management and the green economy" (June 2013. Available at www.iswa.org/index.php?eID=tx_iswaknowledgebase_download&documentUid=3217.
[222] FAO, OPSAR, SEAFO and UNEP.
[223] UNEP.
[224] SEAFO.

dumping of rubbish and poorly managed waste dumps.[225] SEAFO has urged States to further integrate the issue of marine debris into national and regional strategies dealing with waste management, especially in coastal zones, ports and maritime industries.[226] The Pacific Community has suggested locating rubbish dumps away from the coast, and erecting fences around them so as to reduce dispersal.[227] Australia has recommended exploring the use of taxation and other levies to enable the establishment of a global marine responsibility fund for building waste management capacity.

104. Innovation will be key, including changing or adapting products for environmental benefits, improving recovery and treatment technologies in the plastic life cycle and developing sustainable packaging.[228] Some options include using a variety of waste-to-fuel technologies (e.g., gasification) or waste-to-energy ones (e.g., incineration with energy recovery) to treat waste in areas with high waste density.[229] In areas with low waste density, the manual sorting of high-value plastic waste and conversion of much of the remainder to refuse-derived fuel for use in the cement industry constitute an option.[230] In areas where formal recycling systems still do not exist, individuals who collect materials from waste and then sell those materials to recyclers face many health risks and are often part of vulnerable communities; hence, their inclusion and empowerment, along with long-term plans to upgrade their working conditions, may need to be a necessary component of any solution.[231]

4. Clean up of existing marine debris

105. Efforts at reducing or eliminating the entry of MDPMs into the marine environment also need to be complemented by efforts to clean up existing marine debris. Under the Convention on the Law of the Sea, States are required to, inter alia, take all measures that are necessary to prevent, reduce and control pollution of the marine environment from any source, using the best practicable means at their disposal and in accordance with their capabilities. Regional action plans include objectives related to the removal of litter from the marine environment,[232] and a number of regional fisheries management organizations have rules in place to encourage the retrieval or, alternatively, the reporting of lost gear.[233] A global online portal through which to compile information on such gear is under consideration.[234]

106. In contrast with many other issues facing the marine environment, marine debris is a problem that has generated a significant degree of community involvement in clean-up events throughout the world.[235] Along the same lines, there are many ideas, championed on an individual basis, that are centred around

[225] See http://waste-management-world.com/a/waste-management-key-to-cleaning-up-oceans.
[226] SEAFO.
[227] SPC.
[228] Australia and OSPAR.
[229] See McKinsey & Company and Ocean Conservancy, “Stemming the tide” (footnote 21).
[230] Ibid.
[231] Ibid.
[232] OSPAR and UNEP.
[233] CCAMLR, NAFO, NEAFC, SEAFO and WCPFC.
[234] FAO.
[235] European Union, Viet Nam and SPREP. See, e.g., the annual International Coastal Cleanup events organized by Ocean Conservancy, (www.oceanconservancy.org).

exploring larger-scale clean-up operations.[236] These efforts will need to be further tested and supported before they can be mainstreamed.

5. Coordination and cooperation

(a) Cross-sectoral cooperation

107. Strengthening international cooperation and knowledge and information-sharing on transboundary issues of marine debris pollution has been identified as central to solving the this problem. Cross-sectoral cooperation can foster multidisciplinary research and an increase in exchanges of information on the various aspects of the issue, as well as on best practices and environmental technologies. Such cooperation also benefits monitoring and assessment efforts, and enables, in particular, a better assessment of the cumulative and synergistic impacts of the various sources of MDPMs. Cross-sectoral coordination also facilitates the closing of any possible gaps in regulations and implementation (see sect. III.B) and the preventing of overlaps.

108. Furthermore, considering that marine debris originates from a wide range of anthropogenic sources (see sect. II), coordinated action, involving central and local governments, the private sector and civil society, is needed to change behaviours.[237] At the international level, collaboration, including through the Global Partnership on Marine Litter, can ensure consistency of approach, synergy of efforts and exchange of information.[238] A multidimensional approach can also facilitate the consideration of multisectoral issues, including effective capacity-building to keep pace with the state of science, and technological innovations.

(b) Capacity-building

109. On numerous occasions, the General Assembly recognized the need to build the capacity of developing States to raise awareness, and support the implementation, of improved waste management practices, while noting the particular vulnerability of small island developing States to the impact of marine pollution from land-based sources and marine debris. Building capacity in relation to the prevention, control and elimination of this form of pollution is a multifaceted process requiring a continued strengthening of cooperation and partnerships among States, United Nations bodies and organizations, industry and civil society. Capacity-building efforts should be based on a better understanding of the extent of the impact of marine debris on the health and productivity of the marine environment and the resulting economic loss. Those efforts are most efficient when they are integrated into national strategies focused on dealing with oceans and coastal zone, marine and land-based sources of marine pollution, including shipping and land run-off, and with waste management in the coastal zones, ports and maritime industries, and are carried out in conjunction with the development and implementation of prevention and recovery programmes for marine debris.

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[236] See, e.g., the Ocean Cleanup(www.theoceancleanup.com), aimed at extracting plastics from the ocean; and the Seabin Project (www.seabinproject.com), aimed at removing rubbish, oil, fuel and detergents.

[237] New Zealand.

[238] IWC.

110. Issues that need to be addressed in the context of capacity-building activities include insufficient awareness of the impact of MDPMs on the marine environment and of how this form of pollution affects sustainable development; inadequate research capacities, facilities and scientific and technical know-how; inadequate policies, rules, regulations and standards at the national level; inadequate mechanisms for promotion and implementation of existing global and regional commitments; inadequate mechanisms for prevention and control of marine pollution, including from MDPMs; inadequate enforcement capacities; and limited access to technologies. These challenges are frequently compounded by that posed by a limited number of trained personnel. Some targeted capacity-building activities are already under way (see paras. 63-73).

111. It has also been emphasized that the global efforts aimed at the prevention and reduction efforts in respect of MDPMs should be supplemented by the organization of workshops in various parts of the world, with a view to promoting a better understanding of the causes and impacts of marine pollution, exploring new approaches and identifying effective solutions.

112. At both regional and national levels, expectations in respect of capacity-building efforts are high. Given the dominant role of land-based sources of pollution, it appears that a significant proportion of those efforts need to address waste management on land and at sea, including the recycling of materials. Also necessary are capacity-building efforts to assist developing States in the development of relevant legal and policy frameworks and infrastructure, taking into account their specific challenges and their need for low-cost targeted and effective responses. This is required in order to deal with the lack of targeted, comprehensive and integrated strategies for reducing the amount of waste entering the marine environment, combined with the lack of reliable and accurate data on the amount, type and source of marine debris, including plastics and microplastics.

113. Furthermore, there is a need to promote the development and transfer of environmentally sound, and economically sustainable technologies and know-how. This is particularly pertinent in the case of small island developing States for which waste management represents a significant challenge. Those States could benefit in this regard from, for example, technologies for the conversion of plastic waste into other materials or energy.

VI. Conclusions

114. The present report offers an assessment of how marine debris, including plastics and microplastics, are affecting the world's oceans and hindering sustainable development. The findings presented are cause for alarm. The growing and continuing accumulation is sullying the ocean scape and posing a major threat to marine life. This form of pollution also poses a direct threat to food security and to the health, safety and livelihoods of human populations, besides interfering with various activities conducted at sea, such as fishing and navigation.

115. Thus, not only do the assessments of the alarming impacts of marine debris already presented at the sixth meeting of the Informal Consultative Process in 2005 continue to be valid, but recent studies also demonstrate a further exacerbation of these impacts. In 2005, such assessments led the General Assembly, in its annual resolutions on oceans and the law of the sea, and sustainable fisheries, to call for a

number of actions to address the issue of marine debris. That appeal for action has even greater weight today, as the quantity of marine debris, plastics and microplastics in the oceans continues to grow, including as a result of the increased durability of the material and the continued increase in global plastics production. It will therefore be of critical importance to step up efforts if internationally agreed commitments are to be achieved, including those set out under Goal 14 of the 2030 Agenda for Sustainable Development, namely, to prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris, by 2025, and under other ocean-related goals.

116. Not only are MDPMs exogenous, ubiquitous and transboundary, but their sources are mostly land-based. Urgent action is thus required to address activities and patterns of behaviour on land, including harmful production and consumption patterns. In particular, the improvement of product life-cycle management, and the development of cleaner technologies and waste management infrastructures, require attention. There is also a considerable need for greater awareness-raising efforts among populations living near as well as far from the coast, with a view to curbing activities that have the potential to pollute the marine environment through riverine run-offs and the impact of debris-carrying winds.

117. A number of legal and policy instruments at the global, regional and national levels address various aspects of this issue. Implementation of these instruments, in particular the United Nations Convention on the Law of the Sea, needs to be strengthened for effective prevention, reduction and control of marine debris, including plastics and microplastics. This presents numerous challenges for a number of States, owing, inter alia, to inadequate human and institutional capacity, technology and infrastructure.

118. However, such challenges can be overcome if adequate enabling measures are put in place and the appropriate resources are dedicated to addressing the problem. While data and knowledge gaps exist, the lack of full scientific certainty should not be brought forth as a reason to postpone the cost-effective measures needed to address the issue, in line with the precautionary approach. This report has examined the wide range of enabling measures that already exist, as well as the further action that may assist in tackling the issue's root causes, while dealing with existing marine debris. In that regard, the challenges also present opportunities.

119. In particular, the urgency of action needed to address this issue could promote a renewed focus on strengthening the implementation of applicable instruments. The multifaceted nature of the problem also provides an opportunity for increased cross-sectoral cooperation and coordination, and integrated management, as well as the fostering of greater producer and consumer responsibility, including through fiscal and market-based incentives, participative approaches, education and awareness-raising. Innovative reuse and recycling initiatives also offer new economic opportunities.

120. The cumulative impacts of marine pollution, including of marine debris, plastics and microplastics, can no longer be ignored, given the fact that they hinder the achievement of sustainable development goals.

121. It is the collective responsibility of all stakeholders — Governments, industry and consumers — to act promptly and resolutely, with a view to ensuring that activities and types of behaviour both at sea and on land do not result in pollution of the oceans and seas or poison the marine environment and the food chain. All efforts

should be directed at strengthening the resilience of ocean ecosystems as we try to face some of the defining challenges of our time, such as climate change. Oceans are — and must continue to be — an essential asset for efforts to achieve the sustainable development of present and future generations.