

# THE OCEAN AND THE SUSTAINABLE DEVELOPMENT GOALS UNDER THE 2030 AGENDA FOR SUSTAINABLE DEVELOPMENT

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A TECHNICAL ABSTRACT OF  
THE FIRST GLOBAL INTEGRATED MARINE ASSESSMENT



UNITED NATIONS



REGULAR PROCESS FOR GLOBAL REPORTING  
AND ASSESSMENT OF THE STATE OF THE MARINE  
ENVIRONMENT, INCLUDING SOCIOECONOMIC ASPECTS

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The contributions of the members of the Group of Experts and the pool of experts, who participated in the writing of the First Global Integrated Marine Assessment, were made in their personal capacity. The members of the Group and the Pool are not representatives of any Government or any other authority or organization.

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## Purpose and process of preparing the technical abstract

The present technical abstract is based upon the First Global Integrated Marine Assessment (first World Ocean Assessment), which was released in January 2016, and, in particular, upon the summary of that Assessment, which was approved by the General Assembly in December 2015.<sup>1</sup> It has been prepared pursuant to the programme of work for the period 2017-2020 for the second cycle of the Regular Process of the Ad Hoc Working Group of the Whole of the General Assembly on the Regular Process for Global Reporting and Assessment of the State of the Marine Environment, including Socioeconomic Aspects, which was adopted by the Working Group in August 2016 and endorsed by the Assembly in December 2016.<sup>2</sup> The programme of work provides, inter alia, for support for other ongoing ocean-related inter-governmental processes, including the preparation of technical abstracts specifically tailored to meet the needs of, among other intergovernmental processes, the 2030 Agenda for Sustainable Development. In this regard, the present technical abstract provides a synthesis of the information presented in the first World Ocean Assessment and does not introduce any new material or interpretation of the information presented in that Assessment.<sup>3</sup>

The present technical abstract was prepared by the Group of Experts of the Regular Process for Global Reporting and Assessment of the Marine Environment for the second cycle of the Regular Process, on the basis of an outline prepared by the Group of Experts and discussed by the Bureau of the Ad Hoc Working Group of the Whole. Some members of the pool of experts of the Regular Process who contributed to the first World Ocean Assessment were part of the review process, together with the Group of Experts, the secretariat of the Regular Process (the Division for Ocean Affairs and the Law of the Sea of the Office of Legal Affairs of the Secretariat) and the Bureau of the Ad Hoc Working Group of the Whole. The secretariat of the Regular Process also assisted in the finalization of the technical abstract by the Group of Experts. The Bureau of the Ad Hoc Working Group of the Whole considered the technical abstract for presentation to the United Nations Conference to Support the Implementation of Sustainable Development Goal 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development, to be held in June 2017.

<sup>1</sup> See General Assembly resolution 70/235, para. 266. The full text of the first World Ocean Assessment, including the summary, is available from [www.un.org/depts/los/rp](http://www.un.org/depts/los/rp).

<sup>2</sup> See General Assembly resolution 71/257, para. 299.

<sup>3</sup> It should be noted that the table in the present technical abstract is an updated version of table 1 in chapter 15 of the first World Ocean Assessment, which is based on the Food and Agriculture Organization of the United Nations publication *The State of World Fisheries and Aquaculture, 2016* (Rome, 2016).

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## I. Main issues

1. The ocean is vital to all life on Earth, providing many provisioning, regulating and supporting services. If human activities are not carefully managed to ensure that they do not alter ecosystem structure and function, they may result in damage to the marine environment and reduction or loss of crucial ecosystem services.
2. Growing populations and economies and the agricultural and industrial requirements for feeding, clothing and housing the world's population are seriously degrading parts of the marine environment, especially near the coast. Without an integrated, coordinated, cross-sectoral and science-based approach to coastal and marine management, the resilience of coastal and marine ecosystems and their ability to provide vital services will be reduced.
3. Climate change, through its warming and acidification of the world's oceans, is likely to have profound and unpredictable effects on marine organisms and ecosystems, with implications for food security and many marine industries. For many species, the impact of such rapid change and their resilience to it are unknown. Interactions between the various changes in the oceans and responses to the different rates of change in different parts of the world are also unknown. Furthermore, effective arrangements for mitigation and adaptation are largely lacking.
4. The lack of sewage and wastewater treatment (especially for the removal of nutrients in some areas) and the release of pollutants from industrial, shipping and agricultural activities are major threats to the ocean, particularly in terms of food security, safety and maintenance of marine biodiversity. Marine debris, 80 per cent of which has a terrestrial origin, is a particular problem. Despite global efforts, there are inadequate monitoring arrangements for many pollutants in much of the world, accompanied by a lack of effective arrangements to establish norms for levels of harmful substances and to enforce them.
5. Seafood products, including finfish, invertebrates and seaweeds, are a major component of food security around the world. Significant growth in marine capture fisheries has occurred over the last few decades, with over a third of the world's fisheries regarded as overfished. Many States lack the data, associated tools and capacity for robust assessment and development and effective management of their fisheries.
6. In particular, there is a general lack of information on subsistence and small-scale (artisanal) fisheries. This leads to lack of investment, limitations on access to markets and disregard for their need for access to fisheries.
7. Capacity-enhancing subsidies make fishing activities artificially profitable by reducing costs or enhancing revenues, and thereby incentivize fishing beyond economically or environmentally sustainable levels. Beneficial subsidies invest in fisheries management and research and development. They enhance fish stocks, improve fishery habitats, support the establishment and management of protected areas and improve planning on optimum resource extraction that balances social, economic and environmental outcomes. Revisiting the design and impact of fiscal instruments and gradually shifting from harmful to beneficial subsidies are particularly important to the sustainable management of global fisheries.
8. A substantial number of area-based management tools, ranging from the closure of fisheries (both spatial and seasonal) to marine protected areas, have been applied at both the national and global levels. Nationally and internationally agreed criteria to identify sensitive areas have been developed. However, the mapping of marine habitats to provide the basis for identifying the areas that merit protection has been limited. There is also a lack, in most regions, of marine spatial planning systems and the information and frameworks to support them, as

well as the skills needed to implement area-specific conservation.

9. Because of the large ocean areas under their jurisdiction and their limited resources and capacity, many small island developing States and least developed countries lack the detailed knowledge and skilled manpower needed for ocean management. The capacity and technologies for planning and managing land-based activities that have an impact on coastal and marine environments as well as those activities occurring in coastal and marine environments will ensure that economic benefits can be maximized in an environmentally sustainable manner.

10. Knowledge of the current state of the ocean and effective management to achieve its conservation and sustainable use require support for scientific research and the facilitation of capacity and technology transfer. This will ensure continued expansion of understanding and sharing of knowledge.

11. The United Nations Convention on the Law of the Sea provides the legal framework within which all activities in the oceans and seas must be carried out, including the conservation and sustainable use of the ocean and its resources. Effective implementation of the Convention and relevant international and regional instruments is important in ensuring the conservation of the marine environment and the sustainable use of its resources, as well as the protection of the many services that the ocean will provide for future generations.

12. The Sustainable Development Goals are inter-related. Meeting the targets of Goal 14 will ensure that the targets associated with Goals 1 to 3, 6 to 8, 10, 12, 13 and 16 are met, while meeting the targets associated with Goals 5, 6 to 8, 11 to 13 and 17 will support meeting the targets of Goal 14.





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## II. Overall conclusions of the first World Ocean Assessment relevant to Sustainable Development Goal 14, Conserve and sustainably use the oceans, seas and marine resources for sustainable development

13. The ocean provides countless benefits to humans (sometimes called “ecosystem services”).<sup>1</sup> Some of those benefits are delivered without human intervention, though they can be affected or disrupted by such intervention. Examples of the benefits on which the world relies to support life include the regulating and supporting ecosystem services, such as the distribution of heat around the planet, the functioning of the hydrological cycle, the absorption of carbon dioxide as part of the carbon cycle and the coastal protection offered by many coral reefs.

14. Other ecosystem services are obtained as a result of human activity to acquire the benefits. Most are provisioning ecosystem services: an obvious example of such an acquired ecosystem service is the food provided by capture fisheries, which provides significant amounts of the protein required for the human diet. If human activities are not carefully managed to ensure that they do not alter ecosystem structure and function, they can result in damage to the marine environment and reduction or loss of ecosystem services (chap. 3).<sup>2</sup>

<sup>1</sup> The Millennium Ecosystem Assessment describes ecosystem services as “the benefits people obtain from ecosystems” (see Millennium Ecosystem Assessment, *Ecosystems and Human Well-Being: Synthesis*, preface (Washington, D.C., Island Press, 2005).

<sup>2</sup> In the present technical abstract, the chapters referred to are chapters of the first World Ocean Assessment (available from [www.un.org/depts/los/rp](http://www.un.org/depts/los/rp)). When placed at the end of a paragraph, such references apply to all preceding paragraphs up to the previous such reference. The citations on which the text is based can be found in those chapters.

15. Important issues arise for the institutions of ocean governance at the global, regional, national and local levels in balancing the benefits of acquiring these services against the disbenefits (referred to by some as detriments) caused by overexploitation and destructive practices, and in preventing or mitigating those disbenefits (chap. 54).

16. The General Assembly has noted with concern the findings of the First Global Integrated Marine Assessment (first World Ocean Assessment) that the world’s oceans are facing major pressures simultaneously, with such great impacts that the limits of their carrying capacity are being, or, in some cases, have been reached, and that delays in implementing solutions to the problems that have already been identified as threatening to degrade the world’s oceans will lead, unnecessarily, to incurring greater environmental, social and economic costs.<sup>3</sup>

17. Because of the absence of a standard approach to assigning a value to many ecosystem services, the first World Ocean Assessment found it impossible to assign an overall value to the myriad of non-marketed ecosystem services that the ocean provides, and equally could not put a true economic value on even those where there is in principle some form of market price (chap. 55).

18. The Assessment did, however, attempt to summarize the pressures from human activities. Table 1 in chapter 54 of the Assessment summarizes the

<sup>3</sup> See General Assembly resolution 71/257, para. 289.





Photo credit: Steve Jones



challenges to be overcome in achieving the conservation and sustainable use of the ocean and the extent to which we need to make progress in developing management methods for those human activities (chap. 54).

## **A. Target 14.1: By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution**

### **1. General**

19. The agricultural and industrial achievements of the past two centuries in feeding, clothing and housing the world's population have been at the price of seriously degrading important parts of the planet, including much of the marine environment, especially near the coast. Action to deal with agricultural run-off, industrial discharges and emissions and sewage (including industrial wastes that are mixed with human bodily wastes) is therefore important. The underdevelopment of sewage systems and wastewater treatment plants (especially for the removal of nutrients in some areas) is still a major threat to the ocean.

### **2. Sources and types**

#### **Land-based sources of polluting inputs**

##### **Industrial sources**

20. Many industrial processes have brought with them serious environmental damage, largely caused by heavy metals (especially lead, mercury, copper, cadmium and zinc) and by new substances that have been created to fulfil specific functions but have subsequently been found to have harmful consequences (such as the polychlorinated biphenyls used in many transformers). The identification of such problems is a continuing process.

21. Over time, steps have been taken to reduce or, where possible, eliminate many of the impacts of heavy metals and other hazardous substances. In some parts of the world, the efforts over the past 40 years have been successful, and concentrations in the ocean of many of the most seriously damaging heavy

metals and other hazardous substances are now diminishing—for example, in the north-east Atlantic.

22. Problems also arise from imperfectly controlled incineration, which can produce harmful substances, especially where plastics are involved. There is evidence that, in addition to the long-known hazardous substances, some substances (often called endocrine disruptors) that do not reach the levels of toxicity, persistence and bioaccumulation in the accepted definitions of hazardous substances, can disrupt the endocrine systems of humans and animals, with adverse effects on their reproductive success, metabolism and behaviour.

23. The use of the best practicable means to limit the creation of waste, discharges and emissions can help control these problems. However, continued growth in industrial production means that, even with this help, discharges and emissions will increase the inputs of heavy metals and other hazardous substances into the ocean. The only way to avoid this result is for innovations in cleaner production methods and means of reducing discharges and emissions to keep pace with the growth in production. This is particularly the case in areas of rapid industrial growth.

24. International legal frameworks have emerged for addressing some of the problems caused by heavy metals and hazardous substances. In particular, the Stockholm Convention on Persistent Organic Pollutants (2001) and the Minamata Convention on Mercury (2013) provide agreed international frameworks to address some of the heavy metals and hazardous substances. In many States, however, a great deal of capacity-building is still required in order to implement these frameworks.

##### **Agricultural sources**

25. The agricultural revolution of the last part of the twentieth century brought with it problems for the ocean in the form of enhanced run-off of both agricultural nutrients and pesticides. The use of fertilizers is rapidly growing in parts of the world where only limited use has occurred in the past. In the absence of careful management, there is a risk that such growth will increase run-off of the nutrients that fertilizers contain. In the case of pesticides, the issues are analogous to those of industrial development.

Newer pesticides are less polluting than older ones, but there are gaps in the capacity to ensure that the less-polluting pesticides are used.

### Nutrient pollution

26. Excess inputs of nutrients from both agriculture and sewage provide the conditions in which harmful algal blooms can occur. In addition to interfering with aquaculture and spoiling beaches for tourism, such algal blooms can lead to dead zones (anoxic zones) and low-oxygen zones (hypoxic zones). Such zones occur when algal blooms decay and the bacteria breaking up the dead algae use up the oxygen dissolved in the seawater. The zones drive mobile species away and kill the seabed (benthic) wildlife. Where such zones are seasonal, any regeneration that happens is usually at a lower trophic level, and the ecosystems are therefore degraded. Improved sewage treatment is also needed to avoid harmful impacts on human health, both from direct contact with pathogens introduced into seawater from sewage and from polluted shellfish and other food from the sea that has been in seawater polluted by sewage.

27. High levels of nutrients are also one of the causes to which the increase in toxic algal blooms of certain plankton species has been attributed. Such plankton species produce toxins that are ingested by shellfish, among other species, especially filter-feeders such as oysters and mussels. In addition to affecting the marine life that ingests them, the toxins poison humans who eat infected shellfish. The forms of poisoning include paralytic shellfish poisoning. This very quickly (often within 30 minutes) produces symptoms, which may include paralysis of the arms and legs, loss of motor coordination and incoherent speech, and is frequently fatal.

### Radioactive substances

28. Historically, atmospheric testing of nuclear weapon and discharges from some nuclear-reprocessing plants have given rise to concern about increasing levels of radioactivity in the ocean. However, the ending of such tests and, more recently, the improvements in controls on such discharges, have ended or reduced the main sources of concern. Continued monitoring will

ensure that the impacts of unforeseen events are not widespread (chap. 20).

### Solid waste disposal

29. The dumping of waste at sea is controlled under the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter of 1972 and its 1996 Protocol. If these are effectively and consistently implemented, that particular source of inputs of harmful substances will be satisfactorily controlled. However, there are serious gaps in knowledge about their implementation: over 50 per cent of the contracting parties to those instruments are not reporting, and it is consequently not known how effective the instruments are (chap. 24).

### Marine debris

30. Marine debris is present in all marine habitats. It has been estimated that the average density of marine debris varies between 13,000 and 18,000 pieces per square kilometre. However, data on plastic accumulation in the north Atlantic and the Caribbean from 1986 to 2008 showed that the highest concentrations (more than 200,000 pieces per square kilometre) occurred in the convergence zones between two or more ocean currents. Computer modelling confirms that debris will be transported by ocean currents and will tend to accumulate in a limited number of subtropical convergence zones or gyres.

31. Plastics are by far the most prevalent debris item recorded, contributing an estimated 60 to 80 per cent of all marine debris. Some pieces are large—they can be measured in metres and can cause problems such as entanglement. However, plastic microparticles (up to 5 millimetres in size) and even smaller nanoparticles (up to one millionth of a millimetre) are of increasing concern. The density of plastic microparticles within the North Pacific Central Gyre has increased by two orders of magnitude in the past four decades. The majority of marine debris entering the sea (approximately 80 per cent) is considered to originate from land-based sources (chap. 25).

32. Nanoparticles come from various sources: from direct use in various industrial processes and cosmetics, from the breakdown of marine debris, from

fragments of artificial fabrics discharged in wastewater and from leaching from land-based waste disposal sites. Nanoparticles appear to reduce primary production and the uptake of food by zooplankton and filter-feeders. The scale of the threat from nanoparticles is unknown, and further research is required (chap. 6).

### Shipping discharges and emissions

33. Discharges of oil, both as operational discharges and from maritime disasters, occur as ships navigate. Over the past 40 years, great progress has been made both in reducing routine discharges and in avoiding maritime disasters. Concerns remain about certain areas where heavily trafficked routes (such as some straits used for international navigation and the area to the south of the Cape of Good Hope) lead to concentrations of shipping and, consequently, of discharges.

34. By the early 1990s, it was becoming apparent that, in some parts of the world, emissions of greenhouse gases from ships were of concern. In 1997, estimates of total global nitrogen oxide (NO<sub>x</sub>) emissions from shipping suggested that they represented 42 per cent of such emissions in North America and 74 per cent of those in European countries that are members of the Organization for Economic Cooperation and Development. In 1997, a new annex (annex VI) to the International Convention for the Prevention of Pollution from Ships (1973), as modified by the Protocol of 1978 relating thereto (MARPOL) was adopted to limit the main air pollutants contained in the exhaust of ships, including NO<sub>x</sub> and sulphur oxides (SO<sub>x</sub>). Following its entry into force in 2005, it was revised in 2008 to reduce progressively until 2020 global emissions of NO<sub>x</sub>, SO<sub>x</sub> and particulate matter and to introduce emission control areas to further reduce emissions of those air pollutants in designated sea areas.

35. The other main impact of shipping on the marine environment comes from the noise that ships generate. Shipping is the most widely distributed source of human-made noise in the marine environment. Long-term measurements of ocean ambient sound indicate that low-frequency anthropogenic noise has increased, primarily due to commercial shipping. A variety of marine animals are known to be affected

by anthropogenic noise in the ocean, and long-term impacts are not yet known (chap. 17).

### Discharges and emissions from offshore hydrocarbon industries

36. There are a number of potential impacts on the marine environment from the offshore hydrocarbon sector:

- (a) Bursts in pipelines and disasters at well-heads can release massive amounts of hydrocarbons into the ocean, with serious pollution effects;
- (b) Seismic exploration for hydrocarbons has been shown to affect the behaviour of marine mammals;
- (c) Offshore installations release into the sea drill cuttings (contaminated with drilling mud), “produced water” (water contaminated with hydrocarbons that comes up from wells, either of natural origin or through having been injected to enhance hydrocarbon recovery) and various chemicals that are used and discharged offshore in the course of exploration and exploitation.

Regulation of all of these inputs has been successfully introduced in a number of areas within national jurisdiction, but not everywhere (chap. 21).

### 3. Implications for human well-being and biodiversity

37. The complex of pressures from various forms of pollution has major implications both for food security for humans and for the maintenance of marine biodiversity.

38. First, both food security and marine biodiversity are being affected by impacts associated with hazardous substances. Hazardous substances tend to accumulate progressively up the food web: once assimilated by an organism, they are often not broken down or expelled. Consequently, animals feeding at high trophic levels tend to have higher concentrations in their tissue than those feeding at lower trophic levels. High concentrations of hazardous substances appear to be associated with reduced reproductive success

and increased exposure to disease through impairment of immune, endocrine and nervous systems. In addition to affecting marine biodiversity, such reduced levels of reproduction can reduce the availability of fish stocks (chaps. 11, 15 and 20).

39. Secondly, dead zones and low-oxygen zones can lead to systematic changes in the species structure at established fishing grounds. Dead zones and low-oxygen zones can arise from nutrient pollution and from changes in ocean currents resulting from climate change. Such zones can reduce the extent to which fish and other species used as seafood continue to reproduce at their historical rates.

40. Thirdly, hazardous substances represent a direct threat to human health, particularly through contaminated food from the sea. In some places, action has been taken to prevent or discourage the consumption of contaminated fish and other seafood. Elsewhere, levels of contamination dangerous for human health are being reached or there are no adequate monitoring systems to assess the risk for human health.

41. Finally, the lack of proper management of wastewater and human bodily wastes causes problems for human health, both directly, through contact with water containing pathogens and bacteriological contamination of food from the sea, and indirectly, by creating the conditions in which algal blooms can produce toxins that infect seafood (summary and chap. 20).

42. Such effects are significant at the global level, since, on average, 17 per cent of the protein in human diets comes from food from the sea. More locally, the effects on small-scale fisheries could have even worse implications. Such fisheries are very important as a source of food and income in coastal developing countries and, in many cases, provide work for substantial numbers of women (chap. 15).

#### 4. Knowledge and capacity-building gaps

43. There are inadequate means of managing outputs of harmful substances and nutrient levels and frameworks for monitoring them in the environment in much of the world. This is accompanied by a lack of effective arrangements to establish norms for

levels of harmful substances and to implement them (chap. 32).

### B. Target 14.2: By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans

#### 1. Threats to coastal and marine ecosystems

44. Coastal ecosystems are affected by coastal development, numerous coastal industries and climate change. A large proportion of humans live in the coastal zone: 38 per cent of the world's population lives within 100 kilometres of the shore. In most regions, the proportion of people living in the coastal zone is steadily increasing. These developments are producing a complex of pressures:

- (a) Land reclamation has been taking place on a large scale in many countries, in particular by reclaiming salt marshes, intertidal flats and mangroves;
- (b) Where coastal land is threatened by erosion, large stretches of natural coastline have been replaced by "armoured", artificial coastal structures, which can significantly affect coastal currents and the ability of marine biotas to use the coast as part of their habitat;
- (c) The growth of international trade by sea is increasing the demand for port capacity, which is a driver for the pressures described in paragraphs 44 (a) and (b) above. It is also leading to increased dredging to create and maintain navigation channels and to potential damage to sensitive seabed areas from anchors;
- (d) Coastal locations are frequently seen as preferred sites for industrial developments because of their proximity to ports. Such development leads to demands for further housing;





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- (e) Tourist developments have also significantly increased coastal development and the lengths of artificial coastline;
- (f) Changes in river management, such as the construction of dams, and the building of coastal infrastructures, such as ports, can significantly change the sedimentation pattern along coasts. Such changes can increase coastal erosion and promote other coastal changes, sometimes with the effect that coastal land is lost for its current use, producing demands for replacement space;
- (g) Additional inputs of hazardous substances from many of these activities will lead (in the absence of proper management) to the creation of pollution hotspots.

45. In addition, aquaculture, which is growing rapidly, and marine ranching, which has substantial growth potential, require extensive ocean space as well as clean waters and, often, the dedicated use of an unpolluted seabed. Similar demands for ocean space are also made by industries concerned with the production of goods of cultural value, such as pearls. Such dedicated uses of coastal space can conflict with the conservation of existing marine ecosystems (chap. 13).

46. World shipping has been growing consistently for the past three decades. Between 1980 and 2013, the annual tonnage carried in the five main shipping trades increased by 158 per cent. There is a consequent increased risk of disturbance to marine wildlife and mortality from chronic or catastrophic oil and other spills, from the risk of introduction of invasive species and from noise (chap. 17).

47. Offshore mining is currently confined to shallow-water coastal regions. About 75 per cent of the world's tin, 11 per cent of the gold and 13 per cent of the platinum are extracted from deposits near the surface of the coastal seabed. Aggregates (sand, coral, gravel and seashells) are also important. Those activities are all concentrated in coastal waters. In addition, there is a developing practice of discharging tailings from land-based mining through pipelines into the ocean. Marine ecosystems are also likely to be placed under pressure from seabed mining in

the area (the seabed and ocean floor and its subsoil, beyond the limits of national jurisdiction) where the International Seabed Authority has entered into 15-year contracts for exploration for polymetallic nodules, sea-floor massive sulphides and cobalt-rich ferromanganese crusts in the deep seabed (chaps. 20 and 23).

48. Offshore renewable energy generation is still in its early stages in most regions. Many forms of marine-based renewable energy require ocean space. The location of wind, wave and tidal installations has potential effects on marine biota. Special care is needed in siting installations that can affect migration routes or feeding, breeding or nursery areas (chap. 22).

49. Without integrated management of all these pressures, and other pressures such as those from climate change, damage will be done to coastal ecosystems and their resilience will be reduced (chap. 26).

## 2. Knowledge and capacity-building gaps

50. In many countries, there have not yet been sufficient surveys of the seabed or of the marine biota to provide an adequate basis for decisions on planning the use of ocean space. Skills and frameworks for developing marine spatial planning processes are also lacking (chaps. 32 and 53).

## C. Target 14.3: Minimize and address the impacts of ocean acidification, including through enhanced scientific cooperation at all levels

### 1. Ocean acidification

51. Rising concentrations of carbon dioxide (CO<sub>2</sub>) in the atmosphere are resulting in increased uptake of the gas by the ocean. About 26 per cent of the increasing emissions of anthropogenic carbon dioxide is absorbed by the ocean, where it reacts with seawater to form carbonic acid, a process known as ocean acidification. In chemistry, whether a liquid is acid or basic (alkaline) is measured on the pH scale: the lower the figure, the more acid the liquid. Throughout the last 25 million years, the average pH of the ocean has remained fairly constant at between 8.0 and 8.2, with seasonal and spatial variations. In the last three decades, however, declines have been observed in the pH of the ocean, and, if CO<sub>2</sub> emissions continue at present levels, model projections suggest that the oceanic average could reach a pH of 7.8 by the year 2100. This is well outside the range of average pH change of any other time in recent geological history. The lower pH results in there being fewer carbonate ions available in the seawater. In general, because the ocean is mixed more slowly than the atmosphere, absorption of CO<sub>2</sub> is much higher in the uppermost water levels (down to about 400 m), which is where the greatest amount of biological activity occurs.

52. It is difficult to determine what the impacts of ocean acidification will be; controlled exposure experiments have observed different species reacting differently to varying decreases in calcium carbonate ion concentrations. Although there is some evidence that some species may benefit, observations from experiments to date suggest that many will not and that consequently there could be major changes in ecosystem structure (chap. 5).

53. Species such as shellfish are particularly susceptible to decreases in the amount of dissolved carbonate ions in the water around them because this hinders their ability to form their calcium carbonate shells. In parts of the north Pacific, where seasonal upwelling of water with low pH occurs, impacts on the formation and growth of the shells of shellfish

species have already been observed. This has required adaptation action to minimize impacts on shellfish aquaculture industries. As overall ocean pH and dissolved carbonate ion concentrations continue to decrease, more widespread changes to ecosystems are expected, with consequent impacts on the industries that rely on wild shellfish. As the ocean varies around the world and over time, the effects of ocean acidification will not be uniform across areas and there will be substantial variation over small spatial scales.

54. In many parts of the world, beaches are dependent on the production of sand from marine species producing carbonate minerals, particularly corals. The most significant social and economic impact of a possible reduction in carbonate sand production is the potential decrease in the supply of sand to currently inhabited, low-lying sand islands, particularly atolls. Sand cays, formed over the past few millennia on the rim of atolls, are particularly vulnerable, together with the communities that live on them. In the case of reef systems, bleaching as a result of elevated sea temperatures and reduced calcification as a consequence of ocean acidification seem likely to reduce coral cover and production of skeletal material. In areas where corals have already been damaged, acidification may hinder reefs from keeping pace with the rising sea level, in which case wave energy will be able to propagate more freely across the reef crest, thereby exposing shorelines to higher levels of wave energy (chap. 7).

### 2. Knowledge and capacity-building gaps

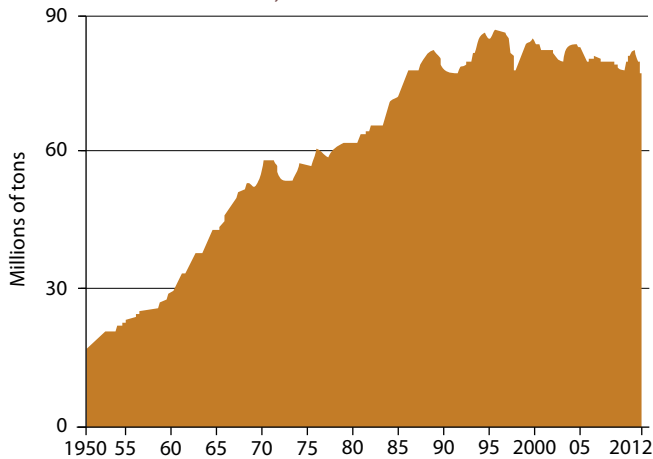
55. Knowledge of many aspects of ocean acidification is very limited. The impacts on, and resilience of, many species are unknown, interactions with other changes in the oceans are unknown and little is known about the different rates of acidification in different parts of the world. Adaptation skills also need development (chap. 9).



**D. Target 14.4: By 2020, effectively regulate harvesting and end overfishing, illegal, unreported and unregulated fishing and destructive fishing practices and implement science-based management plans, in order to restore fish stocks in the shortest time feasible, at least to levels that can produce maximum sustainable yield as determined by their biological characteristics**

**1. Fisheries activity**

Figure  
Global commercial catches reported to the Food and Agriculture Organization of the United Nations, 1950-2012



Source: Food and Agriculture Organization of the United Nations, *The State of World Fisheries and Aquaculture 2014* (Rome, 2014).

56. Reported commercial catches have risen globally over time (see figure above) and are now on the order of 80 million tons annually, with large amounts of subsistence, artisanal and illegal, unreported and unregulated fishing catches in addition. As long as fish populations or stocks are capable of compensating for removals by fisheries through increased growth and reproduction, then fishing can be sustained. However, when the rate of exploitation is faster than the stock can compensate, the removal level becomes unsustainable and the stock declines past the point that fishing can be sustained. At present, approximately 30 per cent of all assessed

commercial fish stocks are regarded as being in an overexploited state, with close to 60 per cent regarded as fully exploited.

Status of world marine capture fishery resources as of 2013

Status	Percentage
Less than fully exploited	10.5
Fully exploited	58.1
Overexploited	31.4

Source: Food and Agriculture Organization of the United Nations, *The State of World Fisheries and Aquaculture 2016* (Rome, 2016).

**2. Role of fisheries in food security**

57. Food from the sea is estimated to provide 17 per cent of the animal protein consumed by the world's population, and more than 20 per cent of the animal protein for over 3 billion people. Asia accounts for two-thirds of the total consumption of fish. Many of the 29 countries for which food from the sea constitutes more than a third of the animal protein consumed are in Africa and Asia. Of these, the United Nations has identified 18 as low-income, food-deficient economies. Thus, fish and invertebrates, usually from the ocean, are most important where food is needed most. Compared to protein from livestock and poultry, fish protein is considered to have benefits in reducing the risk of obesity, heart disease and high blood pressure (chap. 10).

**3. Pressures caused by fisheries**

58. Current overexploitation is undermining the contribution that fisheries could make to both the food and economic security of States. Fishing is a significant specific pressure on ocean biodiversity. Capture fisheries affect marine ecosystems through a number of different mechanisms. For example:

- (a) Heavy fishing can reduce the size of targeted populations to unsustainable levels and can extirpate distinct local stocks;
- (b) Fishing can lead to artificial genetic selection for different body and reproductive traits, leading to populations and species composed of smaller individuals that mature earlier;





Photo credit: Yania Kam

- (c) Fishing can affect populations of non-target species as a result of by-catches or ghost fishing (the entanglement of animals in discarded fishing nets). Each year, by-catch in longline fisheries is estimated to kill 160,000 to 320,000 seabirds from 70 species. Where management action has been taken, by-catch has been substantially reduced;
- (d) Fishing can affect predator-prey relationships, which can lead to shifts in community structure that do not revert to the original condition upon the cessation of fishing pressure (known as alternative stable states);
- (e) Fishing can reduce habitat complexity and trawling can perturb seabed (benthic) communities, particularly when associated with destructive practices (chaps. 11 and 38).

59. Ending overfishing, eliminating illegal, unreported and unregulated fishing, bringing all fishery yields under effective management and rebuilding depleted resources may result in an increase of as much as 20 per cent in potential yield, provided that the transitional economic and social costs of rebuilding depleted stocks can be addressed. The problems of meeting the transitional costs for fishing communities of rebuilding the fish stocks that they have been over-exploiting should not be underestimated. Such an

increase in yield could, however, make a substantial contribution to improving food security (chaps. 10-14).

60. Within this overall picture, small-scale fisheries need to be considered specifically. They are often a critical source of livelihood, as well as of food, for many residents in the coastal areas of small island developing States and least developed countries. Small-scale fisheries support more than 90 per cent of those working in capture fisheries and fish processing, about half of whom are women. Rebuilding the resources on which they depend and moving to sustainable exploitation could potentially have important benefits for food security and securing livelihoods (chap. 15).

#### 4. Knowledge and capacity-building gaps

61. Many fisheries lack the data and associated tools for robust assessment and development of effective management. Greater capacity in interpreting and applying such data to fisheries management and the implementation of effective frameworks is required across fisheries and regions. In particular, there is a general lack of information on subsistence and small-scale (artisanal) fisheries, and thus a lack of capacity to ensure that the biodiversity they are focused on is protected (chap. 16).



## E. Target 14.5: By 2020, conserve at least 10 per cent of coastal and marine areas, consistent with national and international law and based on the best available scientific information

### 1. Status of protected areas

62. There is a wide range of area-based management tools for conserving parts of the marine environment, based on national legislation and international agreements. The following are some examples:

- (a) A substantial number of seamounts and continental slope habitats have now been set aside as marine reserves by national authorities, or are now closed to fisheries through management measures implemented by regional fisheries management organizations or arrangements. Some 35 per cent of areas containing tropical and subtropical corals have some form of area-based management in place, and approximately 7 per cent of the world's mangroves fall within existing protected areas networks. Large marine protected areas have been established in the Indian and Pacific Oceans, and some countries have
- implemented networks of marine protected areas within their exclusive economic zones (chaps. 41 and 51);
- (b) Under some fisheries conventions or arrangements, the closure of areas to fishing or closures if some specified event occurs (known as time/area closures) can provide a level of protection to particular marine areas. The use of time/area closures to protect stocks of tuna and billfish and associated by-catch species is a form of conservation used by fisheries management on both national and regional scales (chaps. 11 and 40);
- (c) Under the International Convention for the Prevention of Pollution from Ships (1973), as modified by the Protocol of 1978 relating thereto (MARPOL) (annexes I, II, IV and V), special areas have been designated in several parts of the world to enhance protection against pollution from ships by imposing discharge restrictions on oil, noxious liquid substances, sewage and garbage;
- (d) Under annex VI to MARPOL, a number of areas have been designated as emission control areas to prevent air pollution by ships in those areas and the adjoining land;







Photo credit: Steve Jones



- (e) Fourteen areas have been designated as particularly sensitive sea areas, including the Great Barrier Reef, the Torres Strait, the Florida Keys, the Galapagos Islands and western European waters, and national management measures have been applied in them. The protection afforded in those areas includes areas to be avoided, mandatory reporting requirements, traffic separation schemes and anchoring bans, and one mandatory deep-water route (chap. 17);
- (f) Of the particularly sensitive sea areas, 3 overlap with the 42 marine and coastal World Heritage Sites designated for their natural interest pursuant to the Convention concerning the Protection of the World Cultural and Natural Heritage and 4 such sites designated for both their natural and cultural interest (chap. 8).

63. In addition, a number of criteria have been adopted to identify significant and vulnerable marine areas and ecosystems. For example, in its decision IX/20, the Conference of the Parties to the Convention on Biological Diversity adopted scientific criteria for identifying ecologically or biologically significant marine areas and scientific guidance for selecting areas to establish a representative network of marine protected areas. The Food and Agriculture Organization of the United Nations (FAO) has also developed International Guidelines for the Management of Deep-sea Fisheries in the High Seas, which provide criteria for the identification of vulnerable marine ecosystems.

## 2. Knowledge and capacity-building gaps

64. There is very limited mapping of marine habitats to provide the basis for identifying the areas that merit protection. There is also a lack, in most regions, of the skills and information needed to develop and implement area-based management tools and marine spatial planning systems for areas within national jurisdiction, and associated monitoring arrangements (chap. 53).

## F. Target 14.6: By 2020, prohibit certain forms of fisheries subsidies which contribute to overcapacity and overfishing, eliminate subsidies that contribute to illegal, unreported and unregulated fishing and refrain from introducing new such subsidies, recognizing that appropriate and effective special and differential treatment for developing and least developed countries should be an integral part of the World Trade Organization fisheries subsidies negotiation

### 1. Fisheries subsidies

65. In the fisheries sector, fiscal instruments are often used to regulate activity, generate revenue, provide social support to vulnerable groups and promote environmental management. One of the most commonly used fiscal instruments is subsidies. Subsidies may include direct payments, the provision of materials or services, price support or the waiving of revenue otherwise due. Global fishery subsidies are estimated at \$35 billion annually.

66. Much of the discussion about overfishing is focused on the environmental impact. However, there is also a significant economic impact. When examined in economic terms, overfishing implies a loss in the potential of economic returns accruing to society from capture fisheries, compared with a situation in which all fisheries are managed to maximize economic benefits. Translated into monetary terms, overfishing has been estimated by the World Bank and FAO to cost the world economy something in the order of \$50 billion per year compared with what could be attained under effective fisheries management.

67. Some estimates of world fishery subsidies are as high as \$25 to \$30 billion per year, while others are much lower (differences in estimates may be largely due to definitional issues with regard to what is considered to be a subsidy). Many fisheries subsidies can be regarded as capacity-enhancing subsidies. Such subsidies make fishing activities artificially profitable by reducing costs or enhancing revenues, thereby

incentivizing fishing beyond economically or environmentally sustainable levels, and are therefore harmful to the sustainability of fisheries. It is estimated that \$20 billion, or 57 per cent, of global fisheries subsidies are of this kind. Subsidies that encourage overcapacity and overfishing undermine the net economic benefits to States, resulting in losses. These losses are often borne by the communities dependent on fishery resources for their livelihood and food security.

68. Other subsidies can be beneficial. Where these improve fisheries management and research, improve the safety of fishers or help avoid discards and waste, they can give greater economic returns than the expenditure that they involve. They can enhance fish stocks, improve fishery habitats, support the establishment and management of protected areas and improve planning on optimum resource extraction that balances social, economic and environmental outcomes. Beneficial subsidies have been estimated at \$11 billion annually.

69. There are a number of examples in which fiscal instruments have been introduced or reformed to deliver positive economic, social and environmental outcomes. Review of the design and impact of fiscal instruments can bring major benefits to the sustainable management of fisheries around the world (chap. 15).

## 2. Knowledge and capacity-building gaps

70. Many countries lack sufficient infrastructure (especially survey vessels) and skills for the assessment of fish stocks and evaluation of the economic impact of subsidies. It is particularly important to the sustainable management of fisheries to revisit the design and impact of fiscal instruments and to shift gradually from harmful to beneficial subsidies. Enhanced enforcement capacity is also desirable (chap. 16).

## G. Target 14.7: By 2030, increase the economic benefits to small island developing States and least developed countries from the sustainable use of marine resources, including through sustainable management of fisheries, aquaculture and tourism

### 1. Challenges facing small island developing States and least developed countries

71. In the context of increasing economic benefits to small island developing States and least developed countries, it is important to note the factors that threaten to undermine even the current situation. In particular, losses of coral reefs resulting from the pressures associated with resource use and climate change have negative effects on fish production, fisheries and coastal protection, with resulting impacts on the industries that rely on them and the social benefits that communities derive from them. Modelling efforts, supported by current scientific data, project that most of the world's tropical and subtropical coral reefs, particularly those in shallow waters, will suffer from annual bleaching by 2050 and will eventually become functionally extinct as sources of goods and services. This will have profound effects on small island developing States and least developed countries in low-latitude coastal areas and their capacity to increase the economic benefits they derive from the ocean (chap. 43).

72. More generally, climate change is one of the largest threats faced by small island developing States and least developed countries. Responding to the environmental and socioeconomic consequences of climate change in order to maintain ecosystem services requires coordinated and integrated efforts to incorporate adaptation and mitigation options into marine policy, planning and management. This, in turn, requires a significant level of skill in planning and implementation. At present, however, even in developed countries, examples of the implementation of climate change adaptation actions are limited, even though acceptance of the need for adaptation



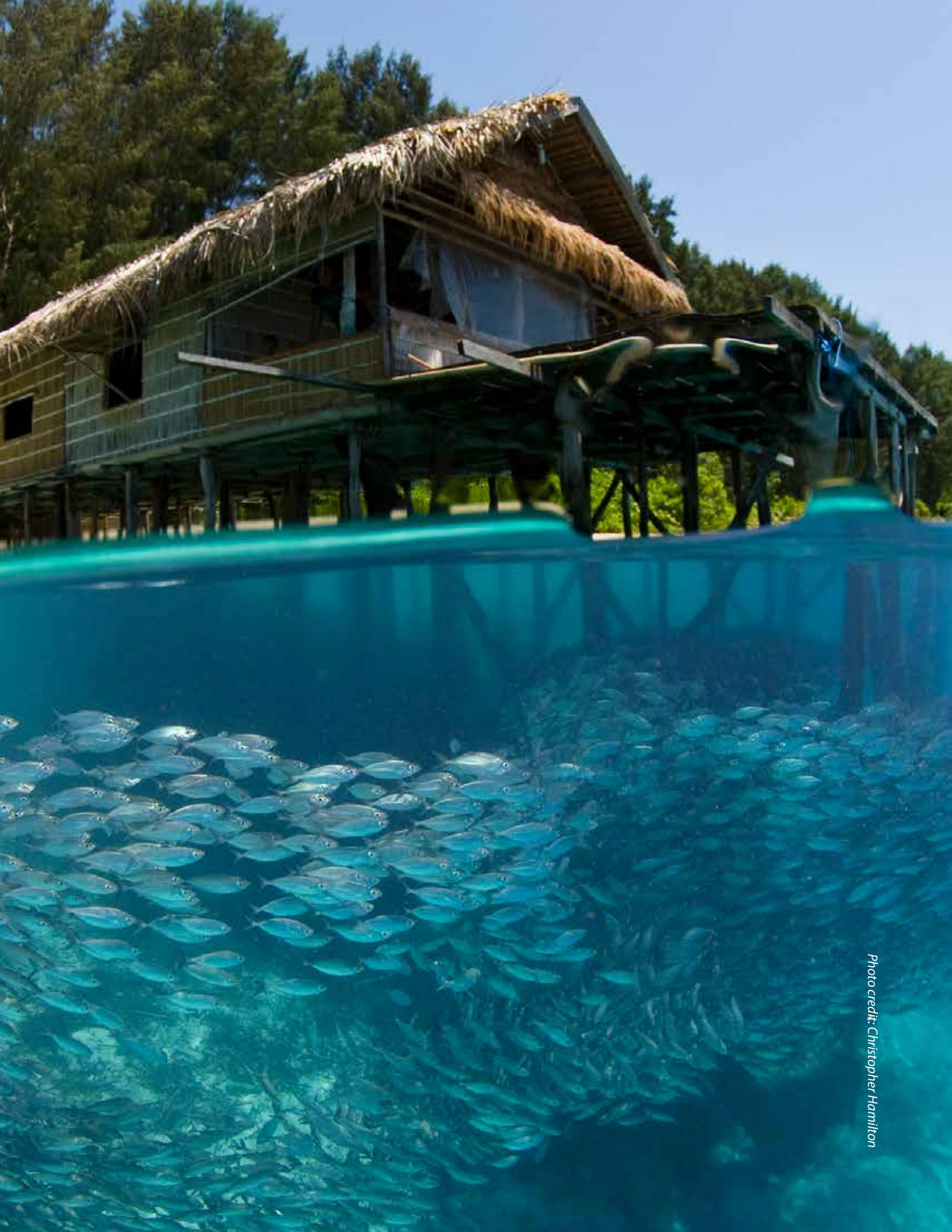


Photo credit: Christopher Hamilton





Photo credit: Steve Jones

and for significant investments in adaptation planning is widespread (chap. 5).

73. In other fields, improving on the current economic situation of small island developing States and least developed countries consistently with sustainable use of the ocean involves addressing other points where action is needed to improve both economic performance and the protection and management of the marine environment:

- (a) The provision of improved sanitation and sewage treatment (the need for and benefits of which are discussed in para. 26 above) poses major challenges with respect to investment and training the necessary staff. In addition, some States, particularly small island developing States, have difficulties in managing sewage discharged ashore from the large numbers of cruise ships visiting their ports;
- (b) Small countries can rarely support the infrastructure required for the safe disposal of hazardous waste, but cannot merely ignore the problem, which is likely to increase with increased economic activity;
- (c) The improvement of agricultural production must include the training of farmers in the use of fertilizers and pesticides in ways that do not result in enhanced run-off into the ocean;
- (d) The successful management of fisheries (including small-scale fisheries), which is an essential element for improved economic performance by small island developing States and least developed countries, requires investment in infrastructure and related scientific and management skills, including in the negotiation of international agreements with distant-water fleets;
- (e) Strengthening of the role that small-scale fisheries can play in the economic life of their countries must involve improved access to markets and the infrastructure to support this;
- (f) Small island developing States often face major problems in establishing adequate port waste reception facilities for garbage, a problem that becomes more significant with increased international shipping trade, which

is a concomitant of improved economic performance;

- (g) The capacity and technologies for widespread monitoring of coastal processes are vital to proper integrated coastal zone management, which is a necessary tool for improving the economic performance of the coastal zone. Where they exist, the challenge is to develop a comprehensive succession planning framework that maintains that capacity over time;
- (h) Because of the large proportion of international trade that is transported by sea, landlocked countries have particular difficulties owing to their lack of seaports. All 31 landlocked developing countries, but especially the 16 least developed countries among them, face serious challenges to their growth and development, owing, in substantial part, to their problems in accessing maritime transport. In general, landlocked developing countries face a 45 per cent higher ratio of freight charges to total value of exports and imports than the average of the developing countries through which their exports and imports must transit. This points to the importance of improving the efficiency of ports in the transit countries and reducing the various barriers faced in moving goods from ports to landlocked developing countries;
- (i) Sound planning and management of tourism is crucial to its success in increasing economic benefits. Since tourists are highly mobile, it is very easy for them to move away from poorly planned and managed tourist areas. This points to the need for integrated coastal zone management, covering everything from the infrastructure needed to enable the tourists to arrive to the way in which beaches and coasts are managed (chaps. 15, 18, 20, 26 and 27).

## 2. Knowledge and capacity-building gaps

74. Because of the large ocean areas under their jurisdiction and their limited resources, small island developing States usually lack the detailed knowledge of their local ocean that would enable them to

manage it properly. Most least developed countries face similar problems. Furthermore, because of their small populations, small island developing States face particular difficulties in finding the skilled manpower needed for ocean management (chap. 32).

#### **H. Target 14.a: Increase scientific knowledge, develop research capacity and transfer marine technology, taking into account the Intergovernmental Oceanographic Commission Criteria and Guidelines on the Transfer of Marine Technology, in order to improve ocean health and to enhance the contribution of marine biodiversity to the development of developing countries, in particular small island developing States and least developed countries**

75. Scientific understanding of the ocean is fundamental to carrying out effective management of the human activities that affect the marine environment. Much effort is already being devoted to improving our knowledge: over 10,000 experts have registered themselves on the ocean experts register of the International Oceanographic Commission (IOC); a register of marine research vessels shows that there are approximately 800 research vessels, although the focus is clearly mainly on coastal waters; and a survey shows that approximately 14,000 scientific articles on oceanography are published per year. In recent years, international cooperation in the field has been growing, especially within the Global Ocean Observing System and within the framework of the International Council for Science, and much new technology (for example, satellite observation and Argo floats) is being deployed. Nevertheless, even this effort is short of what is needed. Much less than 0.0001 per cent of the deep ocean has been studied. As identified elsewhere in the present technical abstract, there are gaps in many fields in developing countries in the skills and infrastructure needed to analyse the state of their marine environment. There are also massive gaps in the knowledge of the ocean beyond national jurisdiction.

Techniques for integrating environmental, social and economic aspects are lacking nearly everywhere.<sup>4</sup>

#### **I. Target 14.b: Provide access for small-scale artisanal fishers to marine resources and markets**

76. FAO defines small-scale, artisanal fisheries as those that are household based, use relatively small amounts of capital and remain close to shore. Worldwide, they involve some 600 to 800 million people. In some developing countries, including small island developing States, small-scale fisheries provide more than 60 per cent of protein intake. The addition of fish to the diets of low-income populations (including pregnant and breastfeeding mothers and young children) offers an important means for improving food security and nutrition. Small-scale fisheries make significant contributions to food security by making fish available to economically poor populations and are critical to maintaining the livelihoods of vulnerable populations in developing countries. Studies have shown that the selling or trading of even a portion of their catch represents as much as a third of the total income of subsistence fishers in some low-income countries. Their role in production and its contribution to food security and nutrition is often underestimated or ignored. At the same time, small-scale fisheries stakeholders often cannot adapt to, and benefit equitably from, the opportunities of global market trends.

77. Subsistence fishing is rarely included in national catch statistics. In the absence of reliable statistics about such fisheries, it is easy for their need for access to fish stocks to be overlooked in discussing permissible levels of exploitation and investment needs. Significant numbers of women work in small-scale fisheries, and many indigenous peoples and their communities rely on those fisheries. Most of the people involved in small-scale fisheries depend on informal work, are exposed to the absence of work regulations and lack access to social protection

<sup>4</sup> The Intergovernmental Oceanographic Commission of the United Nations Educational, Scientific and Cultural Organization will shortly publish the first global ocean science report, which will explore these issues in more detail.





Photo credit: Ellen Cuylaerts





Photo credit: Greg LeCoeur

schemes. The International Labour Organization adopted the Work in Fishing Convention in 2007, but progress towards ratification of the Convention has been slow. FAO continues to encourage the establishment of fishers' organizations and cooperatives as a means of empowerment for small-scale fishers in the management process to establish responsible fisheries policy. It has also highlighted the need to reduce post-harvest losses in small-scale fisheries as a means of improving production. In 2014, FAO adopted the Voluntary Guidelines for Securing Sustainable Small-scale Fisheries in the Context of Food Security and Poverty Eradication.

78. Many small-scale fisheries are under threat because of overexploitation, conflict with larger fishing operations and a loss of productivity in coastal ecosystems with a variety of other causes, including habitat loss, pollution and climate change, as well as the loss of access to ocean space as coastal economies and uses of the sea diversify. Furthermore, modelling of future ocean production projects that the warming ocean will increase the fish biomass available for harvesting in higher latitudes and decrease it in equatorial zones. This will shift resources to benefit the middle and moderately high latitudes, which are often highly developed, at the expense of low latitudes, where small-scale (subsistence) fishing is often important for food security (chap. 15).

## **J. Target 14.c: Enhance the conservation and sustainable use of oceans and their resources by implementing international law as reflected in the United Nations Convention on the Law of the Sea, which provides the legal framework for the conservation and sustainable use of oceans and their resources, as recalled in paragraph 158 of “The future we want”**

79. The United Nations Convention on the Law of the Sea provides the legal framework within which all activities in the oceans and seas must be carried out, including the conservation and sustainable use of the ocean and its resources. In many fields, it is supplemented by more specific, sectoral regulations. These include the implementing Agreements under the Convention and the numerous international conventions and other legal instruments adopted by relevant intergovernmental organizations at the global and regional levels. The development of an international, legally binding instrument under the Convention on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction in the context of the Preparatory Committee established by General Assembly in its resolution 69/292 to study the issue is also pertinent (chaps. 11, 17 and 20).

80. Effective conservation and the sustainable use of the ocean and its resources will only be achieved with the effective implementation of the whole of this body of international law. Capacity-building, the sharing of scientific knowledge and the transfer of marine technology, taking into account the IOC Criteria and Guidelines on the Transfer of Marine Technology, will empower States to fully participate in and benefit from the conservation and sustainable use of the ocean and its resources and assist them in meeting their obligations.





Photo credit: Stefan Beskow

### III. Sustainable Development Goals that will be aided by achieving the targets of Sustainable Development Goal 14

81. The move towards a healthy ocean that is used sustainably—the aim of Sustainable Development Goal 14—will assist in achieving a number of other Goals:

- (a) *Goal 1: End poverty in all its forms everywhere.* As has been described above, small-scale fisheries are important in many low-income countries, not only in providing food, but also in providing income. Safeguarding such fisheries and allowing for their sustainable development will assist with the implementation of Goal 1. In addition, coastal tourism, shipping and other sea-based industries can make a significant contribution;
- (b) *Goal 2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture.* Ensuring proper management of fish stocks and protecting fish and seaweed quality will safeguard the vital role of food from the sea in nourishing the world's population;
- (c) *Goal 3: Ensure healthy lives and promote well-being for all at all ages.* The risks for the safety of food from the sea come from contamination from pathogens (particularly from discharges of untreated sewage and animal waste) and toxins (often from algal blooms). The severity of the risk also depends on individual health, consumption levels and susceptibility. There are international guidelines to address those risks, but substantial resources are required in order to continue to build the capacity to implement and monitor safety protocols from the ocean to the consumer;
- (d) *Goal 6: Ensure availability and sustainable management of water and sanitation for all.* Desalination is already making a major contribution to the freshwater supply in some parts of the world. Some of the States in the Persian Gulf derive as much as 90 per cent of their freshwater supply from this source. As climate change reduces rainfall in densely populated areas, desalination will be a significant means of mitigation;
- (e) *Goal 7: Ensure access to affordable, reliable, sustainable and modern energy for all.* Energy from wind, wave and tidal power is already feeding national distribution systems in a number of countries. Other potential marine sources of energy (osmotic, thermal energy conversion and marine biomass) have not yet progressed beyond the demonstration stage. However, offshore renewable energy is an immense resource awaiting efficient usage. Technological progress to harness the resource is steadily increasing around the world. When fully developed and implemented, ocean renewable energy can increase the diversity of low-carbon energy options and provide viable alternatives to fossil fuel sources. For developing countries and new growing economies, installing renewable energy systems represents a viable path towards a low-carbon future, but would require considerable investment, particularly with respect to the specialist engineering skills required;
- (f) *Goal 8: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.* Maritime transport and submarine cable communications already underpin the world's economic growth. Ensuring fair access to fish stocks for small-scale fishers and improving the health and safety of seafarers and fishers, as part of





Photo credit: Greg LeCoeur



- improving the work of fisheries and maritime transport, will help in the implementation of Goal 8;
- (g) *Goal 10: Reduce inequality within and among countries.* Some global trends related to the marine environment already indicate a move towards greater equality. For example, fish consumption per person in the developing world is increasing, and ship-borne imports to, and exports from, developing countries are moving into balance;
- (h) *Goal 12: Ensure sustainable consumption and production patterns.* Achieving sustainable use of fish stocks will be a significant move towards sustainable consumption and production;
- (i) *Goal 13: Take urgent action to combat climate change and its impacts.* The ocean is the greatest mitigator of climate change, absorbing 93 per cent of excess heat and 26 per cent of annual CO<sub>2</sub> emissions. Ensuring a healthy ocean will promote climate mitigation;
- (j) *Goal 16: Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels.* Implementing international law as reflected in the United Nations Convention on the Law of the Sea, which sets out the legal framework within which all activities in the oceans and seas must be carried out, will promote stability as well as maintenance of international peace and security.



Photo credit: Greg Le Cour

## IV. Sustainable Development Goals whose achievement will contribute towards achieving Sustainable Development Goal 14

82. The achievement of a number of Sustainable Development Goals will assist in delivering Goal 14:

- (a) *Goal 5: Achieve gender equality and empower all women and girls.* Improving the status of the many women working in small-scale fisheries will enable that sector to make a bigger contribution to the well-being of local communities;
- (b) *Goal 6: Ensure availability and sustainable management of water and sanitation for all.* Improvements in sanitation and waste management will make a substantial contribution towards improving the quality of the marine environment and the safety of food from the sea and reducing pressures on the marine environment associated with pollution;
- (c) *Goal 7: Ensure access to affordable, reliable, sustainable and modern energy for all.* Because of the significance for the ocean of ocean acidification, reducing CO<sub>2</sub> emissions from energy generation will help maintain ocean biodiversity and the carbonate cycle;
- (d) *Goal 8: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.* The development of clean technologies, best practices and innovative ways of reducing the footprint of industries on the marine environment will help reduce associated pressures;
- (e) *Goal 11: Make cities and human settlements inclusive, safe, resilient and sustainable.* The proper planning of coastal cities will help ensure that coastal construction and development has no adverse effect on the ocean;
- (f) *Goal 12: Ensure sustainable consumption and production patterns.* Working towards sustainable patterns of consumption and production will help avoid unsustainable pressures on the ocean from human activities such as fishing, tourism, waste disposal and extraction of minerals and hydrocarbons;
- (g) *Goal 13: Take urgent action to combat climate change and its impacts.* The present technical abstract has briefly described the manifold ways in which climate change is affecting the ocean and its biodiversity and the ways in which that will affect the human uses of the ocean. Action to reduce or mitigate those impacts will be essential for ensuring a healthy and productive ocean;
- (h) *Goal 17: Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development.* Since the world ocean is an interconnected whole, much of the action needed to deliver Goal 14 requires cooperation between and among States, economic sectors and other actors. Partnerships are therefore an essential tool to deliver Goal 14.





Photo credit: Edwar Herreño

## V. Conclusion

83. The greatest threat to the ocean comes from a failure to deal quickly with the manifold problems that have been described above. Many parts of the ocean, including some areas beyond national jurisdiction, have been seriously degraded. If the problems are not addressed, there is a major risk that they will combine to produce a destructive cycle of degradation in which the ocean can no longer provide many of the benefits that humans currently enjoy from it.









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