

THE POTENTIAL OF THE

BLUE ECONOMY

Increasing Long-term Benefits of the Sustainable Use of Marine Resources for Small Island Developing States and Coastal Least Developed Countries



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WORLD BANK GROUP



United Nations

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This report is the product of a collaborative effort amongst relevant entities of the United Nations system and other stakeholders, which was led by the World Bank Group and UN Department of Economic and Social Affairs (DESA).

The UN General Assembly adopted resolution 70/226 on December 22, 2015 in which it decides to “convene the high-level 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 support the implementation of Sustainable Development Goal 14.” To support Fiji and Sweden, Presidents of the Conference with technical expert advice for preparing the Conference, an Advisory Group consisting of relevant entities of the United Nations system and other stakeholders was established in April 2016. This Advisory Group agreed to form seven subsidiary informal preparatory working groups (IPWG) in line with the targets under SDG14.

Informal Working Group (IPWG) 6 was assigned to cover SDG target 14.7 and worked on the issue of blue growth and “increasing economic benefits for SIDS and LDCs from sustainable management of marine resources, including fisheries, aquaculture and tourism.” The World Bank Group and UN DESA were appointed as co-conveners of IPWG 6.

The membership of the working group includes: The World Bank Group (WBG), UN Department of Economic and Social Affairs (DESA), UN Environment, Food and Agriculture Organization (FAO), International Maritime Organization (IMO), UN Office of Legal Affairs/Division for Ocean Affairs and the Law of the Sea (OLA/DOALOS), UN Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries and Small Island Developing States (OHRLLS), UN Conference on Trade and Development (UNCTAD), United Nations Development Programme (UNDP), United Nations Industrial Development Organization (UNIDO), United Nations World Tourism Organization (UNWTO), International Seabed Authority (ISA), International Union for Conservation of Nature (IUCN), World Trade Organization (WTO), International Council for Science (ICSU), Organisation for Economic Co-operation and Development (OECD), World Ocean Council (WOC), World Wide Fund for Nature (WWF), Conservation International, Ocean Policy Research Institute (OPRI) of Sasakawa Peace Foundation, and National Oceanic and Atmospheric Administration (NOAA) of U.S. Department of Commerce. These entities contributed to and assisted in the development of this report.

IPWG 6 undertook relevant research and consultations to evaluate the current status of SDG target 14.7 and related issues, including challenges, gaps and opportunities in its implementation, and provided recommendations on necessary future actions, partnerships, projects and commitments to accelerate the implementation of SDG target 14.7 that directly respond to related needs and opportunities. As part of its work, IPWG 6 submitted an informal input to the background note of the Secretary-General for the preparatory meeting of the Conference in November 2016. The informal working group then decided that this input could be optimized to serve an additional purpose. Thus, the group agreed to develop the input into this standalone report with the intention to officially launch it around the Conference in June 2017. The World Bank Group accepted to oversee the production process.

The co-conveners of the working group are Mr. Björn Gillsäter, World Bank Group Special Representative to the UN in New York, and Ms. Irena Zubcevic, Chief, Small Island Developing States, Oceans and Climate Branch, Division for Sustainable Development, UN Department of Economic and Social Affairs. They were supported by Mr. Oluwadamisi (Kay) Atanda, International Affairs Consultant at the World Bank Group New York Office, Ms. Ling

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The publication was coordinated by Marjo Vierros and Charlotte de Fontaubert. Ms. Vierros is the Director of Coastal Policy and Humanities Research, a company that undertakes interdisciplinary research on oceans issues. She is also a consultant for UN DESA on ocean issues. Ms. de Fontaubert is a senior fisheries specialist at the World Bank. Her work supports operations for the development of sustainable fisheries worldwide, with a particular emphasis on East Asia and the Pacific, the Middle East, and North and East Africa.

TABLE OF CONTENTS

Acknowledgments	iii
Table of Contents	v
Executive Summary	vi
Key Messages for Future Action	ix
Introduction	1
Relationship of SIDS and Coastal LDCs to Oceans, Seas, and Marine Resources	2
The Transition to a Blue Economy	4
Challenges to the Blue Economy	10
Sectors of the Blue Economy	12
Fisheries	14
Aquaculture	16
Coastal and Maritime Tourism	16
Marine Biotechnology and Bioprospecting	17
Extractive Industries: Non-Living Resources	18
Activities within National Jurisdictions	18
Activities in Areas Beyond National Jurisdiction	20
Desalination (freshwater generation)	20
Renewable Marine (off-shore) Energy	21
Maritime Transport, Ports and Related Services, Shipping, and Shipbuilding	21
Waste Disposal Management	22
Supporting Activities	23
Ocean Monitoring and Surveillance	23
Ecosystem-based Management	23
Activities Supporting Carbon Sequestration (Blue Carbon)	25
Supportive Financial Mechanisms	26
Annex 1: Linkages between Targets	28
References	34

EXECUTIVE SUMMARY

This report was drafted by a working group of United Nations entities, the World Bank, and other stakeholders to suggest a common understanding of the blue economy; to highlight the importance of such an approach, particularly for small island developing states and coastal least developed countries; to identify some of the key challenges its adoption poses; and to suggest some broad next steps that are called for in order to ensure its implementation.

Although the term “blue economy” has been used in different ways, it is understood here as comprising the range of economic sectors and related policies that together determine whether the use of oceanic resources is sustainable. An important challenge of the blue economy is thus to understand and better manage the many aspects of oceanic sustainability, ranging from sustainable fisheries to ecosystem health to pollution. A second significant issue is the realization that the sustainable management of ocean resources requires collaboration across nation-states and across the public-private sectors, and on a scale that has not been previously achieved. This realization underscores the challenge facing the Small Island Developing States (SIDS) and Least Developed Countries (LDCs) as they turn to better managing their blue economies.

The “blue economy” concept seeks to promote economic growth, social inclusion, and the preservation or improvement of livelihoods while at the same time ensuring environmental sustainability of the oceans and coastal areas. At its core it refers to the decoupling of socioeconomic development through oceans-related sectors and activities from environmental and ecosystems degradation. It draws from scientific findings that ocean resources are limited and that the health of the oceans has drastically declined due to anthropogenic activities. These changes are already being profoundly felt, affecting human well-being and societies, and the impacts are likely to be amplified in the future, especially in view of projected population growth.

The blue economy has diverse components, including established traditional ocean industries such as fisheries, tourism, and maritime transport, but also new and emerging activities, such as offshore renewable energy, aquaculture, seabed extractive activities, and marine biotechnology and bioprospecting. A number of services provided by ocean ecosystems, and for which markets do not exist, also contribute significantly to economic and other human activity such as carbon sequestration, coastal protection, waste disposal and the existence of biodiversity.

The mix of oceanic activities varies in each country, depending on their unique national circumstances and the national vision adopted to reflect its own conception of a blue economy. In order to qualify as components of a blue economy, as it is understood here, activities need to:

- provide social and economic benefits for current and future generations
- restore, protect, and maintain the diversity, productivity, resilience, core functions, and intrinsic value of marine ecosystems
- be based on clean technologies, renewable energy, and circular material flows that will reduce waste and promote recycling of materials.

Components of the Blue Economy

Type of Activity	Activity Subcategories	Related Industries/ Sectors	Drivers of Growth
Harvesting and trade of marine living resources	Seafood harvesting	Fisheries (primary fish production)	Demand for food and nutrition, especially protein
		Secondary fisheries and related activities (e.g., processing, net and gear making, ice production and supply, boat construction and maintenance, manufacturing of fish-processing equipment, packaging, marketing and distribution)	Demand for food and nutrition, especially protein
		Trade of seafood products	Demand for food and nutrition, especially protein
		Trade of non-edible seafood products	Demand for cosmetic, pet, and pharmaceutical products
	Aquaculture	Demand for food and nutrition, especially protein	
	Use of marine living resources for pharmaceutical products and chemical applications	Marine biotechnology and bioprospecting	R&D and usage for health care, cosmetic, enzyme, nutraceutical, and other industries
Extraction and use of marine non-living resources (non-renewable)	Extraction of minerals	(Seabed) mining	Demand for minerals
	Extraction of energy sources	Oil and gas	Demand for (alternative) energy sources
	Freshwater generation	Desalination	Demand for freshwater
Use of renewable non-exhaustible natural forces (wind, wave, and tidal energy)	Generation of (off-shore) renewable energy	Renewables	Demand for (alternative) energy sources

(continued)

Type of Activity	Activity Subcategories	Related Industries/ Sectors	Drivers of Growth
Commerce and trade in and around the oceans	Transport and trade	Shipping and shipbuilding	Growth in seaborne trade; transport demand; international regulations; maritime transport industries (shipbuilding, scrapping, registration, seafaring, port operations, etc.)
		Maritime transport	
	Ports and related services		
	Coastal development	National planning ministries and departments, private sector	Coastal urbanization, national regulations
	Tourism and recreation	National tourism authorities, private sector, other relevant sectors	Global growth of tourism
Indirect contribution to economic activities and environments	Carbon sequestration	Blue carbon	Climate mitigation
	Coastal Protection	Habitat protection, restoration	Resilient growth
	Waste Disposal for land-based industry	Assimilation of nutrients, solid waste	Wastewater Management
	Existence of biodiversity	Protection of species, habitats	Conservation

The blue economy aims to move beyond business as usual and to consider economic development and ocean health as compatible propositions. It is generally understood to be a long-term strategy aimed at supporting sustainable and equitable economic growth through oceans-related sectors and activities. The blue economy is relevant to all countries and can be applied on various scales, from local to global. In order to become actionable, the blue economy concept must be supported by a trusted and diversified knowledge base, and complemented with management and development resources that help inspire and support innovation.

A blue economy approach must fully anticipate and incorporate the impacts of climate change on marine and

coastal ecosystems—impacts both already observed and anticipated. Understanding of these impacts is constantly improving and can be organized around several main “vectors”: acidification, sea-level rise, higher water temperatures, and changes in ocean currents. These different vectors, however, are unequally known and hard to model, in terms of both scope—where they will occur, where they will be felt the most—and severity. For instance, while not as well understood as the other impacts, and more difficult to measure, the impacts of acidification are likely to be the most severe and most widespread, essentially throughout any carbon-dependent ecological processes. Likewise, the effects of sea-level change will be felt differently in different parts of the world, depending on the

ecosystems around which it occurs. Most importantly, however, and unlike in terrestrial ecosystems, further uncertainty results from the complex interactions within and between these ecosystems. In spite of this uncertainty, the current state of knowledge is sufficient to understand that these impacts will be felt on critical marine and coastal ecosystems throughout the world and that they fundamentally affect any approach to the management of marine resources, including by adding a new and increasing sense of urgency.

Healthy oceans and seas can greatly contribute to inclusiveness and poverty reduction, and are essential for a more sustainable future for SIDS and coastal LDCs alike.

Oceans and their related resources are the fundamental base upon which the economies and culture of many SIDS and coastal LDCs are built, and they are also central to their delivery of the 2030 Agenda for Sustainable Development, including the Sustainable Development Goals (SDGs). A blue economy provides SIDS and coastal LDCs with a basis to pursue a low-carbon and resource-efficient path to economic growth and development designed to enhance livelihoods for the poor, create employment opportunities, and reduce poverty. It is also clear that SIDS and coastal LDCs often lack the capacity, skills and financial support to better develop their blue economy. This report lays out steps for countries to follow to make the blue economy an important vehicle to sustain economic diversification and job creation in these countries.

In spite of all its promises, the potential to develop a blue economy is limited by a series of challenges. First and foremost is the need to overcome current economic trends that are rapidly degrading ocean resources through unsustainable extraction of marine resources, physical alterations and destruction of marine and coastal habitats and landscapes, climate change, and marine pollution. The second set of challenges is the need to invest in the human capital required to harness the employment and development benefits of investing in innovative blue economy sectors. The third set of challenges relates to strengthening the concept and overcoming inadequate valuation of marine resources and ecosystem services provided by the oceans; isolated sectoral management of activities in the oceans, which makes it difficult to address cumulative impacts; inadequate human, institutional, and technical capacity; underdeveloped and often inadequate planning tools; and lack of full implementation of the 1982 United Nations Convention on the Law of the Sea (UNCLOS) and relevant conventions and instruments. While stimulating growth in individual oceanic sectors is comparatively straightforward, it is not always clear what a sustainable blue economy should look like and the conditions under which it is most likely to develop.

Key Messages for Future Action

The different pathways toward the blue economy depend on national and local priorities and goals. Nevertheless, there are common steps that will be required by all countries aiming to adopt this approach to managing their oceans. These include:

- **Countries must accurately value the contribution of natural oceanic capital to welfare**, in order to make the right policy decisions, including with regards to trade-offs amongst different sectors of the blue economy.
- **Investment in, and use of the best available science, data, and technology is critical** to underpinning governance reforms and shaping management decisions to enact long-term change.
- **Each country should weigh the relative importance of each sector of the blue economy and decide, based on its own priorities and circumstances, which ones to prioritize.** This prioritization can be carried out through appropriate investments and should be based on accurate valuation of its national capital, natural, human and productive.
- **Anticipating and adapting to the impacts of climate change is an essential component of a blue economy approach.** National investments to that end must be complemented by regional and global cooperation around shared priorities and objectives.
- **Ensuring ocean health will require new investment**, and targeted financial instruments—including blue bonds, insurance and debt-for-adaptation swaps—can help leverage this investment in order to ensure that it maximizes a triple bottom line in terms of financial, social, and environmental returns.
- **The effective implementation of the United Nations Convention on the Law of the Sea is a necessary aspect of promoting the blue economy concept worldwide.** That convention sets out the legal framework within which all activities in the oceans and seas must be carried out, including the conservation and sustainable use of the oceans and their resources. The effective implementation of the Convention, its Implementing Agreements and other relevant instruments is essential to build robust legal and institutional frameworks, including for investment and business

innovation. These frameworks will help achieve SDG and NDC commitments, especially economic diversification, job creation, food security, poverty reduction, and economic development.

- **Realizing the full potential of the blue economy also requires the effective inclusion and active participation of all societal groups**, especially women, young people, local communities, indigenous peoples, and marginalized or underrepresented groups. In this context, traditional knowledge and practices can also provide culturally appropriate approaches for supporting improved governance.
- **Developing coastal and marine spatial plans (CMSP) is an important step to guide decision-making for the blue economy, and for resolving conflicts over ocean space.** CMSP brings a spatial dimension to the regulation of marine activities by helping to establish geographical patterns of sea uses within a given area.

- **The private sector can and must play a key role in the blue economy.** Business is the engine for trade, economic growth and jobs, which are critical to poverty reduction.
- **In view of the challenges facing SIDS and coastal LDCs, partnerships can be looked at as a way to enhance capacity building.** Such partnerships already exist in more established sectors, such as fisheries, maritime transport, and tourism, but they are less evident in newer and emerging sectors. There is thus an opportunity to develop additional partnerships to support national, regional, and international efforts in emerging industries, such as deep-sea mining, marine biotechnology, and renewable ocean energy. The goal of such partnerships is to agree on common goals, build government and workforce capacity in the SIDS and coastal LDCs, and to leverage actions beyond the scope of individual national governments and companies.

INTRODUCTION



Humanity's relationship with the oceans, and how people use and exploit their resources, is evolving in important ways. While the oceans are increasingly becoming a source of food, energy, and products such as medicines and enzymes, there is also now a better understanding of the non-market goods and services that the oceans provide, which are vital for life on Earth. People also understand that the oceans are not limitless and that they are suffering from increasing and often cumulative human impacts. Oceans that are not healthy and resilient are not able to support economic growth.

The fact that oceans and seas matter for sustainable development is undeniable. Oceans and seas cover over two-thirds of Earth's surface, contribute to poverty eradication by creating sustainable livelihoods and decent work, provide food and minerals, generate oxygen, absorb greenhouse gases and mitigate the impacts of climate change, determine weather patterns and temperatures, and serve as highways for seaborne international trade. With an estimated 80 percent of the volume of world trade carried by sea, international shipping and ports provide crucial linkages in global supply chains and are essential for the ability of all countries to gain access to global markets (UNCTAD 2016).

The "blue economy" concept seeks to promote economic growth, social inclusion, and preservation or improvement of livelihoods while at the same time ensuring environmental sustainability. At its core it refers to the decoupling of socioeconomic development through oceans-related sectors and activities from environmental and ecosystems degradation (UNCTAD 2014; UN DESA 2014a). Challenges in the sustainable use of marine resources—such as the impacts of climate change in the form of rising sea levels, increased frequency and severity of extreme weather events, and rising temperatures—are going to have direct and indirect impacts on oceans-related sectors, such as fisheries, aquaculture, and tourism, and on maritime transport infrastructure, such as ports, with broader implications for international trade and for the development prospects of the most vulnerable nations, in particular coastal least developed countries (LDCs) and small island developing states (SIDS). While the blue economy, both as a concept and in practice, is relevant to all countries, this paper focuses on SIDS and coastal LDCs.

RELATIONSHIP OF SIDS AND COASTAL LDCs TO OCEANS, SEAS, AND MARINE RESOURCES

SDG Target 14.7 of the U.N. Sustainable Development Goals focuses on enhancing the economic benefits to SIDS and LDCs from the sustainable use of marine resources, including through the sustainable management of fisheries, aquaculture, and tourism. The world has 54 lower and lower-middle income coastal and island countries for whom oceans represent a significant jurisdictional area and a source of tremendous opportunity. Oceans and their marine resources are thus the base upon which the economies of many SIDS and coastal LDCs are built, and they are central to their culture and sustainable development, to poverty reduction, and to achieving the Sustainable Development Goals.

Small island developing states face particular challenges to their sustainable development, including small populations, limited resources, vulnerability to natural disasters and external shocks, and strong dependence on international trade. Their growth and development is often hampered by high transportation and communication costs, disproportionately expensive public administration and infrastructure due to their small size, and little or no opportunity to create economies of scale (FAO 2014b). The particular vulnerabilities and challenges of SIDS were among others recognized in the Barbados Programme of Action, the Mauritius Strategy of Implementation, the Rio+20 outcome document, and the SIDS Accelerated Modalities of Action (Samoa) Pathway. In the Samoa Pathway, SIDS recognized that “sustainable fisheries and aquaculture, coastal tourism, the possible use of seabed resources and potential sources of renewable energy are among the main building blocks of a sustainable ocean-based economy in SIDS” and expressed their support for sustainable development of ocean resources. Indeed, SIDS often argue that they are better described as “large ocean states,” to acknowledge the size of their Exclusive Economic Zones (EEZs) and the importance of oceans for their lives and livelihoods.¹

Least developed countries are the poorest countries. Their low level of socioeconomic development is characterized by weak human and institutional capacities, low and unequally distributed income, and a scarcity of domestic financial resources. They often suffer from governance difficulties, political instability, and, in some cases, internal and external conflicts. Their largely agrarian economies are affected by a vicious cycle of low productivity and low investment. They rely on the export of a few primary commodities as the major source of export and fiscal earnings, which makes them highly vulnerable to external terms-of-trade shocks. Only a handful has been able to diversify into the manufacturing sector, although

¹ See, for example, speech by Ronny Jumeau, Seychelles Ambassador for Climate Change and SIDS Issues at the United Nations in 2013 entitled “Small Island Developing States, Large Ocean States” (https://sustainabledevelopment.un.org/content/documents/1772Ambassador%20Jumeau_EGM%20Oceans%20FINAL.pdf).

with a limited range of products in labor-intensive industries (textiles and clothing) (UN-OHRLLS 2016).

Similar conditions in SIDS and coastal LDCs provide a basis to pursue a low-carbon and resource-efficient path of economic growth and development designed to enhance livelihoods for the poor, create employment opportunities, and reduce poverty (UN DESA 2008). For both SIDS and coastal LDCs, the move toward a blue economy provides an opportunity to address their particular challenges in a sustainable way. Because their economies rely significantly on natural resources and biodiversity in marine and coastal areas, there is a large potential for diverse ocean economies—from established industries such as fisheries to newer areas such as renewable ocean energy.

SIDS and coastal LDCs, however, often lack the technical, institutional, technological, and financial capacities

to benefit to the fullest from their marine resources. This lack of capacities and resources will need to be addressed in order to allow the blue economy to achieve economic diversification, job creation, poverty reduction, and economic development in SIDS and coastal LDCs. Growth in the blue economy will require an appropriately skilled workforce and the promotion of science, technology, innovation, and multidisciplinary research. Realizing the full potential of the blue economy also requires the effective inclusion of all societal groups, especially women, young people, local communities, indigenous peoples, and marginalized or underrepresented groups (UNECA 2016).

THE TRANSITION TO A BLUE ECONOMY



Sustainable development implies that economic development is both inclusive and environmentally sound, and to be undertaken in a manner that does not deplete the natural resources that societies depend on in the long term. The need to balance the economic, social, and environmental dimensions of sustainable development in relation to oceans is a key component of the blue economy. It is also a difficult balance to reach in practice, given that ocean resources are limited and the health of the oceans has drastically declined due to human activities—ranging from damage caused by carbon dioxide emissions to nutrient, chemical, and plastics pollution, unsustainable fishing, habitat degradation and destruction, and the spread of invasive species. The scientists and experts who prepared the First Global Integrated Marine Assessment (also known as the World Ocean Assessment) warned that the world’s oceans face major pressures simultaneously with such great impacts that the limits of their carrying capacity are being reached—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 greater environmental, social, and economic costs (United Nations 2016).²

The importance of oceans for sustainable development is widely recognized by the international community and was embodied in, among others, *Agenda 21*, the Johannesburg Plan of Implementation, various decisions taken by the Commission on Sustainable Development, the Rio+20 outcome document *The Future We Want*, and the 2030 Agenda for Sustainable Development. The 1982 United Nations Convention on the Law of the Sea (UNCLOS), together with its implementing agreements—the 1994 Agreement relating to the implementation of Part XI of UNCLOS and the 1995 United Nations Fish Stocks Agreement—sets out the legal framework within which all activities in the oceans and seas must be carried out and is of strategic importance as the basis for national, regional, and global action and cooperation in the marine sector. This includes the conservation and sustainable use of all areas of the oceans and their resources. The concept of a blue economy came out of the 2012 Rio+20 Conference and emphasizes conservation and sustainable management, based on the premise that healthy ocean ecosystems are more productive and form a vital basis for sustainable ocean-based economies (UN DESA 2014a).

Under “business as usual,” the costs of marine ecosystem degradation from human uses should be high, but they are not quantified or accounted for. At the same time, the economic contribution of the ocean to humankind has been significantly undervalued (Economist

² The First Global Integrated Marine Assessment was welcomed with appreciation by the U.N. General Assembly and its Summary was approved.

Intelligence Unit 2015), in particular where the value of non-market goods and services, such as carbon sequestration, coastal protection and recreation, and cultural and spiritual values, are concerned. In contrast, a new form of understanding the oceans, and which incorporates environmental and social dimensions, requires a paradigm shift—acknowledging and valuing all ocean benefits (UNEP 2015).

The blue economy moves beyond business as usual to consider economic development and ocean health as compatible propositions. It comes from a realization that humanity cannot continue, let alone accelerate, human-induced changes to ocean ecosystems. In a blue economy, the environmental risks of and ecological damage from economic activity are mitigated or significantly reduced (Economist Intelligence Unit 2015). Thus economic activity is in balance with the long-term capacity of ocean ecosystems to support this activity and remain resilient and healthy. It is generally understood to be a long-term strategy aimed at supporting sustainable economic growth through oceans-related sectors and activities, while at the same time improving human well-being and social equity and preserving the environment (UNEP 2013; UNCTAD 2016).

A blue economy is low-carbon, efficient, and clean (UN DESA 2014a). It is also an economy that is based on sharing, circularity, collaboration, solidarity, resilience, opportunity, and interdependence (UNEP 2015). Its growth is driven by investments that reduce carbon emissions and pollution, enhance energy efficiency, harness the power of natural capital—such as the oceans—and halt the loss of biodiversity and the benefits that ecosystems provide (UNEP 2013).

Blue growth, or environmentally sustainable economic growth based on the oceans, is a strategy of sustaining economic growth and job creation necessary to reduce poverty in the face of worsening resource constraints and climate crisis. The World Bank, for example, defines green growth as “growth that is efficient in its use of natural resources, clean in that it minimizes pollution and environmental impacts, and resilient in that it accounts for natural hazards and the role of environmental management and natural capital in preventing physical disasters” (World Bank 2012a).

While stimulating growth in oceans-related sectors is comparatively straightforward, it is not always clear what a sustainable blue economy should look like and the conditions under which it is most likely to develop (Economist Intelligence Unit 2015). For each country, the formula is likely to be different, depending on:

- Unique national circumstance
- Maritime zones (waters under its sovereignty and those in which it has sovereign rights for the

exploration and exploitation, conservation, and management of living and non-living marine resources)

- Existing economic activities and the degree to which they can be expanded without undue harm to the environment
- The potential for new and innovative activities
- Issues related to capacities and unique environmental, social, and cultural conditions.

Each country will thus need to draft its vision for a sustainable oceans economy, including how to balance growth and sustainability to enable optimal use of ocean resources with maximum benefit (or at least minimal harm) to the environment. The vision could be supported by development of plans and policies, sometimes referred to as blue economy plans, for the maritime zones of each country, which would support the attainment of the agreed-upon vision. The vision must further be anchored in the provisions of UNCLOS, which provides the necessary legal certainty with respect to maritime rights and obligations of states, including with regard to maritime space and resources.

The blue economy can include established ocean industries such as fisheries and tourism as well as emerging and new activities—such as offshore renewable energy, aquaculture, seabed mining, and marine biotechnology. Larger industries such as coastal development, shipping, and port infrastructure and services also rely on the oceans, seas, and coasts. Underlying the need for diversified economies are demographic trends such as population growth and rapid coastal urbanization, which fuel the search for food and job security and for alternative sources of minerals and energy, as well as seaborne trade. At the same time, new technologies can offer significant opportunities to tap into new and previously unexploited resources (UNEP 2015; UN DESA 2014a; Economist Intelligence Unit 2015).

The environmental and social impacts of each of these industries, as well as their potential economic benefits, are unique. And their contribution to the blue economy will need to be weighed against principles and policies that have been established globally, regionally, and/or nationally. For an activity to contribute to the blue economy, it would need to include at least two of the four elements of resource efficiency: reducing food loss and waste along the value chain, energy efficiency (reducing the carbon footprint), decent employment, and innovative financing or technologies. In addition, the project would need to provide environmental, social, and economic benefits (FAO 2014c; WWF 2015; UN DESA 2014a). Box 1 provides a proposed set of principles for a sustainable blue

Box 1: One Example of Principles for a Sustainable Blue Economy

While there is no universally accepted definition of the blue economy, many agencies and organizations are working on describing how they understand the concept. One example are the principles submitted by WWF. Other principles and descriptions are used by different sectors, governments, and organizations.

A SUSTAINABLE BLUE ECONOMY is a marine-based economy that . . .

- **Provides social and economic benefits for current and future generations** by contributing to food security, poverty eradication, livelihoods, income, employment, health, safety, equity, and political stability.
- **Restores, protects, and maintains the diversity, productivity, resilience, core functions, and intrinsic value of marine ecosystems**—the natural capital upon which its prosperity depends.
- **Is based on clean technologies, renewable energy, and circular material flows** to secure economic and social stability over time, while keeping within the limits of one planet.
- **Is governed by public and private processes that are . . .**
 - Inclusive
 - Well-informed, precautionary, and adaptive
 - Accountable and transparent
 - Holistic, cross-sectoral, and long-term
 - Innovative and proactive

To create a SUSTAINABLE BLUE ECONOMY, public and private actors must . . .

- Set clear, measurable, and internally consistent goals and targets for a Sustainable Blue Economy.
- Assess and communicate their performance on these goals and targets.
- Create a level economic and legislative playing field that provides the Blue Economy with adequate incentives and rules.
- Plan, manage, and effectively govern the use of marine space and resources, applying inclusive methods and the ecosystem approach.
- Develop and apply standards, guidelines, and best practices that support a Sustainable Blue Economy.
- Recognize that the maritime and land-based economies are interlinked and that many of the threats facing marine environments originate on land.
- Actively cooperate, sharing information, knowledge, best practices, lessons learned, perspectives, and ideas, to realize a sustainable and prosperous future for all.

Excerpted from WWF 2015.

economy, as suggested by one of the participants in Informal Preparatory Working Group 6.

An important dimension of the blue economy involves how established ocean industries are transitioning to more environmentally responsible practices. An early example of this comes from the fisheries sector. The Blue Growth Initiative of the Food and Agriculture Organization of the United Nations (FAO) will assist countries in developing and implementing blue economy and growth agendas by:

- Eliminating harmful fishing practices and over-fishing and instead incentivizing approaches that promote growth, improve conservation, build sustainable fisheries, and end illegal, unreported, and unregulated (IUU) fishing.
- Ensuring tailor-made measures that foster cooperation between countries.
- Acting as a catalyst for policy development, investment, and innovation in support of food security, poverty reduction, and the sustainable management of aquatic resources (FAO 2017).

The work of FAO is anchored in the principles of its Code of Conduct for Responsible Fisheries, and in this context, research shows that only fisheries that are well governed and well managed can make a long-term contribution to the blue economy.

With established industries such as fisheries leading the way toward tackling the transition to a blue economy, the challenge lies in forming an integrated view of all economic activities, both old and new, relating to the oceans and ensuring that they are undertaken in an environmentally sustainable and socially inclusive manner. As part of this process, it is important to determine what critical elements are required for a blue economy relating to governance, science, cooperation, innovation, capacity, and financing, among other considerations (Economist Intelligence Unit 2015).

A blue economy is supported by a trusted and diversified knowledge base and complemented with resources, which helps to inspire and support innovation (UNEP 2015). In too many instances, clear policy frameworks are not developed at the national level, yet are essential, as is an engaged process of stakeholder consultation and co-creation of a common vision for the blue economy nationally.

In summary, some of the elements required for the transition to a blue economy include the following.

Effective implementation of UNCLOS, its two implementing agreements, and other relevant conventions and instruments. UNCLOS is widely considered to serve as “the constitution for the oceans,” thereby providing for a

legal order in the oceans, the very foundation of sustainable economies. As such, it is accepted as the framework that provides for the rights and obligations of States in the oceans, including defining the various maritime zones of jurisdiction and corresponding rights and obligations of states within them. It accommodates different uses of the oceans for economic and social development, balanced with the need to protect and preserve the marine environment. UNCLOS and related agreements serve to guide the management of the oceans and seas and the activities that take place on and within them, and they contribute to international peace and security, the equitable and efficient use of ocean resources, the protection and preservation of the marine environment, and the realization of a just and equitable economic order.

An assessment of the value of marine resources and their corresponding ecosystem services. Not only are marine living resources poorly measured and understood, they are also rarely valued properly. Measuring the blue economy gives a country a first-order understanding of the economic importance of the oceans and seas. In Mauritania, for instance, a study showed that the value of fisheries and renewable marine resources was much greater than that of the minerals that were the basis for most government decisions on marine resource management. Understanding that, in comparison with mineral resources, marine living resources are of much higher total value and renewable, the government adopted an alternative approach to development based on realizing the long-term potential for blue growth (Mele 2014).

Increased reliance on evidence-based decision making. Countries increasingly recognize that they need more knowledge on biophysical characteristics, carrying capacity, and synergies or trade-offs between oceans-related sectors to ensure an efficient and sustainable management of different activities. Better scientific and economic data are required to understand these activities and their environmental costs. Marine and coastal spatial planning and integrated maritime surveillance can give authorities, businesses, and communities a better picture of what is happening in this unique space. Digital mapping of maritime and coastal space and natural assets in turn can form the basis for cross-sectoral analysis and planning in order to prevent conflicts and avoid externalities. Similarly, the growing science of data-limited stock assessments can provide critical information needed for improved fisheries management. In some instances, such as in South Africa and Indonesia, mobile technology is being tested to gather previously unavailable data, for example on fish landings and fish stock health (World Bank 2016a).

A framework for ecosystem-based management. Historically, economic activity in the oceans has been managed

on a sectoral basis, with only limited coordination between ministries, regulatory bodies, and industry when overseeing, among other things, overlap of property rights (particularly licenses for the exploration of extractive materials), shipping routes, and fishing grounds. Governing a sustainable blue economy will be far more complex (Economist Intelligence Unit 2015). Unlike sectoral approaches that can lead to disconnected decisions, inefficient resource use, and missed opportunities, ecosystem-based management in which both the economy and ecosystems thrive will use tools such as integrated coastal zone management, marine spatial planning (MSP), and marine protected areas (MPAs) as part of the transition to a blue economy. (These are discussed further later in this paper.) Ecosystem-based management can facilitate a coordinated approach to the application of different policies affecting the coastal zone and maritime activities, from traditional ocean sectors to new businesses focused on ocean health. For ecosystem-based management to be successful, several supporting conditions must be met, including clear laws and regulations, strong institutions and interministerial cooperation, inclusive decision-making processes involving all stakeholders, evidence-based support, and credible arbitration mechanisms (Economist Intelligence Unit 2015). This institutional support and capacity varies greatly among countries.

Improved governance to grow a blue economy. This is essential for sustainable use of oceans, seas, and marine resources, for biodiversity conservation, for improved human well-being, and for ecosystem resilience. The use of science, data and technology is critical to underpin governance reforms and shape management decisions. Traditional knowledge and practices can also provide culturally appropriate approaches for supporting improved governance.

New data that can sway decision makers. Well managed, the goods and services produced from marine ecosystems could make a much greater contribution to reducing poverty, building resilient communities, fostering strong economies, and feeding over 9 billion people by 2050. For example, the World Bank's 2016 *Sunken Billions Revisited* report shows that fisheries properly managed, with a significant reduction in overcapacity and overfishing, could provide additional economic benefits to the global economy in excess of US\$80 billion each year (World Bank 2016b). That is almost 30 times the annual net benefits currently accruing to the fisheries sector in spite of prevalent overfishing.

Broad and resilient partnerships for coordination and collaboration of blue economy projects and initiatives. According to an analysis of case studies by the United Nations Environment Programme (UNEP), the blue

economy makes its strongest gains when leveraging existing institutional relationships to address strategic gaps that affect multiple sectors and players and that catalyze visible benefits for them in the long term (UNEP 2015). A shift to a blue economy requires dedicated short- and long-term efforts, which can seize existing opportunities to bring together stakeholders. In addition, the blue economy requires the building of inclusive processes, including a concerted effort to identify and involve marginalized groups (UNEP 2015). Improving market infrastructure and access for small-scale and artisanal fishers can create more-sustainable outcomes that benefit the poor, for example through building on buyer demand for sustainable seafood.

Innovative financing to direct investments into economic activities that can enhance ocean health. Many public and private economic activities that could serve to restore ocean health will carry higher upfront costs and returns that will not immediately accrue to investors (Economist Intelligence Unit 2015). This suggests the need for new and innovative financing mechanisms, more capital than is currently being deployed, and a greater degree of collaboration between the public and private sectors (Economist Intelligence Unit 2015). The private sector can play a key role in the blue economy, especially in SIDS. Business is the engine for trade, economic growth, and jobs, which are critical to poverty reduction.

Indicators to measure and track progress. Indicators used to track progress toward social and ecological sustainability are largely ignored in standard economic metrics such as gross domestic product (GDP) and will be needed to measure key transformation changes in different sectors of the blue economy (UNEP 2015).³ Thus, in countries like Mauritius, an important step in developing a blue economy has been the exploration of alternative economic indicators, based on the recognition that well-being is supported by a variety of economic, social, cultural, and natural assets and processes. Such initiatives are fundamental to developing more diversified, country-specific goals and progress indicators (UNEP 2015). These, in turn, are crucial to formulating policies that can halt ecosystem losses and thereby provide clearer pathways to sustained blue economy prosperity in the long term. Sector-specific monitoring is also necessary to fully understand the economic, environmental, and social impacts of each sector on local and national levels. For example, the International Network of Sustainable Tourism Observatories of the United Nations World Tourism Organization (UNWTO) monitors these impacts

³ In contrast, for all the targets set up under each Sustainable Development Goal, including SDG14, a series of indicators are suggested, against which achievement of the relevant goal can be assessed.

on the destination level, fostering the evidence-based management of tourism.

In the context of its initiative on Wealth Accounting and the Valuation of Ecosystem Services, the World Bank has recently led a joint effort to improve the availability of natural solutions to managing coastal areas. This initiative resulted in the publication of “Managing Coasts with

Natural Solutions—Guidelines for Measuring and Valuing the Coastal Protection Services of Mangroves and Coral Reefs.” This newly developed methodology could in turn be expanded to other, non-tropical marine and coastal ecosystems, leading to much improved decision making based on accurate assessment and valuation of ecosystems and the natural services they provide.

CHALLENGES TO THE BLUE ECONOMY

The potential to develop the blue economy is limited by a series of challenges. For much of human history, aquatic ecosystems have been viewed and treated as limitless resources and largely cost-free repositories of waste. These resources, however, are far from limitless, and the world is increasingly seeing the impacts of this approach. The narrow coastal interface is oversubscribed by myriad sectors and is increasingly affected by climate change. Rising demand, ineffective governance institutions, inadequate economic incentives, technological advances, lack of or inadequate capacities, lack of full implementation of UNCLOS and other legal instruments, and insufficient application of management tools have often led to poorly regulated activities. This in turn has resulted in excessive use and, in some cases, irreversible change of valuable marine resources and coastal areas. In this increasingly competitive space, the interests of those most dependent and vulnerable (for example, small-scale artisanal fishers) are often marginalized, mostly for the benefit of other, more visible sectors (such as coastal tourism), where the actual economic benefits—while more clearly apparent at first—may actually be ephemeral or directly exported to foreign investors.

The major human impacts include, among others, the following:

- **Unsustainable extraction from marine resources, such as unsustainable fishing** as a result of technological improvements coupled with poorly managed access to fish stocks and rising demand. FAO estimates that approximately 57 percent of fish stocks are fully exploited and another 30 percent are over-exploited, depleted, or recovering (FAO 2016). Fish stocks are further exploited by illegal, unreported, and unregulated fishing, which is responsible for roughly 11–26 million tons of fish catch annually, or US\$10–22 billion in unlawful or undocumented revenue.
- **Physical alterations and destruction of marine and coastal habitats and landscapes** due largely to coastal development, deforestation, and mining. Coastal erosion also destroys infrastructure and livelihoods. Unplanned and unregulated development in the narrow coastal interface and nearshore areas has led to significant externalities between sectors, suboptimal siting of infrastructure, overlapping uses of land and marine areas, marginalization of poor communities, and loss or degradation of critical habitats.
- **Marine pollution**, for example in the form of excess nutrients from untreated sewerage, agricultural runoff, and marine debris such as plastics.
- **Impacts of climate change, for example in the form of** both slow-onset events like sea-level rise and more intense and frequent weather events. The long-term climate

change impacts on ocean systems are not yet fully understood, but it is clear that changes in sea temperature, acidity, and major oceanic currents, among others, already threaten marine life, habitats, and the communities that depend on them.

- **Unfair trade.** Exclusive Economic Zones, areas in which a state has sovereign rights over exploration and use of marine resources, are crucial to the economies of small island developing states and often dwarf their corresponding land mass and government's administrative capacity. (In Tuvalu, for instance, the EEZ is more than 26,000 times the size of the land mass.) In the case of fishing agreements allowing access to an EEZ, there is usually a low appropriation of fisheries export revenues by national operators and insufficient transfer to national stakeholders of specific fishing knowledge by foreign fishing companies, so the potential for national exploitation of those resources is reduced in the long run.

Despite a range of actors and large investments, current attempts to overcome these challenges have mostly been piecemeal, with no comprehensive strategy (for example, disparate efforts centered on fisheries governance, improving ports, marine litter efforts, and so on). Even when one sectoral policy achieves some success, these results are often undermined by externalities from

activities in another sector. For example, coastal zone management efforts, or support to coastal fishers, tend to be undermined by unbridled sand mining, ill-sited ports or aquaculture farms, or unregulated tourism development. In coastal zones, declines in mangrove forest habitat resulting from habitat conversion, wood harvest, sea-level rise, destruction of dune systems from sand mining, and changes in sediment and pollutant loading from river basins combined with land reclamation for agriculture or infrastructure have serious negative impacts on fisheries by reducing or degrading spawning and feeding habitats. Loss of mangrove forests, for instance, threatens profits from seafood harvests in excess of US\$4 billion per year; in Belize, mangrove-rich areas produce on average 71 percent more fish biomass than areas with few mangroves.

In view of the challenges facing SIDS and coastal LDCs, partnerships can be looked at as a way to enhance capacity-building. Such partnerships already exist in more established sectors, such as fisheries, maritime transport, and tourism, but are found less in newer and emerging sectors. There is thus an opportunity to develop additional partnerships around newer economic activities, such as marine biotechnology and renewable ocean energy. A list of partnerships relating to the blue economy and its diverse sectors is available on the UN DESA website (<https://www.un.org/development/desa/en/>). The list of partnerships is dynamic and can be updated by users.

SECTORS OF THE BLUE ECONOMY



Oceans-related economic activities are developing against a backdrop of soaring global population, growing consumption, and the ever growing need for new sources of food, energy, and minerals. For example, by 2030 two thirds of the fish for food consumption is expected to be farmed, much of it at sea (World Bank 2013). Offshore wind capacity is forecast to rise to become the leading power generation technology by 2030 (IRENA 2016), and seaborne trade is expected to quadruple by 2050 (ITF 2015). On land, the oceans-related economy will experience a surge in investment in coastal infrastructure, industry, and tourism as the global migration to cities and coasts deepens. At the same time, the risks to coastal populations from rising sea levels and storm surges as a result of climate change will drive the need for a wave of defensive infrastructure development.

As defined earlier, the blue economy consists of sectors whose returns are linked to the living “renewable” resources of the oceans (such as fisheries) as well as those related to non-living and therefore “non-renewable” resources (including extractive industries, such as dredging, seabed mining, and offshore oil and gas, when undertaken in a manner that does not cause irreversible damage to the ecosystem). It also includes activities relating to commerce and trade in and around the oceans, ocean monitoring and surveillance, and coastal and marine area management, protection, and restoration. The following table provides a summary of the types of activities in the blue economy, related industries and sectors, and drivers of growth.

Components of the Blue Economy

Type of Activity	Activity Subcategories	Related Industries/Sectors	Drivers of Growth
Harvesting and trade of marine living resources	Seafood harvesting	Fisheries (primary fish production)	Demand for food and nutrition
		Secondary fisheries and related activities (e.g., processing, net and gear making, ice production and supply, boat construction and maintenance, manufacturing of fish- processing equipment, packaging, marketing and distribution)	Demand for food and nutrition
		Trade of seafood products	Demand for food, nutrition, and protein
		Trade of non-edible seafood products	Demand for cosmetic, pet, and pharmaceutical products
	Aquaculture	Demand for food, nutrition, and protein	
	Usage of marine living resources for pharmaceuticals and chemicals	Marine biotechnology and bioprospecting	R&D and usage for health care, cosmetic, enzyme, nutraceutical, and other industries
Extraction and use of marine non-living resources (non-renewable)	Extraction of minerals	(Seabed) mining	Demand for minerals
	Extraction of energy sources	Oil and gas	Demand for (alternative) energy sources
	Freshwater generation	Desalination	Demand for freshwater
Use of renewable non-exhaustible natural forces (wind, wave, and tidal energy)	Generation of (off-shore) renewable energy	Renewables	Demand for (alternative) energy sources

(continued)

Type of Activity	Activity Subcategories	Related Industries/Sectors	Drivers of Growth
Commerce and trade in and around the oceans	Transport and trade	Shipping and shipbuilding	Growth in seaborne trade; transport demand; international regulations; maritime transport industries (shipbuilding, scrapping, registration, seafaring, port operations, etc.)
		Maritime transport	
	Coastal development	Ports and related services	Coastal urbanization, national regulations
		National planning ministries and departments, private sector	Global growth of tourism
Indirect contribution to economic activities and environments	Tourism and recreation	National tourism authorities, private sector, other relevant sectors	
	Carbon sequestration	Blue carbon	Climate mitigation
	Coastal Protection	Habitat protection, restoration	Resilient growth
	Waste Disposal for land-based industry	Assimilation of nutrients, solid waste	Wastewater Management
	Existence of biodiversity	Protection of species, habitats	Conservation

This section offers an overview of different sectors of the blue economy, including, where information is available, the importance of that sector to SIDS and coastal LDCs. Annex 1 provides a list of linkages with other goals of SDG14.

Fisheries

Sustainable fisheries can be an essential component of a prosperous blue economy, with marine fisheries contributing more than US\$270 billion annually to global GDP (World Bank 2012b). A key source of economic and food security, marine fisheries provide livelihoods for the 300 million people involved in the sector and help meet the nutritional needs of the 3 billion people who rely on fish as an important source of animal protein, essential micro-nutrients, and omega-3 fatty acids (FAO 2016).

The role of fisheries is particularly important in many of the world's poorest communities, where fish are a critical source of protein and the sector provides a social safety net. Women represent the majority in secondary activities related to marine fisheries and marine aquaculture, such as fish processing and marketing. In many places, employment opportunities have enabled young people to stay in their communities and have strengthened the economic viability of isolated areas, often enhancing the status of women in developing countries. For billions around the world—many among the world's poorest—healthy fisheries, the growing aquaculture sector, and inclusive trade mean more jobs, increased food security and well-being, and resilience against climate change.

While the impacts of climate change are being felt throughout the ocean realm, they are particularly acute for fisheries, the fish stocks they target and the marine coastal ecosystems on which they depend. Understanding

of these impacts is constantly improving and can be organized around several main “vectors”: acidification, sea-level rise, higher water temperatures, and changes in ocean currents. These different vectors, however, are unequally known and hard to model, in terms of both scope—where they will occur, where they will be felt the most—and severity. For instance, while not as well understood as the other impacts, and more difficult to measure, the impacts of acidification are likely to be the most severe and most widespread, essentially throughout any carbon-dependent ecological processes. Likewise, the effects of sea-level change will be felt differently in different parts of the world, depending on the ecosystems around which it occurs. Most importantly, however, and unlike in terrestrial ecosystems, further uncertainty results from the complex interactions within and between these ecosystems. In spite of this uncertainty, the current state of knowledge is sufficient to understand that these impacts will add to the current global fisheries crisis, thus adding a renewed and increasing sense of urgency.

All this is at risk from overcapacity, overfishing, unregulated development, and habitat degradation, driven largely by poverty and enabled by ineffective policy. Based on FAO’s analysis of assessed commercial fish stocks, the share within biologically sustainable levels decreased from 90 percent in 1974 to 68.6 percent in 2013. Thus, 31.4 percent of fish stocks were estimated as fished at a biologically unsustainable level and therefore overfished (FAO 2016). Fish stocks are further affected by illegal, unreported, and unregulated fishing, which as noted earlier accounts for roughly 11–26 million tons of fish catch, or US\$10–22 billion in unlawful or undocumented revenue. Thus, IUU fishing is responsible for about the same amount of global harvest as would be gained by ending overfishing and rebuilding fish stocks (United Nations 2016). In fact, poor fisheries management results in foregone revenues of more than US\$80 billion annually, which could be recovered if global fisheries were reformed significantly, including through a 44 percent reduction in the level of fishing (World Bank 2017).

Since 2002, distorting fisheries subsidies that contribute to overcapacity and overfishing have been the subject of negotiations to establish disciplines at the UNWTO, where from the outset a positive outcome has been identified as a potential win-win-win for trade, sustainable development, and the environment. In addition, the persistently high volume of post-harvest losses removes large quantities of fish from the market—up to 25 percent in many developing countries (FAO 2016). Minimizing post-harvest losses is one key to increasing revenues and food security without the need to increase the level of fishing effort.

For many SIDS, fisheries constitute a significant pillar of their economy and a major source of livelihoods. The health and sustainability of fisheries are inextricably linked to the sustainable development of SIDS. According to FAO, the long-term sustainability of fisheries in SIDS has been threatened by overexploitation of living marine resources, land-based pollution, and inadequate fisheries monitoring control and surveillance systems at both national and regional levels. In general, inshore capture fisheries adjacent to centers of urban population are heavily fished, if not overfished. Offshore capture fisheries and associated processing activities provide major economic benefits for a limited number of SIDS. Increasingly, the management of inshore fisheries in SIDS is now taking into account traditional resource use practices, which have served to regulate the exploitation and conserve these resources for generations. Coastal LDCs face similar challenges.

The licensing of foreign fishing vessels in EEZs is particularly important for some SIDS and coastal LDCs that lack the capacity to harvest the resources themselves. In some instances, revenue from access fees represents a significant proportion of national income, but in cases where fees are linked to prices on the global market, wide fluctuations in prices create instability in national revenue, which in turn further increases the vulnerability of SIDS and their dependence on external support.

The main factors that constrain the development and management of the fisheries sector in SIDS and LDCs include a lack of institutional and human capacity in both the public and private sectors, complexities of inshore fisheries management, post-harvest losses, poorly developed safety regulations for fishing vessels, and fledgling and underdeveloped national fishing industries for the harvesting and processing of offshore resources.

Research indicates that only fisheries that are well governed and managed can make a long-term contribution to the blue economy, making governance reform a key component of a transition toward a blue economy. The FAO Code of Conduct for Responsible Fisheries and its related international agreements provide a solid framework for the sector, which can and should be drawn upon much more extensively.⁴

⁴ A practical example of facilitating implementation of the Code of Conduct for Responsible Fisheries is provided in the FAO Global Partnerships for Responsible Fisheries Program, “FishCode,” which includes a component specifically targeted at SIDS (the SIDS Project).

Aquaculture

The world's population is expected to rise to 9.6 billion by 2050, creating a considerable demand for food and sources of protein. Today, fish and fish products supply a significant portion of the daily intake of animal protein in many developing countries. As aquaculture supplies 58 percent of fish to global markets (FAO 2016), invigorating this sector can contribute to food security as well as social and economic inclusion for some of the poorest people in the world. Locally, aquaculture can help lessen the need for fish imports and increase employment, as well as contribute to food security and meet nutrition needs.

For many SIDS and coastal LDCs, the promotion of aquaculture development for food security could play a crucial role. In the Caribbean, for example, a recent report on fisheries and aquaculture suggests that a Caribbean Blue Revolution is needed and possible. It argues that aquaculture development could increase total fish production in the CARICOM states by 30 percent within 10 years if essential investments are made in enabling aquaculture policy and legal frameworks, supported by applied research, capacity building, and information (FAO 2014a).⁵ Similarly, aquaculture has been proposed as a potential way to provide additional food security for Pacific SIDS by filling gaps in domestic fish supplies (Secretariat of the Pacific Community 2010). A recent analysis predicts that coastal fisheries in 16 of the 22 Pacific Island countries and territories will not be able to provide sufficient nutrition to a rapidly growing population by 2020 and that improved access to tuna, more-efficient fisheries governance, and expansion of pond aquaculture can collectively improve food security and public health (Bell et al. 2015).

Regardless of the size of operations, sustainable aquaculture, by definition, must be economically viable and environmentally sound. Additionally, in regions where aquaculture and fisheries have played a culturally significant role over a long period of time, it must also be culturally appropriate and must not be carried out at the expense of reducing access to essential resources by small-scale fishers and others.⁶

Examples of environmentally sustainable aquaculture include integrated multi-trophic aquaculture, seaweed aquaculture, shellfish aquaculture, and well-planned fish rearing based on an ecosystem approach.

⁵ As an example of the type of assistance that can be brought to bear on the sector, legal and technical support for aquaculture development under the FAO Blue Growth Initiative is currently provided by the establishment of the Network for Aquaculture in Micronesia; a similar regional and networking approach may be suitable for other regions.

⁶ The FAO Code of Conduct for Responsible Fisheries contains principles and provisions in support of sustainable aquaculture development, supported by Technical Guidelines (Ecosystem Approach to Aquaculture: EAA).

Coastal and Maritime Tourism

Tourism, fast becoming the largest global business, employs 1 out of every 11 persons globally. According to the World Travel and Tourism Council, travel and tourism's contribution to world GDP grew for the sixth consecutive year in 2015, rising to a total of 9.8 percent (US\$7.2 trillion) (WTTC 2016). The World Tourism Organization calculated that 2016 was the seventh consecutive year of sustained growth in international arrivals, which grew by 46 million over the previous year to reach 1,235 million. The number of international tourists visiting SIDS destinations increased from 28 million in 2000 to 41 million in 2013. In the same period, exports from tourism grew from US\$26 billion to US\$53 billion (UNWTO 2014).

Tourism can therefore be an important source of foreign exchange and is tied to the social, economic, and environmental well-being of many countries. Maritime or ocean-related tourism, as well as coastal tourism, are vital sectors of the economy in many countries, including in SIDS and coastal LDCs. Coastal and ocean-related tourism comes in many forms and includes dive tourism, maritime archaeology, surfing, cruises, ecotourism, and recreational fishing operations. Sustainable tourism can be part of the blue economy, promote conservation and sustainable use of marine environments and species, generate income for local communities (thus alleviating poverty), and maintain and respect local cultures, traditions, and heritage.

In this context, tourism, if it is well managed and monitored, can be an important contributor to the sustainable development of SIDS and coastal LDCs. The tourism sector has played a key role in the development of many island economies and in helping them advance in the fight against poverty. In addition, the sustainable development fostered by the tourism sector can trigger similar developments in other economic activities and help protect the natural and cultural resources of islands. Therefore, policies, programs, and interventions aimed at SIDS and other island economies can in some instances benefit from the inclusion of tourism as a sector to help accelerate sustainable consumption and production patterns in the development of the blue economy.

It should also be noted that the tourism sector in SIDS and coastal LDCs is vulnerable to the impacts of climate change as well as fluctuations in global economies. Thus, addressing vulnerabilities and developing resilience through coastal adaptation and multiple sources of income is important.⁷

⁷ The tourism industry is addressing environmental and social impacts through a number of voluntary initiatives and is conducting monitoring through the UNWTO International Network of Sustainable Tourism Observatories on the economic, environmental, and social impact of tourism at the destination level.

Numerous initiatives and policies can increase the contribution of tourism in SIDS and coastal LDCs:

- There is a need to maximize local benefits from tourism in SIDS and other island economies through increased stakeholder engagement, while remaining open to foreign investment and economic liberalization.
- Leakage from small island economies could be reduced by creating local employment opportunities, improving capacity development programs, developing local supply chains, and promoting tourism based on cultural heritage.
- SIDS, in particular, should confront their resource management challenges by safeguarding the local resource needs against increasing demands from tourism and by ensuring effective handling and disposal of waste generated in the tourism sector.
- Tourism can be used as a tool to directly and indirectly support coastal and biodiversity conservation so that natural resources are protected for the long-term sustainability of the tourism sector and the economy.
- Tourism development in SIDS and coastal regions should take into account the potential impact of climate change and adopt and implement adequate disaster risk reduction policies and practices in order to increase the resilience of tourism sector.
- SIDS should strengthen the links to local and regional markets and develop tourism products that encourage longer stays and maximize the expenditure per person in order to account for any potential changes in transportation costs and travel patterns, particularly the cost of air transportation.
- Adequate policies should be developed and implemented at the national and local levels to promote tourism while focusing on developing diversified products to avoid over-reliance on a single tourism product for revenue generation.
- Core principles of sustainability such as clear land-use planning and development control policies should be incorporated into tourism policies to explicitly address the impact of tourism on the environment and local communities.
- Initiatives to engage various stakeholders in tourism planning and development are integral to the social and environmental sustainability of SIDS.

Equally important is the collaboration between independent SIDS to effectively address key sustainability issues.

Marine Biotechnology and Bioprospecting

The exceptional biological diversity of the oceans—estimated to range from 700,000 to 1 million eukaryotic species (Appeltans et al. 2012) and millions more prokaryotic (Curtis, Sloan, and Scannell 2002) and viral taxa (Suttle 2013)—is an important source of novel genes and natural products, with applications in medicine, food, materials, and energy and across a wide array of bio-based industries. Marine biological prospecting includes the discovery from the ocean environment of novel genes and biological compounds that can lead to commercial development of pharmaceuticals, enzymes, cosmetics, and other products. Because of the low quantities of raw material that must usually be sampled, bioprospecting can generally be considered as having more limited environmental impacts (Hunt and Vincent 2005) and thus be a potential alternative to more-intensive extractive activities.

There is growing commercial interest in marine genetic resources, with the rate of patent applications related to marine genetic material rapidly increasing at rates exceeding 12 percent a year and with over 5,000 genes patented by 2010 that were derived from marine organisms. A majority of these patents have been filed by a few highly developed countries, highlighting the increasing biotechnology capacity gap between nations (Arnaud-Haond, Arrieta, and Duarte 2011).

Capacity-building and technology transfer relating to marine bioprospecting is likely to increase with the ongoing implementation of the Nagoya Protocol to the Convention on Biological Diversity (CBD), under which researchers expecting to commercialize natural products are required to share benefits with the host country. These benefits include both monetary and non-monetary benefits; the latter generally consist of partnerships between researchers in developing and industrial countries, capacity building, and the transfer of appropriate technologies (for example, setting up laboratory facilities in developing country universities).

With their rich and often underexplored marine biological diversity, SIDS and coastal LDCs have the potential to enter into discovery and development of marine genetic resources. A sea sponge from the Caribbean was the source of chemicals that led to the development of an anti-leukemia drug in the 1960s and to the HIV drug AZT in the 1980s, while venom from a cone shell from

the Indian Ocean led to the development of medication for chronic pain. Potential benefits from pharmaceutical bioprospecting in Montego Bay, Jamaica, have been estimated at US\$70 million, though the realization of such benefits is likely to take a long time, with the ultimate odds of developing a successful new drug relatively low (Creary 2007).

SIDS and coastal LDCs are faced with scientific capacity challenges, including a lack of expertise in taxonomy, difficulties in attracting and retaining qualified marine scientists, and limited research facilities and financial resources. Information sharing, capacity building, and the transfer of technology, including through the participation of developing states in research activities, are considered essential to address the general lack of scientific and other knowledge on marine genetic resources in developing countries. Research collaborations among institutions from industrial and developing countries have provided both training opportunities and technology transfer, though such collaborations have thus far been ad hoc and somewhat limited in scope.

A number of research collaborations relating to marine bioprospecting are already in place. For example, the University of South Pacific Centre for Drug Discovery and Conservation collaborates with the Georgia Institute of Technology and Scripps Institute of Oceanography on bioprospecting for marine pharmaceuticals.

Extractive Industries: Non-Living Resources

Offshore oil and gas exploration and exploitation are already under way off the coasts of many states around the world, and much has already been learned about the need to manage the risks these activities incur and some of the measures that can be taken to alleviate them. Less clear, however, is the need to balance the focus on these activities as opposed to other uses, which quite often are not compatible. It is ultimately up to the coastal states to weigh the trade-offs between these potentially lucrative activities and the extent to which they preclude other uses of marine resources, including the sustainable exploitation of marine living resources.

In contrast, the situation is much less clear with regards to the exploitation of offshore mineral resources. To meet the growing demand for minerals, momentum from both national governments and the private sector has catalyzed the development of deep-seabed mining, where a clear distinction must be made between minerals extraction under

national jurisdiction, within the EEZ of coastal states, and potentially beyond national jurisdiction, in the so-called Area, as clearly laid out under UNCLOS, and under the premises of the International Seabed Authority (ISA).

Activities within National Jurisdictions

While mining activity in the form of near-shore dredging and the extraction of aggregates has been taking place within areas under national jurisdiction for some time, recent technological developments have also fueled prospecting for other minerals in deeper areas.

Deep-sea exploration of minerals and resources has been of particular interest to some SIDS in the Pacific with promising geological prospects. Fiji, Papua New Guinea, the Solomon Islands, Tonga, and Vanuatu have granted permits for deep-sea mineral exploration, and the Cook Islands recently undertook a minerals exploration tender process. So far, Papua New Guinea is the only country in the Pacific region to have granted a license for ocean floor mining in an area under its national jurisdiction, through the Solwara 1 Project.

Little is still known about deep-sea habitats, their recovery potential, or the impact that mining operations are likely to have on ecosystems and the wider functioning of oceans. The short- and long-term impacts on economy and society in general remain largely unknown, and a lack of comprehensive and dedicated regulation and enforcement regimes across EEZs can be problematic. Furthermore, the exact interaction between minerals extraction from the seafloor and other activities, such as fishing and exploration of marine genetic resources, is still poorly understood.

For these and other reasons, and in the context of an extensive review of the potential for economic development of Pacific Island countries by 2040, a new World Bank report recommends that countries supporting or considering deep-sea mining (DSM) activities proceed with the highest degree of caution to avoid irreversible damage to the ecosystem and that they ensure that appropriate social and environmental safeguards are in place as part of strong governance arrangements for this emerging industry. The study highlights the need to take a precautionary approach, particularly in view of the potential impacts on marine living resources upon which these states depend almost exclusively (World Bank 2016c). In that context, the World Bank prepared a series of measures that can be considered in order to implement the precautionary approach to seabed mining to the fullest extent possible (see Box 2).

Box 2: Practical Steps toward a Precautionary Approach to Seabed Mining

Removing unknowns

- Fill gaps in baseline data in consideration of need for companies to provide data and institutions to effectively review technical & environmental reports
- Review and compile quantitative resource information, together with improved understanding of extraction (CAPEX and OPEX in a DSM mine model per deposit type)

Need for long-range seabed mining sector planning

- Build capacity for improved management to ensure efficient and effective exploitation
- Strengthen tax design to ensure appropriate government revenue and adequate incentives for investors
- Agree upon a financial model to better understand resource rent distribution, uncertainties, and good revenue administration to ensure that revenue is collected in practice
- Build capacity for improved public expenditure management to ensure that volatile and temporary natural resource revenue translates to permanent benefits for the nation and to manage the risk that resource wealth poses to the wider economy

Integrated marine management

- Build capacity for holistic integrated marine planning similar to landscape management, as is done with terrestrial mining

Capacity-building for effective implementation of the Precautionary Principle

- Include need for effective citizen engagement, including transboundary regional perspective
- Include regulatory monitoring and reporting

Information regarding costs/benefits for effective stakeholder engagement

- Base cost/benefit analysis on (a) the current conditions (“the baseline”), (b) the project scenario, and (c) a counterfactual without project scenario
- Take into consideration the cumulative effects of existing of planned projects within country’s EEZ and neighboring EEZs
- Agree a methodology for the estimation of losses in ecosystem services
- Assess losses in cultural and spiritual values associated with DSM

Regulatory and institutional strengthening

- Implement policy, legislative, institutional reforms on a country-by-country basis
- Ensure that the prescribed regime is consistent with international law and the World Bank Group Safeguards and Performance Standards
- Ensure that the legislation and regulations clearly define i) the requirements for assessing and documenting the environmental and social impacts and risks associated with the proposed DSM project, at each stage of the project, including prospecting, exploration, exploitation, closing, and post-exploitation; ii) monitoring and compliance requirements; iii) transparent and enforceable procedures, including public participation, at each step, and a grievance mechanism; (iv) contract administration

Opportunities for regional cooperation

- Recognize DSM challenges and associated regulatory compliance monitoring costs

Source: World Bank 2016c.

Activities in Areas Beyond National Jurisdiction

The International Seabed Authority has been established as the international body through which all States Party to UNCLOS organize and control seabed mining-related activities in the area beyond national jurisdiction (called the Area and defined as the seabed and ocean floor and subsoil thereof). The ISA has legislative and enforcement jurisdiction over activities in the Area. As such, the ISA is competent to adopt appropriate rules concerning the safety of life at sea and the marine environment, the installations used for the activities in the Area, the equitable sharing of benefits derived from activities undertaken in the Area, and the payment and contribution made pursuant to Article 83 of UNCLOS. The ISA also has specific powers to ensure compliance with contracts and the provisions of the 1994 Agreement Relating to the Implementation of Part XI of UNCLOS.

As of today, 26 contracts for exploration have entered into force. Many of them have been signed between the ISA and developing countries that are willing to engage actively in the work of the ISA through sponsorship of activities in the Area. This is notably the case for four SIDS—Nauru, Kiribati, Tonga, and the Cook Islands—which are sponsoring activities in the Clarion-Clipperton-Fracture Zone currently undertaken respectively by Nauru Ocean Resources Inc., Marawa Research and Exploration Ltd, Tonga Offshore Mining Limited, and Cook Islands Investment Corporation.

The ISA also contributes to the implementation of SDG Targets 14.1 and 14.3 through the three components of its capacity-building scheme: the Contractor training program, the Endowment Fund for marine scientific research, and the internship program. As of today, the ISA has enabled more than 160 qualified scientific and technical personnel from 45 different developing states to participate in training, technical assistance, and scientific cooperation programs.

The ISA has a broad role to play in relation to the protection and preservation of the marine environment from harmful effects that may arise from exploration and exploitation of minerals in the Area. In line with this, and since it came into existence in 1994, the ISA has developed a comprehensive set of rules, regulations, and procedures dealing with prospecting and exploration for minerals resources in the Area. A major effort currently under way is the development of exploitation regulations for which a broad stakeholder consultation process has been engaged. This will provide the necessary framework for regulating and managing exploration and exploitation of deep-sea activities in the Area in a sustainable manner and

will contribute to the effective implementation of international law as reflected in UNCLOS.

Desalination (freshwater generation)

Securing adequate quantities of clean and safe water to meet the needs of a growing population is one of the greatest challenges and obstacle to development. Access to safe drinking water is particularly critical for SIDS and coastal LDCs, with profound implications for economic growth, human rights, public health, and the environment. Meeting this demand for freshwater is expected to become increasingly difficult in the context of climate change, with many regions facing more variable precipitation patterns and decreased water availability. Water managers and planners are increasingly looking at desalination—the conversion of seawater or brackish groundwater to freshwater—as a technical, supply-side solution that can meet current water demands and buffer against the negative impacts of climate change on water resources. Despite its high energy cost, the Intergovernmental Panel on Climate Change lists desalination as an “adaptation option” that may be particularly important in arid and semiarid regions.

The past five years have seen a 57 percent increase in the capacity of desalination plants on-line, according to the latest data published by the International Desalination Association and Global Water Intelligence. This increase in production capacity reflects the fact that coastal communities are increasingly turning to the sea to meet their drinking-water needs, while inland there is a tendency for groundwater to become increasingly brackish over time. Around 60 percent of desalination capacity treats seawater, with the remainder treating brackish and less saline feedwater. Desalination is now used in 150 countries, ranging from Australia to China and Japan, the United States, Spain and other European countries, the Middle East, and North Africa.

Desalination is an attractive option for many water-scarce SIDS and coastal LDCs, especially where the necessary technical and financial capacity is available and when more-traditional strategies are inadequate or inapplicable. Desalination technologies capable of producing significant quantities of water generally have high upfront capital and operational costs and produce environmental impacts that are not well understood but that include potential impacts on marine organisms and their larvae during the intake of seawater (Mezher et al. 2011).

As desalination projects have multiplied, additional concerns have arisen with regards to cumulative impacts,

including temperature pollution (the release into nearby coastal areas of much hotter water used in the process) and the gradual increases in salinity in areas where the brine that results from the process is released (World Bank 2017). These impacts are particularly acute in closed and semi-enclosed bodies of water, where the benefits of dilution through tides and current circulation are limited.

Some of these environmental impacts can be reduced or mitigated, for example through proper siting of seawater intake and dilution of brine before its release in the marine environment. Mitigating impacts, including through capacity building and technology transfer, may make desalination a more sustainable option for SIDS and coastal LDCs confronted with freshwater scarcity. The high demand for energy in desalination has, in a few instances, been addressed through the development of renewable technologies (Ghaffour et al. 2015). For instance, the first solar-powered desalination plant is at the planning stage in Saudi Arabia, and new technology that can both desalinate seawater for drinking and produce electricity by exploiting the difference in temperatures between the surface of the sea and ocean depth (ocean thermal energy conversion, OTEC) is the subject of increasing interest and research. Regardless of these technological advances, however, the costs of desalination technology remain high, and the recourse to desalination remains an option best adapted when other alternatives have been explored and failed.

Renewable Marine (off-shore) Energy

Sustainable marine energy can play a vital role in social and economic development, as well as in climate adaptation and mitigation. While offshore wind energy is becoming more common, particularly in Europe, other forms of marine energy extraction are still experimental, and in most cases have not yet been developed on a commercial scale. These other forms include wave and tidal energy and ocean thermal energy conversion. While these technologies are still untested in SIDS and coastal LDCs, their application on islands is being advanced in Hawaii, where Hawaiian Electric has experimental programs relating to wave energy and OTEC.

Most SIDS and coastal LDCs rely on fuel imports to meet the vast majority of their energy needs, which makes them extremely vulnerable to fluctuating global energy prices and disproportionately high transportation costs. As of 2011, the expenditure on fuel imports in SIDS reached 11.9 percent of GDP, higher than health care spending (UN-DESA 2014). The economic burden of fossil fuel imports slows SIDS development and, together with the

severe environmental burden of carbon dioxide emissions, makes a shift to renewable energy a sustainable development imperative.

For SIDS and coastal LDCs, marine energy could provide a source of clean, renewable energy. The transition to renewables has been slow in SIDS, but with the aid of development partners, SIDS have advanced ambitious targets to become less reliant on fossil fuels, with associated policies being put in place to support the transition. Some examples of developments include the Green Antigua initiative, which includes market incentives and training and certifying renewable energy technicians; the Niue Energy Policy and Energy Action Plan aiming to convert 20 percent of all electricity generation there to renewable energy by 2030; and the 10-year plan in Tonga to reduce reliance on imported fuel for electricity generation.

Maritime Transport, Ports and Related Services, Shipping, and Shipbuilding

In 2015, over 80 percent of the volume of international trade in goods was transported by sea, and this share is even higher for most developing countries. In value terms, some observers such as Lloyd's List Intelligence have estimated the share of maritime seaborne trade at 55 percent of all international trade in 2013, while other estimates exceed 70 percent (UNCTAD 2016).

Globally, shipping provides the principal mode of transport for the supply of raw materials, consumer goods, essential foodstuffs, and energy. It is thus a prime facilitator of global trade and contributor to economic growth and employment, both at sea and ashore. Some estimates indicate that international seaborne trade volumes can be expected to double by 2030 (QinetiQ, Lloyd's Register, and Strathclyde University 2013) while, according to the International Transport Forum, port volumes are projected to quadruple by 2050 (ITF 2015).

The impacts of climate change (such as sea-level rise, increasing temperatures, and more frequent and/or intense storms) pose serious threats to vital transport infrastructure, services, and operations, particularly in SIDS and coastal LDCs, which calls for better understanding of the underlying risks and vulnerabilities and developing adequate adaptation measures. Given the strategic role of ports in the globalized trading system, developing measures for ports to adapt to the impacts of climate and building their resilience is an urgent imperative.

While considerable uncertainties and downside risks are currently weighing down on the various outlooks for the

sector, coastal LDCs and SIDS nevertheless need to position themselves in terms of facilities and capacities to cater for projected seaborne trade growth and in order to optimize their benefits.

Benefitting from the economic opportunities arising from the oceans, including trade, tourism, and fisheries requires investment in transport infrastructure and services and transport policy measures in support of shipping. It also requires efforts to address inter-island/domestic/international shipping connectivity requirements, including their incorporation into the broader regional and international maritime transport connectivity and access agenda.

The main environmental impacts associated with maritime transport include marine and atmospheric pollution, marine litter, underwater noise, and the introduction and spread of invasive species. New international regulations require the shipping industry to invest significantly in environmental technologies, covering issues such as emissions, waste, and ballast water treatment. Some of the investments are not only beneficial for the environment, they may also lead to longer-term cost savings, for example due to increased fuel efficiency.

Two major international conventions have contributed to the reduction in pollution from international shipping: the International Convention for the Prevention of Pollution from Ships and its Annexes and the London Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter and its Protocol. In addition, the International Convention for the Control and Management of Ships' Ballast Water and Sediments seeks to prevent introduction of invasive species from ballast water and will enter into force in 2017. The International Maritime Organization is also developing a set of international measures on biofouling, and in 2014 it adopted guidelines to reduce underwater noise from commercial ships.

While sea transport provides an essential lifeline to SIDS and many coastal LDCs, moving the vast majority of people, goods, and resources, shipping also relies on expensive fossil fuel imports, and in the Pacific SIDS transport consumes some 70 percent of the total fuel imported regionally (UNCTAD 2014). Port infrastructure in SIDS and coastal LDCs is often in poor repair, expensive, difficult to maintain, and vulnerable to extreme weather events. The Pacific Islands Development Forum has highlighted the need for sustainable marine transport transition, noting that development of sustainable sea transport would reduce reliance on imported fuels, and innovative low-carbon technologies in marine transportation are seen as part of the transition to blue/green economies throughout the region.

Waste Disposal Management

As the urban population in some SIDS and coastal LDCs has grown significantly in recent years, the need for extensive waste management systems has likewise increased. For SIDS, almost 90 percent of waste generated is sent to landfills, and the percentage of recycled and composted waste is quite minimal. Because of their limited land area, this situation is particularly problematic for most SIDS. In regards to wastewater, most SIDS for which data were available have more than 20 percent of their population connected to a wastewater collecting system, but the capacity of SIDS to manage wastewater is improving with better access to necessary technologies (UN DESA 2014b). In general, improved waste management, including recycling, is a priority for many SIDS and LDCs as they transition toward a blue economy.

Wastewater, nutrients, and marine litter are the main sources of pollution in marine and coastal areas. Excess nutrients originate from fertilizers, fossil fuel burning, and wastewater from humans, livestock, aquaculture, and industry, leading to air, water, soil, and marine pollution. Wastewater has a direct impact on the biological diversity of aquatic ecosystems, disrupting the fundamental integrity of the life support systems on which a wide range of sectors depend—from urban development to food production and industry. Together, land-based sources account for approximately 80 percent of marine pollution globally (UNESCO 2016), causing eutrophication, harmful algal blooms, and so-called dead zones (hypoxic regions with oxygen levels that are too low to support marine organisms) and resulting in losses in biodiversity and fisheries, diminished recreation and tourism potential, and human health impacts.

The majority of marine litter (about 80 percent) originates from land-based sources, while the remaining 20 percent comes from sea-based sources such as maritime transport, fishing, and industrial exploration. Plastics typically constitute the most important part of marine litter, sometimes accounting for up to 100 percent of floating litter (Galgani, Hanke, and Maes 2015). The impacts of marine litter include entanglement of and ingestion by marine animals, which has been identified as a global problem (see Box 3) (United Nations 2016). Overall, marine litter affects economies, ecosystems, animal welfare, and human health worldwide.

The disposal of hazardous chemical waste related to agriculture and manufacturing poses another challenge, as some SIDS and coastal LDCs lack adequate facilities for storage and disposal. SIDS and coastal LDCs are also faced with the concern of transboundary waste from the

Box 3: Responding to Land-Based Sources of Marine Pollution

The UNEP Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities is an intergovernmental mechanism to address pollution of the marine environment, and it provides active support to countries in pollution mitigation. The Global Partnership on Nutrient Management is a response to the challenge of reducing the amount of excess nutrients in the global environment consistent with global development. The Global Partnership on Marine Litter enhances international cooperation and coordination for implementation of the Honolulu Strategy for prevention and management of marine debris. The Global Wastewater Initiative helps build the foundations for partnerships to initiate comprehensive, effective, and sustained programs addressing wastewater management.

effluents of cruise ships in their ports, as well as ships transiting through their national waters. The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal is an international instrument through which SIDS and coastal LDCs can seek to manage transboundary waste (UN DESA 2014b).

There are myriad other ocean-related business ventures, including some that can contribute to the development of a blue economy. These can include activities such as repurposing plastic debris collected from the marine and coastal environment into products and art, as well as other innovative activities.

Supporting Activities

Ocean Monitoring and Surveillance

Throughout the components of blue economy reviewed in this report, ocean monitoring and surveillance play an important role and can include a wide variety of activities with different legal frameworks. On the one hand, it encompasses monitoring, surveillance, and enforcement of illegal activities, including illegal, unreported, and

unregulated fishing; trans-shipment of contraband; and human trafficking. It can also encompass activities related to human and environmental safety, including search and rescue, weather forecasting, disaster response, and early detection of and response to harmful threats such as oil spills, other pollution, and invasive alien species. Third, this group of activities includes aspects of marine scientific research.

For SIDS with proportionally large marine areas under national jurisdiction (particularly compared with their land territory), as well as for coastal LDCs, monitoring and surveillance are important for ensuring sustainable resource use and disaster prevention, but their implementation is often hampered by lack of capacity, resources, and technology.

While few SIDS or coastal LDCs undertake comprehensive monitoring and surveillance, the Republic of Palau has recently put in place a plan for these activities, and the more effective monitoring, control, and surveillance of its EEZ will have multiple benefits, including greatly improved deterrence, detection, interdiction, and prosecution of IUU fishing and other illegal activities; improved search and rescue capacity; improved pollution detection and response capacity to oil spills; and better weather forecasting, along with improved disaster preparation and response. The plan will also assist with climate change adaptation.

With regard to marine scientific monitoring of the oceans, SIDS and coastal LDCs can benefit from participation in regional and international scientific networks such as the Global Ocean Observing System and the Global Ocean Acidification Observing Network.

Ocean monitoring and surveillance benefits a blue economy not only by deterring the illegal use of resources that may undermine sustainable use but also by providing skilled jobs and building human capacity in SIDS and coastal LDCs.

Ecosystem-based Management

Central to a transformational response to decades of over-fishing, marine pollution, and unplanned coastal development is the need to move from purely sectoral marine and coastal management to a joined approach that incorporates and integrates the seemingly competing interests for oceans and coastal resources with space from different ministries and other stakeholders, within a robust ecosystem approach framework and through a spatial planning perspective, which is key to ensuring equitable access among diverse interests and users.

Marine and coastal ecosystems provide a host of services, some of which are well understood and even quantifiable. But most others are more obscure, poorly understood,

and very difficult to evaluate and quantify. For instance, the services provided in support of the fisheries sector can be scientifically measured (for example, the role that ecosystems such as mangroves and sea grass beds play as feeding, breeding, and nursery grounds for various fish stocks, or as direct sources of food) and even evaluated. But a service such as surge protection or resilience to coastal erosion, sea-level rise, and other impacts of climate change is much less certain and is disproportionately difficult to quantify and valued. Carbon sequestration value is even harder to understand, measure, and quantify and is entirely variable, based geographic location and a host of other biophysical characteristics.

This uncertainty as to the value of the ecosystems should not be an excuse for not taking any and all appropriate measures to protect and manage them, however. Many tools and approaches can be used to apply an ecosystem approach to the management of human activities in ocean and coastal areas. Different ecosystem approaches exist, including those laid out by the Convention on Biological Diversity and FAO. In the context of these approaches, the available tools may include fisheries management measures, other species management measures, integrated marine and coastal area management, marine spatial planning, marine protected areas, and activities supporting carbon sequestration. Overall, a central challenge remains the integration of various management approaches undertaken by different sectors into a comprehensive and cohesive plan, with ecosystems as the central framework.

While this discussion is focused on marine areas under national jurisdiction, it should be noted that the United Nations is currently discussing, in the context of a Preparatory Committee, elements of a draft text of an international legally binding instrument under UNCLOS on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction. Improving the conservation and sustainable use of biodiversity in such areas can benefit SIDS and coastal LDCs through improved cooperation and coordination. This may provide increased opportunities for these areas to participate in marine biotechnology and bioprospecting.

Integrated Coastal and Marine Area Management

Coastal zones are among the most productive areas in the world, offering a wide variety of valuable habitats and ecosystem services that have always attracted humans and human activities. Coastal zones are also among the areas most vulnerable to climate change and natural hazards. Risks include flooding, erosion, and sea-level rise as well as extreme weather events. These impacts are far-reaching and are already changing the lives and livelihoods of coastal communities.

Unlike sectoral approaches that can lead to disconnected decisions, inefficient resource use, and missed opportunities, integrated coastal and marine area management (IMCAM) seeks to coordinate the application of different policies affecting the coastal zone and maritime activities. IMCAM is an iterative process that includes a variety of approaches—from mapping, delineation, and demarcation of the hazard lines and coastal sediment cells to building the capacity of agencies, institutions, and communities to make informed decisions about growing the blue economy within the carrying capacity of its living natural resource base.

According to the Convention on Biological Diversity, IMCAM is now being applied in the majority of coastal countries (CBD 2010). As a holistic approach, IMCAM can be used to manage the multiple threats and pressures in the coastal zone, and it is a major component of developing a blue economy approach.

Marine Spatial Planning

Marine spatial planning is another approach for assisting in a transition to a multistakeholder planning process—one that is gaining considerable importance around the world. Various countries have started to use marine spatial management to achieve sustainable use and biodiversity conservation in oceans and coastal areas. While MSP and IMCAM are similar approaches, IMCAM is generally focused on coastal zones and is often applied on a local scale, while MSP is often applied on larger scales and can extend throughout national Exclusive Economic Zones.

MSP provides a way to integrate human activities without compromising conservation values. Similarly to IMCAM, it provides for operationalizing an ecosystem approach through a planning process involving all stakeholders. Through MSP, the stakeholders can put forward their vision for an area; identify where human activities (including offshore energy, shipping, fishing, aquaculture, tourism, and mining) currently occur and where it might be desirable for them to occur in the future; and identify actual or potential conflicts between different oceans-related uses and human activities and desired conservation outcomes. The resulting spatial plan can provide for sustainable use, while also conserving specific areas through MPAs and other appropriate measures in a manner that avoids potential conflicts.

MSP stakeholders include all ocean users and those who depend on a healthy ocean environment. As with IMCAM, broad stakeholder involvement is important for the long-term success of MSP.

Marine Protected Areas and Marine Managed Areas

Marine protected areas have become a mainstream tool for conserving biodiversity in virtually all coastal countries and SIDS and are recommended under several international and regional treaties and initiatives, including the Convention on Biological Diversity and the Regional Seas Programmes and Action Plans. The past 20 years have seen a dramatic increase in the number and size of MPAs, including large ones in Kiribati and the Cook Islands (Jones and De Santo 2016; Boonzaier and Pauly 2016). MPAs can accomplish a broad range of objectives—from habitat and species protection, fisheries outcomes, sustainable uses, and cultural objectives to public education and outreach and the application of the precautionary and ecosystem approaches. MPAs may also increase the resilience of marine ecosystems to the impacts of climate change and may provide a relatively cost-effective method for adaptation (Jackson et al. 2014).

MPAs have not always reached their full potential, and management effectiveness remains one of the largest problems facing current MPA systems. Management effectiveness requires effective institutions as well as consideration for local livelihoods. The socioeconomic benefits created by MPAs remain difficult to predict and are under debate. MPAs often fail to reach their full potential as a consequence of factors such as illegal harvesting, regulations that legally allow detrimental harvesting, or emigration of animals outside boundaries because of continuous habitat or inadequate size of reserve (Bennett and Deardren 2014; Christie 2004).

Local and traditional approaches have had success in many areas. For example, the Pacific has seen a proliferation of marine managed areas (MMAs) in the last decade. These protected areas, implemented by over 500 communities spanning 15 independent countries and territories, covered over 12,000 square kilometers of ocean space in 2009 (Govan 2009). MMAs are built on a unique feature of the region—customary tenure and resource access—and make use of, in most cases, existing community strengths in traditional knowledge and governance combined with a local awareness of the need for action. Such customary marine managed areas can achieve outcomes benefiting both communities and coastal resources (Jupiter et al. 2014).

Efforts to reach global conservation targets should seek to preserve the effectiveness, representativeness, and connectivity of regional and global MPAs and networks, including through consideration of a range of ecosystem and MPA types and conservation objectives. The latter includes both small MPAs in more heavily used areas, which may also include community-based measures, and larger, more

remote MPAs that may extend to areas beyond national jurisdiction.

Some lessons learned from implementation of marine conservation include the importance of considering community livelihoods when putting in place conservation measures. Areas with strong sociocultural institutions such as customary taboos and marine tenure and with high levels of local engagement in management have been relatively more successful in achieving certain biodiversity outcomes.

Governance structures that foster flexible learning and experimentation (including through adaptive management) and renewed focus on managing the socioeconomic drivers that shape reef conditions are important contributing factors for success. Governance could be improved through increased transparency, accountability, participation, coordination, legitimacy, and adaptability, while fairness or equity could be increased through creating means to share the benefits of conservation locally, particularly by supporting local economic and tourism development, capacity-building programs, and hiring practices (Bennett and Deardren 2014).

Activities Supporting Carbon Sequestration (Blue Carbon)

“Blue carbon” is the carbon captured in oceans and coastal ecosystems (Herr, Pidgeon, and Laffoley 2012). The carbon captured by living organisms in oceans is stored in the form of biomass and sediments from mangroves, salt marshes, sea grasses, and—potentially—algae. Several key coastal habitats, such as sea grasses and mangroves, fix carbon at a much higher rate than comparable terrestrial systems (FAO 2014b; Pendleton et al. 2012). These “blue carbon sinks” can sequester up to five times the amounts of carbon absorbed by tropical forests, and they present an important opportunity for ecosystem-based climate mitigation, which also preserves the essential ecosystem services of these habitats (FAO 2014b).

Globally, the areas of wetland ecosystems declined 64–71 percent in the twentieth century, and wetland losses and degradation continue worldwide (Ramsar 2015). Adverse changes to wetlands and coral reefs are estimated to result in more than US\$20 trillion in losses of ecosystem services annually (Ramsar 2015). The full social cost of carbon released into the atmosphere as a result of mangrove clearance has been estimated at between US\$3.6 billion and US\$18.8 billion per year at a price of US\$41 per ton of carbon dioxide (that is, the true “social” cost) (Pendleton et al. 2012). Conserving marine and coastal ecosystems that sequester carbon could therefore lead to significant emissions reductions.

Arguably, and based on the untapped value of the carbon sequestered thus, if the value of the services provided by these coastal ecosystems in storing carbon could be quantified, payments could theoretically also be extracted, and paid to communities involved in managing and conserving these habitats through a “carbon market approach.” In theory, at least, blue carbon could be traded and handled much like green carbon currently is (such as forest carbon under the UN collaborative initiative on Reducing Emissions from Deforestation and Forest Degradation) and entered into emission and climate mitigation protocols along with other carbon-binding ecosystems (FAO 2014b).

In practice, however, it should be noted that blue carbon has not yet been fully included in emissions accounting and that standards for blue carbon markets are still in their infancy. Some blue carbon pilot projects are currently under way around the world, including in SIDS and coastal LDCs, and research on carbon storage capacity of coastal ecosystems is being undertaken, but much uncertainty still prevails. For instance, it is already understood that carbon absorption capacity will differ based on geography and the physical interactions at play, so it would be almost impossible to come up with one proxy value, based on area of coverage, for instance.

Nevertheless, carbon absorption is clearly one of the critical ecosystem services that must be quantified and valued (along with other services such as shelter, resilience to erosion, source of food, and so on), with the potential for a whole blue carbon sector to emerge eventually, particularly as carbon prices on the voluntary or compliance markets increase.

Supportive Financial Mechanisms

A blue economy offers SIDS and coastal LDCs the opportunity to diversify from a narrow production base, invest in and develop growth and employment opportunities in a wide range of both existing and new sectors and industries, and shift away from predominantly land-based industries toward those that integrate and sustainably develop a broader range of land-based, coastal, and ocean-based sectors.

Pursuing a blue economy approach requires access to affordable long-term financing at scale, but SIDS and coastal LDCs have often had limited success in catalyzing public and private investments in the blue economy, particularly at a scale that would allow the transition of established sectors of the economy or that would open up new sectors. Many SIDS and coastal LDCs have experienced stagnant or declining flows of development assistance and direct foreign investment. They may also have unsustainable levels of external debt that further act as a barrier for

the transition toward a blue economy (Rustomjee 2016; Economist Intelligence Unit 2015).

An additional challenge includes developing the enabling conditions for the blue economy, including institutional, regulatory, governance, and legislative frameworks as well as the human resources needed to achieve both intersectoral and transboundary coordination.

Sources of financing can be broken down to two major components. The first includes support for governance reform, ecosystem-based management of marine areas and resources, and other enabling conditions required for a blue economy. Activities in this category have been advanced and financed by the Global Environment Facility (GEF), the United Nations Development Programme (UNDP), the World Bank Group, the United Nations Environment Programme, and FAO. The second category includes new and innovative sources of financing such as debt for nature swaps and blue bonds.

As an example of the first category, over the last 20 years UNDP-GEF have successfully developed and applied a series of oceans and coastal market transformation methodologies that have proved effective at removing barriers and putting in place an enabling policy environment that can catalyze sizeable quantities of public and private sector financial flows for oceans restoration and protection. The instruments for transformation include the Transboundary Diagnostic Analysis/Strategic Action Programme, which allows countries to work together to address common issues in shared ecosystems; the Integrated Coastal Management/Framework for Sustainable Development of Coastal Areas; and Global or Regional Ocean Legal Frameworks. This last approach involves building upon and helping to advance an existing or anticipated intergovernmental process of negotiating a new regional or global legal framework to address a major oceans-related issue.

Each of these frameworks allows the advancement of ocean governance as an enabling condition for the transition toward a blue economy. Lessons from the application of these methodologies have shown that correcting market and policy failures through the application of science-based integrated ocean planning and barrier removal instruments can not only act catalytically to restore and protect coasts and oceans, it can also generate sizeable business activity and jobs when job creation activities are deliberately built into ocean management reforms.

In the second category are a small but growing number of international public financing and other innovative instruments that are emerging to finance investments in both existing, nascent, and new sectors. Examples include financing through marine conservation, such as visitor entry fees to marine protected areas; debt for nature

Box 4: Blue Bonds

Blue bonds are modeled after green bonds. They are issued to raise capital and investment for existing and new projects with environmental benefits. The Seychelles plan to issue blue bonds, the first trial of this instrument among SIDS. Bond sales, facilitated by multilateral institutions including the World Bank and the African Development Bank, will fund the implementation of a fisheries management plan to develop the Seychelles' semi-industrial and artisanal fisheries (Rustomjee 2016). The World Bank is currently considering a number of projects in which blue bonds provide the means to fund blue economy and fisheries development. The lessons from these projects will be shared post-implementation, as soon as they become available. If the trial is successful, both debt swaps and blue bonds offer significant new blue financing potential for SIDS and coastal LDCs.

swaps, which mobilize private impact investor resources to swap out high-interest-bearing sovereign debt in exchange for governmental commitments to conservation and to climate adaptation and mitigation; and blue bonds, an adaptation of land-based green bond instruments to finance the blue economy (see Box 4).

Debt for coastal/marine nature swaps allow a country to redirect a portion of its current debt payments to fund nature-based solutions to climate change, including marine spatial planning and networks of marine protected areas. For example, the Seychelles is proceeding with a \$30 million debt for conservation swap in exchange for the government's commitment to enhance marine conservation and climate adaptation, including protecting important tuna feeding grounds. The initiative will also establish a permanent endowment generating sustainable financing for marine conservation and climate adaptation activities in the Seychelles.

Public sector finance and philanthropic capital alone are not sufficient to finance a transition to a blue economy. Private capital also has a role to play. The Coalition for Private Investment in Conservation was launched during the 2016 IUCN World Conservation Congress; it aims to help preserve the world's most important ecosystems by creating new opportunities for return-seeking private investment in conservation. There are also efforts to create linkages between investors and those needing funding through initiatives such as the World Ocean Investment Platform. The World Ocean Council is developing the Ocean Investment Platform as a global structure and process to bring the investment community together with major ocean use companies and the companies providing the solutions to ocean sustainable development challenges. The Ocean Investment Platform serves as a uniquely ocean-oriented intermediary/matchmaker to help investors source deals, assess risks and returns, assess impacts, evaluate projects/solution providers, and develop "blended" sources of finance for ocean sustainable development investment opportunities.

ANNEX 1: LINKAGES BETWEEN TARGETS

Target 14.7 is related to all other SDGs, and is instrumental for reaching many of them. At the same time, success in achieving other SDGs often underlies the ability to reach target 14.7 and other SDG 14 targets.

In addition to target 14.7, the activities undertaken as part of the various sectors of the blue economy are linked to the achievement of other SDG14 targets. Table A provides a summary of these contributions. It should be noted that these linkages are explored further through the work of other Informal Preparatory Working Groups (IPWGs). For example, IPWG 4 is addressing sustainable management of fisheries and the elimination of fisheries subsidies that contribute to overfishing and illegal, unreported, and unregulated fishing; more-substantive inputs around these issues, particularly subsidies, are being developed as part of their work.

Table A: Relevance of Blue Economy Sectors and Activities to SDG 14 Targets

Blue Economy Sector or Activity	Relevant SDG 14 Target (in addition to 14.7)	Rationale
Fisheries	Target 14.1 <i>By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution</i>	Improved fisheries management will contribute to a reduction in sea-based pollution from fishing vessels, including in the form of discarded fishing gear, which will help reduce marine debris and ghost fishing
	Target 14.2 <i>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</i>	Improved fisheries management will build resilience of ocean ecosystems as a whole

Blue Economy Sector or Activity	Relevant SDG 14 Target (in addition to 14.7)	Rationale
	<p>Target 14.4 <i>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</i></p>	<p>Achievement of targets 14.7 and 14.4 depend on each other</p>
	<p>Target 14.6 <i>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</i></p>	<p>Achievement of targets 14.7 and 14.6 depend on each other</p>
	<p>Target 14.9 <i>Provide access for small-scale artisanal fishers to marine resources and markets</i></p>	<p>Access to markets will allow artisanal fishers to benefit from the blue economy</p>
<p>Aquaculture</p>	<p>Target 14.1</p>	<p>Sustainable aquaculture causes minimal pollution and in the case of seaweed and mollusk culture is a net remover of nutrients from the aquatic environment</p>
	<p>Target 14.2</p>	<p>Sustainable, climate-smart aquaculture can help build resilience by increasing incomes and diversifying livelihoods</p>

(continued)

Blue Economy Sector or Activity	Relevant SDG 14 Target (in addition to 14.7)	Rationale
Bioprospecting and biotechnology	Target 14.8 <i>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</i>	Capacity building and technology transfer are required for SIDS and developing countries to participate in marine bioprospecting and biodiscovery activities
	Target 14.10 <i>Enhance the conservation and sustainable use of oceans and their resources by implementing international law as reflected in UNCLOS, 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</i>	Benefit sharing from the use of marine genetic resources is tied to the implementation of international law, including the Nagoya Protocol for areas under national jurisdiction; discussions are ongoing on a new international legally binding instrument under UNCLOS on the conservation and sustainable use of marine biodiversity of areas beyond national jurisdiction.
Extractive industries	Target 14.2	Deep-sea mining can undermine the resilience of marine ecosystems and species and should thus be preceded by effective social and environmental impact procedures
	Target 14.8	Capacity building and technology transfer are required for SIDS and developing countries to participate in extractive activities
Renewable (offshore) energy	Target 14.2	Ocean energy helps build self-sufficiency and reduce pollution, thus increasing resilience of SIDS and coastal countries
	Target 14.8	Capacity building and technology transfer are required for SIDS and developing countries to benefit from ocean energy and other renewables

Blue Economy Sector or Activity	Relevant SDG 14 Target (in addition to 14.7)	Rationale
Desalination (fresh water generation)	Target 14.1	Desalination technologies may cause pollution in the form of brine and CO ₂ emissions, which will need to be reduced through appropriate technologies, including renewable sources of energy
	Target 14.2	Desalination, together with water conservation and good water governance, can help build self-sufficiency
	Target 14.8	Desalination plants are expensive; financing, capacity building, and technology transfer are required for SIDS and developing countries to benefit from desalination
Maritime transport, ports and related services, shipping and shipbuilding	Target 14.1	Improved implementation of shipping regulations will reduce sea-based pollution
	Target 14.2	Improvement in management of ballast water, biofouling, and other transportation-related vectors of invasive species will improve overall resilience of marine and coastal ecosystems
	Target 14.8	Implementation of more-sustainable and low-carbon transportation systems globally will require both capacity building and technology transfer
	Target 14.10	Implementation of international law pertaining to the conservation and sustainable use of oceans and their resources, including, e.g., shipping
Coastal development	Target 14.1	Coastal development can increase in increased sedimentation and pollution, which will need to be reduced through sustainable operations
	Target 14.2	Sustainable coastal development and integrating climate change considerations into planning and development can enhance economic, social, and environmental resilience

(continued)

Blue Economy Sector or Activity	Relevant SDG 14 Target (in addition to 14.7)	Rationale
Coastal and maritime tourism	Target 14.1	Sustainable tourism reduces marine pollution both from land-based and ship-based sources
	Target 14.2	Sustainable tourism can help build ecosystem and human resilience
	Target 14.5 <i>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</i>	Sustainable tourism can provide financing for marine protected areas
Ocean monitoring and surveillance	Target 14.2	Ocean monitoring provides better data for sustainable management and protection
	Target 14.3 <i>Minimize and address the impacts of ocean acidification, including through enhanced scientific cooperation at all levels</i>	Monitoring ocean acidification is an important component of gaining better scientific understanding about acidification and its impacts
	Target 14.4	Monitoring and surveillance are important components of sustainable fisheries
	Target 14.5	Monitoring and surveillance are important for marine protected area management
	Target 14.8	Capacity building and technology transfer are required for SIDS and developing countries to benefit from ocean surveillance technologies
	Target 14.10	Ocean monitoring and surveillance will assist in implementing international law, including UNCLOS
Coastal and marine area management, protection, and restoration activities	Target 14.2	Coastal and marine area management, protection, and restoration are key components of Target 14.2
	Target 14.3	While there are scientific uncertainties, marine protection may help provide marine ecosystems and species a better chance to adapt to the impacts of ocean acidification

Blue Economy Sector or Activity	Relevant SDG 14 Target (in addition to 14.7)	Rationale
	Target 14.4	IMCAM, MPAs, and restoration activities help achieve more-sustainable fisheries
	Target 14.5	Marine protection will help achieve Target 14.5
	Target 14.10	Implementing IMCAM, MSP, and MPAs is part of a number of existing international agreements; area-based management tools, including MPAs, are also being considered as part of United Nations discussions on an international legally binding instrument under UNCLOS on the conservation and sustainable use of marine biodiversity of areas beyond national jurisdiction
Activities supporting carbon sequestration (blue carbon)	Target 14.2	Management of blue carbon ecosystems will not only maintain their capacity to store carbon and provide possible economic benefits, but will also to strengthen their resilience
	Target 14.5	Where blue carbon ecosystems are conserved via marine protected areas or other effective means, they would also contribute to achievement of Target 14.5.
Waste disposal management	Target 14.1	Waste disposal management is a key activity for reducing pollution of the coastal and marine environment
	Target 14.2	Waste disposal management contributes to sustainable management of marine ecosystems and builds resilience

REFERENCES

- Appeltans, W., S. T. Ahyong, G. Anderson, M. V. Angel, T. Artois, N. Bailly, R. Bamber, A. Barber, I. Bartsch, and A. Berta. 2012. The magnitude of global marine species diversity. *Current Biology* 22: 2189–2202.
- Arnaud-Haond, S., J. M. Arrieta, and C. M. Duarte. 2011. Marine biodiversity and gene patents. *Science* 331: 1521–1522.
- Bell, J. D., V. Allain, E. H. Allison, S. Andréfouët, N. L. Andrew, M. J. Batty, M. Blanc et al. 2015. Diversifying the use of tuna to improve food security and public health in Pacific Island countries and territories. *Marine Policy* 51: 584–591.
- Bennett, N. J., and P. Dearden. 2014. Why local people do not support conservation: community perceptions of marine protected area livelihood impacts, governance and management in Thailand. *Marine Policy* 44: 107–116.
- Boonzaier, L., and D. Pauly. 2016. Marine protection targets: an updated assessment of global progress. *Oryx* 23 50(01): 27–35.
- CBD (Convention on Biological Diversity). 2010. Report on implementation of the programme of work on marine and coastal biological diversity. Document UNEP/CBD/SBSTTA/14/INF/2 for the fourteenth meeting of the Subsidiary Body on Scientific, Technical and Technological Advice. Nairobi, 10–21 May.
- Christie, P. 2004. Marine protected areas as biological successes and social failures in Southeast Asia. *American Fisheries Society Symposium* 42: 155–164.
- Creary, M. 2007. Jamaica’s marine genetic resources: Challenges and opportunities. Presentation and abstract for the Eighth meeting of the United Nations Informal Consultative Process on Oceans and the Law of the Sea. New York, 25–29 June.
- Curtis, T. P., W. T. Sloan, and J. W. Scannell. 2002. Estimating prokaryotic diversity and its limits. *Proceedings of the National Academy of Sciences* 99: 10494–10499.
- Economist Intelligence Unit. 2015. *Investing in the Blue Economy—Growth and Opportunity in a Sustainable Ocean Economy*. Briefing Paper.
- FAO (Food and Agriculture Organization). 2014a. *Securing Fish for the Caribbean*. FAO Subregional Office for the Caribbean Issue Brief #10, October.
- . 2014b. *Global Blue Growth Initiative and Small Island Developing States*. Rome.
- . 2014c. *SAVE FOOD: Global Initiative on Food Loss and Waste Reduction*. Background paper on the economics of food loss and waste. Working paper. Rome.
- . 2016. *The State of World Fisheries and Aquaculture 2016. Contributing to Food Security and Nutrition for All*. Rome.
- . 2017. *Blue Growth Initiative*. Rome.
- Galgani, F., G. Hanke, and T. Maes. 2015. Global distribution, composition and abundance of marine litter. In *Marine anthropogenic litter* (pp. 29–56). Springer International Publishing.
- Ghaffour, N., J. Bundschuh, H. Mahmoudi, and M. F. Goosen. 2015. Renewable energy-driven desalination technologies: A comprehensive review on challenges and potential applications of integrated systems. *Desalination* 356: 94–114.

- Govan, H. 2009. Status and potential of locally-managed marine areas in the South Pacific: meeting nature conservation and sustainable livelihood targets through wide-spread implementation of LMMAs. SPREP/WWF/WorldFish-Reefbase/CRISP.
- Herr, D., E. Pidgeon, and D. Laffoley (eds). 2012. Blue carbon policy framework: based on the discussion of the international blue carbon policy working group. International Union for Conservation of Nature and Arlington Conservation International, Virginia: Conservation International, Gland.
- Hunt, B., and A. C. Vincent. 2006. Scale and sustainability of marine bioprospecting for pharmaceuticals. *AMBIO: A Journal of the Human Environment*, 35(2): 57–64.
- IRENA (International Renewable Energy Agency). 2016. *Innovation Outlook: Off shore Wind*. Abu Dhabi.
- ITF (International Transport Forum at the OECD). 2015. *ITF Transport Outlook 2015*. Paris.
- Jackson, E. L., A. J. Davies, K. L. Howell, P. J. Kershaw, and J. M. Hall-Spencer. 2014. Future-proofing marine protected area networks for cold water coral reefs. *ICES Journal of Marine Science* 71: 2621–2629.
- Jones, P. J. S., and E. M. De Santo. 2016. Viewpoint—is the race for remote, very large marine protected areas (VLMPPAs) taking us down the wrong track? *Marine Policy* 73: 231–234.
- Jupiter, S. D., P. J. Cohen, R. Weeks, A. Tawake, and H. Govan. 2014. Locally-managed marine areas: multiple objectives and diverse strategies. *Pacific Conservation Biology* 20(2): 165–179.
- Mele, Gianluca. 2014. “Mauritania Economic Update: 1.” World Bank, Washington, DC. <http://documents.worldbank.org/curated/en/2014/07/20133610/mauritania-economic-update>.
- Mezher, T., H. Fath, Z. Abbas, and A. Khaled. 2011. Techno-economic assessment and environmental impacts of desalination technologies. *Desalination* 266(1): 263–273.
- Pendleton, L., D. C. Donato, B. C. Murray, S. Crooks, W. A. Jenkins, S. Sifleet, C. Craft et al. 2012. Estimating global “blue carbon” emissions from conversion and degradation of vegetated coastal ecosystems. *PLoS ONE* 7(9):1–7.
- QinetiQ, Lloyd’s Register, and Strathclyde University. 2013. *Global Marine Trends 2030*.
- Ramsar. 2015. *State of the World’s Wetlands and Their Services to People: A Compilation of Recent Analyses*. Ramsar Briefing Note 7. Ramsar Convention on Wetlands.
- Rustomjee, C. 2016. *Financing the Blue Economy in Small States*. Center for International Governance Innovation.
- Secretariat of the Pacific Community. 2010. *The Future of Pacific Island Fisheries*. Noumea, New Caledonia.
- Suttle, C. A. 2013. Viruses: unlocking the greatest biodiversity on Earth. *Genome* 56: 542–544.
- UNCTAD (United Nations Conference on Trade and Development). 2014a. *Small Island Developing States: Challenges in Transport and Trade Logistics*. Background note to third session of Multi-Year Expert Meeting on Transport, Trade Logistics and Trade Facilitation. Geneva, 24–26 November.
- . 2014b. *The Oceans Economy: Opportunities and Challenges for Small Island Developing States (SIDS)*. United Nations, Geneva.
- . 2016. *Review of Maritime Transport 2016*. United Nations, Geneva.
- UNDESA (United Nations Department of Economic and Social Affairs). 2008. *Achieving Sustainable Development and Promoting Development Cooperation*. Dialogues at the Economic and Social Council. United Nations, New York.
- . 2014a. *Blue Economy Concept Paper*. United Nations, New York.
- . 2014b. *Trends in Sustainable Development: Small Island Developing States (SIDS)*. United Nations, New York.
- UNECA (United Nations Economic Commission for Africa). 2016. *Africa’s Blue Economy: A Policy Handbook*. Economic Commission for Africa, Addis Ababa, Ethiopia.
- UNEP (United Nations Environment Programme). 2013. *Green Economy Definition*. Nairobi.
- . 2015. *Blue Economy—Sharing Success Stories to Inspire Change*. UNEP Regional Seas Report and Studies No. 195. Nairobi.
- UNESCO. 2016. *Facts and Figures on Marine Pollution*. Paris.
- United Nations. 2016. *The First Global Integrated Marine Assessment: World Ocean Assessment I*, by the Group of Experts of the Regular Process. New York.
- UNWTO (United Nations World Tourism Organization). 2014. *Tourism in Small Island Developing States (SIDS): Building a More Sustainable Future for the People of Islands*.

UN-OHRLLS (Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries and Small Island Developing States). 2016. About LDCs.

World Bank. 2012a. *Inclusive Green Growth—The Pathway to Sustainable Development*. Washington, DC.

———. 2012b. *Hidden Harvest—The Global Contribution of Capture Fisheries*. Report No. 66469-GLB. Washington, DC.

———. 2013. *Fish to 2030—Prospects for Fisheries and Aquaculture*. World Bank Report Number 83177-GLB. Washington, DC.

———. 2016a. *Blue Economy Development Framework—Growing the Blue Economy to Combat Poverty and Accelerate Prosperity*. April.

———. 2016b. *Sunken Billions Revisited. Progress and Challenges in Global Marine Fisheries*. Washington, DC.

———. 2016c. *Pacific Possible: Precautionary Management of Deep Sea Mining Potential in Pacific Island Countries*. Washington, DC.

World Bank and Food and Agriculture Organization. 2008. *The Sunken Billions: The Economic Justification for Fisheries Reform*. Washington, DC.

WTTC (World Travel and Tourism Council). 2016. *Travel and Tourism Economic Impact Summary 2016*.

WWF. 2015. Principles for a Sustainable Blue Economy.

